United States Government Accountability Office

Report to Congressional Committees

April 2023

SATELLITE CONTROL NETWORK

Updating Sustainment Plan Would Help Space Force Better Manage Future Efforts

Accessible Version

GAO-23-105505

GAO Highlights

Highlights of GAO-23-105505, a report to congressional committees

April 2023

SATELLITE CONTROL NETWORK

Updating Sustainment Plan Would Help Space Force Better Manage Future Efforts

Why GAO Did This Study

Space Force's SCN provides critical launch and operations support for satellites worth billions of dollars with a broad range of missions. The SCN makes over 450 daily contacts with satellites. The network is facing sustainment and obsolescence issues while demands on the system are increasing.

A Senate report included a provision for GAO to review the SCN program. This report assesses Space Force's (1) current and future needs for the SCN; (2) efforts to address challenges in sustaining the SCN; and (3) acquisition efforts to support SCN needs.

To conduct this work, GAO analyzed SCN utilization and launch data; and reviewed Department of Defense, Space Force, and Air Force reports and briefings, SCN sustainment documents and data, and contracting and acquisition documents. GAO used a non-generalizable sample to select four SCN users from different federal agencies and interviewed representative officials. GAO also interviewed Space Force agency and SCN program officials.

What GAO Recommends

GAO recommends that Space Force update the SCN lifecycle sustainment plan, or issue a new one, that includes current efforts and Space Force responsibilities. DOD agreed with this recommendation.

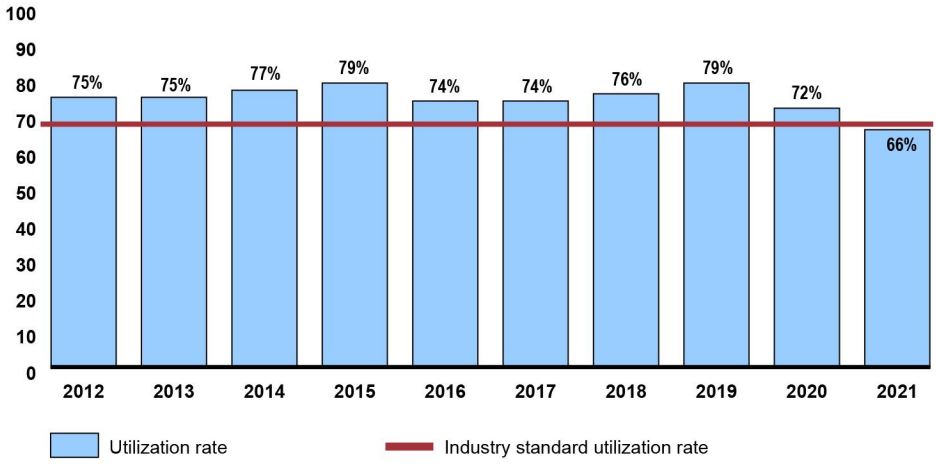
View GAO-23-105505. For more information, contact Jon Ludwigson at (202) 512-4841 or ludwigsonj@gao.gov; or Cathleen A. Berrick at (202) 512-3404 or berrickc@gao.gov

What GAO Found

The Satellite Control Network (SCN) is a system of 19 globally distributed antennas that supports launch and day-to-day control of U.S. government satellites, including defense and intelligence satellites. The U.S. Space Force is responsible for managing, sustaining and upgrading the network.

User demand for SCN support runs high and is expected to increase. The utilization rate for the SCN has averaged 75 percent over the last decade. This rate exceeds the 70 percent level that Space Force officials cite as the threshold the commercial industry uses to indicate the need for more capacity. Annual SCN-supported satellite launches have also tripled since 2012. Satellite users who rely on the SCN and whom GAO interviewed said that this increased demand, and resulting limits on system availability, could compromise their missions in the future.

Satellite Control Network's Average Utilization Rate from Fiscal Year 2012 to 2021



Source: GAO analysis of System for Network Analysis and Planning. | GAO-23-105505

Accessible Data for Satellite Control Network's Average Utilization Rate from Fiscal Year 2012 to 2021

Year	Percentage utilization rate	Percentage industry standard utilization rate
2012	75	70
2013	75	70
2014	77	70
2015	79	70
2016	74	70
2017	74	70
2018	76	70
2019	79	70
2020	72	70

Year	Percentage utilization rate	Percentage industry standard utilization rate
2021	66	70

Space Force is developing approaches to address SCN demand and other challenges, but Space Force lacks an updated long-term sustainment plan. For example, it has requested SCN users to reduce-non critical contacts. This step has helped reduce utilization rates in recent years. Space Force is also managing two improvement efforts to update ground control electronics and antennas intended to sustain the SCN. However, the SCN lifecycle sustainment plan, issued in 2017, does not include these efforts or reflect the transition of SCN's responsibility to Space Force. Updating or issuing a new plan would help Space Force better plan for future SCN sustainment.

Space Force is seeking additional SCN capacity by exploring the use of commercial antennas and those operated by other federal agencies. Both could provide some capacity to SCN-supported satellites. Space Force is also working to develop and acquire 12 new, higher-capacity antennas, an effort known as Satellite Communication Augmentation Resource. The first prototype is expected in 2025.

