

CCS-C: C2 Ground System Leverages Automation to Reliably Manage MILSATCOM's Vast, Growing Constellations



Deployed in 2004, the Kratos-built Command-and-Control System-Consolidated (CCS-C) continues to evolve to meet precise coordination, resilience and new satellite demands.

In 2002, Air Force Space Command (AFSPC) struggled to maintain reliable warfighter communications that matched the pace of battlefield operations due to an aging, overly manual C2 ground system with limited ability to maneuver satellites.

The '90s-era Command-and-Control System (CCS) consisted of a room full of mainframes, green-screen monitors and old coding languages, the maintenance costs for which continued to tick up as parts and expertise became scarce.

Further complicating matters, both satellite constellations flying on CCS — the Defense Satellite Communications System (DSCS), which had provided long-haul comms since the '80s; and the more resilient Milstar — neared replacement. The situation demanded a modern C2 ground system, one with a smaller hardware footprint and updated user interface. Also needed was heightened automation to more easily integrate new satellites for greater comms

CCS-C At A Glance

- Provides command and control (C2) for 25 satellites across four constellations, comprising most of the Space Force's MILSATCOM spacecraft
- **2002:** Kratos wins original contract, replacing the aging CCS system with CCS-C
- **2007-2010:** Wideband Global SATCOM (WGS) and Advanced Extremely High Frequency (AEHF) constellations added to CCS-C
- **2012:** Kratos wins CCS-C Production and Sustainment Contract (CPASC), making virtualization improvements
- **2023:** Kratos wins CCS-C Sustainment and Resiliency (C-SAR) recompetes, starting automation and cloud security prep for current MILSATCOM missions, to include the Evolved Strategic SATCOM (ESS) family

coverage and to reduce operator errors that risked comms loss.

Deployed in 2004, the CCS-C became that modern system through continuous digital transformation with sustainment, resilience and scalability in mind — today providing C2 for 25 satellites on orbit across four constellations and counting.



Schriever SFB, Colorado Springs, CO.

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“CCS-C is the MILSATCOM enterprise solution for out-of-band C2. It has proven to be a robust, resilient, operationally proven, modernized and scalable ground system, currently supporting four MILSATCOM constellations spanning both decades and various spacecraft manufacturers,” said Kelley Schiering, C-SAR program manager with the Space Force. “It provides consistency for operators conducting the C2 mission and for the acquisition pipeline while onboarding new technologies.”

Transforming C2 Through Automation

The Air Force awarded Kratos the initial CCS-C contract in 2002, followed by two recompetes that

have seen the ground system grow to encompass most MILSATCOM satellites operated by the Space Force, which took over AFSPC’s core capabilities in 2019. Kratos’ EPOCH commercial off-the-shelf C2 software was integrated with CCS-C during its deployment at Schriever Space Force Base in 2004, automating routine contacts and satellite maneuvering to sharply reduce operator workload and human error.

Previously, officers often maneuvered MILSATCOM satellites by entering commands, a risky prospect because one wrong entry could, for example, leave a thruster on too long — mispositioning the satellite and potentially jeopardizing warfighters’ comms access.

Automation now performs far more satellite health and location contacts than human operators can, improving collision avoidance, threat detection and overall comms availability. Meanwhile, operators can focus on mission strategy and intelligence.

Seamlessly Integrating Satellites with the Enterprise

The Air Force migrated the DSCS and Milstar constellations to CCS-C at deployment and in 2007 started replacing them with Wideband Global SATCOM (WGS) and Advanced Extremely High Frequency (AEHF) satellites, respectively. Both constellations helped eliminate bandwidth bottlenecks warfighters faced during data-heavy operations, and AEHF also boasted advanced anti-jamming capabilities.

While these satellite families had different manufacturers and procedures, CCS-C avoided the problem of needing fragmented C2 systems for each by seamlessly and affordably integrating them onto one enterprise platform with custom, out-of-the-box automations.

