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MANNED-UNMANNED TEAMING

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Aviation Digest

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ABOUT THE COVER

Sharing information within manned-unmanned team operations.

Editor's Note

"If you are far from the enemy, make him believe you are near."
-Sun Tzu

The complexity and ambiguity of modern battlefields require manned and unmanned systems to roll back the 'fog of war' providing combat commanders improved situational awareness and enhanced mission command. Combat experience demonstrates teaming of manned and unmanned aircraft enhance combat power in ways that far exceed the additive value of separate systems. The capability and reach unmanned aircraft systems offer U.S. forces along with manned systems give them the ability to be simultaneously near and far to the enemy. As the Army continues to expand its unmanned aircraft systems (UAS) roles and responsibilities, commanders increasingly recognize that manned-unmanned teaming (MUM-T) will be even more crucial in the future success of operations.

Today, the AH-64E Apache helicopter pilots are able to control the flight path and payload of the MQ-1C Gray Eagle through Level of Interoperability (LOI) 4. This teaming capability reduces the sensor-to-shooter lag enabling faster and more accurate engagements. MUM-T tactics, techniques, and procedures (TTP) are successfully maturing; however, the opportunity to fully develop TTPs goes beyond Army helicopters and UAS platforms. Manned-unmanned teaming brings synergy to the battlefield where each platform, ground or air, uses its combat systems in the most efficient mode to supplement each team member's capabilities in missions such as overwatch of troops in combat engagements, route reconnaissance, and convoy security. Continued improvements to ground control system architecture will allow real-time users to control UAS payloads and tailor the environmental picture to meet their specific planning and mission needs.

As this edition of Aviation Digest shows, MUM-T provides the increased security capability and lethality combat commanders demand in an ever complex and dynamic operational environment. The edition also illustrates that to remain at the cutting edge of MUM-T, U.S. Army Aviation must continue to advance its development and training to fully expand this capability at the tactical and operational levels where it can provide unparalleled ability to combat commanders in any theater of operation.

ABOVE THE BEST!

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The Command Corner

I continue to be impressed with the articles our Aviation leaders in the field contribute to Aviation Digest that are relevant and oriented on issues that affect the Aviation force today. As we implement the Aviation Restructure Initiative, we must maintain a dialogue of lessons learned and emerging tactics, techniques, and procedures (TTP) in order to continue to maximize emerging capabilities and retain training overmatch. This dialog drives innovative methods to train the way we fight and is essential to develop leaders that understand and know how to plan and prepare realistic and rigorous training while replicating the complexities of the current operational environment.

The articles in this quarter's Aviation Digest focus on manned-unmanned teaming (MUM-T). They provide valuable insights into the emerging TTP along with observations and lessons learned on how to best realize the full potential of this critical component of how we will fight in the future. Though some may believe that MUM-T is old news, the truth is, we've only scratched the surface of the possible. We are entering a period of great opportunity for our Soldiers and leaders in the field to innovate and discover new ways to realize the full potential of MUM-T.

At the center of Army Aviation's current MUM-T strategy is the teaming of systems now resident to the combat aviation brigade: the RQ-7Bv2 Shadow, MQ-1C Gray Eagle, AH-64E Apache, and OSRVT.   This MUM-T strategy not only enables reconnaissance and security over larger areas and increases situational awareness to both air and ground commanders, it also reduces kill chain timelines required through positive identification (PID) of enemy forces, provides more rapid clearance of fires and target designation, and enables air and ground forces to gain and maintain a position of relative advantage by maneuvering out of contact. The United States Army Aviation Center of Excellence continues to work deliberately with other Army Centers of Excellence (Maneuver, Fires, Intelligence, Maneuver Support, etc.) to mature this strategy by further development of MUM-T TTP and incorporation of these TTP into existing doctrine, as well as shape requirements for ranges, simulations, gunnery, and professional military education.

We have tremendous talent in our Branch, and the professional discussion generated from articles written by leaders in the field enables us to hone the already sharp edge that commanders and Soldiers on the ground have come to expect from Army Aviation. We have executed manned-unmanned teaming for more than a decade, but we are not even close to achieving its full capability. As each of you use these systems in the field, at the combat training centers, and while deployed, I would encourage you to continue the dialog about the successes and challenges you encounter so we can continue to improve this very versatile capability.

Thanks for all you do every day in service to our Nation and in support of our Soldiers and units on the ground.

Above the Best!

Mike Lundy
Major General, USA Commanding

MANNED - UNMANNED TEAMING - “TRAINING is the Key Ingredient”

By Mark Taylor

I have the privilege to work in the Training and Doctrine Command Capability Manager’s office for Unmanned Aircraft Systems (UAS) at Fort Rucker, AL. In this article, I would like to share with you some of the insights that I have gained observing the fielding and training of UAS for the past six years. My goal is to offer some relevant recommendations for those of you who will be responsible for the integration of UAS into aviation formations and the execution of manned-unmanned teaming (MUM-T).

Over the last several years there have been strategies developed, articles written, demonstrations conducted, and numerous briefings devoted to describing the concepts of MUM-T. However, many are still asking the question, “What is MUM-T?” If you are familiar with the terms Air-Land Battle, Combined Arms, Air-Ground Integration and Air-Ground Operations, you know more than you think about MUM-T. My aviation background consists of service in four separate Apache battalions, all four organized with the OH-58A/C as the scout component of the Scout Weapons Team. Okay sorry, short history lesson. The OH-58D (unarmed) was initially planned to replace the OH-58A/C. Instead, the OH-58D was organized as a target acquisition and reconnaissance platoon under the general support aviation battalion. Team training between the AH-64A and the OH-58D required coordination outside of my battalion but was necessary and critical when tasked to prepare for live fire cooperative engagements. With MUM-T we are talking about the same thing, but now UAS will be in the attack reconnaissance battalion and the attack reconnaissance squadron. I think we can check that one off as a lesson learned!

The current definition of MUM-T as defined in the 2013 MUM-T Strategy Brief developed at the United States Army Aviation Center of Excellence (USAACE) is;

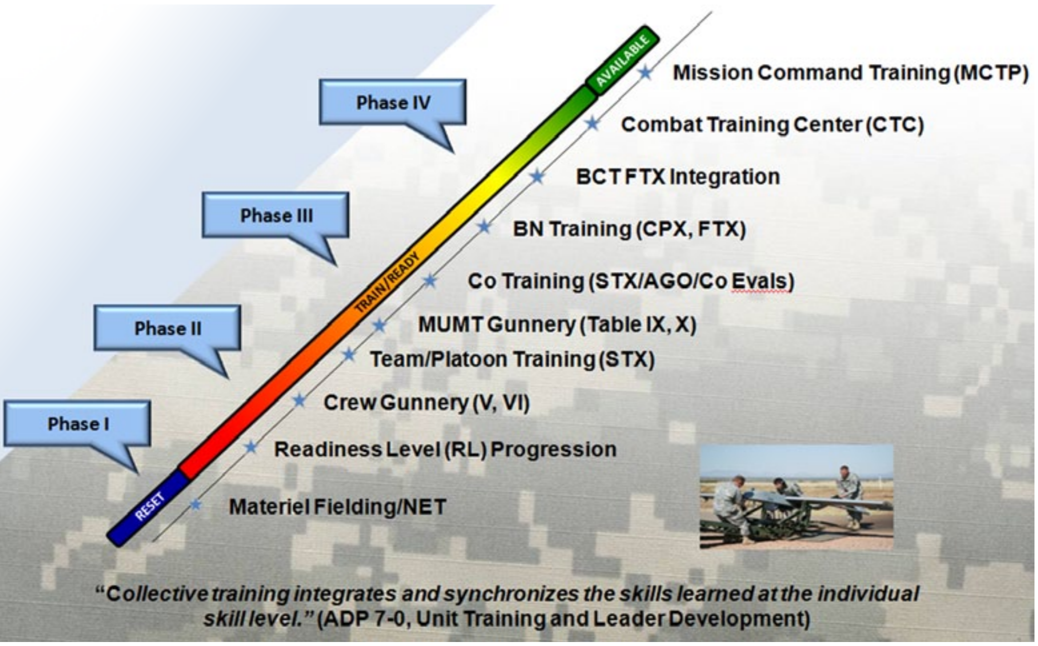
The synchronized employment of Soldiers, manned and unmanned air and ground vehicles, robotics, and sensors to achieve enhanced situational understanding, greater lethality, and improved survivability. The concept of MUM-T is to combine the inherent strengths of manned and unmanned platforms to produce synergy and overmatch with asymmetric advantages.

Synchronize employment, combine the inherent strengths, produce synergy and overmatch... How do units, teams, and crews get to the point where they can synchronize, combine, and produce synergy? I know this is coming from an “old guy” but ***TRAINING*** is the key. In my previous life, I taught a Battle Focused Training class to all the new Aviation lieutenants and warrant officers coming through the Aviation Basic Officer Leadership Course. As part of the class, I used an example of my high school football days to describe the basic concepts of Army training. If you have played football or any other sport, you remember that you didn’t just show up on game night. You started in the heat of August and practiced twice a day. Players were divided into groups - backs, receivers, and linemen. This individual training continued until the coaches were convinced we were ready for collective training.

One of my first experiences observing UAS Soldiers in action was during a limited user test for the MQ-1C Gray Eagle. The test report that followed the event highlighted certain areas for improvement which included training. Some of the same issues were repeated later during the initial operational test and other collective training venues as well. After conducting analysis, one of the main contributing factors that stood out was the lack of time available to prepare for collective training events. I know all units and leaders would love to have more time for training so let me explain. Due to the high demand for UAS capability (full motion video) in two theaters of war, many of the new UAS Soldiers were going straight to the fight immediately following their qualification course with very little time for readiness level (RL) progression. Other examples included UAS units forming at Edwards Air Force Base in California and within just a few months supporting ground units at the National Training Center (NTC) at Fort Irwin. Most recently I have observed units at the NTC and participated in USAACE’s lesson learned collection efforts (Umbrella Weeks) with combat aviation brigades upon their return from deployment. With regard to MUM-T, the overarching comments have been the same. Units were not organized nor afforded the opportunity to train for MUM-T at home station and much of the MUM-T that occurred in theater has been primarily the result of dynamic re-taskings. With that said, a big Army Hooaahh to all those out there who

made it happen in theater and provided the necessary support to our brothers in arms on the ground.

As the Aviation Branch moves forward with the integration of UAS into our formations, we now have the opportunity



to train as we fight. Below are some recommendations that you may also see again in the MUM-T Handbook by the time this article is published.

Institutional/individual training is the foundation of Army training. In accordance with Army Doctrine Publication 7-0, Unit Training and Leader Development, "collective training integrates and synchronizes the skills learned at the individual skill level." To ensure success at the collective level, it is essential that leaders at all levels receive appropriate training on the capabilities and effective employment of manned and unmanned systems. A detailed "crawl-walk-run" training strategy as depicted in the figure below is essential for manned and unmanned unit personnel to develop a strong, more efficient aviation team in support of the ground commander's scheme of maneuver.

RL Progression

Manned aviators and unmanned operators share a common requirement when it comes to individual training. Both have individual tasks outlined in aircrew training manuals. Although the emphasis is on individual training, it is important during this phase of training to conduct classes together to ensure team members understand each other's capabilities and limitations. It is also extremely important to begin reaching out to the supported units and briefing MUM-T capabilities. As training advances from RL 3 to RL 2 and into mission training, additional coordination is required to synchronize training with company and platoon level supported ground units during situational training exercises. Recommended topics during academic classes are:

- Focus on fundamentals of reconnaissance for UAS operators
- Standard operating procedures for communication among team members
- UAS capabilities and limitations briefs for manned aviators and supported ground units
- One system remote video terminal capabilities and employment for supported ground units

Crew Gunnery

Training Circular 3-04.45, outlines requirements for aviators and UAS operators to conduct crew qualification but it also incorporates training requirements for cooperative engagements through advanced tables. Recommended tactics, techniques, and procedures for planning and conducting successful gunnery training include:

- As depicted in Figure 2-1 Gunnery Tables, a crawl-walk-run methodology is necessary to ensure crews are prepared for advanced tables including manned and unmanned teaming.
- Use training aids, devices, and simulation systems to the greatest extent possible.

Company Level Training

The goal for this phase of training should be air-ground operations (AGO). Integration with ground unit training requires prior coordination support between aviation units and G-3/brigade combat team planners. Recommended training includes:

- AGO integration during ground unit company/platoon level situational training exercises

Battalion/Brigade Combat Team Integration

AGO training at the company level should prepare aviation and ground units for integration at the battalion and brigade combat team collective level. These exercises normally occur as a "ramp up" for a combat training center rotation.

This detailed home station training strategy has proven to enhance interaction, overall unit effectiveness and mission success at combat training centers and in combat.

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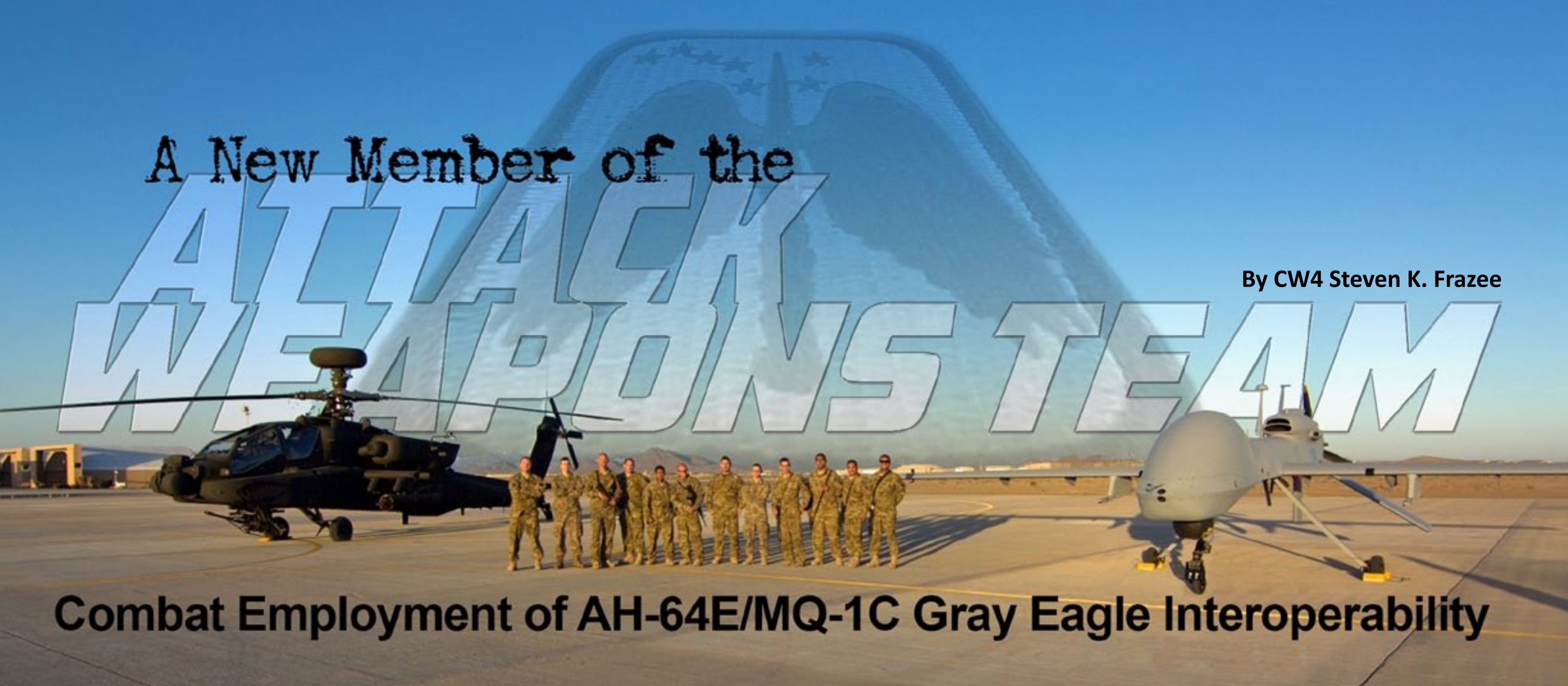
Acronym Reference

AGO - air-ground operations
MUM-T - manned-unmanned teaming
NTC - National Training Center
RL - readiness level
UAS - unmanned aircraft systems
USAACE - United States Army Aviation Center of Excellence

A New Member of the ATTACK WEAPONS TEAM

By CW4 Steven K. Frazee



Combat Employment of AH-64E/MQ-1C Gray Eagle Interoperability

Photo (Above): AH-64E pilots and crew chiefs from TF TIGERSHARK and Gray Eagle operators conducting LOI training in Afghanistan.

"Rifle, Time of flight 19 seconds." These words, and the successful Hellfire strike that followed, were the culmination of over a year of training at home station and a very busy week of unmanned aircraft systems (UAS) and AH-64E Apache integration in Afghanistan. On 12 May 2014, elements of 1-229th Attack Reconnaissance Battalion (ARB) conducted the first ever team employment of the AH-64E and the MQ-1C Gray Eagle in Operation Enduring Freedom (OEF).

The event depicted above started nearly a year earlier at Joint-Base Lewis McChord, Washington during the fielding of the AH-64E with 1-229th ARB, 16th Combat Aviation Brigade (CAB). For AH-64E aviators, training with the Gray Eagle UAS begins at the earliest stages of the aircraft transition course. AH-64E pilots are taught UAS theory of operation; UAS levels of interoperability (LOI); and basic tactics, techniques and procedures (TTP) during a 40-hour block of academic instruction. They also receive 18 hours of simulation training in the AH-64E Longbow Crew Trainer (LCT). Levels of interoperability 2 through 4 are available to the AH-64E crew for UAS integration. Level 2 allows viewing of the UAS video by the AH-64E crew; Level 3 allows video viewing and sensor control; and Level 4 allows video sharing, sensor control, and UAS flight path manipulation by the AH-64 crews. AH-64E crews use both desktop crew trainers and the aircraft LCT to master LOI skills. The training culminates in the LCT where each AH-64E crew must conduct a tactical mission. Here, the crew is required to operate against an enemy equipped with a sophisticated air defense capability and is tasked with employing the UAS as an integrated element of the team, known locally as a linked attack weapons team (LAWT). The crew must conduct both autonomous and remote engagements using the UAS to enhance the lethality of the AH-64E in a high threat environment while also employing the UAS in a manner that ensures its survival.

The instruction provided to Task Force (TF) Tigershark AH-64E crews was presented by subject matter experts from the Apache Project Manager's team, as well as 1-229th ARB Standardization Instructor Pilots and validated by the Directorate of Evaluation and Standardization, United States Army Aviation Center of Excellence. The training armed Tigershark aircrews with the basic knowledge required to conduct LOI integration once they deployed to OEF. The only missing piece to this high quality instruction and certification was a real-world battle drill, teaming an AH-64E with the Gray Eagle. Due to the high operational tempo of TF Tigershark in preparation for deployment to Afghanistan and the lack of a co-located tactical common data link (TCDL) equipped Gray Eagle with 16th CAB, this capstone event was not possible. Once deployed, TF Raptor and Tigershark AH-64E crews immediately began working with Gray Eagle units in theater to prove the LAWT concept and the LOI capability resident in the AH-64E.

On 8 May 2014, two AH-64Es and 20 personnel from TF Tigershark deployed to a base in western Afghanistan to conduct face-to-face planning, rehearsal, and a week of team training with an Army Gray Eagle unit. There were several challenges identified early in the process. While we found that the level of technical proficiency on both sides of the team was excellent; we discovered the Gray Eagle operators had never trained to establish communications through the TCDL with an AH-64E Apache. The training process for Gray Eagle operators does not address this specific concept, as most of their doctrine was based on the U.S. Air Force MQ-1 Predator syllabus. Despite this challenge, it took little time to bring the motivated team of UAS operators up to speed on the process, as they were eager to build relationships and develop TTP to be employed in combat. Some procedural differences were readily apparent between the AH-64E crews and the Gray Eagle operators. For instance, due to the typical usage of the Gray Eagle in Afghanistan and the wide array of joint operators it supports, the close air support 9-line attack briefing was the standard engagement format used by Gray Eagle operators. AH-64E aircrews normally use the close combat attack (CCA) 5-line attack brief as their primary customers are Army ground units. As a result of initial discussions between the AH-64E crews and the UAS operators, it was determined that the crews would train a simplified engagement sequence utilizing the CCA 5-line attack brief.

Interoperability training began with the goal of a successful LOI-2 link and verification of Gray Eagle to AH-64E data transfer on the ramp. This was achieved on the first attempt. All capabilities of LOI-2 control were proven, to include AH-64E storing of UAS viewed targets and AH-64E modernized target acquisition and designation system sensor cueing from the UAS line-of-sight. This exercise also served as a validation of an abbreviated fighter check-in brief developed during the AH-64E/UAS team briefing prior to the mission. Testing then moved to ground-based LOI-3 of the UAS payload from the front seat of the AH-64E. This LOI presented some challenge to the crews as it took several attempts to establish the data link and receive approval in the right order to allow AH-64E control of the UAS payload. Crews found that LOI-3 control of the UAS payload requires significantly more TCDL signal strength than LOI-2 due to the increased amount of data being transferred. After determining the correct linking process, the team verified complete LOI-3 capability.

Another challenge identified during coordination for the training was a Gray Eagle air worthiness release (AWR) that restricts LOI training and operational use of this capability in a combat zone. Currently, an AWR prohibits LOI operations above LOI-2 while in flight unless training at the National Training Center at Fort Irwin, California. The initial training plan included in-flight use of LOI-3 capability but was downgraded to ground control due to the limitation of the AWR. The TF Tigershark standardization team is actively working with outside agencies to modify the AWR to permit LOI-3 operations in OEF to further the training that has already been started and more importantly to use the designed capabilities of the system to increase combat effectiveness.*

The final phase of training involved a live fire training session incorporating all members of the LAWT. The team employment and cooperative engagement training started with validation of the abbreviated fighter check-in radio communications and LOI-2 target handover process. The AH-64E and Gray Eagle crews then conducted multiple iterations, exercising AH-64E to UAS target cueing and laser spot handovers. Gray Eagle operator proficiency increased during communication and positive identification verification exercises with the AH-64E. This training concluded with a simulated remote Hellfire engagement in which the Gray Eagle provided laser designation for the AH-64E Hellfire. This event confirmed the AH-64E's new tactical situation display dynamic indications for remote Hellfire safety fan and validated the LAWT's TTP for employment.

*As this article was nearing publication, the AWR prohibiting operations above LOI-2 was rescinded. The 1-229th ARB began LOI-3 training in preparation for unrestricted mission operations mid July.

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On the final night of training, mission events were ratcheted up to replicate the timelines and pressures of an actual mission. The TF Tigershark LAWT launched without prior knowledge of the fighter check-in information to simulate real-world conditions over an objective. The AH-64E crews determined the position of the Gray Eagle while enroute to the target area. The first event involved a UAS target handover and subsequent call for fire for a 30mm engagement demonstrating the increased speed and precision of target identification using LOI-2 control. The Gray Eagle operator then proceeded with target handover providing a CCA 5 line for a remote Hellfire engagement. The crews verified the range was clear, positively identified the target, and then fired one Hellfire with a "Rifle" call to the UAS operator. The Hellfire directly impacted the target on the range showing the payoff for the hard work the crews put into the training the week prior. The quick and successful engagement was testimony to the proficiency and relationships built by the Gray Eagle operators and Attack Weapons Team over the preceding week of LOI training and represented a combat first for the AH-64E and Gray Eagle LAWT. Milestone actions were conducted for the first time during this training event, and plans are in progress to continue building upon the successful training event with incorporation of the LAWT into combat missions. Aviator and operator integration was critical to making this event a success. The TTP currently being developed will have far-reaching effects in the attack helicopter and UAS communities and will pave the way for future operations through dissemination of the lessons learned. The necessity of real-world team employment training cannot be overstated for all current and future AH-64E Apache and Gray Eagle LAWT missions.

