Strategy Research Project

Shaping Army Aviation Maintenance: Adapting to the Future

by

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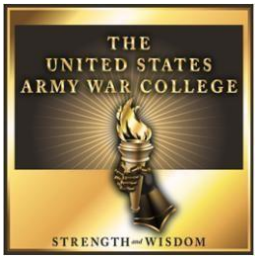

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Abstract

Future Vertical Lift (FVL) platforms will not only look and operate differently from today's Army Aviation fleet, they will also fundamentally change its operational methodology. To effectively leverage these Joint, future systems, the Army will need a more holistic approach to how it trains and organizes its maintainers, and how it conducts maintenance. To prepare for the arrival of FVL, Army Aviation must proceed incrementally and implement new maintenance practices that can be tested, modified, and practiced on today's Mission Design Series (MDS) aircraft. Only by doing so, will Army Aviation be ready to field and sustain FVL upon its arrival. Using elements of a DOTMLPF-P framework, this paper explores maintenance concepts that will enable Army Aviation to sustain FVL. It also makes recommendations about how to implement these concepts, in support of FVL's fielding and operation in a future environment.

Shaping Army Aviation Maintenance: Adapting to the Future

To meet the challenges in facing peer threats and increasing demands for aviation assets with current Mission-Design Series (MDS) rotary wing aircraft (AH-64, UH-60, CH-47), the Army Aviation enterprise must improve its mobility and expeditionary capabilities. As Army Aviation also plans and prepares for the arrival of the family of Future of Vertical Lift (FVL) aircraft and systems, the enterprise can leverage this vision to improve the operational availability of its current fleets. By examining the FVL Family of Systems (FoS) and working backward, Army Aviation can develop maintenance and organizational concepts, test and refine those concepts, and ultimately make changes that enable greater mobility and flexibility in expeditionary environments. Additionally, adopting FVL concepts before their arrival will result in a more seamless transition from current MDS fleets to FVL. The Army needs to make, sound investments in advancing aviation maintenance doctrine, training, and organization to better utilize the assets it possesses and prepare for the future.

The case for these needed changes arises from study of the current Operational Environment (OE) and threat assessments that indicate an erosion in US technical superiority. In the past, the US military has shown the ability to leverage technological advancements against its enemies, which resulted in battlefield success. However, while science and technology will continue to allot a comparative advantage to the US in the character of war, "…winning in a complex world requires powerful combinations of leadership, skilled soldiers, well-trained units, and technology."[1] In this regard, there are "no technological silver bullets" and the Army must compliment new technological capabilities with corresponding changes in existing doctrine, training, and organization.[2] While the FVL FoS holds promise for technological improvements that will increase

operational capability and readiness, Army Aviation's current MDS fleets are slated to continue service beyond the arrival of FVL and as late as 2060.[3] In order to achieve greater mobility and expeditionary capability to meet current and near peer threats, Army Aviation cannot ignore the need to change its maintenance methodology.

Over the past three years, much attention (at least from a technology perspective) in Army Aviation has been focused on increasing Operational Readiness (OR) rates, and ultimately the availability, of Army aircraft to meet minimum standards. Currently, Army Regulation (AR) 220-1 mandates that Army aircraft achieve an OR rate of 75% to meet Readiness Level 1 requirements.[4] In 2017 however, Army Aviation was only able to maintain fleet readiness of 70% for AH-64, 73% for CH-47, and 76% for UH-60. Understandably, Army leaders at both the Army Aviation Center of Excellence (USAACE) and Army Aviation and Missile Command (AMCOM) would like to increase these OR rates.[5] To affect this, Army Aviation leaders are seeking to increase aircraft OR rates by decreasing maintenance downtime through methods that follow two schools of thought. First is to decrease the number of maintenance "touches" by increasing the time between scheduled maintenance tasks (i.e., inspections that must be completed due to flight time accrued on the aircraft). The second is to reduce maintenance requirements by relying more on Conditions Based Maintenance (CBM) or Reliability Centered Maintenance (RCM) that better uses data from existing on-board Digital Source Collectors to self-identify pending part or material failure. While both of these methods demonstrate potential in increasing OR rates and overall aircraft availability, they have already been explored extensively.[6] What these two methods fail to address is the number of maintainers and where maintenance is being conducted. By

stratifying maintenance tasks by unit, increasing the training level of maintainers, and aligning maintainers with tasks based on knowledge and experience, Army Aviation can improve efficiency and increase aircraft availability. The purpose of this paper is to focus on the doctrinal directives of where, and by whom, maintenance is conducted. It also addresses the training and organization of maintenance personnel, in order to propose concepts that will enable greater mobility and expeditionary abilities for Army Aviation.

Defining the requirement

On October 31, 2014, the US Army published Training and Doctrine Command (TRADOC) Pamphlet 525-3-1, titled *The U.S. Army Operating Concept Win in a Complex World*. In essence, this document describes how the Army must adapt in order to meet the challenges it faces from current and future threats. The *Army Operating Concept* (AOC), recognizes that the Army, with primary responsibility for the land domain, must leverage the entirety of the joint force in order to defeat adversaries across all domains: land, air, maritime, space, and cyberspace. To achieve this, the Army must develop its equipment and forces in line with the joint services. Across the Army, the AOC directs the development of "foundational capabilities for the Joint Force" and "…guides future force development through the identification of first order capabilities that the Army must possess to accomplish missions in support of policy goals and objectives."[7]

The Multi-Domain Battle (MDB) concept complements the AOC and serves as a guide to future force development in the Joint Capabilities Integration and Development System (JCIDS) process. This TRADOC developed concept identifies how the Army, as part of the Joint Force, will counter peer adversaries by driving design and organizational changes to the future Army. This document was developed to help

visualize how the Army seeks to fight peer adversaries across domains and guide TRADOC organizations in developing capability-based assessments and requirements, identify gaps, and develop policy solutions.[8]

Building upon the AOC, and with the conceptual understanding of MDB, are six TRADOC Army Functional Concept Pamphlets, written by their respective Centers of Excellence, which describe capabilities the Army needs to conduct *Mission Command, Fires, Protection, Movement and Maneuver, Intelligence,* and *Sustainment* under the framework of the AOC. These documents describe the responsibilities of Army leaders to find joint solutions through materiel, doctrinal and organizational innovation.

