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October–December 2020
Volume 8/Issue 4

LARGE-SCALE COMBAT OPERATIONS AND PROFESSIONAL MILITARY EDUCATION

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UNITED STATES ARMY **Aviation** DIGEST

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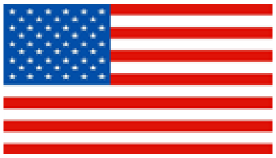

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The Doctrine Division, Directorate of Training and Doctrine (DOTD), U.S. Army Aviation Center of Excellence (USAACE), Fort Rucker, AL 36362 produces the *Aviation Digest* quarterly for the professional exchange of information related to all issues pertaining to Army Aviation. The articles presented here contain the opinion and experiences of the authors and should not be construed as approved Army policy or doctrine.

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About the Cover:

An Army Reserve UH-60 Black Hawk Helicopter from 8th Battalion, 229th Aviation Regiment, based out of Fort Knox, Kentucky, approaches Lakehurst Maxfield Field during a multi-component airfield seizure training exercise between the Army Reserve and the 101st Airborne Division (Air Assault) on March 13, 2017 to kick off Warrior Exercise 78-17-01. U.S. Army photo by SSG Shawn Morris

The Command Corner

Every fight is a hard fight filled with complexity and uncertainty; however, when your enemy can challenge you across every domain, including the electromagnetic spectrum; information; and cyber domains, a revised approach to fighting and leading is required.

Our common understanding of the threat drives our doctrine and shapes the way we train, educate, and develop Army aviators to counter that threat.

Candidly, it has been awhile since we have had to know what vehicles and systems comprise an enemy order of battle and how it deploys to fight, but that is exactly where we have to focus now.

Our adversaries know the American way of war and have created a strategy of stand-off in an attempt to counter our capabilities and separate us from our allies. In order to defeat stand-off, we have to understand how it is employed and how we, as part of a joint combined arms team, can dismantle it.

While it is extremely important to have the modernized equipment and systems that are capable of combating the threat, the critical element becomes increasing the aptitude and awareness of our leaders and Soldiers. This means developing leaders and Soldiers who understand the strengths and weaknesses of their equipment and understand where and when to use that equipment to achieve tactical, operations, and strategic success.

Commanders are the primary trainers in their units, they drive the leader development process by understanding, visualizing, describing, directing, leading, and assessing it. Commanders in operational units use tough, realistic multiechelon training maximizing the Integrated Training Environment (live, virtual, constructive, and gaming) to develop their leaders. Additionally, the unit's training plan and the training events that populate it are the primary venue for unit leader development. Trainers must design training to replicate the complexity of the current and future operating environments. Ultimately, commanders must train their unit as it will fight, preferably in a multiechelon event as a combined arms maneuver team.

To meet the challenges levied on us to execute our core mission in large-scale combat operations, we have to make significant changes in the ways we have been training and fighting over the last couple of decades, which is no easy task. Now is the time to prepare Army aviation for the scale, tempo, lethality, and complexity of the multidomain battlefields of tomorrow. The U.S. Army Concept for Aviation is a key element in guiding that preparation. If you have any feedback on these issues, let us hear about it— this is your forum!

Above the Best!

David J. Francis
Major General, USA
Commanding

U.S. Army photo bySPC Roland Hale

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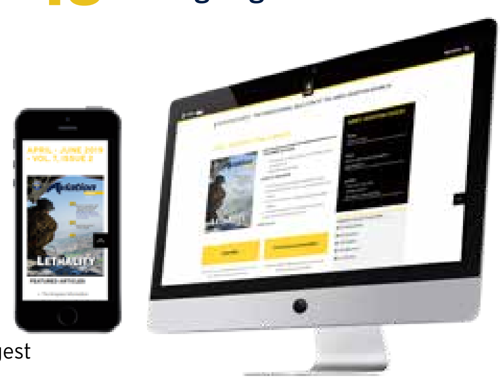

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Visual materials such as photographs, drawings, charts, or graphs supporting the article should be included as separate enclosures. **Please include credits with all photographs**. All visual materials should be high-resolution images (preferably set at a resolution of 300 ppi) saved in TIFF or JPEG format. For Official Use Only or Classified images will be rejected.

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January–March 2021 issue articles due December 1, 2020 (magazine published on or about February 15, 2021)

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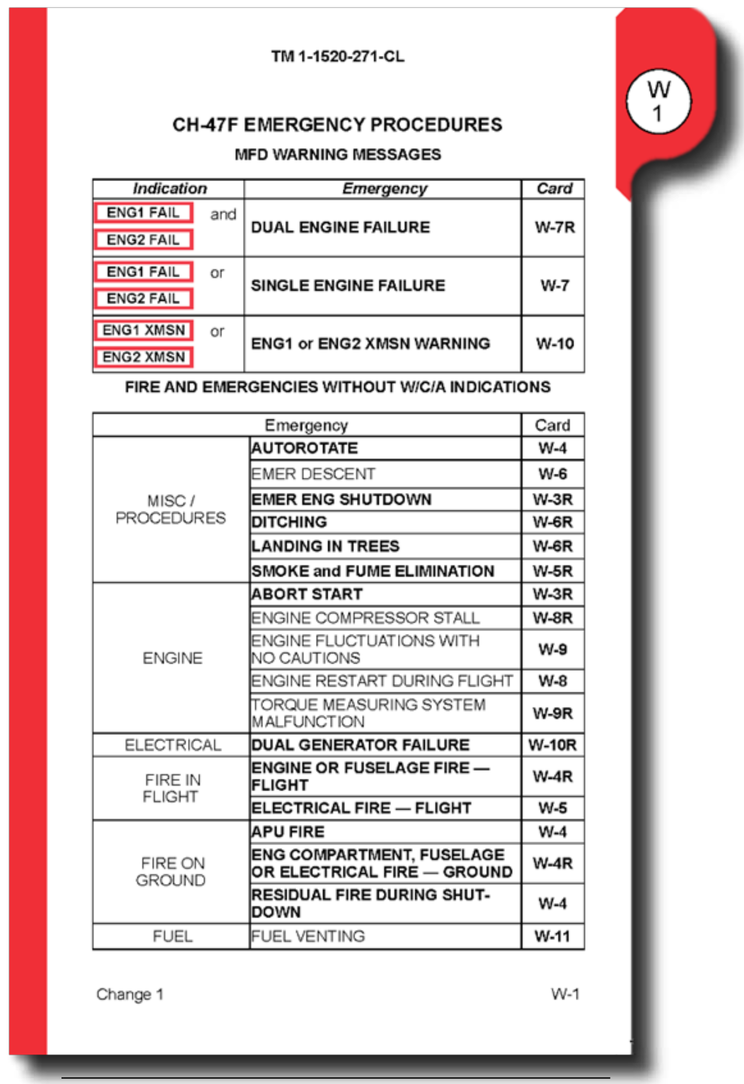
Authors are asked to observe posted deadlines to ensure the *Aviation Digest* staff has adequate time to receive, edit, and layout materials for publication.

EMERGENCY RESPONSE METHODOLOGY UPDATE—FLIGHT REFERENCE CARDS

By MG David J. Francis

Last spring, the U.S. Army Aviation Center of Excellence (USAACE) introduced a new approach for helicopter flight crews facing emergency situations: "The Emergency Response Method," found in *Shared Rotary Wing Aircrew Training Manual Task 1070*. As part of task 1070, the Emergency Response Method (FADEC-F) was the first phase of the overall USAACE effort to fundamentally change the way Army aircrews respond to emergencies. Since the introduction of FADEC-F, several aviation units have reported real-world successes responding to in-flight emergencies and have credited the Emergency Response Method with helping to guide crewmembers through these challenging situations.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CH-47F EMERGENCY PROCEDURES

MFD WARNING MESSAGES

Indication		Emergency	Card
ENG1 FAIL / ENG2 FAIL	and	DUAL ENGINE FAILURE	W-7R
ENG1 FAIL / ENG2 FAIL	or	SINGLE ENGINE FAILURE	W-7
ENG1 XMSN / ENG2 XMSN	or	ENG1 or ENG2 XMSN WARNING	W-10

FIRE AND EMERGENCIES WITHOUT W/C/A INDICATIONS

	Emergency	Card
MISC / PROCEDURES	AUTOROTATE	W-4
	EMER DESCENT	W-6
	EMER ENG SHUTDOWN	W-3R
	DITCHING	W-6R
	LANDING IN TREES	W-6R
	SMOKE and FUME ELIMINATION	W-5R
ENGINE	ABORT START	W-3R
	ENGINE COMPRESSOR STALL	W-8R
	ENGINE FLUCTUATIONS WITH NO CAUTIONS	W-9
	ENGINE RESTART DURING FLIGHT	W-8
	TORQUE MEASURING SYSTEM MALFUNCTION	W-9R
ELECTRICAL	DUAL GENERATOR FAILURE	W-10R
FIRE IN FLIGHT	ENGINE OR FUSELAGE FIRE — FLIGHT	W-4R
	ELECTRICAL FIRE — FLIGHT	W-5
FIRE ON GROUND	APU FIRE	W-4
	ENG COMPARTMENT, FUSELAGE OR ELECTRICAL FIRE — GROUND	W-4R
	RESIDUAL FIRE DURING SHUT-DOWN	W-4
FUEL	FUEL VENTING	W-11

Change 1 W-1

Figure 1. Flight reference card (FRC).

While Task 1070 provided a logical structure for crewmembers to respond to emergencies, the second phase of the Emergency Response Methodology focused on providing crews with a more functional emergency procedure checklist to enable efficient, crew-coordinated decision making in flight. These updated emergency checklists, in a Flight Reference Card (FRC) format, are now being distributed to AH-64 D/E, CH-47 F, and UH-60 A/L/M units throughout all three Components via the Army publication and distribution system (Figure 1). Flight Reference Cards complement Emergency Response Method Phase 1, and allow crewmembers to respond to emergencies in context with the situation, delaying noncritical actions

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while prioritizing aircraft control, crew coordination, and deliberate action.

FRC OVERVIEW AND DEVELOPMENT

Between December 2019 and July 2020, a team comprised of personnel from the USAACE Directorate of Evaluation and Standardization (DES) and the Army's Aviation and Missile Command (AMCOM), and several other partner agencies researched; developed; and tested a new checklist format, which ultimately became the FRCs that are being distributed to units throughout the Army. The FRCs, which are modeled off of products and best practices used by joint service, partner nations, and civilian aviation industry products, provide a more intuitive layout with in-cockpit functionality being the most important consideration. They feature color-coded emergency sections that identify procedures based on severity, rather than simply grouping them by aircraft system. These color-coded sections are separated by durable plastic dividers that correspond to the color of each FRC section (Figure 2). The supplemental divider kit, or "top tabs," (TB 1-1500-1) are an integral piece of the FRCs and should be ordered by units through normal publication channels after they are available in October 2020. Within each FRC section, section indices and tabbed pages enable crews to access specific pages in the document with precision and efficiency.

The initial distribution of FRC will only include Book 2, which will replace the emergency procedures section of the legacy "green" flight crew checklist. A future update in Fiscal Year 2021 will convert the Normal Procedures (N-Pages) and Detailed Procedures (P-Pages) to a similar FRC format, as well. This subsequent update will completely phase out the legacy checklist format and transition all Army advanced rotary-wing aircraft to the FRC format checklist. Flight Reference Cards will also be the format used for future advanced Army aircraft.

The structure and layout of the FRCs facilitate a logical and analytical response to emergencies by guiding crews through the Emergency Response Method, regardless of the severity of the emergency. The layout of the cards enables crews to confirm proper malfunction analysis; review emergency action steps necessary to alleviate the situation; and finally, analyze additional information pertinent to the crew to aid decision making. By promoting physical use of the checklist throughout all phases of flight, and especially during diagnosis and response to the majority of aircraft emergencies, the FRCs provide an essential component to crews executing Task 1070. In all but the most critical emergencies, crews must open the checklist once they have achieved a safe flight profile. With the release of the FRCs, crews now have a checklist that allows them to quickly and efficiently do just that.

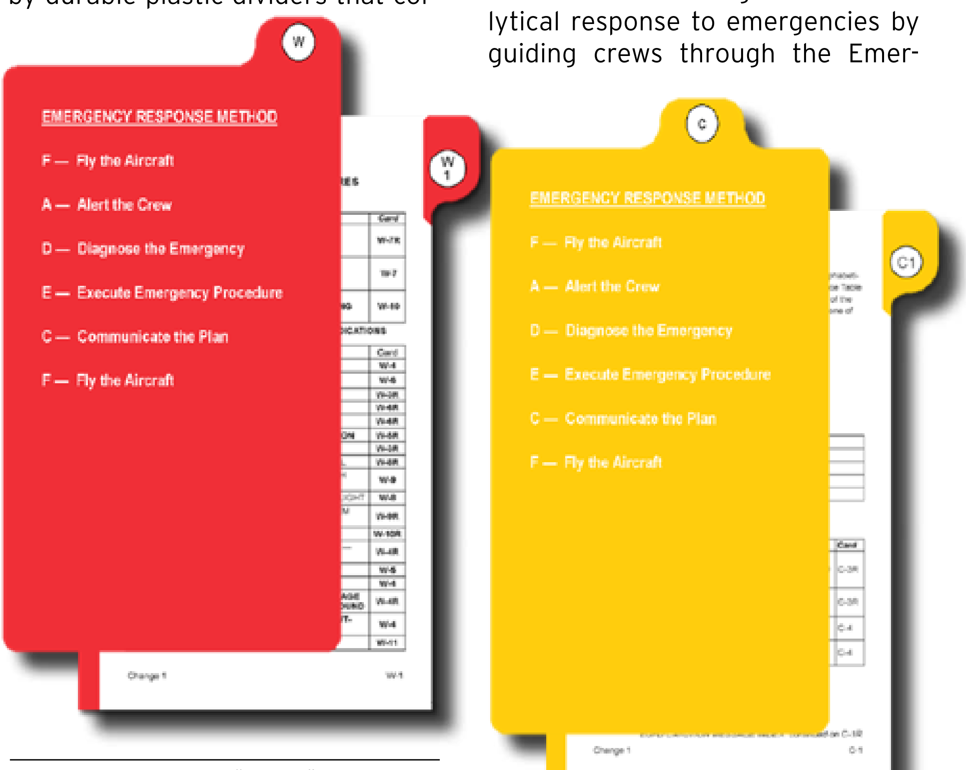

Figure 2. FRC indices and "top tab" dividers.

REDUCED UNDERLINED STEPS

During development of the FRCs, a validation/verification team, consisting of members from across DES, Directorate of Training and Doctrine (DOTD), AMCOM, Systems Readiness Division, and Army Experimental Test Pilots revised many emergency procedures for each aircraft. Through this process, the validation/verification team was able to reduce the total number of emergency procedures with underlined steps across all three combat rotary-wing platforms by approximately 60%. This was a crucial aspect of the overall FRC development process and Emergency Response Methodology, because these updated emergency procedures enable crews to truly focus on identifying the most important emergency procedures to regain or maintain safe flight conditions. This shift in focus aligns with the operations of several joint and partner nation aviation forces and meets the needs of a modernized aviation force.

The remaining underlined steps in each set of FRCs must still be memorized and executed from memory to ensure aircraft control and crew

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safety. However, in all other instances, the FRC format and structure now enables crews to physically open their checklist document in flight before executing any non-underlined emergency steps. By removing many underlined emergency procedure steps, the FRCs provide a method to free crews from memorizing dozens of procedures and enables them to refer to in-cockpit documentation instead, reducing the possibility of cognitive errors.

FRC ROLL OUT TRAINING

To accompany the release of the FRCs, DES developed a Standardized Communication (STACOM) message to standardize implementation across the force. The STACOM is posted to the DES Army Knowledge Online portal, along with links to other resources for FRC training. Of note, units must implement FRCs between November 1, 2020 and May 1, 2021.

The downloadable FRC training package is available on the USAACE DOTD Flight Training Branch (FTB) website, which will to enable units around the world to train crewmembers on their proper use. This package provides a narrated FRC overview presentation intended for delivery to groups of students, as well as several example videos showing the FRCs in use across a variety across a variety of simulated aircraft emergencies, from benign to severe (Figure 3).

In addition to the videos, the training package also features a practical exercise (Figure 4) with simulated emergency scenarios specific to each airframe, which will guide crewmembers to the unique layout and functionality of their respective FRCs. The final phase of FRC implementation training will be a simulator or flight training period to cement the logic and use of the FRCs. This training period will highlight various emergency procedures to expose crews to additional features or unique aspects of each FRC document and highlight changes made to various emergency procedures.

TRAINING IMPLICATIONS & CONCLUSION

With Task 1070 and the FRCs, emergency procedure training and evaluations throughout the Army will shift from determining how quickly crewmembers can recite memorized emergency procedure steps to how well crewmembers maintain safe flight, analyze the situation, and respond appropriately to the emergency. This transformation in emergency procedure training throughout Army aviation will enable crewmembers to respond to emergencies contextually within the situation and utilize their FRCs to determine the best way forward. This is especially critical as units continue building proficiency to operate in the complex and dynamic conditions associated with combat against peer- or near-peer competitors in large-scale combat operations (LSCO).

Figure 4. FRC practical exercises.

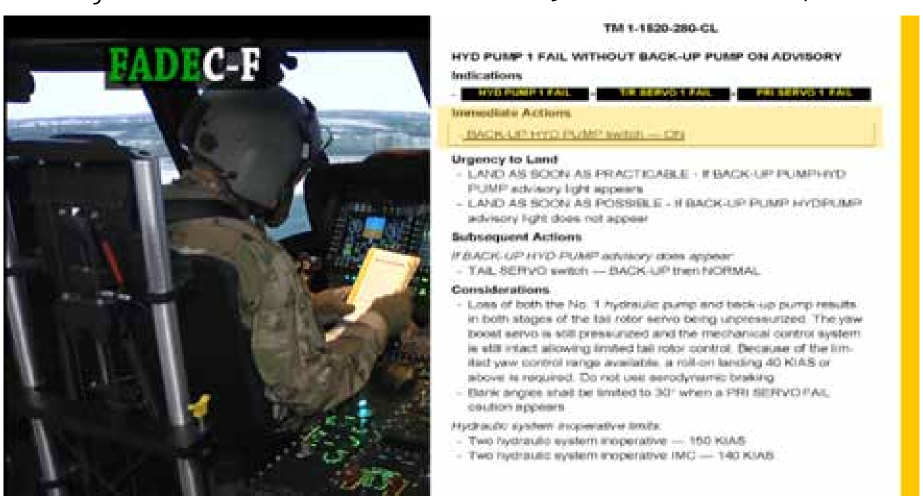

Figure 3. FRC training video.

As the Army continues training to meet the challenges of LSCO, Army aviators must change the way they think, train, and fight for the threats of today and into the future. The Emergency Response Method and the FRCs are part of the evolution that will enable crews to focus on employing the aircraft for that fight. The fundamental changes established in Task 1070 and the FRCs will train our crewmembers to analyze and overcome emergencies, rather than simply reacting to situations through rote execution of memorized procedures. Through the Emergency Response Methodology, Army aircrews will now be better prepared to respond to emergencies so they can continue to fight and win on the battlefields of today and tomorrow.

Above the Best!

MG David J. Francis is the Commanding General, USAACE and Fort Rucker.

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THE **COMBAT AVIATION BRIGADE** ACROSS THE OPERATIONAL FRAMEWORK IN WARFIGHTER EXERCISES

By LTC James F. Watts

Army aviation units have maintained a high operational tempo (OPTEMPO) as the Army continues to operate around the world. Combat aviation brigades (CABs) see the highest OPTEMPO of any functional or multi-functional brigade. Combat aviation brigades continue challenging training regimens while the Army shifts its focus to large-scale combat operations (LSCO). Combat aviation brigades use the Mission Command Training Program as a tool to train in a simulated LSCO environment against a near-peer threat. This is an attempt to focus CABs on successfully enabling divisions within a warfighter exercise (WfX). Aviation Officers can use the new Field Manual (FM) 3-04, "Army Aviation," (Department of the Army, 2020) to understand how Army aviation fights within the operational framework and how CABs enable the division's operations during the WfX.

The CAB, as a formation, conducts aviation operations from across the aviation core competencies.

U.S. Soldiers assigned to Company A, 1st Battalion, 3rd Aviation Regiment (Attack Reconnaissance) conduct maintenance on an AH-64 Apache helicopter at Katterbach Army Airfield, Germany, June 16, 2020. U.S. Army photo by Charles Rosemond

U.S. Army CPT Aaron Rhodes, company commander of Headquarters and Headquarters Company, 12th Combat Aviation Brigade preflights his aircraft on the flight line at Katterbach Army Airfield, Germany, June 16, 2020. U.S. Army photo by Charles Rosemond

Examples of missions across the core competencies include reconnaissance and security missions. Additionally, the CAB can conduct offensive operations, to include attacks, air assaults, and movement to contact, as well as air movement and medical evacuation (MEDEVAC). Each mission set across the core competencies has a different place and differing roles of support in the components of the operational framework. Manned and unmanned assets have their role in these operations. The newly released FM 3-04 discusses many of the opportunities and challenges that the CAB faces within the operational framework (Department of the Army, 2020).

Doctrine describes the operational framework in four components: **area of operation, areas within the framework, decisive-shaping-sustaining operations, and finally, the main and supporting efforts**. The senior commander dictates the first component by designating the area of operation. The next component of the operational framework is the deep area, close area, consolidation area, and support area. Combat aviation brigades have different capabilities in each area across aviation core competencies. Leveraging these capabilities allows divisions to succeed.

In the deep area, the CAB can conduct missions, including attack missions to destroy; defeat; disrupt; divert; or delay enemy forces, reconnaissance operations, air assaults, or air insertions (Department of the Army, 2020). Combat aviation brigades in WfXs typically understand their role in attacking the enemy in the deep area. However, the CAB is often unable to ensure these operations receive high priorities of support (priority of fire, sustainment, etc.). Typically, divisions intensely manage CAB Gray Eagle unmanned aircraft vehicles for information collection. Despite maximizing Gray Eagles as a collection platform, the division and CAB often overlook any manned-unmanned teaming capability within the air cavalry squadron to assist in the identification of priority information requirements or aid in the division's targeting cycle.

