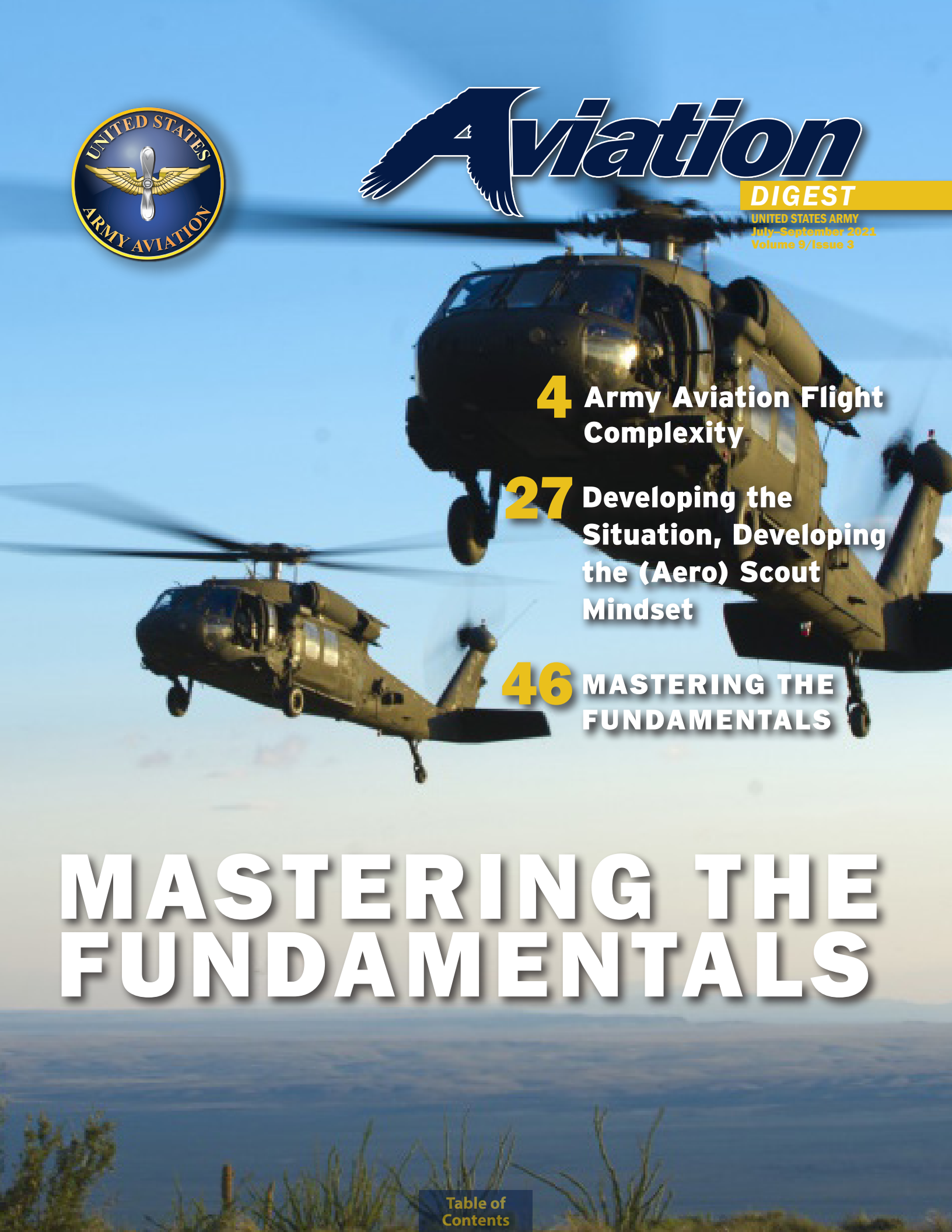

Aviation DIGEST

UNITED STATES ARMY
July–September 2021
Volume 9/Issue 3

MASTERING THE FUNDAMENTALS

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UNITED STATES ARMY Aviation DIGEST
The Professional Bulletin of the Army Aviation Branch, Headquarters, Department of the Army, PB 1-21-3
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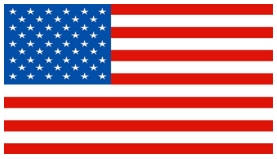

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The Doctrine Division, Directorate of Training and Doctrine (DOTD), U.S. Army Aviation Center of Excellence (USAACE), Fort Rucker, AL 36362 produces the *Aviation Digest* quarterly for the professional exchange of information related to all issues 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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Submit articles or direct comments pertaining to the *Aviation Digest* to: *usarmy.rucker.avncoe.mbx.aviation-digest@mail.mil.*

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:

KATHLEEN S. MILLER
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to the Secretary of the Army
2118004

About the Cover:

U.S. Army UH-60M Black Hawk Helicopters prepare to land during a training exercise at Holloman Air Force Base, New Mexico, 25 September. Soldiers from the 101st Airborne Division use the Holloman and White Sands Missile Range training ranges to conduct a Hostile Environment Medical Training Course, designed specifically for Close Protection Operations during deployments to high threat regions throughout the world.U.S. Air Force photo credited to A1C Chase Cannon

The Command Corner

The focus for Army Aviation remains building multidomain operations (MDO) ready forces for 2028 and beyond. Given our continuing global commitments and operational tempo to support our combatant commanders, the focus for our training remains the blocking and tackling, the fundamental skills, for our aviators. Tailoring the training ensures we achieve a level of readiness to meet mission requirements. Our combat readiness is a result of designing tough, realistic training with sufficient correct repetition to build mastery and expert knowledge.

Transforming our branch to compete in large-scale combat operations (LSCO) includes training scenarios at the correct echelon allowing our units the opportunity to grasp the essential fundamentals. Building battle-ready crews and formations at the company level and below entails running through the "reps and sets" to achieve proficiency in the skills at this level. Mastering the foundational skills enables our junior leaders to build to collective training and maximize opportunities during home station training, a combat training center rotation, or a deployment.

Mastering the fundamentals emphasizes training below the battalion level and includes maneuver, live-fire exercises, and qualifications (crew) for every specialty in the organization. Fundamentals begin with crew proficiency—this is where it begins. Growing our Unit Training/Evaluators (UT/Es) is how we get the reps and sets for advanced tactical skills that are essential for maneuvering in complex environments. The UT/Es will tackle the basic aviator tasks allowing the tactical instructor pilots to focus on the skills necessary for complex coordinated combined arms maneuver.

Our Aviation Training Strategy is a progressive building block approach enabling skills and knowledge from basic to advanced tasks and conditions for individual, crew, and collective training. Challenging training and integration of increasing levels of complexity in both tasks accomplished and the environment is the intent of the strategy. We build and sustain proficiency through repetitive iterations of the same task while increasing the level of complexity and stress, always ensuring task performance is to standard. Under this approach, units are continually training vs. surging to conduct training events.

Multidomain operations includes effective air-ground operations (AGO) with the full integration of aviation maneuver and ground maneuver as a combined arms team. As a maneuver component of the ground scheme of maneuver, Army Aviation achieves interdependence with ground forces through shared understanding of the environment and integrated or synchronized scheme of maneuver and fires with triggers and conditions for employment to meet the commander's intent. Our crews, platoons, and companies must have mastery of the fundamentals so they can focus on the complexities of AGO in a MDO environment.

As a force, we have to include maintenance in our training scenarios. As we build and execute the training for LSCO, the ability to execute dispersed maintenance in a complex environment is essential to our ability to project combat power. Small, distributed maintenance units will leverage the capability at each location with the Soldiers having mastery of the maintenance skills to keep our aircraft in the fight.

Army Aviation provides ground force commanders (GFCs) with unmatched mobility, speed, range, flexibility, and persistent reconnaissance. We established trust with our GFC built on our mastering of the fundamentals of our branch, allowing aviation units to support the commander's objectives for any mission against a wide array of threat capabilities. We are the most dynamic option for every commander providing an adaptable and fundamentally sound force for every environment.

Above the Best!
David J. Francis
Major General, USA
Commanding

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Aviation DIGEST

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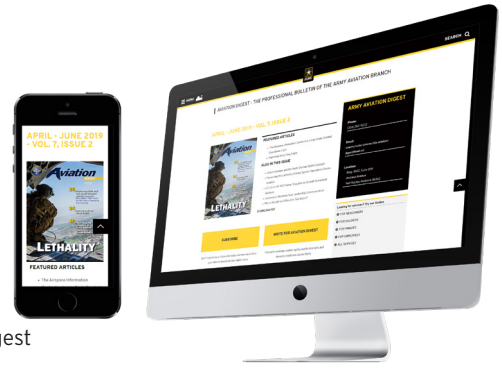

Author Guidelines

Articles prepared for *Aviation Digest* should relate directly to Army aviation or reflect a subject that directly relates to the aviation professional. Submit the article to the Aviation Digest mailbox at usarmy.rucker.avncoe.mbx.aviation-digest@mail.mil.

Please note that *Aviation Digest* does not accept previously published work or simultaneous submissions. This prevents an overlap of material in like publications with a similar or same audience.

Aviation Digest is an open-source publication. As such, we **do not** accept articles containing For Official Use Only or Classified materials. Please do not submit articles containing Operations Security (OPSEC) violations. If possible, have articles reviewed by an OPSEC officer prior to submission.

Please submit articles via MS Word document format. Articles should not exceed 3500 words. Include a brief biography (50 word maximum) with your article. We invite military authors to include years of military service, significant previous assignments, and aircraft qualifications in their biographies.

Aviation Digest editorial style guidelines follow the American Psychological Association Publication Manual, 7th edition; however, *Digest* staff will incorporate all necessary grammar, syntax, and style corrections to the text to meet publication standards and redesign visual materials for clarity, as necessary. Please limit references to a maximum of 20 per article. These changes may be coordinated with the authors to ensure the content remains accurate and reflects the author's original thoughts and intent.

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.

Non-military authors should submit authorization for *Aviation Digest* to print their material. This can be an email stating that *Aviation Digest* has permission to print the submitted article. Additionally, the author should provide a separate comment indicating that there is no copyright restriction on the use of the submitted material.

The *Aviation Digest* upcoming article deadline and publication schedule is as follows:

October–December 2021 issue articles due September 1, 2021 (published on or about November 15, 2021)

January-March 2022 issue articles due December 1, 2021 (published on or about February 15, 2022)

April-June 2022 issue articles due March 1, 2022 (published on or about May 15, 2022)

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

CH-47 Chinooks from B Co "Big Windy," 1-214th General Support Aviation Battalion, conduct a training flight over the Mediterranean Sea off the coast of Cyprus. Photo by MAJ Robert Fellingham, 12th Combat Aviation Brigade

Army Aviation Flight Complexity

By MAJ Jeffry H. Warren (Ret.)

The Setting

This article details my combined personal experience and professional observation at a training mission in the Republic of Korea during winter conditions, overwater, and while under night vision goggles (NVG). The unit was a UH-60A medical evacuation company stationed just south of the tactical exemption zone at Camp Page, situated in a mountain bowl north of the city of Chuncheon.

The airfield runs parallel to a river just north of it. The article involves NVG operations overwater to a small island called Widow Delta, which is situated in the middle of the river and approximately 3 miles southwest of the airfield. The terrain surrounding Camp Page includes high mountains with several valleys that have numerous high-power tension lines running in all directions and across every valley entrance to the airfield. These power lines also cross the river in numerous locations to the east, west, and portions of the south river bank in relation to Widow Delta.

Airfield weather during the winter is typically visual meteorological conditions (VMC) with occasional instrument meteorological conditions (IMC) that usually occur during the mornings and later in the dark hours. The airfield has a special non-directional beacon (NDB) approach requiring a significant turn once NDB-inbound, while requiring tight adherence to procedure turn as depicted, to remain out of the tactical exemption zone during the approach. To add additional complexity, the NDB "bearing to" would typically range in a 70-degree arc oscillating back and forth until within 2 miles, at which time the "bearing to" would stabilize with an accurate-to-station magnetic bearing. The instrument departure procedure for Camp Page was a spiraling climb over the NDB to 7,700 feet or higher until Wonju Approach Control (Wonju Airport) could be contacted via radio to proceed as filed/requested. During the winter, the freezing level was typically below 7,000 feet, so all aircraft anti- and de-ice systems were required to be operational if flight was expected at an altitude within the forecast freezing/icing level.

The Mission

The mission was a day out, night/NVG continuation training mission for dust landings, hoist training, and overwater flight. The crew consisted of two current and qualified aviators, a flight medic in training, a non-rated flight instructor (FI), and a UH-60 crew chief. The mission was to be conducted in VMC and provide the FI with a training opportunity to instruct the new medic during readiness level (RL) progression, while providing continuation training for the two pilots (PIs) to remain proficient in dust landings; hoist operations; and overwater flight under day, night, and NVG conditions.

The Preparation

Mission preparation was standard for a day-out, night-return mission in the local area. The crew conducted a thorough brief of the mission, with the entire crew being involved in the planning. The crew discussed and rehearsed key tasks and critical points for the training mission. The brief was a medium risk due to the crew conducting live hoist training for RL progression no higher than 25 feet above ground level (AGL), with weather forecasts predicting light snow. Visibility was forecast at greater than 3 miles with intermittent 3 miles due to light snow.

The crew conducted the preflight during daylight hours. During the run-up, the de-ice system and anti-ice systems were tested due to the temperature and possible snow conditions. All systems checked operational. The crew departed for Widow Delta and conducted the daylight portions of the training. The training was uneventful. As the sun set, the crew conducted several night tasks until the conditions were acceptable for transition to NVGs.

Once all crewmembers switched to NVGs and completed focusing them, the NVG training portion of the mission began. During the hoist training, a light snow began. Visibility decreased slightly to 3 miles, while the ceiling remained well above 1,000 feet. Once the non-rated crewmember (NRCM) training for hoist RL progression was complete, the crew continued the final portion of training with practice brownout landings under NVGs. Widow Delta had some dust areas that offered a good training opportunity for approximately 50 percent brownout. During the training, the aircraft would depart to the southwest with a left turn over the water and continuing a race track pattern to final to the landing zone (LZ). On the third departure, the pilot-in-command (PC), situated in the left seat, noted that the visibility was dropping slightly and that the snow had picked up to greater than light snow.

From Easy to Complex

The crew continued to the LZ and conducted its fourth landing. The PC and crew noted that due to the weather conditions changing rapidly to conditions not forecast, they would depart and return to base immediately.

The PI was on the controls, conducted the departure with a left turn out to fly northeast over the water, climb to traffic pattern altitude, and return to the airfield 3 miles away. Within 20 seconds after turning northeast over the water, the snow turned to heavy and the visibility dropped to zero with a complete whiteout. This easy training mission had just become a very complex and dangerous mission.

Fortunately, the crew were well-versed in crew communication and coordination. The PC took the controls and vocalized his

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The Army honors all our people for their long-standing courage to answer the call to service and make our communities better. SSG Smith with 2nd Battalion, 11th Field Artillery enjoys the views post-reenlistment. U.S. Army photo by 1LT Stephanie Snyder

actions to the crew, while the other crewmembers acknowledged and gave input. Based on the location and timing, the aircraft was in a very precarious situation. If the crew executed the established unit standard operating procedure (SOP) inadvertent IMC (IIMC) procedure, it would cause the crew to execute a climb from an unknown position with high-power tension lines on two sides and mountainous terrain on the other two sides. No turn could prevent heading toward a known hazard, while entering the circling climb to 7,700 had a high probability of creating spatial disorientation, not to mention the icing factor. These were the factors the PC ran through his mind in a few micro-seconds as he transitioned to instruments and began reducing airspeed to 30 knots. While he continued to fly the aircraft utilizing instruments and following the UH-60 aircrew training manual (ATM)[1] task steps (task 1184) in minus the initiation of a climb, based on conditions and situation he instructed the PI to monitor the radar altimeter, verbally count down, and stop him at approximately 10 feet. The best option in the scenario was to reduce airspeed and altitude to let down until the water gave contrast with the whiteout. As expected, at 12 feet AGL, the crew gained contrast and vision of the water.

With a visual contrast available, the crew vocalized that it had to find a known point, while the PC followed with the verbalized options that had raced through his mind. The crew agreed the least risk and most likely option to land safely was to continue low over the water with minimal turns until it found a suitable landing area or found a known point. The crew formulated that from a known point, it could identify the safest route to get back to the airfield or a point and land the aircraft safely. The crew knew the entry route to the terrain flight training area was to its north and that there were no wires along the river road, which was routed along the southern side of a mountain range. The crew began a slow left turn and headed slowly north. A car happened to be driving along the river road headed southwest, which illuminated the area along the mountain range. From the illumination, the crew identified the entry valley to the terrain flight training area, the known point.

The crew continued to the known point, 10-15 feet AGL over the water, on instruments. Once the crew neared the location, it turned 180 degrees, which it knew headed directly to the airfield and the lowest set of electrical wires and poles. As the crew continued directly to the airfield, it continued to manage the situation and vocalize the assorted tasks. This included the PC maintaining level wings and pitch while staying on heading, and the PI cross-checking systems and heading while managing the radar altimeter callouts. The NRCMs continued to give feedback on what they were seeing out of the gunner's windows, while also on the lookout for better weather conditions.

As the aircraft approached the shoreline, the visibility began to increase while the snow dropped back to a light snow condition. As the conditions improved, the PC announced he would begin a climb.

[1]This publication is available on the U.S. Army Training and Doctrine Command intranet Sharepoint website with a valid common access card.

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As the aircraft made landfall, the whiteout conditions and the zero visibility changed to unlimited ceiling and 2 miles visibility. The PC continued his climb to traffic pattern altitude and once assured of VMC conditions, he transferred the controls to the PI.

The crew entered the traffic pattern, completed a roll-on landing in whiteout conditions, and taxied to parking.

Summary

Army aviation operations can range from simple to complex in a matter of seconds. In this training exercise, the crew found itself in a situation where location and timing changed all the available options. All the possible IIMC and SOP options became extremely high risk, leaving the crew to have to apply real-time risk management and determine the best option based on the situation, which became a let-down over the water. Of course, this procedure isn't in the ATM and isn't taught. However, it became the option with the least risk as the crew vocalized all the options.

It is important to understand that the situation you find yourself in, whether rotary wing or fixed wing, may not always be cut and dried. In complex situations, your judgment and full communication as a crew is what will make the difference. Situations can and will arise that may cause the crew to have to use a mixture of procedures based on location and timing when an unforeseen event arises. In this situation, the crew used the current Emergency Response Methodology (ERM), found in "Shared Rotary Wing Aircrew Training Manual" Task 1070, which was recently produced by the United States Army Aviation Center of Excellence (Francis, 2020).

This mission occurred well before this formal establishment, but the method was still the same. The crew first continued flying the aircraft. The crew was alerted by the PC as the first to announce IIMC. The crew vocalized its situation and possible options. The crew determined how it would attack the emergency situation and continued to communicate. The rated aviators continued to fly the aircraft as a team; each member understanding his tasks and vocalizing them and any deviations he noted. The NRCMs vocalized their tasks and any deviations they noted. The crew communicated to the airfield tower once all aircraft critical tasks and the plan were understood by the crew. All tasks are subordinate to aircraft control, and it takes the whole crew to fully control the aircraft in an emergency situation, whether that be an engine failure or IIMC situations.

Many lessons were learned on this flight. I know; I was the PC. Fortunately, I had a rock solid crew and the PI, CW2 Derek Pepin, was a unit PC and sharp on his pilot skills. We started the mission as a simple day-out, night-return training flight. During my military career, that flight was the most complex I ever encountered—and to think—we were only 3 miles from our home airfield. All I can recommend is always be prepared, expect the unexpected, use the ERM because it works, and survive to fly again.