The *Army Functional Concept for Movement and Maneuver* (AFC-MM) Pamphlet (DA PAM 525-3-6) describes how Army forces will face and conduct combat operations against threats in the 2020-2040 timeframe. It describes the challenges that Army forces will face across the five domains and places a premium on four critical components necessary to win: cross-domain maneuver, semi-independent operations, integrated reconnaissance and security operations, and employing the tenets of mission command philosophy.[9] To attain these four components, the AFC-MM makes its case for Army forces to be more mobile, dispersed across larger areas, and execute decentralized sustainment. To meet these needs, the AFC-MM recognizes that the Army must reduce its logistics demands, increase organic maintenance capabilities, and establish resupply capabilities to sustain high tempo periods up to seven days.[10] By achieving these goals, Brigade Combat Team (BCT) commanders will be better able to retain the initiative and seize advantages when time and opportunity permits, a key to winning in a complex world.

As it pertains to the subject of this paper, the *Army's Functional Concept for Sustainment* (AFC-S) Pamphlet (DA PAM 525-4-1) describes the AOC as, "…provid[ing] the intellectual foundation and framework for learning and for applying learning to future force development under *Force 2025 and Beyond*."[11] The AFC-S was written to aid in developing required sustainment capabilities that were identified in the AOC, MDB, and AFC-MM. Among several sustainment related implications identified in the AFC-S, the key requirement is for forces to self-sustain operations for seven days with minimal resupply. Another identified requirement pertinent to the topic of this paper, is the need for simplified maintenance using line replaceable items and maintainer autonomy to support unit dispersion.[12]

For Army Aviation, the nature of the future OE defined in the AOC, MDB, AFC-MM, and AFC-S necessitates a much more mobile and expeditionary force capable of deploying with minimal notice and preparation. Succinctly described in the AOC, "When called upon, globally responsive combined arms teams maneuver from multiple locations and domains to present multiple dilemmas to the enemy, limit enemy options, avoid enemy strengths, and attack enemy weaknesses."[13] However, only one of these documents addresses Army Aviation operations in the future. Only the AFC-MM briefly addresses Army Aviation with a single comment wherein it states that Future Vertical Lift platforms must be available at both the tactical and operational levels to support the maneuver commander. Understanding that FVL platforms will not reach Initial Operating Capacity (IOC) until 2030, the AFC-MM fails to address the need for current Army MDS platforms to bridge capability gaps before the arrival of FVL.

Recognizing the need for a complementary concept to build upon the AOC and AFC-MM, the U.S. Army Aviation Center of Excellence developed the Combat Aviation Brigade (CAB) Operational and Organizational (O&O) Concept. This concept describes how Army Aviation will approach and contribute support to forces in the future OE. Key to its logic, the CAB O&O specifically delineates four assumptions and 17 capability gaps which define the need for better mobility and expeditionary capabilities in existing aviation formations.[14] In studying the listed assumptions and corresponding requirements however, there appears to be a contradiction. On one hand, the CAB O&O makes the assumption that:

> The existing Army helicopter fleet (AH-64D/E, UH-60M, CH-47F) provides sufficient aircraft performance capabilities (speed, range, payload and loiter time) to support air-ground operations across a typical BCT or Division area of operation/area of influence through the 2040 timeframe.[15]

Further into the document however, the concept defines one “extremely high and high risk” capability gap in Priority Gap #11:

> Army Aviation lacks adequate capability to sustain itself to a 90% operational readiness when task organizing to operate from multiple locations for extended periods of time during joint and combined arms air-ground operations which limits ability to provide responsive aviation support.[16]

To refine for clarity, Army Aviation performance requirements and sustainment capabilities are at odds with each other. While Army Aviation states that its current fleet is capable of meeting the performance requirements of a modern battlefield, it also recognizes that the enterprise is unable to support multiple geographically separated task forces for extended periods of time, which is needed to face a near peer threat.

Other relevant data that must be studied when analyzing the challenges facing Army Aviation today is the results of a comprehensive study report generated by the

“Holistic Aviation Assessment Task Force.” This study, directed by the Chief of Staff of the Army, General Mark Milley, in January 2016, was “…to conduct a comprehensive review of Army Aviation to ensure its readiness for the future.” Under this guidance, “…leadership, readiness, training, maintenance and sustainment, policy, and resources within Army Aviation.” were examined.[17] This landmark study, utilized the expertise of 34 Army Aviation experts, the Rand Corporation and three other senior aviation consultants.[18] These professionals studied Army Aviation past practices and earlier studies, present conditions, and identified shortcomings of future forces when taking into consideration the future OE. This report listed 63 recommendations that will make “Army Aviation… more effective, efficient, and safe as result of this study and applied solutions.”[19] Of those recommendations, there are three which are germane to the topic of this paper, they state:

- TRADOC should develop an Army expeditionary operating concept to describe the ability to deploy, close, consolidate, employ and sustain Unified Land Operations.