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Acronym Reference

ARB - attack reconnaissance battalion
AWR - air worthiness release
CAB - combat aviation brigade
CCA - close combat attack
LAWT - linked attack weapons team
LCT - Longbow Crew Trainer
LOI - level of interoperability
OEF - Operation Enduring Freedom
TCDL - tactical common data link
TF - task force
TTP - tactics, techniques, and procedures
UAS - unmanned aircraft systems

Manned-Unmanned Teaming

An Uncommon Understanding

By CPT Jeff Meinders

The term manned-unmanned teaming (MUM-T) is being used a lot in Army Aviation lately. As we use the term with all of the audiences we interact with, the assumption is that everyone is reading the same page of sheet music, knows exactly what bar we are on, and what note we are about to strike. As a Joint Multinational Readiness Center (JMRC) Observer Coach Trainer (OC/T) for the past year, I've found this to not necessarily be the case. What the unmanned aircraft system (UAS) aircraft operator and payload operator, command post (CP) personnel, ground commander, and AH-64D/E or OH-58D crews think MUM-T means may differ in important ways. These widely varied perceptions of what MUM-T is within our own organizations create the potential for less than optimal employment as a battlefield multiplier.

The acronym MUM-T was likely used more than 1,000 times during the most recent aviation training exercise at the JMRC but did everyone saying it understand MUM-T to mean the same thing? Just as the term 'girlfriend' has a very different meaning to a college student than it does to a kindergartner, MUM-T appears to have many different meanings within its user community. While the military standardizes terminology, it cannot standardize perception and herein lays the problem of common understanding. I hope to highlight these differences and create a common understanding among the diverse groups working MUM-T.

The New Game in Town

The concept of MUM-T has been around for almost a decade. Army rotary wing platforms and maneuver forces have long used the UAS to locate the enemy and

then, through a series of communication links, to call direct or indirect fire to engage and destroy targets. The introduction of real time communications and video sharing with scout and attack aircraft is still relatively new. With the capabilities of the OH-58D, AH-64D, and the newly fielded AH-64E capability, Army aviators can receive video streaming from the UAS and minimize the fog of war that is created when accepting the handover of a time sensitive target.

Why is common understanding important?

As the AH-64E is fielded, its UAS teaming capabilities and tactics, techniques, procedures (TTP) are only beginning to be understood and developed. The first units equipped will be watched closely as they validate existing TTP and develop new procedures to provide the commander increased situational awareness and allow pin point engagement of an enemy combatant with little or no collateral damage. As UAS technology continues to provide previously unimagined capabilities, the UAS and aircraft crews, the CP, and the ground commander will need to adhere to a standardized language and common operating procedures if all of the technology is to be of any tactical advantage. UAS operators, maintainers, and crew chiefs will need to understand what UAS configuration is required for any given mission set so as to maximize its capability for that mission. Each tactical element will require some level of understanding of limits, vulnerabilities, and capabilities of the manned-unmanned team.

As Army Aviation outruns existing doctrinal publications, Fort Rucker and the

Aviation Enterprise are preparing an interim publication to address MUM-T operations. Lessons learned and best practices are being

collected from units in theater currently performing MUM-T to provide a guide to units receiving this new technology. Information from the interim publication reflecting mature TTP will be incorporated in the appropriate doctrinal manuals as they pass through the update cycle.

This process of informing units and fielding UAS takes time, but some units are already using MUM-T without the guidance ofdoctrine publications.

The Ground Commander's Perspective

As aviation continues to operate on the trust built with the ground commander, it is imperative that we keep our focus on providing world class support to the ground force. To the ground force commander, MUM-T means he has an additional enabler on the battlefield, but what is this additional enabler? The acronym should mean exceptional, previously unavailable intelligence and the ability to plan and act on real time information provided to the ground commander. While most battalion and above commanders are able to integrate MUM-T, those ground commanders at the company level and below may not understand the concept.

When the UAS started flying and began streaming real time video of the battlefield many years ago, it was being shown on every flat screen display in theater. Sadly, this video was historically mismanaged; used primarily to watch friendly forces move, validate missed radio calls, and generally distract everyone in the battalion command post. As time has passed and capabilities have improved, the novelty of the new capability is better understood. MUM-T to the ground commander has come to mean the ability to discretely gather intelligence, plan more effectively, and participate in decisions at the objective. Unprecedented video of the target area from the UAS and aircraft and the ability to influence the target have changed the concept of warfare for the ground commander.

Communications (visual, verbal, and common understanding) between the ground commander piece of the manned unmanned team and the elements on the target have increased exponentially. Still at issue in the brigade combat team, however, is the question of who is responsible for bringing the UAS crews and attack helicopter crews together for mission planning? The ground commander is relying on his aviation

experts but the BCT S-3 and aviation liaison officer have failed to recognize this as their task.

The Manned Team Member's Perspective

Helicopters are one of the biggest enablers on the battlefield but they have one big disadvantage; they are noisy and even the passing sound of a helicopter in the distance is enough to send insurgents scrambling for cover among non-combatants. Even with the extended optics provided by their sighting systems, it is challenging to conduct reconnaissance or persistent surveillance without being seen or heard. Allowing the manned aircraft to remain in a secure holding area well outside the target area while observing the UAS video keeps the manned aircraft out of harm's way until their presence is required and enhances the success of the mission. Manned-unmanned teaming extends the visual reach of the manned element of the team well beyond the audio range of the potential target and well outside the enemy's weapons engagement zone. The ability to rapidly acquire potential targets identified by the UAS enhances the timelines associated with an engagement and minimizes collateral damage.

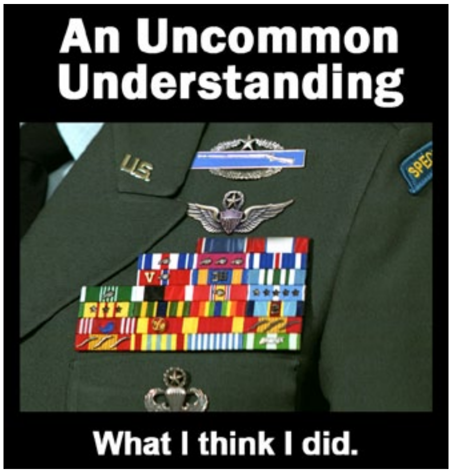
As the commander in a distant CP observes the same scene, the decision to engage is in the hands of the individual ultimately responsible for the outcome of the mission.

As MUM-T doctrine and TTP play catch-up, the helicopter crews have a much better understanding of the concept – perhaps because they view the UAS as nothing more than a new extension of the scout's capabilities. The NTC/JMRC OC/T observations, however, have been that attack planners are not bringing the MUM-T crews together, resulting in hasty planning between these elements even though ample mission planning timelines were available.

The Maintainers Perspective

How does maintenance play in the MUM-T formula? Think of the sophisticated Power Point presentations you've seen of an operational area. The UAV; rotary- wing aircraft; task force/battalion, brigade, and division CPs; and the Soldier on the ground linked with lines representing verbal, positioning, and video data being exchanged between all of these entities. These capabilities are enabled by different components on both the UAS and rotary-wing aircraft. Also consider that a limited

number of aircraft within a unit are equipped with all of the components that enable the aircraft as fully MUM-T



capable. It is essential that the maintainers understand mission requirements so that the correct UAS and aircraft configurations are paired for the mission. It may not be necessary for every component to be operational, but it is essential for maintenance and operations to share a high level of understanding to ensure the parts of the puzzle fit the mission.

As units rotate thru the JRMC, I've asked their maintenance managers and maintainers a basic question – What is a MUM-T aircraft? The answers were as varied as the people I asked indicating that the collective group has not assigned personal responsibility on anyone knowing what the maintenance role is.

The Aviation CP Perspective

The staff in an attack recon battalion (ARB) must understand the incredible tool that they now have at their disposal. Intelligence preparation of the battlefield becomes much more reliable as critical information from the planned area of operations is passed to the CP in real time from the reconnaissance element – the UAS. Information comprising the military decisionmaking process becomes more detailed and reliable as persistent surveillance is able to validate information over extended periods of time. While most engagement areas can be constructed by map observation, video feeds over time may show patterns in people/vehicle movement that suggest triggers in the engagement area or areas to avoid in order to reduce collateral damage. As actions are initiated on an objective, the battle captain or the commander in the CP is able to become more intimately involved by providing guidance or authorizing actions that would otherwise require unrealistic timelines for approval based on real time information from video feeds. All of this equates to better understanding of actions required to support the units on the ground and minimizing collateral damage.

The UAS Operator's Perspective

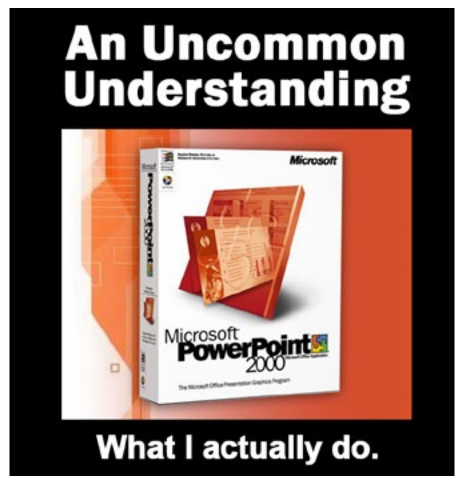
With few exceptions, we have observed the component completing the MUM-T team has been typically the last to be integrated into the plan. Most rotations at the National Training Center and JMRC require the OC/Ts to continually ask "did you tell the UAS when to be at your briefings." The unmanned part of the team must be recognized as a critical team member of the mission and as lessons learned and best practices are collected and broadcast, unmanned elements must be brought into the mission planning cycle and briefed like everyone else. They should be expected to fully participate in the planning process, clarify areas of concern, input their expertise, and adapt to mission requirements.

The Combat Aviation Brigade's Responsibility to the Army

The advantage of any new system is only as good as the people who use it and the manner in which they use it. It is essential that ground commanders understand what to expect from MUM-T and the job of ensuring this happens falls to the attack battalion/task force commander, operations officer, liaison officer, and the teams that demonstrate MUM-T effectiveness. This is especially true since the concept of MUM-T has been fielded with little doctrinal guidance. Similar to many high tech weapon systems fielded in the past, the rough outline for doctrine is developed in combat by the innovative ingenuity of the commanders and Soldiers using the system.

Conclusion

The advantages MUM-T brings to the elements of the team and to the commander are recognized as a revolution in technology. However, MUM-T integration is a slow process with many personnel and training challenges. As the crews and commanders fielding these systems identify TTP and develop best practices, Army Aviation Doctrine will build on these experiences. The message that goes back to Fort Rucker and our doctrine developers is that guidance must recognize and address



every team member that is involved with making each mission a success. It is equally important that MUM-T education include the supported ground commander to ensure he understands capabilities and limitations of the system.

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Acronym Reference

BCT - brigade combat team
CP - command post
JMRC - Joint Multinational Readiness Center
MUM-T - manned-unmanned teaming
OC/T - observer coach trainer
TTP - tactics, techniques, and procedures
UAS - unmanned aircraft systems

New Manned-Unmanned Aircraft Opportunities

By Cole Milstead

A dozen AH-64E and CH-47F Chinooks fly low level over the waves as four Army MQ-1C Gray Eagle unmanned aircraft systems (UAS) fly 30 kilometers ahead. While off the coast flying enroute high above a partial cloud layer, two UAS employ synthetic aperture radar (SAR) and ground moving target indicator (GMTI) radar searching for boats to avoid. As the MQ-1Cs approach shore, radars penetrate clouds to locate enemy vehicles and air defenses using aided target recognition and movement indications. Two other Gray Eagles fly below clouds employing electro-optical/infrared (EO/IR) sensors cross-cued with UAS radars and cued from distant Joint Surveillance and Target Acquisition System E-8C aircraft.

Gray Eagles relay communications for the aviation task force command post (CP) located 100 miles away on an allied island. AH-64Es report radar frequency interferometer (RFI) alerts via frequency modulated (FM) MQ-1C communications relay so CH-47F and distant universal ground control station (UGCS) crews can avoid radar air defenses. Navy jamming drones, EA-18G Growlers, and Army Tactical Missile System (ATACMS) assets, suppress/destroy air defenses. Air Force F-22s and F-35s provide air superiority and additional air interdiction, joint suppression of enemy air defenses (JSEAD), and close air support (CAS) for the air assault. Littoral combat ships provide indirect fires. All communicate on one of several relayed FM frequencies and using Link 16 data link.

One UGCS controls an MQ-1C from the island where manned aircraft have refueled an hour earlier. The UGCS ground data terminal (GDT) employs a line of sight (LOS) Ku-band tactical common data link (TCDL). At a more distant base where aircraft took off before island-hopping, another UGCS controls an MQ-1C via satellite GDT. Two of six AH-64Es control a third and fourth UAS using mast-mounted TCDL assemblies. As ATACMS sub-munitions pummel earlier identified enemy defenses, UAS assess damage for possible re-attacks. Gray Eagles engage targets not forecast or hidden from earlier strikes. Preparatory Gray Eagle autonomous Hellfire engagements safeguard manned aircrews still inbound to shore landing zones (LZ). As AH-64E arrive within range and CH-47F approach the LZ, distant UGCS operators and AH-64E crews engage other targets using remote engagements with UAS designating for AH-64E Hellfires while other AH-64E provide gun and rocket close combat attack (CCA). Six AH-64Es combined with Hellfires on the four MQ-1Cs provide the firepower to destroy numerous point and area targets assisted by Chinook door guns. The AH-64E extended range fuel tanks and CH-47F's ample fuel enable a return to base for most AH-64E/CH-47Fs. One attack weapon team (AWT) remains to provide CCA using a forward arming and refueling point (FARP) dropped off by one CH-47F. One Gray Eagle pair also remains to provide imagery to infantry and joint terminal attack controllers (JTACs) as they secure objectives. MQ-1Cs also ensure LZ area security for FARP and casualty collection points. Manned and unmanned aircraft screen for the air assault force to warn of approaching ground and rotorcraft threats. Another AH-64E company, more armed Gray Eagles, CH-47Fs, and UH-60s soon approach to expand the LZ and secure future airborne drop zones.

The above vignette describes how current manned and unmanned systems may revolutionize how we conduct warfare. Organic Army MQ-1C and Shadow capabilities will provide more assured tactical information collection and lethal support in future conflicts. The Gray Eagle already has deployed repeatedly in a direct support (DS) role in Iraq and Afghanistan.

These Army JP8-powered, larger payload, "Predator-like" aircraft support the tactical information collection needs of Army and Joint force leaders (Figure 1). Frequently advertised Reapers and Predators are similar but often apportioned supporting strategic missions. For example, Predators supporting 2003 Operation Iraqi Freedom primarily searched for Scud missiles. As a result, only limited Hunter UAS assets supported 3rd Infantry Division's march on Baghdad. This led many ground Soldiers to conduct movement to contact during their advance with meeting engagements and other unforeseen contact being the rule rather than exception.

The AH-64E, previously known as the Apache Block III, is another critical new system. AH-64E and MQ-1C interaction capabilities are complementary and unique within the joint services. In-theater, 15W UAS operators and UGCS simplify coordination with aviators and supported ground forces. Colocation with division aviation assets enables more habitual and assured aviation support. An AH-64E AWT or company and one or more MQ-1C can provide DS for Army brigade combat teams (BCTs). Other teams may be DS to supporting effort BCTs such as the corps battlefield surveillance brigade, or fires brigades.

The Guardian's TCDL assemblies resemble Longbow radars, but instead have Ku-band transmitters/receivers allowing control of MQ-1C flight paths and sensors. An MQ-1C's Hellfire missiles allow autonomous laser-designation or remote engagements with other laser-capable aircraft or ground designators. MQ-1C missiles outrange AH-64 Hellfires, and therefore aligning UAS flight path with targets is non-essential. If necessary, UAS are able to engage targets to their rear and the missile turns to find the laser spot.

Identical controls that AH-64E co-pilot gunners (CPGs) employ to operate their modernized target acquisition designation systems (MTADS) also control MQ-1C EO/IR/laser sensors. Resultant positive habit transfer minimizes unique training. Other dual-use systems are the AH-64E CPG multi-functional displays (MFDs). MFDs provide digitized moving-map and imagery for AH-64E applications. Alternately, they can display UAS EO/IR imagery on one MFD and a digital map of the same area and related icons on the other MFD. AH-64E CPGs can exercise one of five Levels of Interoperability (LOI). Most applicable to aviators are receipt of UAS video in the cockpit (LOI-2), control of UAS sensors (LOI-3), and pre-programmed and other automated means of controlling Gray Eagle flight paths (LOI-4) within pre-approved airspace coordination measures.

AH-64E companies or AWTs augmented with one or more MQ-1Cs either can mass to support operations or provide 24-hour support using rotating AWT shifts or aerial reaction forces. MQ-1C aircraft also can mass or rotate. Dependent on missile load, the Gray Eagle's long endurance permits near-continuous coverage for offensive, defensive, and/or stability operations using a single UGCS and rotating 15W aircraft commander (AC) and payload operator (PO) unmanned aircraft crewmember (UAC) pairs. If more UAS missiles are essential, UACs rotate MQ-1C launches in the same manner that Apaches return to base or FARPs. MQ-1C endurance, even with Hellfires installed, far surpasses any manned aircraft time on station.

Mission: To provide the Division Commander a responsive, agile, and flexible capability to perform RSTA (Reconnaissance, Surveillance, and Target Acquisition), Communications Relay, Manned-Unmanned Teaming and Target Attack Capability

Mission Requirements:

- Deployed and integrated with the Combat Aviation Brigade (CAB)
- Immediately responsive RSTA to the Division Commander
- Two simultaneous payloads (EO/IR, Laser Designator, SAR, Communications Relay) and weapons
- "Always on" Medium Communications relay (SINCGARS, EPLRS)
- Tactical Common Data Link (TCDL) & SATCOM Communications
- Heavy Fuel Engine (Diesel/JP-8)

Characteristics/Description:

Wing Span	56 Ft.
Max GTOW	3,200 lbs. w/growth to 3,600 lbs.
Range with Relay/SATCOM	>300/1,200 km
Max Airspeed	150kts
Altitude	>25,000 Ft
Endurance	Up to 30 hours
Weapon	Up to 4 Hellfire Missiles
Launch/Recovery	4,500 Ft max

Figure 1. MQ-1C Gray Eagle capabilities

However, AWTs offer larger ammunition payloads and bring wider pilot peripheral vision than the commonly-noted "soda straw" effect of MQ-1C EO/IR sensors. Apache/Guardian Longbow radars expand aircrew visibility like the SAR/GMTI STARlite radars on MQ-1C. Different aerial perspectives, one elevated and one at lower level, enhance cross-cueing of both EO/IR and radar payloads. Cooperative employment also exploits experience of the AH-64E air mission commander (AMC), pilot-in-command, and CPG with that of the equally capable 15W AC and PO. An MQ-1C mission coordinator (MC) rounds out the package to coordinate with supported ground units and AWTs that team together.

Currently, the division combat aviation brigade has 12 MQ-1C, six ground control stations (GCSs) and 15W UAC sections, and over 120 Soldiers in a separate Gray Eagle F Company. Task organization of MQ-1C companies with AH-64 battalions enhances teaming and transfers knowledge and situational awareness between manned aviators and unmanned operators. The synergy of operating manned and unmanned aircraft together has potential that far surpasses operating either aircraft separately.

The term "manned-unmanned team" is well known, but somewhat of a misnomer because even unmanned aircraft require ample personnel to operate. The nature of manned-unmanned operations require that Soldiers and aviators plan/prepare/execute manned and unmanned missions collaboratively to provide DS to air-ground operations. The MQ-1C often is underutilized, performing hours of surveillance of a single named area of interest (NAI) while operations staff officers task manned aircraft with expanded mission sets. The armed MQ-1C is not simply an intelligence asset. Aviator staffs and aircrews/UACs can plan manned aircraft and UAS employment that fully exploits information collection and armed

coverage of larger parts of the area of operations (AO) to answer more priority intelligence requirements.

The MQ-1C's airspeed and ability to slew sensors to multiple stored targets allows coverage of multiple NAIs or a screen line without missing slow-moving ground targets entering/leaving any single NAI. Up-front integration of both aircraft capabilities might become a preferred tactic, technique, and procedure. Cooperative employment also can employ MQ-1C or Shadow to cover areas that lose aerial support when manned aircraft arm and refuel. At other times, the AH-64E remains on standby until the UAS acquires targets, saving manned aircraft fuel and more costly and maintenance-intensive flight hours.

During security missions, UAS may screen a flank or operate well forward of ground positions while AWTs remain in a holding area or screen another flank while periodically watching MQ-1C video. AH-64E and MQ-1C may participate as part of a larger guard force with ground assets. In preplanned or immediately tasked CCA, a nearby MQ-1C may be the first aircraft on scene. It may receive a CCA request from a ground company commander or a CAS mission from the JTAC to engage in danger close proximity to ground combatants. As AH-64E close in from other areas, UAS can provide in-cockpit imagery and SAR/GMTI data to their CP. This expedites arriving aircrew situational awareness and may allow remote Hellfire engagements while still inbound.

Ground units using one system remote video terminals (OSRVTs) may employ UAS imagery to coordinate CCA/CAS. The ground units work together with the JTAC whose remotely operated video enhanced receiver (ROVER) also gets both manned and unmanned imagery. AH-64E Guardians also can provide MTADS imagery to an OSRVT-equipped ground unit or JTAC ROVER. It is critical to convey to supported ground units that there is greater value using UAS or MTADS imagery to alternately focus between friendly forces and areas surrounding them. CP observation of only the friendly force loses opportunities for ground units to find and engage surrounding threats and for CPs to order indirect fires and CAS.

Deconfliction planning ahead of time alleviates airspace control challenges of numerous fixed wing, rotorcraft, and Joint fires in an AO. Awareness of artillery locations allows gun-target lines (GTLs) forecasts of howitzer and rocket/missile fires entering the AO so UAS and AH-64E can fly offset from the GTL. One challenge for ground commander control of fires and air attacks within an AO, is that the joint air operations center (JAOC) generally controls airspace above the AO coordinating altitude. Also, the JAOC could be a long distance from the ground commander's location.

The BCT air defense airspace management/brigade aviation element (ADAM/BAE) helps resolve potential airspace problems in pre-mission planning. Chat communication between the UACs and airspace control authorities is commonplace. UACs understand airspace requirements above the coordinating altitude, kill boxes/key pads, and other airspace and fire support coordination measures. UAC and ADAM/BAE also can help coordinate the "safe area volume" airspace coordination measures required for AH-64E control of UAS flight paths. This increases value in getting UACs involved in planning lower- and upper-level

airspace and aerial-delivered fires together with the supported ground unit ADAM/BAE.

AH-64E AMCs may be in charge of both manned and unmanned aircraft when operating together. MQ-1C MCs may alternate between junior Soldiers and senior warrant officers during missions without a manned lead. Comfort zones of both manned pilots and MQ-1C UACs must expand to optimize cooperative employment. Trial and error is inevitable until discovering employment solutions and including them in standard operating procedures and schoolhouse instruction.

Based on input received during training of numerous 15Ws, few 15W UACs are pleased at the prospects of AH-64E LOI-3 and 4 control of UAS. In practice, crucial minutes of AH-64E LOI-3 (UAS sensor control) and LOI-4 (UAS sensor and flight pathcontrol) are likely to be minimal compared to hours of UGCS control. LOI-2 UAS imagery inside AH-64E cockpits is always available if sufficiently close to UAS and recall

advantages of FM relay and SAR/GMTI/ Longbow/RFI cross-cueing. Primary reasons AH-64E CPGs might exercise UAS sensor and flight path control are fivefold:

1) Missions that require many MQ-1C to fly beyond TCDL LOS, such as during distant air assaults, AH-64E interdiction, ATACMS strikes, and Joint aircraft air interdiction.
2) Reduced LOS when MQ-1C is flying beneath clouds but above mountains. Teamed AH-64E can maintain control if UGCS LOS is blocked or too far to free air data relay UAS for missions.
3) Insufficient organic and operational GCS/UGCS available for operating up to 12 MQ-1C.
4) Potential for jamming, cyber intrusion, or satellite loss forcing expanded use of TCDL directional data links. Time delays inherent in satellite data links are another potential problem, especially when engaging moving targets.
5) UAC and manned aircrews should perfect talk-on to target procedures to assist target or reconnaissance hand over. In dense urban areas, talk-on to target may prove difficult. Example: "locate the white taxi" in a sea of white cars. AH-64E LOI-3 or 4 control and laser spot tracking are means to overcome this confusion. Also, in LOI-3, AH-64E MTADS can automatically slew to what the MQ-1C designates.

