

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

Executive Summary

- The Air Force has not conducted any OT&E for Joint Space Operations Center (JSpOC) Mission System (JMS) Increment 2, but executed significant development and developmental testing for JMS Increment 2, Service Packs (SP) 9 and 11 in 2017.
- The SP9 developmental testing campaign was extended to address system stability, operator training, and development of operational procedures. Despite improved performance during SP9 developmental testing, there are a number of remaining critical deficiencies that are expected to change the scope of the SP9 operational delivery and testing. DOT&E expects operational testing for SP9 to begin no earlier than February 2018.
- The Air Force is finalizing a revision to the JMS Test and Evaluation Master Plan (TEMP) to reflect program schedule and content changes, including OT&E for SP11, necessitated by the addition of functional capabilities.
- While some interoperability testing has occurred, delays in the JMS Increment 2 delivery increase the risk of late discovery of integration deficiencies between JMS and Space Fence Increment 1.

System

- JMS is a net-centric, service-oriented architecture of hardware, software, data, and network connectivity that is intended to process, integrate, store, and allow for the compilation, exploitation, sharing, and visualization of Space Situational Awareness (SSA) sensor data and analysis to support command and control tasking and battle-management decisions for space forces.
- The Air Force has installed operational JMS hardware strings and infrastructure at Vandenberg AFB, California. The U.S. Strategic Command will fund and install a backup site at Naval Support Facility Dahlgren, Virginia. Additional non-operational instances and partial instances of JMS are installed for development and developmental testing purposes at a multitude of 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 accessible to worldwide users running JMS client software on non-JMS workstations connected through the SECRET Internet Protocol Router Network (SIPRNET) and the Joint Worldwide Intelligence Communication System (JWICS).
- JMS is intended to replace legacy Space Defense Operations Center (SPADOC) and space specific portions of the Astrodynamics Work Station (ASW).



- The Air Force is developing JMS in two increments.
 - Increment 1 delivered an initial service-oriented architecture infrastructure and user tools, including a client workstation-accessible User Defined Operational Picture that allows access to and analysis of data from legacy systems, integrated collaboration/messaging/data sharing tools, and space order of battle processing.
 - Increment 2 is being developed to deliver mission functionality in three SPs.
 - SP7 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 did not operationally test SP7 because it did not replace legacy SPADOC and ASW systems and was not used for mission critical functions.
 - SP9 is 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 (RSOs), assessment of conjunctions (collision risk) between RSOs, and high-accuracy tasking of sensors for orbital safety, threat modeling, and operational decisions.
 - SP11 is intended to complete Increment 2 functionality on the Secret and Top Secret enclaves. It should also include the ability to ingest and integrate more highly classified data, support routine Space Object Identification tasking, and support processing for critical events such as RSO Closely Spaced Operations, breakups, re-entries and de-orbits, launch processing, and

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processing of uncorrelated tracks. SP11 is also intended to encompass test, training, and exercise capabilities and availability and reliability improvements, which had been planned for delivery in the descope SP13.

Mission

The Commander, Joint Functional Component Command for Space uses 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

- The Air Force did not conduct OT&E for JMS Increment 2 in 2017, but did complete significant development and developmental testing for JMS Increment 2, SP9 and SP11, including:
 - Two additional phases of functional developmental testing for SP9
 - Three JMS Astro/catalog Verification and Evaluation against Legacy Instantiations (JAVELIN) tests, which focused on the JMS SP9 capability to maintain the space object catalog in comparison to the legacy system
 - Five SP11 integration tests
- The program manager wisely extended SP9 developmental testing to improve system stability, operator training, and to develop operational procedures. Despite the extension of developmental testing, the Air Force proposed a reduction in the operational scope of SP9 due to remaining deficiencies and operational user concerns.
- The Air Force Operational Test and Evaluation Center (AFOTEC) is planning an Operational Utility Evaluation (OUE) of JMS SP9 following an Integrated Test and Evaluation (IT&E) period; however, the scope of the OUE may be reduced due to the proposed operational changes to SP9.
- The Air Force is finalizing development of a revision to the JMS TEMP, to reflect program schedule and content changes, including the addition of OT&E for SP11, necessitated by the addition of functional capabilities.
- The Air Force validated a modeling and simulation tool to support the evaluation of system capacity under high-user loading.

Assessment

- Despite improved performance during SP9 DT&E, there are a number of remaining critical deficiencies that are expected to change the scope and timing of SP9 operational testing. Additionally, the Program Office is reassessing the Increment 2 schedule following the delay of IT&E. DOT&E

expects operational testing for SP9 to begin no earlier than February 2018.

- Due to SP9 development problems, resource constraints related to SP9 and SP11 concurrency, and an unrealistic schedule, DOT&E expects SP11 to be delayed. While some interoperability testing has occurred, delays in the JMS Increment 2 delivery increase the risk of late discovery of integration deficiencies between JMS and Space Fence Increment 1.
- The Program Office and AFOTEC have placed significant focus on cybersecurity assessment and hardening; however, additional work remains to enable defenders to monitor JMS in order to provide an adequate cyber defense.
- The Air Force deferred, to an undefined increment, validated JMS CDD requirements, which were planned for delivery in SP13 and not included in SP11. This undefined increment may become the program of record being planned to equip the new National Space Defense Center.

Recommendations

- Status of Previous Recommendations. The program has implemented several changes to address FY16 recommendations, however the Air Force still needs to:
 1. Develop an acquisition strategy for post-Increment 2 capabilities and the National Space Defense Center program of record.
 2. Provide cyber defenders, system administrators, and operators with the ability to detect cyber attacks and mitigate their operational impacts.
 3. Conduct independent, non-cooperative, threat representative penetration testing to assess protect, detect, react, and restore components of cybersecurity for Increment 2. This testing is planned for SP9 and SP11.
 4. Conduct JMS-Space Fence interoperability testing. While partial JMS SP11 and Space Fence interoperability testing occurred at the SPAWAR development system, this testing

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did not encompass sufficient system configurations for adequate interoperability testing.

5. Develop and validate modeling and simulation tools to support evaluation of JMS high accuracy catalog size and accuracy. This is planned for delivery in SP11.
- FY17 Recommendation.
 1. In addition to prioritizing Space Fence requirements in SP11, the Program Office needs to develop courses of

action with the Space Fence Program Office to achieve operationally representative integration testing between both systems during OT&E.

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