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Abbreviations

AST	Air Force Satellite Control Network Scheduling Tool
BCS	Satellite Control Network Sustainment Office
BCTI	Information Mobility
CAS	Commercial Augmentation Services
DOD	Department of Defense
ERM	Enterprise Resource Management
FAS	Federal Augmentation Services
LCSP	Life-Cycle Sustainment Plan
NOAA	National Oceanic and Atmospheric Administration
NRO	National Reconnaissance Office
SCAR	Satellite Communications Augmentation Resource
SCN	Satellite Control Network
SpRCO	Space Rapid Capabilities Office
SpOC	Space Operations Command
SOPS	Space Operations Squadron
SSC	Space Systems Command
TT&C	tracking, telemetry, and commanding

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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April 10, 2023

Congressional Committees

The Satellite Control Network (SCN) is a ground-based satellite control system within the Department of Defense (DOD) that plays a critical role in managing the increasing amount of satellite systems operating in space. First established in 1959, SCN supports the communication and control of satellites operated by DOD and other government agencies. The SCN is primarily used to (1) support launches and early operations for satellites (2) track and control satellites; and (3) provide emergency support for tumbling or lost satellites. DOD reported that each fiscal year, SCN supports the launch of satellites worth a total of $14 billion and preserves over $4 billion worth of satellites through emergency support. Although its role is critical, Space Force has reported that SCN's systems are experiencing sustainment and obsolescence challenges even as federal agencies launch more satellites that are reliant on the system. SCN availability is critical to missions such as missile warning and intelligence gathering for the United States.

Senate Report 116-236 accompanying the National Defense Authorization Act for Fiscal Year 2021 contains a provision for GAO to review the SCN program.[1] This report assesses (1) Space Force's current and future needs for SCN, (2) the extent to which Space Force is addressing challenges in sustaining SCN, and (3) acquisition efforts Space Force is implementing to support SCN future needs.

To assess SCN, we reviewed DOD, U.S. Space Force, and U.S. Air Force reports and briefings related to SCN operations as well as analyzed SCN utilization and launch data provided by SCN operators. To determine the reliability of the data we interviewed SCN operators and assessed the SCN utilization data by reviewing existing information about the data collection program, and performed logic testing on the data set. We determined that it was sufficiently reliable for the purposes of describing SCN's utilization. We also reviewed SCN sustainment documents; assessed contracting and acquisition documentation; and interviewed officials from Space Force offices, squadrons and commands responsible for sustaining, modernizing, and developing new programs

[1]Senate Report 116-236, at 370 (2021).

that address SCN needs. In addition, we used a non-generalizable sample to select four operators of satellite systems—representing both DOD and non-DOD users—that rely on SCN, then reviewed documents and interviewed officials representing those operators. Additional details on our scope and methodology are provided in appendix I.

We conducted this performance audit from October 2021 to April 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

