

**United States Space Force
Vision for
Satellite Communications
(SATCOM)**

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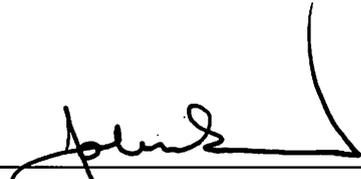
United States Space Force
Vision for
Satellite Communications
(SATCOM)

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FOREWORD

Our ability to deliver global satellite communications (SATCOM) is unprecedented, and the joint warfighter relies on this capability at all levels and across the range of military operations. SATCOM provides survivable communications for Presidential support and nuclear command and control, and affords national and military leaders a means to maintain strategic situational awareness and convey their intent to the Joint Force Commander (JFC). SATCOM relays the intelligence, surveillance and reconnaissance that allow the JFC to understand the operating environment, and the command and control to shape the environment and act decisively. At the tactical level, SATCOM provides critical, beyond line-of-sight connectivity for mobile forces, enables control of remote sensors and remote or in-flight weapons, transmits real-time battlefield intelligence, and ties sensors to shooters.

Adversaries understand the advantage SATCOM brings our warfighters and are working to deny, degrade, and destroy these capabilities. Despite the global, instantaneous reach of our SATCOM capabilities, which includes both military (MILSATCOM) and commercial (COMSATCOM) capabilities, the enterprise needs to improve its resiliency, robustness, flexibility, and manageability. In order for the United States to maintain its asymmetric advantage of global space-based communications, the SATCOM enterprise must evolve quickly. We must prepare now to fight SATCOM as a single enterprise through a contested, degraded and operationally-limited (CDO) environment, prevent or withstand loss, and continue to deliver effects to warfighters. United States Space Force (USSF) refers to this operational vision of the future as “Fighting SATCOM.”

Recent events have created a unique inflection point and provide USSF an exceptional opportunity to transform how SATCOM capability is procured, operationally managed, and delivered. On 29 Aug 2019, United States Space Command (USSPACECOM) was established to protect America’s interests in space and to assure access for the full range of military operations. The day after, the Commander, U.S. Space Command, ordered the establishment of the Combined Force Space Component Command (CFSCC) with a mission to plan, integrate, conduct, and assess global space operations to deliver combat relevant space capabilities to Combatant Commanders, Coalition partners, the Joint Force, and the Nation. The CFSCC replaced the previous Joint Force Space Component Command (JFSCC) operated under U.S. Strategic Command. On 12 Dec 2018, Air Force Space Command assumed sole responsibility for the procurement of COMSATCOM services for the Department of Defense (DoD), which have subsequently transferred to USSF. On 28 May 2019, the Secretaries of the Air Force and Navy agreed to transfer responsibility for the future narrowband capability from the Navy to the Air Force as a prudent step to consolidate space capabilities in anticipation of the Space Force. Finally, the USSF was established on 20 Dec 2019 to develop military space professionals, acquire military space systems, mature the military doctrine for space power, and organize space forces to present to our Combatant Commands. These new acquisition authorities, combined with USSF’s authority to organize, train, and equip military space forces of the United States, allows USSF to deliver better integrated solutions, ensuring warfighters have the resilient communications capabilities they need to fight and win.

This paper outlines a vision for the future state of SATCOM that USSF is pursuing. Grounded in multiple studies going back many years and recent Concepts of Operations (CONOPS) for the SATCOM Integrated Operating Division (SIOD) and Fighting SATCOM, this future state will have attributes familiar to many – capacity flexibility, terminal and network agility, cyber and link security, and data interoperability with Joint C2 systems. It will also address the key components of the enterprise – space, terminal, network, enterprise management and control, command and control, and governance. USSF is moving toward a new way of delivering SATCOM, and encourages other DoD SATCOM organizations with equities in the enterprise, to join us.

BACKGROUND

Warfighters require SATCOM capabilities that can effectively operate in a CDO environment. In 2015, the Fighting SATCOM Working Group, a multi-service and agency task force, identified specific SATCOM enterprise (Figure 1) areas to improve. Addressing these areas will provide the CFSCC enhanced capabilities to deliver resilient SATCOM effects to warfighters in CDO environments. Areas identified for improvement include:

- Synchronization of operations across the SATCOM enterprise
- Situational awareness across the SATCOM enterprise
- Full-spectrum Defensive Space Control (DSC) allowing warfighters to communicate through any environment
- Ability to manage and direct commercial SATCOM resources employed by DoD users

In addition, multiple analyses and requirements documents have documented needed improvements. Some of these include:

- 2010 Joint Satellite Communication Layer Initial Capabilities Document with 2018 Change 1
- 2012 Resilient Basis for Satellite Communications in Joint Operations Study Final Report
- 2013 AFSPC White Paper on “Impediments and New Approaches for Leveraging COMSATCOM in Support of the Air Force and DoD”
- 2015 Protected Satellite Communications Services Analysis of Alternative (AoA) Final Report
- 2019 Wideband Communications Services (WCS) AoA Final Report

Finally, the joint community made an effort to describe future states through an SIOD and Fighting SATCOM CONOPS. The USSF SATCOM vision is consistent with these reviews.