- TRADOC should conduct organizational assessment of Aviation maintenance and sustainment requirements essential to sustain expeditionary operations

- TRADOC should define Aviation maintenance roles, missions, functions, and responsibilities by echelon (Aviation Company, Aviation Maintenance Company and Aviation Support Company.[20]

In reviewing all of the documents previously discussed, it is clear that Army Aviation must approach the challenge of facing a near peer threat from multiple locations with both technological improvements and improved methodology. As stated earlier, the technological improvements needed within Army Aviation have been explored extensively and are outside the scope of this paper. This study will next

explore how to modify current doctrine, organization, and training to achieve greater mobility, availability, and expeditionary capabilities in support of the AOC.

Getting the horse in front of the cart

The benefit of a shared understanding of what the likely future OE will look like is that it gives TRADOC Capability Managers the direction needed to write requirements for future systems that acquisition personnel can act upon. The FVL FoS is being designed and built to provide greater mobility, expeditionary capability, and a reduced sustainment requirement and footprint. These new aircraft will not only look strikingly different from the current fleet of rotary wing aircraft in the inventory, their maintenance requirements will also be reduced due to improved design, enhanced systems resilience, and simplified maintenance procedures. While initially identified to be a fully joint/interservice acquisition program in the 2009 *National Defense Authorization Act*, FVL acquisition is largely being pursued and led by the Army. Current plans for the FVL FoS delineate requirements for five capability (or “Cape”) sets, each with different operational requirements. These five operational requirements are numbered sequentially from Cape Set 1 to 5, with 1 being the smallest (a reconnaissance security attack variant) and 5 being the largest (a heavy lift aircraft). Currently, the Army and Marine Corps are jointly pursuing the Cape Set 3 variant which seeks to replace the UH-60 Blackhawk, UH-1Y Huey, and AH-1Z Cobra respectively. On its own, and in conjunction with US Army Special Operations Aviation Command, Army Aviation is leading the development of a Cape Set 1 aircraft to fill a reconnaissance security attack role.[21]

Current FVL FoS goals revolve around increasing sustainment technology to increase aircraft availability, improve the ability of aircraft to self-identify faults, reduce

scheduled maintenance requirements, and require a smaller number of maintainers and tools to support. With respect to increasing aircraft availability, current goals for the FVL FoS call for a reduction in the number and frequency of scheduled maintenance requirements and enhanced aircraft systems design to increase reliability. The goal is to effectively double or triple current Operational Tempo (OPTEMPO) limits beyond what is considered a high OPTEMPO of 100-175 hours per month to a surge capacity of 100 hours per week. In addition to reducing maintenance requirements through systems design, FVL seeks to reduce maintenance down-time by increasing the ability of aircraft systems to self-diagnose and identify faults. Currently, scheduled maintenance requirements are a fixed and rigid schedule of maintenance requirements per flight hour. These requirements dictate when maintenance must be performed and provide limited autonomy in rescheduling or extending maintenance for surge, or in extremis, operations. This rigidity leads directly to increased aircraft downtime and loss of aircraft availability to the commander. By relying more on aircraft sensors to diagnose faults and/or indicate healthy operation, scheduled maintenance requirements can be better adjudicated to provide flexibility to the commander. By so doing, the commander will be empowered with information to dictate when maintenance is required, or its schedule modified, to meet operational requirements. From a maintenance manpower standpoint, FVL FoS designs seek to reduce the number of specialized maintainer skill sets, in favor of fewer, but more broadly trained maintainers. By also seeking to reduce or eliminate the number and type of special tools needed to maintain FVL aircraft, designers hope to achieve greater efficiency in manpower utilization and a reduction in special tooling requirements. Both of these will improve the deployability of sustainment

formations and equipment by reducing their footprint. Ultimately, this additional flexibility also allows commanders to better task organize for the missions at hand – dividing their support packages more readily.

Today, the TRADOC Capability Manager for FVL is working with Program Manager FVL and the civilian aviation industry to fulfill FVL requirements. However, the timeline for this program is long as FVL is not slated to begin fielding for IOC until 2030. Additionally, as the initial plan for fielding FVL aircraft places them at echelons above brigade, they will be limited assets committed in small scale and likely for specialized purposes and missions. The reality is that, until these units are fielded in quantity (and at the CAB level), current MDS fleets need to adopt some of the FVL characteristics to operate in the interim.[22]

The good news is that with FVL on the horizon, Army Aviation is poised to retain the capability needed to meet and defeat peer threats well into the 21st century. However, the underlap of today's fleets to meet tomorrow's threats and FVLs arrival and integration into daily operations is still more than a decade away. To ensure that today's MDS fleets can defeat the challenges of today and those of the future, Army Aviation must evolve its current doctrine and maintenance practices toward FVL like practices to ensure continued success while smoothing the path to FVL realization. As understanding the past is a key to the future, a brief look at Army Aviation's past, and how it evolved into its present state, will help inform future transformation efforts.

Where we are and how we got here

As eloquently stated by Theodore Roosevelt, "…the more you know about the past, the better you are prepared for the future." So too is understanding how Army Aviation arrived at its current practices is critical to shaping the force for the future. Army

Aviation maintenance doctrine, based on Air-Land Battle, was developed to support legacy aircraft with a focus on split-base operations and forward repair capabilities. During the time when most of our current fleet of aircraft were being developed, the Army used three levels of maintenance with multiple levels of intermediate maintenance capability interspersed in the aviation force structure.[23] Since 2003, and in accordance with Army Regulation 750-1, *Army Materiel Maintenance Policy***,** Army Aviation now exercises a two-level maintenance system: Field and Sustainment.[24] While the myriad reasons that led to this two-tiered system were undertaken to reduce maintenance manpower requirements and costs, their net result was largely insignificant. Fundamentally, most of the unit changes were largely in name only, vice structural reorganizations; they simply realigned units and did not address maintenance responsibilities. These alignment changes, coupled with efforts to reduce maintenance costs, resulted in redundancy and inefficiency in maintenance organizations.