The CAB's tasks in the support area or consolidation area include air movement, MEDEVAC, and C2 support missions (Department of the Army, 2020) typically led by the general support aviation battalion, with possible augmentation from the assault battalion. Warfighter exercises simulate hybrid threats in the support area, which often necessitates attack, reconnaissance, or security missions. This forces

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division and CAB leaders to make hard decisions and choices regarding asset allocation for AH-64s and unmanned assets. These decisions and choices include when to retask platoons or troops from the air cavalry squadron or attack battalion from the deep area or operations in the close area.

In the close area, CABs experience difficulty supporting the division. Causes of these difficulties include the division's inability to best allocate CAB resources and the CAB's inability to articulate its capabilities. Combat aviation brigade missions suited to the close fight include movement to contact, attack, reconnaissance, security, air assault, air movement, command and control support, and evacuation missions (Department of the Army, 2020). Combat aviation brigades and divisions often miss opportunities to conduct movement to contact, reconnaissance, or security with the CAB's involvement. Instead, CABs often focus on hasty attacks. The key for CABs and aviators on the division staff is to work from the purpose of the mission and apply the best tactical task or tactical-enabling task. Movement to contact and reconnaissance are tactical tasks better suited to find enemy forces and develop the situation. Clear tactical tasks, enabled by appropriate command and support relationships, allow the division to best leverage the CAB's capabilities. At this point, the aviators at division and the CAB transition within the operational framework to the decisive/shaping/and sustaining element.

Once division leaders see the deep, close, consolidation, and support areas, they determine the decisive, shaping, and sustaining operations. Critically, Army Doctrine Publication 3-0, "Operations," states, "Commanders plan to conduct decisive operations using maneuver… in the close area, and they position most of the maneuver force in it" (Department of the Army, 2019). Decisive operations are operations that directly accomplish the mission (Department of the Army, 2019). Warfighter exercises typically see brigade combat teams (BCTs) conducting the decisive operation, with the CAB conducting shaping operations to enable the scheme of maneuver, while supporting sustainment operations. Responsibilities for the division aviators include recommending tactical tasks that meet the purpose of shaping the decisive operation. The tactical task should also enable the division to choose the best command or support relationship for the CAB and subordinate units. Direct support, general support, operational control, and tactical control all give the division, CAB, and BCT commanders options in controlling movement and maneuver, fires, and sustainment. Additionally, command and support relationships facilitate understanding of C2, sharing and reporting intelligence. Aviation officers accustomed to the "steady state" of counterinsurgency operations can expand their tactical toolkit with the understanding that phasing, whether by air tasking order (ATO) cycle or objective-based conditions, is a way to initiate, change, or terminate command or support relationships in an attempt to achieve the decisive operation.

Often, divisions create ad-hoc cavalry squadrons, and the division and CABs struggle to establish command or support relationships. In the past, the Army tailored the "DIV CAV" with a mix of ground and aviation units. These units do not exist within the current force structure; thus, the creation and execution of these formations become difficult. The CAB typically forms relationships in a pre-warfighter command post exercise and are at a disadvantage compared to the habitual relationships with other established units. Choosing the best tactical task and command and support relationship is critical to enabling the success of this unit. Aviation is critical for support to movement to contact or reconnaissance, and selecting the best command and support relationship is key for aviators at echelon. This collaboration enables the aviation units to report timely and actionable information requirements to either the DIV CAV or the division commander, giving the decision makers the opportunity to seize initiative. The resultant cost of not shaping the fight in the first 48 hours, particularly within the reconnaissance fight, leads to missed opportunities or delays in executing the decisive operation. A common cause for the lack of aviation integration to these operations can come from dedicating assets away from the decisive operations occurring later in the exercise. Commanders and planners can utilize the operational framework to mitigate risks in allocating assets at the outset of operations.

Phasing, based off time or event, allows the division commander to break up tasks within the operational framework to set favorable conditions for the decisive operation. This brings in the main effort and supporting effort components of the operational framework. Army Doctrine Publication 3-0 states that this component of the framework allows the commander to allocate or reallocate resources. The CAB's typical role in the outset of operations includes, but is not limited to, the reconnaissance-counter-reconnaissance fight or deliberate attacks to gain the initiative. An ATO cycle may see a deliberate attack in the deep or close areas. The division could designate the CAB's attack battalion as the main effort, which is a designated subordinate unit whose mission at any given point in time is most critical to overall mission success (Department of the Army, 2019). If the CAB is the main effort during the operation, it is critical that it is included

Soldiers with the 101st Combat Aviation Brigade, 101st Airborne Division (Air Assault) load equipment into a CH-47 Chinook helicopter in preparation to jump their tactical operations center (TOC) to a new location during Warfighter, a 2-week command and control exercise February 13, 2017 at Fort Campbell, Kentucky. U.S. Army photo taken by SGT Marcus Floyd, 101st Combat Aviation Brigade

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in and receives priority of fires, as many divisions neglect the CAB's inclusion. Most divisions assume CABs will be calling fire through BCTs. This typically occurs when the CAB is a supporting effort to a BCT with an established command or support relationship. Conversely, when the CAB is the main effort, it shapes the high payoff target list, prioritized protection lists, and priorities of sustainment. The CAB also conducts operations as a supporting effort. When the CAB is a supporting effort, the division can strengthen the relationship to the main effort with tactical tasks and command or support relationships allowing the division to conduct the operations required to reach the decisive operation.

The operational framework provides leaders a way to visualize the problem that the division and CAB must fight. During a WfX, the division and CAB have many tools to accomplish their objectives. Using aviation throughout the operational framework is critical to planning for the most dynamic Army assets available in the WfX. Seeing the effect required for the decisive operation—where that operation is on the battlefield and applying phasing to ensure units get there—is critical to success. The operational framework allows aviation officers to see tasks and allows divisions and CABs to task-organize to achieve the commander's end state and maximize effects of the CAB. Aviation officers preparing for a WfX can assist their formations with familiarity of the entirety of the CAB's capabilities for utilization within the operational framework, enabling those aviation officers to influence the division to make the best use of aviation assets in LSCO.

U.S. Army Apache helicopter pilot, CW2 Jacqueline Paszkiewicz, assigned to Company A, 1st Battalion, 3rd Aviation Regiment, 12th Combat Aviation Brigade makes final checks during maintenance on an AH-64 Apache helicopter at Katterbach Army Airfield, Germany, June 16, 2020. U.S. Army photo by Charles Rosemond

LTC James F. Watts currently serves as an Observer-Coach/Trainer with the Mission Command Training Program. He is a Senior Aviator rated as a Maintenance Officer in the OH-58D, and has deployed in support of OEF and OIF.

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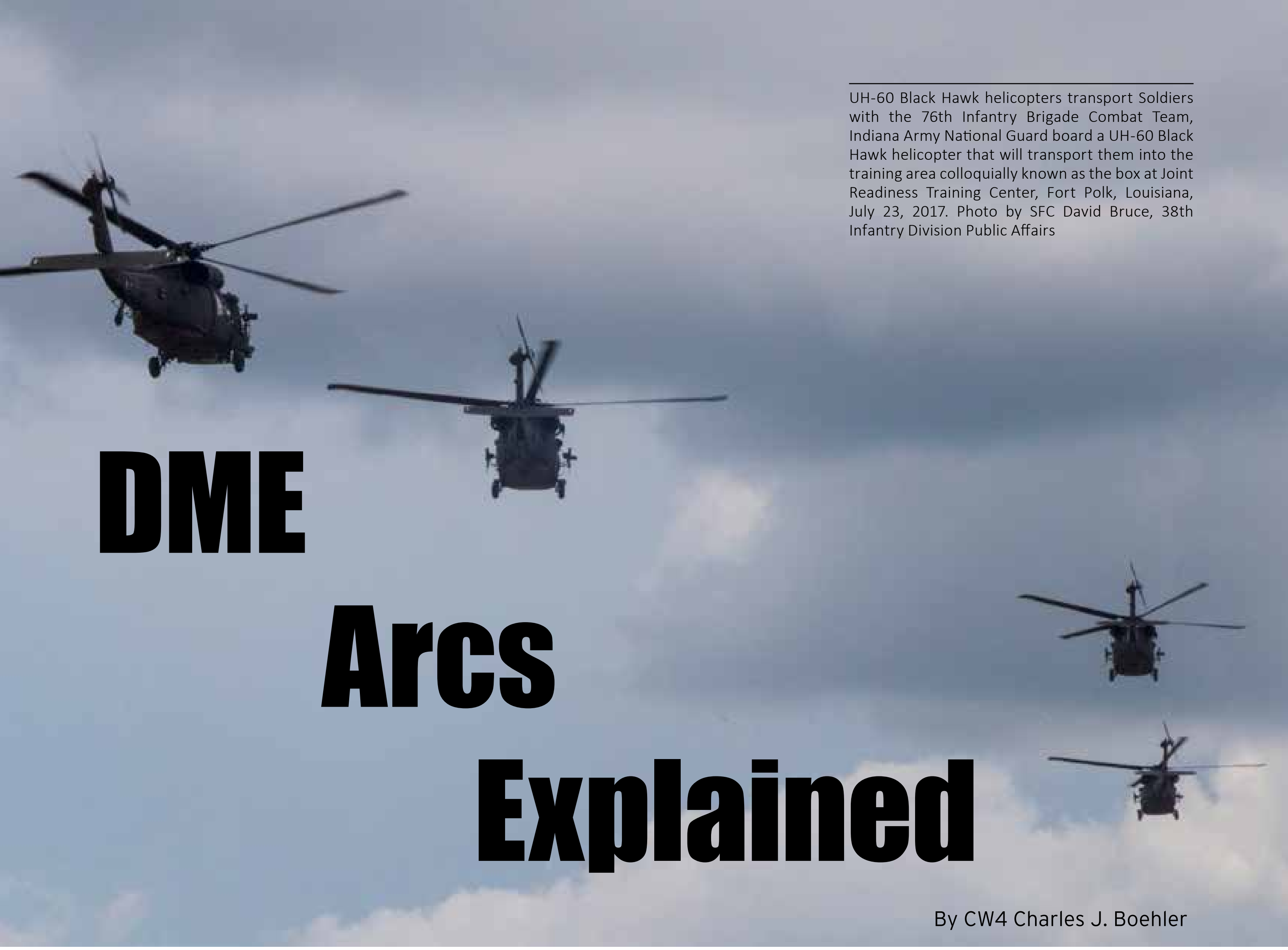

UH-60 Black Hawk helicopters transport Soldiers with the 76th Infantry Brigade Combat Team, Indiana Army National Guard board a UH-60 Black Hawk helicopter that will transport them into the training area colloquially known as the box at Joint Readiness Training Center, Fort Polk, Louisiana, July 23, 2017. Photo by SFC David Bruce, 38th Infantry Division Public Affairs

DME Arcs Explained

By CW4 Charles J. Boehler

Distance measuring equipment (DME) arcs are an important component of many instrument approach procedures. Procedure turns are becoming a thing of the past, making the ability to fly a DME arc not just a nice-to-know thing, but a necessary skill. In a flight director equipped aircraft, flying a DME arc is as simple as configuring it correctly; however, pilots should know how to hand-fly this procedure and understand potential pitfalls with the automation. Instructor pilots (IPs) and instrument flight examiners (IFEs) at training facilities and units should begin teaching this procedure immediately if they're not already doing so. With just a little knowledge and training, this is a very easy procedure to fly.

Per Army Regulation 95-1, "Flight Regulations," Global Positioning Systems (GPS) are authorized as replacements for DME as long as it is instrument flight rules (IFR)-certified with a current database. In order to use the GPS in lieu of DME, the station from which DME is derived must be in the GPS's database (Department of the Army, 2018). In Figure 1, the station used to measure DME from the arc is the SAF VHF (very high frequency) Omnidirectional Radio Range/Tactical Air Navigation (VORTAC). Note that once the localizer has been joined, the DME station changes to the localizer (I-SGB). Among the many limitations that the digital aeronautical flight information file (DAFIF) has is that there are no localizers in the database. This could have serious implications upon how the approach is flown and if it can even be flown at all (in this case it can, because the stepdown fixes are named waypoints). An excellent

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article describing the limitations of DAFIF was recently published by the United States Army Aeronautical Services Agency (Reynolds, 2019),[1] which should be read by all Army aviators who fly aircraft using a DAFIF database. Distance measuring equipment arcs are never based off of a localizer, because they are not omnidirectional-sensing (Federal Aviation Administration, 2017), so it should be relatively safe to fly them; however, always check that the station used to measure DME from is in your database before takeoff. The assumption through the rest of this article is that GPS will be used in lieu of DME, as the UH-72 is (almost) the only helicopter in the Army's inventory that has DME. The instrument landing system (ILS) or LOC runaway (Rwy) 2 to Santa Fe Municipal Airport (International Civil Aviation Organization designation KSAF) does not have a procedure turn; therefore, the only initial approach fix (IAF) options are the two DME arcs or the dead reckoning waypoint (LIYIR).

Distance measuring equipment arcs are used to transition an aircraft from the en route phase to the intermediate or final approach segment. They are typically the initial segment of the approach (Federal Aviation Administration, 2017). When an IAF for a DME arc is depicted with a radial, it is also associated with a victor airway (Machado, 2003). When the IAF is not a named waypoint, the only way to fly onto the DME arc is from the depicted radial (victor airway) either to or from the VOR, although flying to an arc IAF from the VOR could complicate your life (as mentioned later in this article). If the IAF is a named waypoint, it may be flown direct to from any direction, not needing to be on an airway. Distance measuring equipment arcs cannot be joined before or after the IAF unless vectored onto the arc by air traffic control (ATC). The standard for maintaining distance on a DME arc is +/- 1 nautical mile (nmi), and the altitude used to maintain the arc is depicted on the approach chart right on the arc itself, as circled in red on Figure 1 (Department of the Army, 2017).

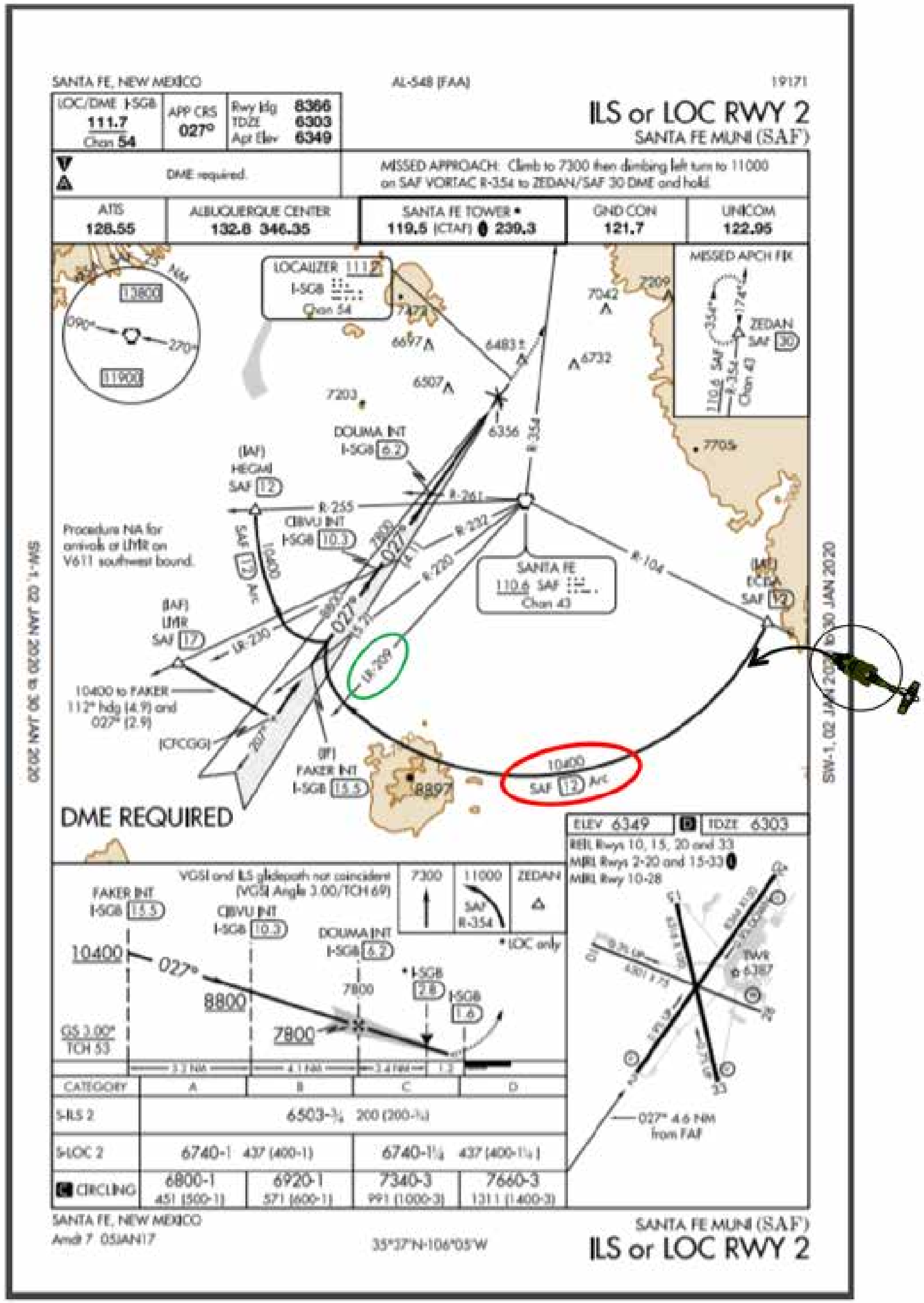

Figure 1. ILS or LOC Rwy 2 to KSAF (Federal Aviation Administration, 2020).

Procedures for flying a DME arc are fairly straightforward, although it is often easier to demonstrate in flight than explain. As in all things related to instrument flying, awareness of aircraft position is key. Prior to approaching the IAF, the pilot must lead the turn by about 0.5 nmi to avoid overshooting. If the GPS is being used to fly directly to a named IAF waypoint, the VOR station used to measure the DME distance from must be loaded into the GPS upon reaching the IAF. Keep in mind that the VOR receiver must also be tuned to the VOR frequency. If the aircraft you're flying has only one VOR receiver, don't be tempted to tune the localizer frequency yet (when flying an ILS or localizer approach). You'll need the VOR tuned up to identify the lead radial.

[1] This publication is available on the Army Knowledge Online Website with a valid common access card.

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In this example (Figure 1), the ILS or LOC Rwy 2 to KSAF will be used, approaching KSAF from the east on the victor airway (V62 on the en route low altitude chart, as shown by the helicopter and arrow on Figure 1) and flying to SAF on the 104° radial (284° course) toward the named waypoint ECISA. At about 12.5 nmi DME from SAF, the pilot begins a left turn to a heading of approximately 200°. This heading is derived from simply looking at the direction the arc takes from the IAF ECISA and is just a ballpark for reference in the beginning stages of the turn (or if you want to do math, the beginning of the arc is 90° from the radial, which comes to 194°). Having a precise heading in mind at this point, and throughout the entire DME arc, is immaterial. Holding a fairly precise distance is what's required. As the pilot approaches a 200° heading, it will become apparent if the turn was sufficient to arrive on the arc at 12 nmi DME. In this case, if the distance is more than 12 nmi as the heading approaches 200°, something greater than a 200° heading must be flown to get closer to SAF. Conversely, if the aircraft is too close (less than 12 nmi), then a heading less than 200° must be used to fly further from SAF. These adjustments will be fairly obvious in the aircraft when GPS distance is correlated to the horizontal situation indicator (HSI). Additionally, wind will obviously play a part in this, and knowledge of it will assist in accuracy. When flying aircraft equipped with an autopilot, the aircraft will fly to the IAF and fly a perfect DME arc when the approach is properly loaded and activated, but even in this case, more must be done properly later in the approach for a successful outcome.