Reference:

Francis, D. (2020, November). Emergency response methodology update–Flight reference cards. *Flightfax*. https://safety.army.mil/Portals/0/Documents/ON-DUTY/AVIATION/FLIGHTFAX/Standard/2020/Flightfax_95_November_2020.pdf

Biography:

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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Photo by *PS Magazine*

PS MAGAZINE:

INFORMING AVIATION READINESS

By MAJ John Osterson, Dr. Rob Hill, and Mr. Frank Chase

You're an aviation leader responsible for the maintenance of not only your unit's aircraft but all other assigned fleets. These duties include ensuring supply and logistics functions are handled competently and efficiently. The systems and functions under your watch are complex. The technical manuals are immense. They're also sometimes missing information, incorrect, or outdated. And while there are aviation newsletters and other information resources available to help out, there's no single repository of information to help make you successful.

PS Magazine offers a wealth of information to aviators responsible for the care and maintenance of their aircraft and equipment. June 2021 marks *PS Magazine's* 70th anniversary of providing Army maintainers, supply specialists, unit leaders, and individual warfighters with the information they need to ensure their units achieve the highest possible operational readiness rates, stay safe, reduce wasteful spending and, ultimately, are combat ready.

This article will provide a brief history of *PS Magazine*, with emphasis on its coverage of aviation-related topics, its recent evolution to a fully online information portal, and ways aviation leaders can use this information resource to enhance unit and fleet readiness.

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PS Magazine–A Brief History

The history of *PS: The Preventive Maintenance Monthly*, also known as *PS Magazine*, begins with its creator, Will Eisner. If you're a fan of comic strips, comic books, and graphic novels—otherwise known as sequential art (a term coined by Eisner)—then you've likely heard of Mr. Eisner. The equivalent of an Oscar for the best in motion pictures is the Eisner Award for sequential art.

Eisner was already an established comic writer and illustrator (having created *Sheena*, *Queen of the Jungle*, and *The Spirit*) when he was drafted into the Army in 1942 (Will Eisner.com, 2021). Initially assigned to Aberdeen Proving Ground, he wrote and illustrated for the installation's military newspaper, *The Flaming Bomb*. While there, he created a comic strip featuring Private Dogtag and also a series of posters dealing with preventive maintenance featuring a hapless character named Joe Dope (Rutigliano, 2017).

In 1944, now Warrant Officer Eisner, was assigned to the newly created *Army Motors* magazine, to which he brought Joe Dope. Whereas before he only reached a local audience, now his reach would be Army-wide. Eisner formerly introduced Joe as "helping to win the war by being the doggondest fool in the Army!!!" He was "a new character with a desperate destiny designed to call attention to habitual failures in maintenance of all Army equipment" (Army Motors, 1942b, pp. 238-239). Eisner also created new characters: MSG Half-Mast McCanick (the only Soldier in the Army to wear a name tape with his first rather than last name), who answered letters to the editor; and the vivacious mechanic, CPL Connie Rodd (Army Motors, 1942a, p. 166).

After the war, Eisner returned to writing and drawing *The Spirit*, along with other endeavors. In 1948, aware of a possible business opportunity, Eisner created a company, American Visuals Corporation, which aimed to use comics, cartoons, and illustrations for educational and commercial markets (Knodell, 2015).

Will Eisner in uniform. Photo via Ohio State University Library

In 1951, at the outbreak of the Korean War, Eisner's American Visuals was asked to produce a replacement magazine for *Army Motors* called *PS: The Preventive Maintenance Monthly*. Whereas *Army Motors* had been a largely conventional text-heavy magazine with technical illustrations and photographs supplemented with cartoons, *PS Magazine* was a full-fledged comic book.

Since its inception, the magazine has been written, researched, and edited by Department of the Army Civilians and managed by various editors. The home office of PS was first located at Aberdeen Proving Ground, Maryland, from April 1951 through January 1955. It moved its home several times thereafter, including Raritan Arsenal, New

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Jersey; Fort Knox, Kentucky; and Lexington-Blue Grass Army Depot, Lexington, Kentucky. In June 1993, it moved to and remains at Redstone Arsenal, Alabama. In June 2017, the magazine published issue 775, its last paper issue (Redstone Arsenal, 2017b). From June 2017 till November 2019, the magazine continued to be published as a 64-page, cartoon-illustrated, monthly magazine, delivered online and via mobile application. Starting in December 2019, the monthly magazine ceased to exist. All content is now published directly to the *PS Magazine* website, located at https://www.psmagazine.army.mil.

Aviation in *PS Magazine*

The first mention of aviation in *PS Magazine* was in Issue 7, which covered December 1951 through July 1952. In an article titled, "Army Aircraft: Maintenance and Supply Switches to Ordnance," the magazine reported:

As many of you know, the care and feeding of Army aircraft is now the responsibility of the Ordnance Corps. The changeover from Air Force to Army is a gradual thing, that's been taking place ever since the National Security Act of 1947 established the Air Force as a separate service. Before that time, the Army Air Force was in charge of all aircraft including the few planes then used by the Field Forces. Using units of the Army did organizational maintenance only....Your old friend PS Magazine is now included in this program too. Viz: Starting with this issue, you now have an Air Department, run by a gent called Sgt Windy ["Windy" Windsock], who will do on the wing what Half-Mast does with his feet on the ground. You can look for the latest dope, field fixes, and suggestions from him, and moreover, he's anxious to hear your problems. So write soon, will yuh? (Aberdeen Proving Ground, 1951-1952, p. 300).

Ever since, *PS Magazine* has had a dedicated section devoted to fixed- and rotary-wing aircraft. Its first aviation-related cover was in August 1952. The Army Aircraft section of that issue focused on L-17B, L19/L-19A, and LC-126 fixed-wing aircraft and H-13, H-19A, H-23, and YH-18A rotary-wing aircraft. Since then, aviation has been featured on *PS Magazine* covers routinely, especially during the 60s and 70s. In 2002, the PS character associated with aviation for 50 years, SFC Windy Windsock, "departed" for a new assignment, replaced in 2003 by SFC Benjamin "Rotor" Blade (Redstone Arsenal, 2002, pp. 27-36). The last

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Photo by *PS Magazine*

aviation-related cover was in May 2017, when the magazine paid tribute to the Tuskegee Airmen who served in the 332nd Fighter Group known as the Red Tails (Redstone Arsenal, 2017a, pp. 28-34).

PS Magazine Today: Still Here for Aviators

The aviation community is rich with information sources. In addition to this publication (Army Aviation Branch's Professional Bulletin), there are numerous fleet newsletters and websites. For aviation knowledge, it makes sense to turn to these sources first. *PS Magazine* should also be required reading for all aviators, especially those on the front line responsible for maintaining not just aircraft but small arms; communications/electronics equipment; tactical vehicles and trailers; and chemical, biological, radiological, and nuclear equipment and masks. Says CPT Kaitlin Lafferty, 2-10 Assault Helicopter Battalion, 10th Combat Aviation Brigade, "I discovered *PS Magazine* when I was a young lieutenant. The content of the [magazine], to include vehicles, aviation, radio equipment, and more has guided me and helped me solve several problems throughout my career" (personal communication, May 6, 2021).

The magazine's mobile-friendly website offers a few features to optimize the user experience in the pursuit of enhanced unit, fleet, and personnel readiness:

- The "meat and potatoes" of the website is found at the **Articles** tab in the website's navigation menu. Click on it and you'll find more than 80 pages (and growing) of content. To narrow your search, you can either click on the **Aviation** category on the left side of the page or execute a search for specific terms, such as "Apache," "Black Hawk," "stabilator," etc. The *PS Magazine* staff is currently working to aggregate content by fleet or platform. In the near future, it will be possible to click on a link and see all Chinook articles, for example, on a single page.

- The search function on the website only provides results for content that appears on the website; however, it's still possible to search the older, now archived monthly issues of the magazine. To execute that search, click on the **Archive/Index** tab in the navigation menu. Under the **Legacy/Archive** heading, there are instructions on how to access a separate site to search every monthly issue from 1999 through 2019. There are also links to current and past indexes (1999 through 2019), which provide an alternative method of searching for specific topics.

- The magazine has a year-old recognition program called "I Own This." Its purpose is to spotlight warfighters of all services who exemplify the highest standards of care for their assigned vehicles and equipment and contribute in meaningful ways to their unit's overall maintenance and supply posture. In short, they live and breathe readiness. To date, the program has not had any aviation mechanics or maintainers nominated, so consider taking a few minutes to nominate a peer, subordinate, or superior who models readiness by going above and beyond in caring for their units or personally assigned vehicles and equipment.

- Much of *PS Magazine's* content originates from its readers. Since its first issue, it has provided opportunity for readers to submit questions, as well as offer ideas, suggestions for improvement, or best practices. Examples of what readers submit to *PS Magazine* include something that doesn't make sense to them in a technical manual, uncertainty about maintenance or supply policy, needing the latest national stock number, or suggesting better ways to maintain equipment. It's important to understand that the *PS Magazine* staff is comprised of writer-editors, not equipment specialists. Every inquiry must be sent to the appropriate life-cycle management command, commodity owner, subject-matter expert, or policy office for review; they're the ones with the expertise to accurately respond to the question or validate and endorse any suggestion or best practice. To submit either a question or an idea, simply click on the *Submit Questions and Ideas* tab on the website's navigation bar.

70 Years More

Not many missions in the U.S. Army can proudly claim 70 continuous

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years of service. *PS Magazine* can only do so because it's kept its focus on serving front-line Soldiers of all branches and specialties (as well as sister-service personnel who maintain Army-sourced equipment). Some readers miss the paper version and the cartoons, but the magazine's fundamental task of informing Army readiness and improving Soldiers' ability to perform their preventive maintenance checks and services remains unchanged. In fact, it's even enhanced because it can get this information into Soldiers' hands much quicker.

The aviation community deals with sophisticated, complex, and expensive fleets and equipment. Aviators, especially unit leaders, need to be able to make fully-informed decisions that ensure their aircraft and other vehicles and equipment are fully mission-capable and at the highest operational readiness rates. Add safety concerns and avoiding costly repairs, and the value of reading *PS Magazine* on a routine basis becomes clear.

Being "above the best" means using every resource available to ensure your aircraft, vehicles, and equipment are maintained to the highest possible standards. *PS Magazine* is specifically designed to help you achieve this end state and looks forward to partnering with the aviation community for yet another 70 years and beyond.

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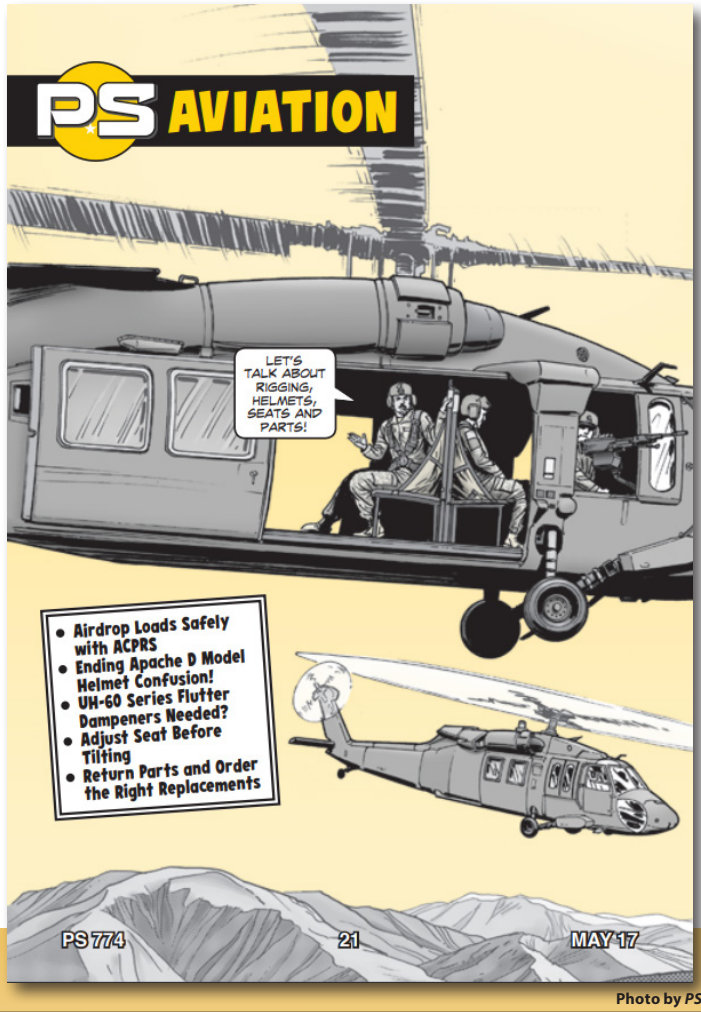

Photo by *PS Magazine*

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Army Ground Based Sense And Avoid System Exceeds 10 Thousand Hours of Safe Unmanned Aircraft System Flight Support in the National Airspace System

By Ms. Janet Davis, Mr. Larry Herbek, and Ms. Ashley Casiano

The Army Ground Based Sense And Avoid (GBSAA) system recently surpassed the 10,000 hour mark in providing safe access to the National Airspace System (NAS) for the Department of Defense's (DoD's) unmanned aircraft systems (UAS). System support has included more than 4,350 successful UAS flight operations. Unmanned aircraft supported include the Army's Gray Eagle UAS and the Air National Guard's MQ-9 Reaper, with future expansion potential to other Army tactical UAS. Initial operation of the GBSAA system at Fort Hood occurred in September 2016, with radar installation occurring in 2015 (Figure 1). Since that time, the UAS Project Office has fielded four additional Army sites and one Air National Guard (ANG) site in Syracuse, New York. Four additional ANG sites are currently in work, along with the development of a transportable system designed to support field exercises, starting with support for Northern Strike at Alpena, Michigan this summer. Since fielding, the GBSAA system has been instrumental in identifying and safely deconflicting numerous airspace conflicts between UAS and manned aircraft across the NAS. With more than 10,000 hours of safe UAS flight support in the NAS, ongoing daily use by multiple DoD services, and Federal Aviation Administration (FAA) approval at multiple sites with minimal flight restrictions, the system has been a significant success story for the DoD. The DoD continues to increase its reliance on UAS after establishing a track record of mission successes in contingency operations across the globe. This increased dependence on UAS has resulted in a new problem, as airspace in the NAS to safely fly UAS for Soldier training and readiness, as well as system development and testing, is limited and in high demand. Unmanned aircraft are also seeing increased use supporting domestic needs such as national disasters, border control, and law enforcement.

Figure 1. Army ground based sense and avoid radar at Fort Hood (GBSAA Office, 2015).

The lack of an onboard pilot presents an issue when flying in the NAS. Federal Aviation Regulations (FARs) prescribed by the FAA, specifically FAR 91.113, "Right-of-way rules: Except water operations," require each person operating an aircraft "to see and avoid other aircraft" (Right-of-way-rules 2017, para. b). The lack of an onboard pilot in a UAS makes this impossible, therefore prompting the need for an alternate technology to mitigate this risk. Historically, the DoD has accomplished this task with ground observers or chase planes, but the UAS Project Office developed the Sense And Avoid (SAA) advanced technology to address this issue.

GBSAA SYSTEM DESCRIPTION

The Army GBSAA is a system of systems designed to enable the safe integration of unmanned aircraft into the NAS the same as a manned aircraft would, without requiring special services or support from observers or air traffic control (ATC). The system utilizes multiple sensors, including organic radar systems and local ATC radar feeds,

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to detect aircraft in the surrounding airspace. The GBSAA system feeds data from these sensors into a dedicated fusion engine, which builds an integrated 3-dimensional model of the surrounding airspace. It then feeds it into a custom target classifier subsystem, which discriminates target aircraft from other returns (ground traffic, radar clutter, birds, etc.). Two independent sets of complex algorithms analyze this integrated air picture to determine if any aircraft present a possible collision hazard to the UAS and prioritize them in order of relative threat. **Figure 2** provides the high-level operational concept for the GBSAA system.

Ground Based Sense And Avoid operators receive both visual and audible alerts of impending air safety threats along with recommended avoidance maneuvers. This is

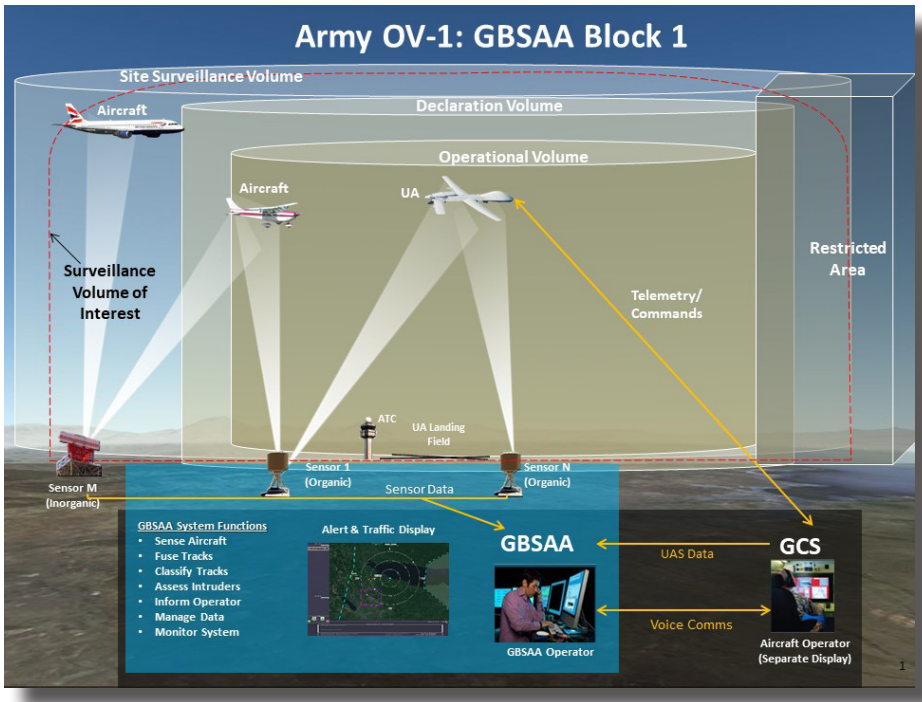

Figure 2. GBSAA block 1 OV-1 (GBSAA Office, 2017).

similar to the system utilized in the Traffic Alert and Collision Avoidance System, or TCAS II, equipment in manned aircraft cockpits to ensure greater traffic separation. The MIT Lincoln Laboratory developed these algorithms to maintain a 1000-foot vertical and 1 nautical mile horizontal separation from other aircraft and to calculate an optimized avoidance maneuver to ensure safe deconfliction of the encounter. The system display for the GBSAA system is shown in **Figure 2.**

The system also includes extensive health monitoring and a robust 'failover architecture' that ensures there are no single points of failure in the system. In the event of system hardware/software failures, this failover architecture automatically reroutes system data/processes to continue providing services, even if in a degraded mode. **Figure 3** shows the complete block diagram for the GBSAA system, to include lines of communication between the subsystems.

With the GBSAA sensor suite described above, the system provides 360 degrees of coverage for the UAS, greatly increasing the level of safety over the use of ground observers and chase planes. Since its initial deployment, the GBSAA system has been instrumental in identifying and safely deconflicting numerous airspace conflicts within the NAS.