The most recent and relevant changes to Army Aviation Maintenance doctrine focused on both unit manning and equipping, as well as changes in maintenance practices. In this change, the Aviation Unit Maintenance (AVUM) Company and Aviation Interim Maintenance (AVIM) Company were renamed as the Aviation Maintenance Company (AMC) and the Aviation Support Company (ASC) respectively. With this change, the ASC was also moved from the Division Support Command to the Combat Aviation Brigade (CAB), becoming part of the Aviation Support Battalion (ASB). This placed all aviation Field level maintenance within the CAB structure. The Aviation Classification Repair Activity Depots, which provided Sustainment level maintenance, were subsequently renamed Theater Aviation Sustainment Maintenance Groups

(TASM-G). This change moved Sustainment level maintenance from a Table of Distribution and Allowances to a Table of Organization and Equipment (TOE) unit and aligned all deployable sustainment activity under the TASM-G umbrella. While this provided the basis for a deployable equipment set, much of the larger equipment proved too difficult to move and was deleted from the TASM-G TOE. The end result is that TASM-Gs provide only a slightly more capable intermediate maintenance capability and for the most part are bypassed in favor of Depot level maintenance. In total, these changes amounted to semantic adjustments and achieved very little in changing the capabilities of Field or Sustainment level maintenance elements. Aside from eliminating the tiered tooling allocations previously applied to division, corps, and theater level AVIMs, all ASBs have the same tooling today--which significantly impacts deployability.

During the same time period, the ASC (previously AVIM) moved away from component repair in favor of Direct Exchange/Repairable Exchange programs and direct-to-depot repair programs. This decision was a function of multiple factors, including the following:

- ASC Consolidation- Larger tooling configurations were reserved for Special Repair Activities[25]
- Increased reliance on aircraft Built-in-Test (BIT) and BIT Equipment (BITE)[26]
- Reduced emphasis on obtaining technical data rights for component repair[27]
- Lack of training and soldier proficiency due to increasing component complexity and technical data right privacy[28]

Concurrently, the enactment of the Single Stock Fund was executed to take advantage of increased supply chain velocity, while utilizing a Working Capital Fund to make transactions less expensive. However, when improved supply chain velocity was

never realized, and local repair capability was reduced, these changes resulted in the unintended consequence of increasing rather than decreasing Authorized Stockage List (ASL) and Prescribed Load List (PLL) repair parts and components that CABs carry.

Another unintended consequence, was that the cost for an operational unit to repair a component at the ASC was the same as shipping the part to Depot for repair. This resulted in a negative incentive; rather than repairing components forward, ASCs shipped components to the rear and maintainer repair experience was lost. The combined problems of a negative incentive to repair and unrealized supply chain velocity, led directly to units overstocking parts (often “off the books”) to ensure they were not reliant on a supply chain that might not meet their mission requirements for unscheduled maintenance. Ultimately, this increased the quantity and physical size of materiel units carried on their ASL and PLL to sustain the CAB.[29]

In total, these doctrinal, organizational, and cost reduction efforts have resulted in redundant and bloated Field level maintenance units and capabilities. Further attempts to reduce costs, increase accountability, and difficulties in achieving a faster supply chain have only exacerbated these problems. Ultimately, it is the failure of doctrine to stratify maintenance actions or responsibilities between the AMC and ASCs that has caused this dilemma. By failing to ascribe maintenance responsibilities by level of expertise, experience, and capability, AMCs and ASCs carry nearly the same equipment and spare parts while they compete for maintenance tasking and talented maintainers which should be complementary versus rivalrous. These competing practices and realities have furthered embedded a maintenance methodology that is inefficient and ultimately hampers expeditionary capabilities.

Today's reality

Due to ongoing support for the Global War on Terror over the past 15 years, Army Aviation has been decisively engaged supporting low intensity, counter-insurgency operations. Correspondingly, Army Aviation has employed its maintenance paradigm during fixed-based operations and supported its maintenance practices with sustainment parts via semi-rigid logistic chains from supplier to end user. This has fostered aviation units' reliance on hardstand, often preexisting, airfields within a generally static Area of Operations. These facilities are close enough to easily receive support from higher echelons of maintenance and supply and are convenient for nearly all maintenance practices. They are also relatively secure from large-scale attack as the enemy simply does not have a robust capability. In the face of a peer threat however, these practices will be difficult, if not impossible, to sustain.

It is clear that Army Aviation leaders have found ways to successfully support ground commanders despite inefficiencies in doctrine, organization, and training. However, many of these adaptions have resulted in great disparities between how CABs organize themselves and how they conduct daily operations. Today, these disparities make it extremely difficult to apply lessons learned from one CAB to another, and even more difficult to plan or organize the sustainment needed to maintain operations on a larger scale.[30] The following paragraphs illuminate some of the more major issues that Army Aviation units currently face.

As previously discussed, the failure to doctrinally echelon maintenance tasks in the current two-tier maintenance system has caused differences in maintenance capabilities, tooling and equipment, and training skillsets between the AMC and ASC. This has caused excessive redundancy between the AMC and ASC, which now carry

the same parts to conduct the same maintenance tasks. Currently, most of what the ASC carries in its ASL is the same as the PLL in the AMC and is used primarily to support the same unscheduled maintenance and pass-back maintenance the AMC is unable to accomplish. So instead of handling higher-level tasks, the ASC is often just processing back-logged work. The associated movement and storage requirement for these redundant parts results in increased operating costs and millions of dollars lost every year to corrosion from improper storage.[31] While redundancy can often be beneficial in military operations, in this case, it results in greater purchasing and storage costs for identical replacement parts, and a loss of mobility.