Figure 2 is from Training Circular 3-04.5, "Instrument Flight for Army Aviators," which shows how to make turns to get back on course when the DME distance starts to drift. Maintaining a DME arc is simply a matter of keeping the desired distance from the facility while flying in the direction dictated by the arc. This is done by observing the distance shown on the DME or GPS display and turning toward or away from the facility as needed. Ideally, the bearing pointer that is slaved to the VOR will be at either the 90° or 270° reference tick mark (depending on which side of the aircraft the navigational aids are) on the HSI with the aircraft at the correct distance as in aircraft 1 (Figure 2). In the case of aircraft 2, it is getting too close to the VOR and a left turn to place the correct bearing pointer 5° to 20° below the 90° reference mark is made. Conversely, if the aircraft is getting too far away, then a right turn to put the bearing pointer 5° to 20° above the 90° reference mark must be made. Five

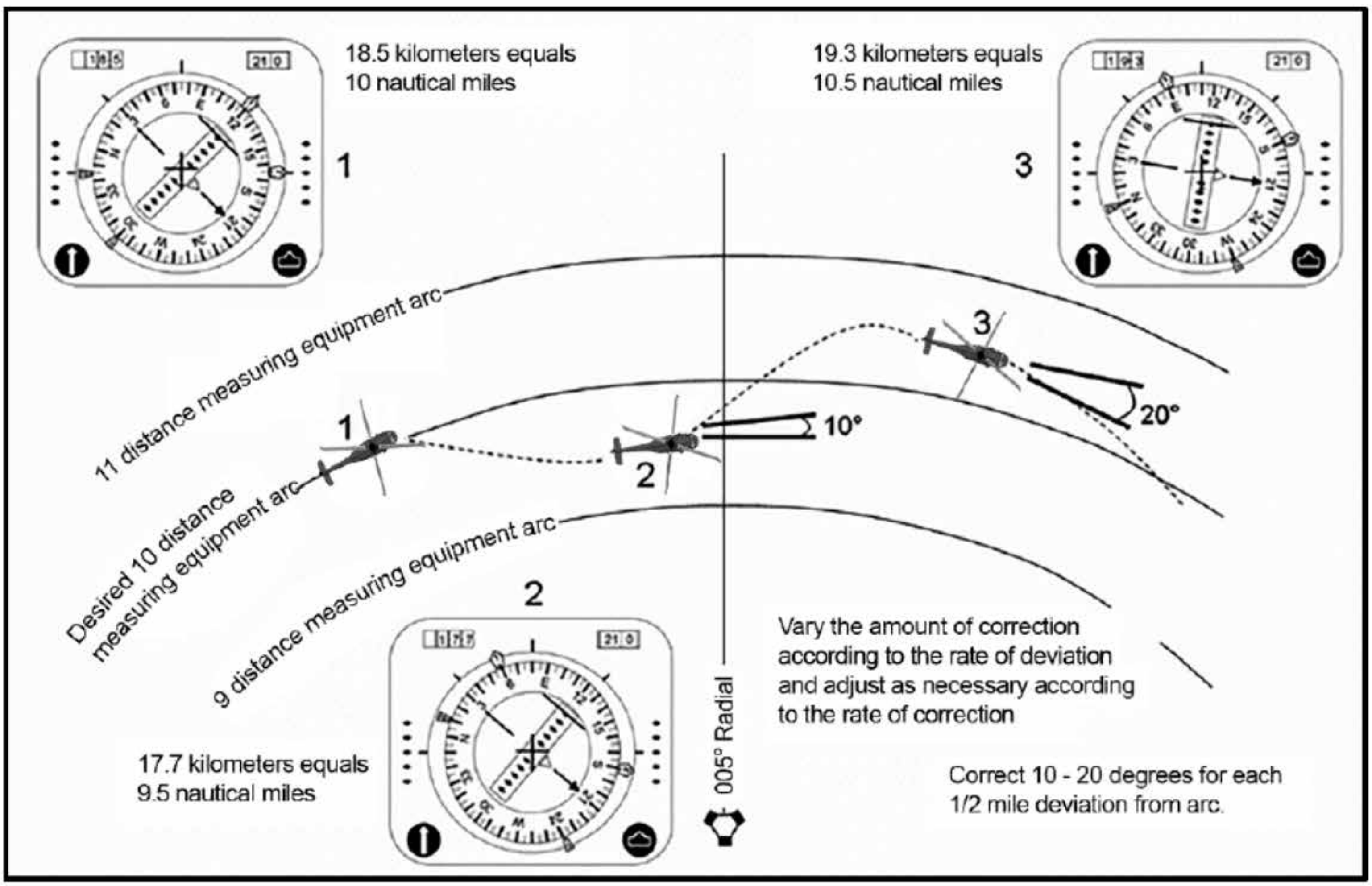

Figure 2. Procedures for maintaining a DME arc (Department of the Army, 2017, p. 7-30).

to 10° heading changes are generally enough to provide correction; however, if this doesn't produce the desired results quickly enough, then a bigger heading change must be made. Horizontal situation indicator heading selector changes should be adjusted after the aircraft is established on the arc so that the pilot on the controls has the inbound approach course selected, and in the case of an approach where a lead radial is depicted, the non-flying pilot should have the lead radial's course selected to assist in situational awareness for arrival at the lead radial. While the depiction of a DME arc makes it look like it's one gradual turn, in practice, it's a series of small turns to keep the aircraft on the arc (Federal Aviation Administration, 2012).

The last phase of the DME arc is dependent upon what type of approach is being flown. On approaches where the turn from the DME arc to the final approach segment is other than 90° (when the source of the arc is not aligned with the final approach course), a lead radial is used to begin the turn from the arc to the intermediate or final approach course and is depicted on the approach chart by "LR" and the three numbers depicting the radial (e.g., LR-209). Upon reaching the lead radial as shown on the VOR bearing pointer (not the GPS!), the pilot must turn to intercept the inbound course while the non-flying pilot tunes in the localizer at this time. At that point, it's simply flying to the localizer inbound course and intercepting the glide slope as with any ILS. Note that the position of the VORTAC (Figure 1) has an effect on the angle used to intercept the localizer. Since SAF is about 4 nmi south/southeast of the airport, the turn to intercept is much sharper from the lead radial on the west arc (LR-230) as opposed to the shallower angle on the east arc. When flying an automated aircraft coupled to the flight management system or GPS, it is necessary for pilots to be aware that they must change the primary navigation source to the localizer **at the lead radial** (Federal Aviation Administration, 2017). Failure to do so will allow the aircraft to fly from the lead radial directly to the next depicted waypoint. In the case of Figure 1, it would be from LR-209 to waypoint CIBVU. This will cause the aircraft to go above glide slope since the localizer intercept angle is too shallow between these two points, as well as keeping the aircraft outside of the localizer course, necessitating a missed approach.

In an approach where the source of the arc (the VOR) aligns with the intermediate or final approach segment, such as the KSAF VOR 33 in Figure 3, the DME arc is flown until reaching the inbound course (the point that the course deviation bar on the HSI starts moving, assuming the cockpit is set up correctly for the inbound course) giving a 90° course intercept. At that point, the

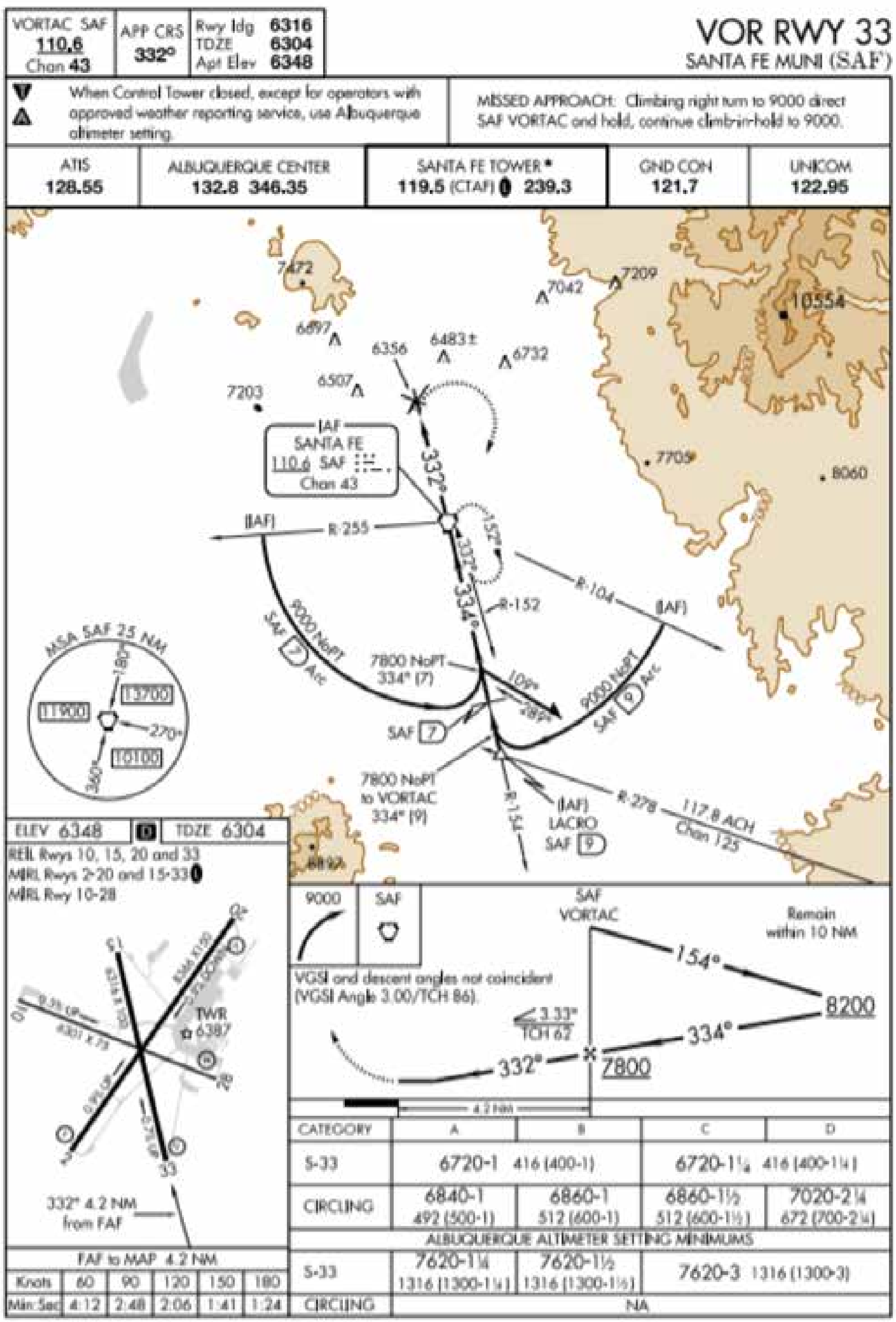

Figure 3. VOR Rwy 33 to KSAF (Federal Aviation Administration, 2020).

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UH-60 Black Hawk helicopter crews from 3rd Battalion, 501st Aviation Regiment, Combat Aviation Brigade, 1st Armored Division completed aerial gunnery at Fort Bliss, Texas, December 12, 2017, maintaining their combat readiness and M240 machine gun skills. U.S. Army photo by CPT Tyson Friar, 1st Armored Division Combat Aviation Brigade Public Affairs

pilot simply turns to intercept the inbound approach course. Similar to the description of the ILS approach mentioned earlier, upon reaching the point where the inbound course is intercepted, pilots of autopilot-equipped aircraft must switch the primary nav source from GPS to the VOR at this time. Note that in this approach, the DME arcs use IAFs from the same radials as the ILS in Figure 1. However, the VOR 33 approach does not have named waypoints at the IAFs (the DME distances are different) and can only be flown from the SAF 104 or 255 radials or their reciprocals. This approach also still has a procedure turn, but the simplicity of flying a DME arc (no timing, remain within distance, multiple large turns, etc.) may make them a more favorable option, even when flying outbound from the VOR. However, be aware that if you are flying to the SAF VORTAC not on a victor airway that makes up the entry point for the DME arc and you are cleared for the approach, the procedure turn is the expected form of course reversal to be flown, since the VOR is an IAF and the DME arcs can only be entered from the appropriate airways (Machado, 2003). In other words, if you want to fly the DME arc, you should fly inbound to the VOR on the victor airway that aligns with the IAF. If you're unsure of what ATC expects, always query them. It never hurts to make them aware of your intentions early if you think the situation is unclear.

These procedures aren't new, and we as Army aviators must ensure we keep our skills current and relevant. While the acceptable standards for staying within a DME arc are a generous +/- 1 nmi, precision should be the goal. Being at 0.9 nmi inside the DME arc upon intercepting the lead radial could make the rest of the approach more difficult at best. Pilots cannot depend on getting radar vectors onto the final approach course. They may not be available and/or may not fit into the sequence of traffic flowing into the airfield. Likewise, IFEs and IPs that perform "self-vectoring" with pilots in training are setting up unrealistic (unsafe) expectations and missing out on a key element of the approach. If you fly an automated aircraft, you must understand what it's actually supposed to do as opposed to what it is doing, and be prepared to intervene as necessary.

CW4 Charles J. Boehler is a UH-60 SP/IE in the NMARNG with 33 years of service between the active Army and ARNG. He is also rated in the UH-72. Mr. Boehler served three combat deployments to the first Gulf War, Afghanistan, and Iraq. He holds a B.S. from Embry-Riddle Aeronautical University in Professional Aeronautics and an M.S. from Embry-Riddle in Aeronautics.

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[2] This publication is available on the Army Knowledge Online Website with a valid common access card.

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U.S. Army Sling Load Operations—The Value of Remote Resupply

By 1LT Leonard Genders

The value and importance of using adaptive solutions to logistics resupplies is critical to maintaining and extending the operational reach of forward-located units. The helicopter sling load mission set allows a wide variety of loads to reach a vast amount of locations, often unattainable by more standard methods of resupply. The training, rehearsals, planning, and coordination by all parties involved in sling load resupply operations continue to exemplify the ingenuity and abilities of the U.S. Army to find a way to complete their mission.

Sling load operations are complex and synchronized events that require astute attention to detail and an in depth planning process that involves the supporting aviation element and the supported unit. The supported unit must understand a myriad of responsibilities ranging from properly selecting the location of the landing site to properly rigging the load in accordance with all appropriate technical manuals (TMs). Oftentimes, combat operations require creative and effective solutions to logistics problem sets. Within the current counterinsurgency environment, more common methods of resupply include ground movements such as tactical convoys, sling load resupplies, and aerial delivery airdrops to forward operating bases. While both convoys and aerial delivery methods meet mission requirements, there are situations in which a convoy cannot maneuver over the terrain to the final destination, or airdrop is not feasible due to the minimally-sized remote location.

U.S. Army SPC Pete Sigala, who hails from Anaheim, California, a helicopter landing zone sling load specialist from Headquarters Company, 626th Brigade Support Battalion, 3rd Brigade Combat Team "Rakkasans," 101st Airborne Division (Air Assault), prepares to hook a sling load of supplies to a civilian contacted air asset helicopter at Forward Operating Base Salerno, Nov. 5, 2012. Sling loads help resupply Soldiers at outlining Combat Outposts and FOBs with essential items such as fuel, water, food, and other various supplies. U.S. Army photo by SFC Abram Pinnington, TF 3/101 Public Affairs

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"The helicopter sling load method of carrying cargo and equipment overcomes many of the obstacles that hinder other modes of movement.... Helicopters rapidly move troops and supplies where they are needed" (Department of the Army, 2012, p. 1-1 and 2-1).

In most operations, the continual and routine resupply of classes I (Food and Water), III (Fuel), and V (Ammunition) are at the top of the priority of demand. In the U.S. Central Command area of operations, specifically Afghanistan and Iraq, the resupply of class I (Water) is commonly distributed via prepackaged bottles from a civilian-contracted source such as Dasani®. The water comes in packages of 16 bottles, stacked and secured to a standard sized wooden pallet that is then stored in a wooden shed. Counterinsurgency operations in Afghanistan and Iraq often include firmly located and established known bases of operations with generally solidified lines of resupply. However, these operations are only a piece of the logistics puzzle the Army demands to be solved for both the present counterinsurgency and future near-peer adversary mission sets.

Operations against a near-peer foe require an understanding that prepositioned stocks of necessary classes of supply will not be readily available, are not easily accessed, and will undoubtedly be a reason for competition. One major logistics challenge when operating against a near-peer opponent includes the resourcing and distribution of class I (Water) throughout the area of operations. Long-range artillery and rapidly changing objectives require a force capable of moving at a moment's notice, essentially crippling any intention to remain in a singular location for extended amounts of time. Naturally provided water sources effectively become the most efficient and cost-effective solution to resourcing class I (Water) to the force in a near-peer fight. Water treatment systems such as the tactical water purification system (TWPS) provide an edge to logistics units responsible for sustainment; capable of purifying water from any classification, even chemical, biological, radiological, and nuclear contaminated sources (Department of the Army, 2017).

CLASS I (WATER) DISTRIBUTION AGAINST NEAR-PEER ADVERSARIES

The Hippo (load handling system [LHS] compatible water tank rack) is a portable water tank storage system that is capable of holding up to 2,000 gallons of potable water. The Hippo employs an integrated pump, engine, alternator, filling stand, and 70-foot hose reel with bulk suction and discharge hoses capable of distributing water at a rate of 125 gallons per minute (U.S. Army, 2020). Not only is the Hippo a replacement for the previously used 3,000 and 5,000 gallon semitrailer-mounted fabric tanks, but the system is capable of withstanding arctic environments down to minus 25 degrees Fahrenheit (U.S. Army, 2020). The Hippo provides flexibility and mobility essential to a continuously moving force, especially against peers who are expected to compete for water sources.

The Hippo and TWPS are both systems found within a combat aviation brigade (CAB), nested within the modified table of organization and equipment of the Alpha Company (Distribution) in the aviation support battalion (ASB) (U.S. Army Force Management Support Agency Commander , 2020).[1] Not only can the Hippo be sling loaded into remote locations, but the system is compatible with both the LHS and the palletized loading system (PLS). Essentially, the Hippo can reach the end user through a conventional ground convoy or a sling load if the route is impassable. The Hippo is an independent system, proficient at receiving, storing, and issuing water as required. The Hippo can function while still loaded onto a PLS, LHS, or the ground and can operate as a stand-alone class I (Water) point. The Hippo provides approximately 344 personnel 5.81 gallons per day within a cold weather environment at a sustained rate (Department of the Army, 2017).

PUTTING THE PLAN TO THE TEST

During a company-level training exercise in January of 2019, the Soldiers of Alpha Company, 277th ASB, 10th CAB tested and validated the processes for class I (Water) distribution throughout a challenged atmosphere. In order to adequately prepare for sling load operations, deliberate coordination and mission planning occurs at the company and platoon levels. Designation of roles, responsibilities, and timelines are solidified at least 6 weeks prior to the execution date. The Alpha Company commander tasked the supply platoon as the main effort of the training exercise, and the platoon began their rehearsals under winter conditions.

Sling load operations rehearsals include a myriad of tasks that the supply platoon conducted, to include: hand and arm signals, landing zone procurement and establishment, landing zone site selection, landing zone security, aircraft approach procedures, emergency bail out procedures, aircraft hookup sequences, rigging and derigging loads, and rigged load dismounts.

Hand and arm signals provide both the aircraft personnel an additional safety measure to validate that the landing zone is safe and secure and also act as a guide to orient the aircraft directly over the sling load. The signalperson is responsible for directing the aircraft over the prepared sling load, in addition to "waving off" the aircraft if there is a safety concern and the aircraft should

[1] This document is available via the Enterprise Access Management Service-Army to the Force Management System Website with a valid common access card.

not land or attempt a hookup. The signalperson also assists in the notification that the sling load is properly secured, and that the hookup to the cargo hook is complete. The supply platoon rotated all of its participating personnel through the signalperson position, which forced each Soldier to understand the seriousness and complexity of directing aircraft. As expected, observing another person conduct signalperson duties is significantly easier than actually performing them.

To validate the platoon's ability to operate in harsh subarctic conditions, the training exercise took place on snow-covered terrain when temperatures hovered between 0 and 5 degrees Fahrenheit. The Hippo weighs 9,200 pounds empty, and the Hippo used during the training exercise contained approximately 1,000 gallons, weighing approximately 16,000 pounds. Although Technical Manual 4-48.11, "Multiservice Helicopter Sling Load: Dual-Point Load Rigging Procedures" recommends a 10K sling set, the platoon used a 25K sling set as a precautionary measure (Department of the Army, 2013). A CH-47F from the 3-10 General Support Aviation Battalion, 10th CAB, supported the air mission request, and the Alpha Company sling load team completed all dual-point rigging, inspection, and certification of the Hippo prior to the first lift.

The Alpha Company sling load team consisted of an officer-in-charge (OIC), range safety officer, hookup team, and a signalperson. The hookup team was comprised of six personnel, located on top of the Hippo in the front and rear positions in groups of three. Within the group, two personnel assisted in "spotting" while the remaining Soldier lifted the 25K cargo hook reach pendant (CHRP) to the forward and aft cargo hooks on the CH-47F. The OIC was located between the forward and rear positions on the Hippo to oversee and facilitate the hook up procedure. The Alpha Company sling load team opted to use two 25K CHRPs rather than static discharge wands due to the frozen ground when attempting to stake the grounding rod and because of the additional safety measures the CHRPs provide.

The CH-47Fs conducted multiple elevator lifts on the Hippo before flying with the load in a predesignated flight route. Upon completion of the route, the CH-47F returned the Hippo to the predesignated helicopter landing zone (HLZ) depicted by a brightly colored VS-17 panel. Other methods of marking, such as chem-lights and colored flags, were deemed ineffective due to the rotor wash of the CH-47F on takeoffs and landings. The snow and ice that covered the HLZ simply shielded all other methods of marking besides the brightly colored VS-17 panel.

The training exercise was a successful application of class I (Water) distribution to units within a contested setting, flexing the abilities of the systems readily provided to the Alpha Company in an ASB. The Hippo truly can make the difference when distributing logistics support within a near-peer environment, especially if time is of the essence.

Counterinsurgency and near-peer adversary conflicts highlight challenges to traditional methods of resupply. Ever-changing and intricate battlespaces require creative and environment-dependent solutions for sustaining the warfighter. Within Afghanistan's area of operations, sling load resupply operations are restricted due to elevation, distance, and temperature. It is unlikely that the Hippo could be delivered via sling load, especially to distant and austere locations within Afghanistan. Sling load operations using the Hippo is a technique to get bulk water to austere and dislocated locations that deliver the needed supplies at the supported unit's points of need.

1LT Leonard Genders is a QM assigned to the 10th Combat Aviation Brigade.

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Kosovo Force Regional Command- East Task Force Aviation Soldiers, comprised of Soldiers from Alpha Company, 2-238th General Support Aviation Battalion, Colorado Army National Guard, train personnel from KFOR RC-E's Maneuver Battalion, comprised of Soldiers from Delta Company, 2-162 Infantry Battalion, Oregon Army National Guard, on sling load operations on Camp Nothing Hill, Kosovo on May 11, 2020. Sling load operations enhance KFOR RC-E's ability to rapidly transport items such as equipment and sustainment supplies. U.S. Army National Guard photo by WO Shaun Morey

CREDENTIALING OF AVIATION MAINTAINERS IMPROVES OVERALL UNIT READINESS AND LETHALITY

By 1SG Brandan Beiermann

Professionalism and technical expertise have long been the hallmark of Army aviation. Soldiers within the Aviation branch are responsible for maintaining some of the most expensive aircraft and associated equipment in the Army's inventory. While advanced individual training (AIT) certifies Soldiers on the specifics of their chosen military occupational specialty, graduates are apprentices who require extensive training and mentorship on their path to becoming professional maintainers. In fact, AIT graduates are not authorized to inspect or maintain aircraft outside the military because of the lack of Federal Aviation Administration (FAA) qualifications. Lack of qualifications creates issues for Soldiers upon retirement or transition in their job searches. The Bureau of Labor and Statistics reported that the average annual salary in May 2019 for FAA qualified technicians was $64,310 (U.S. Bureau of Labor and Statistics, 2020). However, most Soldiers fail to meet requirements for these positions because they lack an FAA license. Besides the potential impact to Civilian earnings, Soldiers who exit military service without credentials can negatively represent military service as a whole. As the Army continues to focus on enriching the lives of our Veterans, leaders must place emphasis on providing opportunities to our Soldiers whenever possible. The shift to provide our Soldiers with more opportunities and professional credentials has gained exposure in the last decade. How do we express our commitment to the professional development of our Soldiers while simultaneously improving the aviation enterprise? The solution lies in the implementation of unit FAA airframe and powerplant (A&P) training and certification programs.