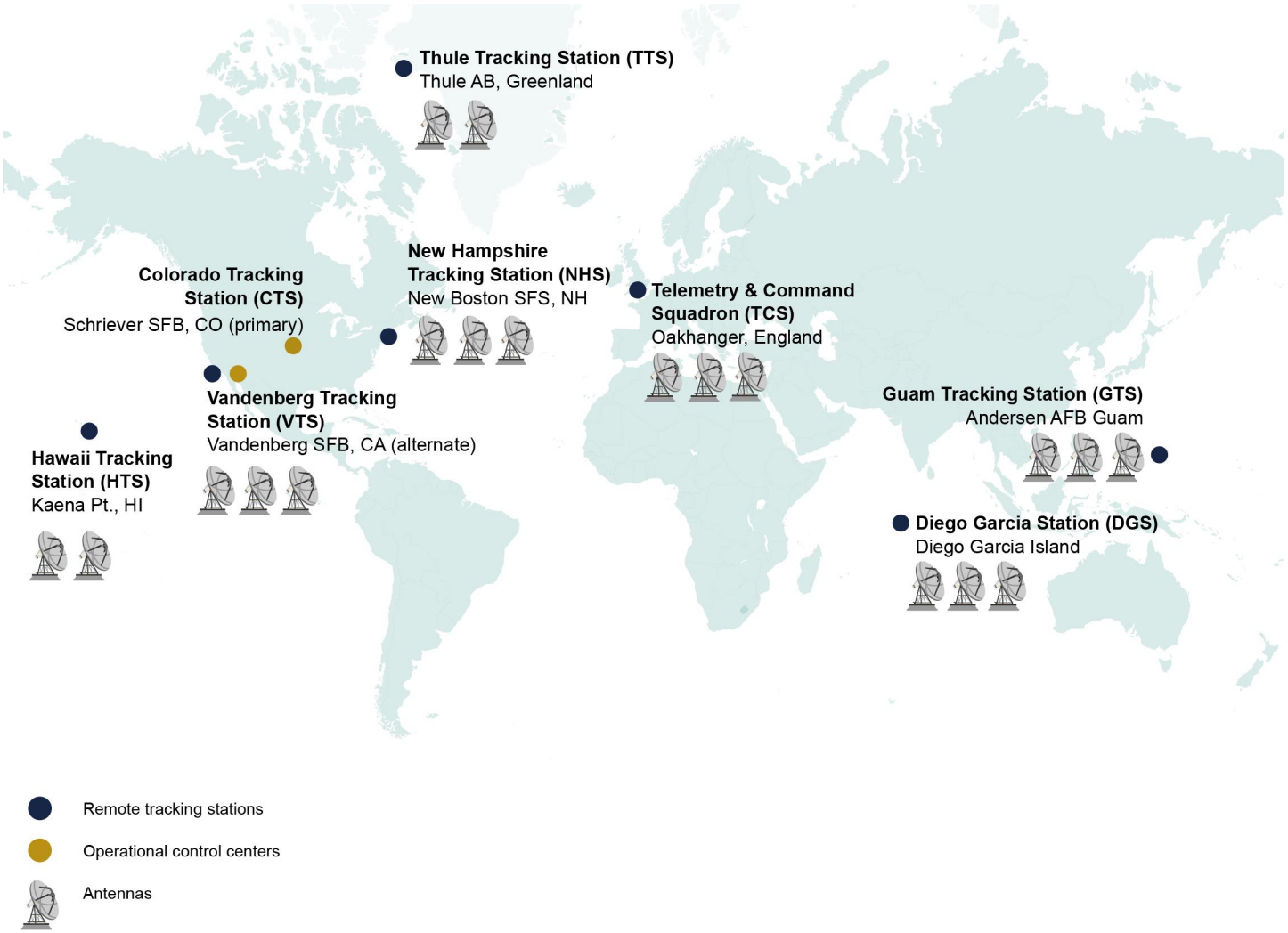
Background

SCN Operations

SCN is a global ground terminal network made up of 19 parabolic antennas distributed across seven locations around the world. It supports satellite systems from multiple agencies. In recent years, SCN has averaged over 164,000 contacts with satellites per year, or about 450 per day, according to Space Force. SCN supports a wide range of critical missions including: positioning, navigation, and timing; intelligence, surveillance and reconnaissance; missile warning and missile defense; communications; weather; and research and development. The primary control center for SCN is located at Schriever Space Force Base, Colorado; with a backup center at Vandenberg Space Force Base, California. The Vandenberg Space Force Base also accounts for one of the seven worldwide locations for SCN antennas and remote tracking stations that provide the space-ground link between orbiting satellites and the antennas.[2] Figure 1 shows the location of the related centers, stations, and antennas.

[2]The SCN network also includes the Eastern Vehicle Checkout Facility which has tracking station capability to conduct launch-based compatibility testing and collect launch data. Information about this facility was not included in any utilization analysis in this report.

Figure 1: Satellite Control Network



Source: GAO analysis of DOD documents; Map Resources (map). | GAO-23-105505

Note: Air Force Base (AFB), Air Station (AB), Space Force Base (SFB)

Satellite control operations such as SCN function separately from the missions of the satellites they control. Control operations consist of (1) tracking—determining the satellite's location based on position and range measurements; (2) telemetry—collecting health and status reports from satellites; and (3) commanding—transmitting signals from the ground to the satellite to control satellite subsystems such as power supply, antennas, and mechanical and thermal control. These functions—collectively referred to as TT&C—ensure that satellites remain in the

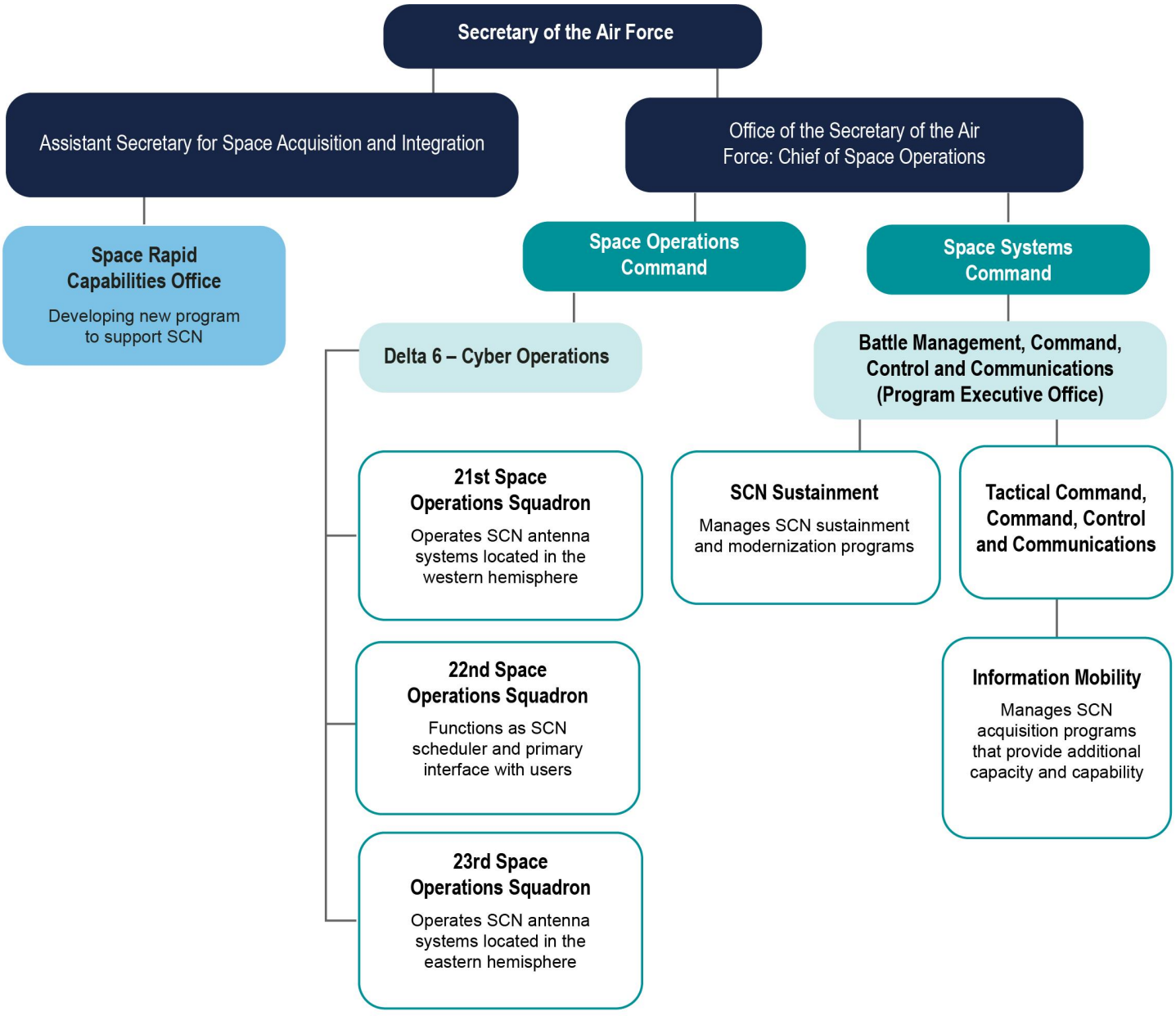
proper orbit and are performing as designed. These functions are accomplished through the network of ground stations, ground antennas, and communication links between the control centers, antennas, and satellites, strategically located around the world. Location of the antennas is important because for some satellites, there is a limited window of time to make contact with an antenna and transfer data as they complete their orbits before the satellite passes over the horizon and out of contact.