Another major problem with failing to delineate maintenance tasks is that it creates confusion regarding which unit conducts Phase Maintenance Inspections (PMI) and where it is performed. The PMIs, a mainstay of Army Aviation preventative scheduled maintenance, are carried out by disassembling aircraft, in most cases down to the airframe, to complete specific inspections and conduct repairs. While there is no time requirement associated with completing these inspections, the goals for completing them range from 11-36 days depending on the type of airframe.[32] Due to a lack of assigned responsibility for performing these PMIs, they are either performed in the maneuver battalion's AMC or the ASB.[33] In CABs where the AMC performs this work, ASC maintenance managers and individual maintainers' skills and experience atrophy. As a result, when ASCs are tasked with conducting a PMI, they often exceed the number of days allocated to complete these rigorous inspections. If facing a peer threat in the future, an aviation maneuver battalion cannot retain mobility if its aircraft are torn down for up to 36 days. In order to provide support to the maneuver battalions,

the ASC must also be able to perform PMIs within acceptable time limits to support aircraft availability. However, without a prescriptive guideline in place the AMCs often retain responsibility for their own PMIs, relegating the ASC to more minor maintenance tasks. This wastes an asset and is contrary to the doctrine that originally established the tiered maintenance system.

In addition to footprint, the movement capability of aviation maintenance formations is another major issue affecting maneuver battalions today. Within their structure, aviation maneuver battalions are only designed to move 75% of their assigned ground equipment, vehicles, or personnel in a single move.[34] Often the AMC must rely on movement assets from the ASB to support their movement. Exacerbating this reality is the fact that the ASB itself is only designed and outfitted to move 50% of its equipment at one time, let alone to provide movement support to the AMCs of four maneuver battalions.[35] Further complicating a maneuver battalion's inability to move itself, is the compounding effect resulting from a lack of clear echelon maintenance responsibilities between the AMC and ASC. In the ad-hoc deployment of aviation units, specific equipment and tooling is often required to support maintenance at great distance from the ASC. In this case, specific ASC tooling or equipment is often moved down to the AMCs to support mission requirements. This additional materiel, which often doesn't arrive with additional assets or manpower to move it, results in even greater mobility problems for maneuver battalions. This is an enterprise level, organizational design problem and the net result is that maneuver battalions may not be able to move quickly enough to succeed against a peer threat.

The key cross section of maintainer organization and training further complicates the aviation maneuver battalion's ability to retain mobility. Specifically, maintainer Military Occupational Specialties (MOS) are too narrowly structured and too rigidly managed. Today, there are ten different maintainer MOS skill sets to support three different MDS aircraft. Within these ten different skill sets, maintainers are neither trained and/or have limited authority to perform maintenance functions outside of their individual skill set. Aircraft Non-Rated Crew Members (NRCM), or "Crewchiefs," are currently trained only as General Mechanics on the airframe they service when they could be trained and proficient to perform other maintainer functions as well. "Backshop" maintainers are trained and managed according to seven different skill sets. This inefficiency multiplies the number of maintainers required to support aircraft, increases the assets and tools to move, and reduces maintainer versatility and depth. In addition to the lack of interchangeability within skillsets, from a human resource management standpoint, the Army promotes enlisted personnel within their MOS. This linear, "stove pipe" promotion process too often results in personnel with inferior potential for leadership positions being promoted ahead of their more capable peers, who happen to be in another maintenance MOS. This causes some of the best maintainers in the Army to either leave the service due to frustration or change their MOS to career fields with greater upward mobility.

However, despite all of these problems, Army Aviation leaders are still able to provide aviation assets necessary to support ground maneuver commander requirements. These leaders, having recognized an increased demand on aviation assets and the dispersed nature of operations, are already using existing aviation units

in innovative ways. To achieve this, Army Aviation leaders rely on the “work-around” of the Aviation Task Forces (AVN TF) to support missions. Today, aviation formations as small as platoon size, are tasked to deploy for training and missions outside of their parent battalions and divisions. This proliferation of AVN TFs is largely a good development as it signals an increase in the trust of aviation training, aircraft capability and aviation competency, as well as ensuring aviation assets are more efficiently deployed to meet demand requirements. The downside is that parent maintenance formations are not organized to support the deployment of platoon size elements. In order to deploy these platoons forward, maintenance leaders must also send forward a supporting package of maintainers and equipment. Often, this maintenance support package is nearly equal in size to the number of aircraft and aircrew being supported. As long as these maintainers have the ability to move themselves between bivouac sites or airfields, this is a viable approach. However, in an OE facing a near-peer threat, this becomes much more difficult. The ability to move maintenance personnel and equipment requires additional vehicles, exposes those sustainment Soldiers to increased risk, and wasted time during tear-down, movement, and set-up at the new location. If this process is repeated frequently, as it would likely be against a near-peer threat, the AVN TF could not effectively “maintain on the move.”

The good news is that Army Aviation leaders have shown the ability to improvise and win against adaptive enemies today. However, they are doing so through ad-hoc relationships and “first-aid” solutions to larger problems. To set the conditions for success in the future against peer threats, Army Aviation must undergo complimentary changes in doctrine, organization, and training to achieve greater synergy.

Adapting for the future

Bringing about change in complex systems like the Army is never easy. According to John Kotter, a well-known organizational leadership expert and author of *Leading Change*, “By far the biggest mistake people make when trying to change organizations is to plunge ahead without establishing a high enough sense of urgency in managers and employees.”[36] Clearly, the urgency for change in Army Aviation is evident from review of concept documents like the AOC, AFC-MM, AFC-S, and the CAB O&O. However, none of these documents addresses the need for change in maintenance doctrine, training, or organization. Technology advancements alone will not make Army Aviation more versatile or expeditionary; change in methodology is needed to face peer threats in the future.