Ivy Eagles: Training Experts on and off Duty

The 4th Combat Aviation Brigade (CAB) has done just that in the last few months. Driven by CSM James Etheridge's initiative to improve morale and illustrate commitment to Soldiers, the Ivy Eagles have integrated a brigade-level A&P program. The CAB's program represents an innovative approach to ensuring our Soldiers are the most qualified maintainers on the battlefield. Instead of an obscure program housed in a policy letter, the Ivy Eagles utilize frequent program briefings, program administrators in every battalion, and an administrator who reports directly to the brigade leadership. The brigade's program exploits the availability of training/testing resources in Colorado while relying on the Army's Credentialing Opportunities On-Line (COOL) program.[1] The brigade has doubled-down on its commitment to Soldiers by authorizing temporary duty (TDY) entitlements for Soldiers participating in the program. This entitlement significantly reduces the financial hardship for Soldiers and extends opportunities to junior Soldiers across the formation. Similar programs around the force require Soldiers to pay for any lodging and transportation costs that financially eliminate a large proportion of the formation. The COOL program provides funding for A&P training/examinations, as well as hundreds of

[1] This resource is available at https://www.cool.osd.mil/army/index.htm

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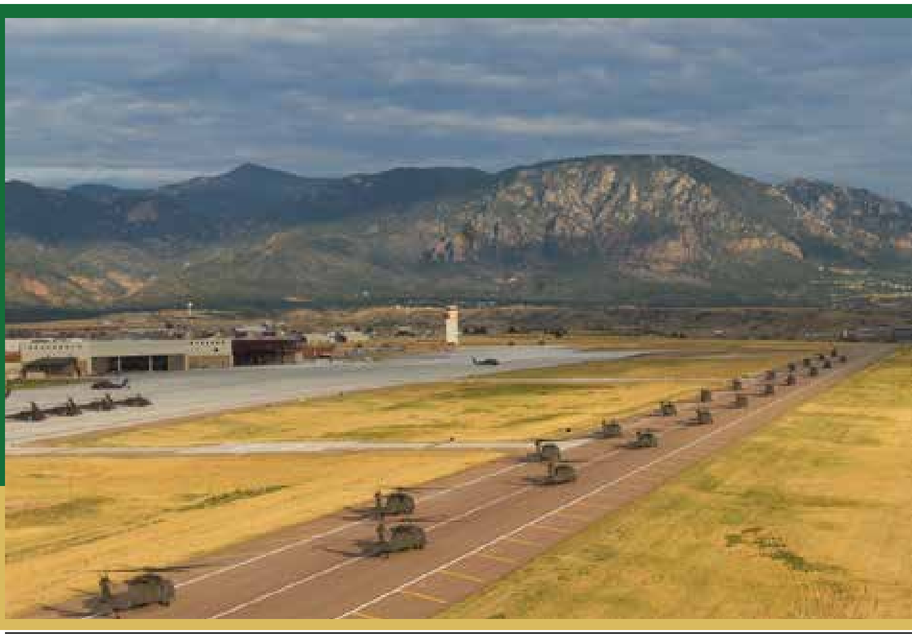

3-4 AHB conducts a 24 ship UH-60M assault over Colorado Springs and the United States Air Force Academy. U.S. Army photo credited to MAJ Brian Burns, 4CAB PAO

other professional certifications. With the combination of TDY entitlements and COOL funding, Soldiers can obtain their A&P at no out-of-pocket costs. The traditional costs of this training/certification vary by the region of the country and can be in excess of $2,000. Overall, the Ivy Eagles have established a foundational program that ensures Soldiers have access to professional development training, while reducing the financial burden typically associated with obtaining an FAA certification.

The Ivy Eagles' program is organized with a coordinator at the brigade level who is responsible for overall execution and administrative requirements. Each subordinate battalion selects a program administrator who conducts interviews of eligible Soldiers and briefs the formation on program specifics. The coordinator and administrators are senior leaders in the organization, most of whom are already FAA-certified technicians. Soldiers must be interviewed to ensure FAA requirement thresholds have been obtained in order to be eligible for program integration. Once identified, eligible candidates are enrolled in the 128th Aviation Brigade's Air University and on-the-job training (OJT) programs to familiarize themselves with FAA technician requirements. The Air University is a virtual training program, while the OJT program relies on unit leadership to train candidates on specific maintenance areas, including airframe, hydraulics, electronics/avionics, and powerplant systems.[2] Once the Soldier has completed training on a particular trade, the shop supervisor signs off on his or her packet. This training continues until Soldiers have rotated through all applicable subject areas. The utilization of the 128th OJT packet ensures that Soldiers are vetted by unit leadership and afforded opportunities to learn/grow as aviation maintainers. This system places heavy emphasis on developing our maintainers into technical experts by utilizing subject matter experts housed within the organization. Additionally, the training schedule is self-paced and can be adjusted around training calendars to reduce impacts to unit missions. The entire process is monitored by program administrators to ensure Soldiers are progressing and fully understand the requirements. If Soldiers have questions or concerns, unit leaders can address issues and redirect Soldiers, if necessary. Instead of being an afterthought, the Ivy Eagles have integrated the A&P program into daily operations and ensure unit leadership is aware of the program's overarching goals, policies, and fundamentals.

After the completion of the OJT packet and Air University, the Soldier contacts the 128th program coordinator, who provides the "Airman Certificate &/Or Rating Application," also known as FAA 8610-2 forms, that are necessary for testing.[3] These authorization forms can be utilized at testing facilities across the United States and enable Soldiers to choose where/when they test. Most states have some form of testing facilities and can be easily found on the FAA's web site. The A&P certification consists of three online knowledge tests and an oral/practical examination all of that must be conducted at FAA-endorsed facilities. The Ivy Eagles have coordinated with certified testing centers and several designated maintenance examiners (DMEs) in Colorado to reduce travel times and keep Soldiers closer to their families. There are numerous training/testing facilities around the country that require anywhere from several days to 3 weeks to complete. The CAB's arrangement with DMEs in the local area serves two essential purposes: reducing overall costs for the unit and Soldier, while minimizing the impact of Soldier unavailability in the unit. Additionally, the proximity of testing facilities enables a broader portion of the formation to take advantage of credentialing programs that would otherwise be unable to participate.

One major benefit that accompanies assisting the professional development of Soldiers is increased morale and improved command climate. Current command climates across the aviation branch have suffered due to increased deployments, Combat Training Center rotations, and near-constant demand for aviation support. When leaders

[2] The Air University resource is available at https://www.airuniversity.af.edu/

[3] The FAA 8610-2 electronic form is available at https://www.faa.gov/documentLibrary/media/Form/FAA_Form_8610-2.pdf

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Troopers from 6-17 CAV performing field maintenance while attached to Task Force Comanche. U.S. Army photo credited to the 3-4 AHB, 4th CAB

take time to recognize quality Soldiers and provide avenues of development, this fact does not go unnoticed within the organization. The Ivy Eagles have witnessed firsthand, the positive impacts of providing career-developing opportunities to Soldiers on increased retention rates and vastly improved command climates. Morale rates across the formation have also reaped the benefits of providing Soldiers with various opportunities to increase their proficiency and effectiveness. Retention rates often illustrate the underlying story of units, and the Ivy Eagles have listened to Soldiers yearning for more opportunities to better themselves. Morale rates are often indicative of engaged leadership and directly impact organization success. The Ivy Eagles have continually led the 4th Infantry Division in retention goals since the inception of Soldier-first initiatives like the A&P program and many others.

Conclusion

The quality and skill of aircraft maintainers has been a defining characteristic of Army aviation since the branch's inception. It is trait that remains unique to the United States, despite our adversaries possessing advanced technology. The creation and seamless integration of Soldier development initiatives, like unit level A&P programs, highlight the Army's dedication to ensuring technical abilities remain a distinguishing trait of the branch. Professional credentialing provides Soldiers with much-deserved recognition and improves the overall efficiency of the units they represent. Leaders who recognize this fact and enact policy to promote certifications create positive command climates and motivate Soldiers to remain in the military. Professional credentials, A&P notwithstanding, can often be transferred into college credit, which adds to the long-term benefits of unit programs. Soldiers have been trained and certified to maintain complex aircraft and subsystems; the integration of A&P programs provides an avenue for Soldiers to pursue collegiate recognition for their efforts.

For many Soldiers, the FAA certification represents a culmination of the technical knowledge and training opportunities they have experienced throughout their careers. The A&P not only opens doors to Civilian employment, it vastly improves the quality of maintainers in our enterprise. By implementing a brigade-level program, the Ivy Eagles have paved the way for Soldiers to gain recognition for their hard work and commitment to technical expertise. The program boasts several benefits and represents zero risk for organizations. Soldiers are already required to document technical training in accordance with the aviation maintenance training program (AMTP), and that experience directly correlates into technical certification. The Ivy Eagles' program has integrated its A&P program into the AMTP to ensure qualified Soldiers are afforded opportunities to obtain their credentials. Every brigade should integrate FAA certification programs to increase the quality and overall proficiency of our aviation maintainers. Credentialed maintainers have, time and time again, illustrated higher proficiency levels and represent combat multiplier for unit readiness. Despite increased operating tempo and constant demand for aviation support, similar programs enacted across the force can ensure that Soldiers remain the aviation branch's top priority for years to come.

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GENERAL WILLIAM "BILLY" MITCHELL:

PROPHET OF MILITARY AVIATION

By CW4 Christopher Briley Beaty

General William (Billy) Mitchell was one of the most controversial officers of his time. He proposed the creation of a separate air branch, which was to be used not only in the augmentation of ground forces, but as an offensive weapon. On numerous occasions, General Mitchell spoke out on his position concerning the defense of the United States and how it was vulnerable to the attack of enemy forces that possessed superior air power. His ideas were considered radical and ignored, and his visions of the future were dismissed as mere fantasy. Today, we live in a world in which technology is constantly evolving at a rate beyond that of General Mitchell's day. Army aviation needs forward thinkers who can use modern technology and develop new capabilities to support our current and future operations.

General William (Billy) Mitchell. Photo Credit: U.S. Army

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The road leading to General Mitchell's court-martial had been paved with his reluctance to back down on his position of America's need for an independent Air Force. He struggled continuously to be given the opportunity to prove his theories of air superiority against what the Navy believed to be the future of defense, the battleship. Mitchell was finally given his chance in June of 1921, with a series of tests off of the Virginia Capes against a small group of obsolete Navy vessels and the captured German Battleship, the *Ostfriesland*, a vessel that many Navy officers considered unsinkable.

The tests began on 21 June and continued for 1 month, ending on 21 July. At the beginning, General Mitchell and his men were restricted to using a small number of bombs in a given flight, allowing the control ships to move in and investigate the damage after the bombing run was complete. Several days into the testing, General Mitchell and his men sank a Navy destroyer in 19 minutes using 50 planes and 44 bombs. Naval officers argued that the destroyer was sitting still and would have been able to defend itself from an aerial attack with anti-aircraft fire. In later testing (1924), this would be disproved by Army examinations with airplanes towing targets behind them for anti-aircraft guns, all of them missing (DiMona, 1972). With the testing coming to a close, General Mitchell had one last challenge to face, the *Ostfriesland*. He knew that he would need bombs bigger than those available in the Army's inventory, and he enlisted the help of General C. C. Williams, U.S. Chief of Ordnance, to manufacture 2000-pound bombs (Harris, 1988). Finally, on 21 July 1921, General Mitchell and his team attacked the *Ostfriesland*, sinking her in 22 minutes. It has been said that the "old seadogs wept aloud, admirals sobbed, tears streamed from the eyes of younger navy men, and bigwigs of all sorts unashamedly used their handkerchiefs"(Mitchell, 1953, p. 265).

After his success in sinking the unsinkable, General Mitchell reported to the War Department that the use of aircraft was an absolute necessity. He further advised that the use of Naval ships be limited to 200 miles off the coast of the United States (Cooke, 2002). This report, like most of General Mitchell's ideas, would be ignored and tossed to the side.

As General Mitchell's term as assistant Chief of the Air Service came to an end, the Secretary of War had Mitchell reverted to his rank of Colonel and stationed at Fort Sam Houston in San Antonio, Texas. His superiors in Washington believed that taking him out of spotlight would muzzle him and put an end to his ridiculous crusade. What they did not count on was that they placed him in a position with no command, giving him a lot of time to continue writing his articles on America's need for an Air Force. In fact, after it was published, the governments of all the great powers were studying Mitchell's book, *Winged Defense* (Mitchell, 2010; Gauvreau & Cohen, 1942).

On 31 August 1925, the Navy attempted a long-distance flight from California to Hawaii with three aircraft: two PN-9s and one Boeing PB-1. The PB-1 failed to start, the second of the PN-9s was forced down after 400 miles, and the lead PN-9 missed its check point and radioed in that it was low on fuel (Harris, 1988). Three days later, on 03 September, Commander Zachary Lansdowne died while trying to navigate his dirigible, the *Shenandoah*, through a squall that had developed over the Great Lakes. For the next 2 days, Colonel Mitchell used his sources to learn the facts behind this latest incident. He discovered that Commander Lansdowne had been ordered to take off against his wishes and travel over local county fairs at the request of Congressmen who saw an opportunity for good will and potential votes (Gauvreau & Cohen, 1942). On the morning of 05 September, Colonel Mitchell issued a press release stating that it was his opinion "that these accidents are the direct results of incompetency, criminal negligence and almost treasonable administration of the nation's defense by the War and Navy departments" (Levine, 1972, p. 327). Colonel Mitchell released this statement fully aware that it would deliver him into the hands of his enemies and in front of a court-martial.

On 28 October 1925, Colonel Mitchell walked into the dilapidated warehouse that, up until recently, had only housed old records and a thick coat of dust. The belief with higher brass in Washington was that placing Colonel Mitchell's trial in this run-down building would somehow slap at the arrogance that this "flyboy" possessed. Not to be dismayed, Colonel Mitchell greeted all with a fond "hello!" and handshakes

Bombing of *Ostfriesland*. Photo Credit: U.S. Army

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all around, including the judges. He knew the government had him on the charges of insubordination, but he was going to use this opportunity to help spread his ideology to the masses.

Colonel Mitchell's defense team, Colonel Herbert A. Whit, William H. Webb, and Frank Reid, a Congressman from Illinois, brought forth a line of witnesses testifying from their experience, the superiority of airplanes in combat. Among these witnesses were Eddie Rickenbacker, the Ace of Aces in WWI, and the future Mayor of New York City, Fiorello LaGuardia. Even though the prosecution failed to gain anything useful from these individuals, the testimonies fell upon deaf ears. Finally, it was Colonel Mitchell's time upon the stand.

The first part of the prosecution's plan was to discredit Colonel Mitchell and his beliefs, not only to the judges on the panel, but also to the American people. One of Colonel Mitchell's beliefs was that the station of Pearl Harbor was vulnerable to an air and sea attack, mainly from the Empire of Japan. The prosecution's first question, which confused everyone in the courtroom, was "Colonel Mitchell, do you have any idea of the estimated wealth of the United States" (DiMona, 1972)? Colonel Mitchell responded that he did not, and after a short series of questions, the prosecution brought everything into focus. In 1922, the estimated wealth of the United States was $302,803,862,000 and estimated that to use submarines the way Colonel Mitchell predicted would cost the Japanese $625 billion, twice of what the U.S. wealth was. In a report Colonel Mitchell made during a tour of the Pacific, he stated that an enemy force could use submarines all over the Pacific to interrupt shipping traffic but the prosecution, after doing some estimates of their own, felt that any such attempt could not be made due to cost of operation.

When the prosecution could not effectively break down Colonel Mitchell's theories, they changed tactics and went with the one charge they knew he could be found guilty of, discredit of military service. Colonel Mitchell was to be tried under the 96th Article of War, the "catch-all" or "Old Mother Hubbard"(Levin, 1972), which read, "Though not mentioned in these Articles, all disorders and neglects to the prejudice of good order and military discipline, all conduct of a nature to bring discredit upon the military service" would be subject for a court-martial (DiMona, 1972, p.99). Of this charge, Colonel Mitchell knew that he would be found guilty and instructed his defense team to proceed no further, even after this the prosecution still continued for 15 minutes to make a grand speech on the reckless nature of Colonel Mitchell.

In the end, on 17 December 1925, and after several hours of deliberation, the judges of the board reached their verdict. Colonel Mitchell was found guilty of all charges and sentenced to 5 years suspended from rank, command, and duty with forfeiture of all pay and allowances (DiMona, 1972). No longer part of the Air Service, left with no job, Colonel Mitchell resigned only a few months after his court-martial to raise cattle in Virginia.

General William "Billy" Mitchell has been called a prophet without honor, and rightly so. To date, all of his theories and predictions have come to pass, including the attack on Pearl Harbor by the Japanese Empire in December of 1941. General Mitchell was a forward thinker, and service members like him have advanced Army aviation since its beginning, whether it is creating a new type of air-delivered munition, attaching a rocket pod to a UH-1 for the first time, or developing a mounted radar system for target detection. Though his methods to spread his views would not be considered within the Army Values of today, we need these types of thinkers. As Army aviation looks to the future, trying to determine the desired capabilities of our aircraft, we should take a lesson from the past and look for those "out of the box" ideas that will continue to secure our air superiority.

General William (Billy) Mitchell.
Photo Credit: U.S. Army

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LONG-RANGE PRECISION FIRES

Building the Team of Army Aviation and Field Artillery

By CPT Michael E. Haynes

In July 2019, I learned that I would serve as an instructor in the Combined Arms Division for the Field Artillery Basic Officer Leadership Course (BOLC) at Fort Sill, Oklahoma. I was excited for the opportunity to help shape and mold future Army leaders. I can still remember my BOLC instructors and their valuable guidance. Additionally, I found the history of Fort Sill to be quite interesting, in particular, the link to Army aviation and the early development of the branch. Army aviation has always been a pivotal part of the Army targeting process and fires kill chain, as evidenced by the early role the branch had in the targeting process displayed at the U.S. Army Artillery Museum. Fort Sill is also home to Henry Post Army Airfield, which is the oldest continuously operated Army airfield. It was established in 1917 and is considered the birthplace of Army combat aviation (Sherman, 2012). Fort Sill served as a proving ground during the early development of field artillery and combat aviation, which led to a connection between Army aviation with field artillery.

Troopers assigned to Archer Battery, Field Artillery Squadron, 2nd Cavalry Regiment, with support from a 12th Combat Aviation Brigade CH-47 Chinook Helicopter crew, conduct sling load training with M777 Howitzers during the Squadron's Artillery Systems Cooperation Activities at the 7th Army Joint Multinational Training Command's Grafenwoehr Training Area Germany, March 21, 2016. U.S. Army photo by Visual Information Specialist Gertrud Zach/released

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To my dismay, I soon discovered this connection has slowly dissolved over time. The exodus of Army aviation started with the movement of the U.S. Army Aviation School to Fort Rucker, Alabama in 1954 (Meador, 2018). This shift slowly continued until it reached a point in which the only permanent aviation presence on Fort Sill is an Army Radar Approach Control facility, which is primarily operated by civilians. There have been several Army National Guard aviation units rotate through for training during my tenure; however, there is no substantial permanent Army aviation presence. To add to my disappointment, there are even fewer aviation officers assigned to the Fires Center of Excellence (FCoE).

While I did not expect a substantial presence of Army aviators to be assigned to Fort Sill, I was disappointed as I checked the table of distribution and allowances (TDA) for the FCoE. There is one position for a 15B, a graduate of the Aviation Captains' Career Course, which I currently fill. As I dug deeper, I found the skill identifier my TDA position was for was an OH-58D or Kiowa Warrior pilot. For those unaware, the Army retired the OH-58D in 2014, and its last flight was taken in September 2017 (Cleveland, 2017). In my eyes, the outdated skill identifier highlighted a lack of coordination between the FCoE and the United States Army Aviation Center of Excellence (USAACE). I found it to be somewhat confusing.

As I pondered this information, I thought about the Chief of Staff's number one priority from the *2019 Army Modernization Strategy,* which is long-range precision fires (Department of the Army, n.d.). Army aviation plays a pivotal role in the current execution of long-range precision fires. Additionally, the branch will continue to be an important player as the development of Future Vertical Lift (FVL) and Air-Launched Effects (ALE) increase. I thought about my last assignment with the 25th Combat Aviation Brigade (CAB), specifically, the relationship between Army aviation and field artillery. While I contemplated, I was struck by how odd the lack of permanent Army aviation presence is at Fort Sill. The reason I say this is that in a light infantry division, 25th Infantry Division in particular, the CAB makes up more than half of the division's long-range precision fires. The modified table of organization and equipment (MTOE) called for the 25th CAB to have a large number of AH-64s. The other portion of fire power is the division artillery (DIVARTY) or the field artillery battalions, which are synchronized by the DIVARTY, at a minimum. With a similar outline of fires capabilities across the Army, why is there not a greater presence of Army aviation at the FCoE, the proponent organization for all things fires related?