At the current Army sites, the system provides coverage for the UAV while it is transitioning from airfields to nearby military controlled restricted airspace, where the UAV can fly without concern for commercial or civilian aircraft. Due to the limited volume and congestion of existing restricted airspace, the UAS Project Office is actively working to gain approval to expand the coverage into adjacent airspace, to include local military operating areas, or MOAs, and Class E/G airspace. This expanded airspace will provide greater training opportunities for the Gray Eagle units.

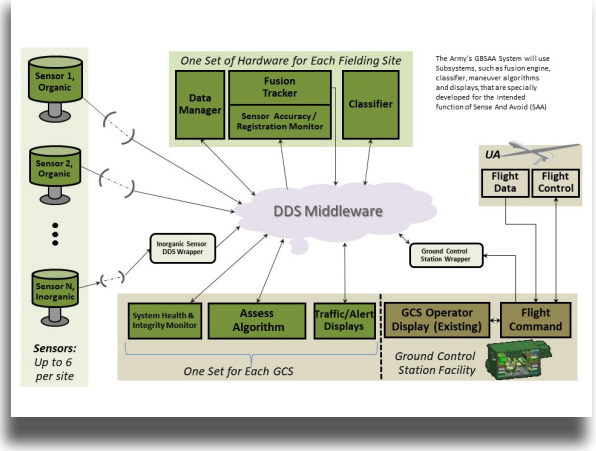

Figure 3. GBSAA block diagram (GBSAA Office, 2018a).

GBSAA HISTORY

In approximately 2009, the Office of the Secretary of Defense Airspace Integration Integrated Product Team, or AI IPT, designated the U.S. Army as the lead for Ground Based SAA development and the U.S. Air Force (USAF) as the lead for Airborne SAA development. Based on this designation, the U.S. Army Program Executive Office Aviation, or PEO AVN,–Project Manager Unmanned Aircraft System (PM UAS) began the effort to develop and field a GBSAA system in support of Gray Eagle training missions in the NAS. Project Manager UAS developed the GBSAA system over more than 5 years prior to first flight at Fort Hood. Subsequently, the UAS Project Office successfully fielded the system to Fort Bragg, Fort Campbell, Fort Riley, and Fort Stewart in support of training missions for

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Gray Eagle Units. Project Manager UAS worked closely with the Army Systems Readiness Directorate–Airworthiness (formerly Aviation Engineering Directorate) to ensure the system met all requirements to obtain an Airworthiness Approval. To this end, the GBSAA system meets DO-178C[1] guidelines for software safety at an overall Design Assurance Level B.[2]

The first fielded GBSAA system was Block 0 (baseline), which provided an integrated airspace picture including information on the heading, velocity, and elevation of other aircraft in the airspace via the system displays. The system identified potential conflicts relative to the unmanned aircraft currently receiving GBSAA services, designated as "Ownship," and provided a prioritized list on the system displays. The system operator, who had experience as either a pilot or an ATC, would determine an appropriate avoidance maneuver recommendation. Developers used this Block 0 system to validate the automated maneuver recommendations as the avoidance algorithms were running in the background, but the operator's screen didn't display the maneuver. Project Manager UAS fielded Block 1 of the GBSAA system in April 2018. This system included several improvements, including the display of the validated automated maneuver recommendation, as shown in **Figure 4.**

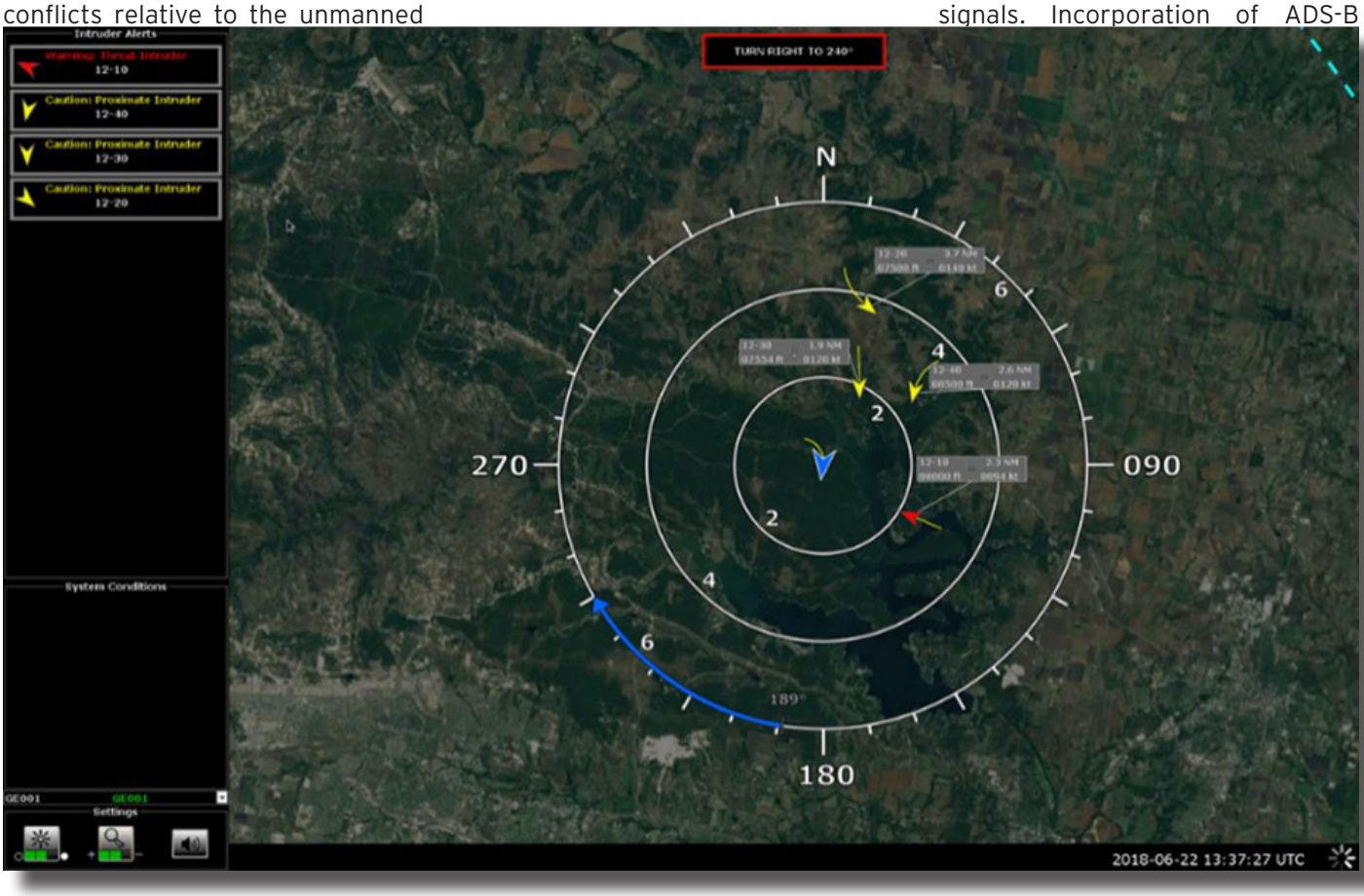

Figure 4. GBSAA system display (GBSAA Office, 2018b).

BLOCK 2 UPGRADE

Since fielding Block 1, the development team has continued to work to improve the system's performance via fielding a Block 2 system. Block 2 improvements will include a "Congested Airspace Mode," which will enhance system functionality in higher density airspaces, such as terminal areas and restricted airspace. Block 2 will reduce the number of unnecessary alerts in these areas where additional airspace structure and procedural controls are in effect, allowing reduced separation between aircraft.

Block 2 GBSAA upgrades will also include the incorporation of Automatic Dependent Surveillance-Broadcast (ADS-B) as an additional sensor added to the integrated air picture. Automatic Dependent Surveillance-Broadcast is a key part of the FAA's NextGen efforts to modernize the nation's airspace system and provides precise aircraft tracking using satellite signals. Incorporation of ADS-B will provide additional information on participating aircraft, including higher accuracy and faster updates on the aircraft position. Automatic Dependent Surveillance-Broadcast will also pave the way for the GBSAA system to provide coverage for a UAV without a physical connection to the ground control station (GCS). The GBSAA system currently

[1] **"DO-178C is the standard that governs the certification of software for airborne systems in commercial aircraft" (AdaCore, 2021).**

[2] **"DAL B [Design Assurance Level] describes flight electronics hardware whose failure or malfunction could cause a severe or hazardous condition that could involve some loss of life" (Military & Aerospace Electronics, 2016).**

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Figure 5. GBDAA Radar at Hancock Field (GBSAA Office, 2018).

requires a physical connection to the Ownship's GCS shelter to obtain telemetry data for the Air Vehicle, but this enhancement will be a first step toward eliminating that requirement.

A third major enhancement in the planned Block 2 will be improving the system's ability to recover from temporary anomalies and conditions that might impede the system from providing services, such as fewer missed data packets or temporary errant target detections on items such as storm clouds. The improved system will allow these types of system alerts to be 'un-latched,' assuming the condition is short-lived and corrects itself. This will improve performance and availability without impacting system safety.

AIR NATIONAL GUARD GROUND BASED DETECT AND AVOID

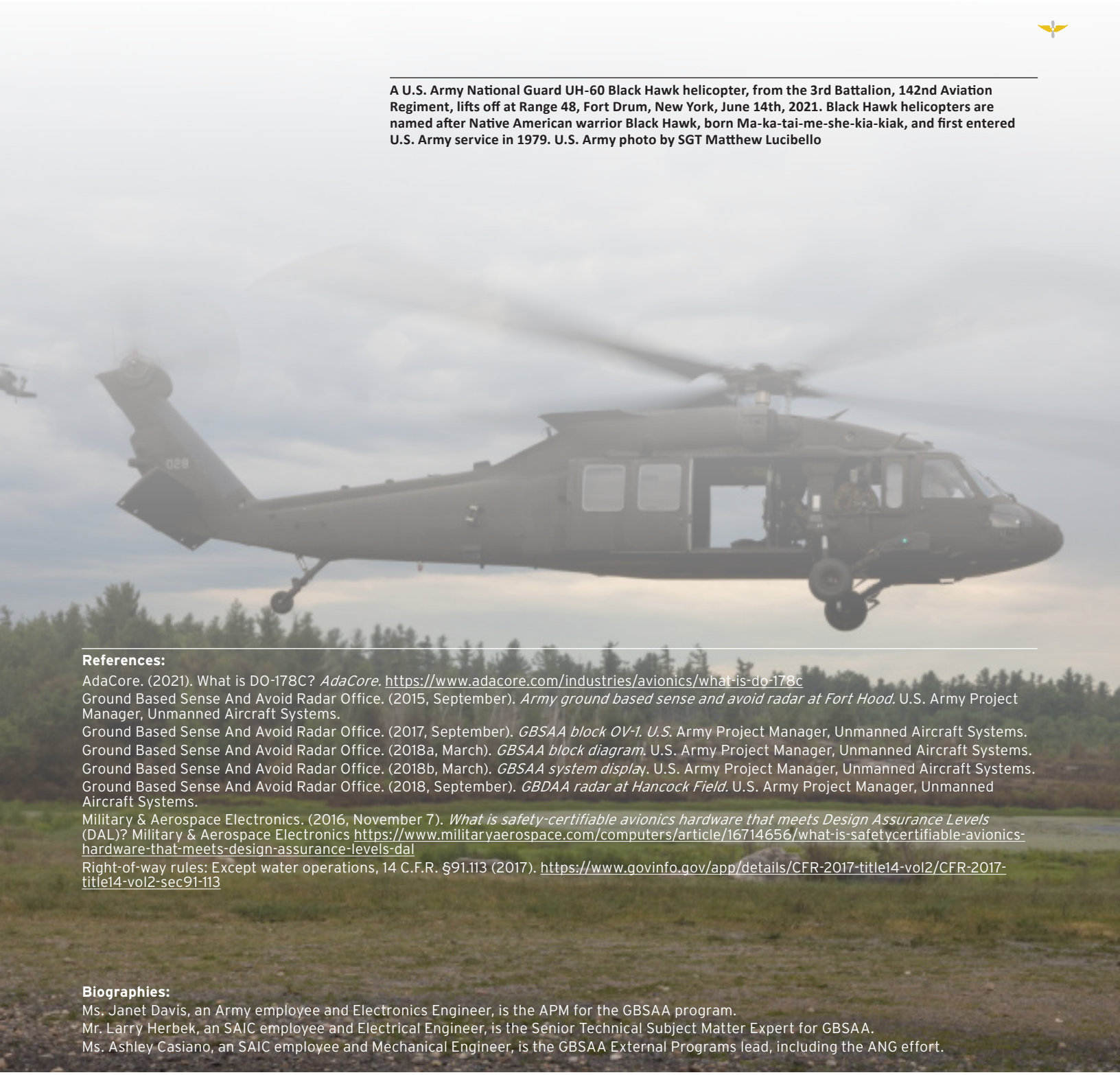
With the proven support to Gray Eagle units at the five Army sites, the ANG selected the GBSAA system for fielding at five Continental United States, or CONUS, sites in support of MQ-9 Reaper training missions. The USAF uses the nomenclature of "detect and avoid" rather than "sense and avoid," so the systems being fielded for ANG are termed Ground Based Detect And Avoid (GBDAA) systems. They utilize the exact same software and hardware as the Army sites, with the primary difference being that the ANG has the system displays placed directly in front of the pilot inside the GCS. The ANG sites operate with one organic radar system, as opposed to the two radar systems currently used by the Army. This is largely due to their planned flight operations, which involves the ANG Reapers departing the airfield and climbing directly up to Class A Airspace at 18,000 feet before proceeding to designated training areas.

The ANG is already flying with GBDAA in non-restricted airspace from Hancock Air Field, a Class C airport in Syracuse, New York **(Figure 5)**. Future fielding sites will be located in Fargo, North Dakota; March Air Reserve Base, California; Fort Huachuca/Davis-Monthan Air Force Base (AFB), Arizona; and Ellington AFB, Texas. In addition to these sites, the ANG has funded development of a transportable system, which is composed of the system hardware enclosed in a weatherized container with the system radar mounted on a transportable trailer. This capability will allow the ANG to support field exercises, starting with Northern Strike, held annually in Alpena, Michigan. While this is not an "on the move" capability, it still expands the utility of the GBDAA system, providing the possibility of using the system for disaster relief, border protection, and other transitional activities.

SUMMARY

The fielding of the Army GBSAA system has proven to be a great success story and a significant first step forward in the integration of unmanned aircraft into the NAS. In parallel with enabling ongoing Soldier training and readiness, this system is paving the way for future sense and avoid technology, as well

as future airspace processes and procedures.



A U.S. Army National Guard UH-60 Black Hawk helicopter, from the 3rd Battalion, 142nd Aviation Regiment, lifts off at Range 48, Fort Drum, New York, June 14th, 2021. Black Hawk helicopters are named after Native American warrior Black Hawk, born Ma-ka-tai-me-she-kia-kiak, and first entered U.S. Army service in 1979. U.S. Army photo by SGT Matthew Lucibello

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Right-of-way rules: Except water operations, 14 C.F.R. §91.113 (2017). https://www.govinfo.gov/app/details/CFR-2017-title14-vol2/CFR-2017-title14-vol2-sec91-113

Biographies:

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Mr. Larry Herbek, an SAIC employee and Electrical Engineer, is the Senior Technical Subject Matter Expert for GBSAA.

Ms. Ashley Casiano, an SAIC employee and Mechanical Engineer, is the GBSAA External Programs lead, including the ANG effort.

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Under the Radar: Solutions to Fire Control Radar Employment in Attack Aviation

By CPT Clayton B. Jaksha

AH-64D Apache Longbow Fire Control Radar Maintenance. U.S. Army image by Charles Rosemond, Training Support Activity Europe

Author Note:

The opinions expressed herein are the author's alone and do not represent the United States Army or the Department of Defense. Correspondence concerning this article should be addressed via email to CPT Clayton Jaksha at clayton.b.jaksha.mil@mail.mil.

A column of staggered T-80 tanks roll through a misty mountain pass, seeking to out-maneuver American forces on the other side. Fortunately, a platoon of AH-64D Apaches equipped with AN/APG-78 Longbow® Fire Control Radars (FCR) (Lockheed Martin & Northrop Grumman, 2019) and AGM-114L missiles hover masked behind the mountain's ridgeline. Unmasking only the FCR, one Apache scans the column of tanks and divides the targets amongst the platoon. On command, the Apaches launch AGM-114L missiles from behind the ridge and destroy the entire tank column, while never actually seeing the tanks or exposing themselves. This late-1980s scenario drove the development of the FCR (Silk & Sparrow, 2006). Yet, 24 years after the first Longbow unit fielding in 1997, attack battalions and air cavalry squadrons today would struggle to accomplish that mission with their organic FCRs.

Some modern attack aviators look warily on the FCR—most attribute this ambivalence to 20 years of counterinsurgency fighting, where the FCR was not the optimal means of orienting effects on the enemy. Throughout the Global War on Terror, attack aviation saw "fluctuating use" of the FCR and little, if any, live-fire FCR training (Kennedy, 2013, p. 26). Now, as Army aviation shifts to training multidomain operations (MDO), the community is uncrating its FCRs and facing a harsh reality: maintenance expertise and aircrew mastery have eroded over the last 2 decades. A general suspicion of the system festered as radars rotted in containers, aged on hangar floors, or idled on aircraft—never powered-on. Fire control radar detractors perceive that the system is frequently not mission capable (NMC), argue that it presents excessive false targets, and realize that they never have to actually train with a live FCR. These justifications for avoiding the FCR are laced in materiel truth, but they are also the product of lacking command emphasis and poor training management. Correctly maintained and trained, commanders can employ the FCR to provide overmatch on massed vehicle formations in MDO.

The FCR is value-added to attack aviation and, despite its faults, the system accelerates the pace of identifying and engaging targets. After using the AH-64D to defeat Saddam Hussein's Republican Guard in 2003, the vast majority of returning aviators found the FCR effective against moving columns of vehicles under adverse weather conditions (Silk & Sparrow, 2006, p. 1). Despite calumny from detractors, the FCR had demonstrable combat success against armored threats. To overcome distrust in the system, leaders at echelon must apply materiel and training solutions and bring the FCR back into Army aviation's suite of capabilities. In particular, commanders must emphasize FCR maintenance, train aviator expertise in radar employment, and most importantly, develop systems to evaluate collective FCR proficiency.

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Overcoming Environmental and Maintenance Challenges

The first reason an Apache pilot will give for not using the FCR will almost certainly be "it's broken." Unfortunately, this is the byproduct of sitting in containers for 20 years. As early as 2013, a National Training Center (NTC) observer-controller/trainer (OC/T) noted that "lack of FCR use has resulted in component failure or degradation resulting in [systems] that now require a significant number of parts and time to be invested in order to make them fully mission capable" (Kennedy, 2013, p. 26). Eight years have passed since that OC/T's assessment and sure enough, the problem has compounded.

Whether they possess AH-64Ds or AH-64Es, commanders who seek to rebuild their organic FCR combat power face steep initial costs, both in air budget and manpower. Worse yet, technical experts capable of troubleshooting FCRs are few and far between; aviation maintenance companies will likely draw on their entire section of technical inspectors to repair a decades-old NMC radar. Some units are seeing the long-term benefit of restoring their radars and investing time and money into the systems now. But if air budgets shrink in the coming years, commanders will have to make difficult decisions between fixing FCRs and delaying other aircraft maintenance. Commanders who invest in restoring their systems now will be better positioned to absorb the smaller costs of upkeep rather than the larger costs of complete restoration.

