Abstract

Current tensions within the global operational environment, and the state of the U.S. military’s global posture has generated the need for review of the improved coordination, synchronization and execution capability within the Joint Automated Deep Operations Coordination Software (JADOCS) and the Advanced Field Artillery Tactical Data System (AFATDS). The joint community is experiencing an increased requirement for improved coordination, synchronization and execution capabilities to successfully enable global requirements. However, current procurement mandates are attempting to incorporate JADOCS capabilities into AFATDS. This is not suitable, feasible or acceptable considering AFATDS does not have the processing capability to account for JADOCS current strategic responsibilities. The following effort described will streamline the service components within the Department of Defense and the procurement process when acquiring Fires coordination, synchronization and execution software.

Today’s world of software-based devices and the increasing complexity of the operational environment can create austere conditions to predict system failures. It is not a question of if a failure is possible, but how often it can be detected and whether the mission can be completed. Some leaders within the U.S. Army Fires community believe the current Fires digital infrastructure is redundant and that incorporating JADOCS and its planning, coordinating and processing capability under the digital architecture of AFATDS would be a more feasible, suitable and acceptable approach. This could not be further from the truth.

What seems to have been missed or lost in translation are these systems, high availability. At the most basic level, availability can be defined as a probability that a system is operating successfully when needed. Availability is often expressed mathematically or as a percentage.

Availability (A) is calculated using the formula $A = \frac{MTBF}{MTBF + MDT}$, where MTBF is mean time between failure and MDT is mean down time. MDT is often assumed to be the same as MTTR, the mean time to repair. MTTF, mean time to failure, is often considered interchangeable with MTBF, although there are subtle differences. The term high availability has been used to encompass all things related to productivity, specifically reliability and maintainability. So let’s take a closer look at these terms.

Reliability

Reliability can be defined as the likelihood that a device will perform its intended function during a specific period of time (often called the mission time). It is a measure of system success over a time interval. To help make sure that products meet customer expectations, reliability can be designed using efficiency models and techniques and enabling system diagnostics in order to detect faults and when faulty hardware needs replacing. This helps achieve high availability.

However, even the most robust and reliable system may not be the most available. To be available, a system must also be easy to troubleshoot, modify and repair during the mission time.

Maintainability

Maintainability of a system significantly impacts the user’s perception of availability. For example, AFATDS 6.8.1 and JADOCS under their current, not projected, operational mandates have diagnostics that can improve availability. The key to keeping a system maintained is to make sure there are qualified and trained personnel. Less obvious – but just as important – are physical characteristics that affect maintainability. Modules and components should be capable of being removed, replaced or added to system without interrupting the mission. Features like online edits, partial downloads, adding input/output online and removing and inserting modules (e.g. 1 or 2 disk) under power help make maintainability successful.

Understanding the components above, is it feasible to assimilate two systems that operate effectively under their current mandates? Is it suitable to increase AFATDS command and control (C2) responsibilities as the Fires direction manager for the tactical and operational levels? Is it acceptable to require JADOCS, the joint coordinator and managing system at the operational and strategic levels, to assimilate its joint
responsibilities into a system that does not currently have the same processing power?

These are all questions that should bring an impetus of review in order to effectively enable the Fires warfighter. The remainder of this paper will highlight background information, findings, supporting information and conclusion, with a recommended way forward to support the effort of this document.

Method

In 2013, TRADOC Capabilities Manager Fires Cell briefed Operational Support Directive (OSD) that 90 percent of JADOCS Fires and targeting capabilities already existed in AFATDS. This was an inaccurate statement then and is an inaccurate statement now. However, TCM Fires was able to convince the OSD and Army G8 that a convergence made sense and would reduce the cost of maintaining two systems versus one. The OSD and Army G8 agreed with this concept and began the assimilation of JADOCS functionalities into AFATDS, starting with AFATDS 6.8.1 and potentially being completed with AFATDS v6.8.1.1.