If, as Kotter believes, the biggest mistake affecting organizational change is a lack of urgency, then his comment on vision is equally astute, “Of the remaining elements that are always found in successful transformations, none is more important than a sensible vision.”[37] The following paragraphs will describe a vision for transforming the Army Aviation Maintenance methodology.

To achieve greater versatility in utilization, and enhanced expeditionary and mobility capability, Army Aviation must first define its base element of employment at the maneuver company level. The insight for this idea comes from study of peer threat capabilities and the proliferation of ATFs built upon requirements from the ground force commander, wherein often only a company sized aviation element is needed. Additionally, Army Aviation must also stratify its Field level maintenance structure into three distinct echelons of support (i.e., Tactical, Unit, Field).[38] These echelons should be assigned by examining the time, tools and equipment, and repair parts required to

complete maintenance tasks in a field environment. These levels should begin with basic maintenance at the company, move to more involved tasks at the AMC, and culminate with the hardest tasks, and those tasks requiring larger pieces of equipment, at the ASC.

Throughout the task depth of this construct, maintainers with diversified skill sets should be assigned from the company level to the ASC. This ensures that, as a maintainer moves up in both rank and responsibility, their knowledge and expertise is sufficiently developed at each level. In this construct, special tools and equipment and ASL/PLL are similarly streamlined which greatly reduces requirements for moving and storage. In parallel, it increases unit mobility and decreases parts loss due to corrosion from improper storage.

By organizing aviation companies with great maintainer versatility and expeditionary capabilities, aviation maneuver battalions will likewise garner the same effects. Achieving this vision requires significant changes in doctrine, organization, and training specialties of Army Aviation. The next section addresses how Army Aviation Maintenance can achieve this vision and correct the current resource misalignment. Implementing these recommendations will help fundamentally improve Army Aviation's ability to move and thrive on a modern battlefield.

Maintenance Doctrine

Based upon the redundancies in equipment, tools, maintainer skill sets, and parts stockage, maintenance doctrine delineating Field level maintenance at the Maneuver (or "flight") Company, AMC and ASC level tasks needs more distinct delineation. Currently, Training Circular 3-04.7, *Army Aviation Maintenance* only briefly addresses maintenance task assignment with the following statement:

> Specific tasks will be accomplished based on modified table of organization and equipment (MTOE) set, kits, and outfits assigned to the command and qualified personnel available to perform the required task.[39]

By assigning Field level maintenance tasks into more definitive maintenance echelons of responsibility, Army Aviation can achieve greater efficiency, effectiveness, and mobility at all levels. To achieve this, aviation maintenance doctrine should limit flight companies to component replacement, on-airframe scheduled and unscheduled maintenance tasks, and inspections of parts that do not require removing airframe components.

At the AMC echelon, maintenance tasks should include responsibility for additional flight company level maintenance support and tasks up to, but excluding PMI. These AMC company tasks should also be limited to maintenance actions that require less than three days of aircraft downtime to complete in a field environment. The ASC echelon of maintenance should be tasked, organized, and equipped to provide additional maintainer support down to the flight company as well as primary responsibility for the conduct of aircraft PMI. Within this overall construct, aircraft that cannot be repaired with sustainment assets, or expertise, at the point of need would be evacuated to the next higher level of maintenance. Alternately, a contact team consisting of personnel and materiel to complete repair could also be dispatched to repair the aircraft forward. By echeloning maintenance task responsibility in this manner, Army Aviation maintainers will have a more focused maintenance task list, become more proficient and efficient in conducting their respective level of maintenance, and achieve greater mobility and expeditionary capability down to the company level.

Maintenance Training

By far the greatest change required to accomplish this vision relates to maintainer training, since training is critical in achieving the organizational vision that it supports. As previously discussed, Army Aviation maintenance personnel are divided into ten distinct MOS, each of which is limited in their training to corresponding responsibilities. At the flight company level, all assigned maintainers are school trained in Programs of Instruction (POI) to be only General Mechanics, or “Crewchiefs” on their associated aircraft. In units where aircraft type includes training these crewchiefs to perform NRCM functions (and serve as part of the flying aircrew) these flying crewchiefs undergo all their NRCM training upon assignment to a flight company. “Backshops” mechanics who make up the other seven maintainers specialties are school trained in POIs across the following skillsets: Powerplant Repair, Powertrain Repair, Aircraft Electrician, Aircraft Structural Repair, Aircraft Pneudraulics Repair, Avionics Repair, and Armament/Electronics Repair. Given that the minimum Armed Services Vocational Aptitude Battery test scores to meet minimum eligibility for these different MOS varies only slightly, many of these mechanics are fully capable of succeeding across the breadth of maintenance tasks.[40]

By first merging these seven backshops POI into functional categories – Powerplant/Powertrain, Electrician/Avionics/Armament, and Structural/Pneudraulics, these distinct POIs are reduced from seven to three. Following the same precedence used in the way the Army trains aviators, once a mechanic is trained, the maintainer can then be assigned in a variety of positions based on the needs of the Army. Upon completion of the General Mechanic POI for the airframe selected the maintainer is designated a Multi-Function Maintainer (Figure 1).