Given airspace constraints, ACs nearly always should control the MQ-1C flight path. Even after AH-64E and future ground systems are fielded allowing LOI-3 sensor control, crew coordination advantages exist in retaining PO sensor control seated next to the AC. Radar control only occurs from the UGCS. Unarmed UAS can designate for AWTs arriving on scene. Autonomous designation is an option, but the Longbow radar cannot distinguish between friend and foe and UAS greatly assist positive identification (PID). Self-designation and PID may be difficult for AWTs when approaching/hovering at low altitudes to defeat more advanced radar/IR air defenses. Joint jamming/ JSEAD may or may not be effective. MQ-1C designation closer to target may prove preferable, allowing engagements even if objects or battlefield smoke/dust are between the target and manned shooter. Understanding locations where UAS can remotely designate safely is critical to both current and future missions involving manned aircraft and UAS.

Augmenting AWT with MQ-1Cs improves air-ground operations as exhibited in recent wars only if both coordinate with ground forces and habitually plan/prepare/execute together. Fielded AH-64Es and MQ-1Cs will support deterrence or fight future conflicts that may require longer intratheater flights against anti-access/area denial threats, hopping through several austere bases and even ships to monitor threats or conduct assisted or forcible entry. MQ-1C information collection will enhance security to provide pattern-of-life, improvised explosive device/network detection, indications, warnings, reports, imagery, radar data, and communications relay to aid both tactical and strategic commander decision-making.

Aviators have unique abilities to process information all around them, adapt to unusual situations, and make rapid decisions. However, Army UAS have unmatched endurance, an elevated perspective, and greater expendability. Fighting AH-64E and MQ-1C as a team exploits advantages of both to accomplish future offensive/ defensive/stability information collection and lethal missions with minimal fratricide risk or collateral damage. These new capabilities are complementary and will help Army Aviation better support the ground maneuver commander to deter or win future battles.

Cole Milstead has 27 years of military and private sector experience to include tours flying in Germany and the Sinai. His last five years involved parallel United States Army Aviation Center of Excellence Directorate of Training and Doctrine and industry development of lesson plans and Soldier instruction of newly-created MQ-1C units.

Acronym Reference

AC - aircraft commander
ADAM/BAE - air defense airspace management/ brigade aviation element
AMC - air mission commander
AO - area of operation
ATACMS - Army Tactical Missle System
AWT - attack weapons team
BCT - brigade combat team
CAS - close air support
CCA - close combat attack
CP - command post
CPG - co-pilot gunner
DS - direct support
EO/IR - electro-optical/infrared
FARP - forward arming and refueling point
FM - frequency modulated
GCS - ground control station
GDT - ground data terminal
GMTI - ground moving target indicator
GTL - gun-target line
JAOC - joint air operations center
JSEAD - joint suppression of enemy air defenses
JTAC - joint terminal attack controller
LOI - level of interoperability
LOS - line of sight
MC - mission coordinator
MFD - muti-functional display
MTADS - modernized target acquisition designation system
NAI - named area of interest
OSRVT - one system remote video terminal
PID - positive identification
PO - payload operator
RFI - radio frequency interferometer
ROVER - remotely operated video enhanced reciever
SAR - synthetic aperture radar
TCDL - tactical common data link
UAC - unmanned aircraft crewmember
UAS - unmanned aircraft system
UGCS - universal ground control station

TRAINING FOR MANNED-UNMANNED TEAM OPERATIONS

By CW4 Dustin C. Engelhardt

Unmanned aircraft systems (UAS) have been in use by the military for decades. Originally used primarily for surveillance missions, UAS assets now regularly perform long duration surveillance, reconnaissance, search and rescue support, resupply, and attack missions. As more and more UAS assets populate the battlefield, they are increasingly being tasked to operate directly with teams of rotary wing attack aircraft in a manned-unmanned team (MUM-T). With proper training and the right mindset of all crews involved, the UAS can become a valuable asset to the air mission commander (AMC) of any rotary wing element or ground commander.

To begin, the term "unmanned" is a misnomer; true, there is no one physically sitting in the aircraft, but the UAS is flown and employed by a crew of fully qualified and trained operators. This means that the UAS is not just a robot performing pre-programmed actions but is being operated as a responsive, reconnaissance, surveillance, and target acquisition platform that can adapt to changes in mission, weather, and enemy actions. Just like any scout or attack mission, the success or failure of UAS crews participating in a MUM-T resides in training and pre-mission planning.

The UAS was initially placed in the Military Intelligence branch of the Army. The primary mission of UAS then was providing surveillance to feed intelligence collection efforts. Academics and training plans were designed to support that mission. When UAS became a member of the Aviation branch in 2006, the focus on academics began shifting to more tactical instruction designed to provide real-time support for troops on the ground while continuing to provide long term surveillance. Academics have begun to incorporate more of the skills taught to scout and attack helicopter pilots, such as the fundamentals of reconnaissance and security, but the bulk of training and education for UAS operators will occur during their readiness level progression and training events once they arrive at their first unit.

For rotary wing pilots working with UAS, the first hurdle to overcome is the outdated mindset that UAS are nothing more than a nuisance to pilots on the battlefield. UAS are operated by soldiers that are highly trained in the operation and employment of their system. They are very capable of learning and adapting to new concepts and employment methods. Most operators that are fresh from initial qualification training do not have the requisite knowledge of scout and attack operations but are very eager to learn from seasoned scout or attack pilots. It is beneficial for those operators to receive training and mentorship from senior aviators within the combat aviation brigade (CAB). There is no amount of schoolhouse training that can replicate the wisdom and advice of someone that has years of experience conducting reconnaissance and attack missions.

The second step is to learn what each platform can contribute to the mission. For pilots, spending time in the UAS ground control station or "shelter" (essentially the UAS cockpit) will provide an idea of how they operate as a crew, the capabilities and limitations of their sensors, and how they perform actions during the course of a mission. While not feasible to take UAS operators up for a familiarization flight to demonstrate aircraft capabilities, they can be included in simulator training flights and can be shown most relevant aircraft systems during a "hot cockpit" training session. Once both sides understand more about how the other operates, integrated training plans can be created. In addition to these sessions, it is also beneficial to conduct joint academic classes for the rotary wing pilots and UAS operators. Topics including how reconnaissance and security missions are executed, landing zone/pickup zone security, and engagement area development will be a great benefit to the UAS operators, and probably a good refresher for the rotary wing crews. Additionally, per the new Combat Aviation Gunnery Manual (TC 3-04.45), both Gray Eagle (MQ-1C) and Shadow (RQ-7B) have requirements to perform remote designation for a Hellfire missile. Since AH-64D and OH-58D crews also have a requirement to fire a remote Hellfire missile as part of their gunnery tables, linking these two events saves flight hours and provides a great training opportunity for all crews involved.

If a dedicated MUM-T or "gray team" is being executed, the aircrew mission brief must include the UAS crewmembers. The UAS crew should be included in all parts of the brief to include common responsibilities, actions on contact, and actions in the event of a downed aircraft. The UAS provide several unique abilities that are invaluable during enemy contact or in a downed aircraft situation. First, they are generally located in or very near the tactical operations center and can very quickly action a ground or an aviation quick reaction force to the scene. Second, they can provide a real-time video feed to the downed aircraft recovery team or personnel recovery assets to make a better assessment of any equipment that may be required to extract the aircraft or personnel. Finally, they can do all of these tasks and still conduct reconnaissance while leaving the other rotary wing aircraft on scene free to suppress enemy contact and provide close-in security to the downed aircraft. Conducting a solid briefing prior to the flight will ensure that all members of the team know their roles and can execute them without question or delay.

Finally, conducting a thorough after action review (AAR) after every mission allows for every member of the team to evaluate what parts of the process went well and should be sustained, or what failures were noted and decide how they can be fixed in future missions. The final step that is frequently overlooked in the AAR process is the archiving of the results and including them in future planning. The definition of insanity is doing the same thing over and over and expecting a different result; yet, this is precisely what happens when AARs are not used to change standing operating procedures or doctrine.

UAS will continue to expand their role in the reconnaissance and security efforts in future conflicts. As with any other rapid expansion or new application of an existing technology, there are bound to be growing pains. It will take some time for the Aviation Enterprise to fully integrate UAS into the Aviation branch to include equipping, training, and manning a UAS company just like an Apache company or Kiowa troop. Until that happens, senior scout and attack aviators within the CAB can assist the UAS units near them and help bring them up to standard through training and mentorship.

CW4 Dustin Engelhardt is currently assigned to the Tactics Branch in the Directorate of Training and Doctrine at the United States Army Aviation Center of Excellence. CW4 Engelhard's previous assignment was as a 2-17th Cavalry Squadron OH-58D Standardization Instructor Pilot and Master Gunner at Ft. Campbell, KY. He deployed with the first full spectrum CAB with an assigned troop of RQ-7B Shadows. CW4 Engelhardt has completed three deployments to Iraq and one to Afghanistan; all as a scout pilot. He has 13 years' service.

Acronym Reference

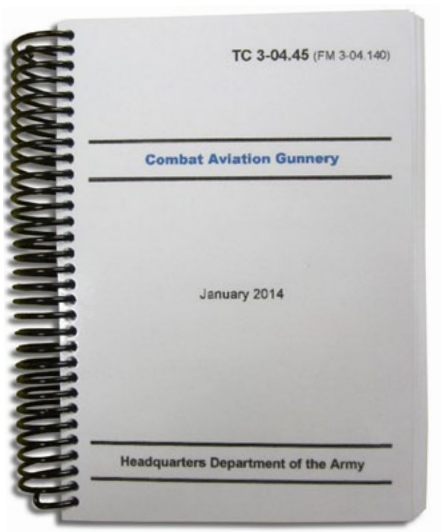
AAR - after action review
AMC - air mission commander
CAB - combat aviation brigade
MUM-T - manned-unmanned teaming
UAS - unmanned aircraft systems

UAS Gunnery STANDARDIZATION

By CW3 (P) Frank Capri

Apache 22, a team of two AH-64D helicopters, report taking enemy fire prior to reaching the objective. Shadow 11, an RQ-7B unmanned aircraft system (UAS) assigned to the brigade combat team (BCT), conducting aerial reconnaissance forward of the objective is dynamically re-tasked to gain and maintain visual contact with the enemy force element. Apache 22 deploys to cover and remains southwest of the objective, masked behind a hillside. Shadow 11 makes positive identification of six dismounted personnel carrying AK-47s, rocket propelled grenades, and a PKM machine gun and observes them maneuvering and subsequently occupying a building northeast of the objective. Shadow 11 passes a situation report to Apache 22, confirms the laser designation code and states clearance to fire is verified through the command post within that area of responsibility.

Who is the final weapons release authority? What consideration has been given to the type of Hellfire or other weapon selected for the target? What consideration has been given for potential collateral damage? Is the UAS mission coordinator (MC) familiar with the characteristics of the weapons carried by Apache 22? Is the MC familiar with Apache 22's launch criteria and other safety considerations? Apache 22 is being asked to execute this remote engagement by a UAS crew not trained to the standards required of the combat aviation brigade (CAB) assigned Shadows or Gray Eagles. The UAS operator, in this example, is not trained or standardized in aerial gunnery, nor is the operator qualified in manned-unmanned teaming (MUM-T) operations. Historically, BCT UAS operator training has been accomplished by tactical standard operating procedures and command guidance. While some measure of this localized training may be commendable, neither Apache 22 nor any other launch platform, which is ultimately responsible for that munitions' effects, can feel comfortable in placing their careers, their reputation, or the lives of non-combatants in the target area in jeopardy. However, this is exactly what is being asked of them when the necessity of teaming with a BCT Shadow occurs.



The AH-64D/E can carry numerous types of missiles on the same launcher; each designed for a specific purpose and each generating a specific devastating effect on the target. During the engagement process, someone (typically the UAS operator) must determine an appropriate weapon-to-target pairing. The operator with eyes on the target and performing the laser designation must understand the weapon systems and their characteristics in order to create the desired target effects. That person must have the requisite knowledge to assess fires or provide an accurate/useful battle damage assessment. This critical evaluation, coupled with collateral damage estimation, must occur to ensure the commander's intent and desired outcome is achieved.

Following the assumption that the launching platform is responsible for the missile effect during a remote engagement, the alternative to an untrained observer is for the launching platform to maneuver so as to unmask and self-designate the target. This obviously defeats the synergy of MUM-T, jeopardizes the elements of surprise, and substantially increases their risk to an attack.

The CAB UAS community is required to progress through pre-gunnery academic classes and execute specific gunnery tables on a recurring basis to attain and maintain the necessary proficiency to coordinate and conduct air-to-ground fires. Without UAS designated master gunners (to oversee gunnery training) in either UAS community, we have even less confidence in the knowledge, skills, and training of BCT UAS operators – a situation requiring the immediate attention and action of the Aviation and Maneuver Centers of Excellence.

As the concept of MUM-T has moved to the forefront of Army Aviation headlines, so too have training requirements for the newest member of the team – the UAS operators. Training Circular (TC) 3-04.45, Combat Aviation Gunnery's Chapter 7, Unmanned Aerial Scout Gunnery includes standardized requirements for UAS gunnery. These requirements exist for the same reason the

requirements exist for the armed rotary-wing community - to produce qualified, combat ready crews capable of delivering accurate and timely fire. While Chapter 7 establishes minimum proficiency levels to ensure CAB UAS operators are qualified to operate the platform weapon systems, we have yet to address two major issues related to the armed UAS. The first issue is the failure to require non-CAB assigned UAS to follow gunnery training guidelines established in TC 3-04.45. The second issue is the lack of a designated position for a master gunner on a UAS unit's table of organization and equipment (TO&E).

The UAS platforms assigned to the CAB are standardized by TC 3-04.45. The training circular currently does not provide mandated gunnery requirements for the non-CAB assigned UAS. The non-CAB assigned UAS are standardized at the direction of the BCT commander. Currently BCT assigned UAS teams are not held accountable to Aviation standards, not formally required to maintain gunnery standards, and not trained on munition effects. Yet, as an aviation platform, the BCT assigned UAS team could potentially be the sole observer for a call for fire directing the launch of a missile from a remote platform in which the target is visible only by the UAS team as demonstrated in the earlier example. Requiring the BCT assigned UAS to align their gunnery training with Chapter 7 holds all Army weaponized (laser-equipped) and armed (laser and HELLFIRE missile equipped) UAS accountable to a standard level of proficiency. As the tactical significance and utility of MUM-T becomes more important to the ground commander, we need to ensure MUM-T operations occur with the greatest efficiency, lethality and with the highest probability of success on the battlefield. The most effective means to this end is by incorporating the BCT UAS into the Army Aviation gunnery standardization program now.

UAS training is conducted without the benefit of a master gunner position designated in the UAS unit's TO&E. While someone within the unit may be expected to administer the commander's UAS training program and qualify crews to operate weaponized UAS, that person receives no formal training. Therefore, the position is not denoted on the Officer Record Brief or the Enlisted Record Brief, nor given the same credence that a designated position would provide. Without the formal designation or leadership emphasis, feedback from the field contends that being in charge of the unit's gunnery program or in charge of the unit's culminating training event - live fire gunnery, rates well behind any leadership duties to stay professionally competitive.

It would be unacceptable to assign an unqualified Apache crew to conduct an engagement. A certain level of proficiency is assumed and expected within the manned and unmanned CAB community. Why do we not enable and hold the unmanned community to the same consistent standard of accountability, empowering the entire Army community with the same level of confidence afforded when teamed with manned assets?

Standardizing all UAS platforms assigned to CAB and BCT elements within the Aviation Enterprise to the standards detailed in TC 3-04.45 Combat Aviation Gunnery manual is critical. Let's do this correctly and assist the BCT with establishing the proper training environment to create critical combat skills and formalize the position of master gunner throughout the UAS community. A formal aviation master gunner designation ensures the program is managed by an Aviation proponent trained professional. This not only ensures the greatest interoperability with manned, fixed-wing, joint and special operations capabilities, it ensures all personnel are trained and qualified throughout the unit and the UAS team is a thoroughly qualified member of the combat arms team conducting unified land operations. Let's properly train and qualify all UAS operators to the tenets of aviation standardization. Start by emplacing a TO&E designated master gunner responsible to the commander and unit that adheres to the gunnery standardization in the TC 3-04.45 so where and when we meet on the battlefield to conduct the engagement; we are synchronized, unified and effective!

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Acronym Reference

BCT - brigade combat team
CAB - combat aviation brigade
TO&E - table of organization and equipment
MC - mission coordinator
MUM-T - manned-unmanned teaming
TC - training circular
UAS - unmanned aircraft systems

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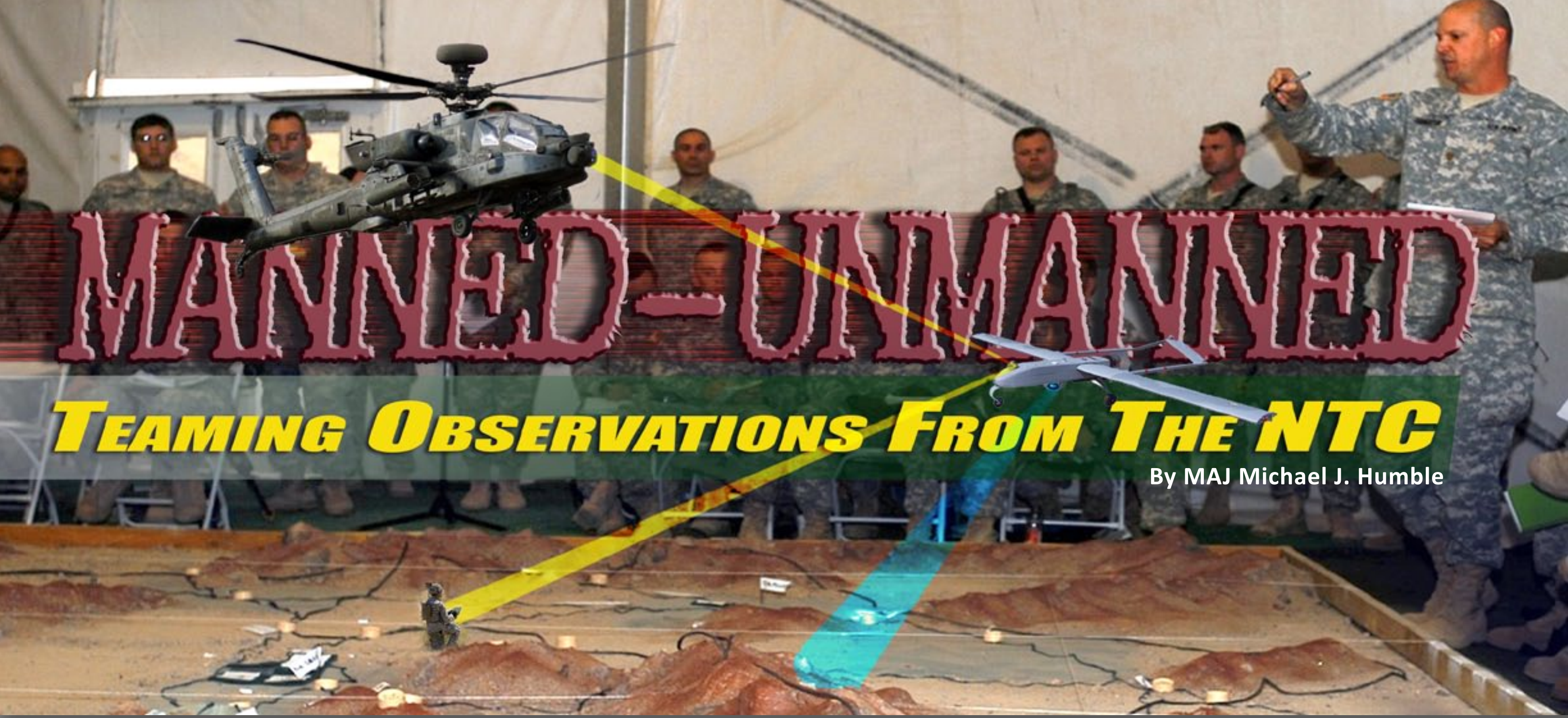

Manned-Unmanned Teaming Observations From The NTC

By MAJ Michael J. Humble

In September 2009, I was the Commander of B/2-159th Attack Reconnaissance Battalion (ARB) conducting relief-in-place/transfer of authority with B/1-10th ARB at Forward Operating Base (FOB) Speicher, Iraq. The eight AH-64D Apache Longbows I received were equipped with a system called video from unmanned aircraft systems for interoperability teaming level 2. This system enabled our Apaches to pull C-band unmanned aircraft system (UAS) video and push our target acquisition designation sight video on Ku-band to a ground unit one system remote video terminal (OSRVT). The concept and technology was as new to us as it was to our supported ground units. The ground units we supported, with the exception of special operations, either did not have an OSRVT on patrol or did not have the Ku-band antennae required to receive our video. When we were able to pull UAS video, it was basically useless as we were unable to talk with the payload operator. Without a communications link, we had no way to de-conflict our sensors or conduct target handovers. Even if my aircraft or the UAS found a target to prosecute, we couldn't communicate directly and had to resort to communication patches linked through the battalion or the brigade who had contact via Mircosoft internet relay chat (mIRC) with the UAS operators. The time lapse made it nearly impossible to conduct real-time target handovers.

Fast forward to February 2012. B/1-28th Infantry has occupied the National Training Center's (NTC) Combat Outpost (COP) #2 for a situational training exercise (STX) lane on training day four. Expecting an enemy attack shortly after nightfall, the company commander requests a Shadow and an Attack Weapons Team (AWT) in a direct support role from Task Force (TF) 2-17. At 1950, the TF 2-17 Shadow arrives on station. At 2200, the AWT is readiness condition level two at FOB Miami monitoring the Shadow video feed in the aircraft and talking to the payload operator on FM via the Shadow's communications relay package (CRP). At 2214 the enemy initiates their attack on COP 2 with mortars. Fifteen minutes later the Shadow identifies the mortar team; the AWT stores it as a target from the cockpit video feed, and departs FOB Miami for COP 2. At 2235, the AWT arrives on station and within five minutes engages and destroys the mortar team identified by the Shadow. At 2245, the AWT engages a mass of enemy dismounts found by the Shadow. The AWT conducts four engagements in 40 minutes of station time and is credited with 13 enemy killed in action. The situational awareness gained from the Shadow feed in the cockpit significantly reduced the time required for the AWT to acquire and engage enemy attempting to attack the COP.

The preceding discussion illustrates how Rotation 12-04 at the NTC featured an aviation unit that brought a new and unique task organization not previously seen at the NTC. Task Force 2-17, consisting of aircraft from the 2-17th Air Cavalry Squadron (ACS) and 1-101st Attack Reconnaissance Battalion (ARB) of the 101st Combat Aviation Brigade (CAB), was the first component of the Army's new full spectrum CAB to deploy to the NTC with RQ-7B Shadow UAS organic to the unit. Traditionally, the Shadow platoons are only found in brigade special troops battalion (BSTB) of a brigade combat team. In addition to having UAS, TF 2-17's OH-58D Kiowa Warriors and

AH-64D Apache Longbow helicopters were alsocapable of receiving UAS video in the cockpit and transmitting video to a remote optical video enhanced receiver (ROVER) or an OSRVT. TF 2-17 went on to demonstrate manned unmanned teaming (MUM-T) to a level not previously seen at the NTC.

In the 10 months prior to deploying to Fort Irwin, CA for NTC rotation 12-04, TF 2-17 fielded their Shadow UAS troop and started training on MUM-T operations. The senior warrant officers in TF 2-17 created an academic training program for the Shadow operators focusing on fundamentals of reconnaissance. The organic Shadow troop enabled TF 2-17 to pair a Scout Weapons Team (SWT) with a Shadow UAS for reconnaissance and security missions without outside coordination. The 2-17th ACS is currently the only Army Aviation unit to have the Shadow UAS organic and is still in the process of perfecting their tactics, techniques, and procedures (TTP) for the employment of their manned and unmanned reconnaissance assets.

TF 2-17 Aircraft Capabilities

The OH-58D and AH-64D helicopters in TF 2-17 had different levels of MUM-T integration. All 12 OH-58Ds could receive UAS video as well as push their video down to a ROVER, OSRVT, or another aircraft. Only two of the six AH-64Ds from the 1-101st ARB could receive UAS video, but all six could push video. The AH-64Ds could view the unmanned aerial vehicle on their moving map as well as store targets from the UAS video. The OH-58D crews had to manually input the target from the grid they read off of the video feed. The different levels of integration created aircraft scheduling challenges for TF 2-17. The possibility existed for an AWT to be paired with a Shadow, but the AWT would be unable to view the video if one of the two aircraft with the proper antennae was not on the mission.