SCN Organizational Structure

The Air Force transferred management of SCN to Space Force after Congress established Space Force in 2019 as a military service within the Department of the Air Force.[3] Space Force continues to make organizational changes as well as update policies and guidance as part of its management of SCN, according to Space Force officials from various offices within the service. The responsibility for operating, upgrading, assessing and sustaining the SCN is spread over multiple commands, squadrons, and offices in Space Force. Figure 2 shows those offices within Space Force and Air Force involved with SCN operations, maintenance, and acquisition:

[3]See National Defense Authorization Act for Fiscal Year 2020, Pub. L. No. 116-92, §§ 951-961, (2019) (codified at 10 U.S.C. § 9081(a)).

Figure 2: Offices Involved with the Satellite Control Network



Source: GAO analysis of United States Space Force documents. | GAO-23-105505

- **SCN operations and maintenance:** The 22nd Space Operations Squadron (22 SOPS), located at Schriever Space Force Base, Colorado, is responsible for functioning as the primary interface with SCN users. This responsibility includes scheduling multiple satellite

contacts for the limited time available for each antenna. Two other squadrons, 21 SOPS and 23 SOPS, execute operations and maintenance of SCN antenna systems and tracking stations in the western and eastern hemispheres, respectively. All three squadrons operate within Space Force's Space Operations Command (SpOC), one of three field commands within Space Force.

- **SCN sustainment:** The SCN sustainment office, which Space Force refers to as BCS and is located at Peterson Space Force Base, Colorado, is responsible for efforts to sustain and address obsolescence challenges to the aging system, including managing contracts related to SCN sustainment and modernization. The program office is under the program executive office of Battle Management, Command, Control and Communications. That office is within the Space Systems Command (SSC), which is another field command within Space Force that is primarily responsible for developing, acquiring, fielding, and sustaining space capabilities.
- **SCN acquisition programs:** Space Force has two organizations responsible for managing SCN-related programs. The Information Mobility program office, which Space Force refers to as BCTI and is located at Los Angeles Air Force Base, California, is responsible for managing new acquisition programs related to addressing the system's future needs. It is within the same program executive office as the SCN sustainment office in SSC. Outside SSC, the Space Rapid Capabilities Office (SpRCO), located at Kirtland Air Force Base, New Mexico, is responsible for developing critical technologies for space operations, including for the SCN. DOD created SpRCO at the direction of Congress to, among other things, coordinate and execute space rapid capabilities efforts across DOD with respect to planning acquisition and operations.[4] SpRCO is designed to have a short and narrow chain of command in order to expedite the development of critical capabilities. SpRCO reports to the Office of the Assistant Secretary of the Air Force for Space Acquisition and Integration, who is also the Department of the Air Force Service Acquisition Executive for space systems and programs.
- **SCN users:** Satellite users across multiple federal agencies rely on SCN for TT&C support. These satellites rely on SCN for primary, alternative, contingency, or emergency operations. Each SCN

[4]Congress re-designated the Operationally Responsive Space Office as the Space Rapid Capability Office. See National Defense Authorization Act for Fiscal Year 2018, Pub. L. No. 115-91, § 1601(b) (2017).

interfaces with 22 SOPS through an operations center to schedule SCN use.

Prior GAO Work

GAO previously assessed the SCN in 2013 when it was managed by the Air Force. In the report, we noted that DOD satellite control networks were fragmented and potentially duplicative, that SCN's modernization efforts did not include increasing the network's capabilities, and commercial practices have the potential to increase the efficiency and decrease costs of DOD satellite control operations.

In response, we recommended that DOD develop (1) a business case for future satellite acquisition programs to determine whether to use a shared network such as SCN or a dedicated network and (2) a long-term modernization plan for SCN capabilities that identifies commercial practices, if any, that could improve SCN operations.[5] DOD concurred with both recommendations. DOD implemented the first recommendation when the Air Force Director of Strategic Plans, Programs, Requirements and Analysis at Air Force Space Command issued guidance in April 2017. The guidance mandated that all existing and new space acquisition efforts and prototypes transition to a single program—Enterprise Ground Services—no later than 2027; this move would better facilitate the conduct of satellite control operations and reduce fragmentation, according to the guidance. In May 2018, the Air Force was preparing a draft DOD satellite ground control system plan for the approval and signature of the Principal DOD Space Advisor, according to Air Force officials. However, a provision in the National Defense Authorization Act of Fiscal Year 2018 terminated the position.[6] As of July 2019, DOD officials could not determine the status of the satellite control system plan given the elimination of the position. GAO closed the second recommendation as not implemented.