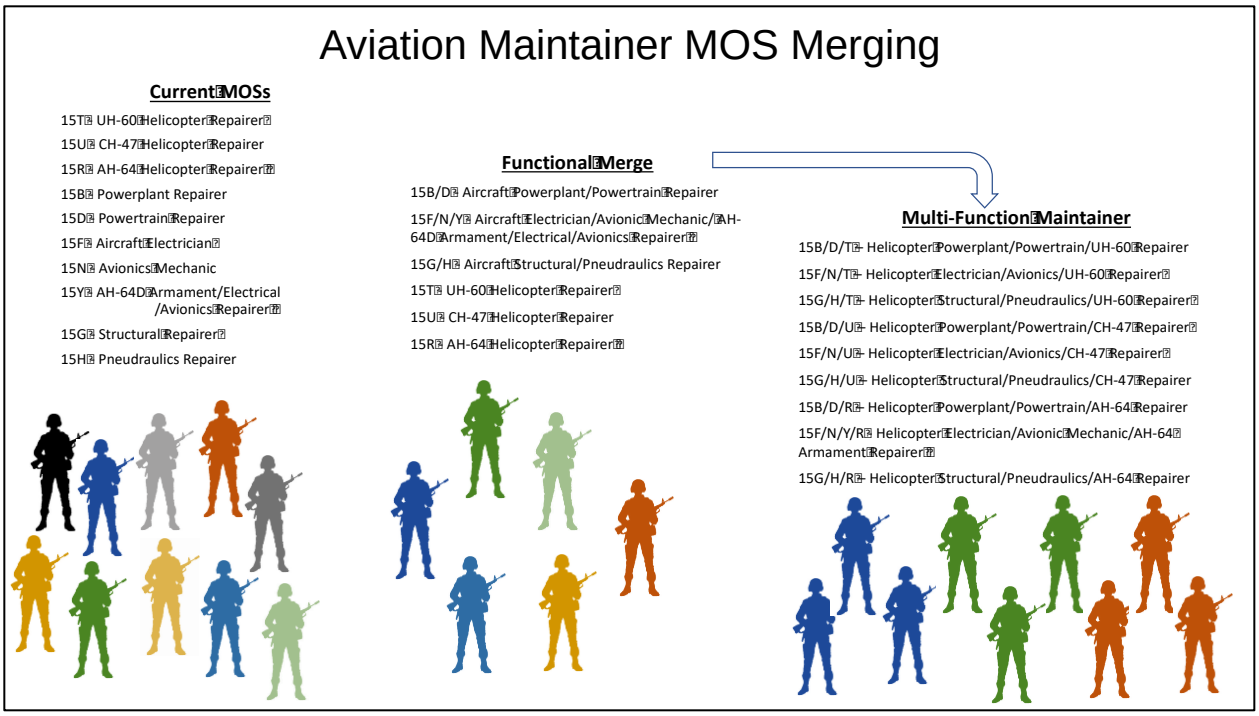

Figure 1. Proposed Multi-Function Maintainer Concept[41]

The end result of this training methodology is a smaller number of maintainer-specific skillsets, greater versatility among maintenance Soldiers, and more flexibility in assigning mechanics to different units. Additionally, if a maintainer is needed on a different airframe, or no longer qualifies for flight status as a NRCM, a transition POI, as is currently done with aviators, could be created to transition the mechanic to a different airframe. Another key benefit of training and assigning mechanics in this way is that it reduces stove-pipe promotions that are the result of the present system that promotes Soldiers only within their own narrow MOS rather than by comparing them to their maintainer peers as a whole. Together, these changes would result in better maintainers and leaders for the Army, greater Soldier career satisfaction, and potentially better retention of the best and brightest maintainers.

Maintenance Organization

By creating a more stratified hierarchical maintenance doctrine and optimizing maintainer functionality, Army Aviation maintenance organizations can be optimized for expeditionary deployability. With flight companies organized and manned to contain a cross section of all functional and general aircraft maintainer skillsets, aviation battalion commanders attain a greater ability to disperse platoon and company size elements to different task forces or co-locate them with ground maneuver elements without the need for a large support package. The AMC's mission set would require greater experience to perform more difficult tasks, so its maintainers would be more experienced than those in the flight companies. Conceivably, the AMC could also be comprised of fewer personnel, which would reduce the temptation of using the AMC to "round out" the maneuver company's personnel shortages.

With a smaller, doctrinally mandated task list, the tooling, equipment, and ASL package of the AMC would also be reduced. This would effectively enable maneuver battalions to move all of their assigned materiel in a single lift with their present number of vehicles and personnel. While the number of ASC echelon assigned maintenance tasks would grow, the personnel assigned to the ASC would be composed of Soldiers with significant experience at the flight company and AMC echelon, ideally in their second tour of enlistment. Though the ASC would still be unable to transport all of its equipment in a single move, it's organizational template would be smaller after divesting some maintenance tasks to the AMC.

By establishing the doctrine, training, and organization outlined above, aviation commanders would attain greater versatility, expeditionary capability, and have greater control over their formations and resources. This construct, coupled with future

technology and reliability advancements, will increase aircraft availability and provide greater support to ground forces.

As change to any complex system can create unforeseen outcomes, these changes should not be made individually, or all at once. To affect lasting change, Army Aviation must make incremental changes, test their effectiveness, and modify or abandon them if they do not work as intended. However, performed and synchronized correctly, aviation maneuver elements would be more responsive to peer threats and able to move closer to, and with, supported ground maneuver units. Because these ideas support the goals of the FVL FoS, they will also have the complimentary effect of being practiced, refined, and trained prior to the arrival of a drastically different aircraft. Laying this groundwork now, will set conditions for future success.

In the face of today's peer threats and those of the future, Army Aviation and its maintenance capacity cannot afford to wait for the arrival of technological advancements. By moving forward today with changes that will make the force ready for the future, the enterprise will ensure that supported ground forces will always receive first-class Army Aviation support. By planning ahead and adapting itself now, Army Aviation will be ready to leverage the FVL FOS and ensure it is ready to meet any threat on any battlefield.