After taking time to contemplate and digest this, I consulted with mentors, peers, and subordinates but still did not have a good answer. I have, however, come to the conclusion that serious consideration should be given to building a greater aviation presence at the FCoE. This will strengthen and deepen Army aviation's relationship with field artillery and enhance the Army's long-range precision fires capabilities. While I believe field artillery could benefit from a similar exchange at USAACE, I leave that to be addressed at a later time. The positive impact on Army aviation will be enormous. It will strengthen the coordination and relationships aviation officers have with field artillery officers and, in turn, CABs have with DIVARTYs in Forces Command (FORSCOM). In multiple FORSCOM units, there are strong working relationships between the CABs and DIVARTYs, but that is not necessarily the case for all units. My time spent on brigade staff with the 25th CAB opened my eyes to this disparity. It also provides an illustration of how strong relationships are built

The 1st Squadron, 17th Cavalry Regiment, 82nd Combat Aviation Brigade, conducts a flyover with their OH-58D Kiowa Warriors over the City of Fayetteville and Fort Bragg, North Carolina, April 15. The flyover serves as a final "thank you" and farewell to the residents of Fort Bragg and the Fayetteville community. U.S. Army photo by SGT Daniel Schroeder

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and furthered. As a CAB, we had an incredibly strong link with the 25th DIVARTY. During the train-up and execution of the Warfighter exercise 18-02 (WFX 18-02) as a brigade Battle Captain for the 25th CAB, I oversaw systems and processes that allowed for the streamlined prosecution of targets through the kill chain by all long-range precision fires assets in the 25th Infantry Division, whether they belonged to the CAB or DIVARTY. This relationship resulted in a seamless integration with employing fires in support of attacks out of contact with friendly forces and deep operations.

Ideally, integration and coordination between CAB and DIVARTY should be a goal for divisions. I think it is especially important for light infantry divisions; yet, it continues to be an issue. "Units have emphasized synchronizing assets for targeting, but they still struggle to integrate all available capabilities that each unit possesses" (Morgan, n.d., p. 23). A step toward fixing the lack of synchronization is fostering a relationship between Army aviation and field artillery at the FCoE. The relationship built during my time on staff did not organically occur, nor was it easy to do. In fact, it took multiple command post exercises and months of integration to forge a partnership and streamline processes. Ultimately, it was because of the direct efforts of the leaders of the 25th CAB and 25th DIVARTY, as well as those involved in both the mission planning and battle tracking that cultivated a relationship during WFX 18-02.

The relationship between the two organizations should not be contrived, but embraced at the highest levels in the Army and assembled at the lowest levels. Ideally, this relationship starts long before officers take leadership positions within either organization. As Army aviation officers, we must be able to articulate to field artillery officers that, "Aviation attacks are effective at executing precision engagements against moving enemy forces, armored forces, hardened targets (such as bunkers), or targets located in terrain that restricts, prohibits, or degrades artillery strike accuracy and effectiveness" (Department of the Army, 2016). During my time thus far at Fort Sill, I often talk with counterparts and realize the lack of understanding of the capabilities Army aviation can provide. Additionally, these counterparts are unaware of what a CAB can offer in a combined arms fight. Building a connection early between Army aviation and field artillery would develop better relationships in FORSCOM units. A great illustration of this relationship is what the FVL team is doing with ALE. Brigadier General Walter Rugen, Future Vertical Lift Cross Functional Team director, recently said at the Joint Warfighting Assessment in 2019, "'When we look at ALE and Long-Range Precision Munition....what we're finding, in our modeling and experimentation at Yuma last year, is you really generate that stand-off and overmatch against threats....We can stay outside their weapon engagement zone, and put effects on them....Air-Launched Effects are what is going to find and fix these threats, and then what the long-range precision munition is going to do is finish that threat'" (as cited in Freeberg, 2020). This concept highlights what Army aviation and field artillery can do as a team and the need for the two branches to be integrated.

The future of Army combat is large-scale combat operations, specifically multi-domain operations. In order to win in these operations, it requires close integration of Army aviation and field artillery capabilities across all domains. In order to prepare for the future of warfare, we must understand the past. Irish statesman and philosopher, Edmund Burke, said, "Those who don't know history are doomed to repeat it" (as cited in Goodreads, n.d.). While it sounds cliché, it is true and drove my desire

U.S. Army Soldiers assigned to 25th Division Artillery, 25th Infantry Division, prepare to fire a 155 mm artillery round from an M777 howitzer in support of Operation Lightning Strike on Pohakuloa Training Area, Hawaii, May 16, 2018. Operation Lightning Strike is a combined arms live-fire exercise that increases unit interoperability and synchronization in an effort to concentrate combat power on the battlefield. U.S. Army photo by SGT Ian Morales

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to understand the historical link between the two branches. While conducting research, I came across the after-action report (AAR) from then COL Hal Moore and the 1-7 Cavalry's operation in the Ia Drang valley from 14–16 November 1965. In the AAR, COL Moore talks of the integration of Aerial Rocket Artillery. While that is no longer a doctrinal term, Army aviation provides the same capabilities. He specifically highlights the effectiveness of its use during the operation. "Aerial rocket artillery is extremely effective especially if the pilots knew the exact location of friendly. It has a tremendous shock effect on the enemy. The thing about ARA which makes it at times more effective than artillery is the fact that it does not have to be seen by ground observers to be adjusted. If the front lines or a friendly position is marked and can be recognized by the pilots, quick, accurate fire support is the result" (Moore, 1965, p. 19). I was struck by the simplicity of this concept but once again dismayed by the lack of institutional focus on creating and developing this relationship. Why is there no institutional link at Fort Sill and more importantly, how can it be built? In order to build trust in the ability of Army aviation to serve as an effective fires platform, it requires a greater integration with the FCoE. I propose assigning more aviation instructors, students, staff officers, liaisons, and team members at Fort Sill.

Army aviation officers should be integrated into the FCoE as instructors and small group leaders for the Field Artillery BOLC and the Field Artillery Captains' Career Course. Additionally, Army aviation should have a presence on the FCoE staff and potentially be integrated into the precision fires cross functional team. We should strive to send more Army aviation officers through the Joint Fires Observer Course and Joint Operational Fires and Effects Course. These courses provide the skill sets necessary to apply and integrate joint lethal and non-lethal fires and effects at the tactical and

The crew of a 105 mm howitzer sling-loads their cannon to a Black Hawk helicopter as part of a combined arms training exercise July 23 at Fort McCoy, Wisconsin. Three Wisconsin National Guard battalions - 1st Battalion, 147th Aviation Regiment; 2nd Battalion, 127th Infantry Regiment; and 1st Battalion, 120th Field Artillery- combined forces for the first such joint training event in memory for the Wisconsin Army National Guard. 32nd Infantry Brigade Combat Team photo by SGT Alexandria Hughes

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operational level. The specific numbers of the positions and the quantity of students sent is not the issue; as a branch, we need to do more to build the relationship of the long-range precision fires team. If we as an Army wish to meet the Chief of Staff's number one priority of long-range precision fires, we must carefully examine how we currently operate. If our current operations do not support or enable this priority to be met and exceeded, it is time we shift gears and reattack. If we look at our actions and realize we now or historically have not met this intent, then we as a professional branch must do the examination and homework on how to improve. I believe we can and must do better. I acknowledge it is a process to implement such recommendations and that I have not proposed specific TDA changes or the creation of new positions, teams, or elements at Fort Sill. However, this is a starting point to have the tough conversations. We owe it to the Army and our Nation's citizens to forge relationships with the fires team we fight side-by-side with every day in battle.

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CH-47 Chinooks assigned to 12th Combat Aviation Brigade, fly over 7th Army Training Command's Grafenwoehr Training Area during Exercise Dynamic Front II, Germany, March 7, 2017. Dynamic Front is an artillery operability exercise and focuses on developing solutions within the theater level fires system by executing multi-echelon fires and testing interoperability at the tactical level. It includes nearly 1,400 participants from nine NATO nations. U.S. Army photo by Sarah Tate

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THE TRANSITION FROM THE TACTICAL OPERATIONS OFFICER COURSE TO THE AVIATION MISSION SURVIVABILITY OFFICER COURSE

By CW5 Tobias B. Long

In 2017, a restructuring of the Tactical Operations (TACOPS) Officer course was required to train officers. The TACOPS course focused on the survivability of aircraft, aircrew, and the assault force in large-scale combat operations (LSCO). As the former course director from 2017 to 2019, I wish to provide the background transition from the TACOPS course to the Aviation Mission Survivability Officer (AMSO) course. For clarity, the TACOPS course is meant to signify the old program of instruction (POI), and the AMSO course is meant to signify the current and new POI.

As the Army transitioned from counterinsurgency operations to LSCO, so did the Army Aviation Center of Excellence (USAACE). As the incoming course director, it was my job to transition the TACOPS officer to AMSO role within the combat aviation brigade formations in preparation for LSCO. Small arms munitions; barrage fire; and infrared (IR) guided man portable air defense techniques, tactics, and procedures (TTPs) used by the enemy during Operation Enduring Freedom and Operation Iraqi Freedom and operations to date do not capture the breadth and depth of peer adversary. Although Army aviation experienced losses from those enemy TTPs, they do not compare to the

LTC William A. Ryan, 1st Battalion, 101st Combat Aviation Brigade commander shakes the hand of CW2 Adam Marik, Headquarters and Headquarters Company, 1st Bn., 101st CAB Apache pilot before Marik's night operation during Jaded Thunder training exercise at MacDill Air Force Base, Florida, Oct. 24, 2011. The purpose of Jaded Thunder was to train on aviation tactics, techniques, and procedures in a joint forces environment to prepare for the upcoming deployment. U.S. Army photo by SGT Tracy R. Myers

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capability a single motorized rifle brigade will have to deny or degrade Army aviation's ability to conduct our core competencies and support divisional forces.

Understanding Threats to Army Aviation

The AMSO course is getting the students back to basics on how the Army doctrinally conducts mission planning and analysis; one of the key components of mission analysis is conducting intelligence preparation of the battlefield (IPB) in accordance with Army Techniques Publication (ATP) 2-01.3, "Intelligence Preparation of the Battlefield" (Department of the Army, 2019). This knowledge provides the basis for AMSOs to integrate with the intelligence section's threat analysis. In order to evaluate the threat and "understand how a threat can affect friendly operations" (Department of the Army, 2019, p. 1-4), the students must fully understand the capability and limitations of our aircraft survivability equipment (ASE), as well as how Army aviation aircraft are detected using the electromagnetic spectrum.

The TACOPS course provided very technical information on the theory of operation for IR, radio detection and ranging (RADAR), and light amplification by stimulated emitted radiation (LASER) threats. Students received training similar to the unclassified and classified versions of the computer-based ASE Training (CBAT). To complete the training module, the TACOPS students provided a generic class that described an air defense threat, but it did not instruct aviators on ASE detection or ASE defeat.

The AMSO course currently discusses how air defense threats tactically apply IR, RADAR, LASER, and ultra violet targeting systems, with periodic practical exercises into the Air Force threat and tactics guide to apply research on the threat and threat doctrine. Since Army aviators are required to complete CBAT-Operator and CBAT-Classified training annually, a restructuring of the ASE module requires AMSO students to analyze the ASE capabilities and limitations against peer adversary air defense systems, identify known exploitable limitations that can be briefed, and articulate situational understanding and survivability TTPs to the Army aviator. Ultimately, future AMSOs will understand their role within IPB and can advise the commander on all things survivability, tactics, and joint enabler integration.

Maximizing the Aviation Mission Planning System Changes to the AMSO Course

The TACOPS course not only showed how to update the Aviation Mission Planning System (AMPS), but it also showed how to utilize each function of the AMPS. Prior to 2017, initial entry rotary wing course (IERW) students were being issued Windows-based tablets with AMPS installed for receiving approximately 22 academic hours in common core AMPS training. Additionally, there was academic AMPS training ranging from 9 to 24 hours, depending on the IERW aircraft qualification courses in the advanced airframes. In order to gain time in other areas within the TACOPS course, AMPS training was reduced to just system health management, which was necessary for increasing rigor during mission planning, threat analysis, and AMS 2900-series task training. This also meant the "how to network computers" training was removed, because anyone can find out how to do that on YouTube, and it is a function of the S6. Following the 2019 AMSO Critical Task and Site Selection Board (CTSSB), the meeting that votes on the critical tasks for a Soldier's jobs, AMPS management was voted to be removed from the AMSO critical task list in order to prepare the AMSO for survivability tactics training and to prepare units for LSCO.

The current AMSO course POI trains students on employing AMPS as a mission analysis tool and how to provide that situational understanding to aviators. Additionally, the students leave with increased knowledge of advanced mission analysis tools that aid in IPB. The two main programs trained and that can only be used on classified environments are the Improved Many on Many, or IMOM, a program that provides probability of detection from an enemy situation template, and the Multi-Intelligence Spatial Temporal, or MIST tool, a web-based program that provides near-real time information collection capabilities across multiple intelligence sources.

Rethinking Personnel Recovery

The TACOPS course's personnel recovery (PR) curriculum was focused on the capability gap of training an officer whose responsibility is on the training, staff coordination, and recovery planning of isolated personnel. It was also designed for field grade officers to operate as personnel recovery officers (PRO) at the brigade echelon, Personnel Recovery Coordination Centers, or Joint Personnel Recovery Centers. This hindered company-grade warrant officer learning because the majority of the PR module curriculum was not designed to be executed at the company level.

Current doctrine gives the commander the ability to assign the PRO at the brigade level in accordance with Army Regulation 525-28, "Personnel Recovery," and Field Manual 3-50, "Army Personnel Recovery" (Department of the Army,

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2010; Department of the Army, 2014). The PRO is responsible for advising the commander and staff of PR gaps during staff planning, serves as a staff coordinator in the event of the isolating incident, and trains PR. Through observations of AMSOs at the National Training Center from 2014 to 2017, AMSOs would focus on PRO duties throughout the rotation but fail to provide situational understanding of the associated air defense threats within the opposing forces' mechanized infantry brigade.

The Combined Arms Center–Personnel Recovery Proponent Officer (CAC-PRPO)—is the organization responsible for Army-wide PR training and certification. The Personnel Recovery Officer Qualification Course (PRO-QC) is the only approved certification for PROs in the force and can be requested through the CAC-PRPO as a mobile training team through general officer request with a class size of 20–30 personnel. For more information on the PRO-QC, use the "Contact Us" link in the right upper corner of the CAC-PRPO's web site.[1] During the 2019 CTSSB meeting, PR was voted out as a critical job task for the AMSO, which includes moving the management of the combat survivor evader locater radio to flight operations training.

Tactics Training to Keep Army Aviation in the Fight

In 2017, USAACE and other joint organizations planned and executed a quick reaction test to validate survivability tactics that became USAACE's initial stepping stone for tactics development and future training. The USAACE Survivability Branch provided training to the TACOPS course cadre on these TTPs, which were then programmed into the POI through the use of simulators such as the Aviation Combined Arms Tactical Trainer (AVCATT) or flight training simulators. These TTPs in simulations enabled the TACOPS Officer to train proper ASE employment to aviators, and to also provide an understanding of different survivability TTPs against air defense threats.

CPT Michelle Brady, commander, Company C, 1st Battalion, 3rd Aviation Regiment, discusses the finer points of the deliberate attack scenario with CPT Joshua Kelly at the Aviation Combined Arms Tactical Trainer on Hunter Army Airfield March 6. U.S. Army photo by SGT William Begley, 3rd CAB Public Affairs

The AMSO course's survivability tactics training consists of a 3 hour block of academic instruction on the current 2900-series tasks. In order to prepare the student for combat maneuvering, a review of aerodynamic factors aiding in safe execution of tasks such as mushing, high-bank angle turns, and transient torque are trained academically and in the aircraft simulators to show application and preventative measures. Following the 2900 academics, there is a 1 hour rehearsal on concept where the students "lane walk" the maneuvers and perform the associated crew coordination to execute the 2900 tasks. Students also receive 3 hours of 2900 series tasks in day-only simulator training in an accredited flight simulator. A small portion of that simulator training is dedicated to nap of the earth and contour flight techniques. Additionally, there is a 1 hour "hands on" AVCATT demonstration session highlighting the complexities of platoon to company-sized formations executing a survivability tactic during actions on contact—this is not AMS 3900 series tasks—the exercise is meant to exhibit the importance of maneuvering as a flight and flight communications during actions on contact. Finally, a scenario-based training exercise is conducted to allow the students to plan a company mission to an objective, such as an engagement area or landing zone, and use survivability tactics to get them to and from the objective.

To support the USAACE command-directed guidance to get tactics into professional military education, the AMSO course instituted a Unit Trainer (UT) week, which consists of fundamentals of instruction (FOI) and methods of instruction (MOI) with an end of module evaluation designed to prepare the AMSO to be returned to the unit ready to take a unit trainer check ride. Currently, 8 hours are dedicated to FOI that is used in the instructor pilot course POIs. Additionally, there are 6 hours of 2900-series MOI in accredited flight simulators in day modes of flight only provided by the AMSO course, the USAACE Survivability Branch, aircraft survivability development and tactics, and 110th Avia-

[1] The CAC-PRPO's web site may be found at https://usacac.army.mil/organizations/mccoe/prp

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Infantrymen with 3rd Armored Brigade Combat Team ("Iron Brigade"), 4th Infantry Division (3-4 ABCT), conduct an air assault in August with 3rd General Support Aviation Battalion, 10th Combat Aviation Brigade during the U.S. Army Europe Combined Resolve IX exercise at Grafenwoehr Training Area, Germany. Army S&T is pursuing aircraft survivability technologies across a spectrum of technologies and areas of expertise. U.S. Army photo by CPT Scott Walters, 3-4 ABCT

tion Brigade instructors. The students receive an evaluation on how they develop and train a volunteer Aviation Captains Career Course student on the AMS initial qualification in accordance with Training Circular 3-04.9, "Commander's Aviation Mission Survivability Program" Chapter 4, which includes 3 hours in an accredited flight simulator in day modes of flight (Department of the Army, 2015).[2]

Other improvements to the course, such as an entrance exam, rubric testing on threat briefs, evaluation on 5000-series tasks related to UTs, joint cyber-electromagnetic activities, and fires training became key attributes to reinforce lessons and provide knowledge on capabilities to aid in Army AMS. Another improvement was the combined effort of the AMSO course and the USAACE Survivability Branch's knowledge management web sites and online conferencing to keep AMSOs in the field informed and provide a one-stop shop for information and links to conduct Army aviation threat analysis on threats to Army aviation.

Drastic and vital changes had to occur within the AMSO course POI to ensure the survivability of Army aviation in LSCO so that we remain in the fight with the troops we support; no amount of PR training and networking of the AMPS will aid us in that effort. The recent AMSO critical task list will reveal the full removal of PR and of AMPS management from the AMSO course in order to prepare for the inclusion of the future 3900-series tasks' training to units. The USAACE Survivability Branch is currently analyzing the IERW POI and, along with the Directorate of Evaluations and Standardizations, will provide recommendations in the future to improve lessons to include AMPS management and updating. Our aircraft have become so reliant on the AMPS that every pilot must learn to keep the AMPS updated, just like the current master aviators had to keep mission, map, and flight data updated through analog systems when they were junior pilots in command.

[2] This document is available via the Enterprise Access Management Service-Army with a valid common access card.

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CW5 Tobias Long is a former OH-58D Kiowa Warrior scout pilot (2002-2018) with four combat tours, one to Iraq (2006, 2-17 CAV 101st CAB) and three to Afghanistan (2008 and 2010, 2-17 CAV 101st CAB; 2012, 2-6 CAV 25th CAB). CW5 Long has been assigned roles as a TACOPS Officer from troop to brigade formations, the AMSO and Senior Warrant Officer Observer/Coach/Trainer at the National Training Center's Eagle Team, the TACOPS/AMSO course director, and deputy director of USAACE Survivability Branch. He is currently the 25th CAB AMSO and UH-60M aviator. Scouts Out! Air Assault!

[3] This document is available via the Enterprise Access Management Service-Army with a valid common access card.

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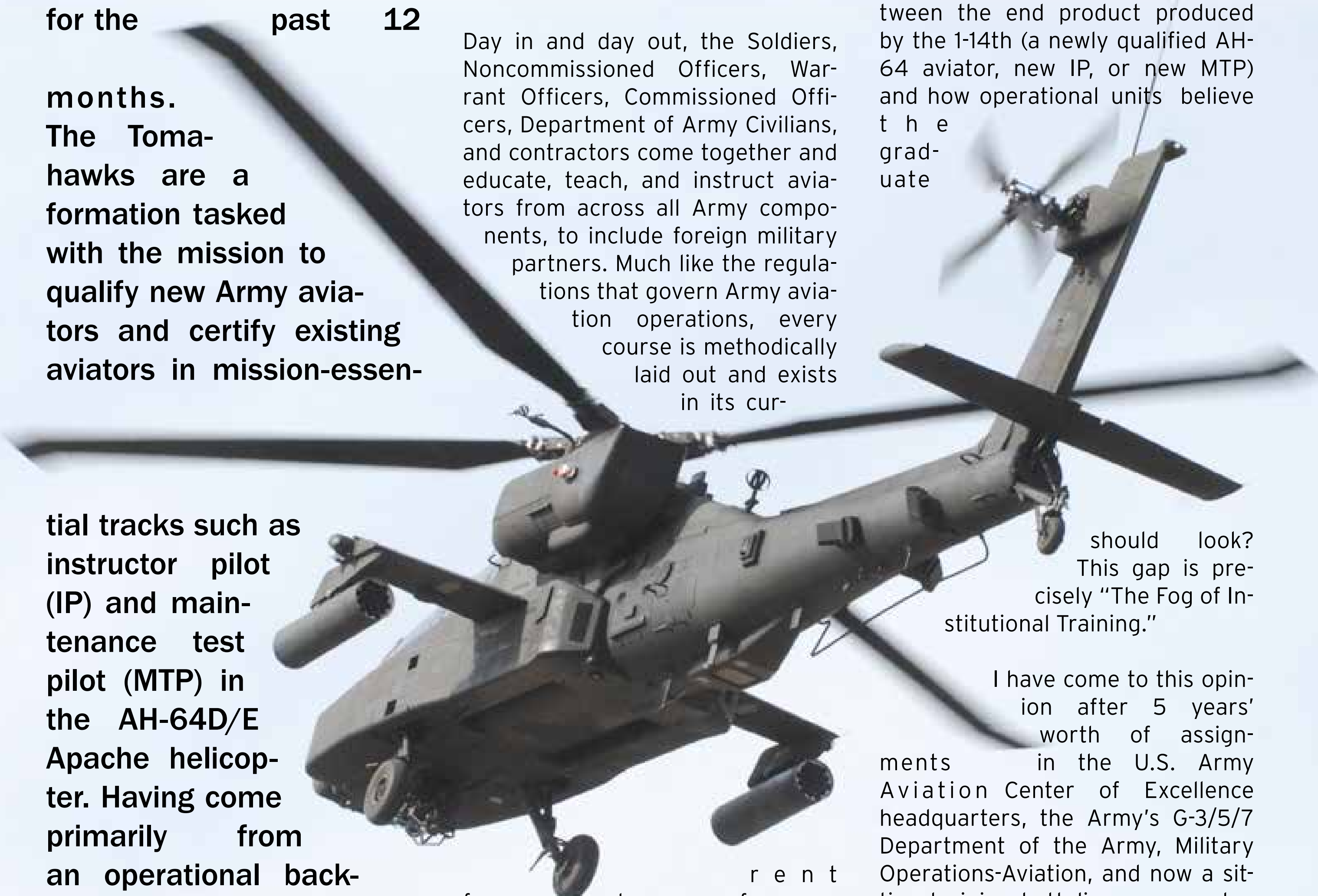
The Fog of Institutional Training

By LTC Michael Shaw

I have been in command of the U.S. Army's lone Attack Reconnaissance Training Battalion, 1-14th Aviation Regiment, "Tomahawks," for the past 12 months. The Tomahawks are a formation tasked with the mission to qualify new Army aviators and certify existing aviators in mission-essential tracks such as instructor pilot (IP) and maintenance test pilot (MTP) in the AH-64D/E Apache helicopter. Having come primarily from an operational background, my current experiences in the workings, functionality, and connectedness of both the Army's operational and institutional commands brings to light some gaps or points of friction that I would like to discuss. Altogether, these points become what I call "The Fog of Institutional Training."