[5]GAO, *Satellite Control: Long-Term Planning and Adoption of Commercial Practices Could Improve DOD's Operations*. GAO-13-315 (Washington, D.C.: Apr. 18, 2013).

[6]Pub. L. No. 115-91, § 1601(b) (2017).

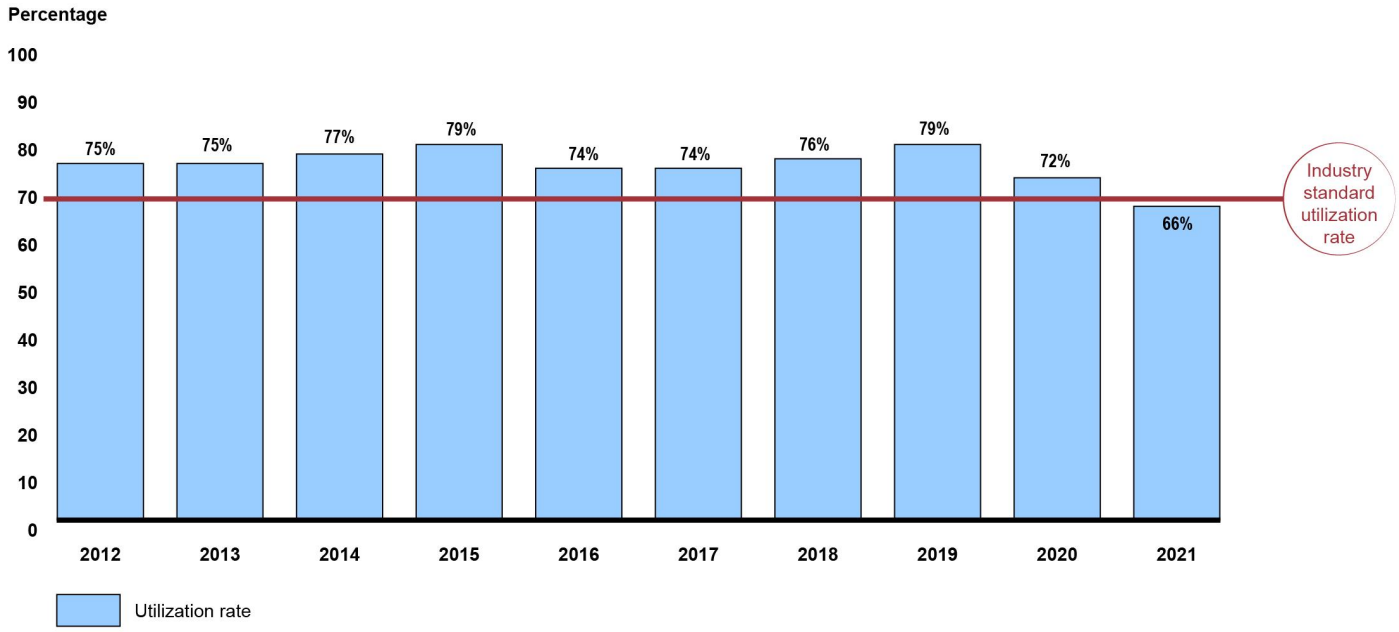
SCN Is Operating at a High Utilization Rate, and DOD Expects Demand to Increase

DOD components and other agencies have been using SCN at a high utilization rate that exceeds industry standards, resulting in schedule conflicts and deferred maintenance of the SCN network. DOD expects that the projected increase in satellite launches and the number of new satellites expected to become operational in the near future will put additional strain on the SCN system. SCN users we interviewed are also concerned that the increase in demand could compromise their satellite missions.

SCN Has Been Operating at High Rates of Utilization for Many Years

SCN has been operating at a high utilization rate for at least the past 10 years, which has resulted in limited available capacity for operating both existing and new satellites and increased maintenance challenges. According to Space Force, a utilization rate above 70 percent, which includes both the time an antenna is in use for operations and when it is down for maintenance, indicates that the SCN is operating under stress and may negatively affect operations. Data compiled by Space Force shows that the yearly network utilization rates for SCN averaged approximately 75 percent from fiscal year 2012 through fiscal year 2021 (see figure 3).

Figure 3: Satellite Control Network Average Utilization Rate from Fiscal Year 2012 to 2021



Source: GAO analysis of System for Network Analysis and Planning. | GAO-23-105505

Accessible Data for Figure 3: Satellite Control Network Average Utilization Rate from Fiscal Year 2012 to 2021

Year	Percentage utilization rate	Percentage industry standard utilization rate
2012	75	70
2013	75	70
2014	77	70
2015	79	70
2016	74	70
2017	74	70
2018	76	70
2019	79	70
2020	72	70
2021	66	70

According to SCN operators, the 70 percent antenna utilization threshold is the standard used in the commercial industry to indicate the need to add additional capacity. However, according to Space Force officials, DOD has not increased the number of SCN antennas in years.

We found that SCN users have experienced schedule conflicts due to capacity limitations as a result of the high utilization rate. The continuing utilization rate near or above 70 percent creates the risk that the programs relying on SCN to communicate with their satellites may not be able to use the network when requested. According to Space Force officials, currently, each SCN antenna can maintain contact with one satellite at a time. Conflicts may occur when two satellite operators attempt to schedule a contact with the same antenna at the same time, or when the schedule changes due to unplanned outages, maintenance, or emerging priorities. In these high utilization circumstances, operators must determine which contact will occur and which will not be accommodated. SCN operators refer to these schedule changes as conflict deletes. For example, the unforeseen need to recover a satellite—such as when it may have drifted out of its planned orbit—may conflict with a scheduled routine health check on another satellite. As a result, SCN operators would need to adjust the schedule. SCN operators identified 15,780 of these conflict deletes as a result of schedule conflicts from January 2021 through June 2022. This high number of conflict deletes also indicates SCN user demand in excess of what is reflected in the formal utilization rate, as deleted contacts are not part of the utilization rate.