Units that choose to restore their FCRs will encounter a unique problem that necessitates an Army aviation-wide materiel solution. Currently, the only means of troubleshooting an FCR is to install it on an Apache and power on the aircraft. These old FCRs are almost all in an NMC or partially mission capable (PMC) status, so when units install them on a fully mission capable (FMC) aircraft to troubleshoot the system, the aircraft becomes PMC. Commanders who value their monthly FMC rate over FCR readiness will be unwilling to make that trade—aircraft readiness disincentivizes FCR readiness. To avoid this tradeoff, Apache formations need a test-bench system to conduct power-on diagnostic checks of the FCR while uninstalled from the aircraft. Along with expediting routine FCR repairs, fielding such a system to the force would prevent commanders from having to choose between aircraft and radar maintenance. Yet, even if a unit brings its FCRs to FMC status, some units will continue to self-impose maintenance challenges through indiscipline.

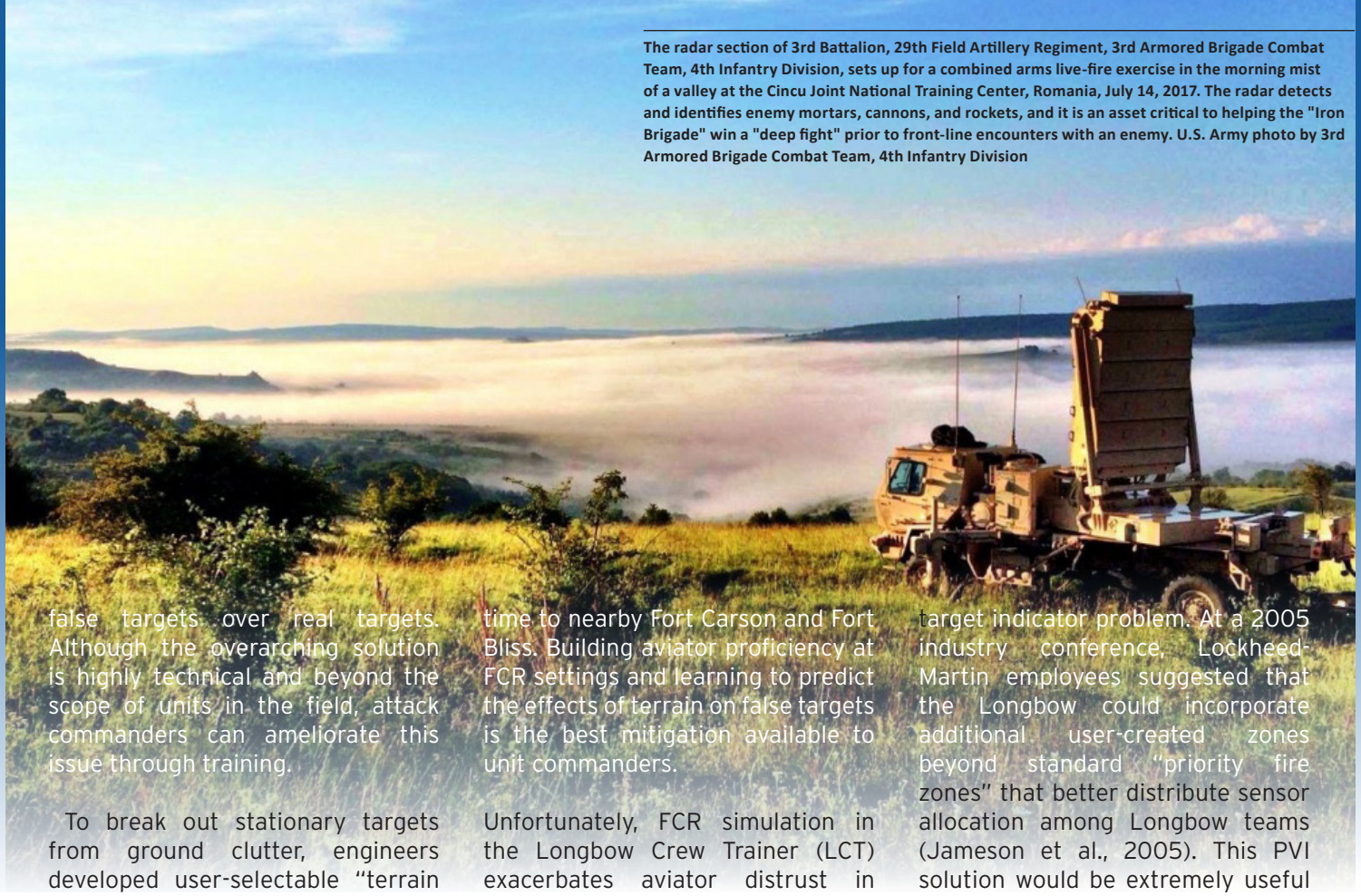
A wise maintenance test pilot once asked me, "If you wouldn't leave your brand-new laptop out in the Texas summer and Alaska winter, why would you leave these aircraft outside in that weather?" Like many other aircraft components, the radar is temperature-sensitive and occasionally struggles with excessive heat, cold, and moisture (U.S. Government Accountability Office, 1997). Except in rare circumstances, it would be impractical for an attack battalion or air cavalry squadron to hangar all of its aircraft when not in use—there simply is not space. The hangar floor is reserved for maintenance, but units should consider using any remaining space to hangar FCR aircraft. A warm, dry hangar will prevent component damage and save units their money and manpower in unscheduled FCR maintenance. For aircraft that must remain on the ramp, units should purchase and install FCR covers (NSN: 1730-01-508-3684);[1] much like other flyaway gear, discipline and standard procedures are key. Those who take the time to hangar or cover their radars will preclude expensive unscheduled maintenance.

Ultimately, aviators already know the solution to FCR readiness: Manage FCR maintenance like aircraft maintenance. Leaders should know their FCR statuses, brief their FCRs every morning at the production control (PC) meeting, and hold themselves and others accountable for stewarding the system. Even if the PC officer does not report FCR readiness on monthly reports, the unit must deliberately choose to care about maintaining its radars. It is impossible for an attack formation to train FCR employment techniques without any FMC FCRs. Devoid of leader presence, those FCRs will quickly drift back into their dusty containers in the corner of the hangar.

Mitigating False Target Indications

Since the program's inception, the FCR has struggled with finding excessive false stationary targets. Developers knew from the outset that the principal technical challenge would be detecting stationary targets and breaking them out from the ground clutter (Silk & Sparrow, 2006, p. 1). During its 1995 operational testing, the FCR "classified large numbers of stationary clutter objects as air defense units," and many indications "could not be correlated with any targets" (Silk & Sparrow, 2006, p. 12-13). As the system saw combat for the first time in 2003, the majority of those Apache pilots who destroyed columns of Iraqi tanks also found it produced excessive false stationary targets (Silk & Sparrow, 2006, p. 1). In the best case scenario, false stationary targets distract the aviator and muddle displays. At their worst, these false targets are detrimental to tactics and survivability as the radar prioritizes

[1]Readers with access to the Joint Technical Data Integrated website may reference the Apache -17 inventory listing for all variants of FCR covers and determine which best suits their aircraft.



The radar section of 3rd Battalion, 29th Field Artillery Regiment, 3rd Armored Brigade Combat Team, 4th Infantry Division, sets up for a combined arms live-fire exercise in the morning mist of a valley at the Cincu Joint National Training Center, Romania, July 14, 2017. The radar detects and identifies enemy mortars, cannons, and rockets, and it is an asset critical to helping the "Iron Brigade" win a "deep fight" prior to front-line encounters with an enemy. U.S. Army photo by 3rd Armored Brigade Combat Team, 4th Infantry Division

false targets over real targets. Although the overarching solution is highly technical and beyond the scope of units in the field, attack commanders can ameliorate this issue through training.

To break out stationary targets from ground clutter, engineers developed user-selectable "terrain sensitivity settings" (Silk & Sparrow, 2006, p. 7). Ideally, an aviator can match terrain sensitivity settings to the operational environment and increase the probability of correctly detecting stationary targets. A 2013 ***Aviation Digest*** article noted that rotational Apache units at the NTC habitually struggled with "limited knowledge and practical use of the FCR" and "determining which terrain sensitivity setting and schemes to use" (Kennedy, 2013, p. 27). This seemingly obvious solution is immediately available to all attack units; however, training FCR settings must go beyond a slideshow at a pilots' brief. If aviators only conduct FCR operations in their local flying area, they witness few differences in terrain and ground clutter from flight-to-flight. A unit's FCR training plan should include cross-country flights to areas of drastically different terrain to explore the strengths and weaknesses of each setting. These do not have to be dramatically large training events either—for instance, a Fort Hood unit could train terrain sensitivity settings by rotating a platoon at a time to nearby Fort Carson and Fort Bliss. Building aviator proficiency at FCR settings and learning to predict the effects of terrain on false targets is the best mitigation available to unit commanders.

Unfortunately, FCR simulation in the Longbow Crew Trainer (LCT) exacerbates aviator distrust in the radar. The FCR in the LCT is ***too*** good—it finds all targets, all correctly identified, all of the time, with minimal regard to the appropriate terrain sensitivity setting. Because aviators learn to use the radar in the LCT, they build unrealistic expectations that belie actual system performance. Then, aviators operate actual FCRs, and each false target enervates trust that the radar earned in simulation. Fire control radar training for attack aviators must include a thorough understanding of the system's strengths and weaknesses, so crews know how to best employ the radar. The LCT must simulate the common errors and faults that crews will encounter, so they can better react to those situations in the aircraft. Simulation is a key factor in building trust between aviators and equipment; realism in simulation heavily contributes to that trust.

Finally, as the Army continues to invest in future FCR technology, it should consider pilot-vehicle interface (PVI) options that would better mitigate the false stationary target indicator problem. At a 2005 industry conference, Lockheed-Martin employees suggested that the Longbow could incorporate additional user-created zones beyond standard "priority fire zones" that better distribute sensor allocation among Longbow teams (Jameson et al., 2005). This PVI solution would be extremely useful in pre-mission planning; aviators could fuse intelligence and targeting data to ensure they mass effects on the enemy. The newest versions of the AH-64E incorporate a nascent adaption of this concept that shows promise for future development. Another solution exists in the FCR priority schemes. A Boeing employee described the priority schemes at a 1999 international conference as "basic: either predator or prey" (Dimmery, 1999, p. 1). This prioritization methodology makes sense when all of the targets are true, but not when a high probability of false targets exists. A novel scheme would weight target priority by radar confidence in correct target detection. Then, the highest priority target would not be the most dangerous predator, but the most dangerous predator with the highest probability of correct detection. A combination of PVI solutions, LCT updates, and unit FCR training could effectively mitigate any technical challenges the radar currently experiences with stationary targets.

Achieving Collective FCR Proficiency

The FCR exists in an awkward limbo. The system is fully fielded, but its simulation is inadequate for collective training, home-station multiuse ranges have limited FCR targetry, and there is no requirement to actually use it. Despite the radar's capabilities and its several million dollar price tag, no regulation, pamphlet, or training circular requires a unit to power-on its radars and train with them. Neither readiness level progressions, annual evaluations, nor aerial gunneries require aviators to use the physical radar. Aircrew Training Manual Task 2019 allows aviators to complete individual FCR training either in the LCT or in the aircraft—given simulation's ease of access, most will complete this task in the LCT.[2] Theoretically, a zero-hour Apache pilot could progress and become a seasoned, 20-year master aviator, having never touched an FCR. With the LCT's challenged FCR realism and its limitations on multi-ship operations, commanders should not feel comfortable declaring their unit "FCR proficient" after only conducting individual, simulated FCR training.

The 2020 ***Aviation Training Strategy*** notes that inadequate targetry and training areas at home station restrict live FCR training.[3] Multiuse ranges have some variance in targetry across Army installations; some have stationary and moving pop-ups, others have constructed targets, and the best have hulks from actual systems. Not all of these targets are optimized for FCR training. In a 1997 Command and General Staff College thesis, the writer identified that standard multiuse ranges do not adequately allow for the unique training required by Longbow upgrades (Williams, 1997). Twenty-four years have passed and few have pressed to upgrade multiuse ranges to include more targetry suitable for the FCR. Now, if commanders want to build their FCR proficiency, they must push for appropriate range targetry. Commanders can begin on their next monthly unit status report—note whether the installation's training facilities meet their FCR training needs (Department of the Army, 2005). For those fortunate enough to have adequate multiuse ranges, the next challenge is integrating the radar into crew and collective training.

Across combat arms, units build collective proficiency in major weapons systems through gunnery tables. These tables progress from individual knowledge and proficiency, to simulated employment, and then to live-fire practice and qualification at echelon. For the attack community, this means passing a gunnery skills test, completing a table in the LCT, then qualifying on live-fire crew tables (IV-VI), team tables (VII-IX), and platoon tables (X-XII). These tables typically include live-fire engagements using every weapon and every sight—except the FCR. While Training Circular 3-04.3 provides commanders and master gunners the tools to incorporate the FCR in Apache gunnery, there is no requirement to evaluate Apache aircrews on their live-fire FCR proficiency.[4] Including the FCR in gunnery would not only increase unit FCR proficiency, but it would also build much-needed aviator confidence in the system. Even more, an increase in live-fire FCR usage across the force would provide critical data for project managers, life-cycle sustainers, and doctrine writers as they evaluate the ongoing development, maintenance, and employment of the system.

As commanders plan upcoming gunneries and shape their scenarios, they should consider adding a familiarization engagement for any FCR-equipped aircraft on tables IV-VI: pop a moving target, find the target with the FCR, and then engage with a train-mode AGM-114L. Because this engagement plays into the radar's strength and does not require additional ammunition (train-mode is a simulated mode built into the aircraft software), it engenders aircrew confidence in the FCR. Similarly, tables VII-XII require FCR-equipped aircrews to find a target with the radar and send a radar frequency handover to another aircraft in their flight. These small additions to aerial gunnery will give commanders insight into their unit's FCR proficiency and could shape their future training priorities.

Even if individual unit commanders begin incorporating FCRs into their training and gunnery, branch-wide FCR training deficiencies require branch-wide solutions. When the Army Aviation Center of Excellence recognized an enterprise need for terrain flight training, the Directorate of Training and Doctrine (DOTD) developed a terrain flight training support package (TSP); similarly, DOTD should develop an FCR TSP. Problems with FCR confidence and proficiency are the product of factors that affect the entire Army, are common between the AH-64D and the AH-64E, and are not isolated to a single unit. An FCR TSP would provide a synchronized framework to bring the entire attack community back to an acceptable level of FCR proficiency. Developers of an FCR TSP should draw not only from pre-2003 doctrine and techniques, but also from the modern experience of international partners like the United Kingdom and Israel, who place significant emphasis on FCR employment in Apache operations. In the end, if Army aviation wishes to claim the FCR as a capability, it must be able to standardize its training

[2] More information on this task is available on the U.S. Army Training and Doctrine Command intranet Sharepoint website with a valid common access card.

[3] More information on this publication is available on the U.S. Army Training and Doctrine Command intranet Sharepoint website with a valid common access card.

[4] Readers with a common access card may log in to the Enterprise Access Management Service to learn more about this Training Circular, including a full explanation of AH-64 gunnery tables.

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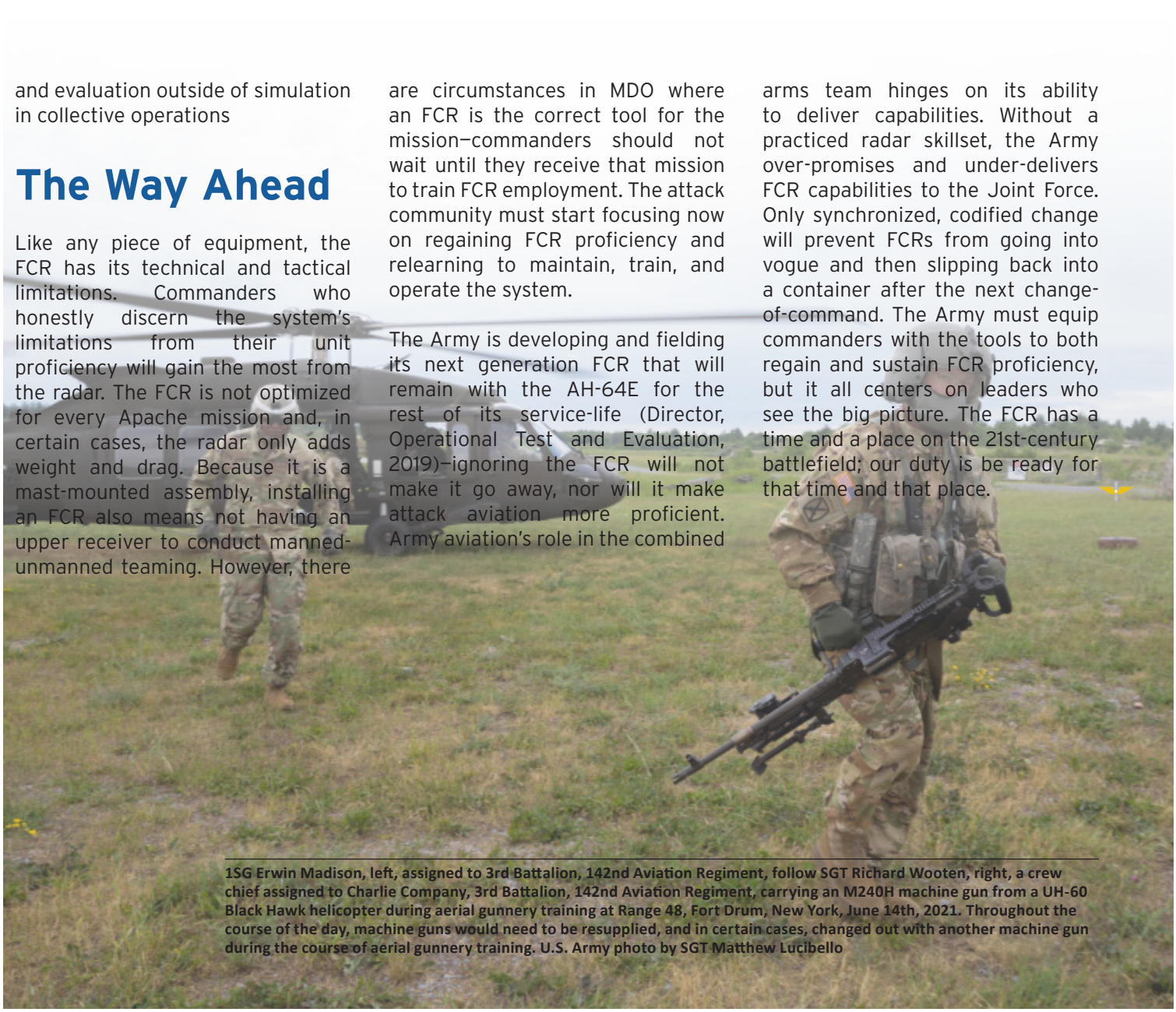
and evaluation outside of simulation in collective operations

The Way Ahead

Like any piece of equipment, the FCR has its technical and tactical limitations. Commanders who honestly discern the system's limitations from their unit proficiency will gain the most from the radar. The FCR is not optimized for every Apache mission and, in certain cases, the radar only adds weight and drag. Because it is a mast-mounted assembly, installing an FCR also means not having an upper receiver to conduct manned-unmanned teaming. However, there are circumstances in MDO where an FCR is the correct tool for the mission—commanders should not wait until they receive that mission to train FCR employment. The attack community must start focusing now on regaining FCR proficiency and relearning to maintain, train, and operate the system.