Endnotes

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[10] Ibid., 20.

[11] TRADOC, *US Army Functional Concept for Sustainment 2020-2040*, TRADOC Pamphlet 525-4-1 (Fort Eustis, VA: Training and Doctrine Command, February 2017), 7, http://www.tradoc.army.mil/tpubs/pams/tp525-4-1.pdf (accessed December 9, 2017).

[12] Ibid., 35.

[13] Ibid., 17.

[14] These assumptions and requirements were generated from an FY2016 Army Aviation Capabilities Needs Analysis

[15] Capabilities Development and Integration Directorate*, Combat Aviation Brigade Operational and Organizational (O&O) Concept*, Mid Update V1.0 (Fort Rucker, AL: US Army Aviation Center of Excellence, December 8, 2017), 3.

[16] Ibid., 14.

[17] U.S. Congress, House of Representatives, Committee on Armed Services, Subcommittee on Readiness, *Statement by Major General William K. Gayler, Commanding General, U.S. Army Aviation Center of Excellence on Aviation Readiness*, 115th Cong., 1st sess., November 9, 2017, 2-3, http://docs.house.gov/meetings/AS/AS03/20171109/106611/HHRG-115-AS03-Wstate-GaylerW-20171109.pdf (accessed March 27, 2018).

[18] LTG Kevin W. Mangum, CW5 (Ret.) Michael L. Reese, and SGM James H. Thomson, "Maintaining our Sacred Trust with Teammates on the Ground, 2013 to the Future", *Army Aviation Magazine*, April/May 2017, 67, http://reader.mediawiremobile.com/ArmyAviation/issues/200811/viewer?page=66 (accessed March 27, 2018).

[19] U.S. Congress, House of Representatives, Committee on Armed Services, Subcommittee on Readiness, *Statement by Major General William K. Gayler, , Commanding General, U.S. Army Aviation Center of Excellence on Aviation Readiness*, 115th Cong., 1st sess., November 9, 2017, 3.

[20] Frederick W. Pieper, email messages to author, March 3, 2017 and March 28, 2017.

[21] The Future Vertical Lift (FVL) platforms discussed and detailed in this paper came from the author's experience working at Redstone Arsenal, AL in the office of the Program Executive Office-Aviation.

[22] Timothy F. McConvery, Deputy Director TCM FVL, e-mail messages to author, December 7, 2017.

[23] James W. Williams, *A History of Army Aviation: From Its Beginnings to the War on Terror* (New York: iUniverse, Inc., 2005), 143.

[24] Headquarters, Department of the Army, *Army Aviation Maintenance,* Army Technique Publication (ATP) 3-04.7 (Washington, DC: Headquarters, Department of the Army, September 11, 2017), 2-1, http://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/ARN5138_ATP%203-04x7%20FINAL%20WEB%201.pdf (accessed December 9, 2017).

[25] This reduced the tooling and manpower present within the ASC and improved the unit's overall mobility.

[26] The ability of aircraft to self-diagnose faults reduces required troubleshooting equipment and reduces maintenance manpower burden. Maintainers would simply conduct "black-box" or wiring bundle replacement in lieu of diagnosing faulty equipment or wiring.

[27] As components became more advanced the ability to repair required better training and education. To circumvent this problem the Army opted to save money by not purchasing those rights and relying more on contracts with component providers for repair.

[28] As components became more sophisticated and technical data rights more expensive, Army maintainer training did not advance in harmony. Thus, the knowledge, experience and skill to repair components began to atrophy. This resulted in fewer maintainers with the ability or understanding in how to repair components.

[29] Andrew C. Cranford, Program Executive Office (PEO) Aviation, e-mail messages to author, December 2017.

[30] These observations come from my time as an Aviation Support Battalion (ASB) Commander in the 10th CAB and through conversations with peer aviation maneuver and ASB commanders in CABs throughout the Army. While not all of our experiences or critiques are identical, these observations were largely universal across Army Aviation.

[31] Jen Judson, "Army aviation leaders: If we don't modernize, we risk more crashes, declining readiness," *Army Times Online*, November 9, 2017, https://www.armytimes.com/land/2017/11/09/current-trends-make-for-uphill-battle-to-keep-army-aviation-fleet-ready-to-fight/ (accessed December 12, 2017).

[32] Department of the Army, *Army Aviation Maintenance,* 1-6.

[33] Ibid., 2-4, 2-12.

[34] Ibid., 2-4.

[35] Ibid., 2-12.

[36] John P. Kotter, *Leading Change* (Boston: Harvard Business Review Press, 1996), 4.

[37] Ibid., 7.

[38] "Tactical" – maintenance conducted at flying company level, "10" level or "daily" maintenance activities.
"Unit" – AMC level, "20" level maintenance but would include pass back maintenance from the "tactical" level but exclude lengthy maintenance tasks or Phases
"Field" – ASC level, "30" level requiring extensive experience and/or time to perform to include primary responsibility for aircraft Phase maintenance.

[39] Department of the Army, *Army Aviation Maintenance,* 2-1.

[40] Armed Services Vocational Aptitude Battery (ASVAB) minimum test scores for all ten MOS can be found at: *Army Home Page*, http://army.com/info/mos/Aviation (accessed March 8, 2018).

[41] This chart was created by the author to visually demonstrate "functional merging" of current ten maintainer MOS career fields into six functional career fields and further merge into six distinct MOS career fields for utilization at the company level.

Holistic Aviation Assessment Task Force, *Regaining Decisive Action Readiness,* i. As this document is classified "For Official Use Only" (FOUO), this document was not formally published. The author obtained a hard copy while assigned to Redstone Arsenal, AL.