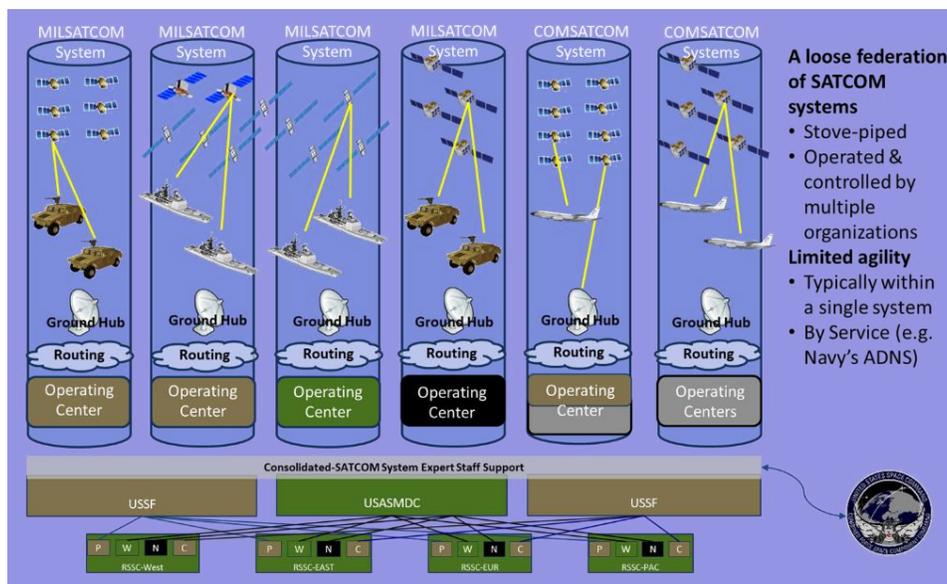


Figure 1 – Current SATCOM Approach

VISION

USSF will provide an operationally effective, affordable, resilient, and secure satellite communications architecture that supports global mission priorities and is adaptable to rapidly changing requirements, technologies, and threats.

DESIRED END STATE

The Chief of Space Operations provides enterprise SATCOM capabilities to CDRUSSSPACECOM in order to support joint warfighters across the full spectrum of conflict, in CDO environments and tactically-relevant timelines.

ENTERPRISE ENVIRONMENT & KEY ATTRIBUTES

To achieve this vision, the SATCOM enterprise must, at a minimum, possess the following key attributes

- Rapid, resilient, sustainable and global access to SATCOM capabilities
 - The ability for all DoD users to quickly obtain and maintain satellite communications through all operating environments relevant to their mission
- Terminal and modem agility
 - The ability for terminals to operate on a variety of waveforms over varying frequencies, with quick transition or, when possible, simultaneously
- Network agility
 - The ability for users to maintain their networks when transitioning to a different beam, antenna, satellite or system
- Cyber, link and operational security
 - The ability to provide cyber resiliency for warfighters, protecting their information and control systems in the face of a determined and sophisticated attacker
- Data interoperability with joint command and control (C2) systems
 - The ability of warfighters and space enterprise C2 systems to effectively exchange information

The enterprise has multiple segments and aspects that interconnect and must be addressed together. Reference Figure 2.

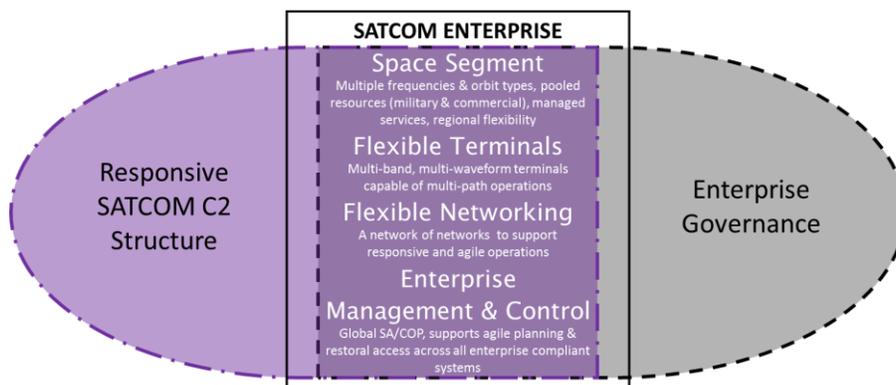


Figure 2 – Enterprise Summary

KEY CONCEPTS

These key concepts, when aggregated, deliver the key attributes and achieve the vision.