The Army is developing and fielding its next generation FCR that will remain with the AH-64E for the rest of its service-life (Director, Operational Test and Evaluation, 2019)—ignoring the FCR will not make it go away, nor will it make attack aviation more proficient. Army aviation's role in the combined arms team hinges on its ability to deliver capabilities. Without a practiced radar skillset, the Army over-promises and under-delivers FCR capabilities to the Joint Force. Only synchronized, codified change will prevent FCRs from going into vogue and then slipping back into a container after the next change-of-command. The Army must equip commanders with the tools to both regain and sustain FCR proficiency, but it all centers on leaders who see the big picture. The FCR has a time and a place on the 21st-century battlefield; our duty is be ready for that time and that place.



1SG Erwin Madison, left, assigned to 3rd Battalion, 142nd Aviation Regiment, follow SGT Richard Wooten, right, a crew chief assigned to Charlie Company, 3rd Battalion, 142nd Aviation Regiment, carrying an M240H machine gun from a UH-60 Black Hawk helicopter during aerial gunnery training at Range 48, Fort Drum, New York, June 14th, 2021. Throughout the course of the day, machine guns would need to be resupplied, and in certain cases, changed out with another machine gun during the course of aerial gunnery training. U.S. Army photo by SGT Matthew Lucibello

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Biography:

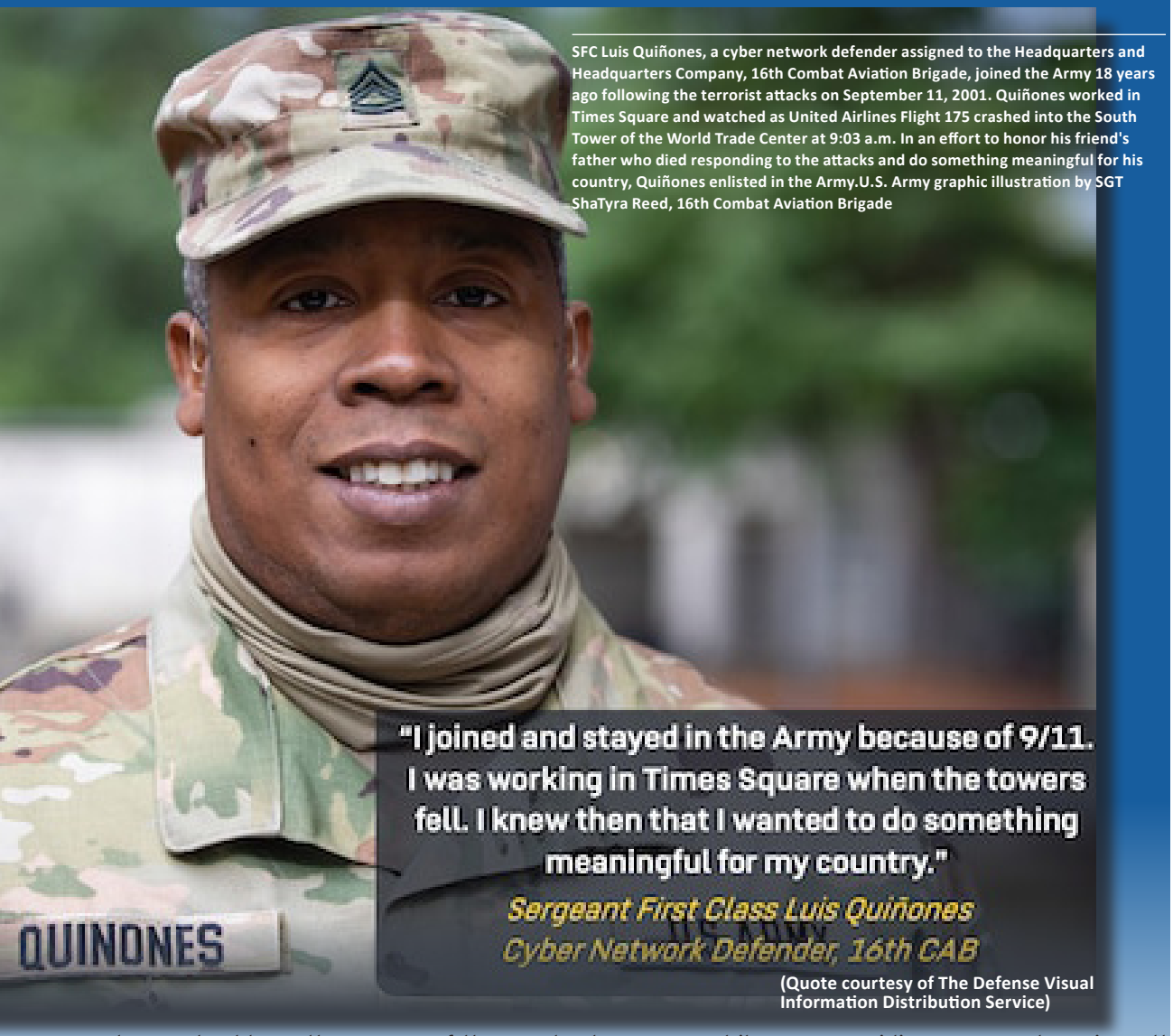
CPT Clayton Jaksha is an Army Aviator qualified on the AH-64E with operational experience in support of Operation Inherent Resolve and Operation Atlantic Resolve.

How We Fix It. Achieving Racial Diversity in Army Aviation

By CPT Andrew Lightsey, IV

CW4 Anne Wiley (left), the senior standardizations instructor pilot for the 7th Squadron, 17th Cavalry Regiment, and CPT Carmel Cammack, an assistant operations officer for the unit, both OH-58D pilots, conduct pre-flight inspections on their aircraft at Kandahar Air Field. U.S. Army photo by SFC Stephanie Carl

On December 17, 2020, the then Acting Secretary of Defense, Christopher C. Miller, wrote a Memorandum for Senior Pentagon Leadership with the subject: Actions to Improve Racial and Ethnic Diversity and Inclusion in the U.S. Military (Miller, 2020). A noble and long overdue pursuit, it begged the question from many in the community of how Army aviation would respond. Being considered a "Maneuver" branch and one of six Operational Division branches in the Army, the numbers of minorities in aviation have historically remained low compared to other branches; however, the question has remained, how do we fix it? The Department of Defense (DoD) Board on Diversity and Inclusion, whom Former Secretary Miller affectionately referred to as "the Board," came up with some helpful recommendations to answer this pertinent question for the Army in their report entitled ***Department of Defense Board on Diversity and Inclusion Report: Recommendations to Improve Racial and Ethnic Diversity and Inclusion in the U.S. Military*** (U.S. Department of Defense, 2020). One more recent initiative, the Army's "Project Inclusion," begins to address the challenge of establishing an equal playing field to sustain a diverse workforce by combatting racial disparity and mistreatment based on ethnicity (U.S. Army Public Affairs, 2020). This bold initiative directed by the former Secretary of the Army, Ryan D. McCarthy, and Chief of Staff of the Army, General James C. McConville, put in the initial measures of ridding the Army of official photos that could be discriminatory on officer and enlisted personnel selection boards, conducted an examination of the justice system to check for trending racial biases, and made provisions for sensing sessions throughout the service "to converse on race, diversity, equity, and inclusion) (U.S. Army Public Affairs, 2020, measure number 3). Although these efforts are greatly appreciated by those impacted, not much is done through Project Inclusion to add new diverse faces to the Army and to the discussion. Likewise, is the U.S. Army Aviation and Missile Command's (AMCOM) new Employee Diversity Board, which aims to "develop and foster a culture of inclusion that builds upon diversity and maintains equity within the command" (Crum, 2020. para. 2). This Employee Diversity Board at Redstone Arsenal, is an outlet for AMCOM workers to formally discuss and give recommendations to command leadership on their concerns regarding workplace diversity practices and inclusion. Hosting meetings through Microsoft Teams and face-to-face, the group is primarily made up of nonsupervisory workers to ensure its authenticity. While this board and other similar Army projects are a step in the right direction for change at organizational level, it



SFC Luis Quiñones, a cyber network defender assigned to the Headquarters and Headquarters Company, 16th Combat Aviation Brigade, joined the Army 18 years ago following the terrorist attacks on September 11, 2001. Quiñones worked in Times Square and watched as United Airlines Flight 175 crashed into the South Tower of the World Trade Center at 9:03 a.m. In an effort to honor his friend's father who died responding to the attacks and do something meaningful for his country, Quiñones enlisted in the Army.U.S. Army graphic illustration by SGT ShaTyra Reed, 16th Combat Aviation Brigade

(Quote courtesy of The Defense Visual Information Distribution Service)

does not address the source of the problem; the lack of diverse faces that are joining Army aviation to begin with.

Although there is no simple answer to this question, one strong option to recruit more minority aviation professionals into the branch is through strategic college partnerships. Tribal Colleges and Universities, Hispanic Serving Institutions, and Historically Black Colleges and Universities are all pools of talented students who could enhance and grow the force. This aligns with the Board's recommendation to increase applicants from minority institutions through the Reserve Officer Training Corps (ROTC) program. By connecting with these schools and establishing dedicated flight programs, Army aviation can continue to resource pilots and curtail its rated crewmember shortage while providing opportunity (Randel, 2020. para. 5). Many of these schools already have ROTC programs or have a long history of military service that could smooth the transition into greater partnerships for aviation. One example of this is at Tuskegee University, which showcases its history with the Army Air Corps and the famous 332nd Fighter Group "Tuskegee Airmen" of World War (WW) II. The school boasts an Accreditation Board for Engineering and Technology (ABET)-certified Aerospace Engineering program, which guarantees quality technical education; ensures that program graduates are prepared for the science, technology, engineering, and mathematics, or STEM workforce; and gives them a distinct competitive advantage over non ABET-accredited peers when applying for jobs (ABET, 2021). Tuskegee University students are also given the opportunity to compete in the "Show Us Your Angle" Innovation Challenge. This competition endorsed by Boeing, the world's largest aerospace company, tests students' innovation and creativity by having them reimagine a commercial jetliner to change the way people think about the future of aviation (Tuskegee University, 2021a). The storied Golden Tiger ROTC Battalion at Tuskegee University has a rich history of producing Army Officers since 1918 following WWI. Since that time, the program has continued to produce waves of quality service members, including six of whom made it to the Army's General Officer ranks (Tuskegee University, 2021b). Due to these preexisting programs, Tuskegee University would be an excellent place for a partnership to attract more capable minority aviation service members through a dedicated flight program. And

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SGT Koku Adzoble, an automated logistical specialist with Task Force Wolfpack, 82nd Combat Aviation Brigade, is deployed to Forward Operating Base Salerno in Afghanistan. Adzoble emigrated to the United States in 2007 from the west-African country of Togo under the Diversity Visa program, run by the U.S. Department of State. He won a lottery to earn one of less than 4,000 visas offered in his country that year. "I had a chance," said Adzoble. Some countries don't get that chance, so you play every year you're eligible, and if you win, you get to come to the United States and get a visa. I was very lucky." Photo by U.S. Army SFC Eric Pahon, 82nd Combat Aviation Brigade

this is only one example of many universities that are natural fits for the Army to make connections with.

Another potential roadblock in diversifying the branch is the Aviation Warrant Officer Application process, as many quality minority candidates from outside the Army aviation community do not apply. Perceived barriers include the belief that the applicant's chances of being selected are low due to lack of personal experience in the field. They may be dissuaded by not personally knowing anyone who looks like them in the branch, due to the lack of present minority representation. Representation is important. Columnist Devi Ruia wrote that representation is important "because it can **shape** how minorities are viewed by society and how they view themselves" (Ruia, 2020, para. 2). This idea is addressed by the recommendation from the Board's report, ***Update Recruiting Content to Represent All Service Members*** (U.S. Department of Defense, 2020). By continuing to advertise and celebrate that the branch is comprised of people of all colors, it begins to make the idea of applying less intimidating to potential aviators who may come from racially homogeneous backgrounds.

The last pertinent recommendation from the Board, ***Increase Transparency of Promotion Selections and Career Opportunities***, also points to aviation revisiting how it does business as it relates to the Warrant Officer Application process (U.S. Department of Defense, 2020). By the branch leadership presenting clear outlooks on career progression in aviation, championing efforts to inform minority individuals outside of the community of the need for Warrants, and by highlighting stories of minorities in the branch, more Soldiers of color would begin to consider a career transition to Army Flight. In her publication ***"Commit 'Intentional Acts of Inclusion' to Combat Racism,"*** LTC Octavia Scott details why branch transparency is so important by showing the discrepancies of African American women in the Military Intelligence branch being selected for Lieutenant Colonel (Scott, 2021). This well-received periodical serves to warn our branch that minority service members are constantly considering opting out of the Army instead of progressing when reasons for denied advancement and career opportunity are vague or unpublicized. Leadership should be cognizant of that fact and counter it by continuously providing resources that highlight the ability for everyone to succeed (Scott, 2021).

Aviation is an amazing branch that prides itself on its ability to solve complex tactical problems for the ground force by not only utilizing its members' technical skills, but by also capitalizing on their mental abilities. By recruiting and retaining diverse professionals with varying life experiences, the branch helps itself to complete any mission it faces by having more perspectives from which it can view a problem. By implementing recommendations from the DoD Board on Diversity and Inclusion's report, aviation branch leaders can begin the process of opening up the door to even more diversity in its ranks and start to answer the main question, "how do we fix it?"

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U.S. Army SPC Eric Amphavannasouk, a human resource specialist, grew up in Modesto, California. His family, originally from Laos, emigrated after the Vietnam War. Amphavannasouk joined the Army to travel, open up opportunities, and show his grandparents his appreciation for their sacrifices. Amphavannasouk is currently assigned to 3rd Squadron, 17th Cavalry Regiment, 3rd Combat Aviation Brigade, 3rd Infantry Division, and is preparing to attend a leadership course required to become a sergeant. U.S. Army photo by SPC Savannah Roy

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Biography:

CPT Andrew Lightsey, IV commissioned from Appalachian State University in 2016. He is qualified in the UH-60M Black Hawk and LUH-72 Lakota Helicopters. He has served both as a UH-60M and AH-64 Maintenance Platoon Leader, Troop Executive Officer, and Assistant Operations Officer. In 2019 he deployed in support of Operation Freedom's Sentinel in Afghanistan.

An AH-64 Apache helicopter hovers in front of the sun and conducts movement drills as part of a maintenance test flight in Kunduz province, Afghanistan, Nov. 19. Photo by SGT Duncan Brennan, 101st Combat Aviation Brigade

This is the first of two articles in a series

Developing the Situation, Developing the (Aero) Scout Mindset

By CW3 Andrew Maney

With over 2,000 years of examples behind us we have no excuse, when fighting, for not fighting well.

—T.E. Lawrence

In the October–December 2020 quarterly issue of ***Aviation Digest***, CPT Allan Newman wrote a thought-provoking article about scout integration into attack aviation formations as a consequence of the Aviation Restructuring Initiative (ARI). In his article, he describes the reassignment of former OH-58D Kiowa scouts into AH-64 Attack Battalions (AB) and Air Cavalry Squadrons (ACS), with their unique, value-added contribution to reconnaissance and security (R&S) as an unintended side-effect (Newman, 2020). Considering the doctrinally distinct, yet overlapping mission tasks performed by ABs and ACSs, his assessment is on target. We still need professional aeroscouts. However, I believe the effect was deliberate, not accidental.

As an AH-64E instructor pilot at the U.S. Army Aviation Center of Excellence, I found CPT Newman's discussion about the prevailing—some would say, exclusive—attack-first mentality in the Apache community both familiar and troubling. This is particularly true regarding our warrant officer population, many of whom have spent their entire career devoted to finding the enemy in order to engage him, not merely report on his activities. Our commissioned officer counterparts have similar instincts but have benefitted from tactically relevant institutional learning throughout their career progression. For warrant officers flying the

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Apache, securing our reputation as both technical and tactical experts means embracing and understanding our expanded role within both the Intelligence and ***Maneuver*** warfighting functions—namely, R&S. This goes far beyond the mere technical ability to establish data linkages with other platforms to produce a localized effect, or employ an effective attack pattern against targets of opportunity. Mastery will require fresh approaches to warrant officer professional military education and a renewed commitment by individual aviators and unit leadership to seek and provide first-rate education and training in ***Maneuver*** warfare. These requirements are critical to the successful conduct of large-scale combat operations (LSCO).

How then, should we tailor education and training to preserve attack capabilities while building scout proficiency within our ranks? Where are we succeeding? Where do we need to improve? What essential skills are assessed as underutilized, underdeveloped, or improperly applied across the spectrum of attack/reconnaissance operations? What assets can be leveraged at the institutional and operational force to build readiness?

Crucially, do our aircrews possess the "scout" mindset in addition to the "attack?" If not, how can we instill it? Ultimately, why does any of this even matter?

Finding solutions to these enduring challenges will decisively shape the way we fight and factor heavily into whether or not we win. I submit to you one warrant officer's supplementary analysis to CPT Newman's argument.

LINE OF DEPARTURE

War is not for waging, but for winning. Armies do not get paid to come second, not least due to the severe penalties incurred in losing. Useful military theories relate to winning. We want things that work; not merely things that are elegant or intellectually pleasing.

—Jim Storr, "The Human Face of War"

Reconnaissance, security, and counter-reconnaissance are battlefield missions as old as military history itself and are missions that many armies have created specialized units to perform. In most cases, these units were trained, equipped, and employed differently than the majority of an army's fighting units (McGrath, 2013). Since the early 20th century, the search for the proper mix of equipment, the proper organization, and the proper employment of reconnaissance units has bedeviled armies around the world.

Over the past several years, the Army as a whole, and the aviation branch in particular, have undergone a doctrinal and organizational pivot to LSCO that reflects the shifting operational environment (OE). Some of these changes have resulted in—or are themselves the result of—force restructuring. The proliferation of unmanned aircraft systems (UAS) and the divestiture of the OH-58D changed the tools in our kit bag, necessitating doctrinal changes to tactics, techniques, and procedures (TTPs). Still other changes are a response to current or anticipated threat capabilities.

In all recent U.S. Army conventional operations, the most common type of action was movement to contact, a type of operation in which the lead unit, whether cavalry or not, was effectively the reconnaissance element. Similarly, in nonconventional operations such as counterinsurgency (COIN), where there are no actual front lines, all combat units—even most combat support and some combat service support units—become de facto reconnaissance units by the nature of the conflict (McGrath, 2013). According to doctrine—and common sense—every unit has the implied mission to report information about terrain, Civilian activities, and friendly and enemy dispositions (Department of the Army, 2019c).

For many years, the United States and its allies have enjoyed complete tactical supremacy over technologically inferior adversaries in every form of contact, to include operations in the air, space, and cyber domains (Christian, 2016). Such tactical dominance has fueled the proliferation of unmanned systems to take advantage of their unique capability to deliver persistent coverage over an objective with full motion video transmission to both ground and airborne users. Coupled with assured access to the air domain, the addition of UAS into the intelligence, surveillance, and reconnaissance (ISR) architecture has provided a robust information collection umbrella over whole theaters of operations, augmenting battle command and control systems and shaping ISR capability expectations for an entire generation of Soldiers, leaders, and commanders.

Can we assume then, that the retention of manned formations designed, equipped, trained, and organized to perform R&S missions no longer reflects operational realities? Let's take this assumption and apply it to AH-64 organizations.

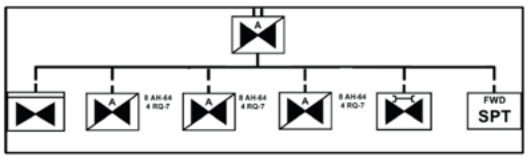

Figure 2–8. Air cavalry squadron

CAPABILITIES

2-39. The ACS conducts the following tasks:

- Zone, route, and area reconnaissance.
- Reconnaissance in force (when task-organized).
- Screen.
- Guard and area security (when task-organized).
- Movement to contact.
- Attack.