Day in and day out, the Soldiers, Noncommissioned Officers, Warrant Officers, Commissioned Officers, Department of Army Civilians, and contractors come together and educate, teach, and instruct aviators from across all Army components, to include foreign military partners. Much like the regulations that govern Army aviation operations, every course is methodically laid out and exists in its current form because of operational, training, fiscal, and equipment priorities. So methodical is the approach to training development and implementation that it can appear to many not directly involved in the process that the method is more burdensome than responsive. Systems across the operational and institutional forces have developed over time and due to a specific need. Also, much like most of our organizations, it is easier to add requirements than it is to retract. We are no different. How then, with expert developers and technical experts at the helm, can disparity exist between the end product produced by the 1-14th (a newly qualified AH-64 aviator, new IP, or new MTP) and how operational units believe the graduate should look? This gap is precisely "The Fog of Institutional Training."

I have come to this opinion after 5 years' worth of assignments in the U.S. Army Aviation Center of Excellence headquarters, the Army's G-3/5/7 Department of the Army, Military Operations-Aviation, and now a sitting training battalion commander.

An AH-64D Apache helicopter crew, assigned to the 10th Combat Aviation Brigade, 10th Mountain Division (LI) is being instructed on where to conduct a short final on approach March 14 during an overwater training exercise at Wheeler-Sack Army Airfield, Fort Drum. The exercise was designed to enhance the pilot's landing tactics and techniques on simulated ship decks in order to become overwater qualified. U.S. Army photo by CPT Linda Gerron

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The staff work I provided, the branch problem sets for which I have wrestled, and the involvement with Army Command operational aviation staffs and combat aviation brigade (CAB) leadership from across U.S. Army Forces Command, U.S. Army Europe, and U.S. Army Pacific have all led me to the belief that there is a broad lack of knowledge of how aviation's institutional processes work and how those workings connect to the operational force. Insert the "Fog."

Much like the Prussian general and military theorist Carl von Clausewitz's usage of the term "fog" to describe lack of clarity in intelligence or the ambiguities that surround warfighting, the term *fog* also appropriately describes the existing chasm of perspective that I believe exists between the institutional and operational force (von Clausewitz, n.d.). Three factors generate and sustain this fog 1) perspective, 2) reflection, and 3) innovation. Furthermore, with the current rate of exposure to institutional assignments and the pervasive impression of a lesser value found in institutional vs. operational assignments, I argue that the fog is and will be omnipresent. While it may fluctuate in density and duration, it will never truly dissipate.

PERSPECTIVE AS IT RELATES TO THE INSTITUTIONAL DOMAIN

The first factor that makes up the "fog" is the aviation branch's overall lack of understanding and perspective as it relates to the institutional domain. Operationally, we all have experienced the difficulty in changing aviation culture from counterinsurgency (COIN) to decisive action (DA). For evidence, just look to the Directorate of Training and Doctrine's (DOTD) terrain flight training support package (TSP) that now exists.[1] We, as a branch, cannot know everything; however, a lack of understanding of how the more extensive system works certainly does generate obscuration.

It is this author's opinion that perspective is one of the most powerful tools any leader and follower can develop. The topic of perspective is one of the common themes seen throughout most of my writings and indeed, all of my counseling. Perspective allows us to see the problems and challenges that we face, not as an individual struggle, but as part of something more substantial. While perspective will not necessarily remove or change one's response, understanding the multitude of additional factors bearing on any situation can make the path more digestible. Because of how our branch is designed, most aviation professionals lack a common understanding of how the institutional domain supplies graduates and merges with the operational force. The career path for many an aviation Soldier is one solely focused on the operational domain. Take a look at received and dispensed evaluation and counseling. Many will be hard-pressed to see the mention of service in the institutional domain.

Furthermore, if the institutional domain exists in one of those documents, how positively received was that phrase or assignment recommendation? Moreover, there is a pervasive belief in the aviation branch, as seen through leader professional development, "King Maker" jobs and assignment tiering that identifies many a role outside the operational domain as less than. Terms such as "soft KD (key and development)" or "UQR (unqualified resignation) staging base" abound. While the size and structure of our branch make it impossible for everyone to have a similar background, the need for perspective becomes that much more important when having to navigate the fog.

Before battalion command, a senior leader told me that my career was now limited because of my assignment to the 1-14th. If assignments within the institutional domain remain viewed as a point of limitation for further advancement and service in Army aviation, how will perspective and understanding promulgate within our formations? Look back at your careers. Except for initial entry training; flight school; and brief periods of professional military education, many Soldiers, leaders, and technicians will never be part of the institutional domain to any significant degree. Who we assign and the value we place on those assignments need to change.

REFLECTION

The second factor, the operational domain, often compares a graduate's readiness as he comes out of the institution against the memories of one's self and what an individual can recall from his personal experience. Those experiences are often more than a decade in the past.

I often hear comparisons of a graduate's readiness as he comes out of the institution against the memories of one's self and what that individual can recall from his personal experience. These comparisons take place when discussing training redesign, tasks required for qualification, overall product success, etc., etc., etc. The training of our aviation Soldiers is a planned activity. There is a specific list of tasks that Soldiers must perform to standard as agreed upon by our branch and codified in our manuals. Along with the students, the instructors must meet specific experience gates and all the while, staying current on all new technology and procedures. In the end, Soldiers depart for their first unit of assignment with the confidence to accomplish the tasks put before them with the equipment or airframes provided to them. And yet, impressions exist in the operational force that something was left out, skills are missing, or proficiency was not attained. How can such an exacting and deliberate process be seen as incomplete or lacking? Simple. When the operational force grapples with the complex problems

[1] The terrain flight training support package may be accessed via Army Knowledge Online 2 with a valid common access card.

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that confront individual formations, leaders look to the skills they need to accomplish the mission.

We often fall back on what we do know—our own experiences. We all do this. In the case of flight training and the product such training produces, many reflect 10, 15, and sometimes 20 years back trying to compare their experiences and needs with today's graduates. Unfortunately, today's research demonstrates just how flawed human memory can be and how we shape our remembrance and interpretation of events around current situations. For example, look to Harvard University's Dr. Daniel L. Schacter and his ongoing studies into how one's mind uses a flexible combination of past events, thus leading to present day memory errors (Schacter, 2001). Ask yourself, how many hours did you fly last month, in what order, with what tasks accomplished, and how well did one perform those tasks? Now magnify that memory by adding experiences with units one served, deployment completed, personal events encountered and we just scratch the surface of topics that many of us, including myself attempt to use as comparisons for today's execution models. Before we jump to examine what we think should come from the institution, we need to pause and understand what is first required. What we want, what we believe, and what arrives are often entirely different. So before we become critical of a process, it is imperative we understand the end state. Just like a commander's intent, there is a purpose, key tasks, and end state that many are not familiar with, and some still choose to criticize. This ties directly into the first factor of perspective.

INNOVATION IN THE OPERATIONAL AND EQUIPPING DOMAIN

The third factor causing visibility restrictions is the rate of change in the operational and equipping domain. Be it deployment locations, a unit-specific training focus, a unit's readiness goals, the software in the unit's fleet, or the equipment attached to airframes, these individual needs and equipping priorities vary from unit to unit, thus, making expectations and end states different across 11 independent CABs. Nowhere does one specific path exist as more correct than another, nor do I diminish the factors that go into the generation of the fog. Instead, I bring these three concepts to light, proffering an understanding of the broader aviation community and highlighting the intricacies and importance of constant and deliberate communication between both the institutional and operational domains.

An AH-64E Apache helicopter provides notional security for the Philip A. Connelly Award competition. U.S. Army photo by SFC Andrew McClure

Often, like the terrain flight TSP example, the skills or proficiencies required today are not readily available in the force. Additionally, and increasingly frustrating for operational units, is the battle they undergo daily to train aviation mission-essential tasks while being tasked to support every ground force as it prepares for often separate requirements. In the end, it all boils down to time. When a Second Lieutenant or Warrant Officer One graduates the AH-64E qualification course, he shows up to a unit qualified in the operation of a machine. The mission and collective tasks that must be honed are left to the unit and its needs. Designer graduates do not exist. The sheer scale of attack aviator production does not allow for a specific mission focus; instead, we must create generalists. If the summation of the general skills that comprise a course graduate does not meet the needs of the operational force, then the institution requires a relook. However, such a relook dictates direct, consolidated, and agreed upon input from the operational base that meets the needs of the force 2 years from now—not the needs of today and not the needs of one attack battalion or one CAB.

The best analogy for the training and operational relationship I can think of is that of a bullwhip. The operational force is the handle, flight school is the thong (primary) and fall (advanced airframe), and the newly arrived aviator in the unit is the popper. The operational force says they need a specific quantity and skill; thus, the handle moves. For the next 18 months, the thong and fall follow in that path to provide the number of aviators with the skills requested, assuming the handle is pointed in the right direction and used in the correct form. At months 20 to 24, the popper sounds, and a new aviator arrives at his unit and ready to begin his progression. However, the unit has deployed twice to tow different mission sets and is now focusing on a third and separate mission. Skills the unit thought it needed are no longer of primary importance. And so, with each crack of the whip, the cycle repeats itself.

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Communication is vital, and yet, the dialogue is sparse. Elements like the Directorate of Evaluations and Standardization do all they can to visit the operational force and uncover what needs have arisen. The DOTD holds a Critical Task and Site Selection Board (CTSSB) every 2 to 3 years, or as significant changes to doctrine, organization, equipment, or a job occur. The CTSSB develops the Individual Critical Task List from a list of all tasks identified in that position's job analysis. The individual critical tasks are the foundation of lessons and lesson plans used in training. Ironically, the CTSSB is designed to capture diverse field input on the critical tasks at all echelons, thus making the process operationally focused. How many operators have taken part in the CTSSB process directly or through a survey? I had not. Moreover, how much priority would you place on such a request/tasking, especially with all the other demands placed upon one organization or team? Again, I know how many surveys I have ignored.

Even if the mitigation of readiness is attained, the rate of aviation innovation will continue to cause problems. Innovation can be explained much like Master Ben Obi-Wan Kenobi's description of "the Force" in the 1977 movie *Star Wars: Episode IV–A New Hope*, innovation is what gives the Soldier his power...It surrounds us and penetrates us. It binds the branch together (Lucas, 1977). Innovation is everywhere. It is in the politics that approve authorizations and funding, in technology, in doctrine, in training, in tactics, in the environment, in our enemies, etc. Often, innovation is happening at a rate that most cannot keep pace.

Reflect upon the operational domain in 1995, 2001, 2007, 2014, and 2020. Where were the Army and branch focusing all those years ago? Post-Gulf War, post 9/11, mid-Iraq surge, initial push into Syria, predominantly hover fire, imbedded COIN, on the cusp of DA? All of these innovative factors shaped the environment. While the operational domain has struggled to try and keep pace with the amount of innovation, so has the institution. But much like the operational needs that are sprung upon us, the institutional domain's ability to react must stand in line. Only now, in Fiscal Year 2020, has the AH-64 fleet gone pure AH-64 Echo. With that change, operational accessories are not apparent. Items such as aviation survivability equipment, fire control radar, advanced arresting gear, manned-unmanned teaming, Blue Force Tracking 2 network (provides friendly force tracking information), and Link-16 (a military tactical data link network) are all absent or in short supply within the institutional force, requiring simulation to cover down. This is not a prod for equipment, because senior leaders are making necessary and important decisions with trusted resources for the branch of today, tomorrow, and the future. What this does do is bring a collective understanding that while innovation and advanced equipment is an edge; it comes at a cost, and thus, a requirement for training in locations besides the institutional training base.

Within the institutional domain, systems, techniques, processes, and testing continue to adapt to the needs of the branch's formations. But without a deliberate understanding of the three factors of **1) perspective, 2) reflection, and 3) rate of innovation**, the fog of training will continue to dominate and cause unnecessary friction. We must attain perspective if there is ever to be a common understanding. Reflection, while important, cannot substitute for perspective or innovation. Finally, the rate of change will not slow, and the systems and processes that react to such innovation must begin to adapt at a much more rapid pace. Common ground does exist. No Soldier will leave training and arrive at his first assignment as functional as the unit desires but, through communication, understanding, and flexibility, the aviation branch, specifically the institutional domain, will continue to strive to produce the best trained and most qualified Soldier possible.

LTC Michael C. Shaw is currently serving as the Battalion Commander of 1-14th AVN REGT. Previous assignments include HQDA G-3/5/7 DAMO-AV, Executive and Operations Officer, 3-159 Attack Reconnaissance Battalion (ARB), and Commander, A Company, 4-4 ARB. LTC Shaw is a graduate of the Army's Command and General Staff College at Fort Leavenworth and has a Ph.D. in Human Resource Education and Leader Development from Louisiana State University.

1st Squadron, 17th Cavalry Regiment, 82nd Combat Aviation Brigade receives their initial fielding of the new Echo Model Apache, replacing the previous generation's Delta Apache helicopter. U.S. Army photo by SSG Sharon Matthias

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TIME FOR A CHANGE

ARMY AVIATION OPERATIONS IN BROWNOUT/WHITEOUT CONDITIONS

By MAJ Jeff Warren (Ret.)

Brownout and whiteout conditions contribute to mishaps and fatalities in Army aviation operations due to degraded visual environments (DVE). Typically, in accident investigations, it's found that the crewmember or crewmembers lost situational awareness (SA). This loss of SA is the human factor contributing to the mishap.

A CLOSER LOOK

Let's peel the onion back a bit on DVE and the implications of losing SA. While during flight, crewmembers maintaining SA is expected for crews to be able to manage the flight and mission, and respond to short notice or unexpected changes while keeping the aircraft in a safe flight envelope. Yet, when a mishap occurs in a brownout/whiteout DVE condition, how can a crew who has lost all visual references and in close proximity to the ground and other terrestrial objects "maintain SA?"

While crews performing instrument flight rules (IFR) flight in instrument meteorological conditions (IMC) are instructed to maintain SA by utilizing their flight instruments as per Training Circular 3-04.5, "Instrument Flight for Army Aviators," it seems that this instruction has also migrated into operations while in brownout/whiteout conditions (Department of the Army, 2017). Should this be the case for operations in brownout/whiteout conditions? Just as when conducting instrument flight in IMC, can't aviators utilize their instruments to maintain SA while landing in brownout/whiteout conditions when they lose all visual references?

INSTRUMENT IMC SITUATIONAL AWARENESS

At first glance, many aviation personnel would say that as with IFR in IMC, during DVE, you can and should use your flight instruments to maintain SA. But at second glance, does this pass the common sense test? During instrument flight, which has several tasks each with a task, condition, and standard in each aircraft aircrew training manual (ATM), you are required to meet the standards and utilize Army regulations and Federal Aviation Administration (FAA) publications to safely complete instrument flights. Interestingly though, during IFR/IMC flight, there is high concern for maintaining aircraft separation from the ground, obstacles, and other aircraft. This is why instrument approaches have visibility and cloud height minimums. Ask any aviator if, while on final approach to an airfield, when you are still in IMC conditions, and when you have no visual reference, it is within regulation and safe to shoot an approach below decision height (DH) or mini-

One of the most hazardous situations for aircraft pilots is degraded visual environments, which include darkness, snow, rain, blowing sand, dust, fog, smoke and clouds. The S&T community, industry, academia and the other services are developing capabilities like the Degraded Visual Environment Mitigation Program, which will allow aviators to maintain an asymmetric advantage on the battlefield in all weather conditions, including brownouts. U.S. Army photo

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mum descent altitude (MDA). The resounding answer is NO! Your instrument examiner will tell you procedurally you execute the missed approach.

Now, we understand why you shoot the missed approach when you don't break out of the clouds at DH or break out of the clouds at MDA once you're at the missed approach point. The reason Army and FAA regulations direct this is because there is no visual reference to safely negotiate landing the aircraft (even with flight instruments available). So why would it be okay for aircrews to land without visual references in much more demanding conditions of tactical operations in brownout/whiteout conditions and instruct them to use their flight instruments? This seems in direct opposition to what Army manuals tell us during instrument flight operations.

SHOULD THERE BE A TASK?

For DVE operations, none of the ATMs have a task, condition, and standard developed. You will see it as a consideration for certain tasks. Maybe a task, condition, and standard hasn't been developed for DVE, particularly for brownout and whiteout during the landing phase of flight (which is extremely hazardous due to proximity to the ground and terrestrial objects) because it's too hard. If we are going to prevent SA while in brownout/whiteout conditions, we need to pick up our instrument scan and crew coordination; why then can't we develop a task and tell aviators how to do it? If it is okay for aviators to land with no visual references in pickup zones (PZ) or landing zones (LZ) that oftentimes they have only a high reconnaissance look at the PZ or LZ because they get engulfed in a dust or snow cloud at 10 to 30 feet above ground level, why can't we also continue our instrument approaches to the runway with no visual references?

I think for experienced aviators and crewmembers reading this who have had to operate in desert or snow conditions and make those brownout/whiteout landings at night, under night vision goggles, and with no visual references, you immediately feel the cringe. Can Army aviators perform these landings? Of course they can, and they do. Is it fair to say that when an aircraft is rolled during a brownout landing, you're operating in a desert environment, and you have no other option that the rolled aircraft was caused by loss of SA on the pilot's part and crew? I think not. When you lose your visual references, are within 10 feet of the ground and are executing the landing-even using your flight instruments to maintain level attitude-you don't have SA. All you know is that the aircraft is level and the pilot not on the controls is counting down your radar altitude giving you an indication of when you will touch down. You have no idea what obstacle is near or in the rotor disk, you have no idea if the ground where you land is level, or if it is waddies that drop off 15 feet on one side.

Providing the aviation air Soldier with the task, condition, and standard can do nothing but provide our aviation personnel the standardized procedure for how to execute the brownout/whiteout landing and takeoff. Our units currently do this when their instructor pilots take aviators out and conduct brownout/whiteout initial or refresher training; yet, it's the unwritten task. While we conduct these trainings regularly, why not codify it in our ATM and have standardized tasks, conditions, and standards that aviators can read and train to meet the standard? Having the foreknowledge of the procedure and do's and don'ts that the ATM explains certainly lends itself to reducing the risk of the procedure.

Once the DVE mitigation system the program executive office has their DVE team working on becomes available as a program of record, it will be easy to integrate it into the ATM task. This provides the age-old holistic approach to standardized training that has been ingrained in the Army since the earliest days.

WEIGHING THE RISK

Army aviation makes the mission happen. We operate in all environments and geographic locations. We talk about solid training to overcome obstacles to executing the mission in these environments. For brownout and whiteout conditions, the risks are high even in the best cases; we as an organization should develop and institute a task, condition, and standard so instructors can do what they do best, teach our aviators how to make these landings as low risk as possible or better yet, expedite the acquisition of DVE systems, which allow us to see through an obscuration.

We must look past the methodology of how we currently conduct aviation risk reduction just through the risk assessment worksheet, the risk-common operational picture, and the mission brief and approval. We should, as an enterprise, incorporate the risk reduction into the standardization of training we do, and ensure that we incorporate those tasks that are higher risk into a task, condition, and standard. This incorporation would help to drive down those risk such as are inherent in brownout/whiteout DVE conditions. We could then conjecture that other tasks we conduct without actually having a task in the ATM would sur-

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U.S. Army Combat Capabilities Development Command Aviation & Missile Center Aviation Development Directorate-Eustis pilots conduct an instrument flight rules refresher at Fort Eustis, Virginia, July 24. The pilots are preparing for upcoming Degraded Visual Environment Mitigation tests next year. The DVE-M program is a science and technology initiative across CCDC to develop a system that allows rotary-wing operations in all terrain, weather, and battlefield environments and is compatible with existing and future helicopter systems. The trials will be performed throughout 2020 with initial checkout at Fort Eustis and in degraded visual conditions at Cape Cod, Massachusetts; Yuma, Arizona; and Camp Dawson, West Virginia. Photo by U.S. Army Combat Capabilities Development Command Aviation and Missile Center

face that should have a task, condition, and standard in our training programs.

As an example of how our current methodology doesn't fully account for the actual risk we encounter, we could look at past mishaps which involved DVE and the loss of situational awareness by the crew as an investigation outcome. In many cases, the risk assessments were shown as low, and in many instances the crews were high flight time aviators. Yet, these high-time aviators with low-risk assessed missions still ended up with an aircraft mishap due to rolling over during a brownout landing or flew perfectly functioning aircraft into the ground or sea. Maybe had we had a defined task, condition, and standard for DVE in the ATM and officially recognized it with the training of that high-risk task, we could surmise that we probably would've done a better job of understanding the risk, training the task, and having fewer mishaps.

