Joint Space Operations Center (JSpOC) Mission System (JMS)

Executive Summary

- The Air Force Operational Test and Evaluation Center (AFOTEC) conducted operational testing on the Joint Space Operations Center (JSpOC) Mission System (JMS) Increment 2, Service Pack (SP)-9 from March to May 2018.
- JMS SP-9 is not operationally effective or suitable for its Space Situational Awareness (SSA) mission.
- The JMS Program Office, developers, operators, and testers could have prevented many of the problems identified during operational testing if they better synchronized their efforts from requirements creation through system development and all stages of testing.
- The JMS Program Office placed the JMS Test and Evaluation Master Plan update for SP-11 on hold while the Air Force determines the way forward for the JMS program.
- The current SP-11 schedule is not executable because it does not incorporate time to fix SP-9 deficiencies, account for the continued resource constraints related to SP-9 and SP-11 concurrency, or address lessons from SP-9 development and testing.
- JMS will not be ready to support Space Fence operational testing or operations.

System

- The Air Force is developing JMS to process, integrate, store, and present SSA sensor data in a net-centric, service-oriented architecture of hardware, software, and network connectivity. JMS data and analysis is intended to support command and control tasking and battle-management decisions for space forces.
- The Air Force installed operational JMS hardware and infrastructure at Vandenberg AFB, California. Additional non-operational instances of JMS are installed for development and developmental testing purposes at other sites, including Vandenberg AFB, California, and Space and Naval Warfare Systems Center Pacific at the Point Loma Annex of Naval Support Center San Diego, California.
- JMS net-centric enterprise services, including data visualization, mission applications, and functional queries, are intended to be accessible to worldwide users. Users can run JMS client software on non-JMS workstations connected through the SIPRNET and the Joint Worldwide Intelligence Communication System.
- JMS is intended to replace Space Defense Operations Center (SPADOC) and space-specific portions of the Astrodynamic Support Workstation (ASW).
- The Air Force is currently developing JMS in two increments:
  - Increment 1 delivered an initial service-oriented architecture infrastructure and user tools. Tools included a User Defined Operational Picture, accessible through the client workstation, which allows analysis of data from legacy systems, integrated collaboration and data sharing tools, and space order of battle processing.
  - Increment 2 is being developed to deliver mission functionality in three Service Packs.
    - SP-7 delivered updates and additions to Increment 1-delivered hardware and software infrastructure, including servers, space surveillance network (SSN) communications services connectivity, system security and message processing capabilities, and limited space surveillance data processing and visualization tools. The Air Force operationally accepted SP-7 in 2014, but did not operationally test SP-7 because it did not replace legacy systems and was not used for mission critical functions.
    - SP-9 was intended to update and expand JMS hardware and software to perform functions currently performed by SPADOC and ASW, with improved accuracy, efficiency, and responsiveness. Those functions include administration and maintenance of the space catalog, orbit determination for resident space objects, and high-accuracy tasking of sensors for orbital safety, threat modeling, and operational decisions. However, the SP-9 Operational Utility Evaluation (OUE) was descoped twice due to capability limitations identified during developmental and operational testing. Critical issues identified during the OUE led to the test's premature conclusion in May 2018.
    - SP-11 is intended to complete Increment 2 functionality on the Secret and Top Secret enclaves. It is designed to support space object identification tasking and processing for critical events such as closely spaced satellite operations; breakups, re-entries and de-orbits; launch processing; and processing of uncorrelated tracks.

The Air Force transferred content from SP-9 and SP-13 to SP-11, adding risk to this delivery. During the JMS Critical Change in 2016, the Air Force canceled SP-13. The Key Performance Parameter requirements for SP-13 were moved to SP-11, while most of the remaining SP-13 content was deferred.

Mission

The Joint Force Space Component Commander intends to use JMS to enable the coordination, planning, synchronization, and execution of continuous, integrated space operations in support of national and Combatant Commander objectives.

Major Contractors

- Government prime contractor:

    - Air Force Space and Missile Systems Center – Los Angeles AFB, California
- System Integrator, Increments 1 and 2:
    - Space and Naval Warfare Systems Command (SPAWAR) – San Diego, California
- Increment 1 sub-contractors:
    - Polaris Alpha – Colorado Springs, Colorado
    - The Design Knowledge Company – Fairborn, Ohio
- Increment 2 sub-contractors:
    - Analytical Graphics Incorporated – Exton, Pennsylvania
    - Artificial Intelligence Solutions – Lanham, Maryland
    - Omitron – Beltsville, Maryland

Activity

- AFOTEC conducted SP-9 operational testing from March to May 2018. The Air Force ended the test earlier than planned due to significant performance problems.
- AFOTEC and the Army Research Laboratory conducted a cybersecurity Cooperative Vulnerability and Penetration Assessment (CVPA) from March to April 2018.
- The Air Force canceled the SP-9 cybersecurity Adversarial Assessment, originally scheduled for August 2018.
- The Program Office placed the JMS TEMP update for SP-11 on hold while the Air Force determines the way forward for the JMS program.
- It is unclear if the Air Force intends to continue with JMS development, modernize existing capabilities for extended operations, or merge SSA and command and control development into an undefined program.

Assessment

- The SP-9 OUE was adequate to determine effectiveness and suitability; however, underperforming mission functions, system instability, and poorly defined or missing requirements caused the Air Force to reduce the scope of testing twice. The system suffered from poor pre-test set-up, configuration problems, and maturity problems that reduced system performance during the test and produced invalid operational test data.
- SP-9 is not operationally effective. SP-9 cannot consistently perform basic SSA mission functions in a correct, consistent, or timely manner.
- SP-9 is not operationally suitable. SP-9 operator training and documentation are not relevant to operational tasks and workflows.
- The JMS Program Office, developers, operators, and testers could have prevented many of the problems identified during operational testing if they better synchronized their efforts from requirements creation through system development and all stages of testing. The operational units are not currently

staffed to support both current operations and sustained engagement with the acquirers and developers.
- The current SP-11 schedule is not executable because it does not incorporate time to fix SP-9 deficiencies, account for the continued resource constraints related to SP-9 and SP-11 concurrency, or address lessons from SP-9 development and testing.
- JMS will not be ready to support Space Fence Increment 1 operational testing or initial operations.

Recommendations

- The Air Force should synchronize the effects of the JMS Program Office, developers, operators, and testers through all stages of system development and developmental testing to increase problem discovery before operational testing.
- If the Air Force goes forward with SP-11, it should provide additional staffing to the operational units so they can support both SP-11 development and testing while executing their operational mission. If the Air Force moves forward with another program instead of JMS or changes the JMS acquisition approach, it should still properly staff the operational units to support continued engagement between operators and acquirers.
- The Air Force should identify lessons learned and develop courses of action to avoid repeating the mistakes of SP-9 development and testing in SP-11 (or other future development).
- If the Air Force decides to go forward with SP-9, it should ensure SP-9 mission functions perform correctly, consistently, and timely, and verify the fixes with testing.
- The Program Office, in coordination with the operational units, should develop operator training and system documentation relevant to operational tasks and workflows for any delivery to operations.
- The Air Force should operationally test Space Fence, SPADOC, and ASW together to ensure the existing SSA systems and their operators can process Space Fence data correctly, consistently, and in a timely manner.