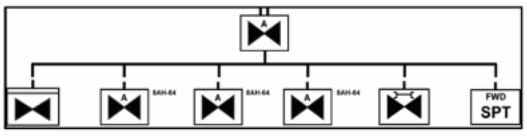

Figure 2–9. Attack battalion

CAPABILITIES

2-42. The AB conducts the following tasks:

- Attack.
- Zone, route, and area reconnaissance.
- Screen.
- Guard and area security (when task-organized).
- Movement to contact.
- Reconnaissance in force (when task-organized).

Figure 1. **The ACS and the AB (Department of the Army, 2020, p. 2-8).**

Attack battalions and ACSs both utilize the AH-64 D/E; they are each populated by aviators from a singular qualification course of instruction whose attack-centric roots run deep. A quick glance at the 2020 revision of Field Manual (FM) 3-04, "Army Aviation," illustrates a subtle, yet key distinction in their doctrinal roles, which alludes to the "attack mindset" previously mentioned **(Figure 1)**. The manual differentiates each by noting, "Although the ACS is fully capable of conducting attacks, **the integration of RQ-7B UAS at the troop level makes the ACS the best formation for conducting reconnaissance, security, and movement to contact as primary missions**, with attack operations as a secondary mission" (Department of the Army, 2020, p. 2-7).

As for the AB, "Although the AB is fully capable of conducting reconnaissance, security and movement to contact operations, **it has less overall reconnaissance capability than the ACS** due to the lack of organic UAS at the company level, unless the Gray Eagle company is released partially or in total from division control to conduct dedicated MUM-T [manned-unmanned teaming] in support of the AB" (Department of the Army, 2020, 2-8).

It's worth questioning, then, whether the Apache community—from the Institutional force to the Operational force—is correctly oriented on the R&S mission they've been (re)organized to execute. When an AH-64 student pilot graduates flight school, he or she has an equal chance of being assigned to an AB or ACS, which we've just seen are doctrinally distinct in their mission focus and capability. The ACS's job is to scout first, attack second.

Across the spectrum of military operations within the Department of Defense, whether a Marine reconnaissance patrol or an Army cavalry squadron, effective scouts must be adept at:

- Developing tactical situations and gaining meaning from what they observe.
- Understanding and collecting upon the commander's intelligence requirements.
- Developing an understanding of the enemy by identifying enemy locations, movement techniques, and TTP[s].
- Identifying patterns in human behavior.
- Estimating enemy composition and strength.
- Observing and uncovering anomalies in the operational environment and accuratelyreporting information in a timely manner.
- Utilizing movement techniques and selecting routes to effectively move through alltypes of terrain.
- Utilizing camouflage, cover, and concealment.
- Recognizing terrain features and understanding their tactical value.
- Reading maps, GRGs [gridded reference graphics], and aerial photographs to determine location and direction.
- Making accurate sketches.
- Understanding how to use all organic daylight optics and NVDs [night vision devices] (United States Marine

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Corps, 2020, p. 6-1).These skills are in addition to the Apache crew's ability to target the enemy, weaponeer the correct munition, and fight for information within the flight's capability to disrupt, defeat, or delay enemy forces.

As ARI proceeded in 2015 and beyond, the transition of former Kiowa pilots into newly created and existing Apache formations provided a sudden, massive infusion of professional aeroscouts with precisely the type of specialized experience, perspective, and expertise that make the doctrinal ACS concept workable in the short term. We have Soldiers in place who are familiar with the mission and properly oriented to it—for now. However, ARI had other consequences. Among them is the reality that no dedicated aeroscouts have been trained at Fort Rucker in roughly 7 years (OH-58D class 14-002 was the last). Compounding the issue is the ongoing deliberation about a Future Attack & Reconnaissance Aircraft (FARA), whose selection and fielding is still an open question. Taken together, such a condition could eventually lead the Army down a path in which it possesses no specially trained aeroscouts or a specially designed and built aerial scout platform.

Soldiers of 2-6 Calvary Squadron, 25th Combat Aviation Brigade were afforded the unique opportunity of an orientation AH-64D Apache flight with our Squadron senior Instructor Pilots on Wheeler Army Airfield, Hawaii. These Soldiers work diligently every single day to ensure the readiness of our Apaches. U.S. Army photo by SGT Sarah D. Sangster

The clear implication from the force realignment, the operational trend, and the change in doctrine is that the approach to R&S has changed since the days of the horse cavalry (and the Kiowa helicopter). We are left to infer that scouting may no longer be a specialized function performed by units with unique capabilities (the augmentation of ACS with RQ-7Bs aside), but rather one of several functions any unit—not just Attack Aviation—is expected to accomplish.

Is that a winning strategy? Are commanders and their staff content with a generalized aviation force that has not received thorough training and evaluation in R&S? Could such a force be expected to satisfy the commander's priority information requirements during operations against a peer threat? Should it?

THE RECONNAISSANCE PARADOX

Reconnaissance accomplished by small units primarily relies on the human dynamic rather than technical means.

—Department of the Army, 2019c, p. 5-1

Almost all of the articles, white papers, and interviews I've seen or read about pertaining to ARI, MUM-T, and FARA focus exclusively on which platform or platform mixture is best suited for R&S. Don't misunderstand, I fully recognize that modernization and technology overmatch are legitimate lines of effort. Years ago, the Apache replaced the Cobra as the dedicated attack platform, and we are a better, more capable Army because of it. Yet, such

dialogues about the scout aircraft replacement seldom mention the training and development of the Soldiers we expect to operate these combat systems to perform the R&S mission. Reconnaissance and security will persist as vital enabling tasks—regardless of platform—whose proficiency must survive if we expect to win in a complex world on current and future battlefields.

Some argue that UAS operating independently or teamed with AH-64s are sufficient to bridge any potential gaps. Others argue that such an approach is sub-optimal; neither the most efficient nor the most effective.[1] "Although a remarkably deadly and combat-proven beast of an attack helicopter, the Apache is not well-suited to the traditional air cavalry role filled in the past by the OH-58A/C, the OH-6, and the OH-58D. These aircraft were cheap, quiet, simple to maintain, and easy to move and hide—all of which the recently upgraded AH-64E is not" (Ryan, 2016). While these are all desirable characteristics of a scout aircraft, there are other desirable traits that the Apache does provide, such as range, firepower, speed, survivability, stand-off, connectivity, and sensor performance. Tailoring our TTPs to employ a proven combat system isn't a far-fetched proposition.

Still, prewar reconnaissance doctrines tend to undergo significant change once fighting begins, leading to post-conflict analysis that reconnaissance units were "misused" in one way or another (McGrath, 2013). The reconnaissance paradox **(Figure 2)** ensures that tension will always exist between fielding a reconnaissance force that is perceived as either too heavy or too light. If the forces are too light and, while stealthy, not survivable on the battlefield, or so perceived, commanders tend to use other units for reconnaissance operations. On the other hand, if the reconnaissance force is too heavy or has a mobility or firepower differential equal to or greater than the force which it supports, commanders tend to use the reconnaissance element as an additional combat maneuver force (i.e., mobile reserves) (McGrath, 2013).

The development and application of MUM-T is a textbook example of this tension and illustrates the pursuit of an optimal mix of reconnaissance platforms into one organic unit—the ACS. By teaming heavily armed, manned Apaches with light UAS (which commanders are more willing to sacrifice), we can purportedly achieve all the associated benefits with few of the associated costs. However, the effectiveness of this model loses its appeal when arrayed against a peer adversary with robust air defense systems and substantial electronic warfare/electronic attack capability. Unmanned aircraft systems and other platform-centric approaches to R&S—while delivering significant capabilities—have drawbacks. Manned-unmanned teaming theoretically enables increased depth and breadth of aviation reconnaissance and maneuver, increased persistence over the reconnaissance objective, increased ability to gain and maintain enemy contact, increased survivability for manned crews, and more options to develop the situation with enhanced maneuver, fires, and command and control (Department of the Army, 2000).

In contrast to the OE of the past 20 years, peer threats pose significant challenges to employment of any manned or unmanned aircraft above terrain flight levels due to the increased detection quality of early warning systems and the lethality of surface-to-air fires. Additionally, UAS often rely on global positioning systems for navigation and satellite communications to receive commands from a ground control station, with either node (platform or operator) potentially vulnerable to electronic attack in a denied, degraded, or disrupted space operational environment (Center for Army Lessons Learned, 2018). This would conceivably result in a "lost-link" condition,[2] rendering MUM-T ineffective (Nichols et al., 2019).

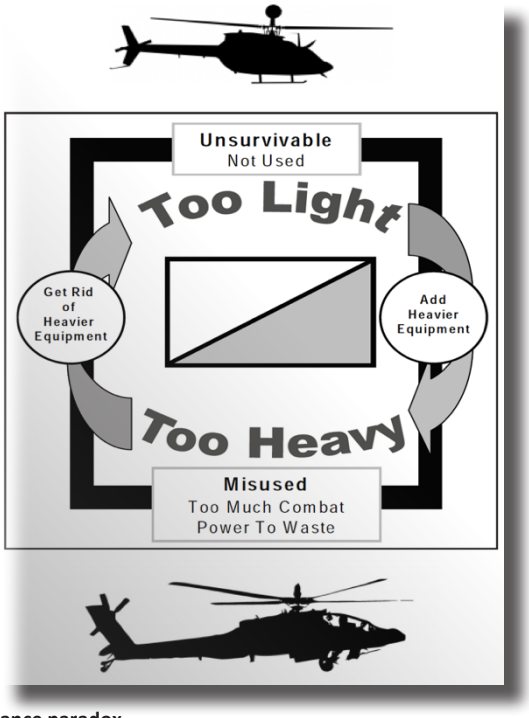

Figure 2. **The reconnaissance paradox (McGrath, 2013, p. 199).**

[1] **More information on this statement is available via the Enterprise Access Management Service-Army, with a valid common access card.**

[2] **More information on "lost-link" condition is available via the Enterprise Access Management Service-Army with a valid common access card.**

On March 17, 2021,12th CAB launched 14 Apaches from the 1st Battalion, 3rd Aviation Regiment for both day and night battalion attack training missions. Pictured here, fuelers, ground maintenance crews, and aircrews work together seamlessly at the forward area refueling and rearming point. This complex operation moves the entire formation of AH-64s through hot refueling and back out to the next mission in an extremely short time window. U.S. Army photo by MAJ Robert Fellingham

This is a plausible scenario that could prevent UAS from providing accurate and timely information collection (an Army Aviation Core Competency), thus compromising situational understanding, tempo, and the ground force commander's exercise of initiative. Put simply, we cannot be reliant on platforms like UAS—even when paired with Apaches—to fill the role vacated by the OH-58D, and we cannot delay until FARA is fielded to reconstitute scout expertise within the branch. For one, if we fail to emphasize superior training and correct orientation to R&S missions right now, then manned aircraft formations risk losing proficiency over time as legacy aeroscouts retire from the force. We expose ourselves to a single-point-of-failure when UAS are not available or removed by enemy action.

Second, if Apache crews and/or UAS operators do not understand a commander's security or reconnaissance guidance or their unit's actions within the larger scheme of maneuver, then MUM-T cedes its potential altogether. This is a Soldier-centric capability gap that can and must be avoided.

THE RECON OBJECTIVE

Understanding the theory of war allows a commander to break free from the constraining bonds of petrified instruction, obsolete doctrine, and slavish adherence to 'how we fought the last war'.

–CDR Joseph A. Gattuso, United States Navy

Field Manual 3-55, "Information Collection," states: "Commanders use reconnaissance and surveillance to provide intelligence to reduce the inherent uncertainty of war. **Achieving success in today's conflicts demands an extraordinary commitment to reduce this uncertainty"** (Department of the Army, 2013, p. 1-1). It is impossible to eliminate uncertainty from combat, but it can be reduced to an acceptable level by Soldiers who understand effective information collection and how it accelerates the tempo of operations to gain a position of relative advantage over the enemy. The debate over new platforms (what we fight with) may be unsettled, but the content of validated doctrine (how we fight with the people and equipment we already have) is our roadmap for effective employment regardless of the tools at our disposal.

I used to shrug whenever someone implied that I needed to know doctrine in order to do my job well. "Everything I need to know is in my aviation publications," I would say. "What could doctrine possibly contribute?" When doctrine comes up, many of us have flashbacks to PowerPoint presentations about the Military Decision Making Process, or MDMP, Warfighting Functions, Operational Art, or some other vague concept seemingly unrelated to our

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daily duties (unless you're the S3).

Fortunately, I had a company instructor pilot in the 12th Combat Aviation Brigade (CAB)—and later—a company commander in the 16th CAB, illustrate how doctrine influences and connects operations all the way down to the small unit level. As it turns out, doctrine has several important contributions to all operations—not just R&S. Among others, doctrine provides a common professional language with which to transmit information, develop plans, and conceptualize the battlefield. More importantly, it supplies us all with a coherent vision of warfare (Department of the Army, 2019b).

Anyone who has deployed as a rotational force overseas or been humbled by the red team at a combat training center in the past several years has experienced the frustration of conducting decisive action using doctrine and TTPs developed during the Global War on Terror and tailored to COIN. As forces return to training against a hybrid threat with peer and near-peer capabilities, our supremacy in certain domains is not necessarily lost, but our training must bring back some of the lost disciplines and tasks (Christian, 2013).

The transition from COIN to LSCO—to borrow from a quote by Chinese revolutionary and statesman, Deng Xiaoping—has felt like *crossing the river by feeling the stones.*

Thankfully, our doctrine is beginning to catch up with operations.

In addition to the changes seen in FM 3-04, (Department of the Army, 2020), there have been significant changes to TTPs through several revisions of other publications. None more so than Army Techniques Publication (ATP) 3-04.1.[3] It is virtually unrecognizable compared to the 2016 edition and takes direct aim at the "how" as well as the "why" when conducting aviation operations, serving as a primary reference for all company-level planning, preparation, and execution for aviation tactical tasks, to include a broad discourse on R&S. It is a teaching document that applies to any OE, applicable down to the team tactical level.

Following suit, our Aircrew Training Manuals have begun placing extra emphasis on operational knowledge vs. foundational knowledge, particularly regarding the scope of the annual proficiency and readiness test, with additional annual requirements now tied to aviation mission survivability. These changes are welcome and necessary, as they sharpen an aviator's focus on topics and skills that relate to winning.

In July of 2019, capstone references such as Army Doctrine Publication (ADP) 1 "The Army," Department of the Army, 2019a); ADP 3-0 "Operations," (Department of the Army, 2019d); ADP 5-0 "The Operations Process," (Department of the Army, 2019e); ADP 6-0 "Mission Command: Command and Control of Army Forces," (Department of the Army, 2019f); ADP 3-90 "Offense and Defense," (Department of the Army, 2019c); and every other ADP in circulation received updates, revisions, or overhauls. In the same cycle, ADP 1-01 "Doctrine Primer," (Department of Defense, 2019b), was introduced. It is a short publication providing a wave-top overview of doctrine origins and taxonomy every leader in the profession of arms should read.

Updates to doctrine often take several years to permeate the force, but the dominant themes remain unchanged. Tempo, audacity, surprise, and concentration—supported by trust and disciplined initiative through the exercise of mission command—are the core characteristics of the offense in Combined Arms Operations, the U.S. Army's approach to large-scale combat. I don't consider myself an expert in doctrine or complex theories about warfare, and I'm not here to make you an expert, either. I think it's bad policy, generally, to consider yourself an expert at anything because it releases you from the responsibility to continue learning. My intent over the next few paragraphs is to spark an interest in the subject and to outline the tenets that connect it to R&S.

Maneuver is the central idea.[4] It is focused (primarily) on defeating the enemy's plan rather than simply destroying enemy forces. It contrasts with other visions of warfare such as ***Attrition***, whose central aim is to exhaust the enemy to the point of collapse through continual losses of personnel and materiel, and ***Positional Warfare*** defined as the use of force—through tactics, firepower or movement—to move an opponent from one position to another for further exploitation, or to deny them access to an area for further exploitation (Fox, 2017). Turning movements are forms of ***Positional Warfare*** and can also be applied to

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

[4]Maneuver, Attrition, and Positional Warfare are capitalized and italicized to avoid confusion between the theoretical construct of Maneuver Warfare and the physical act of maneuvering forces, or the maneuver warfighting function.

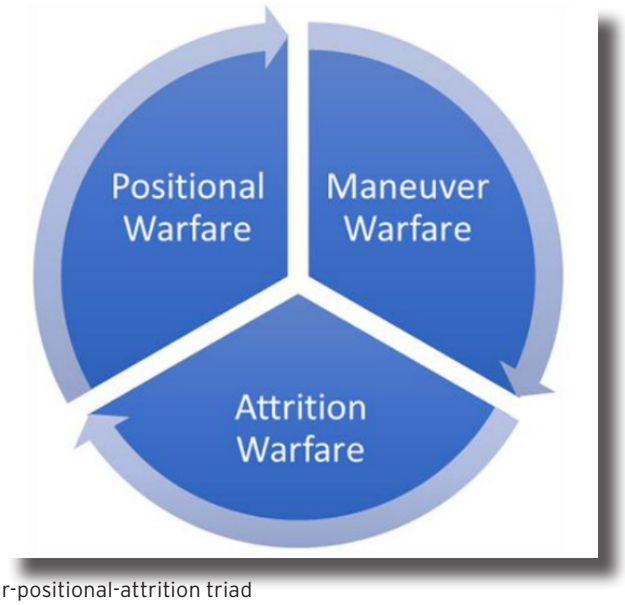

Figure 3. Maneuver-positional-attrition triad (Fox, 2017).

anti-access/area denial models with the elements of key terrain. There is some element of *Maneuver, Attrition, and Position* inherent to all warfare; close combat is intrinsic to all three, but the right cocktail is governed by operational and mission variables. Most often, *Maneuver* is the tool we reach for in our kit bag **(Figure 3)**.

The *Maneuverist* approach is a state of mind born of ruthless opportunism. It is a methodology bent on shattering the enemy's cohesion by paralyzing and bewildering him, by avoiding his strength, aggressively exploiting his vulnerabilities, and striking him in the way that will hurt him most (Marine Corps Doctrinal Publication, 2018). It seeks the enemy's collapse through a series of actions orchestrated to a single purpose: creating an unstable and rapidly deteriorating situation filled with multiple dilemmas with which the enemy cannot cope. Its aim is to undermine the enemy's center of gravity and *will* to fight by incapacitating their decision-making through shock and disruption, rather than merely obliterating the enemy's means to fight (Boyd, 1987; Lind, 1980; Wilson et al., 1981). In short, *Maneuver* is a philosophy for generating the greatest decisive effect against the enemy at the least possible cost to ourselves. Blitzkrieg—as employed by Germany in WWII—is a prime example.

Figure 4 illustrates a process known variously as the "OODA loop," or "Boyd cycle" after Colonel John Boyd (USAF) who pioneered the concept in his lecture series "A Discourse on Winning and Losing (Patterns of Conflict)" (Boyd, 1987).