In November of 2015, the Fires TCM briefed U.S. Central Command on a transition plan for JADOCS capabilities to AFATDS. CENTCOM representatives were assured that several critical capabilities had been incorporated into AFATDS. Several CENTCOM attendees expressed concerns about the critical capabilities function and if the system could operate as required, to include being able to process the volume of information that is solely under JADOCS responsibility. During this time frame, the Fires TCM indicated absence of operational command to test the concept that AFATDS could or could not manage the planning, coordinating and processing responsibilities and capabilities of JADOCS. That was an inaccurate statement then and is an inaccurate statement now. United States Forces Korea provides the perfect platform to test any digital revisions, upgrades or concepts.

Findings

As of August 2017, one of the only operational commands that fully integrates and tests the full capabilities of JADOCS and AFATDS is the USFK. In the Korea operational environment JADOCS is utilized as a joint planning and coordination tool and most importantly as an archive for the AFATDS data base. As the senior targeting officer for 210th Field Artillery Brigade from August of 2015 to August of 2016 I had first-hand experience. I was a part of three readiness exercises that identified gaps in the AFATDS ability to manage the high volume of Fires required to support USFK operations. This allowed for the recognition and understanding of the limitations within AFATDS, and validate JADOCS pre-established additional duty as an archive for AFATDS within the Fires digital architecture. In addition, these exercises re-enforced JADOCS prime purpose as the Fires C2 integration tool.

Currently, 210th FAB provides general support Fires to the Ground Component Command. Meaning that, on order, 210th FAB assembles and deploys in support of Combined Forces Command counter-provocation efforts, Fires shaping operations in support of the Air Force, conducts counter-fire operations, and fires time sensitive targets in support of GCC, Combined Joint Task Force-8, and the CFC. This is a massive requirement, and currently, 210th FAB is the only field artillery brigade with this level of responsibility. This mission requirement maximizes the full capacity of a field artillery brigade and provides a unique opportunity to integrate JADOCS and AFATDS to their fullest capacity.

However, the above examples are not the only situations of AFATDS inability to process the current responsibilities of JADOCS. In March of 2016, 197th Field Ar-

Staff Sgt. Nicole Mayberry completes a practical exercise using an Advanced Field Artillery Tactical Data System at a field artillery military occupational specialty course hosted by the Wisconsin Army National Guard’s 426th Regional Training Institute at Fort McCoy, Wis. (Capt. Joe Trovato/U.S. Army)
tillery Brigade performed a compatibility test to see if AFATDS could in fact support the robust requirements of JADOCS. As a whole, AFATDS could not (March 2016). Additionally, in November of 2016, the program manager for both AFATDS and JADOCS along with representatives from Fort Sill, Okla., conducted a review in order to validate 197th FAB’s findings. These were the findings:

• AFATDS Fires manager, nominative candidate target list and collaboration list has limited permissions.

• AFATDS does not use the same abbreviations as JADOCS.

• There is not a clear requirement of how AFATDS pulls from the Joint Targeting Toolbox.

• There is not a comprehensive understanding of the Fires manager from JA-DOCS to AFATDS.

• Currently AFATDS managers are not suitable, feasible or acceptable to assimilate the JADOCS current responsibilities.

• AFATDS does not have a suitable approach to export mission fired report data to Excel. This will hinder commanders’ ability to see real-time information and degrade the intelligence community’s ability to conduct expeditious Fires analysis.

• AFATDS weapon pairing solution is not as efficient as the Joint Munitions Effectiveness Manual Weaponing software, when generating feasible and suitable munition requirements.

• Fires Command Web (FCW, a client to AFATDS) is too liberal in its permissions.

• The FCW does not give a digital signature to its processes.

Supporting information

The previous information is not to discredit AFATDS capability, but to illuminate the need for both AFATDS and JADOCS separately. Below are multiple examples of this. The examples range from a vignette that took place with 197th FAB, to excerpts from the Joint Publication 3-03 (Sept. 16), Joint Publication 3-09 (Dec. 14) and Army Techniques Publication 3-60.1 (Sept. 15).

