Space Command and Control System (Space C2)

The Space Command and Control (Space C2) system did not undergo any DOT&E-approved operational testing activities in FY22, primarily due to delayed product delivery, understaffed development teams, unclear test team constructs and responsibilities, and development focus on non-critical capabilities. To address those concerns, the program changed key leadership personnel, restructured development teams, more clearly defined their integrated testing construct, and refocused capability development to only the most crucial capabilities. Despite the lack of operational testing, one Data-as-a-Service capability, Warp Core, was conditionally accepted for operations by the U.S. Space Force (USSF) in FY22, pending completion of cyber survivability testing. Two other data environments (known as tenants) within Warp Core were operationally fielded by the Air Force and North American Aerospace Defense Command (NORAD)/U.S. Northern Command (USNORTHCOM).

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. System capabilities fall into three general categories: Battle Management Command and Control, Space Domain Awareness, and Space Defense. Space C2 enables multi-domain operations that are integrated with classified mission partner capabilities.

Space C2 uses a hybrid cloud, as well as hardware at operations centers for resiliency and accessibility.

The system has its own continuous integration/continuous deployment (CI/CD) pipeline for capability and application development.

MISSION

USSF Guardians will use Space C2 to provide a wide range of battle management command and control, space domain awareness, space defense, and cross-mission data 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 National Space Defense Center, the Combined Space Operations Center, and 18th and 19th Space Defense Squadrons.

PROGRAM

The Space C2 program was initiated as a Development, Security, and Operations (DevSecOps) pathfinder in 2019. The program is currently seeking designation as a software acquisition pathway (Execution Phase) program. USD(A&S) has placed conditions on that declaration, including the development of a DOT&E-approved Test and Evaluation Strategy (TES) for the program. The formal designation is anticipated in December 2022. The TES has been in-work for 3 years but has not yet been formally submitted to DOT&E for approval. The TES is expected to enter into formal approval coordination in early FY23.

In FY22 the program restructured its capability development efforts to focus on the near-term challenge of retiring outdated Space Defense Operations Center infrastructure. The restructure was done to accelerate delivery of Advanced Tracking and Launch Analysis System (ATLAS) capabilities to allow for the decommissioning of the Space Defense Operations Center, while deemphasizing the delivery of non-critical applications. The restructure included a realignment of existing development teams and associated priorities as well as a change of program leadership personnel.

The program will use an integrated testing construct and has made significant efforts to define how that testing will be accomplished within USSF's new Integrated Test Force model.

Despite the lack of operational testing, one of the program's major capabilities – Warp Core, the program's current Data-as-a-Service capability that provides data distribution, manipulation, analysis, and visualization capabilities to its users – was fielded to the Air Force and NORAD/USNORTHCOM to support readiness data analytics and Operation Allies Refuge activities respectively.

» MAJOR CONTRACTORS

- General Dynamics Mission Systems – Fairfax, Virginia
- L3Harris Technologies, Inc. – Colorado Springs, Colorado
- Leidos Inc. – Reston, Virginia
- Lockheed Martin – Littleton, Colorado
- ManTech – Herndon, Virginia
- Omitron – Colorado Springs, Colorado
- Palantir Technologies, Inc. – Denver, Colorado
- Parsons Corporation – Centreville, Virginia

TEST ADEQUACY

The Space C2 program did not conduct any operational testing in FY22. USSF's Space Training and Readiness Command submitted two operational test plans to DOT&E for approval. The first

test plan is a cyber survivability adversarial assessment plan for Warp Core, Space C2's Data-as-a-Service capability. The second test plan is the overarching plan covering multiple test events for the phased-delivery of ATLAS. The first ATLAS operational test is planned for early FY23 and will focus on foundational capability deliveries that are the key underpinnings of future ATLAS capabilities.

One system capability (Warp Core) was operationally accepted by USSF's Space Operations Command in October 2021. That operational acceptance was granted with a condition to complete DOT&E-mandated cyber survivability testing. That testing is scheduled to occur in early FY23.

Warp Core has undergone developmental cybersecurity testing, both by the developer and external non-governmental organizations. Those test results did not identify significant findings or vulnerabilities with Warp Core. Government-led cooperative vulnerability identification and cooperative vulnerability and penetration assessment (CVPA) activities were conducted on Warp Core in FY21, but those tests were limited in scope and the system was not in an operationally-representative configuration. DOT&E personnel observed the CVPA and the testing was accomplished in accordance with the DOT&E-approved test plan.

Two other tenants that share Warp Core's virtual space were fielded without operational testing. The Air Force and NORAD/USNORTHCOM fielded Envision and NorthStar, respectively, to support readiness data analytics and Operation Allies Rescue and Operational Allies Welcome activities, respectively.

PERFORMANCE

» EFFECTIVENESS, SUITABILITY, AND SURVIVABILITY

Because no operational testing has been performed on Space C2, DOT&E cannot assess its effectiveness, suitability, or survivability. In addition, DOT&E is concerned that the lack of cyber defenders currently assigned to Space C2 poses a significant risk to its cyber survivability.

RECOMMENDATIONS

The USSF should:

1. Continue to define their Integrated Test Force construct, in order to conduct operational testing earlier in program timelines to realize the benefits of agile program development.
2. Synchronize across product deliveries within Space C2 to enable efficient testing of related capabilities.
3. Perform government-led operational cyber testing (i.e. CVPA and adversarial assessment) on Space C2's software factory to ensure CI/CD pipeline survivability.
4. Assign cyber defenders for Space C2-related capabilities.