“Fight” SATCOM as an integrated enterprise under a single warfighting commander. Currently, MILSATCOM capabilities are prioritized and allocated individually by capability per Chairman of the Joint Chiefs of Staff Instruction 6250.01. In some cases, users directly procure COMSATCOM leases to meet their mission needs; these resources are dedicated to the purchasing user for the duration of the lease. For the future, the CFSCC will have the ability to centrally-manage DoD COMSATCOM leases to gain greater allocation efficiencies and improved situational awareness.

Consolidating all SATCOM (both MILSATCOM and COMSATCOM) requirements collection, planning, allocation, and operational management processes under a single command, provides CDRUSSPACECOM the holistic knowledge and resources to support all warfighters within tactically-relevant timelines. The unity of effort under USSPACECOM improves support for responsive allocation and re-provisioning of SATCOM resources (military, commercial, and coalition systems), automatic moving and restoring the highest priority users in times of degraded service or conflict, faster resolution of electromagnetic interference (EMI), crisis planning, faster reconfiguration and optimization of the enterprise when resources are lost.

Dynamically optimize access for users operating in diverse environments. Improve efficiency and user access through centralized, enterprise-wide management and control responsive to warfighters’ operational needs as they dynamically change, and radically reduce the allocation resource process from weeks or months to minutes. A single point of entry for users enables easy access while allowing the enterprise to provide the most effective satisfaction of their SATCOM needs. USSPACECOM will provide comprehensive mission management to enable resilient, uninterrupted satellite communications and rapidly plan, apportion, monitor, detect, locate, assess and resolve SATCOM issues for users.

Improved resilience and operational agility in CDO environments. The enterprise will leverage DoD and commercial systems, capabilities, and products to deliver connectivity to users in all operational conditions, especially in CDO environments. Within tactically-relevant timelines, it will quickly reroute users and their networks to other SATCOM resources and dynamically adjust to any unpredictable CDO environment. The enterprise will provide interoperability and enhanced resiliency by giving users the ability to access multiple diversified and proliferated SATCOM capabilities, allowing users to operate through CDO environments. Future international partnerships could further increase path diversity and resiliency for warfighters.

Rapid fielding of SATCOM capabilities to deliver a flexible, resilient enterprise supporting agile operations for users. The enterprise will deliver capabilities at a rate that out-paces adversary tactics, techniques, and procedures. This will require fielding of multiple systems, networks, and products. Capabilities will be a mixture of military and commercial, U.S. and non-U.S., and leverage commercial and defense industrial bases for innovative technologies, products, tools, services, and processes.

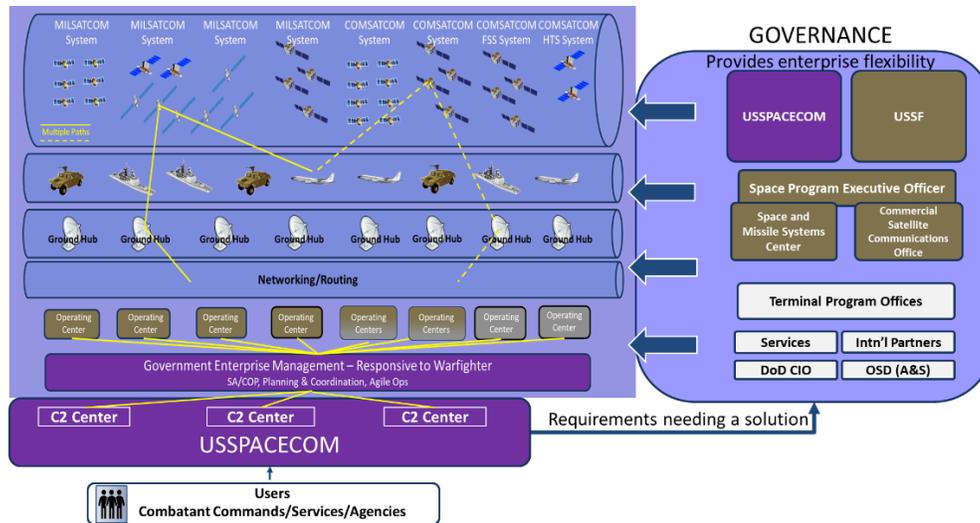


Figure 3 – Enterprise SATCOM – Detailed View

KEY ENABLERS:

As depicted in Figure 3 above, the key concepts are underpinned by a number of key enablers. These include:

Global Situational Awareness (SA) & Common Operational Picture (COP): To fight SATCOM as an enterprise, CDRUSSPACECOM will require an automated enterprise-wide situational awareness/common operational picture (SA/COP). This SA/COP will be fed by long-term and real-time user needs and capable of tailorable views. It will support campaign planning and execution, operations assessment, and other relevant decisions. During real-time execution, it will present situational awareness of resource activity and display threats (e.g. jamming) against the resources. Finally, the SA/COP will have an ability to distribute data to other domains' C2 systems (i.e., Theater Battle Management Core Systems, Joint Automated Deep Operations Coordination System) so that integrated, multi-domain planning and responses can be executed.