TF 2-17 MUM-T TTP

Task Force 2-17 primarily employed their Shadows as part of a SWT or AWT. Since the Shadow platoon was organic to the aviation TF, TF 2-17 was able to ensure the Shadow UAS mission coordinator (MC) attended the pre-mission operations & intelligence (O&I) brief provided to the SWT or AWT aircrews. All TF 2-17 crews were provided the most current graphic control measures and friendly and enemy situation graphics from the TF S-2 and battle captain. Following the O&I briefing, the Shadow MC then participated in the team brief conducted by the air mission commander. The Shadow UAS team was part of the plan from the initial stages of each operation with their capabilities integrated into the reconnaissance and collection plan. In contrast, the "briefing" provided to the Shadow platoon assigned to the 4-1st BSTB during NTC Rotation 12-04 consisted of a one page document that listed the grids to observe and a quick synopsis of the ground commander's intent. The lack of graphics and enemy and friendly situations led to a lack of understanding of what was truly occurring on the ground. Due to this lack of understanding, the ability of the brigade combat team Shadow to directly support a ground maneuver operation was not as effective as the TF 2-17 Shadows.

Another effective TTP employed by TF 2-17 SWTs and AWTs was to utilize the Shadow's CRP to enable the Shadow crew to communicate on the FM team internal. This enabled the aircrews to talk directly to the Shadow's payload operator for sensor de-confliction and target handovers. Although the CRP proved to have some bugs with an occasional "hot-mike" and locking up the team internal, it enabled the aircrews to coordinate with the Shadow payload operator instead of merely watching his video. This TTP worked extremely well when the AWT/SWT would find a potential target and request the Shadow continue to monitor said target while they went to refuel/rearm. The aircrews were able to monitor the Shadow's video during refuel turns, thus never breaking contact with a potential target.

MUM-T Practical Application

The most effective application of MUM-T observed during rotation 12-04 occurred during three COP defense missions. Two occurred during the STX and one occurred later in the rotation during full spectrum operations. The COP defense STX missions are some of the most challenging STX lanes that take place during an NTC Operation Enduring Freedom mission rehearsal exercise. An infantry company is given less than a day to occupy a COP before

being attacked by contemporary operating environment forces (COEFOR) from the 11th Armored Cavalry Regiment under the cover of darkness. The COEFOR generally attacks with a force equal in size to the company occupying the COP. The successful employment of attack aviation and UAS in a COP defense STX scenario can have an impact on the course of the battle. TF 2-17's MUM-T made a significant impact on the COP defense missions.

In two of the three COP defense missions, the Shadow UAS was on station prior to manned aircraft launching in support of troops in contact. During both missions, the SWT and AWT were able to monitor the Shadow's video and identify potential targets prior to launch. Once the aircraft launched, they were able to positively identify, engage, and destroy those targets less than five minutes after arriving over the COP. The station time of the Shadow UAS, up to nine hours with the extended wing configuration, makes it an ideal platform for real-time reconnaissance ahead of manned assets.

During the third COP defense mission, an AWT found a large group of suspected COEFOR in the vicinity of the COP, but could not positively identify weapons. The AWT then requested the Shadow monitor the group and pushed out of audible range of the COP. Once the AWT departed, the COEFOR picked up their weapons and moved toward the COP. The Shadow MC alerted the AWT, which was watching the UAS video, and the AWT returned to the COP to engage the confirmed enemy.

TF 2-17 crews did attempt to transmit video to ground forces at the NTC. In most cases, the ground force commander (GFC) seemed more interested in pulling the Shadow video over that of the manned asset as that was what he had used in the past. Also, the ability of the GFC to pull the AWT or SWT video depended not only on the proficiency of the OSRVT operator, but also on whether he had the correct antennae. The TF 2-17 crews were committed to implementing this capability going so far as to add a line to their fighter check-in requesting the status of the GFC's OSRVT and conducting one-on-one air ground operations instruction to educate the GFCs on the benefit of using their sensor video for enhanced situational awareness.

Future MUM-T Training and Fielding

Task Force 2-17 CAV took a very proactive approach to MUM-T training prior to deploying to the NTC where they could practically apply their new TTP. The AWT crews, having completed aircraft component installation just prior to NTC, were not as proficient as the SWT crews. Eagle Team Observer Coach/Trainers (OC/T) found that TF 2-17 aircrews were open and willing to integrate the Shadow UAS and its crew into the mission. When communication or video link issues arose, however, the crews were more likely to continue the mission as a traditional SWT or AWT after attempting to troubleshoot the issue. This was apparent during a MUM-T live Hellfire shoot. The Shadow UAS was able to designate for a successful Hellfire engagement. The Shadow CRP then hot-miked on the AWT's FM team internal and subsequent Hellfire shots were done autonomously by the AH-64Ds.

Manned-unmanned teaming integration into missions was also dependent on aircrew proficiency. Senior aviators were found to be open to MUM-T integration during the reconnaissance phase, less so during the attack phase and were quicker to transition to traditional scout/attack tactics if issues arose. The junior aviators were very proactive in the integration of MUM-T video, but quickly became task saturated (or overwhelmed) with the addition of UAS video while still learning to employ the aircraft's existing sensors. As the proficiency of the TF 2-17 Shadow crews and aircrews in MUM-T improved, the level of UAS integration into the mission increased. For example, the use of a common internal frequency for the three-aircraft team proved problematic at first, but proved to be a better TTP than dedicating an aircraft radio to talk to only the Shadow crew.

Initially, successful employment of MUM-T with the ground commanders at the NTC was limited due to unfamiliarity with the technology, availability of OSRVTs, and proficiency of the OSRVT operator in receiving Ku band video from helicopters. By the end of the fourteen day rotation, however, ground commanders were requesting the AWT/SWT downlink frequency and had the Ku-band antennae available for the OSRVT. This exceptional progress was a direct result of TF 2-17 creating a checklist of how to set up the OSRVT for aircraft video as well as their air ground operations efforts to educate the 4-1st Brigade Combat Team units on their capabilities and how they could positively impact the GFC's mission.

Task Force 2-17 also proved that the effectiveness of the Shadow UAS and the situational awareness of its crewmembers can be enhanced by assigning it to an aviation unit and providing the operators with the same intelligence and operations graphics that aviators receive. The Eagle Team Shadow OC/Ts found that between

the two Shadow platoons at the NTC during 12-04, the TF 2-17 platoon was far more integrated into mission planning and execution than their counterparts in the 4-1st BSTB. I believe this was a direct result of TF 2-17 not only taking ownership of the asset, but also treating it like a reconnaissance aircraft with scout pilots, not just a camera that looks where you tell it.

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Acronym Reference

ACS - air cavalry squadron
ARB - attack reconnaissance battalion
AWT - Attack Weapons Team
BSTB - brigade special troops battalion
CAB - combat aviation brigade
COEFOR - contemporary operating environment force
COP - combat outpost
CRP - communications relay package
FOB - forward operating base
GFC - ground force commander
MC - mission coordinator
MUM-T - manned-unmanned teaming
NTC - National Training Center
O&I - operations and intelligence
OC/T - observer coach/trainer
OSRVT - one system remote video terminal
ROVER - remote optical video enhanced receiver
STX - situational training exercise
SWT - Scout Weapons Team
TF - task force
TTP - tactics, techniques and procedures
UAS - unmanned aircraft system

Manned-Unmanned Teaming AND Air-Ground Operations

By CPT John Q. Bolton

The fires and S-2 sections in the command post (CP) observed the suspected cache location for several hours, predicting that insurgents would move weapons once night fell. They maintained 'eyes-on' the location using the airborne persistent threat detection system (PTDS) color day TV and forward looking infrared (FLIR). After nearly six hours of observation two individuals on motorcycles arrived and began digging and pulling weapons from the location before moving on motorcycles at high speed without lights.

While the CP developed the situation, an Attack Weapons Team (AWT) was already postured and aware, observing the same video feed at the flight line with a remote computer connection. Based on pattern of life analysis, the ground force commander (GFC) determined the individuals were transporting weapons from the cache to a known bed-down location. The CP alerted the aviation task force, requesting the AWT go to readiness condition (REDCON) level 2. The AWT's crew maintained situational awareness (SA) by observing the PTDS video feed in the aircraft during run-up. After the GFC determined to engage the weapons facilitators, the AWT launched in less than 10 minutes using quick-launch procedures. Once airborne, the AWT correlated their sights with the PTDS video, maintaining positive identification (PID) while enroute. After a final verification of PID, the AWT engaged the individuals, destroying them and the weapons under the prevailing rules of engagement (ROE). Total time from notification to effects was less than 15 minutes.

New equipment, combined with effective tactics, provides the AWT SA during all portions of the mission from alert to launch to target location and weapons employment. It enhances the AWTs effectiveness and provides quicker, more precise effects for the GFC. This article describes the technological capabilities of manned-unmanned teaming (MUM-T) and how Task Force (TF) Gunfighter employed it with success using quick reaction force (QRF) tactics during operations in Regional Command-South, Afghanistan.

Figure 1: Displayed PTDS Video (Notional Data)

MUM-T Capabilities

The tactics described above are not a vignette from special operations TF utilizing multiple dedicated assets and in-depth mission planning; rather, they are executed on a near-daily basis by the aviators of TF Gunfighter (1-1st Attack Reconnaissance Battalion) working with Combined Task Force (CTF) Duke (3-1st Brigade Combat Team) at Forward Operating Base Apache in Zabul Province, Afghanistan. Their combined efforts during over 45 iterations of QRF launches for cache interdiction resulted in several enemy personnel and over 30 motorbikes with supporting weapons destroyed. These successful interdictions were a result of new equipment fielded to the AH64D. Just as important, these successes were directly related to close, synchronized coordination between the aviation TF and the supported ground unit.

Quick reaction force and dynamic re-tasking are routine missions in Afghanistan. However, aviation TFs and AWTs may execute them differently today thanks to new tools and tactics. Rather than simply fly to 'the sound of the guns,' MUM-T upgrades allow AH64D crewmembers to receive the video/data feeds from PTDS, unmanned aircraft systems (UAS), and joint assets directly into the aircraft cockpit. MUM-T increases the effectiveness of an AWT while minimizing the chance of collateral damage. Furthermore, the AWT doesn't need to view the target individuals or area with their own sights; the UAS video provides that SA. As shown in Figure 1, the video quickly informs crewmembers about adjacent terrain, avenues of approach, and target description rather than through a time consuming verbal description or potentially confusing radio "talk-on" to a target.

This ability comes from integrating the upper receiver (UR) and air to air to ground (AAG) components of MUM-T. Combined, the UR and AAG components give the AH64D crew level of interoperability (LOI) 2 control. Level of interoperability 2 consists of the ability to receive both the video from UAS platforms with C-band capability as well as the metadata from Ku-band capable platforms. Figure 2 illustrates the data exchange between the UAS, AWT, and ground elements. As depicted, only one aircraft in the AWT needs to have an UR installed. Using the AAG component, the UR-equipped aircraft receives the video/metadata stream from the UAS while simultaneously sharing it and the aircraft's own sight picture with other aircraft(s). The AWT can generally view the video from all platforms and receive the data from platforms equipped with the UR. The metadata, if available, allows cueing to the UR equipped platform's sensor line of sight (LOS).

Metadata consists of structured, transmitted data (telemetry) which describes the characteristics of a resource. Metadata includes critical information such as UAS sensor range, sensor cueing (azimuth/elevation) information, platform/sensor location, selected sensor type (TV/FLIR/IR), and UAS flight parameters.

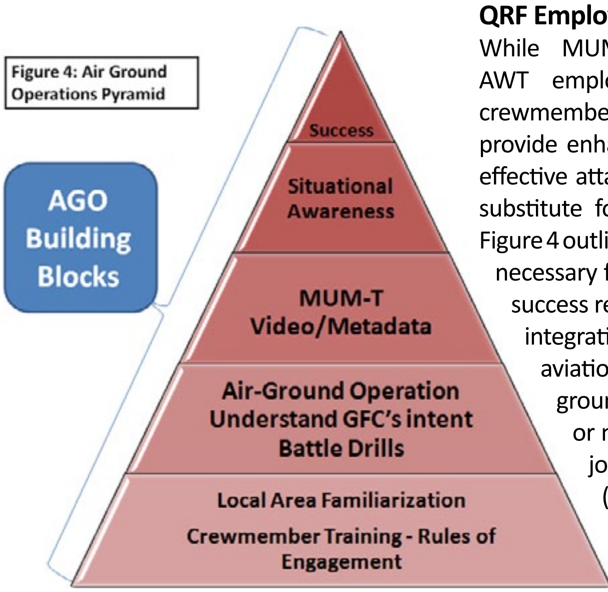

Figure 4: Air Ground Operations Pyramid

MUM-T equipped aircraft may operate in three configurations which can operate concurrently:

- AAG equipped aircraft to the ground
- Attack/intelligence, surveillance, and reconnaissance platforms (such as PTDS) to UR equipped aircraft
- AAG to AAG equipped aircraft

Metadata allows the receiving aircraft to calculate its own range and bearing to the UAS sensor LOS as well as cueing solution. This information is dynamically displayed on the AH-64D's tactical situation display (TSD). Figure 3 shows an example of a TSD screenshot during MUM-T operations. In this case the UR metadata is relayed from the aircraft's wingman. The AAG icon is an Army PTDS observing a nearby road, shown as AAG since it is relayed from another aircraft. The receiving aircraft may then switch between the UR video/data and the wingman's sight. If the source is the AAG wingman, the pilot has constantly updated information about his wingman, rather than present position reports updated at 30 second intervals. This makes team de-confliction much easier, particularly at night or in marginal weather.

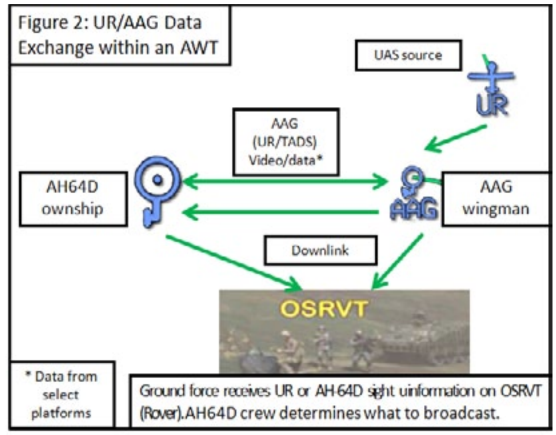

Figure 2: UR/AAG Data Exchange within an AWT

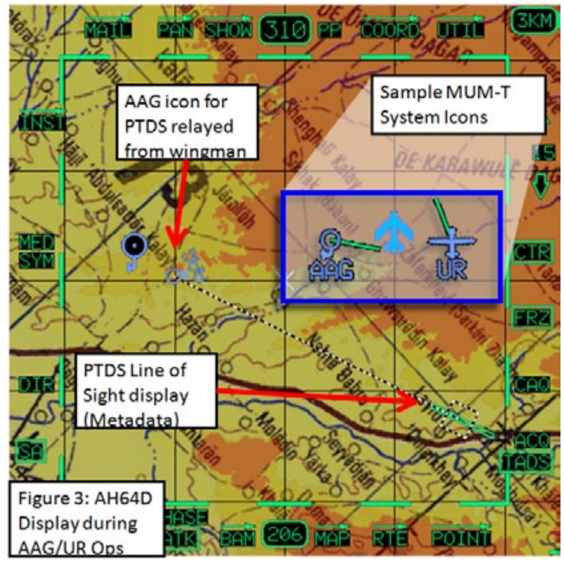

Figure 3: AH64D Display during AAG/UR Ops

Air to Ground Operations (AGO) and QRF Employment

While MUM-T is a leap-forward for AWT employment, it only augments crewmember effectiveness. While it can provide enhanced SA, it does not replace effective attack helicopter pilot training or substitute for effective tactics and AGO. Figure 4 outlines some of the building blocks necessary for effective AGO. The steps to success rest on a foundation of training, integration, and trust between the aviation task force and supported ground unit. The GFC, battle captain or non-commissioned officer, and joint terminal attack controllers (JTAC) must understand the GFC's intent, the capabilities and limitations of the AWT, as well as the overall battlefield dynamics.

Aviation units must work laterally to coordinate and disseminate capabilities to supported units; all players must have an understanding of employment tactics, techniques, and procedures (TTP) and the considerations involved. Expectation management between ground units and aviation assets is critical. Lastly, practice makes perfect; crews and CP personnel must conduct battle drills to refine TTP for QRF employment to ensure success.

Often, the most difficult aspect of AGO is target PID. Locating a specific point, individual, or vehicle is often difficult due to the different perspectives of the attack platform, the ground controller, and the dynamics of the tactical situation. This process is even more difficult in QRF or re-tasked situations where the AWT is unfamiliar with the operation in general. Army Training Publication (ATP) 3-09.32, JFIRE Multi-Service Tactics, Techniques, and Procedures for the Joint Application of Firepower, provides fire support planning considerations in Table 1. Though designed for deliberate mission planning, this checklist is also applicable to hasty operations involving QRF air support.

Some of the primary considerations that are discussed include airspace coordination measures such as holding points and air corridors, friendly marking procedures, sensor management plans, ROE, and attack guidance matrix for weapons employment. Planners should implement these measures into deliberate and steady-state operational mission planning to increase the MUM-T sensor to shooter fidelity while reducing time from alert to effects on target.

The AH-64D is a complicated weapon system and typically requires longer run-up times to bring all systems on-line. Deficiencies occurring during start may delay mission launch or result in a partially mission capable aircraft. Crews can mitigate some of these issues through run-up drills conducted immediately following aircraft assignment and following clear, unit established, 'Ready to Launch' criteria. Practiced run-up drills helped TF Gunfighter crews reduce their time to launch to under 10 minutes from notification to wheels-up. Establishing minimum mission equipment allowed crews to quickly determine the suitability of the aircraft for the mission. Additionally, running the aircraft up to REDCON 2 often helps keep unforeseen maintenance issues to a minimum.

Manned-unmanned teaming gives AWTs the ability to maintain stand-off using video supplied by a UAS, PTDS, or suitably equipped joint asset. The AWT can maintain SA from a distance outside audible/visible or threat weapon ranges, retaining the advantage of surprise. Alternatively, the AWT may proceed directly to the area of interest, with the ability to view the video of the target area and determine standoff and build a target, pattern, munitions, range plan for weapons employment while enroute. TF Gunfighter and CTF Duke used this TTP to reliably observe enemy in villages while the AWT maintained standoff. Once the observing platform verified that enemy was in the open and clear of any collateral damage potential, the AWT moved into position, made PID, and engaged the target.

Manned-unmanned teaming eliminates the need for potentially confusing or misunderstood voice-only "talk-ons" or sole reliance on error prone transmission/reception of map coordinates, which can be problematic in mountainous terrain. For example, slight changes in elevation of grid coordinates can manifest large location errors (±300m) resulting in cueing the AWT sights on the wrong hilltop, building, or other terrain feature. By correlating the metadata cueing and UAS video, the AWT can quickly verify their sights are on the correct target. Additionally, since MUM-T allows each aircraft to see the other's sight as well as the UR feed, the air mission commander has total SA throughout the engagement process. Though the UR can receive video from most UAS and close air support platforms (C-Band), it only receives metadata from select platforms in the Ku-band such as the PTDS (see Figure 5). Figure 6 shows an example of video-only operations from an F-16. Even without metadata, video-only information clearly provides a worthwhile SA enhancement. Using operational ground reference graphics, the AWT crew can quickly match the video to their own sights.

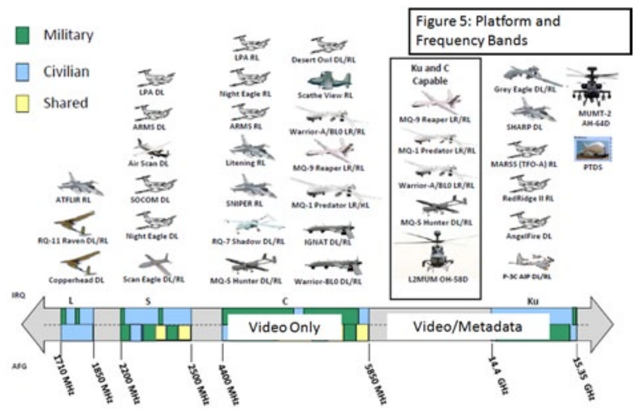

Figure 5: Platform and Frequency Bands

Task Force Gunfighter and CTF Duke developed a standard QRF battle drill for AWT employment. Using a detailed surveillance plan, CTF Duke determined how and when to engage individuals conducting cache, weapons transport, or other insurgent activities. During the observation, the CTF Duke Battle Captain alerted TF Gunfighter who watched the same video feed from the CP and flight line crew shack. TF Gunfighter verified CTF Duke's intent and other parameters such as readiness status and weather. They then updated the AWT crews who quickly gained SA from the same video feed provided to the flight line crew shack. The crews would then proceed to the aircraft with instructions to prepare for immediate launch (REDCON 1) or standby (REDCON 2).

The components that provided MUM-T capability allowed the crew to view the same video feed, thereby maintain SA while getting radio updates from CTF Duke's JTAC. Once airborne, the AWT either loitered to avoid alerting the target while using MUM-T to observe, or proceeded directly to the target for an engagement, based on CTF Duke's intent and the prevailing ROE as well as specific tactics used in the area of operations. These tactics proved very effective as all players, CTF Duke, GFC Mike, and the AWT had SA throughout the engagement, from notification to launch to weapons employment.

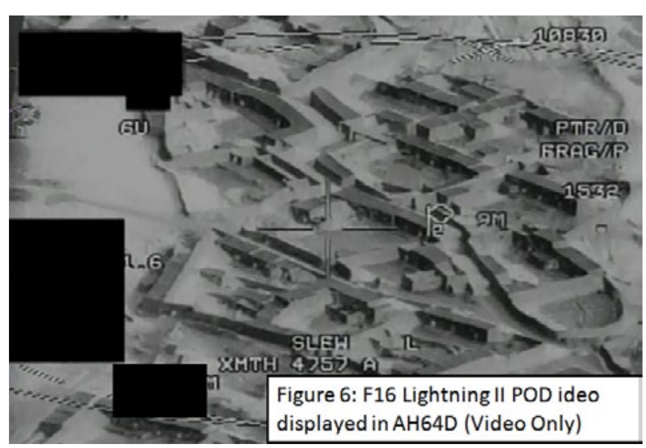

Figure 6: F16 Lightning II POD ideo displayed in AH64D (Video Only)

Recommendations

Aviation task forces should endeavor to conduct AGO capabilities briefs to all supported units whether in direct or general support. They must understand the capabilities of the various intelligence, surveillance, and reconnaissance and close air support (CAS) platforms they can expect to operate within the local area. Units should develop mission loads in the aviation mission planning system software to include UR presets as shown in Figure 7. This allows the AWT to quickly gain a 'handshake' (video/data link). Having presets for various platforms allows the crewmember to simply change a preset frequency to the appropriate 'remote video terminal code' (frequency), rather than manually entering data during flight, saving precious seconds.

The human element of AGO is particularly critical during hasty operations. A thorough understanding of the ROE and GFC's intent enhances the relationship and trust between the AWT and the GFC allowing for more effective and rapid employment of aviation assets. Getting crewmembers and ground commanders in the same room to ensure that the commander's intent is understood is a good first step toward building trust. This will allow crews to anticipate and plan their actions based on commander's intent and standing guidance.

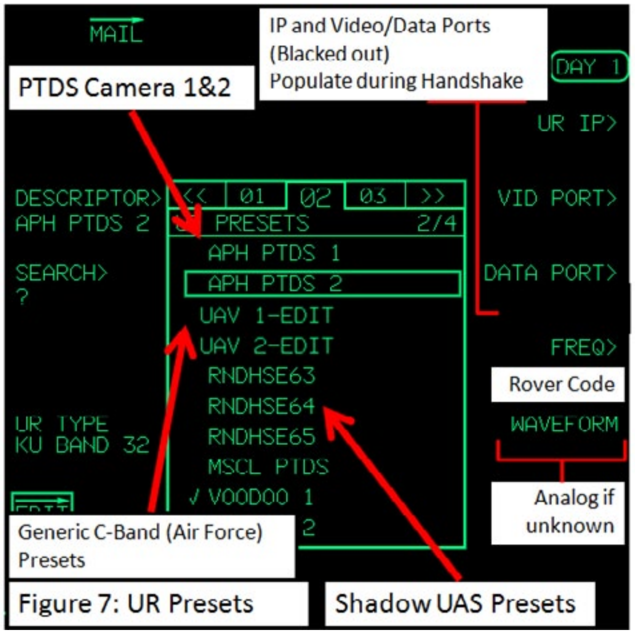

Figure 7: UR Presets

Deliberate operations, particularly air assaults, will generally have enablers such as AWT, CAS, and intelligence, surveillance, and reconnaissance assets allocated for specific times. Mission planners should facilitate the exchange of video/metadata information into the mission briefing process in the same way that frequencies and timelines are shared. AWT crews can build specific mission loads with this data as preset frequencies, allowing for a quicker and more effective fighter check-in. If AWT crews are responding as a QRF, this data will be critical to reducing response timelines. The AWT will arrive able to view UAS/CAS feeds while simultaneously sharing the information with the GFC. On at least one occasion, the ground commander was able to view AWT video from an Army Airborne Command & Control System UH-60 during an air assault operation involving two AWTs and six assault aircraft conducting multiple turns to more than one objective.