"Every satellite that's made tends to be a snowflake or a unicorn, so there's always something you have to customize," says Clay Hyink, senior solutions architect at Kratos. "These customizations are now easier to integrate."

In addition to sustaining the functionality of DSCS and Milstar spacecraft that remain operational long past their projected lifespan, CCS-C is preparing to fly next-generation satellites like Boeing's WGS-11, planned for launch in 2027. This interoperability supports the Space Force's move to an integrated MILSATCOM enterprise and efforts to launch new satellites countering advanced jamming and cyberattacks.

"We've certainly proven that we can keep up with the current satellite capabilities of the day," says Kevin Hein, senior systems engineer at Kratos.

Boosting Resilience by Virtualizing

Cybersecurity increasingly became a driving force of C2's modernization around 2012, when the first CCS-C recompile, CPASC, went to Kratos. Warfighters were operating in increasingly contested environments and satellites fielding higher volumes of sensitive traffic, making cyber resilience a MILSATCOM priority.

Virtualization under CPASC reduced CCS-C's attack surface, while centralizing patches and updates, and allowed virtual machines and access to be scaled based on the mission.

Under the C-SAR recompile Kratos won in 2023, the Space Force is rolling out cloud-based containerization and zero-trust security capabilities.

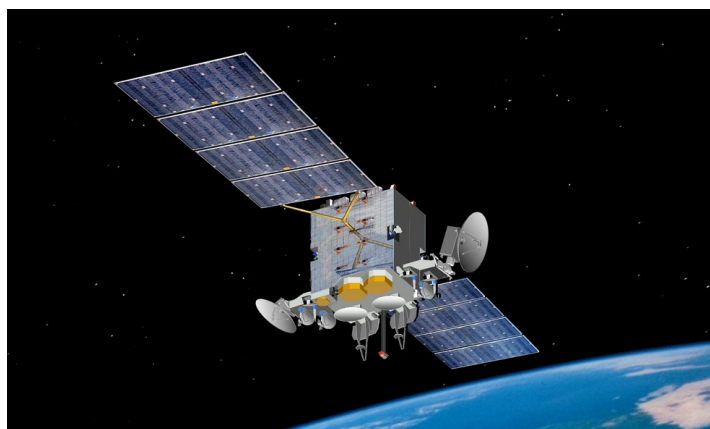
Implementing Future-Ready Modernization

CCS-C's continued importance to the SATCOM mission is underscored by the addition of three

servers under C-SAR and move to continuous integration/continuous delivery (CI/CD) software development. CI/CD uses automation for faster, more reliable ground system updates ahead of future satellite launches.

The Space Force is continuing the work to add the AEHF replacement, the Evolved Strategic SATCOM (ESS) constellation, to CCS-C, which will extend resilient nuclear comms to the polar regions.

"We are applying modern, agile design thinking and systems thinking architecture," says Kevin McHugh, development manager and release train engineer for C-SAR at Kratos. "Everything that we're doing here is pulling the system forward."



The Space Force's New Operational Paradigm

The Space Force's CCS-C is a living system of systems that integrates legacy and next-generation constellations. Two decades of deep experience addressing evolving mission demands have assured that.

From its early days, the ground system leveraged automation to reduce satellite operator workloads and errors, and — as jamming and cybersecurity threats to MILSATCOM satellites multiplied — Kratos virtualized CCS-C and introduced cloud security capabilities to boost its resilience and scalability.

As a result, the Space Force has continued to add servers and satellites to the ground system in its C-SAR era, shifting its operational paradigm from keeping contact and sometimes moving spacecraft to coordinating them within a space battlefield to maintain warfighter comms.

"CCS-C has provided a stable baseline to MILSATCOM operations since 2004. This has given Space Force leaders the confidence to integrate new and evolving SATCOM missions like WGS and their

functionality, such as the Unified Data Library, into the enterprise," Schiering said. "Kratos' long history and deep knowledge of the work supporting CCS-C is the foundation for a strong partnership with the government that ultimately benefits our warfighters."