Recently while deployed in support of a combatant command, 197th FAB had some targets built that had between 15-22 aim points. They understood the 12 aim-point limitation and worked with that, but building 22 separate targets for a single mission with a time constraint was not feasible. Meaning that the AFATDS FCW requires that the target is built twice instead of once and this decreases high availability and increases a probability of error (March 2016).

Within the Combined Air Operations Center and also in Iraq, the 197th FAB has Navy and Air Force agencies in different locations building targets on JADOCS. Setting up FCW access is not simple due to firewall issues between networks, along with the aforementioned doubling of the work for an FA target. Mortar Anti-Personnel/Anti-Material (MAPAMs) are being shot on a near-daily basis in Iraq right now. There is an operational need for JADOCS to support the sending of MAPAM missions up to the limit of the AFATDS capability and that needs and has to be communicated to the program manager and throughout the Program Office.

JADOCS is a software application and collaborative tool used for dynamic targeting and facilitates the integration of joint/multinational Fires. Digital integration of U.S. and multinational Fires systems enables timely execution of time sensitive targets (TST), component-critical targets and high-payoff targets. The joint management function provides the ability to change and display operational maneuver graphics, ACMs on the airspace control order, fire support coordination measures (FSCMs) while conducting joint fire support. The air interdiction (AI) planning and execution function provides more effective employment of AI assets through time and improved information flow for the identification, assignment, and nomination of AI targets.

JADOCS is a software application consisting of managers’ databases, and tables that present and manipulate command,
control, communication, computers and intelligence (C4I) information and communications interfaces to and from various C2 and C4I systems to obtain, coordinate and disseminate information. The JADOCS application can reside on any commercial off-the-shelf computer with a Windows operating system and connection to the appropriate theater networks.

**Dynamic targeting use**

In dynamic targeting (DT), JADOCS is the principle collaborative and force assignment tool. It provides the ability to nominate, vet, assign and plan cross-component DT missions. It interacts with other platforms, increasing situational awareness and provides immediate visibility to all staffs from the joint operations center to the command executing the DT mission.

**Communication capabilities**

JADOCS is a software application package and can reside on all classified networks. For DT purposes, JADOCS interacts with AFATDS, Modernized Integrated Database, Global Command and Control System Family of Systems, Naval Fire Control System, Theater Battle Management Core System (TBMCS), and select coalition systems.

JADOCS is used at all levels of warfare, but its use varies by component, as follows.

1. Joint commands: geographical combatant commands and joint task forces.
2. United States Army: brigade and above.
5. U.S. Air Force: air operations centers.

**JADOCS DT considerations.**

1. The theater J-2 and J-3 are required to track, assign and monitor the engagement of TSTs, joint force commander critical targets and component-critical targets within their area of operations. During DT missions, this is accomplished using the Tactical Data Network (TDN) within JADOCS.
2. Throughout the planning and engagement processes, the managers within JADOCS are continuously updated with mission information and mission status by all managing stakeholders. These managers provide the joint Fires element and component Fires coordinators with an executive-level update of the target, including the estimated and actual times on target. Components can control their unique mission manager without impacting the managers within other components or the joint operations center.

In the Army and Marine Corps, AFATDS is the primary automated fire support and fire direction system at the division level and below. AFATDS can communicate over a variety of networks, including frequency modulation, very high frequency, ultra-high frequency, Enhanced Position Location Reporting System and local area networks.

1. Internal communications: AFATDS is an automated system and communicates with other automated systems via the data distribution system. It can publish, receive and distribute information. Information types include target lists, FSCMs, ACMs, ATOs, airspace control orders, Department of Defense Form...
1972s, graphic control measures, and unit locations.

2. External communications: AFATDS communication between the Army and Marine Corps is conducted via communications networks established within the joint master unit list. There are limited communications with the Air Force (DD Form 1972, ATO, etc.) via the TB-MCS. Cross-component coordination and information dissemination is best achieved through the data link between AFATDS and JADOCS.