According to the SCN operators responsible for SCN scheduling, they can often resolve conflicts easily through rescheduling or deferring contacts. In other cases, SCN operators need to prioritize based on mission need or type of contact. To determine which contacts will be rescheduled or canceled when a conflict on the SCN occurs, Space Force utilizes a prioritization matrix.[7] This matrix determines the operational priority among the various assets that utilize the SCN and helps Space Force allocate SCN resources to the activity with the highest priority for a particular time and site. The priority matrix takes into account the kind of mission for which a user needs to utilize the SCN, such as whether it is an emergency mission, a launch, a mission checking the health of a satellite, or a non-critical mission and then ranks those missions based upon their priority. For example, according to the priority matrix, a mission sensitive contact related to cyber operations would take priority over a pre-planned maintenance contact with a satellite, as these missions are time sensitive or important to support counter space or cyber operations.

[7]Air Force 50th Space Wing Instruction 10-217-O, *Air Force Satellite (AFSCN) Users' Operations Instructions* (July 5, 2018).

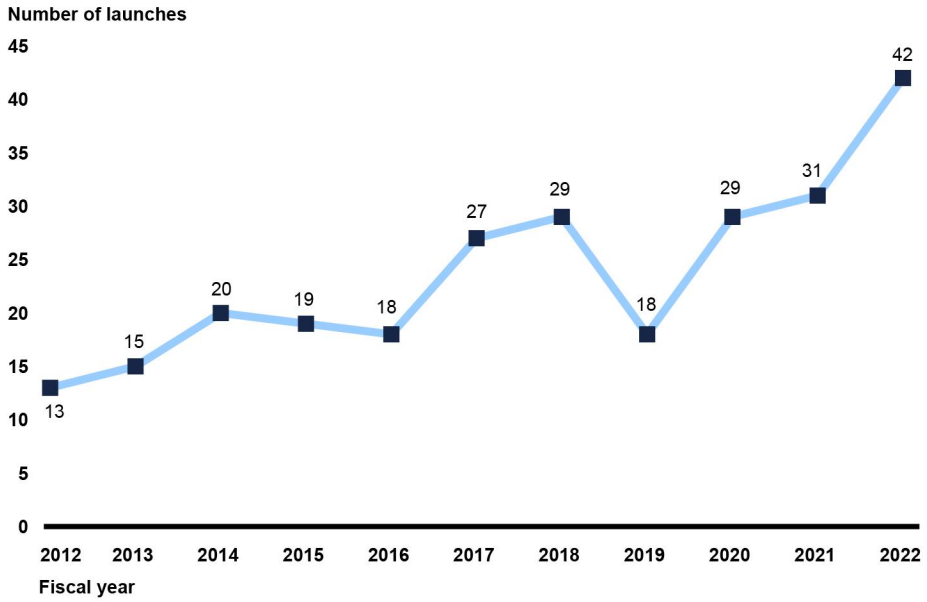
The high utilization rate of the SCN has also affected maintenance of the SCN. According to Space Force officials, high utilization rates have resulted in deferring scheduled maintenance on antennas to keep them in operation. According to these officials, this deferred maintenance has led to antenna failures. In one incident, an antenna was offline for 18 months before maintainers brought it back on line. Continuous high utilization rates mean that Space Force leaders constantly face decisions about whether to cease operations on an antenna to allow time for maintenance or meet immediate operational needs with an increased risk of critical failures.

Space Force Expects SCN Demand to Increase

According to Space Force officials, demand is expected to increase as DOD and other agencies continue to develop, launch, and operate new satellite systems. DOD has known of challenges facing SCN capacity since at least 2011. For example, a 2011 briefing stated that the high operational tempo of the network posed an operational risk to the SCN. According to Air Force officials, the agency conducted a series of studies from 2016 to 2020 to determine the extent of the capacity gap and potential solutions to meet demand. Space Force cited the lack of sufficient investment into SCN as contributing to its inability to meet estimated future needs. These studies resulted in recommendations that the Air Force increase the capacity and resiliency of the network to meet demand.

Space Force officials noted that projections of the Space Force's new space warfighting posture have significant implications for SCN due the increase in expected launches and satellite contacts officials expect SCN will have to support. The projections show that, beginning in 2019 and going through 2027, there will be a greater need for SCN to contact satellites during the initial launch period. According to SCN users, launch support takes up a large amount of SCN capacity. A satellite launch requires the use of at least two antennas, one of which acts as the primary antenna for the launch and one or more of which serves as a supporting antenna. Including preparation for the launch and the launch itself, those antennas will be unavailable to other SCN users for a considerable amount of time. The number of launches SCN supports annually has more than tripled since fiscal year 2012, from 13 to 42 in fiscal year 2022 (see figure 4). Space Force expects the number of launches the SCN will need to support to increase in the future.