Another key aspect of effective AGO is terminology. Specifically, JTACs, joint fires observers, and AWT crewmembers must understand and utilize the proper brevity terms outlined in Appendix B of ATP 3-09.32. Particular importance should be paid to the video brevity terms listed in section 4. Proper terminology allows crews to develop SA more quickly and diagnose technical problems more effectively. JTACs must understand that while Army Aviation can perform standardized 9-line CAS procedures, they prefer close combat attack. The difference is more than doctrinal as Army aviators can acquire PID and release their ordnance independently of a JTAC. The advantages of AAG/UR capability combined with QRF tactics give AWT crewmembers and supported ground units tremendous capabilities. The find, fix, and finish cycle is markedly decreased while simultaneously reducing the potential for collateral damage since all players can view the same video feed and the metadata allows the AWT to cue their sight to the same LOS. AWT crews now enjoy a high level of target fidelity from notification to launch to trigger pull. MUM-T is a great step toward more effective support for our ground brethren. As many TF Gunfighters expressed, 'It's the best thing since the Modernized Target Acquisition Designation Sight!'

Take-Aways

- Build UR Presets for UAS, PTDS, and CAS platforms expected to participate in the mission.
- AWT crews must practice quick-launch drills to be effective in the QRF role.
- AGO briefs build understanding about capabilities and limitations and should include all participating operational elements.
- Practicing ground unit and aviation TF battle drills builds proficiency and trust.
- Planners should add MUM-T data to air mission briefing checklists.
- All aircraft should be brought to REDCON 2 as they are assigned to the day's mission to minimize launch delays.

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Acronym Reference

AAG - air-to-air-to-ground	**MUM-T** - manned-unmanned teaming
AGO - air to ground operations	**PID** - positive identification
AWT - Attack Weapons Team	**PTDS** - persistent threat detection system
ATP - Army training publication	**REDCON** - readiness condition
CAS - close air support	**QRF** - quick reaction force
CP - command post	**ROE** - rules of engagement
CTF - combined task force	**SA** - situational awareness
FLIR - forward looking infrared	**TF** - task force
GFC - ground force commander	**TTP** - tactics, techniques, and procedures
JTAC - joint terminal attack controller	**TSD** - tactical situation display
LOI - level of interoperability	**UAS** - unmanned aircraft system
LOS - line of sight	**UR** - upper receiver

ARTIFICIAL INTELLIGENCE

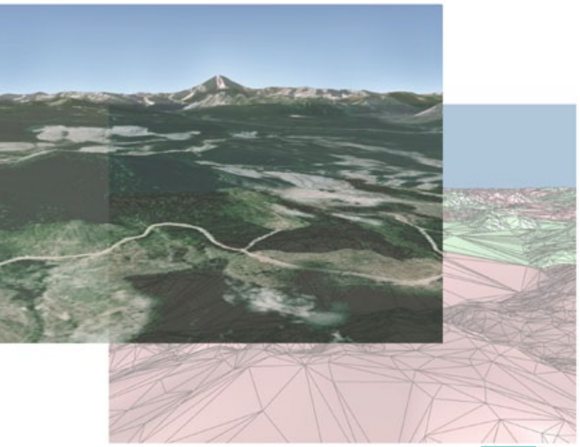
FOR THE NEXT GENERATION OF ARMY UNMANNED AIRCRAFT SYSTEMS

By CPT Tim C. Walsh

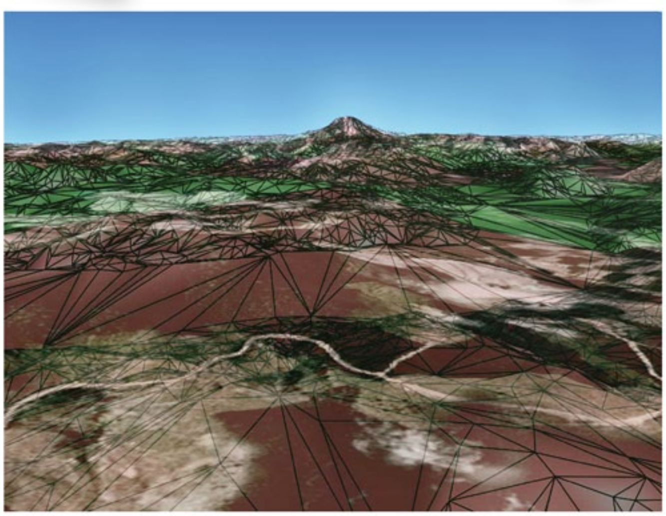
While unmanned aircraft systems (UAS) have gained acceptance in Army formations and doctrine over the past decade, the limitations of today's UAS may have also bred skepticism among aviators regarding what UAS can ultimately contribute on the battlefield, especially in a high intensity conflict. The current capabilities of Army UAS largely limit their role to loitering in a permissive environment at medium altitude while providing surveillance video to humans on the ground or in a nearby cockpit (as in the concept of manned-unmanned teaming). Rapidly procuring systems focused on that role made sense as commanders in Iraq and Afghanistan had immediate needs for more real-time intelligence and our enemies had few air defense capabilities. We should now recognize, however, that a range of artificial intelligence technologies could open new roles for next-generation UAS. This is not an exercise in science fiction; many technologies already exist, at least as proofs-of-concept, and will continue to mature in the near-term.

As we look beyond Iraq and Afghanistan, into the unknown where future enemies may possess more robust air defenses, being able to fly low becomes crucial again for survivability. Admittedly, doing so is out of reach for our current family of UAS. The manual for the RQ-7B Shadow, for example, reminds operators to plan routes that ensure 500 feet of clearance above the highest terrain or obstacle.[1] Equipping UAS with a terrain following radar or terrain profile matching system (common in Cold War era attack jets) would be an improvement, but still would not allow for flight down at the tree-top or roof-top level. In order to fly nap-of-the-earth,[2] UAS must be able to "see" and avoid obstacles more like a human. In that area of artificial intelligence, researchers at Google and Stanford University have made great advances in their work to develop self-driving cars. At the heart of their system, a 64-beam, rotating laser range finder (called LIDAR or LADAR) continuously updates a high resolution, three-dimensional, digital model of its surroundings to identify obstacles and other traffic. With a clear and detailed description of the environment, a path planning algorithm can then adjust the vehicle's speed or steer around obstacles while adhering to rules of the road and other parameters.[3] Since work began at Stanford in 2004, four states have chosen to allow testing on public roads and self-driving cars have safely covered more than half a million miles in real-world traffic.[4] Aircraft move at higher speeds, so automation requires longer range sensors and faster control algorithms, but a project involving Boeing, Piasecki Aircraft, Carnegie Mellon University, and Aurora Flight Sciences shows substantial progress. Their Unmanned Little Bird (ULB) H-6 helicopter, first demonstrated in 2010, uses LIDAR to detect obstacles like buildings, trees, and wires literally "on the fly."[5]

ULB's advanced vision system and path planning software also allow it to land without prepositioned infrastructure at the landing site, which is a major step forward in terms of versatility for tactical UAS. The RQ-7B Shadow, MQ-1C Gray Eagle, and MQ-8B Fire Scout helicopter all depend on carefully installed systems on the ground (or ship) to guide the

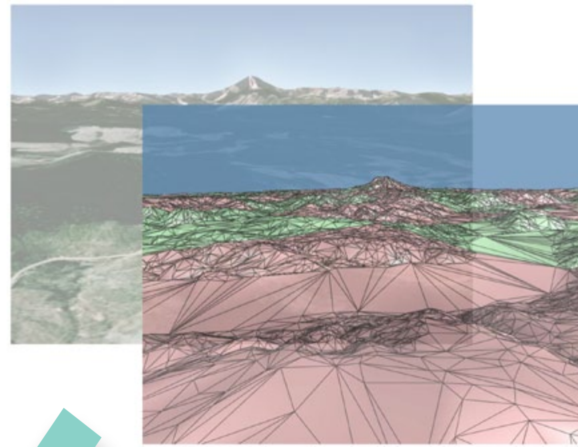


aircraft down.[6,7,8] The unmanned K-MAX helicopters that actually moved cargo in Afghanistan, instead of simply conducting surveillance missions, also relied on specially trained operators at each landing zone (although a newer, more autonomous version from Lockheed is now competing with ULB).[9] The ULB, on the other hand, can choose where to land in a given area after overflying it and constructing a digital map of the terrain and obstacles. Like a human pilot, the system evaluates and ranks numerous choices in real-time based on size, slope, wind direction, approach angle to remain clear of obstacles, and escape routes in case it encounters a new obstacle on final approach. Work on the project, now overseen by the Office of Naval Research, is ongoing with the goal of being able to fly faster and land without making an initial pass to reconnoiter the area.[10]



Of course, handling normal flight conditions is one thing but handling an emergency is something quite different. For example, the flight director in a UH-60M will attempt to maintain its speed and altitude even as the engine reaches maximum torque available and rotor speed decays; in the event of mechanical failure, a human pilot must be ready to disengage the flight director and manually control the aircraft.[11] Performing an autorotation to the ground, in particular, requires a high degree of "feel" that is difficult to replicate in machines, but another project at Stanford University dealt with this challenge in 2008. Using a technique called "apprenticeship learning," researchers recorded flight control inputs from a human pilot while he performed a series of autorotational landings of a large, remote-control helicopter. They also recorded the aircraft's state throughout each maneuver such as its forward speed, rate of descent, height above the ground, attitude, and rotor RPM. Their apprenticeship learning algorithm then determined ideal states and control inputs for each phase of the maneuver. In practice, their helicopter was able to autonomously perform a series of twenty-five successful landings after researchers disabled the engine in flight over an open field.[12] We may be far from seeing control systems that can autonomously handle every possible emergency, but the work at Stanford does provide a vision of how to move forward.

As memory, bandwidth, and computing power have continued to get cheaper in recent years, the increased amount of data that we can collect and analyze has led to tremendous improvements in the field of pattern recognition. The result is software with an uncanny ability to recognize things like speech (e.g. Apple's Siri), people in photographs (e.g. Facebook), foreign language text (e.g. Google Translate), and handwriting (e.g. U.S. Postal Service machines for sorting mail[13].) Given vast quantities of old data already labeled by humans, it is possible to write programs that can correctly label new data. For example, optical character recognition software can "read" handwritten letters and digits with up to



99.5% accuracy by essentially searching for the closest match in a database that contains only 100,000 labeled examples.[14] A more sophisticated type of software called an "artificial neural network" (ANN) can label new data without having to reference a database of examples each time. ANNs "learn" to identify patterns by processing vast amounts of training data and fine-tuning their logic with each round of feedback. ANNs can even continue to train and improve their performance by getting feedback while on the job.

The U.S. military is no stranger to collecting and storing data, having acquired more surveillance video and other imagery than intelligence analysts will ever look at. In 2009, the Air Force alone collected so much video over Iraq and Afghanistan that it would take 24 straight years to watch it all, and the total amount of video collected each year was almost doubling. The chief of Air Force intelligence predicted that his analysts would soon be "swimming in sensors and drowning in data." [15]

One application of pattern recognition is automated, real-time identification of enemy troops and equipment. The Longbow fire control radar currently offers this capability to some degree, classifying ground targets as tracked vehicles, wheeled vehicles, or air defense units.[16] Implementing similar but improved technology in UAS could go a long way toward relieving the workload on human operators and analysts, and speeding up the response to threats for greater survivability. A few people on the ground could manage a much larger number of next-generation UAS that autonomously fly routes while avoiding terrain and obstacles, processing sensor data to identify possible enemies, and sending immediate spot reports back to base for further analysis or clearance to engage.


Amalgamation of images captured from Video: "Super Computer" by Tech. SGT Theodore Warne, USAF

Hoards of terrain data and imagery may also enable UAS to navigate in new ways. The reliance on GPS among our current family of UAS could present a serious vulnerability in a high intensity conflict that includes degradation or denial of GPS. When the RQ-7B Shadow loses its GPS signal, for example, it switches to a dead-reckoning mode which may be subject to significant amounts of drift.[17] However, in the same way that a human pilot can find his or her location on a paper map by using "terrain association," a computer can compare sensory input with stored digital terrain data.

By 1960, decades before GPS became operational, researchers developed a guidance system allowing cruise missiles to follow a route over many miles and strike within 165 feet of a target.[18] The system, called terrain contour matching (TERCOM), uses digital terrain elevation data (DTED). The missile compares observed changes in elevation (the difference between its barometric and radar altimeters) with the known elevations along its programmed route. If the observed elevations begin to match the terrain data for the left-hand side of its programmed route, for example, the missile will adjust course to the right.[19] By the 1980s, cruise missiles used TERCOM in conjunction with another system called digital scene matching area correlation (DSMAC) to provide additional accuracy upon reaching the target. DSMAC attempts to maneuver the missile until its camera image matches stored photographs of the target.[20]

Modern computing power and storage capacity, combined with higher resolution imagery and DTED collected in recent years, offer the potential for more accurate and flexible terrain-aided navigation algorithms. Instead of only being able to follow along a narrow, preprogrammed route to a specific target, new systems could dynamically fix their position (updating an inertial navigation system) anywhere in a wide area of operations by determining the location that most closely matches whatever they detect with cameras, radar, LIDAR, and other sensors. In a 2008 experiment at Linköping University in Sweden, researchers developed a visual navigation system using a simple camera and satellite imagery downloaded from Google Earth. During a half-hour flight of their small, unmanned helicopter, the visual navigation system always found the aircraft's position within eight meters of the GPS solution.[21] The Linköping University experiment was just one of many projects in recent years to pursue this active area of research. Google's self-driving cars actually use a similar approach in order to improve their precision beyond what it is available through GPS alone.[22]

Thinking long-term, many aviators seem to conclude that UAS could own the attack and reconnaissance roles, but that nobody will ever risk putting troops in the back of an "unmanned" aircraft. With that said, history shows that better automation eventually changes the skill-set required to operate a class of vehicle. Someone who learned to drive a car or fly a helicopter in 1950 had to learn certain skills that are now somewhat antiquated, such as operating a manual transmission or throttle. At one time, elevators required a specially trained operator to manipulate levers and monitor gauges. Now an elevator passenger is the operator. Instead of trying to imagine passengers in the back of a pilotless UH-60, perhaps we should think about how the line between pilot and passenger might blur as more tasks can be more reliably automated.

Increasingly, advances in artificial intelligence will enable UAS to operate in complex, high-threat environments, and perform tasks that are currently the exclusive domain of highly trained aviators. If UAS do not take on new roles, it will not be for lack of technical progress. In guiding the branch toward new doctrine and equipment, Army aviation leaders should remain open to the idea that UAS could do much more than we have asked of them so far.

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Acronym Reference

ANN - artificial neural network
DSMAC - digital scene matching area correlation
DTED - digital terrain elevation data
GPS - global positioning system
TERCOM - terrain contour matching
ULB - unmanned little bird
UAS - unmanned aircraft system

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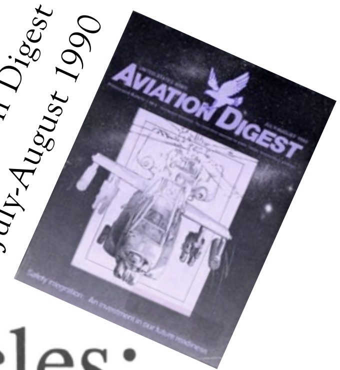

Remotely Piloted Vehicles: One Marine's Perspective

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2d Marine Aircraft Wing
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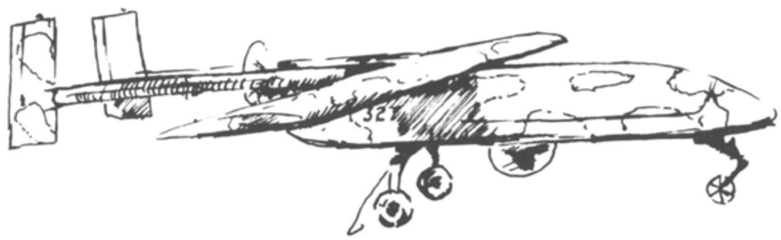
WHY IS A MARINE captain writing an article for an Army publication, and about remotely piloted vehicles (RPVs) at that? I am writing this article to provide information about a little-known subject and to give some food for thought. To write an indepth study on the capabilities, limitations and methods of employment of RPV is beyond the scope of this article. With budget support for the Army's Aquila program cut and the recent success of the U.S. Navy employment of the Pioneer RPV system in the Persian Gulf, the Army is taking a closer look at the Pioneer Short-Range Tactical RPV System. This article will cover a brief history of RPVs in the Marine Corps, organization, system description, employment and food for thought.

History

Although RPVs were used in Vietnam, the current family of tactical RPVs began their history with the Mideast War of 1973. Following heavy losses of manned aircraft to Soviet-type air defense systems in that war, the Israeli Defense Force (IDF) began a priority project to develop an unmanned platform for aerial reconnaissance. The success of the project was clearly demonstrated during the 1982 invasion of Lebanon. (See also "The Israeli Air Forces and the 1982 Lebanon War 'Operation Peace for Galilee'" article beginning on page 60.) As a significant asset of the IDF's intelligence network, the real-time video RPVs provided enabled Israeli commanders to stay consistently one step ahead of their adversaries.

The current RPV program in the Department of the Navy began its history with the Multi-National Force in Lebanon. Because of the loss of manned aircraft, the untimeliness of aerial photo reconnaissance and the inaccuracy of unobserved naval gunfire on targets deep in the Shouf Mountains, Mr. John F. Lehman Jr., then Secretary of the Navy, directed that U.S. forces be provided RPV capability.

Detachment A, Target Acquisition Battery, 10th Marine Regiment, Camp Lejeune, NC, was formed in January 1984, de-



ployed to the Middle East, and trained on an operational RPV system. Returning to Camp Lejeune, the unit continues to evolve as an operational and test-bed unit for RPV development. Detachment A was redesignated 1st RPV Platoon in September 1984, and subsequently renamed 2d RPV Company in October 1986. The 2d RPV Company is located with the Surveillance, Reconnaissance Intelligence Group, 2d Force Service Support Group at Camp Lejeune.

From January 1984 until December 1986, the Marines operated the Israeli-made Mastiff Mk III RPV system. During the spring of 1987, the 2d RPV Company received its first Pioneer RPV system. The Pioneer RPV system is another Israeli system, purchased through an American contractor. At that time, the Pioneer system was not an operational system with the IDF. Initially, the Marines experienced severe electronic, mechanical and spare parts problems. There are still many things about this system that do not work.

Organization and System Description

The Marine RPV companies are organized into a company headquarters, a maintenance platoon and flight platoons. The number of flight platoons is undetermined at this time, but each flight platoon will operate one Pioneer system. Each system consists of a ground control station (GCS), tracking control unit (TCU), portable control station (PCS), air vehicles (RPVs), remote receiving stations (RRSs) and associated ground support vehicles and equipment.

The GCS is the brains of the system and is where the flight crew performs its mission under the supervision of the mission commander. There are two stations: the pilot bay and the payload bay. The pilot bay controls the flight of the RPV while the payload bay controls the onboard video camera.

The TCU is the remotable antenna system for the GCS and houses all tracking and communications equipment for controlling the RPV. Both the GCS and TCU are housed in S-250 shelters on commercial utility and cargo vehicles or one S-280 shelter on a 5-ton truck.

The PCS and its antenna perform the functions of the pilot's bay from the GCS. It is used primarily for preflighting and launching or recovering the RPV when the GCS/TCU are not located at the launch or recovery site.

The air vehicles have an approximate wingspan of 17 feet and are 14 feet long. Maximum weight for takeoff is about 429 pounds. The flight endurance varies from 4 hours with the infrared (IR) camera to about 5½ hours with the daytime black-and-white camera.

The RRS is the most important piece of equipment that the RPV company uses to support other units. It is a black-and-white monitor that mounts in a vehicle radio mount. This is a receiver only and allows the supported unit commander to see the battlefield or target area on a real-time

Remotely Piloted Vehicles, *continued*

basis and to react accordingly.

The following are some of the advantages of the RPV system:

- A real-time data link capability that provides video for acquisition, storage, interpretation and dissemination of combat information out to 100 nautical miles (nm).
- A low probability of detection because of the reduced visual and IR signature.
- Rapid and accurate targeting for adjustment of supporting arms.
- A day and night system capability.
- A preprogramed mode of operation that reduces radio frequency emissions.
- Reduced exposure of manned aircraft to lethal weapons systems.
- No requirement to collocate GCS at the launch or recovery site.

Several disadvantages that must be considered when employing RPVs include:

- Environmental considerations.
- The inability to fly in rain or icing conditions.
- Video quality is reduced by certain meteorological conditions and battlefield obscurants.
- Wind limitations for launch and recovery.
- A line-of-sight transmission limitation exists between the TCU and RPV, and the RPV and RRS.
- While more than one air vehicle may be airborne at any given time, only one can be actively controlled at a time. Also video down link can only be processed from one RPV at a time.
- Transportation requirements include handling of nonmilitary special equipment (i.e., the system is fragile).
- System location data accuracy is based on a survey requirement for the TCU.
- Special fuel considerations require 100 octane low-lead aviation gasoline.
- For now, a cadre of civilian technical representatives will accompany the system.

Some vulnerabilities of the system include the following:

- The video signal from the RPV is nonencrypted and can be interrupted or exploited by any threat force with compatible equipment.
- Once detected, it can be destroyed by any weapon used for antiaircraft artillery purposes.
- Normal RPV operations require that the TCU be an emitter, which then makes it susceptible to enemy electronic warfare actions.

Employment

Since the Pioneer system has a 100-nm radius of operation, the launch or recovery site normally is located in the rear area outside the range of threat artillery. The RPV company normally is attached to the command element of the Marine Air Ground Task Force (MAGTF). It is used in general support of the MAGTF. But the RPV company also may be put in direct support of any subordinate element of the MAGTF for specific missions or periods of time. The GCS/TCU are normally located forward near the supported unit combat operations center or fire support coordination center. Units submit requests for RPV support to the controlling headquarters identifying the desired targets, locations, times and coordinating instructions in as much detail as possible. The RPV operations officer or liaison officer then coordinates the mission with the air officer, intelligence section, operations section and fire support coordinator. The G3 or S3 resolves any conflicts based on the commander's guidance. Because of the flight endurance of the RPV, it is ideally suited for immediate mission tasking. After receiving an immediate tasking, the RPV mission commander coordinates the change with the airspace control agency before directing the crew to divert from the already approved flight profile. The Pioneer RPV is not well suited to strip alert (standby) missions because of the tendency for the avionics to overheat. Time required to preflight the GCS/TCU and RPV, crank and launch the RPV is about 2 to 3 hours depending on the problems discovered during preflight tests. Upon completion of the mission, the recorded video tapes are then forwarded to higher headquarters for further detailed exploitation.

The RPV integrates easily into the existing command, control and communications system. The MAGTF commander establishes mission priorities and whether RPVs are placed in general support or direct support units. The mission commander, in coordination with the airspace control agency, always retains flight control of the RPV. To the greatest extent possible, the RPV company uses existing communication nets to connect the RPV company with supported units and airspace control agencies. The RPV company command net is the only new radio net established.

During a mission, the mission commander is in constant contact with the supported unit or higher headquarters. The mission commander: provides intelligence or adjustment of supporting arms; provides the RPV launch or recovery site; coordinates flight handovers from the PCS to GCS and back; and serves as the airspace control agency for route clearance and flight following. Usually, there are no conflicts with rotary-wing aircraft, except during the launch or recovery phase, since the mission altitude is normally 3,000 to 4,000 feet above ground level (AGL).

Food for Thought

While performing a reconnaissance mission, the mission commander normally takes direction from the supported unit's intelligence officer. If during the mission the RPV finds a target of opportunity that the MAGTF commander wants supporting arms to engage, the mission commander contacts the supporting artillery unit. The payload operator of the artillery unit conducts the adjust-fire mission. It is essential that the payload operator be cross-trained as photo interpreter and artillery forward observer.