While we are at it, we need to rethink how we determine loss of SA. When a crew and aircraft are engulfed in a giant dust cloud with no outside visual references in one of the most critical phases of our mission profile—landing, and have a mishap—we say they lost SA. This posits if the crew has no outside references and are in a landing profile, how could they possibly have SA? This is what is called a "koan," a paradoxical riddle. The paradox being the mishap crew is put in a flight situation where there is no SA (brownout) but then the finding on the mishap is loss of SA (that never existed during the accident phase). Let's acknowledge the realities of brownout/whiteout conditions and move toward the best mitigations.

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Jeff is a retired Army Master aviator with over 20 years of service. He conducted operations as a maintenance test pilot, maintenance manager, and instructor pilot in the UH-60. He served in air cavalry, assault helicopter, and MEDEVAC units throughout his career. He served division assignments with the 7th ID (LIGHT), 2ND ID, the 101st Airborne Division (AIR ASSAULT), and the Aeromedical Research Laboratory. He has worked with the Directorate of Training and Doctrine producing doctrinal publications, MEDEVAC proponency as a subject matter expert, and the Combat Readiness Center as an aviation technical writer. Additionally, Jeff holds a master's degree in management.

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An Unintended Side Effect of the Aviation Restructuring Initiative:

THE ATTACK AND SCOUT COMMUNITIES JOINING TO FIGHT AND WIN IN LARGE-SCALE COMBAT OPERATIONS

By CPT Allan J. Newman

AH-64s arrive to the 10th Mountain Division (LI) from National Guard units in August 2016 to complete 6th Squadron, 6th Cavalry Regiment's conversion to a Heavy-Attack Reconnaissance Squadron. U.S. Army photo by CPT Allan Newman

The Aviation Restructuring Initiative's Effect

The Army began executing the Aviation Restructuring Initiative (ARI) in 2014 (Pate, 2014). In a statement on the posture of the United States Army before the Senate Committee on Appropriations Subcommittee on Defense, the then U.S. Army Chief of Staff, General Raymond Odierno, quantified that the "plan avoids $ 12B in costs and saves an additional $ 1B annually if we fully implement ARI" (*On the posture of the United States Army*, 2015, p. 7).

The Kiowa was retired and temporarily replaced with the AH64D/E Apache Longbow/Guardian until the Army could develop a new armed scout aircraft. Attack reconnaissance squadrons became known as heavy-attack reconnaissance squadrons (now air cavalry squadrons). Significant to this initiative was the transition of Kiowa pilots to other airframes, assignments, and branches. With the addition of an extra Apache squadron in almost every combat aviation brigade, many scout pilots became attack pilots and transitioned to the Apache. One quality they kept: the scout and cavalry mindset.

The transition of Kiowa pilots into the attack community has widened its focus to benefit division commanders by expanding the often-narrow focus within the Apache community of attacks against enemy forces out of friendly contact.

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The former Kiowa pilots bring a broader understanding of the importance of intelligence preparation of the battlefield, and coordination with friendly units makes attack aviation assets more versatile and lethal. They built a deeper appreciation within the attack community of higher echelons' and lateral units' missions. This enables air mission commanders to make decisions that fulfill the commander's intent. Merging the attack and scout communities significantly benefited Apache readiness to fight and win in sustained large-scale combat operations because it created a new culture of actively understanding and integrating into division and corps operations.

The Broad Differences

The example of Apaches flying low level in the night, attacking strategic enemy targets, and destroying critical enemy elements either within hours of a war starting or during the first shots of a war are the often-discussed missions for an attack battalion (AB) in a decisive action fight. It describes Lieutenant Colonel Richard Cody's legendary mission as commander of the AB in the 101st Combat Aviation Brigade against Iraqi radar in 1991 (Robinson, 2011). It also describes Colonel Bill Wolf's similarly planned attack as the commander of the 11th Aviation Helicopter Regiment against the Iraqi Republican Guard, Medina Division, in 2003 (Fontenot et al., 2004). It does not describe the three other forms of attack as outlined in Field Manual 3-90-1, "Offense and Defense Volume 1," (Department of the Army, 2013b) movement to contact, exploitation, and pursuit. It also does not show how attack aviation is utilized as a supporting element in the six forms of maneuver as one of many units working together: envelopment, turning movement, frontal attack, penetration, infiltration, and flank attack. As described in Army Doctrine Publication 3-0, "Operations," "**Combined arms is the synchronized and simultaneous application of arms to achieve an effect greater than if each element was used separately or sequentially**" (Department of the Army, 2019, p. 3-9). Attack aviation consistently trains as the supported element in combined arms training, often supported by indirect fires and electronic warfare, rather than training as one of many friendly units on the battlefield executing the same mission. The cost of this narrow training is a lack of understanding attack aviation's ability to support the wide variety of missions required in large-scale combat operations.

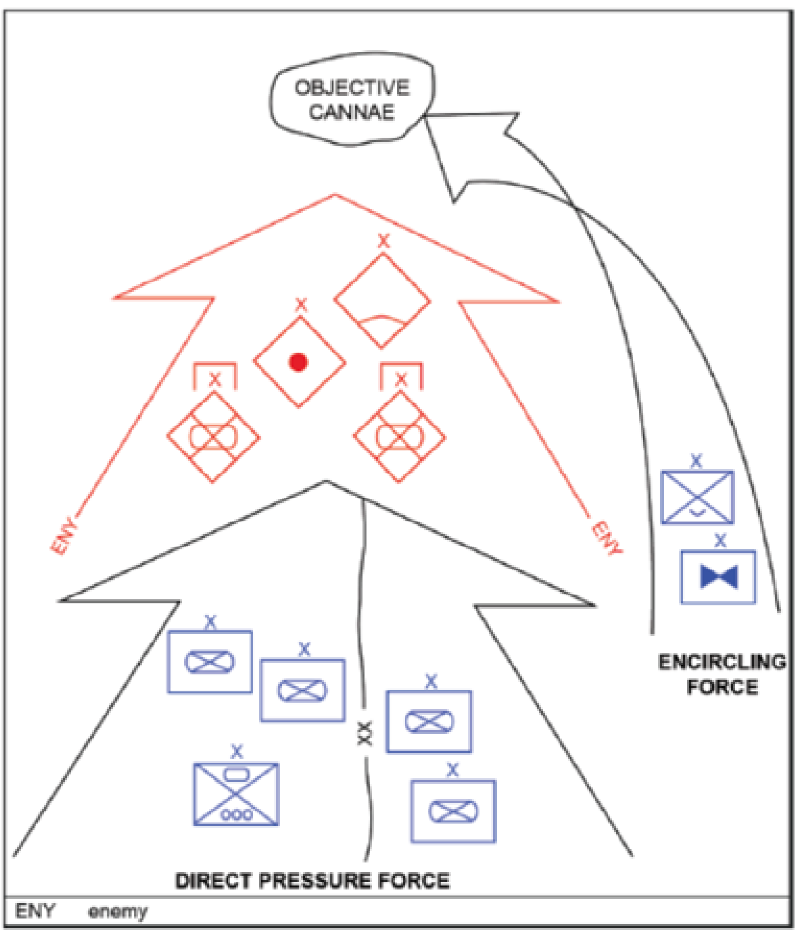

Figure 1. **Corps level pursuit mission with aviation encircling the enemy (Department of the Army, 2017, p. 7-50 [Figure 7-22]).**

The air cavalry or scout mindset is different from the attack mindset. "The fundamental purpose of Cavalry is to set conditions for successful operations of the unit for which they are conducting reconnaissance and security tasks," states Field Manual 3-98, "Reconnaissance and Security Operations" (Department of the Army, 2015, p. 1-3). Often part of a shaping operation, scouts need to understand the commander's critical information requirements and an understanding of the higher echelon's mission (and often lateral forces' missions) to successfully shape the battlefield. Although the attack against enemy forces out of friendly contact enables other missions, such as opening airspace to fixed-wing missions, it often requires little understanding of other units' operations, or truly operating as a member of the combined arms team. For example, how are attack helicopters utilized as part of an encircling force? Field Manual 3-90-1 states that they can conduct countermobility operations against the enemy, such as targeting choke points or bridges to hinder the enemy's withdrawal. Armored, air assault, and airborne operations are also effective in providing countermobility (Department of the Army, 2013b). Figure 1, taken from Field Manual 3-0, demonstrates corps-

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level pursuit utilizing attack aviation as an encircling force (Department of the Army, 2017).

The broader point is that significant coordination with higher echelons and an understanding of higher echelons' intents are required to conduct large-scale combat operations with combined arms—much more so than indirect fires and airspace coordination required for an AB independently operating.

Doctrinal Mission Differences

Examples of the differences between the attack and scout perspectives are found in the reconnaissance and attack vignettes in Field Manual 3-04, "Army Aviation" (Department of the Army, 2020). The air cavalry squadron's (ACS) task is to conduct a zone reconnaissance in support of a brigade combat team's main body movement. Two scout weapons teams (SWTs) are tasked to conduct the reconnaissance while an attack weapons team is tasked to screen. For the purposes of this comparison, the SWTs are the focus as representative of an ACS's mission. Figure 2 details this concept of operations sketch.

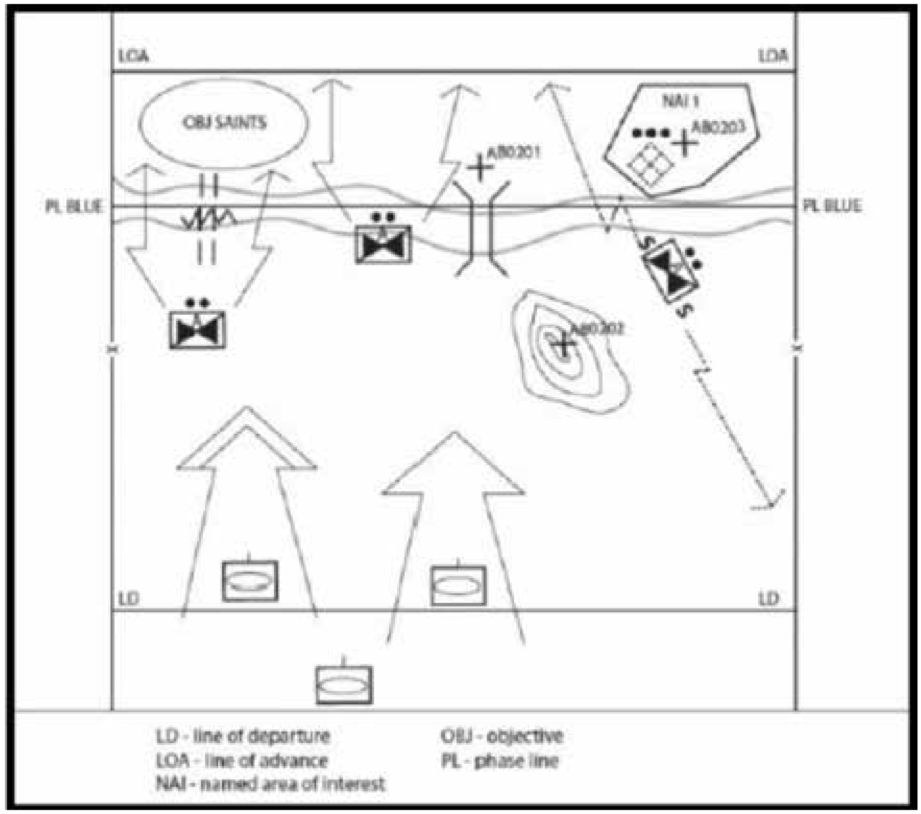

Figure 2. **Example ACS zone reconnaissance mission (Department of the Army, 2020, p. 3-25 [Figure 3-17]).**

In contrast, the AB task is to conduct an attack out of friendly contact to disrupt an enemy mechanized regiment in a deep area of linear operations. Field Manual 3-04, "Army Aviation" designates the attack out of friendly contact as, "Army Aviation attack and reconnaissance units, maneuvering independently against an enemy force not in close contact with friendly ground maneuver forces" and continues, "These attacks are conducted at such a distance from friendly ground forces that detailed integration with them during actions on the objective is typically not required" (Department of the Army, 2020, p. 3-8). Figure 3 details this concept of operations sketch.

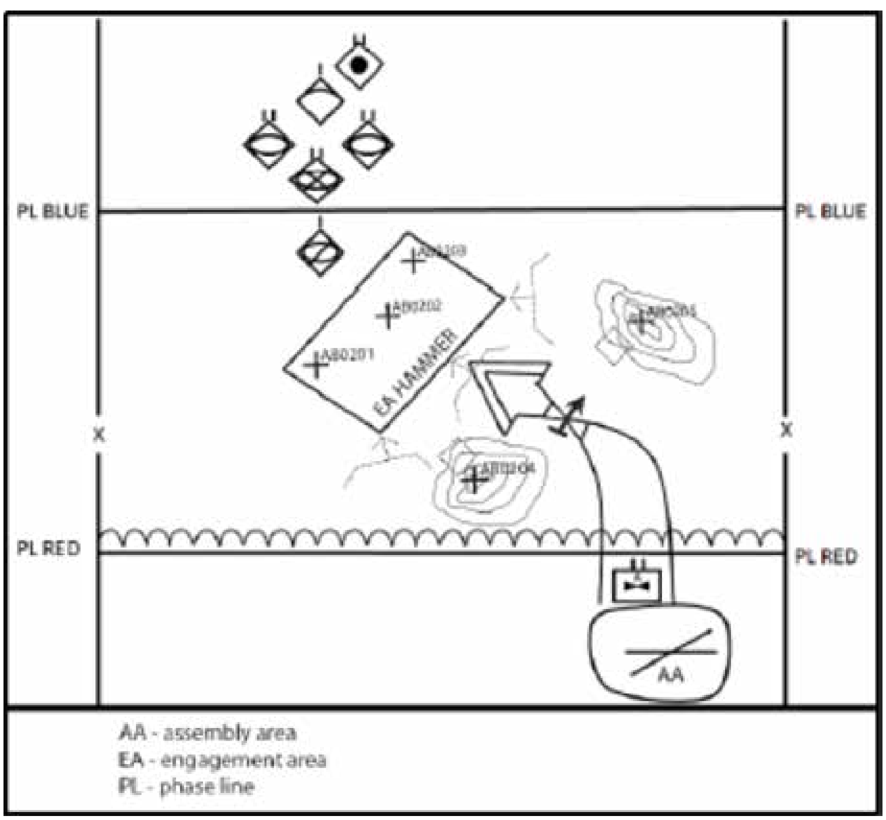

Figure 3. **Example AB attack mission (Department of the Army, 2020, p. 3-11 [Figure 3-8]).**

From the figures alone, differences are apparent in the perspectives between the scout and attack roles. The ACS is focused on named areas of interest, the supported unit's objective, terrain that affects friendly ground movement, and the brigade combat team. The AB is focused on multiple fire coordination measures, the engagement area, and the enemy. While the ACS is concerned with the brigade combat team's entire area of operations, the AB is solely focused on getting to and from the objective. Comparatively, the ACS's mission requires a greater understanding of the brigade's battlespace, while the AB's mission required more detailed analysis of specific routes, battle positions, and direct fire control measures.

From the conceptual standpoint, differences are apparent in how the ACS is utilizing two SWTs to support a brigade as likely the rest of ACS is not held in reserve and is tasked to supporting other brigades across the division. Although not labeled the decisive operation in the division, the AB is tasked a focused mission and the division's and brigade combat teams' staffs are tasked to support the AB's mission by coordinating passage of lines and joint suppression of enemy air defense. The ACS's largest challenge is to identify enemy and report effectively to the supported brigade. The AB's challenge is to maximize firepower within minutes of arriving to the objective. The different missions require a significantly different focus of analysis from planners. Adding the cavalry's broader understanding of the division's missions will contribute to attack mission success. The AB benefits from the addition of experienced ACS planners.

Combining the Different Perspectives to Benefit the Ground Force Commander

Intelligence preparation of the battlefield is fundamental to Army mission planning before course of action development and guides the rest of the planning process. The scout pilots' focus on the enemy composition, disposition, and order of battle will assist the AB in successfully achieving the destruction criteria. In a training environment, it is difficult to replicate friendly and enemy corps maneuvering in the battlespace well within the range of a helicopter's area of influence. With thousands of vehicles and tens of thousands of uniformed personnel within the range of one mission, there is added potential of a target-rich environment amid competing priorities at the battalion, brigade, and division levels. While a scout may be tasked with identifying whether a specific variant of a vehicle is present to assist the S2 in assessing if the enemy's main body is committed to an avenue of approach, attack aviation is far more focused on what munition will destroy what vehicle. One issue with the solely attack focused pilot executing a mission is when the information is more valuable to the ground force commander than an enemy vehicle destroyed.

The Democratic People's Republic of Korea has 4,100 tanks and 2,100 armored vehicles (Office of the Sec-

Kiowas conduct their final flight over 10th Mountain Division (LI) as 6th Squadron, 6th Cavalry Regiment retired the aircraft in July 2015. U.S. Army photo by CPT Peter Smedberg

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retary of Defense, 2012, p. 12). It may be more important to develop the situation, transmit the information to higher headquarters, and retain freedom to maneuver rather than to destroy tanks, get decisively engaged, and spoil a friendly maneuver that required information no longer possible to gather and report. The benefit of the scout's focus on the order of battle is a greater understanding about how enemy forces task organize, how the enemy accomplishes their mission, and a detailed analysis of the variants of enemy assets. Understanding an order of battle enables an air mission commander to analyze the situation on the objective to better support the commander's intent when friendly plans change, the enemy conducts an unexpected maneuver, or it becomes apparent the destruction criteria will not achieve the commander's intent. The more an attack pilot understands about the enemy, the better decisions he/she will make during dynamic missions.

Serving in the supporting role rather than being in the supported role requires thoroughly understanding higher echelon's products. This benefits ABs, with planners and pilots able to effectively utilize the resources on the battlefield. For example, an information collection (IC) matrix's primary use for attack aviation is to know when, what, how, and where assets are collecting on the attack commander's critical information requirements. The remainder of the key information described in Field Manual 3-55, "Information Collection," includes specific information requirements, indicators, essential elements of information, and priority information requirements that are key to a scout's understanding of the mission and require greater insight into the purpose of the mission (Department of the Army, 2013a).

Understanding what data that asset is collecting and how the interpreted data drive a decision to utilize attack aviation will better prepare an attack commander to integrate attack aviation into large-scale combat operations. Instead of waiting for the division commander's decision support matrix to trigger the AB launching and being just the proverbial bullet of the division, an attack commander, his/her staff, and subordinate leaders can be the men or women behind the gun firing the bullet. Understanding the friendly forces information requirements and priority information requirements that trigger the division commander's decision enables an AB to get ahead of developing events and shape decisions to best utilize attack assets.

An error made during an attack training exercise provides an example of the importance at the tactical level of understanding the higher echelon's products. During the 4-2 AB's cumulative training exercise last spring, a misunderstanding of the IC matrix led a company to attempt numerous radio transmissions to the UAS asset for a situation update 5 minutes out from the objective. That asset had departed the objective 1 hour earlier (on schedule with the IC matrix). While across the forward line of troops, the company wasted essential time, increased electronic emissions, and showed it did not understand adjacent units' plans. Possibly a mistake caused by a junior pilot learning during training, the risk of a similar error can be minimized with the intentional focus scout pilots place on IC matrices

The broader perspective of scouts reaches up to the comparison between branch and joint doctrine. Scout's terminology of named areas of interest, priority information requirements, and the IC matrix are at the joint level in the Joint Publication 2-0 Intelligence Series (Chairman of the Joint Chiefs of Staff, 2017a; Chairman of the Joint Chiefs of Staff, 2017b; Chairman of the Joint Chiefs of Staff, 2013). Attack rotary-wing operations are described in Joint Publication 3-09, "Joint Fire Support," and described as an Army maneuver force (Chairman of the Joint Chiefs of Staff, 2019). Attack aviation terminology, planning, and tactics, including engagement areas; fire control; and maneuver are nested within Field Manual 3-0, "Operations" (Department of the Army, 2017). Again, the scout perspective is broader across friendly operations because joint publications determine specific intelligence products and tools, while the attack perspective in large-scale combat operations is focused on the Army maneuver level. The ability to understand and utilize joint products benefits AB commanders and planners through nesting their operations within all spectrums of conflict within the division's area of operations.

The Way Ahead

The Army continues to spread the scout mindset across the aviation community as scout pilots of all ranks transition to other airframes. Air cavalry squadron commanders, now in charge of a traditional attack asset, ensure the fundamentals of cavalry operations that guided them as platoon leaders and company commanders, are taught to junior Apache pilots. Across ABs, former Kiowa pilots continue to teach the importance of cavalry operations to attack pilots. Additionally, there is a specific course for cavalry missions that is unique to the Army aviation community called the Air Cavalry Leaders Course.

The Air Cavalry Leaders Course (ACLC) is a 2-week course at the U.S. Army Aviation Center of Excellence, established in 2015, to integrate the cavalry mindset into aviation leaders. In a 2018 article for *Army Aviation Magazine*, authors LTC Clifton Causey, a Kiowa to Apache transitioned 3-17 ACS Commander, and LTC Michael Gourgues, the ACLC course director, issued an overview of ACLC summarizing, "After 16 years of fighting in a counter insurgency (COIN) environment, Aviation leaders planning against our near peer threats are inexperienced in the critical skills required to win. Our nation will call upon us to fight a near peer threat and we must therefore immediately shift our focus to the difficult task of warfighting in the decisive action environment. Essential to this fight are the reconnaissance and security operations that must occur to gain and maintain the initiative" (Causey & Gourgues, 2018, p. 40).