Figure 4: Launches Supported by the Satellite Control Network Satellite from Fiscal Years 2012 to 2022



Source: GAO analysis of Space Force data and documents. | GAO-23-105505

Accessible Data for Figure 4: Launches Supported by the Satellite Control Network Satellite from Fiscal Years 2012 to 2022

Fiscal year	Number of launches
2012	13
2013	15
2014	20
2015	19
2016	18
2017	27
2018	29
2019	18
2020	29
2021	31
2022	42

Space Force officials added that it is not just the increase in launches that is increasing SCN utilization but also the increase in the number of satellites per launch. The officials stated that each satellite launch can

now include 20 or more satellites at a time that will rely on SCN for regular contact whereas in the past launches would typically include a single satellite. This increase in satellites reliant on SCN will further limit available SCN capacity. SCN operators said that without additional technology that allows more than one contact per antenna, they would need an additional 16 parabolic antennas, for a total of 35 antennas, to keep up with future demands.

Projections of the space warfighting posture also estimate increases in contacts to new and existing satellites for satellite payloads, satellite contacts, and the support time and frequency of contacts, all of which will increase the utilization of SCN. Space Force officials stated that they expect the number of satellites requiring SCN contacts to more than double between 2019 and 2027. One SCN user noted, however, that its newer satellites generally require less time per contact than older ones and will not necessarily use SCN capacity at the same rate as satellites that have already been operational for years.

SCN Users Expect Increasing Demand to Affect Missions

SCN users who we spoke with, whose satellite systems rely on the network, are concerned that increased demand and reduced capacity will compromise their missions. For example, officials from the National Reconnaissance Office (NRO) assessed the risk associated with SCN's capacity limits. According to NRO officials, there will be increasing demand on the SCN from their assets, including launch support of new satellites. According to NRO officials, more of their new systems will rely almost solely on the SCN for TT&C. According to NRO officials, they are anticipating 20 to 30 new launches from 2022 through 2024. In addition to the need for SCN during launches, these new satellites will pose an increased operational burden on the SCN because the new satellites are not meant to replace existing satellites. The increased lifespan of orbiting systems means that fewer systems are coming offline while more are coming online.

Officials from the 10th Space Operations Squadron (10 SOPS) stated they are also concerned about the effect of SCN availability on their existing satellites.[8] 10 SOPS operates several communications satellite constellations. The squadron relies on the SCN to track several of its

[8]In June 2022, 10th Space Operations Squadron took over responsibility of satellite missions previously managed by the Naval Satellite Operations Center.

satellites because the SCN has capabilities that 10 SOPS antennas do not have. Officials noted that a loss of SCN support could have an immediate negative effect. 10 SOPS officials also noted that they have had support requests that are not mission critical denied on the SCN many times starting in 2021. The officials stated that users are concerned that high SCN demand could lead to a situation in the future where critical contacts are out-prioritized and cannot be addressed by SCN.

Space Force Has Efforts Under Way to Better Manage and Sustain SCN, but Outdated Plans Hinder Space Force's Ability to Address Challenges

Space Force is taking a number of actions to manage the capacity challenges of the SCN through practices and policy. Space Force is also addressing SCN obsolescence issues with two sustainment projects to replace aging components within the existing SCN antenna systems. The long-term sustainment strategy for the system is guided by the SCN Life-Cycle Sustainment Plan (LCSP), which serves as the primary document for sustainment planning. The plan, issued in 2017, however, has not been updated to address changes to the SCN and the Space Force organizational structure.

Space Force Has Efforts Under Way to Manage SCN Capacity Challenges

Space Force has taken a number of actions to manage the capacity challenges of the SCN through changes to practices and policy. These efforts reduced the utilization rate of the SCN in the short term and are expected to help minimize utilization rate increases in the future. These efforts include the following:

- **Reducing pre-pass times for satellites:** According to Space Force officials, Space Force is attempting to return capacity to the SCN by reducing the time needed to set up contacts with satellites, known as pre-pass time. According to Space Force officials, pre-pass is the time allotted prior to the contact with a satellite to ensure everything is configured correctly between a ground station and a satellite. The standard pre-pass time currently allotted to SCN users is 10 minutes. According to Space Force officials, they estimate that reducing the

allotted pre-pass time to 5 minutes would save them approximately 12 days a month of capacity on the SCN while a reduction in pre-pass time to 2 minutes would save them approximately 27 days a month.

- **Eliminating non-critical contacts:** Space Force requested that satellite users reduce non-critical contacts and move contacts to their own antennas, if possible, to reduce the utilization of the SCN. According to SCN operators, during the COVID-19 pandemic, SCN users scaled back contacts with satellites. As a result, the utilization rate of the SCN temporarily dropped down to the 40 percent range. According to SCN operators, this indicated that there were many non-critical contacts taking place on the SCN. To maintain this lower utilization rate, Space Force requested that SCN users, such as the Global Positioning System and the Space Based Infrared System, decrease the number of contact requests to what is necessary for operations and eliminate non-critical contacts on the SCN. According to SCN operators, these efforts to scale back non-critical contacts allowed them to save about 12 percent capacity on the SCN. Space Force officials also noted that they have requested users contact satellites through their own dedicated mission systems (if they have such a system) to free up additional SCN capacity. For example, according to 10 SOPS officials, they have been in communication with Space Force regarding capacity challenges to the SCN and have been advised to help mitigate these challenges by moving some of their contacts on the SCN to their own antenna and cutting non-mission critical supports on the SCN.
- **Managing contacts among SCN antennas:** Space Force is also managing contacts with satellites among antennas to reduce conflicts. For example, according to Space Force officials, SCN operators began directing SCN users not to request a specific antenna for their contact so that Space Force can utilize all available resources to satisfy the contact. This helps them distribute contacts more evenly across the network.
- **Revising contact priority matrix:** According to Space Force officials, Space Command in conjunction with Space Force recently revised the priority matrix to clarify priorities across SCN assets and help manage SCN contacts. This matrix helps Space Command allocate resources to the SCN user with the highest priority for a particular time and site when conflicts on the SCN occur. According to NRO officials, Space Command revised the priority matrix to address updated national security priorities. SCN operators, mission partners, and users within and outside Space Force were involved in the discussions with Space