In the past, different types of overlays or control measures have been used to depict the RPV area of operation. The most widely used and understood methods are to use the aviation check points and air corridors that the aviation combat element (ACE) of the MAGTF uses. Another method is to establish RPV patrol routes and loiter areas oriented to areas of interest. Still another method is to establish restricted operating zones (ROZ) and have the RPV fly direct from ROZ to ROZ. I found that using the ACE overlay was the most flexible and widely understood method.

The Pioneer RPV system is a sophisticated computer system, and like any computer system changes in temperature and weather affect the system. It may be working fine when power is secured for the day, but when power is applied for the missions the next day, several fault conditions may exist. The troubleshooting procedures may take anywhere from 10 minutes to 2 hours. Because of this, launch times are not definite.

The operational radius of the Pioneer system is 100 nm. However, you must maintain electronic line of sight between the TCU and the RPV. The further the distance, the greater the altitude the RPV must fly, thus the lower the camera resolution. The black-and-white daytime camera with its 10-to-1 zoom offers excellent resolution to identify vehicles and count individual people from about 4,000 feet AGL. Moving targets or objects that contrast with their surroundings are easier to locate and identify than small stationary or well-camouflaged targets. The RPV is not an area search platform. It works best when ground reconnaissance elements or remote sensors are cued to a particular area.

The IR day and night camera offers four different focal lengths that roughly approximate the 10-to-1 zoom of the daytime camera. This camera allows operation at night and through thin haze or light fog. It also makes the task of locating camouflaged targets that produce a heat signature easier. On a recent exercise, the GCS crew could count the individual people debarking from a landing craft. The time was predawn (read dark), RPV altitude was 5,000 feet and slant range was about 3½ kilometers.

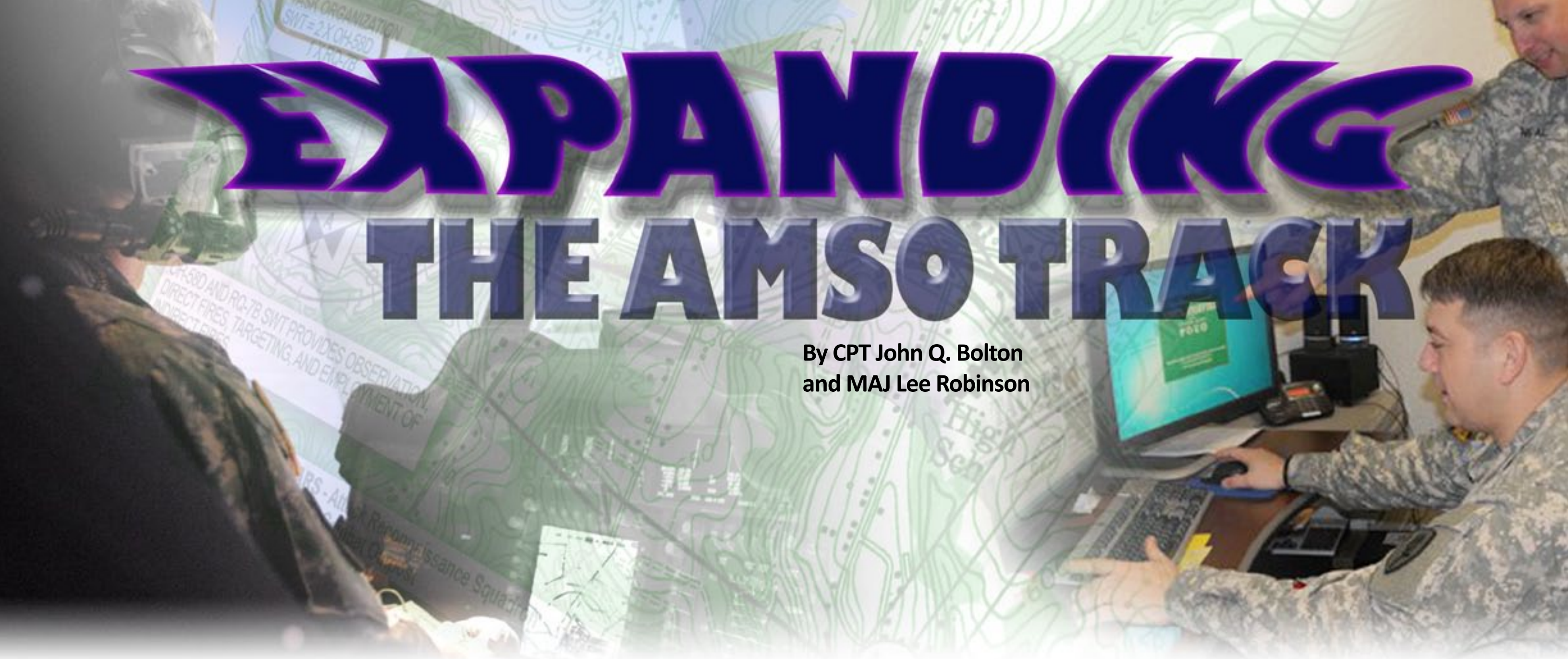
The Pioneer system has a large foot print for shipboard or air movement. Essential equipment can be carried in one C-5 Galaxy aircraft, but some spare and motor transport items may not fit.

As mentioned before, the Pioneer is a short-range, tactical RPV system that can operate out to 100 nm. The Navy is also developing a midrange RPV with a range of 350 to 400 nm. It probably will be an air-launched, high-subsonic speed jet RPV. Another capability being explored is a high-altitude, long-endurance RPV built on the technology of the *Voyager* that flew around the world without refueling. It is obvious that RPVs are here to stay and the skies will be getting more and more crowded. The time is upon us to learn how to safely integrate these systems into our airspace management system.

I hope this article opened your eyes somewhat as to the use of RPVs as a force multiplier. I did not intend to cover all aspects in detail, but to give an overview and provide some food for thought. The Marine Corps Operational Handbook 2-2, *Remotely Piloted Vehicles Employment*, and Navy Surface Force TACMEMO XZ 0010-1-86, can provide you with a more indepth description of employment procedures and tactics.

EXPANDING THE AMSO TRACK

By CPT John Q. Bolton
and MAJ Lee Robinson



A commander's major responsibility is to plan and manage unit training. A vital tool is the use of live and virtual training scenarios. However, at the company and battalion level, it is difficult to develop specific training scenarios with limited manpower and expertise, particularly as simulation and other mission training and rehearsal systems evolve. Take a common situation: an aviation company commander seeks to develop the unit's competency in decisive action operations, specifically focusing on interdiction attacks using AH-64Ds to destroy a threat weapon system prior to an air assault. Once the commander identifies the individual, team, and collective tasks for the mission, he must develop a training scenario. Who does the commander turn to in order to develop that scenario to accomplish his training objectives? Our current organization structure does not provide a clear answer.

> ...the TACOPS track must focus more broadly on mission planning and training development.

Constructing a realistic training scenario requires a significant amount of background work to meet the commander's training objectives. S-2 analysis, creating the correct threat profile, and constructing the supporting simulation products are all required for a realistic training scenario. The job of actually building training scenarios and environments varies from unit to unit, but the bottom line is that aviation companies are not staffed nor trained to prepare scenarios. It is time to fill this role using warrant officer expertise.

The lack of a dedicated aviation planner on staff manifests itself every time we task organize for a mission, whether for a deployment to Afghanistan or a cross-country flight to the National Training Center. Units must re-learn the capabilities and planning factors of each aircraft type, as well as merge different standing operating procedures and tactics, techniques, and procedures (TTP) as aviation battalions adjust their task organization to support maneuver brigades at the combat training centers or home station training. Since Army Aviation fights as multi-functional aviation task forces (MFATF), it makes sense that our home-station task organizations support integration amongst different airframes.

While the aviation mission survivability officer (AMSO) fills a role within Army Aviation, we should re-brand this specialty to focus on mission planning at the company and battalion level, including integration of different aircraft mission design series and joint asset capabilities. This 'operations and training' track would greatly enhance unit effectiveness, the quality of staff products, and provide greater opportunities for warrant officers in the planning process at all levels.

Three warrant officer tracks have specific duties enumerated in various publications or regulations. The AMSO position, however, seems to be the catch-all for tasks not directly associated with the other tracks. The Commander's Aircrew Training Program for Individual, Crew, and Collective Training states that the tactical operations (TACOPS) officer (now the AMSO) is responsible for advising the commander on aviation mission survivability (AMS) and unit tactical maneuver. It also states that the AMSO is responsible for integrating threat versus aircraft survivability mission planning, formulating and disseminating TTP, and training small team and collective scenarios as part of the commander's aircrew training program and unit mission. In practice, however, AMSOs are generally associated with two functions at the company and battalion. First, they provide material for annual training in the form of recognition of combat vehicles and computer-based aircraft survivability equipment training. Secondly, AMSOs maintain the aviation mission planning system (AMPS) and prepare mission data that will be downloaded into the aircraft.

Ideally, AMSOs should plan and execute annual aviation mission survivability training requirements, consisting of both academic and scenario-based training. Since Army provided web-based training meets the academic requirement, the remaining AMS training usually involves executing one or two mission iterations in a simulator against threat weapons systems. As a result, AMSOs spend a majority of their time working on the AMPS and creating 'base' loads for the unit. This limited focus takes away from what should be a critical AMSO function within the unit - ***mission planning.*** It also encroaches on the duties of pilots-in-command (PCs) function as first-level trainers.

The Army Aviation community shares collective blame for this situation. Commanders and standardization instructor pilots typically view the AMPS as a technical system as opposed to a key component of mission planning. Rather than plan the mission on the AMPS as a team using specified planning cells, units typically make a plan and then outsource the data entry to the AMSO. Unit PCs should be experts on utilizing the AMPS and required to train junior aviators in its use. Making more effective use of PCs as trainers will allow tracked warrant officers to focus on their specialties, enhancing unit performance, and dividing the workload within the unit more efficiently.

Way Forward

The AMSO track should be re-designated as TACOPS as its former name is both fitting and accurate. This re-branded track would have the same responsibilities for personnel recovery and AMS training, but also have a focus on operational planning. Company TACOPS officers would be the experts in constructing training scenarios in accordance with the commander's training objectives. This role would assist the commander and standardization pilot in the development of live and virtual training scenarios in order to facilitate the company training plan.

Currently, there are a variety of simulators and devices such as the Longbow Crew Trainer and the Aviation Combined Arms Tactical Trainer but no single point of reference for actually developing the scenarios and plans for execution using them. Commanders seeking to utilize these systems will find a virtual world ripe for training, but no scenarios or training support packages unless they developed them internally. This is a function ideally suitable for the TACOPS officer to provide the expertise in leading planning cells.

Once a TACOPS officer spends one to three years at the company level as a lead planner and training developer, he would move to battalion staff. The first job would be as a flight operations officer providing experience and expertise for this critical function. Most units currently fill this role with a newly arrived lieutenant or warrant officer as an additional duty. Assigning the duty to a tracked senior CW2 or junior CW3 would give legitimacy to the position as well as allow the battalion to track current operations more effectively. Furthermore, it would free up flight operations Soldiers (15P) to do their primary job of managing the battalion Centralized Aviation Flight Records System.

The second operations officer position at the battalion level would have the primary responsibility for planning missions. Here is where the re-branding will show its versatility as it will be non-airframe specific. The tracked officers would have experience in planning air assaults, battalion training missions, battalion gunnery exercises, etc. The TACOPS officer would level competence and experience while broadening warrant officers at the battalion level. Each battalion should have a requirement for two operations tracked warrant officers in the S-3 section. The junior officer should lead the flight operations section and manage the standardization and training on the AMPS across the battalion. The senior operations warrant would focus on mission planning, training development, and major operations. This would enhance the capability of each S-3 section while simultaneously giving warrant officers ownership of missions by embedding technical and tactical experts with aviation captains trained in the military decisionmaking process (MDMP). Additionally, it would enhance the professional development of junior aviation commissioned officers assigned to the S-3. Developing a similar section at the brigade S-3 would have the same effects of leveraging competence, aiding mission planning, giving warrant officers an integral role in operational planning, and adding an additional step in career development.

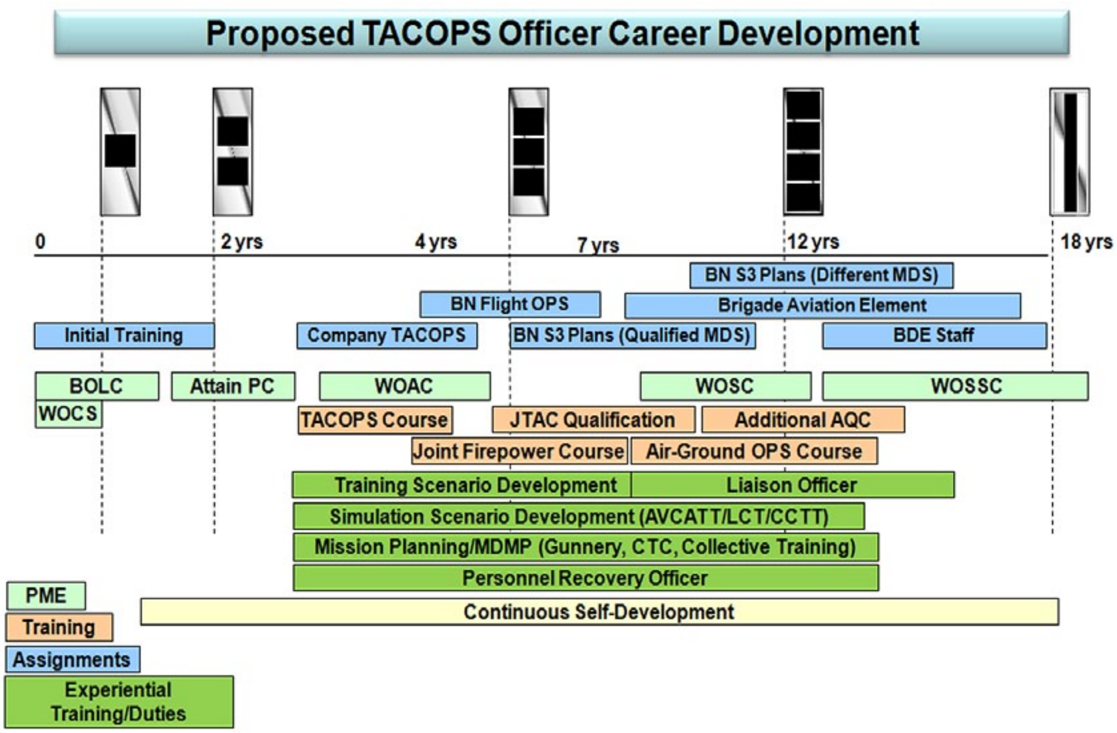
Furthermore, having on-hand expertise outside of each battalion's mission (attack, lift, scout, etc.) generates two key advantages. First, since aviation units organize as MFATF for missions, expertise about different aircraft capabilities and missions is already built-in to the operations section. Secondly, each battalion would, in effect, already have a liaison officer on staff; it would greatly aid lateral and vertical coordination.

As the Army transitions from a counterinsurgency centric focus to unified land operations, the TACOPS officer track would be perfectly suited to become the aviation expert on entry into non-permissive environments as well as the transition between decisive action and wide area security operations. At the tactical level, the TACOPS warrant officer would provide the knowledge base for company and battalion tactics and threat systems. We need to simply expand the scope of the track from aviation mission survivability and threat systems to the broader range of mission planning and training development.

The shift from AMSO to TACOPS officer would not necessitate a major change in Army Aviation warrant officer staffing or career development. It would enhance the choices in a highly attractive career field and develop multiple competencies and skill sets, rather than the limited focus currently assigned to AMSOs. The development of training support packages and template scenarios for simulation and situational training exercises are critical skills needed in the unit. Furthermore, by having a dedicated S-3 section for these requirements, the products and training packages will be more thorough and more standardized across battalion and brigade as opposed to the inconsistent product that is typically currently provided.

To accommodate this re-branding, the TACOPS track must focus more broadly on mission planning and training development. This focus does not mean losing expertise in threat weapon systems and aircraft survivability equipment; in fact, those knowledge sets are essential to operational-level mission planning. The change should entail aspects of hasty and deliberate mission planning, including MDMP, route development, and weapons employment. Education on the current operational environment, threat systems, and corresponding team and company tactics are vital. Additionally, TACOPS instruction would require curriculum for teaching live and virtual training scenario development. Army Aviation has a variety of simulation tools available, but the training scenarios and unit integration is lacking. The TACOPS officer would fill that void.

Much of the schooling required for the TACOPS officer track already exists. For example, the Air Force Joint Firepower Course teaches a two-week course focusing on joint service platforms that include close air support and unmanned aircraft systems capabilities and employment TTP. Sending TACOPS officers to this course would enhance their capabilities, allowing them to function outside their immediate airframe-specific competence at marginal cost.



Giving significant roles and responsibilities to the TACOPS warrant officer would lend credibility to the track. Once employed as a vital element of operational planning, the track will prove itself as a critical functional area the commander needs to achieve mission success at the company, battalion, and brigade. Training plans and scenarios and operational planning would all increase in detail and effectiveness by employing warrant officers in the development, rather than solely in the execution of these events. The need for dedicated planners and operational experts is necessary for training and 'real-world' missions, particularly at the battalion level. In this vein, giving that responsibility to our technical experts seems only logical.

References:

TC 3-04.11 (Commander's Guidance to Aircrew Training Program) and FM 3-04.126 Attack Reconnaissance Helicopter Operations

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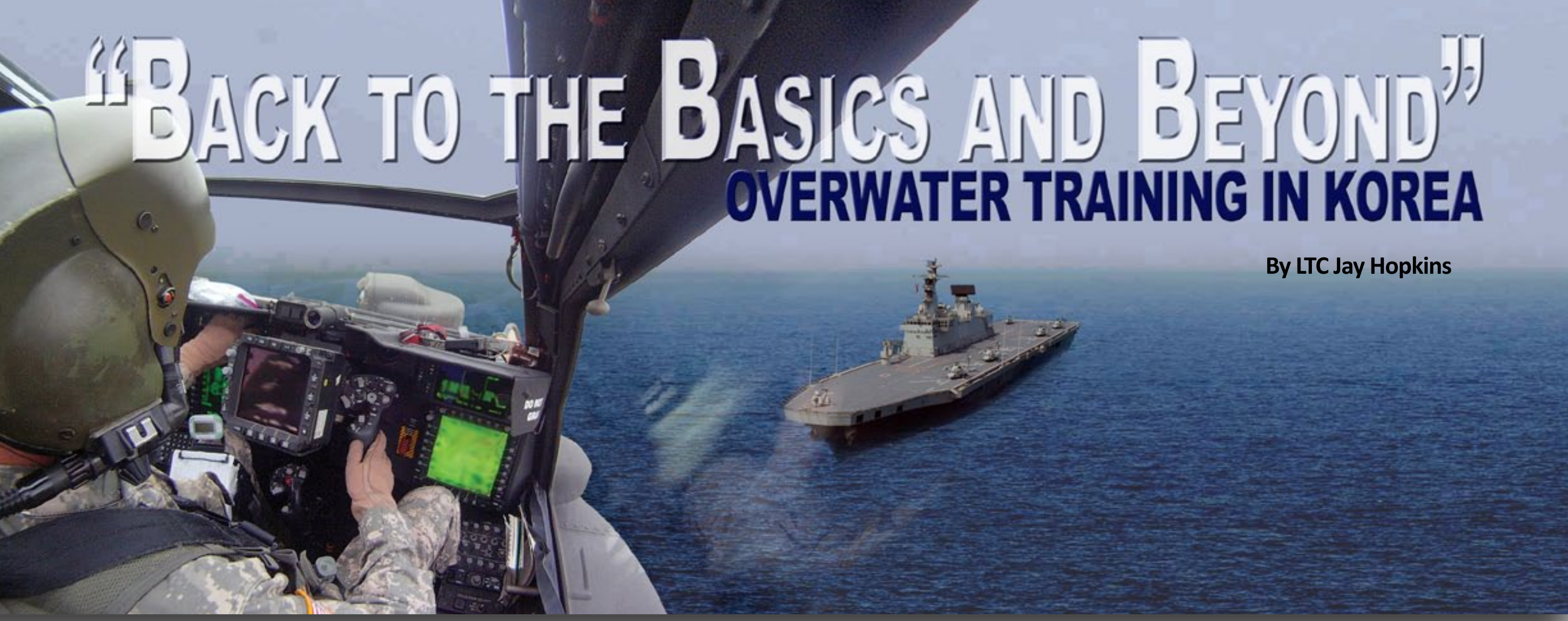
Major Lee Robinson is the Executive Officer for 1-1st Attack Reconnaissance Battalion (Task Force Gunfighter) at Kandahar Airfield in Afghanistan. Major Robinson's previous assignments include two deployments to Operation Iraqi Freedom, Company Command in 1-227th Attack Reconnaissance Battalion, and an instructor at West Point. He is qualified in the AH-64D as a Pilot in Command with over 1,700 flight hours.

Acronym Reference

AMSO - aviation mission survivability officer	**MFATF** - multi-functional aviation task force
AMPS - aviation mission planning system	**PC** - pilot-in-command
AMS - aviation mission survivability	**TACOPS** - tactical operations
MDMP - military decisionmaking process	**TTP** - tactics, techniques, and procedures

"Back to the Basics and Beyond"

Overwater Training in Korea



By LTC Jay Hopkins

AH-64 overwater mission sets have been a staple in the Republic of Korea (ROK) for the past 20 years. The maritime threat that exists on the flanks of the ROK has been accounted for using a joint/coalition team that incorporates AH-64s in a non-standard over-water role. The first accounts of using AH-64s in a counter-maritime role in the ROK originated with the 5-501st Aviation Regiment who arrived on the peninsula in 1994. The 5-501st immediately began training overwater tactics in the East Sea, conducting deck landing qualifications (DLQ) at Pohang, and performing individual overwater survivability at the Camp Eagle swimming pool.

The 6th Air Cavalry (CAV) Brigade Headquarters and 3-6th CAV arrived at Camp Humphreys, ROK in 1996 giving the 8th Army the flexibility to allocate a squadron on both the east and west coast (1-6th CAV, formerly 5-501st operated on the east coast and 3-6th CAV operated on the west coast) The 4-501st Aviation Regiment arrived in 1994 and was later reflagged as 1-2nd Aviation Regiment and served as the 2nd Infantry Division's (ID) primary attack, reconnaissance and security arm. Three attack battalions in Korea meant that both the Combined Forces Command and 2nd ID mission sets were accounted for in mass.

The 6th CAV Brigade revolutionized the basic individual and collective over-water training tasks and tactics, techniques, and procedures from 1996 until 2005 when the 6th CAV Brigade was reflagged as the 2nd Combat Aviation Brigade (CAB). A fully operational dunker was installed at Camp Humphreys in order to streamline the requirements outlined in Army Regulation 95-1. The Jik-do range Hellfire shoots became legendary and allowed aircrews to train overwater t-bone tactics using the Hellfire point target weapon system on what remains the most permissive Hellfire range within the Army. When the leadership of the 6th CAV Brigade moved on to positions of greater responsibility within the Aviation Branch, they took the lessons learned from the ROK and shared them with the rest of the Army.

By 2004, the Regular Army Apache fleet had become strained from the wars in Iraq and Afghanistan. The operational tempo on both personnel and aircraft led to the initial decision to move an AH-64 squadron from the ROK back to Forces Command. In 2004, 1-6th CAV moved back to Fort Hood, Texas to round out the 4th CAB. 1-2nd became the second AH-64 unit to return to the United States when they departed to Fort Carson in 2009. 4-2nd Attack Reconnaissance Battalion (ARB), formerly 3-6th CAV, was left to fight an economy of force mission that accounted for both the counter maritime mission and the 2nd ID attack, reconnaissance, and security missions.

A team of 4-2nd ARB AH-64D Longbow Apaches firing Hellfire missiles at Jik-do range in August 2013

From 2009 to 2012, the 4-2nd ARB maintained a minimal over-water capability that allowed the organization to continue to shoot Hellfire missiles at Jik-do, but often overlooked the requirements for the joint/coalition counter maritime mission. Resources, to include personnel, were prioritized to the 14 Regular Army ARBs dedicated to the wars in Iraq and Afghanistan.

