Space Command and Control System (Space C2)

The Space Command and Control (Space C2) program continues to progress toward delivery of capabilities that will allow retirement of the Space Defense Operations Center (SPADOC) system. However, the process has been slower than planned. A cyber survivability cooperative vulnerability and penetration assessment (CVPA) was performed on the Advanced Tracking and Launch Analysis System (ATLAS) and other associated Space Domain Awareness (SDA) capabilities in May 2024, in accordance with the DOT&E-approved test plan. OT&E of Space C2 had been planned for FY23 and FY24 but has moved into FY25 due to ongoing software delays.

The Space C2 Program Management Office has increased system stability and made progress on developing operator training and on baselining an operationally relevant system configuration. However, integrated testing of ATLAS, Space C2's primary SDA C2 capability, did not produce relevant data to accomplish OT&E objectives.

SYSTEM DESCRIPTION

The Space C2 system uses a common commercially supported platform to access data and services for user applications that enable command and control operations. Space C2 uses a hybrid cloud — as well as hardware at operations centers — for resiliency and accessibility, and to enable multi-domain operations integrated with classified mission partner capabilities.

The Space C2 system is comprised of five lines of effort (LOE), including:

- LOE 0: System Engineering, Integration, and Test
- LOE 1: Platform, Infrastructure, and Data
- LOE 2: SDA Software
- LOE 3: Theater Support Software
- LOE 4: Space Defense Software

The LOEs deliver capabilities across three broad categories for Space Delta 2 (SDA and Space Battle Management), Space Delta 5 (Combined Space Operations Center), and Space Delta 15 (National Space Defense Center):

- SDA Software focuses on modernizing SDA astrodynamics toolsets.
- Theater Support Software focuses on developing space systems tasking, electronic warfare awareness, and combatant command integration capabilities.

- Space Defense Software focuses on providing operational command and control capability and supporting battle management services for the integration of new and legacy systems to address critical mission needs.

The system has its own continuous integration/continuous deployment pipeline, known as Kobayashi Maru, for capability and application development. As noted in the FY23 report, Space C2's development efforts are still primarily focused on delivering the capabilities that will allow retirement of the SPADOC.

MISSION

Space Force Guardians will use Space C2 to provide a wide range of space defense, SDA C2, and theater support capabilities to facilitate timely, quality battlespace decisions by DoD and mission partners at multiple classification levels. Those capabilities include infrastructure, data and enterprise services, and mission applications to enable responsive, resilient operational-level command and control capabilities for the Space Deltas 2, 5, and 15, and other command and control centers.

PROGRAM

The Space C2 program was initiated as a Development Security Operations (DevSecOps) pathfinder in 2019 and is using the software acquisition pathway. Space C2's entrance into the Execution Phase, originally expected in December

2022, is now expected no earlier than 1QFY25. The program has been on the DOT&E oversight list since FY19 and has a DOT&E-approved TES with approval caveats. An updated version of the TES to address those caveats was delayed by over a year and is now expected in 1QFY25, along with a classified appendix to detail testing for classified Space C2 capabilities.

In FY22, the Space C2 program restructured its capability development efforts to focus on the near-term challenge of retiring the SPADOC system. The restructure was intended to accelerate delivery of ATLAS capabilities to allow for the decommissioning of SPADOC, while deemphasizing the delivery of non-critical applications. The foundational capabilities required to allow for the retirement of SPADOC were the focus of product developers in FY23 and FY24. While progress was made because of the program restructure, product development remains slower than anticipated, and the projected date to decommission SPADOC continues to extend further into approximately mid-FY25, a delay of more than three years from the original timeline.

The Space C2 program uses an integrated testing construct but continues to struggle with implementing the Space Force's Integrated Test Force vision. The program currently implements quarterly integrated testing events to assess SDA C2 capabilities but struggles to define incremental capability operational acceptance

T&E goals and test methodology. The Space C2 Integrated Test Force, established in September 2023, has not yet been able to close out any operational test objectives and now plans to conduct dedicated operational test events, rather than integrated test events, in FY25 to demonstrate the operational capabilities currently performed by SPADOC.

» MAJOR CONTRACTORS

Space C2 is comprised of a multitude of contracts and contractors developing capabilities, including:

- Parsons Corporation, Space Operations Division – Centreville, Virginia
- Omitron, Inc. – Colorado Springs, Colorado
- Tecolote Research, Inc. – Goleta, California
- Systems Planning and Analysis, Inc. – Alexandria, Virginia
- The Boeing Company – El Segundo, California
- General Dynamics Missions Systems – Fairfax, Virginia
- Lockheed Martin Corporation – King of Prussia, Pennsylvania
- Peraton, Inc. – Herndon, Virginia
- Palantir Technologies, Inc. – Denver, Colorado
- L3Harris Technologies, Inc. – Colorado Springs, Colorado
- Leidos Inc. – Reston, Virginia
- ManTech – Herndon, Virginia

TEST ADEQUACY

While integrated test events for ATLAS occurred in FY24, they did not produce operationally relevant data and therefore cannot be used to meet operational test needs, primarily due to delayed capability delivery, a lack of trained operators, and non-operationally representative test environments. ATLAS operational testing is intended to be phased product release testing, aligned with quarterly program increment development timelines, executing as integrated tests known as SDA capability integrated tests (SCITs). SCITs are intended to produce usable data for both developmental and operational testing communities. However, the four SCITs conducted in FY24 did not produce relevant operational test data.

Test activities for ATLAS were useful to the contractor testers, government-led developmental testers, and numerical validation analysts responsible for ensuring ATLAS accuracy meets the minimum legacy program standards. Progress was made towards increasing system stability, baselining an operationally relevant system configuration and development of valid operator training.

A cyber survivability CVPA was performed on ATLAS and other associated SDA capabilities in May 2024 in accordance with a DOT&E-approved test plan. DOT&E observed the event. Test planning for FY25 has shifted towards dedicated operational test events once the ATLAS developers deliver the remaining required capabilities. The Space Force intends to perform end-to-end operational testing of all SPADOC decommissioning-related ATLAS capabilities in FY25. The Space C2 Integrated Test Force plans to conduct a cyber survivability adversarial assessment (AA) of all SDA capabilities, using insights from the CVPA, in 2QFY25.

PERFORMANCE

» EFFECTIVENESS AND SUITABILITY

Insufficient data were collected in FY24 to inform an assessment of operational effectiveness or suitability for the Space C2 program.

» SURVIVABILITY

The CVPA revealed cyber vulnerabilities that the Space Force should address prior to fielding. DOT&E intends to publish an ATLAS cyber survivability report based on results from the May 2024 CVPA and the planned 2QFY25 AA.

RECOMMENDATIONS

As recommended in the FY23 Annual Report, the Space Force should:

1. Continue focused efforts on development and adequate operational testing of SDA capabilities required

to complete the SPADOC decommissioning.

2. Perform additional government-led cyber survivability testing of Space C2 capabilities, including the continuous integration/continuous deployment pipeline and cross domain solutions, as part of major capability releases, once all relevant external users, data feeds, and operational applications are finalized across each applicable security domain.

3. Continue to refine the Integrated Test Force construct to clearly define OT&E phases, as well as common T&E goals and methodology across all Space Force programs, to satisfy the equities of all T&E stakeholders.

4. Finalize the placement of cyber defenders for Space C2-related capabilities.

5. Develop and submit test plans for DOT&E approval.