C2/Management System: The enterprise's management and control system must support agile planning, operations and restore to meet users' tactically relevant timelines. The system must provide the CFSCC a comprehensive mission management ability to rapidly plan, apportion, monitor, detect, locate, assess and resolve SATCOM issues for users. It serves as the tool to quickly respond to users' satellite access requests and can dynamically replan and reallocate SATCOM resources.

SATCOM Terminals: User terminals will be capable of multi-band and multi-waveform operations, whenever possible, to support agile, "path-agnostic" connectivity, reducing vulnerability to interference and jamming.

Governance: The enterprise will need a governance structure to lead and support the development and delivery of policies, standards, interfaces, products and capabilities required to enable CDRUSSPACECOM to deliver SATCOM through a CDO environment and still deliver effects to warfighters. Governance entails binding together existing systems, networks and capabilities users rely on today with the future systems, networks and capabilities of tomorrow. It performs in-depth technical, schedule and cost trades to deliver enterprise flexibility, resiliency and affordability. Commercial, government and international partners will collectively support the development and implementation of appropriate standards to support the enterprise. A single governance authority for the SATCOM enterprise promotes efficiency and helps avoid duplication of effort; governance directs and coordinates

the acquisition activities and programs of multiple organizations to deliver a flexible and responsive enterprise to CDRUSSPACECOM and users. To enable rapid adoption of private sector capabilities, the governance authority must examine and adjust policy, contracting, testing and certification processes to ensure processes are streamlined.

Acquisition: The practice of multiple authorities (combatant commands, services/agencies and acquisition organizations) buying multiple SATCOM products and services led to stovepiped SATCOM systems, vertically integrated within each system, but with virtually no ability for users to receive simultaneous operational benefits from multiple systems due to their disparities. Additionally, lack of segment synchronization has been a long-time weakness in the acquisition of MILSATCOM systems. All SATCOM system segments must be fielded to enable an operational capability for users.

By creating a single entry point for all SATCOM requirements, enterprise SATCOM needs can be acquired in a deliberate and efficient manner, avoiding the stovepipes of the past. A portion of commercial SATCOM will be provided through managed services, providing flexible, cost-efficient (by-the-byte) support across multiple constellations, frequency bands, possibly orbits. In some cases, specific power-bandwidth for special user and legacy terminals will be acquired using multi-year, pooled-resource contracts when possible. Individual single-year leases will be rare and only used when no other options exist.

For those frequency bands, coverage areas, or specialized capabilities not offered by the commercial SATCOM industry, purpose-built constellations and payloads will be acquired. To speed acquisition, USSF will use demonstrations and prototyping to rapidly evaluate the military utility of innovative, agile enterprise solutions and operations. In addition, USSF will deliver scalable solutions that can absorb new systems and products beneficial to users and the overall enterprise while preserving competition and technology innovation. Hosting arrangements and international agreements with allies will be pursued when financial and operational advantages are apparent.

CONCLUSION

A single, integrated SATCOM enterprise will deliver unparalleled options to joint warfighters for mission success. Compared to today's collection of stovepiped SATCOM systems, the enterprise will deliver the performance and resilience necessary to address a 21st century contested space domain. Ultimately, the enterprise must:

- Accommodate disruptions and loss and still deliver effects
- Employ new tools to optimize usage allowing proactive management of SATCOM resources, capable of responding to changing operational environments and adversary actions
- Possess the ability to rapidly redirect resources to the highest priority missions
- Support agile roaming for users across multiple systems
- Deliver and fuse real-time information to support decision makers
- Provide cyber resiliency by managing the operational risk, keeping mission platforms operational
- Be trained, exercised and operated as a single enterprise
- Rely on agile acquisition processes capable of absorbing innovative capabilities, commercial and military, that make the enterprise more flexible, agile and resilient for warfighters

We must move faster than our adversaries to ensure warfighters receive the operational benefits of a SATCOM enterprise capable of delivering SATCOM effects in CDO environments. We must adopt faster acquisition processes and faster command and control constructs to maintain the advantage in any conflict.