In late 2011, the War in Iraq was over and soon after the President's 2012 "Pivot to

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East Asia" regional strategy was revealed. Tensions on the Korean peninsula were at an all time high as the Democratic People's Republic continued to display aggression and rhetoric against the ROK. North Korea sank the Cheonan, a ROK Navy ship, in March 2010 in the Yellow Sea and shelled Yeopyeong-do Island in November 2012 proving that they were capable and willing to make aggressive offensive attacks against South Korea. The Angi-V long range ballistic missile test on April 17, 2012 validated North Korean intent for continued aggression and the need for a medium CAB in the ROK.

The President's "Pivot to East Asia" strategy began to take effect in early 2013 when 4-2nd ARB received an influx of combat veterans into the formation. The combat proven aviators were able to quickly perform the 2nd ID's attack, reconnaissance, and security missions and were eager to revitalize the complex overwater training mission established in the mid 1990s. The "Pivot to East Asia" also increased funding for training and technology. In the spring of 2013, 4-2nd ARB was approved for the Army's newest AH-64D technology known as MUM-T (manned unmanned teaming). The battalion underwent the major MUM-T aircraft modification that would later prove critical in conjunction with the satellite radio communications (SATCOM) and Blue Force Tracker (BFT) upgrades that the battalion had received in earlier years.

4-2nd ARB began a deliberate training plan to revert back to the basics that had been established and proven by the 6th CAV almost a decade earlier. Dunker/Helicopter Emergency Egress Deployment System training at Fort Rucker and Camp Humphreys, aviation life support equipment academics and issue, over-water tactics classes, Longbow cockpit trainer (LCT) over-water missions, and live day/night over-water training were all once again part of the minimum requirements for individuals, crews, and teams to perform the counter maritime mission. Jik-do overwater Hellfire missions continued and were augmented with sensors from the 3rd Military Intelligence Battalion, firepower from the United States Air Force, mission command from the ROK Navy and Coast Guard, and critical search and rescue ability from both 2-2nd Assault Helicopter Battalion and 3-2nd General Support Aviation Battalion.

Base training model exercised in 4-2nd ARB for all AH-64D Readiness Level 1 aviators

In the spring of 2013, 4-2nd ARB enlisted the assistance of the 1-151st ARB, South Carolina Army National Guard. The 1-151st ARB had recently returned from a deployment in the Persian Gulf where they had become the Army's subject matter experts on AH-64D deck landing qualifications. The 1-151st ARB AH-64D Instructor Pilots provided 4-2nd ARB Instructor Pilots with the tools necessary to conduct pilot academics, LCT training, field deck landing practice and day/night landings on the USS Germantown. The 1-151st ARB instructors jump started a deck landing program that resulted in AH-64Ds landing on the ROK Navy's Dokdo amphibious assault ship for the first time in history during the summer of 2013.

By the fall of 2013, 4-2th ARB was re-integrated into the joint/coalition exercise models that focused on the counter maritime missions of both the east and

An AH-64A from 1-6th CAV (left) landing to the USS Germantown as part of the 1995 Foal Eagle DLQ and an AH-64D from 4-2nd ARB (right) landing to the USS Germantown as part of DLQs in the spring of 2013

west coast. Simultaneously, the 4-6th CAV arrived on the peninsula giving the 2nd ID the additional attack, reconnaissance, and security coverage that had been lost when 1-2nd Attack departed in 2009 thus creating opportunity for 4-2nd ARB to add focus on the counter maritime mission. The 2013 fall exercise revealed a multitude of pre-mission planning and communications voids created after years of non-participation with the United States and ROK Navies. As a result, the 2nd CAB and 4-2nd ARB developed a robust liaison package focused on the multitude of planning conferences with the goal of furthering the once common ability to work the counter maritime mission on the east and west coasts.

Foal Eagle 2014 presented the latest opportunity for AH-64s to integrate as part of the counter maritime mission. The planning process, led by Destroyer Squadron 15 and Commander, U.S. Naval Forces Korea, provided the foundation for aircrews to garner critical frequencies, code words, airspace de-confliction measures, time blocks, and areas to maneuver that were outlined in the exercise air tasking order and special instructions. 2nd CAB led the planning for rotary wing assets and agreed to provide liaison on the east and west coast as well as with the ROK Navy.

4-2nd ARB established a robust mission command center that maximized the standard BFT and SATCOM capabilities utilized for daily tracking of aircraft over the horizon. They added the Link 16 capability of the 2nd CAB Air Defense and Air Management cell which provided critical real time data on positions of participating naval and air force assets. The Combined Operational Very Small Aperture Terminal Network-Korea (COVN-K) was established to facilitate real-time chat capability between the 4-2nd ARB Emergency Operations Center (EOC) and the east and west Maritime Air Support Operations Centers (MASOC). Members of the 4-2nd ARB EOC were tasked with providing AH-64 aircrews with real-time data prior to launch and updates on enemy and friendly activity prior to going "feet wet." The EOC coordinated throughout the day with the Air Force Joint Surveillance Target Attack Radar System (JSTARS) crews and the 2nd CAB Liaison Officers on both MASOCs to synchronize critical information prior to the arrival of the 4-2nd ARB pilots.

During the first night of the Foal Eagle exercise, 4-2nd ARB was able to successfully engage multiple opposing force (OPFOR) vessels by receiving target handovers from a Navy SH-60 and JSTARS Maritime Air Controllers (MAC) utilizing voice communications. By the third night the aircrews were armed with real-time friendly and OPFOR target data obtained from the Link-16 feed and through the real-time chat rooms that were established on the COVN-K. Target data and friendly forces information was easily uploaded to the onboard tactical situation display. Aircrews were provided continuous SATCOM voice updates and BFT updates that refined a 55 KM engagement area down to two 8-digit enemy grid locations which could be further refined by the MH-60R MAC. The exercise and subsequent after action review proved once again that AH-64s are a lethal and flexible deterrent option for fighting the joint/coalition counter maritime fight in the ROK.

As 4-2nd ARB and 2nd CAB look ahead, they plan to expand upon the foundation set some two decades ago by the original AH-64 units in the ROK. Follow on exercises will capitalize on the recent lessons learned during Foal Eagle 2014 and ongoing AH-64 specific over-water individual and crew/team training. SATCOM and BFT over the horizon communications will continue to allow a single battalion to overcome an economy of force mission and simultaneously fight on two coasts. In the future, MUM-T will provide aircrews a clearer picture utilizing full motion video from the MAC, MH-60R or P3/P8 maritime surveillance aircraft, and will allow AH-64 aircrews to identify targets at greater ranges in conjunction with the Modified Target Acquisition Designation System. MUM-T may also provide an opportunity for joint/coalition forces to explore the use of unmanned aircraft systems, specifically the Army's Grey Eagle, during counter maritime exercises. Use of Link 16 in the 4-2nd ARB EOC during Foal Eagle was a great success and enhanced situational awareness. Link 16 serves as the primary targeting interface between the joint/coalition navies and air forces while conducting counter maritime missions. The Link 16 capability warrants further thought and testing for fielding Link 16 in the AH-64 fleet as a mechanism to increase cockpit situational awareness for pilots while operating in a complex joint environment. With 4-2nd ARB forward deployed, re-focused on over-water basics, and enhanced through new technology, we are truly ready to "Fight Tonight!"

OPFOR ship at 24.3 KM identified by a 4-2nd ARB AH-64D's MTADS after receiving vectors from a HH-60S MAC and cross cued using the AH-64D Longbow radar during FOAL Eagle 2014 on the east coast

LTC Jay Hopkins served as 4-2nd Attack Reconnaissance Battalion Commander from April 2012 to May 2014. He currently serves as a planner in the J3/5, Joint Staff at the Pentagon.

Acronym Reference

ARB - attack reconnaissance battalion
BFT - Blue Force Tracker
CAB - combat aviation brigade
CAV - air cavalry
COVN-K - Combined Operational Very Small Aperture Terminal Network-Korea
EOC - emergency operations center
ROK - Republic of Korea
DLQ - deck landing qualification
ID - infantry division
LCT - Longbow cockpit trainer
MAC - maritime air controller
MASOC - marine air support operations center
MUM-T - manned unmanned teaming
SATCOM - satellite radio communications

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Army Training Airspace Management

By CW4 Steve Crandall

The management of Army training airspace is becoming more challenging with the proliferation of unmanned aircraft systems (UAS) and air-to-ground integration efforts. Airspace challenges are not relegated to the commander in combat; they are present throughout everyday training operations conducted at home-stations. Past airspace management techniques are losing some of their effectiveness as the training resources become congested and less available. In the face of these challenges, the Department of the Army Management Office—Training Simulations directed the formation of the Army Airspace Management Workgroup (AAMW). This workgroup is led by TRADOC Capability Manager-Ranges and includes representatives from designated installations, U.S. Army Forces Command, U.S. Army Training and Doctrine Command, U.S. Army Installation Management Command, U.S. Army Air Traffic Services Command, U.S. Army Aeronautical Services Agency, and select members from the Marine Corps. It's easy to imagine there are differing opinions about the best way to manage activities within Army training airspace; however, installation site visits have revealed some "best practices" of existing range management facilities that have helped develop course of action (COA) recommendations for an Army level solution to training airspace management. The purpose of this article is to give a background of the AAMW and an idea of the pre-decisional COAs.

The initial focus, following the inception of the AAMW, was to identify material solutions to facilitate a proper level of situational awareness for air activity within the confines of installation training airspace—similar to the multilateration fielding at Joint Base Lewis-McChord. While awareness within the training airspace can be critically important, it was quickly identified that a material solution by itself cannot possibly solve the airspace management challenges installations face. Observation of installation practices revealed that each installation performs airspace management differently because there is not an Army standardized model. The two most common models of airspace management used on Army ranges (with slight variations) are: a combined air/ground range operations center with an embedded airspace information center (AIC), or separated duties with range operations performing the ground function and an AIC, or AIC-like, facility performing the air function. There are varying degrees of performance, safety and efficiencies between the two models.

When air/ground operations are managed from separate facilities, information sharing is complicated. This complication often results in missed data that can cause confusion, safety challenges and loss of efficiencies. Confusion often results from, but not limited to, pilots attempting to receive permission for something that is not commonly practiced, such as a route deviation near active ranges or training areas. As an example: pilots will contact the AIC—the AIC will inform them to contact range operations—range operations will tell them it is the responsibility of the AIC—the result is usually aviators not getting what is needed. This scenario is not limited to one location; multiple installations across the Army experience similar situations. Safety challenges include aircraft flying through active surface danger zones because the AIC doesn't know the dimension of a non-frequently used training scenario or range operators approving hazardous ground activities that pose a risk to aircraft because they don't have a full understanding of airspace activities. A common risk control measure for these challenges is to implement an unnecessarily large buffer between the activities—resulting in wasted resources and maneuver training space.

The combined operational facilities afford excellent situational awareness within the operations room and a common operating picture of ground and air operations from a central location. This prevents one entity from missing important information about the other; resulting in a safer operating environment. Additional benefits gained over the traditional separated facilities is the ability to maximize range resources to facilitate multiple and individual training events between different activities—such as aircraft sharing a training area with ground maneuver units, where the UAS or manned aircraft is attempting to occupy usable airspace, and are not part of a combined event. Historically, when one activity occupies a training area, non-participating activities are kept out; although portions of the training area could accomodate additional training deconfliction(s) from the first activity. With a combined facility, these activities are dynamically managed and coordinated safely without interrupting each other—greatly improving the efficiency and use of resources. Current locations that use the combined facility are: Fort Bragg, Fort Bliss with its Joint Air-Ground Integration Center, all Marine Corps installations, and some emerging Army National Guard facilities.

Combined range operations are commonly sought as a solution to manage the difficult task of a combined-arms training event. While an air/ground facility can certainly provide an effective means to manage complex training environments; simultaneous individual training events within an installation's control can present unique challenges that pose greater difficulty than a combined arms event. This may seem counterintuitive; however, as an administrative function of managing range training areas, when a combined-arms event is underway, detailed planning and control is exercised through player unit means, e.g., command and control aircraft or a Joint Terminal Attack Controller. At this point the installation management function serves to "safe" the event and provides necessary administrative deconfliction; whereas day-to-day individual training events require diligent and constant monitoring/management—without the player unit control function.

Range managers have the difficult task of ensuring "safe operation of ranges, training areas, and airspace" in accordance with AR 385-63. This requirement requires diligent range managers to establish creative means to solve the airspace management function.

Continuing with the status quo will continue to produce dissimilar (nonstandardized) range facilities with dissimilar capability; therefore, it is recommended that range operations facilities should be reorganized to the combined air/ground model. Standardization doesn't mean one size fits all; however, standardization will result in a range operations center (ROC) within the range operations complex; which will look the same and provide the same functions (on an appropriate scale). A tier solution will enable a scalable means that meets individual installation requirements. The tiered range airspace approach (1 to 4) will give all range operations the necessary tools

to properly perform the mission without unnecessary fiscal challenges. A benchmark example for tier 1 would resemble Fort Bragg which provides the necessary flight following capability located within range operations, while a tier 4 would resemble Fort Eustis, which provides little if any airspace information to aircraft. Tier 2 and 3 would meet requirements that are between tiers 1 and 4 of range airspace management. This right sized solution concept will differentiate quantities/type of personnel, requisite equipment, and established ground/air management processes. When an aircraft "checks-in" with a ROC, the aircrew will know what to expect regardless of the installation.

It is important to mention that, although each installation completes the task of airspace management differently, the tireless efforts by motivated range and air traffic control personnel have been very successful in mitigating risk and air/ground safety. The AAMW will continue to leverage synergies from airspace management pioneers who have established ingenious methods of managing air and ground operations, out of necessity, for efficient operations. Aviation training whether integrated with ground training or not, requires a dynamic managing capability. The objective is to achieve a standardized Army model to ensure when soldiers show up to train they are provided with the best service possible— facilitating challenging, realistic training in a safe, efficient, and cost-effective manner.

CW4 Steve Crandall is currently assigned as a Range Development Officer with the Training and Doctrine Command Manager – Ranges. Previous assignments included 1st and 3rd Squadrons, 6th Cavalry Regiment in the Republic of Korea and the 82nd Combat Aviation Brigade, Fort Bragg where he served as an AH-64 Standardization Instructor Pilot and Master Gunner. CW4 Crandall has one deployment to Iraq and three deployments to Afghanistan. He has 17 years' service and is qualified in the AH-64 A and D aircraft.

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AR 385-63: Range Safety
FM 3-04.120: Air Traffic Services Operations
MCRP 3-0C: Operational Training Ranges Required Capabilities

Acronym Reference

AAMW - Army Airspace Management Workgroup
AIC - airspace information center
COA - course of action
ROC - range operations center
UAS - unmanned aircraft systems

Transitioning Aviation's Maintenance Programs

TO A FINANCIALLY CONSTRAINED ARMY

By CPT Aaron C. Feudo

The age of limitless funding for a deployed Army is ending and the aviation community is unprepared. For the last ten years, the Army has operated in a wartime environment of unlimited funding which has fostered an attitude of nonchalance with regard to money and resources. There has been no need for expectation management because every logistical requirement, be it flight hours, parts, ammunition, or fuel, has been readily available. Our metric for effective maintenance has become how little time aircraft spend as not mission capable (NMC). It is now standard practice to make aircraft "last until reset" instead of keeping them in optimal condition at all times. Caught in back-to-back deployments, many units have had the support available to remove any regard for an adherence to available flight hours. The question becomes, how do we prepare for the impending revocation of a ten-year blank check while balancing the proficiency of our aircrews with the maintenance of our aircraft?

The answer is to change how we think about maintenance. This does not require a complete overhaul of the maintenance program but will require subtle changes to what have become standard procedures and attitudes. There are defined and established processes that will allow units to succeed in a severely budgeted Army. Aviation maintenance personnel do well in following regulations on managing key tasks such as bank time and the flight hour program until deployments, reset programs, and unlimited contractor and supply funds become factors in the equation. As time between resets and deployments lengthen and as funding is drastically reduced, three easy changes will make this transition smoother. In order to set the conditions necessary for Army Aviation to succeed in the future, we need to change the way we measure successful maintenance, adhere to a strict projection of bank time and available flight hours, and lastly, conduct more thorough inspections.

Quantifying successful maintenance is not easy as it is mostly subjective. Operational readiness (OR) grades the quality of our maintenance programs. This is a fine metric, but with ever-present pressure on meeting mission requirements, we have manipulated it into a measure of the speed of maintenance completed instead of effectiveness and quality of maintenance completed. The purpose of scheduled and phased maintenance is to preempt issues with the aircraft by identifying deficiencies that could cause significant problems later. In a perfect world, aircraft would only be NMC during these more substantial inspections. Our task force captures how close our maintenance program is coming to this perfect template by tracking the number of days an aircraft is fully mission capable in the first thirty days coming out of phase. The end state is the same—a high OR rate-- but it places the focus on the quality of maintenance, not the speed at which maintenance was performed. The goal is to have every aircraft returned to the owner with all previous issues fixed and ready to fly until the next scheduled major maintenance event. When Soldiers know they are held accountable for their work quality, not their speed, the result will always be a better product that lasts longer with less follow-on maintenance required. With fewer resources to spend, this is exactly what the Army needs to produce every time an aircraft comes down for maintenance.

The focus on quality over time not only keeps aircraft from incurring down time between phases, but also allows for a more consistent projection of bank time. Reset cycles are three to five times longer than they were previously. This change forces units to stop surging flight hours at the end of deployments. The bank time accrued at redeployment is what will be available when training restarts at home station. This makes the projection of bank times all the more important. Without a clear projection of available flight hours every month and adhering to those estimates, it is easy to either out-fly a maintenance program or leave the unit in a precarious position upon redeployment. We forecasted every phase by aircraft during our deployment based on hours and available phase teams. Adhering to these projections allowed us to know our monthly available flight hours throughout deployment, as well as our exact bank time upon redeployment. The key is to plan, follow, and continually update phase and bank time projections. Starting these projections at the beginning of a deployment or training cycle allows a unit to project the bank time required to make it through extended periods until aircraft go into reset.

The change in reset plans also emphasizes why a change in actual maintenance performed is necessary. Phase and scheduled maintenance are no longer a quick mend to carry an aircraft into reset. The objective of this maintenance now is to fix as much of the aircraft as possible every time, deferring nothing. This maintenance practice is evident in our task force's CH-47D fleet. After multiple tours, these aircraft are finally ready to redeploy. In the last four months since inheriting these aircraft, four aircraft have required major depot-level repairs during phase with each aircraft down between forty-five and seventy days. This is not necessarily the fault of the prior units as the practice of maintaining aircraft with the expectation that they would go to reset sooner has been a systemic problem in Army Aviation maintenance practices for years. Historically this practice has worked and even now, these CH-47s came very close to making it to reset before succumbing to major maintenance repairs. For the rest of the fleet not expedited to reset, however, this could pose catastrophic issues to the airframe and components. The solution is to conduct thorough inspections to identify deficiencies during major scheduled maintenance events. The hundreds of airframe cracks found in the CH-47D aircraft did not all happen in one phase period. The cracks were either carelessly overlooked while rushing the aircraft through phase maintenance or were a result of deferring the repairs until a later time over a period of multiple phases.

By becoming more proactive and conducting thorough inspections to identify faults early, maintainers could have caught the crack in the CH-47Ds before they ever became a depot-level repair. In a budget constrained environment, catching these issues early will result in simpler, less extensive repairs resulting in providing a fully mission capable aircraft sooner than if it had undergone maintenance that is more extensive. Overall, the practice proves to be quicker and more cost-effective than waiting until the deficiency becomes a more costly repair. It is true fixing these additional faults will generate a few more days of down time during scheduled inspections, but it is certainly better than losing two months to an unscheduled major overhaul. It is the mentality of performing maintenance early and proactively that will ultimately save time, resources, and money.

Intense budgeting will surely be a rude awakening for many that, like me, have never been a part of an Army without an unlimited budget. Having a command focus on maintenance is the only way to assure the survival of both aviation's maintenance program and the proficiency of Army aviators. Transforming the view of OR rates from simply a calculation of down time to a grade of scheduled maintenance can help with this focus. By teaching maintainers to be more thorough every time they touch a helicopter or its components, more downtime may initially be incurred, but over an entire phase period, this detail can save countless man-hours and dollars. Proactive care for the aircraft will reap great benefits as these aircraft go longer and longer between resets or the availability of funds. Maintainers know these practices as standard operating procedures but, unfortunately, often select a quicker maintenance turnaround time in lieu of quality. By instilling these practices into our Soldiers, Army Aviation can not only survive but also excel within the new financially constrained operating environment.

Captain Aaron C. Feudo has been in Army Aviation for the past six years. He was initially assigned to Fort Hood, Texas where he served as 2nd Battalion, 4th Aviation Regiment Assistant S-3 and deployed in support of Operation Enduring Freedom 10-11. While deployed he served as an Alpha Company, 3rd Battalion, 4th Aviation Regiment Battle Captain and Platoon Leader. Upon redeployment, he attended the Aviation Captains Career Course and Aviation Maintenance Officers Course at Ft. Rucker, Alabama. He currently serves as the Commander, Delta Company, 2nd Battalion, 3rd Aviation Regiment and deployed in support of Operation Enduring Freedom 13. CPT Feudo is qualified on the UH-60L helicopter.

Acronym Reference

NMC - not mission capable	**OR** - operational readiness

U.S. ARMY AVIATION

STANDARDIZATION

This article is re-published here, with permision, from the March 2014 issue of the FlightFax Newsletter

Defragging The Hard Drive: A Change in Aviation Training Philosophy

By LTC Josh C. Sauls

One of the most grating problems that we deal with in today's business environment is a computer that is so bogged down with extraneous information that it is no longer able to perform even the most mundane tasks in a timely manner. We can feel our blood pressure rise as we watch that hourglass spin and spin when we are simply trying to open an email. Only a year earlier, this very same computer probably worked with lighting-like speed but slowly over time, we have bogged it down with information so that it is now an actual hazard to our health because of its blood pressure elevating properties.

Given how exasperating this is, it is amazing that we, the aviation branch, do the very same thing to our Aviators' organic hard drives – their brains. We at DES routinely observe instructor pilots demanding that their aviators commit to memory every pressure, temperature, and voltage possible on their aircraft. We have observed pilot in command (PC) oral evaluations that lasted two hours and never got beyond the performance planning card and the electrical system. Given that these PC evaluations were for AH-64 PCs, I was surprised that the instructor pilots were so concerned that their students could regurgitate the voltage required to operate a pressure regulator shut-off valve (PRSOV) but did not ask them any questions regarding tactical employment.

Let's face it, today's aircraft are so technologically advanced that they can and will provide vast amounts of information to the pilot that formerly had to be committed to memory. I can still remember the days of memorizing every conceivable pressure and temperature of the AH-1 because that venerable old airframe was instrumented with nothing but steam gages with slippage marks on the glass. The lack of technology required that an aviator memorize that type of data. However, today's aircraft are equipped with digital indications that warn an aviator of impending exceedences with everything from count-down timers to color codes to human voices. We have systems that record temperatures and pressures out to the third decimal point and times out to the millisecond. We even have systems that will display emergency procedures to the aircrew automatically.

With that being the case, why are we not unburdening our aviators of the requirement to fill up their hard drives with this type of information – information that the aircraft is quite capable of managing on its own? Why are we not spending more time requiring our aviators to know and understand aviation doctrine and tactics? Apache pilots should spend the vast majority of their study time ensuring that they are experts at employing weapons systems. Blackhawk pilots should spend the majority of time becoming subject matter experts at conducting air assaults. We as standardization leaders should be creating tactically proficient war fighters as opposed to competitors for the show "Jeopardy."

We started to embrace technology when we first fielded the AH-64D. DES sent a memo to the field that relieved aviators of the responsibility of memorizing a significant amount of data because the aircraft did an excellent job of managing that information. However, over time, the community slid back to the old habits of playing "I'm a drop of oil" again.

It is time that we embrace the advantages that our advanced technology offers. We have to break the bonds of inertia and unburden our aviators of the requirement to spend so much time with rote memorization. Instructor pilots must shift their focus and require their pilots to become true subject matter experts in their mission and the associated doctrine, tactics, techniques and procedures. Does an aviator really need to be able to recite each and every monocular cue from memory or be able to draw the eyeball? We believe that the branch would be much better served if our aviators had a good general knowledge of this type of information and spent more study time on how to tactically employ their respective aircraft.

Obviously, there are things that we will continue to have to commit to memory. Underlined steps of emergency procedures are a good example. Pilots will always have to have an intuitive understanding of how to manage aircraft emergencies. This level of knowledge will require some rote memorization no matter how much technology resides on an aircraft. However, if the aviator can't use a particular piece of information from the cockpit, did he ever really need to commit it to memory in the first place?