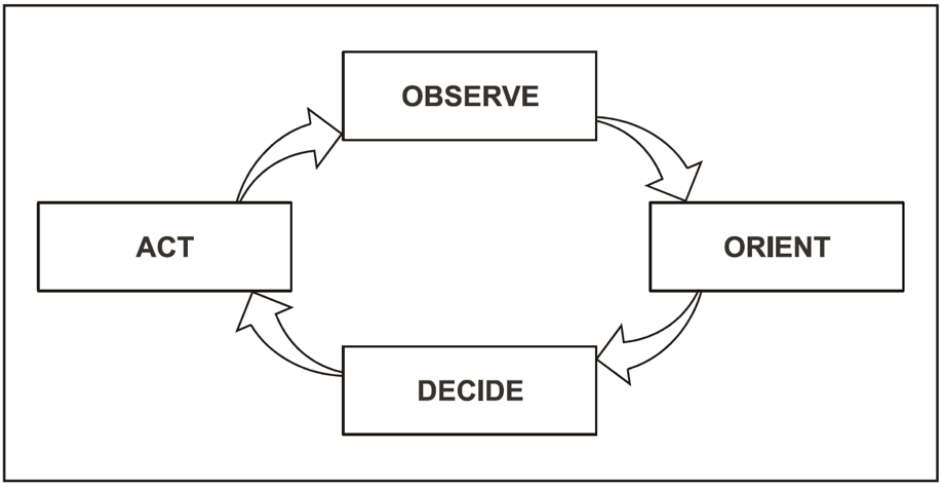

Figure 4. The observe-orient-decide-act (OODA) cycle (Department of the Army, 2003, section A-1).

Boyd's work—initially developed for fighter aircraft in aerial combat—synthesized a construct for *Maneuver* with applications to land warfare that garnered significant attention from all the services in the late 1970s and early 1980s. After retiring from the Air Force, Boyd worked closely with the Marines in the 1989 development of the Marine Corps Doctrinal Publication 1, "Warfighting." The current manual, published in 2018 (Change 1), discusses the OODA loop as the main idea behind the concept of **Tempo**:

> Decisionmaking in execution thus becomes a time-competitive process, and timeliness of decisions becomes essential to generating tempo … often associated with a mental process known variously as … the OODA Loop …. Boyd theorized that each party to a conflict first **observes** the situation. On the basis of the observation, he/she **orients**; that is, he/she makes an estimate of the situation. On the basis of the orientation, he/she **makes a decision**. Finally, he/she implements the decision … **he/she acts**. Because his/her action has created a new situation, the process begins anew. Boyd argued that the party who consistently completes the cycle faster gains an advantage that **increases with each cycle**. His/Her enemy's reactions become increasingly slower by comparison and therefore less effective until, finally, the enemy is overcome by events (U.S. Marine Corps Doctrinal Publication, 2018, p. 4-16 and Notes 6). Generating tempo is paramount. Friendly forces must operate at a tempo faster than the enemy can keep up, operating ahead of (or

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inside) the enemy's version of the same decision cycle. Speed relative to the enemy, paired with appropriate timing, equals tempo. Major General Kevin Kennedy (USAF), former director of the Joint Capability Directorate at Joint Forces Command and now the Director of Operations at U.S. Cyber Command, put it this way:

'It's all about how accurate my decisions are versus your decisions.' 'Let's say I can make better decisions at least as quickly as you can.' 'Now I'm going to outmaneuver you because I'm making better decisions. Or let's say I can make only an 80 percent solution, but I can do it faster than you. I'm still probably going to out maneuver you because I'm making maneuvers faster than you're making decisions. And even if your decisions are better, they're going to lag behind mine, so I'm going to outmaneuver you' (Rosenberg, 2010).

The Army doesn't explicitly codify Boyd's concepts like the Marine Corps, but his central idea is recognizable in processes we're familiar with such as **DIDEA** (Detect, Identify, Decide, Engage, Assess); **D3A** (Decide, Detect, Deliver, Assess); **F3EAD** (Find, Fix, Finish, Exploit, Analyze, Disseminate); and **DILR** (Detect, Identify, Locate, Report).

To find an overt discussion about Boyd's OODA loop in historical Army doctrine, you have to reach all the way back to 2003 and FM 6-0, "Mission Command: Command and Control of Army Forces," Appendix A (section A-3). It generally follows the Marine Corps excerpt but concludes the discussion with an excellent summation:

"See first,

understand first,

act first, and

finish decisively"

Current doctrine echoes this "See First" imperative: "Successful commanders manage uncertainty by developing the situation through action, using reconnaissance, surveillance, and other capabilities to identify opportunities across multiple domains that can be exploited … Effective information management to process information quickly is **essential** for staying inside the enemy's decision-making cycle" (Department of the Army, 2019d, p. 1-11).

Applying appropriate combat power at the decisive point through Combined Arms Maneuver requires observation of the enemy to develop accurate situational understanding. Observation is the first step when entering the decision cycle. Therefore, without accurate and timely observations, the decision cycle cannot achieve advantageous tempo. Effective air mission commanders possess an understanding of the maneuver commander's potential decision points and aggressively seek to inform and make recommendations to them. This is the essence of effective reconnaissance, and the reason Apache crews in both ABs and ACSs must take notice.With that, I'll interrupt the tempo of the article and take a tactical pause. The discussion thus far has related to observations about doctrine, force restructuring, and the theory of ***Maneuver warfare***, generally. In the next issue of the *Digest*, I'll continue my analysis, orienting on specific insights about the current state of readiness within the branch pertaining to R&S operations, and some conclusions and recommendations that you may find useful.

A UH-60 Black Hawk helicopter, operated by Soldiers with Alpha Company, 2-104th General Support Aviation Battalion, 28th Expeditionary Combat Aviation Brigade, flies over the 28th ECAB's area of operations in the Middle East. U.S. Army photo by SGT Andrew Johnson

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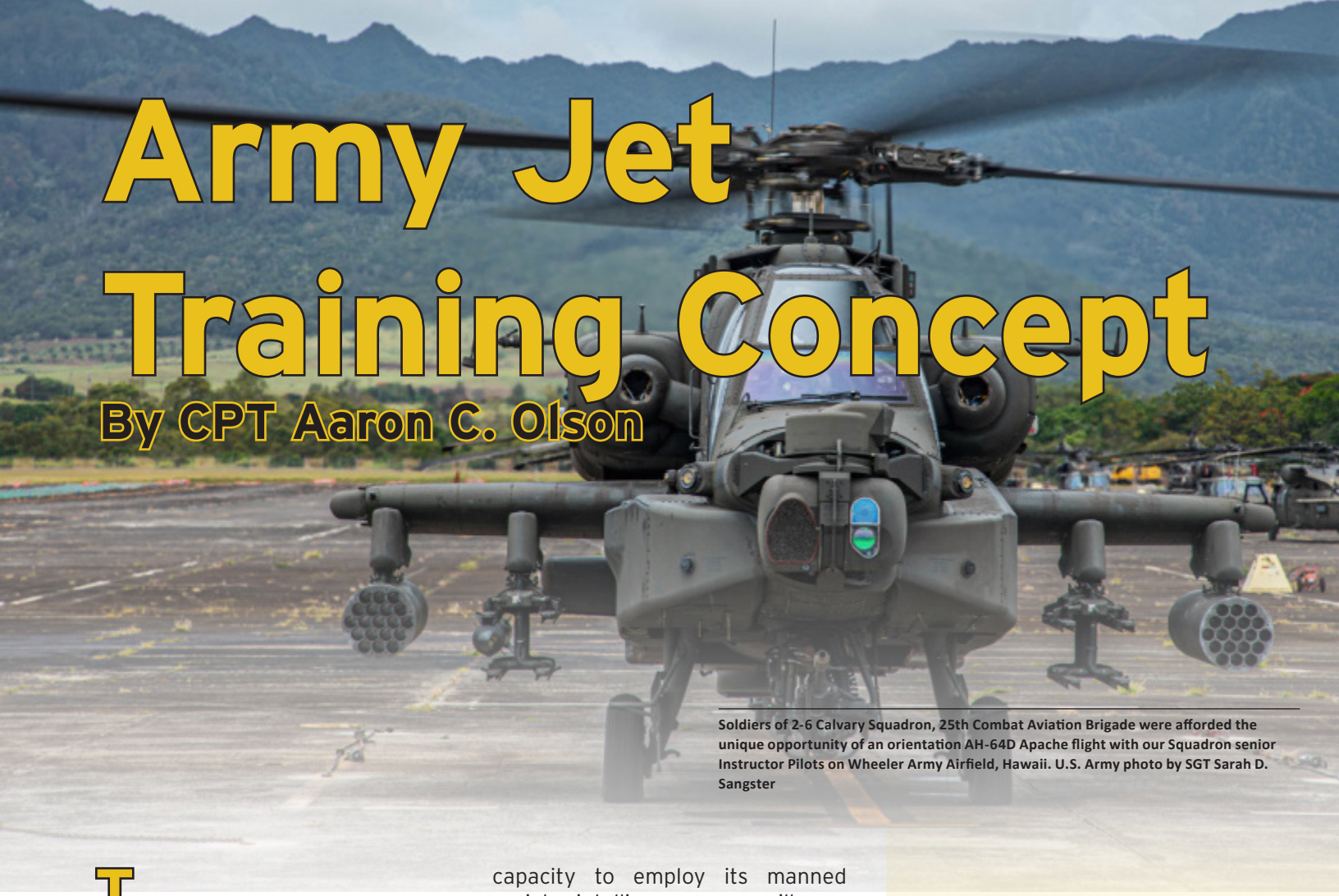
Biography:

CW3 Maney entered active service in 2010 as a 13P fire direction specialist for the Multiple Launch Rocket System (MLRS) with 2/4 Field Artillery Regiment (Fort Sill). He has flown the AH-64 D/E since 2013, first with the 12th CAB (Germany), and later the 16th CAB (JBLM), with 3 combat tours. He holds a Bachelor of Science from the University of Florida (2007), and is pursuing a Master of Arts in Foreign Policy and International Relations from the University of Oklahoma (2021). Graduate of the AH-64 D/E Instructor Pilot Course and Aviation Warrant Officer Advanced Course, he is currently an Instructor Pilot with 1-14th Aviation Regiment (Fort Rucker).

Army Jet Training Concept

By CPT Aaron C. Olson



Soldiers of 2-6 Calvary Squadron, 25th Combat Aviation Brigade were afforded the unique opportunity of an orientation AH-64D Apache flight with our Squadron senior Instructor Pilots on Wheeler Army Airfield, Hawaii. U.S. Army photo by SGT Sarah D. Sangster

The Army recognized and codified a need for change in its 2019 Modernization Strategy. The strategy identifies concepts, doctrine, organizations, and training, or 'how we fight,' and equipment, or 'what we fight with,' as two of its three pillars in the effort to fight and win future wars (Department of the Army, 2019). The ability to detect, identify, and prosecute targets at long range is one of the key requirements for the future Army engaging in large-scale combat operations.

Additionally, Field Manual 3-0, "Operations," reflects this reality in the foreword, "The Army and joint force must adapt and prepare for large-scale combat operations in highly contested, lethal environments where enemies employ potent long range fires and other capabilities that rival or surpass our own" (Department of the Army, 2017). The Army's capacity to employ its manned aerial intelligence, surveillance, and reconnaissance (A-ISR) assets is essential in providing timely and accurate information to the ground force commander. This necessitates a platform that has both the range and the altitude capability to conduct sensing and detection missions outside the range of enemy air defense systems. The concept name for this future high-altitude surveillance system platform is HADES, or the High Accuracy Detection and Exploitation System.

The Army Futures Command Concept for Intelligence (Army Futures Command, 2020, p. 27) identifies that the Army's current A-ISR platforms are approaching the end of their useful lives and that a more capable platform is required for future warfare. Today's inventory includes medium-altitude, short-range, and low-endurance platforms suited to uncontested, typically counterinsurgency (COIN)-focused operations. They require large

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logistical and support footprints and service a small geographic area relative to the effort required to sustain operations. Additionally, deployments require extensive prior coordination, and especially so for unprepared areas. The typical transatlantic flight, for example, takes a minimum of 3 days just to position the aircraft to conduct mission flights from an existing location. This is contrasted with a medium-high altitude, high-speed, long-range jet such as a large cabin business jet, which can cover the same distance in one day's flight and still offer collection time on the target area.

The Army's legacy fleet's collection capabilities, while suitable for COIN, are insufficient to match the range of current weapons delivery systems such as the high-priority Long Range Precision Fires initiative, which purports range greater than 300 kilometers (km) (U.S. Army Acquisition Support Center, 2021), and potentially greater than 500 km (Feickert, 2021, p. 17). The future sensor must possess the ability to match or exceed the deliverable range in the fires community. This will only occur with significant gains in altitude over today's medium-altitude platforms. The same logic applies to the platform's ability to provide adequate intelligence preparation of the battlefield during competition to set the conditions for conflict. In order to operate in semi-permissive airspace and still locate targets, the platform requires an advanced aircraft survivability equipment suite and a sufficient altitude to identify and track targets and areas of interest. Today's Beechcraft King Air fleet does not possess the ability to fly in this type of airspace or locate and track targets at the type of distance necessary to enable success in the multidomain operations (MDO) environment. The future sensor should operate in the 'deep' range defined as greater than 300 km.

The platform of choice with these attributes is a medium-high altitude, long-range, high-endurance aircraft, and a large cabin business jet meets or exceeds the desires as voiced by platform developers and called for in the Army's MDO concept and modernization strategy. There are several challenges with the transition from a King Air fleet to a HADES fleet, to include an experience deficit in jets, the current

A UH-72 Lakota from the Indiana National Guard's Company C, Detachment 1, 1st Battalion, 376th Aviation Regiment, flies over Volk Field, Wisconsin, on July 15, 2016, during PATRIOT Exercise 2016. PATRIOT is a Domestic Operations disaster-response exercise conducted annually by National Guard units from throughout the U.S. working with state and local emergency management agencies and first responders. U.S. Air National Guard photo by technical sergeant Amber Monio

UH-60 Black Hawk helicopters, assigned to the 28th Expeditionary Combat Aviation Brigade, parked on an airfield in the 28th ECAB's area of operations in the Middle East. U.S. Army photo by SGT Eric Smith

training qualification course model, and the difficulty in ensuring continuation training. The transition to the multidomain sensing system and the HADES platform is necessary, though, and the training concept should change in anticipation of this paradigm shift.

Jet Experience Deficit and Bridging the Gap

The most often cited deficiency among the Army aviation community, and fixed wing in particular, is the lack of experience. The aviation branch, within the last 5 years, instituted a change in training wherein new aviators select the C-12 and receive rotary training in the UH-72 exclusively. This program achieved the aim of producing younger, more competent fixed-wing pilots, an obvious benefit. It has; however, also produced experienced and qualified candidates for transitions to civilian flying careers. The average fixed-wing officer, when their active duty service obligation (ADSO) is complete after 6 years (increased to 10 years as of October, 2020), can expect to market themselves as a commercial multiengine pilot, many of whom also possess their airline transport pilot certificate with around 1,500 hours of flight time and a significant amount of pilot-in-command time. It's important to note, and is addressed later, that the ADSO has increased to 10 years, and that far fewer aviators will possess the pilot-in-command time that is now common because of the community transition to a jet. In the meantime, however, these qualifications, coupled with attractive market alternatives for which these officers readily qualify, have led to a rather significant departure of experience in the fixed-wing ranks. The rotary community has experienced some of these issues, though not to the same extent, because of the lesser number of market alternatives and the steep barriers to entry associated with transitioning from a military rotary pilot to a civilian fixed-wing pilot. A military helicopter pilot has to pay for his own fixed-wing ratings and flight time or serve several years in a rotor transition program. Additionally, Boeing's recent Pilot and Technician Outlook study (Boeing Corporation, 2019) projected a 20-year cumulative shortage of 743,000 fixed-wing pilots and only 61,000 rotary pilots, which demonstrates the uniqueness of the challenge facing the fixed-

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wing community.

The other significant experience issue with regards to the HADES concept is that of jet airplane experience within the Army. There are currently four units in which an Army aviator will fly a jet aircraft, and the number of aviators within those units is a fraction of the overall community. Of the four potential places for an aviator to gain jet experience, only the U.S. Army Priority Air Transport Battalion (USAPAT) flies a business jet that compares to the type of platform required to achieve the desired speed, range, and endurance of the HADES concept. In a further narrowing of the scope, the unit flies both the smaller UC-35 and the larger C-37, meaning that some aviators do not fly the larger jet at all. Because of the screening and selection process associated with a USAPAT assignment and the traditional demographic, most selectees are senior aviators who retire from this unit rather than rotate back into the Aerial Exploitation Battalions (AEBs) as a younger aviator would. There are multiple reasons why senior aviators do not return to AEBs, to include their experience, marketability, and lack of ADSO after several years in USAPAT. This fact, combined with the Army's King Air focus, presents an experience gap that requires bridging.

The Army has a dearth of jet experience and exposure and will, therefore, require short-term (3–5 years) assistance to build the experience bench and self-generate capable aviators. One method to ensure safe crews and to build the talent pool is to use contract pilot augmentation through the nascent program years. The Army aviation community and the ISR community, specifically, has employed contract solutions to bridge manpower and capability gaps in the past, and this method would work well in that scenario. The use of proven contract aviators is a responsible course of action to expose Army aviators to and train them in a new aircraft and mission set.

One medium long-term remedy to the experience deficit is the new aviation ADSO. The new (as of October, 2020) policy, which increases the commitment from 6 to 10 years post-flight school, will help to ameliorate this issue. The

INCIRLIK AIR BASE, Turkey – A UC-35 jet from the 29th Combat Aviation Brigade's UC-35 flight detachment, is parked at a taxiway after landing at Incirlik Air Base, Turkey, June 19, 2017. Stationed throughout the region, elements of the 29th CAB provide intra-theater airlift capabilities for people and cargo in support of Operation Spartan Shield, Operation Inherent Resolve and Operation Freedom Sentinel in Afghanistan. U.S. Army photo by CPT Stephen James

assertion that the new ADSO will exacerbate the retention problem is false, though there could be an argument made that it will reduce new accessions. These data are not available and will not present themselves until the fiscal year 2021 accessions results are compiled; however, the policy change will obviously retain aviators for 4 years more than the previous ADSO. While the retention is out of compulsion and not choice, it doesn't change the fact that aviators will stay in the Army longer. This will benefit the community through the additional years of experience accumulation and the time it offers to train and mentor junior aviators.

Qualification Training

Today's Special Electronic Mission Aircraft (SEMA) aviators attend one of several qualification programs in order to fly ISR aircraft. Those assigned to an RC-12X or MC-12 unit attend an 8-week course at the Intelligence Center of Excellence on Fort Huachuca, Arizona. The reason for the RC-12 qualification course, which started more than 20 years ago, was its highly modified nature; there is not an equivalent civilian aircraft in weight, drag, avionics, or systems. The same held roughly true for the MC-12 when it came online in 2014, which led to another separate course. Conversely, aviators assigned to an Airborne Reconnaissance Low (ARL) or ARL-Enhanced unit attend a civilian-type rating course in the DHC-7 or DHC-8, followed by unit training and progression.

The precedent exists within the community to use civilian-type rating courses rather than Army-run qualifications, and this should continue with the jet model until the Army can establish an equivalent program of instruction in which to qualify aviators. In the interim, the type rating will teach systems, automation management, and emergency procedures, and the unit will teach the mission and related tasks. Likewise, the Army's eventual initial training course should focus on the fundamentals of flying the aircraft, and the unit should focus on mission and progression. This maximizes use of limited aircraft and moves aviators to their units more quickly and efficiently. The Army qualification course should mirror the civilian type-rating model through the use of simulators. The

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use of aircraft in a qualification-only course reduces aircraft availability in the operational unit and should not occur in order to keep mission aircraft conducting mission and integrated training.