The ACLC is available as a mobile training team, temporary duty travel, and to those on permanent assignment at Fort Rucker, Alabama. Regardless of future attack or cavalry assignment, Apache-pilot captains are automatically enrolled in the course if slots are available while attending the Aviation Captains Career Course (AVCCC). The additional 2 weeks produces captains headed to ABs who are better able to integrate their unit into large-scale combat operations. After a mobile training team held a class at Fort Drum, New York during 6-6 heavy-attack reconnaissance squadron's transition to Apaches in 2017, the graduates utilized many of the course's scenarios, products, and training to train the rest of the squadron. The scout mindset, understanding of higher echelon's operations, and cavalry missions are effective tools for training attack aviators as a supplement to attack training. Combat aviation brigades should prioritize scheduling an ACLC mobile training team to increase readiness in large-scale combat operations.

Divisions should utilize live, virtual, and constructive (LVC) training tools to rehearse utilizing attack aviation supporting ground units. 4-2 AB organized an LVC training event that included platoons of Bradley fighting vehicles (BFV) from the rotational brigade, HMMWVs from 4-2 AB's companies, platoons of Apaches, and a command post integrated into one simulation during its Fiscal Year 20 Quarter 1 cumulative training exercise. Including the BFVs into an AB's training exercise served as a forcing function to ensure the battalion's pilots understood their adjacent unit's scheme of maneuver

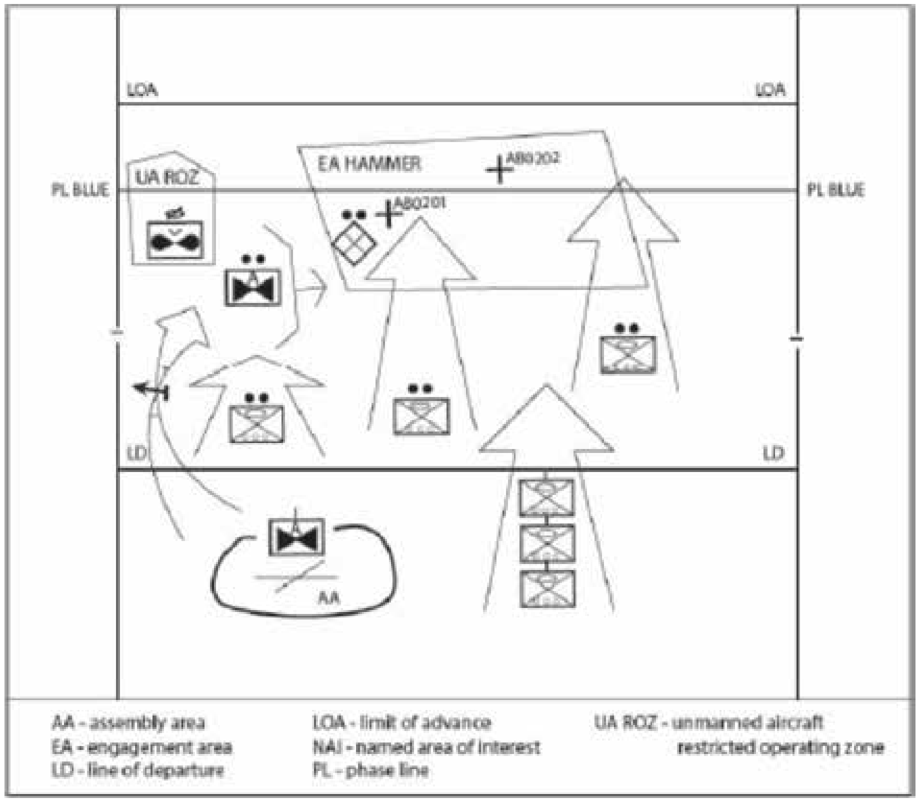

Figure 4. **Deliberate attack by an attack weapons team in support of a Stryker battalion conducting a movement to contact (Department of the Army, 2020, p. 3-5 [Figure 3-2]).**

and participated in combined arms rehearsals. Starting points for missions that utilize attack aviation are found in Field Manuals 3-90-1 "Offense and Defense Volume 1" and 3-90-2 "Reconnaissance, Security, and Tactical Tasks Enabling Volume 2" (Department of the Army, 2013b; Department of the Army, 2013c). Beyond Field Manual 3-90 series' guidance to integrate attack aviation into ground maneuver, Field Manual 3-04 includes examples of attacks against enemy forces in close friendly contact (Department of the Army, 2020). Figure 4 displays a deliberate attack that requires close coordination with the ground maneuver force. The LVC environment mitigates the risk of a real-world accidents while running division through battalion staffs and company planners through combined arms planning and execution iterations.

The attack against enemy forces out of friendly contact provides great training and a challenge for attack aviators. It enables a battalion to conduct a large training exercise by integrating all subordinate units and requires little to no support from higher headquarters. It does not train attack pilots on conducting sustained large-scale combat operations. As the historical operations of 1991 and 2003 show, the traditional deep attack is often executed once in a war, while a peer or near-peer fight will require longer duration operations and a greater integration into friendly maneuvers. Versatile attack companies that understand the scout mindset and missions can better perform their attack task and provide the AB commander the support he or she needs to accomplish an attack. Attack battalions and companies should prioritize their attack tasks, but deliberately train the cavalry-aligned mission-essential tasks. Reconnaissance and screening training as a supplement to attack training is worth the time. Cavalry training provides a broader perspective, deeper understanding of the battlefield, and better decision making from air mission commanders in large-scale combat operations.

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An OH-58D "Kiowa Warrior" passes through water from fire trucks after its final flight at Joint Base Langley-Eustis, Virginia, Sept. 18, 2017. As part of the Army's Aviation Restructure Initiative, the Army began divesting the aircraft in 2014. U.S. Air Force photo by SSgt Teresa J. Cleveland

Future Attack Reconnaissance Aircraft Potential Effect

Until the Future Attack Reconnaissance Aircraft starts fielding in 2028, the merger between attack and cavalry will remain in place as Apache pilots switch between ABs and ACSs (Kimmons, 2020). Once the Bell 360 Invictus or the Sikorsky RAIDER X is fielded, the option is available for Army aviation to split the communities or train some pilots in both airframes throughout their careers to continue the benefits of a cross-trained community. Until then, attack aviation will continue to integrate the scout's perspective to better understand the enemy, support friendly operations, and conduct attacks that will provide the greatest benefit to the ground force commander. The Army executed the ARI to save $12 billion and subsequently changed the cultures within the scout and attack aviation communities through a merger affecting the spirit, focus, and tactics of ACSs and ABs (Pate, 2014).

CPT Allan Newman is currently serving as the commander of C/4-2 AB in Korea, is qualified in the AH64D, and previously served in 6-6 ACS at Fort Drum, New York as the Squadron transitioned from Kiowas to Apaches.

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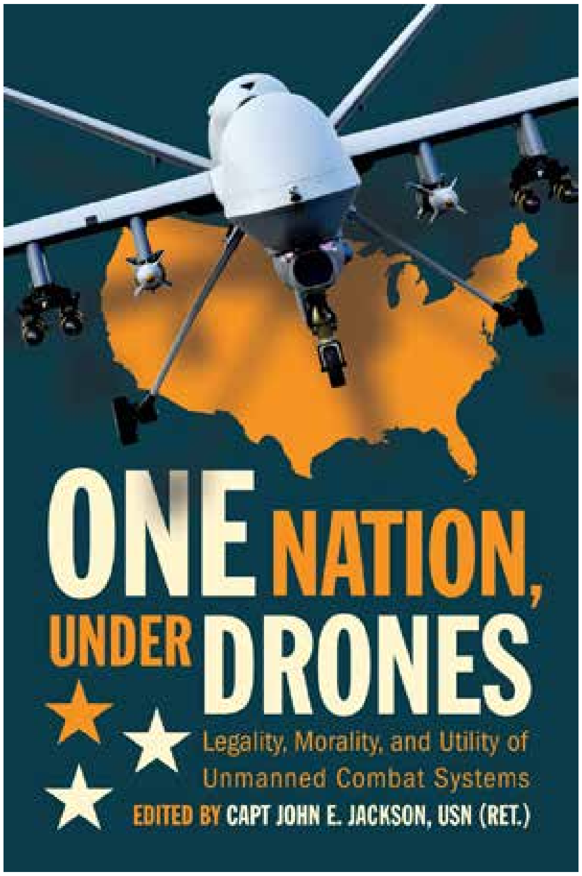
ONE NATION, UNDER DRONES: LEAGALITY, MORALITY, AND UTILITY OF UNMANNED COMBAT SYSTEMS

CAPT John E. Jackson, USN (Ret.). 2018. Annapolis, Maryland: Naval Institute Press, 238 pages
A book review by CW3 Brandon K. Lancaster



It is reasonable to state that the technological advancement of drones has increased exponentially in the last 2 decades. The effects of unmanned aerial vehicles (UAVs) on the wars in Iraq and Afghanistan could be compared to that of rotary-wing aircraft in Vietnam. They performed missions from a theatre level all the way down to squad sized elements on a daily basis. The images provided have ushered in a new era of command and control that was previously unattainable. The increased request and operational need in these two theatres has been a steady driving force in UAV development.

One Nation, Under Drones covers the full range of topics that become a necessary conversation when employing unmanned vehicles. It begins with a brief historical overview using examples as far back as WWI and the pilotless "Kettering Bug." As the history is covered, it becomes apparent that as prolific as drones are today, they have been present in some form in most major conflicts. They were typically used to a substantially lesser degree. The desire for the capabilities were far ahead of what the technology could accommodate in most cases. Successful operations were nowhere approaching routine until Vietnam and the "Ryan Model 147 Lightning Bug." This was a jet-powered UAV that conducted a multitude of aerial reconnaissance, surveillance, and electronic warfare missions throughout Southeast Asia. Even with the success of these missions, overall impact to the war effort could be considered relatively low. In Operation Desert Storm, technology advanced enough to allow unmanned vehicles to provide a greater impact but were not as prevalent in numbers as today. Although aerial vehicles are often the most publicized examples, Naval applications are brought to light throughout the book. The Navy's first underwater vehicle was deployed in the 1960s for unexploded ordnance recovery. Since then, underwater drones have been used for mapping and mine-clearing operations. Then, the Navy continues to progress forward with underwater and surface-based systems. Future missions may include hunting submarines, scouting ahead of manned ships, conducting reconnaissance, and force protection. Today, unmanned vehicles are present in every branch of the Armed Forces.

The author dedicates a large portion of the book to the moral, ethical, and legal questions that arise from unmanned vehicles in conflict. Current examples are given on how today's international and human rights laws are applied to drone strikes. Lethal strikes by remotely piloted vehicles have become an expectation in the war on terror. The desirable attributes are low risk to friendly forces and the ability to exercise tactical patience and minimize civilian casualties. They are often criticized for their proportionality or military advantaged gained vs. death and destruction caused with no risk to the operator. Ultimately, the strikes are held to a legal standard, even with the wide array of opinions and interpretations that many people have. The questions then turn to the future where increased autonomy is desired, if not required. Can we hold autonomous vehicles to the same moral and ethical requirements as their human counterparts? Would the standard then be that they simply make as few or fewer mistakes? Currently, with a remotely piloted vehicle, the operator can be held accountable for things like collision avoidance, even when operating semi-autonomously. If we apply the same standard for a fully autonomous vehicle, is there an acceptable margin of error? The stakes are heightened even further when we consider giving a lethal capability to an autonomous vehicle. Programming then becomes responsible for accessing positive target identification, civilian casualty assessments, and acting within current legal

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stipulations. Some argue that the technology will never progress far enough to fully eliminate the human requirement and that to expect it to do so is unrealistic. Manned-unmanned teaming has provided a path forward, extending capabilities and providing increasing levels of autonomous control. Afghanistan has provided an arguably optimal setting for the progression of remotely operated aerial vehicles given its uncontested low-density airspace and favorable weather. With that advantage, development was able to occur in a "real world testing" environment. Feedback could then be provided daily, rather than just from limited training missions. The ocean may provide another optimal setting for autonomous vehicles. The ocean surface significantly lowers the potential for civilian casualties compared to land and underwater even more so. It also brings new factors to consider; the environmental impacts to the ocean in destroying large ships may not be as localized as a vehicle on land. Effects could potentially spread undesirably and have impacts well after the event. Currently, the expectation is that vessels at sea will render aid to individuals lost at sea when they have the capacity to do so and would not jeopardize the safety of the vessel and those on board. Would a remotely piloted vehicle be considered an extension of the vessel it is operated from with the same requirement to render aid? On the opposite side of the argument, autonomous vehicles could perform better in some regards. They may not have a need to make hasty decisions when reacting to self-defense situations. In combat, there would be no undesirable outcomes from the need to take revenge, inexperience, or unclear orders. The balance will ultimately come from how far laws and restrictions allow the technology to progress.

The progression of technology has not been restricted to the Armed Forces. Civilian drone usage has increased as well, sometimes outpacing military advancement to the point that equipment is procured from civilian sources. The ScanEagle for example, was originally the Insitu SeaScan and was developed for commercial fishing. Aerial drone footage can be found in most cinematic applications, from filmmaking down to personal use. Additionally, they provided a cost-effective way to inspect infrastructure like roads, powerlines, and railroads. They also enhance search and rescue operations and aid in minimizing risk to firefighters, while allowing them to perform critical duties faster. In the near future, it may become commonplace to see unmanned vehicles delivering packages from various vendors who have expressed interest in developing the technology. This will most likely require, at least to some extent, the autonomous navigation requirement previously mentioned. Obstacle detection and avoidance technology is already available on recreational drones. Its current application is to prevent crashes caused by operators and provide a "return to home" capability in the event of lost signals and low battery conditions. This technology will be an essential requirement if the expectation is for aerial drones to safely navigate in residential areas below the altitude required to deconflict with manned aircraft.

The increase in numbers and accessibility of these vehicles has brought new problems to overcome. In the civilian sector, laws and restrictions are continuously developing to protect civil and commercial aviation from a potential "drone strike." Solutions like "geo-fencing" prohibit more advanced drones from flinging into restricted airspace and areas where security must be maintained. Less advanced drones will not have the option for these safeguards, and as of now that responsibility relies solely on the operator. Operating altitude restrictions are also in place to minimize the risk to low-flying aircraft colliding with a small nearly impossible-to-recognize drone. The low cost and availability have also made them desirable assets for terrorist groups. In current conflicts, aerial vehicles have been used themselves as weapons, as well as a weapons delivery method. Some small to medium-sized purchases are purpose-built, but the majority are civilian drones with modifications to carry payloads. They are easily transportable and can be deployed quickly. They have also assumed the same reconnaissance roles as their military counterparts. Their small size makes them extremely difficult to detect. They are often too small to be detected by radar and are difficult to detect visually, thus exploiting a critical gap in air defense. Defenses against this threat are currently being developed. The ease of transportation and the ability to operate with minimal to no training make it a difficult problem to solve.

In conclusion, *One Nation, Under Drones* covers the full spectrum of historical, current, and future drone operation. I found myself searching the internet for images of the little-known historical references and stories pertaining to each. The usage of drones is covered from a multiservice and international perspective. Each service-unique requirement is discussed. It also highlights moral, legal, and ethical questions, some of which have already been partially answered in today's society. I found the discussions about how drone strikes are justified from a legal perspective on the world stage to be particularly interesting. Questions about future technology are unanswered, but the author ensures some guidance is provided so that the right questions are being asked. Drone technology has changed and will continue to change the way military, industrial, and civilian personnel do business.

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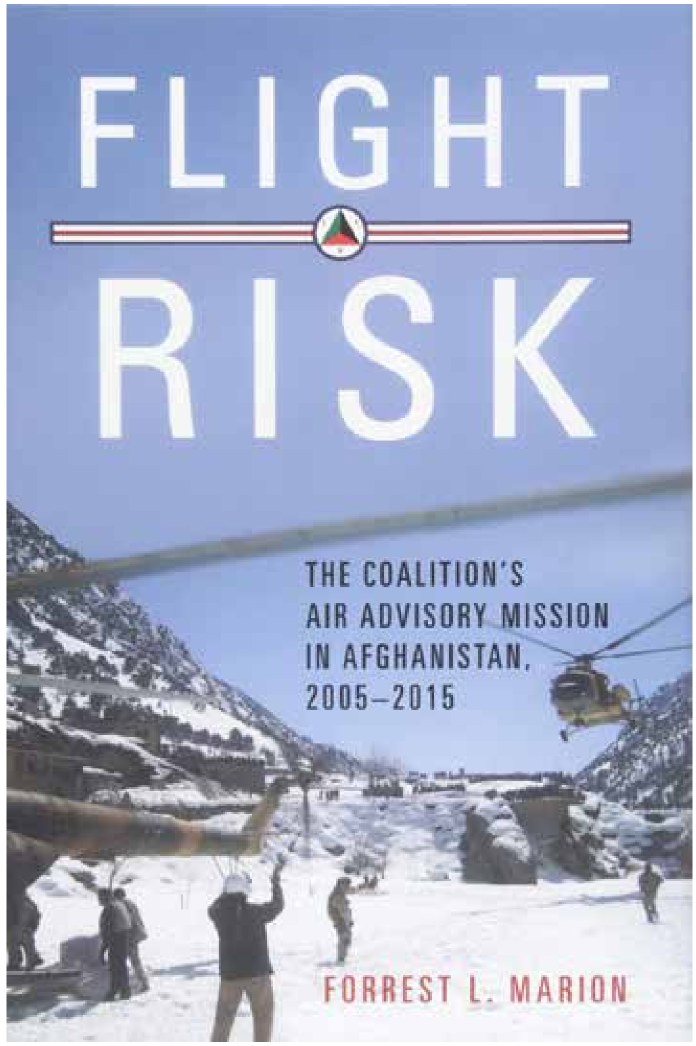
TURNING PAGES

book reviews of interest to the aviation professional

Flight Risk: The Coalition's Air Advisor Mission in Afghanistan, 2005-2015

Forrest L. Marion, Author, Naval Institute Press. 2018. 376 pages.

A book review by SFC Bowie Daniel Hall



Forrest L. Marion's *Flight Risk: The Coalition's Air Advisor Mission in Afghanistan, 2005–2015* recounts an eventful period that would be punctuated by tragedy for those whose challenging mission involved developing military aviation capacity in a country beset by corruption and insurgency. Marion, a retired U.S. Air Force Reserve Colonel who earned a Ph.D. in history and twice served as a wing historian in Afghanistan, engages readers in a thoroughly researched and cogently presented work.

Flight Risk's chronological organization begins with two chapters establishing the proposition that between 1919 and 2005, Afghan air power relied heavily on foreign support, managing to stay aloft with local ingenuity, and perhaps out of geographic necessity, as technical assistance from various countries ebbed and flowed. This point becomes clear with the historical "test case" of Afghanistan's decline in military aviation capabilities during the 1990s, particularly after losing assistance from the Soviet Union, which had served as a frequent and important benefactor.

One would err to overlook the importance of Marion's first two chapters because although their time frame precedes his main period of interest, they demonstrate patterns of dependence and tribal allegiance that emerge in Chapter 3 with a nascent but expanding U.S. air advisory mission from 2005 to 2010.

With its focus on the first 4 months of 2011, Chapter 4 details a rapid departure from signs of progress in the professionalization of the Afghan Air Force (AAF) when one of its members, Colonel Ahmed Gul, committed the deadliest insider attack on U.S. Forces since 2001. Nine U.S. air advisors died in his rampage at Kabul International Airport's Air Command and Control Center (ACCC). Chapter 5, covering the remainder of 2011 to the summer of 2013, reviews the complexities of instituting new force-protection measures and aircraft against the backdrop of the same old problems; readers of Marion's work may begin to think that "corruption and control" is a more appropriate phrase than "command and control" to describe the type of C2 that has defined Afghan air power. The final two chapters of Flight Risk relay effects of political uncertainty and summarize that despite individual successes, "it was AAF institutional success that remained elusive through 2015" (p. 216).

The disproportionately large section of the book dedicated to the 2011 insider attack at Kabul's ACCC may suggest an appeal to Pathos, but Thucydides would

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not likely find fault, as this event constitutes a turning point near the middle of Marion's period of focus, sets the stage for the events to follow, and illustrates important realities of operational risks in Afghanistan.

Appeals to Logos are in fact the strongest feature of *Flight Risk*. The decline in Afghan air power

in the absence of Soviet support, as well as comparisons to advising missions in Korea, Vietnam, and El Salvador, demonstrate Marion's generally scientific approach. This draws methodological support from highly effective archival research and oral history interviews, many details of which appear in appendices and notes that offer more information than most casual readers might want, but that historians would likely appreciate.

Another consistent strength exists in Marion's attention to substantiate concepts that other writers may leave vague. For example, the importance of cultural awareness appears in multiple instances with a clear link to language skills. This presents itself on the side of advisors, with General Walter D. Givhan's skills in French and Dari and Czech air advisors' skills in Russian, as well as on the side of advisees, with the importance of English literacy for Afghan pilots.

Despite its author's apparent high regard for the importance of language, *Flight Risk* could benefit from translation work to support more historical background. Kautilya's Arthashastra, a strategic classic with a title meaning "*Treatise on the Science of Political Economy*," refers to reconnaissance from mountains and conveyance of information via "flying pigeons of the royal household with passage seals or fire and smoke at successive distances" (Book II, Chapter XXXIV; present author's translation from Sanskrit). This is not to suggest that *Flight Risk* requires a discourse on antiquity, but that some reference to the extensive history of operating in the difficult terrain between the Indian subcontinent and Central Asia would add context.

Marion acknowledges other potential questions that readers may pose regarding his book's breadth and depth. He notes, for example, after highlighting his interest in deploying to Afghanistan in 2009, due in part to experience learning about the Soviet Mi-8 helicopter as a former U.S. Air Force pilot (p. xiii), that the acquisition details of this aircraft's export variant, "the politically volatile, Russian-built Mi-17" (p. xv), remain for other historians to address.

Overall, given Marion's dedication to applying logic to present evidence, readers may be left wishing that he would be the historian to undertake the challenge of investigating more aspects of operations in Afghanistan. For its purpose, *Flight Risk* succeeds and offers valuable lessons for anyone interested in military or technical advisory work in a foreign country.

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