AFATDS is a multi-service integrated fire support system that processes fire missions, air support requests and other related information to coordinate and maximize the use of all fire support assets (i.e., mortars, FA, attack helicopters, air support, naval gunfire and offensive electronic warfare). It meets the needs of the FA for planning the use of critical resources and for managing, collecting and passing vital fire support data throughout fire support channels. AFATDS can create, store and check FSCMs/ACMs for violations during fire mission processing. AFATDS can send both preplanned and immediate air support requests through each echelon of command to the supporting AOC. It is fielded from echelons above Army corps or Marine expeditionary force to firing battery levels. With their AFATDS, the Direct Air Support Center is able to link digitally into the artillery and target acquisition channels to achieve a rapid counter-fire capability from either ground or air systems.

Joint Publication 3-09 Joint Fire Support: Joint Automated Deep Operations Coordination System (December 2014). JADOCS integrates communication, coordination, collaboration and execution of joint and multinational targeting and Fires. Digital integration of U.S. and allied joint Fires information enhances situational awareness to reduce friendly fire incidents and enables timely execution of TSTs and high payoff targets.

Discussion
In moving forward what we need to define is what is the end goal? Is it a single “one-stop-shop” system or two systems that operate efficiently under their respective, not projected/proposed, mandates? Currently JADOCS is a system of record which assists with knowledge management of entity-level target development, supports target list management; TDN submissions, candidate target list submissions, situational awareness to targets and status on the joint, restricted, integrated target list, and no-strike lists. Figure 3 illustrates this.

In addition, JADOCS allows organizations to work internal points of interest, providing situational awareness to external organizations to de-conflict targeting efforts within a given operational environment. JADOCS also enables the joint targeting process through capabilities analysis, commanders’ decision and force assignment, and mission planning and force ex-
ecution. Providing an integrated common operational picture and mission planning tools that allow for a range of capabilities against developing or approved targets, coordinating actions against targets approved by the Joint Targeting Coordination Board and conducting analysis of Fires within JADOCs to execute via appropriate managers. Figure 4 illustrates this.

However, the AFATDS is a reliable C2 system for the tactical and divisional levels, but JADOCs is the C2 integration system at the forefront of the corps and strategic (joint) levels. From face value, the idea of an AFATDS/JADOCs assimilation looks somewhat like JADOCs, but does not operate like JADOCs. Under the hood is not the same and the behind-the-scenes programming is completely independent of the logic of programming in JADOCs. We need to ensure that we are not wasting tax payer dollars on this vision of potential AFATDS/JADOCs assimilation with uneducated guesses as to how this is supposed to be implemented.

A way forward

A starting point in achieving functional resolution is to ask how we got here? It needs to be determined if, where, and when this plan was validated through the interdependent provisions of Chairman of the Joint Chiefs of Staff Manual 3130.03, Adaptive Planning and Execution overview and policy framework (APEX) (March 2015), Chairman of the Joint Chiefs of Staff Instruction 3180.01 Joint Requirements Oversight Council (October 2002), the Chairman of the Joint Chiefs of Staff Instruction 3170.01 Joint Capabilities Integration and Development System (January 2015), and the Joint Fires Warfighting community.

Finally, as Fires warfighters we should be asking where are the requirements that were written to put JADOCs into AFATDS? Training and Doctrine Command Capabilities Manager is unable to provide any current data to facilitate a comprehensive walk through on how AFATDS supposedly can integrate JADOCs (experts of these applications have proven it cannot), nor can the TCM clarify why we are at this point of chaos, and produce the written requirements to the AFATDS/JADOCs field engineers. Is the TCM going to re-write the operational test? Does this concept have high availability, and is it truly enabling the joint Fires community and warfighter? These are just a few questions and statements to initiate an effort to conduct an effective comprehensive review by actual users/programmers of both systems into whether JADOCs should or should not be assimilated into the AFATDS digital infrastructure.

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