Continuation Training

The current King Air model uses numerous airplanes (sometimes exclusively) for continuation training, and often uses mission-capable aircraft to conduct training not related to mission tasks. This model has to change in the light of a HADES platform–there is no justification for an inflated inventory to provide training-only aircraft. Current practices require that aviators fly roughly 110 hours annually (for Flight Activity Category 1 designated officers) and meet certain currency requirements (typically a flight every 60 days, at a minimum). Today's King Air aviators must fulfill all but a handful of these hours in an aircraft rather than a simulator.[1] While this practice is much preferred, especially in a King Air, it isn't feasible to expect that every ISR aviator is going to fly the jet with the same regularity that the community knows with the King Air. Aviators will fly extensively when deployed or supporting combat training center (CTC) rotations, but the current practice of using a mission aircraft for training flights on a weekly basis will not work in the HADES concept.

Additionally, instructors conduct annual evaluations, to include emergency procedure training such as simulated engine failures and single engine landings, in the aircraft. These maneuvers will not occur in a large cabin business jet, nor will the frequent traffic patterns to which most ISR aviators are now accustomed. Instead, the community should identify and accept the training opportunities and value associated with a simulator-based program.

[1] More information about this statement may be found via the U.S. Army Training and Doctrine Command intranet Sharepoint website with a valid common access card.

The fixed-wing community should to purchase and integrate high fidelity, Level D simulation into its training plan. Two to three Army-owned simulators will allow the unit to train its new aviators, prepare them through emergency and abnormal procedure practice, and maintain proficiency with automation management. The jet reflects the overall trend in both military and civilian aviation in that it relies more on system programming and monitoring than it does manual flying skills. Organic simulator capabilities and a revised training program would allow instructors to focus more heavily on this aspect of flying. The cost savings are significant, and the fact that mission aircraft remain available is essential.

As for flying hours, the fixed-wing community should tie continuation flights into maneuver unit training and CTC support. Aside from some limited exceptions, the current A-ISR footprint does not provide widespread support to maneuver unit exercises. Tying these opportunities into the training plan will provide realistic and challenging situations to develop aviators and produce significant learning. The jet should benefit maneuver commanders through integration in CTC rotations and field exercises. This support will lead to increased familiarity and interaction, which will ensure utilization and confidence in the system's capabilities.

One of the reasons that the current SEMA fleet does not conduct this training is the additional time and monetary cost associated with a CTC rotation. A King Air would need to pre-position at an airfield close enough to the training area to provide meaningful on-station time, which would incur additional temporary duty yonder, or TDY, costs and logistical hurdles. The jet, by contrast, would plan the mission through pre-coordination, launch from home station, fly to the CTC to provide several hours of support,

A Green Beret assigned to 3rd Special Forces Group (Airborne) prepares to load onto a UH-60 Black Hawk helicopter for extraction during a training event near Nellis Air Force Base, Nevada, Aug. 27, 2019. U.S. Special Forces and U.S. Air Force Joint Terminal Attack Controllers conducted a raid and utilized multiple weapon systems ranging from small arms weapons to A-10 Thunderbolt II aircraft. U.S. Army photo by SGT Steven Lewis

and recover to its home airfield. The unit would not assume any additional TDY costs or logistical challenges, the aircrews would receive realistic and beneficial training, and the maneuver units would benefit from real-time ISR in the training environment. These missions will progress new aviators, evaluate pilots-in-command, and develop new tactics, techniques, and procedures. The value added from a domestic training perspective is immense and should find a place in the jet's continuation training model.

The Army ISR community has enmeshed itself within the realm of short-range, medium endurance tactical assets, such as the MC-12. The theater-level RC-12 also possesses the limited range and endurance that bemoans the tactical assets. The U.S. defense policy and the Army's modernization strategy demand a paradigm-changing approach to ISR. The jet serves the goals of speed, range, and endurance, and meets the aims of competing with peer and near-peer adversaries. The community should change its qualification model, start building the jet experience bench, and invest in its future through simulator and integrated training strategies.

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A U.S. Air Force F-15 Eagle conducts a show of presence during a memorial to a fallen Soldier, Specialist Octavious Lakes Jr., 3rd Armored Brigade Combat Team, Fort Hood, Texas, during Decisive Action Rotation 19-03 at the National Training Center (NTC), Fort Irwin, California, Jan. 20, 2019. The show of presence was in memoriam to the fallen Soldier who passed away Jan. 14 while training at the NTC. U.S. Army photo by PVT Brooke Davis, Operations Group, National Training Center

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Biography:

Captain Olson currently serves as the SEMA Committee Chief on Fort Huachuca, Arizona. Previous assignments include command of Alpha Company, 3rd MI BN; Executive Officer of Bravo Company, 3rd MI BN, and Brigade Staff in the 501st MI BDE and TF ODIN, Afghanistan. He holds various ratings in fixed- and rotary-wing platforms.

Reprint article

"Mastering the Fundamentals" was originally published in the January 31, 2020 issue of ***ARMY AVIATION*** Magazine

Army Aviation Branch Chief's Corner

Mastering the Fundamentals

By MG David J. Francis

U.S. ARMY PHOTO BY PIERRE-ETIENNE COURTEJOIE, VISUAL INFO SPECIALIST

The adversaries we face in Large Scale Combat Operations (LSCO) will employ multiple layers of standoff across all domains in an attempt to disrupt our operations in competition as well as in conflict.

U.S. Army SGT Darrel Rueger, mechanic assigned to the 1st Combat Aviation Brigade, 1st Infantry Division, checks an engine while performing 40-hour maintenance on a UH-60 Black Hawk helicopter staged on Chièvres Air Base, Belgium, Jan. 31, 2019. Chièvres Air Base served as an intermediate staging area before the 1st Combat Aviation Brigade deploys to Germany, Poland, Latvia and Romania for nine months to train with NATO partners in support of Atlantic Resolve.

This change of strategy requires a counter stratagem on our part, which is what the concept of Multi-Domain Operations (MDO) provides. Central to Army Aviation within MDO is the concept of independent maneuver. This entails continuing operations in a contested environment for an extended period without continuous support from higher echelons while retaining the ability to converge capabilities rapidly at the time and place of our choosing to present multiple dilemmas to our adversaries.

One of the significant factors of independent maneuver for Army Aviation is the manner in which we maintain and sustain our aircraft during the execution of this operational construct. The solution to maintaining our aircraft is not simple, but it is relatively straight forward and achievable – by mastering the fundamentals.

Over the last decade plus, the nature of the fight and the OPTEMPO drove us to rely heavily upon contract maintenance, which was feasible for counterinsurgency operations. That same approach is not compatible with independent maneuver at the battalion and brigade level. Our doctrinal definition of Expeditionary Aviation Operations, however, is well-suited for that mission. Within our definition

are two vital departure points for leaders and Soldiers to grasp regarding maintenance and sustainment. First is that we must be prepared to operate with limited external resupply and sustainment for up to a few weeks at a flight hour rate per month per airframe double that of normal training rates. Second, we must be prepared to move our formations at a minimum of every few days, and at worst case multiple times a day – depending on the nature of the threat. In this scenario it is incumbent upon leaders and Soldiers that they know, and are capable of upholding, maintenance standards in this austere and expeditionary environment.

The Soldiers that are graduating today from the 128th Aviation Brigade at Ft. Eustis, VA will be the platoon sergeants and experienced aviation maintenance techs across our formations in 2028 when we are MDO capable and they will be the sergeants major and brigade/division maintenance officers in 2035 when we are MDO ready. These are the Soldiers that must understand the ramifications of fighting in LSCO, and must help shape that capability.

With the intent of providing clarity on a common way forward for these Soldiers, and all Soldiers across Aviation, the branch is producing an SOP that will streamline maintenance standards across the force. Additionally, our requirements for future vertical lift must ensure that maintainability and sustainability are incorporated to increase time between major maintenance actions. Based on how we expect to conduct operations in LSCO, this will be an essential operational requirement.

2028 is right around the corner. The time is now to ensure we build those invaluable foundational maintenance skills for leaders and Soldiers across the Aviation branch so that in 2028 and 2035 we continue to provide the Army an asymmetric advantage in Large Scale Combat Operations.

Above the Best!

MG David J. Francis is the Army Aviation branch chief and commander of the U.S. Army Aviation Center of Excellence and Fort Rucker, AL.

"Be brilliant in the basics. Don't dabble in your job; you must master it."

-Jim Mattis, Call Sign Chaos: Learning to Lead, March 2, 2021, Random HouseTrade Paperbacks

"Before you start telling your Soldiers to master the fundamentals, take the time

to have a conversation with your team. What are those fundamental tasks at ech-elon? How do you structure every organizational activity around the tasks? Howdo they collectively contribute to the overarching purpose and reason for yourorganization's existence? How does the accomplishment of these tasks nest withthe essential task of cohesive small units? Your subordinates will thank you. Pur-pose leads to focus, and focus leads to fundamental tasks that drive every aspectof great units. Focus minimizes confusion and maximizes teamwork. True team-work builds cohesive units that care for one another, because everyone matters.Genuine teamwork builds trust and confidence in ourselves, the organization, andone another. Repetitive practice leads to teams that can truly master the funda-mentals."

-COL Michael J. Simmering, Outlaw 01, Operations Group, The National TrainingCenter & Fort Irwin from ***Mastering the Fundamentals,*** Publication No. 21-19

WHAT'S STOPPING YOU FROM SUBMITTING YOUR ARTICLE TO *AVIATION DIGEST*?

BEING A PUBLISHED AUTHOR IS A GREAT WAY TO:

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A Message to Garcia

Author, Elbert Hubbard; Taciturn Pipe Publishing, 2017, 46 pages

An Essay Review by Ms. Charlotte Honsinger

This book was a fluke, a hastily written essay that exploded across many spectrums. I learned of it in the infancy of my military career and carry the 'lessons' on with me now 3 decades later. I read it again, from time to time, just to check myself and see if I am still carrying out the intent given. I challenge anyone to take the time to read this essay. It consists of about 10 pages found completely free on the World Wide Web.[1] This small book packs more of a message, to anyone, than many of today's huge repositories of knowledge. Internally, many in the Army are familiar with the acronym 'KISS'– Keep It Simple Soldier or variations that are not so kind, gentle, or politically correct. This tiny relic, from years past, keeps the message simple; discussing the understanding of one specific word 'Initiative.' It challenges the reader to take the time to do a self-assessment; an internal check of his own moral fortitude to do the right thing for the right reasons.

The body of this little book explains, quite simply, what 'is needed' by all in those positions that request a subordinate to complete a task, or as stated, "do the thing," whatever that may be. The book continues to explain how you can put the matter to the 'test' to see if what is stated within is true. Assign that 'unknown or unusual' task and see how your personnel respond. The final parts of the story explain how one man did exactly that, ending with discussion on how the world cries out for others who can do the same. Everyone can benefit from the simple wisdom tucked into this tiny tome. Take a few minutes to read and decide for yourself.

[1] ***A Message to Garcia*** **may be found at this link: *A Message to Garcia*-by Elbert Hubbard (govleaders.org).**

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Jet Girl: My Life in War, Peace, and the Cockpit of the World's Most Lethal Aircraft, the F/A-18 Super Hornet

Author: Caroline Johnson, with Hof Williams; St. Martin's Press, New York; 2019; 324 pages

A book review by CPT Christopher S. Poppleton

Fast-paced, on-the-edge, fly-by the seat of your pants, and never look back: The life of a naval aviator proves to be continuously on-the-go and never slows down in Caroline Johnson's ***Jet Girl: My Life in War, Peace, and the Cockpit of the World's Most Lethal Aircraft, the F/A-18 Super Hornet.*** As evidenced in this wonderful and eye-opening memoir by the aviator herself, we see an incredible glimpse into the life not only of the exhilaration and adventure that military pilots encounter in their journeys, but the trials and challenges that all aviators experience today, especially females. Ms. Johnson's book details her journey through many important phases in her life, beginning with her first day at the Naval Academy at Annapolis, Maryland, to her deployment to the Middle-East, and to her time at home before transitioning off active-duty and to the naval reserves.

The timeline of the novel transitions back and forth between more recent experiences, such as Johnson's combat deployment to Afghanistan, Iraq, and eventually Syria in 2015, and those of her first days in the military, beginning in 2005. This transitioning provides the reader with a balance of the lessons that our author has experienced and learned from, some of which would become constant themes throughout her career. A major underlying theme that is consistently apparent, and justly so, is Ms. Johnson's desire to "retain her femininity" (Johnson, pp. 15). There simply are not that many female aviators in comparison to their male counterparts in the military, particularly in fields such as aviation, infantry, and special operations units even. While that change is occurring more and more every day as the military becomes more modernized and open, Ms. Johnson does everything she can to embrace and stay true to who she is in an otherwise unbelievably challenging environment. Met with opposition and resistance from her first days as a freshman (plebe) at Annapolis, to her days with the Fighting Blacklions, Ms. Johnson demonstrates that in order to achieve your goals and succeed to be at the top, you have to indeed be a "trailblazer" as she so aptly embodies.

From graduating top of her class in flight school and becoming a Weapon Systems Operator aboard the F/A-18 Super Hornet, Caroline Johnson would go on to become the first female aviator to drop live ordnance on enemy targets in 2015 in Syria when ISIS first began to push toward and into Iraq. What can be simply overlooked in her stats of 16 confirmed kills in her engagements in 2015 (Johnson, 259), are her more impressive numbers of flight hours, and especially, briefing and debriefing times logged. From this book, any reader will be able to see not only the incredible amount of training time that is required in the cockpit, but the true diligence outside of it in planning and studying in order to be successful. On top of spending an enormous amount of time studying not only flying, Caroline spent her deployment working on completing a Master of Arts in Administrative Leadership. The mental ramifications of constant studying, flying, and breathing aviation however, can be draining and certainly takes

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its physical toll in many other ways too, sometimes completely unbeknownst to the aviator themselves (Johnson, pp. 263).

What will, and should, resonate more deeply, however, are the ties that the aviation community retains within itself, spanning on a global scale. There are customs, traditions, and a thousand habits that pilots learn to embrace and incorporate into their daily lives, as well as rules to abide by beyond what's written by regulation. Naval aviators learn to embrace the good, such as enjoying port calls, a short trip to the mainland to help break up the long, several-month stints aboard aircraft carriers. They also learn to embrace and recognize the bad, such as the rule of three (Johnson, 193), wherein recognizing that bad things come in threes, and sometimes those events can have incredibly devastating effects on aviators on a very personal level. Many of them train and fight alongside their friends for many years, sometimes across the five branches of the military, and the ties that are formed are beyond just friendship and even romance, but that of family. This is true especially for female aviators, as they are so few in number that it makes both the accomplishments and losses that much more evident in the eyes of those who know them. It is even more difficult when some of those close-knit ties decay and dissolve over time, sometimes isolating or even alienating female soldiers from one another and their group, simply for the sake of having to fit into the male-dominated, naval-fighter jet community (Johnson, 269).

Ultimately, this book should be read by all aviators, of all aircraft, and all branches, for it is a love letter to the passion and determination that aviators require to do what they love most: fly. Caroline Johnson's memoir portrays both the successes and difficulties that reside in not only the aviation community, but in a military that is constantly changing and moving forward, striving to achieve the betterment of all its service members.

BOOK REVIEWS

Do you have a favorite book on military history or on a professional military reading list that you'd like to share with others in the Army Aviation community? Consider writing a book review for *Aviation Digest's* Turning Pages section. We request that the review be one written page (approximately 825 words). Query the *Aviation Digest* editor through the AD mailbox regarding the book you'd like to share with us.

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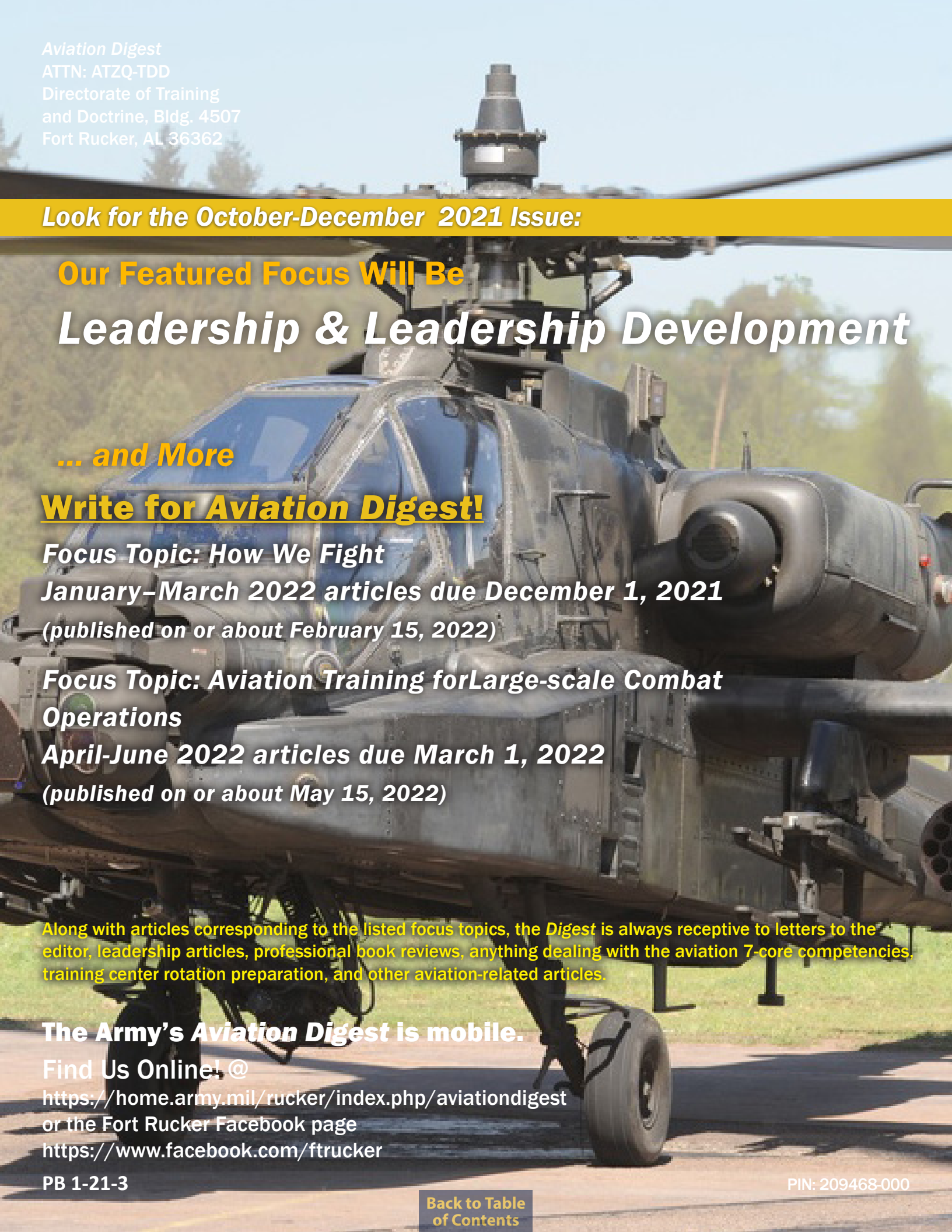

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January–March 2022 articles due December 1, 2021
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Focus Topic: Aviation Training forLarge-scale Combat Operations
April-June 2022 articles due March 1, 2022
(published on or about May 15, 2022)

Along with articles corresponding to the listed focus topics, the *Digest* is always receptive to letters to the editor, leadership articles, professional book reviews, anything dealing with the aviation 7-core competencies, training center rotation preparation, and other aviation-related articles.

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