There is no doubt that this is a topic that will require some focused discussions within the standardization community. DES will be taking a very hard look at how we can manage effective change in this area. We are interested in hearing from the field on this subject and are challenging the branch to take an honest look at our training philosophies and make a real effort to figure out how we can use our technology to more efficiently unburden the most important processor on the aircraft....the aviator's brain.

LTC Josh C. Sauls is currently assigned as Deputy Director and AH-64D Instructor Pilot, Directorate of Standardization and Evaluation. His previous assignments include Professor of Military Science, University of North Dakota; Deputy C3 Air, U.S. Forces -Iraq/I Corps; Director of Operations, Plans, and Logistics U.S. Army Kwajalein Atoll; S-3/XO 3-101st Aviation Regiment; Combat Aviation Training Team Chief/Instructor Pilot, 21st Cavalry Brigade; Company Commander/Instructor Pilot, A Company 1-14th Aviation Regiment Mesa, AZ and Fort Rucker; Deputy TRADOC Systems Manager, Apache Longbow; Commander, B Troop, 1-6th Cavalry; and S-1 and Platoon Leader 4-6th Cavalry. LTC Sauls has completed two deployments to Iraq. He has 27 years' service with 24 years as an aviation officer. LTC Sauls is qualified in the UH-1, AH-1, and AH-64A/D.

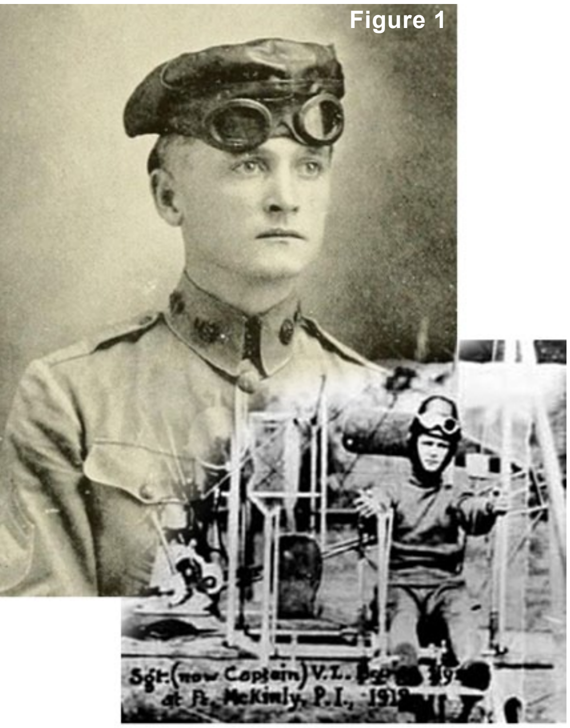
The Enlisted Pilot Program

By SSG Cain S. Hennings

Why is an Army Aviation pilot required to be a commissioned officer? Noncommissioned officers (NCO) in the U.S. Army have a long and rich history of being involved in Army Aviation. Aviation NCOs are subject matter experts (SME) within their specific areas (general maintainer, avionics, and engines). This is very similar to the training U.S. Army warrant officers receive. Let's look at some historical examples of NCOs pioneering Army Aviation and qualifying as pilots.

The first enlisted NCO trained and certified as an Army pilot was CPL Vernon L. Burge (see figure 1). He started his career as a mechanic under the leadership of Lt. Benjamin Folios in 1910 at Fort Sam Houston, TX. Two years later CPL Burge volunteered to become a pilot under the training of CPT Frank Lahn at a military flight school at Fort William McKinley in the Philippines. At that time the Army was short on flight candidates and began looking into the Army enlisted ranks, to fill aviation positions. The aircraft that CPL Burge learned to fly was the Wright 1909 military flyer, the first aircraft in the Army's inventory (above).

Figure 1



CPL Burge received his aviator's certificate (No. 154) from the Federation Aeronautique International and was promoted to Sergeant. In July, 1914 Congress authorized the training of enlisted pilots. This allowed 26 regular Army enlisted soldiers to become pilots and 60 more during WWI. The 60 that earned their wings were used to ferry aircraft from French factories to the U.S. squadrons fighting on the frontlines during WWI.

"The Air Corps Act of 1926 directed that at least 20 percent of the pilots assigned to tactical units be enlisted" (nationalmuseum.af.mil). The missions that the enlisted pilots were trained to do were extremely dangerous and diverse. Those flights encompassed test flights following maintenance, cargo and passenger hauling, anti-aircraft target towing, parachute drop test, photo mapping, weather reconnaissance, and scientific test flights.

With the onset of WWII in Europe and Asia, the War Department concluded that there wouldn't be enough college graduates or men with two years of college to fill aviation cadet requirements. So in response to this lack of qualified cadets, in June of 1941 Congress passed public law 99, authorizing the Enlisted Pilot Training Program.

With this law, enlisted pilot cadets would receive the same primary, basic, and advanced training as their commissioned counter parts. Upon graduation they were promoted to sergeant (see figure 3).

Many served in roles as flight instructors, transport pilots, and in various utility roles. This doesn't mean that just any Soldier/NCO could enter the program. The candidate had to have graduated high school and be in the top 50% of his class, completed 1.5 credits of math, and be between the ages of 18-22. The first class of successful graduates of the flight course was class 42-C on March 7, 1942. The class

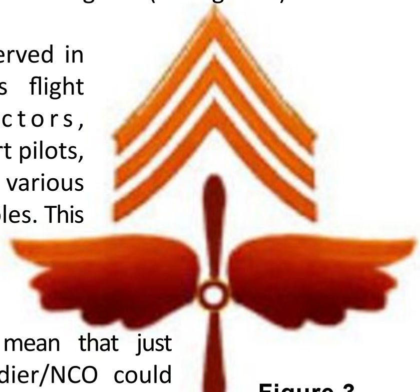


Figure 3

training was provided at two separate locations, half at Kelly Field and the other half at Ellington Field, Texas. The entire class was assigned to P-38s (see figure 4) in combat and support units following graduation. Members of this class


Figure 4

went on to account for shooting down 130 enemy aircraft. Nine members of class 42-C would go on to be fighter Aces. The title "Ace" can only be earned after shooting down 5 enemy aircraft. In total, the enlisted pilot program would produce 18 Aces and account for 249.5 enemy aircraft shot down.

Not all candidates successfully completed the course to become enlisted pilots. Those that were able to complete a solo training flight but failed the course were given the opportunity to become liaison pilots. The training to become a liaison pilot (see figure 5) consisted of 60 hours of flight time and placed a premium on short field landings and take offs, aerial photography, low level flight navigation, first aid, day and night reconnaissance, and aircraft maintenance.

Liaison pilots piloted single engine aircraft (see figure 6) that were unarmored and unarmed, in 28 different squadrons in all theaters of war. The only protection these pilots had was a personal .45 caliber pistol(s) or .30 caliber carbine(s). Liaison pilots were entrusted with a variety of missions to include: medical evacuation; delivering munitions, blood plasma, mail, and supplies to the frontlines; personnel transport; intelligences missions; and battle damage assessments for bomb run and fighter attacks. Between December 10-25, 1944 a dozen L-5 aircraft were flown to deliver a 300 bed hospital to the men of the 11th Airborne Division in the remote mountain of Leyte during the campaign to recapture the Philippines.

Figure 5

The enlisted pilots had to overcome discrimination from the officers in the Army. Regardless of this discrimination, 2,576 enlisted men would go on to earn their pilot wings. However, the enlisted flight program was short-lived ending in late 1942. The program ended because the standards for enlisted and aviation cadet program


Figure 6

became equal. The only requirement was that the cadet had to be a high school graduate. Upon graduation of the flight program the cadet was appointed to flight officer or second lieutenant (2LT).

On November 17, 1942 the War Department ordered that all enlisted pilots that had earned their wings before the change in qualifications were promoted to the rank of flight officer or 2LT. This order took nearly two years to be enforced. These new 2LT. Pilots did not want to be confused with "cherry" pilots. So they would rub their gold bar in the dirt until it more closely resembled that of a 1LT. Seven pre-war Sergeant Pilots and four WWII pilots would later become general officers.

So why is a commission, which is solely an academic based achievement, required to be an Army Aviator? History clearly shows that NCOs have the mental fortitude and physical prose to qualify as an Army Aviator. The Army promotion system/selection process is a history based system with past performance being an indicator of future performance. So, following this thought process, history clearly shows NCOs can do it. So I say let us (NCOs) do it again. I am not suggesting that the Army should reduce the standards to become a pilot. I just want NCOs to have the opportunity to try as NCOs. It is unfortunate under the current law/regulation we can not.

SSG Cain Hennings is currently assigned as the Air Systems Division Non-Commissioned Officer-in-Charge, Night Vision and Electronic Sensors Directorate, Fort Belvoir, Virginia. Previous assignments include CH-47 Section Chief and UH-60 Section Chief, 209th Aviation Support Battalion. SSG Hennings has two deployments supporting Operation Enduring Freedom and three supporting Operation Iraqi Freedom. SSG Hennings has 13 years of service.

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FIGURES

Figure 1: CPL Burge in the Philippines learning to pilot a Wright 1909 Military flyer
Figure 2: Wright 1909 Military flyer
Figure 3: Enlisted Pilot rank
Figure 4: P-38 Lighting
Figure 5: Enlisted flight wings
Figure 6: Liaison Pilot Aircraft
* Picture courtesy of http://www.nationalmuseum.af.mil.
** Picture courtesy of https://www.google.com/image.com

feedback FORUM

Your Articles and Feedback Compel Thoughts and Actions

Aviation Digest's Feedback Forum is where readers can see the results of author contributions, USAACE collection efforts, and the professional discussions that followed. It is an essential part of our commitment to the continuous advancement of the Aviation Branch.

A Review of the Threats to Army Aviation - By CW3 Robert Olson
Volume 2 / Issue 2 Aviation Digest
(Apr-Jun 2014, p. 10)

CW3 Olson reiterates known threats as well as introduces what may be considered "new" threats by some. The article serves to show that as the Army looks to contending with a future near-peer adversary, there are more methods by which the enemy can affect Army Aviation. Of note, factors within the use of the electromagnetic spectrum and cyberspace were mentioned as evolving capabilities that deserve our attention as aviators.

Aviation Branch Response:

There is a newly filled position within the Directorate of Training and Doctrine (DOTD) for an Electronic Warfare (EW) Staff Integration Officer responsible for providing a Functional Area 29 (EW) perspective for Aviation doctrine as well as instruction at various professional military education (PME) courses at Fort Rucker. The Army is in transition from an Electronic Warfare Functional Area to a new Cyber Electromagnetic Branch (MOS 17-series). Cyber electromagnetic activities (CEMA) include cyberspace operations, electronic warfare, and electromagnetic spectrum management. As Aviation professionals rotate through Fort Rucker for PME, they will receive instruction on principles of CEMA and discuss many of the points made in the article by CW3 Olson. Army aviators will soon understand how best to integrate CEMA into flight planning and operations.

AH-64D Fire Control Radar Success in Decisive Action Training - By CPT Lucas Kennedy
Volume 1 / Issue 4 Aviation Digest
(Oct-Dec 2013, p. 26)

Although the Longbow radar provides a substantial increase in threat vehicle detection and targeting ability, it has taken a back seat over the past 12 years of conflict because of the points the author brings out – primarily heavy weight impacting flight performance in the high-hot environment (with no perceived mission value). Removing the radars allowed the commanders the flexibility to carry more fuel/munitions which was probably the right thing to do for mission success. Unfortunately, the down-side is that junior pilots don't gain the critical systems training and combat experience with the complete Longbow Apache mission equipment package – including the radar, but that is about to change.

Aviation Branch Response:

The TRADOC Capabilities Manager – Reconnaissance & Attack and the Apache Project management Office are making great strides in addressing all the negative aspects with carrying the radar. The 701D engines bring back the Apache flight performance to pre-Longbow days. The Lot 6 upgrades (fielding in FY18) include substantial improvements to the radar including extended range, improved situational awareness (SA) in degraded visual environments; UAS detection, tracking, and identification; advanced littoral functionality; etc. The new modernized radar frequency interferometer integrates with the radar to expand the threat frequency detection capability and passively locate and accelerate targeting of threat radar emitters. The Link-16 network radio (Lot 4) allows seamless transfer/allocation of radar targets, providing full SA across the team as to who is engaging what target - and when.

Observations from Redeploying Units
10th CAB Redeployment (Umbrella Week)

In previous Umbrella Week collections, units have stated that the lack of weather sensors across the battlefield has resulted in difficulties of Air Force personnel to provide accurate weather forecasts. While the tactical situation may not always allow for sensors to be placed at the most beneficial locations, there are several possible fixes that the DOTD and the Aviation Enterprise are pursuing to remedy the lack of current and accurate weather data.

First, current unmanned aircraft systems (UAS) fielded and flown by the Army provide a number of real-time weather related data including temperature, precipitation, clouds, winds, and visibility. This data can be used by forecasters to help augment their weather briefs in areas that are not appropriately serviced by ground weather sensors.

DOTD will work with the Army Weather Proponent Office (AWPO) at Fort Huachuca to help design a recommended course of instruction for Air Force weather forecasters on utilizing UAS metadata to enhance their predictions. This course will cover UAS measurement capabilities and how to gather that data from UAS personnel within a combat aviation brigade or brigade combat team.

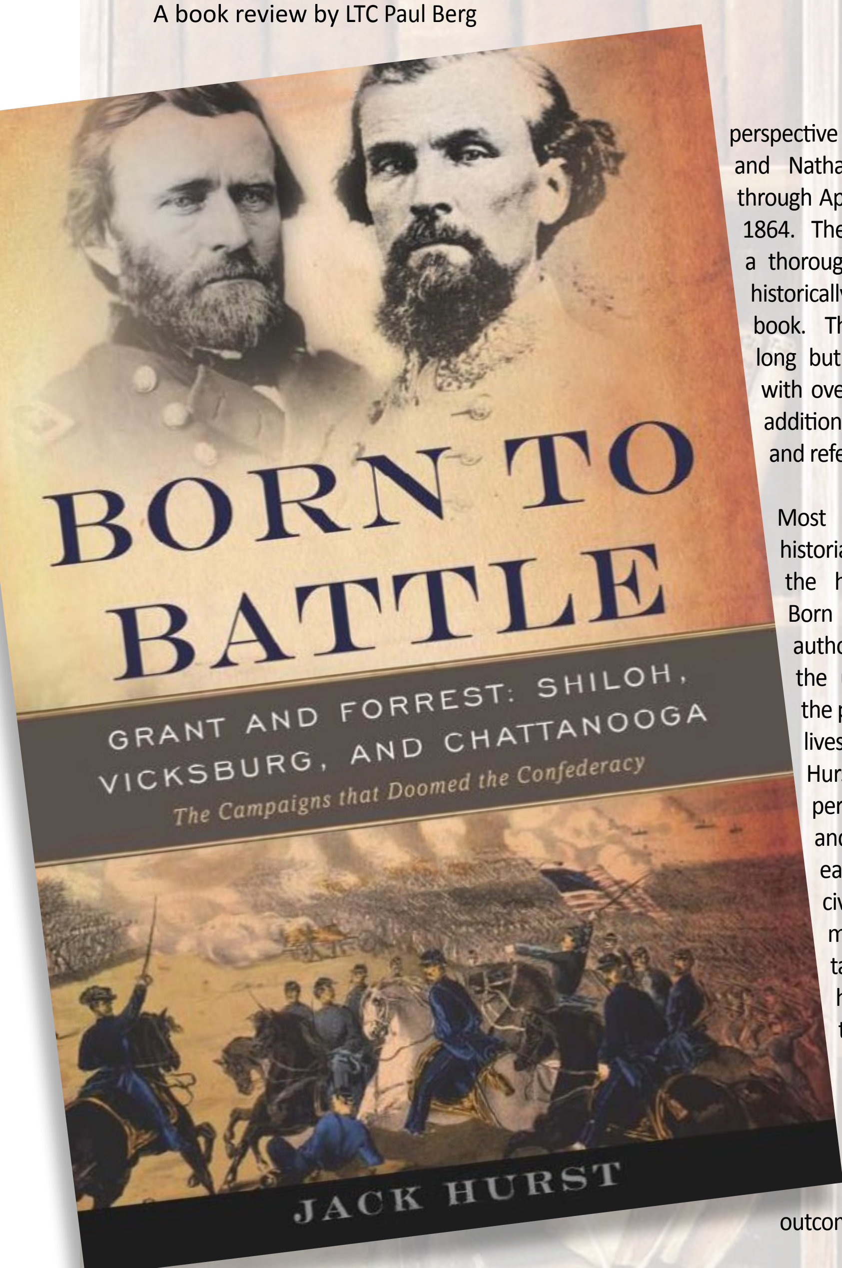
The second option is for certain Army personnel to receive limited weather observation training. The intent of this is not for Army personnel to make weather forecasts or give weather briefs, but rather to teach them how to provide information to the Air Force weather observer that will improve the accuracy of their briefs. The AWPO is currently working alongside the Air Force to modify the training Air Force weather personnel receive to ensure they are capable of training select Army personnel in providing weather observations to support forecasting.

Born to Battle:

Grant and Forrest: Shiloh, Vicksburg, and Chattanooga; the Campaigns That Doomed the Confederacy

By Jack Hurst. *Born to Battle: Grant and Forrest: Shiloh, Vicksburg, and Chattanooga; the Campaigns That Doomed the Confederacy*. Published by Basic Books, a member of the Perseus Books Group - 387 Park Avenue South, New York, NY 10016-8810. Photographs and artwork used courtesy of the Library of Congress. Formats available are; Hardcover, Kindle, Adio Book, and MP3 CD.

A book review by LTC Paul Berg



Born to Battle is a concise historical biography of two of the most extraordinary and non-aristocratic generals of the American Civil War within the analysis of the three most important battles that doomed the confederacy. Jack Hurst vividly and historically describes the events of the battles of Shiloh, Vicksburg, and Chattanooga through the perspective of Ulysses S. Grant and Nathan Bedford Forrest through April 1862 to February 1864. The author has written a thoroughly researched and historically detailed Civil War book. The book is relatively long but historically concise with over 417 pages and an additional 50 pages of notes and references.

Most Civil War military historians will appreciate the historical details of Born to Battle, but the author's intent is to tell the unique story about the personal and military lives of Grant and Forrest. Hurst abbreviates the personal lives of Grant and Forrest through early childhood, civilian, and early military careers but takes exceptional historical clarity on the exact actions of the Shiloh, Vicksburg, and Chattanooga during the Civil War and their meaning in the final outcome of the Civil War.

Hurst's main theme throughout the book is that the Southern West Point aristocratic military leaders failed the South and prevented victory in key battles especially Vicksburg and Chattanooga. Hurst also describes how northern elitist officers did everything they could to prevent Grant from succeeding and winning the war sooner. Hurst clearly blames the West Point political military machine for causing the additional years of the war. Hurst also severely criticizes the many Northern officers to West Point blue-blood classist who could not be adaptive, or show any initiative unless it came from the curriculum of West Point. Hurst describes how the teachings of West Point Professors in reference to military tenets went right over the heads of students who were self-serving aristocrats like Bragg and Halleck.

The book clearly describes the difficult military service that Grant and Forrest faced daily by not coming from social elite and working against the aristocratic elitist officers to win the war instead of receiving credit or fame like their fellow officers. Both men proved to be exceptional combat commanders but sometimes their worst enemies were not the opposing force but the fellow military officers. Both of these men conducted some of the most difficult fighting in the Civil War which caused their superiors to have distaste for the success instead of letting them achieve more victories. Grant's famous quote provides a clear conviction that "War means fightin' and fightin' means killin" which was a clear distinction of the West Point theorist minimal mind-set of an academic exercise.

Jack Hurst successfully and with an acute historical background tells the unlikely story of two lower-societal men who in spite of the national military culture became two of the most legendary generals of the Civil War. He clearly tells the true story of both sides of military elitism and how it cost the South any chance of victory. This book encompasses the quality of leadership values and duty which are relevant today especially with the experiences of Iraq and Afghanistan generalship. I highly recommend this book for those interested in Ulysses S. Grant, Nathan Bedford Forrest, and especially those interested in the battles of Shiloh, Vicksburg and Chattanooga.

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Distinctive Unit Insignia
A silver color metal and enamel device 1 3/16 inches (3.02 cm) in height overall consisting of a blue shakefork reversed, the three arms of equal length and couped, the vertical arm between two silver wings of five feathers each the tips of feathers inward and surmounted by a golden orange arrowhead, a silver scroll in base passing over the throat of the arrowhead and over and back of the ends of the two lower arms of the shakefork, and bearing the motto "WILL DO" in blue letters.

Symbolism
The wings and the shakefork which simulate the rotor blades of a helicopter refer to the aviation mission of the organization, the ten feathers in the wings alluding to its original numerical designation and the arrowhead placed over the rotor blades and wings to the major assault function of flying (carrying) troops into actual combat. The motto "Will Do" reflects the unit's determination and success in accomplishing its objectives. The colors, ultramarine blue and golden orange, are those authorized for the Army Aviation.

Background
The distinctive unit insignia was originally approved for the 10th Aviation Group on 24 March 1966. It was redesignated for the 229th Aviation Group with description and symbolism updated on 30 July 2001. It was redesignated effective 1 March 2005, for the 110th Aviation Brigade.

Shoulder Sleeve Insignia
On an ultramarine blue shield 3 inches (7.62 cm) in height by 2 1/2 inches (6.35 cm) in width overall with a 1/8 inch (.32 cm) golden orange border, a golden orange spearhead surmounting a white vol in chief and issuing from a four-blade white propeller shaded gray, in base.

Symbolism
The wings, along with the colors ultramarine blue and golden orange, represent Army Aviation. White denotes integrity and purpose. The propeller refers again to aviation; the spear-point symbolizes the attack mission and the airmobile assault of personnel to battle zones. Together, the spear-point and propeller simulate the numerals "one" and "ten," from the Roman numeral "X" for ten, a reference to the brigade's designation, as in the "one-tenth."

Background
The shoulder sleeve insignia was approved effective 1 March 2005. (TIOH Drawing Number A-1-871)

110TH AVIATION BRIGADE

The 110th Aviation Brigade was activated March 23, 2005 upon the deactivation of the U.S. Army Aviation Center's Aviation Training Brigade at Fort Rucker, AL. The 110th Aviation Brigade assumed command of the Aviation Training Brigade assigned units including 1st Battalion, 14th Aviation Regiment; 1st Battalion, 212th Aviation Regiment; 1st Battalion, 223rd Aviation Regiment; and the Spanish Helicopter School Battalion.

The 10th Aviation Group was activated in July 1965 at Fort Benning, Georgia and evolved from the 10th Air Transport Brigade, a component of the U.S. Army Tactical Mobility Requirements Board (better known as the Howze Board) which was inactivated on June 30, 1965. The 10th Aviation Group was deactivated in May 1970 and reactivated 21 years later on October 15, 1991 at Fort Bragg, North Carolina. The 10th Aviation Group was redesignated on September 16, 1992 as the 229th Aviation Group at Fort Bragg. The 229th Aviation Group was inactivated on September 15, 2004 and concurrently redesignated as the 10th Aviation Group.

The designation as the 110th Aviation Brigade is a result of the combined efforts of the then Army Aviation Branch Historian, Dr. Jim Williams; the U.S. Army Center for Military History; and the U.S. Army Institute of Heraldry to assign the lineage of the 10th Aviation Group. The 10th Aviation Group served as a core to oversee the activation and training of numerous aviation companies destined for assignment to the Republic of South Vietnam including conducting transition training in the UH-1 and CH-47; conducting individual training of air traffic controllers; and activating, organizing, equipping, training tactically, and deploying UH-1 airmobile companies and CH-47 medium helicopter companies. It is this heritage of training Army Aviation Soldiers that is reflected in the 110th Aviation Brigade's assumption of the 10th Aviation Group's lineage.

While the 110th Aviation Brigade assumed the lineage of the 10th Aviation Group, the numerical designation of the unit was changed to the 110th to avoid confusion with the 10th Mountain Division's 10th Combat Aviation Brigade.

In the true spirit of aviation training excellence established 49 years ago by the 10th Aviation Group; the 110th Aviation Brigade continues to produce the highest quality aviators to meet the needs of the Army Aviation Branch and the Nation.

Campaign Participation Credit – None

Decorations – Army Superior Unit Award, Streamer embroidered 1997

Aviation Digest
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and Doctrine, Bldg 4507
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