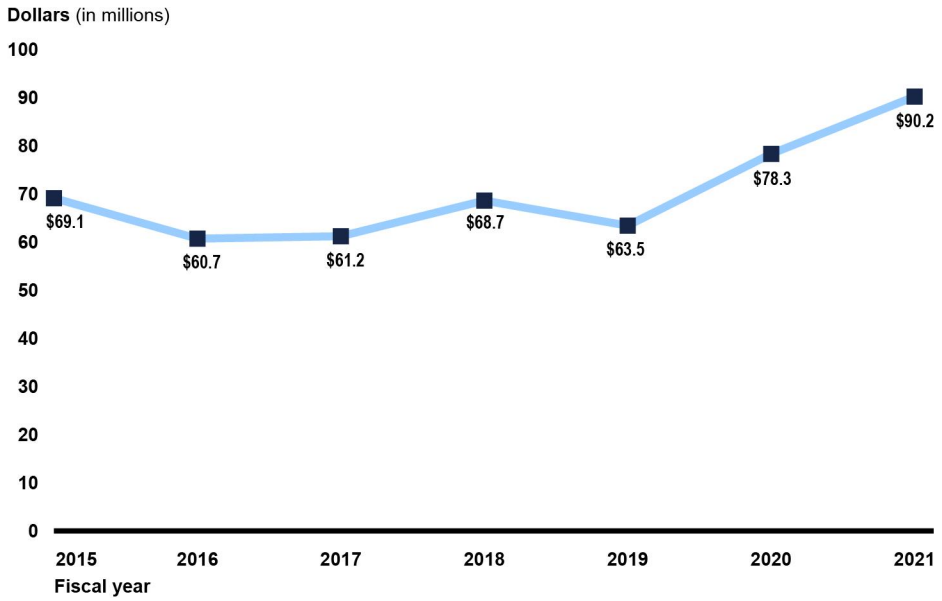
Force about the revisions to the matrix and Space Command made the final decisions on prioritization.

Space Force Has Efforts Under Way to Manage Identified Sustainment Challenges

While Space Force is managing multiple efforts to sustain the SCN, these efforts are complicated by the age of the system. According to SCN sustainment officials, the program often lacks available parts and faces increasing costs to maintain its aging systems. Those officials also stated that, in some cases, Space Force had to pay a manufacturer to establish a production line to produce replacement parts for obsolete SCN equipment.

Operating and sustainment challenges are also exacerbated by outdated infrastructure. For example, Space Force officials said the power infrastructure for Schriever Space Force Base—SCN's primary control center—requires modernization to meet current and future demand. Specifically, they noted that efforts to maintain current operations at the base are unsustainable and mitigation efforts are close to exhausted. Overall, the Air Force and Space Force obligated $491.8 million for operations and maintenance of the SCN from fiscal years 2015 to 2021. During that time, annual obligations increased over 31 percent from $69.1 million to $90.2 million. According to SCN operators, increases in SCN operations and maintenance costs during this period are also due in part to inflation, COVID-19 challenges, and the varying costs associated with SCN sustainment projects. See figure 5 for total SCN operations and maintenance obligations.

Figure 5: SCN Operations and Maintenance Obligations from Fiscal Years 2015 to 2021



Source: Space Force budget execution data. | GAO-23-105505

Accessible Data for Figure 5: SCN Operations and Maintenance Obligations from Fiscal Years 2015 to 2021

Fiscal year	Dollars(in millions)
2015	69.1
2016	60.7
2017	61.2
2018	68.7
2019	63.5
2020	78.3
2021	90.2

Note: This figure depicts the operations and maintenance funding obligated by the SCN sustainment office for the Satellite Control Network from fiscal years 2015 to 2021. According to Space Force officials, operations and maintenance funding includes obligations for hardware and software maintenance, engineering for sustainment, cyber security, and a contract that consolidates modification, maintenance, and operations efforts. This figure does not represent the full operations and sustainment costs for the SCN during that time as it excludes obligations such as military and civilian pay.

Space Force's primary tool for sustaining the SCN is a contract that consolidates modification, maintenance, and operation efforts. The Air Force awarded this consolidated sustainment contract in 2016 for a

performance period of up to 8 years and, in March 2022, was valued at over $476 million. The contractor is responsible for complete and integrated SCN operations, organizational and depot level maintenance, logistics management, and sustainment engineering. According to SCN sustainment officials, the current consolidated sustainment contract, however, does not provide the SCN with a sufficient level of maintenance. As of September 2022, Space Force is preparing to pursue a task order on a different contract to provide future sustainment services. According to those officials, the task order will represent a change from the primarily fixed price contract for standard maintenance to a cost reimbursement structure that will address deferred maintenance on the SCN.

Space Force's SCN sustainment office is also managing two efforts to improve the existing SCN antennas, and related equipment, to address the system's obsolescence issues.[9] The first effort is the remote tracking station block change project. This effort started in the early 2000s to update the existing electronics on the network's ground control computers and antennas, much of which had been in place since the 1980s. The project includes improving

- the electronic core of the existing antennas that communicates with satellite operations centers and provides TT&C capabilities to the SCN, and
- the ground station that houses the updated electronic core and serves as the point of human-machine interface for the SCN.

The project includes the installation of automated TT&C capabilities instead of the semi-automated TT&C that was provided by the older system. According to SCN sustainment officials, this project takes between 18 and 24 months per antenna and temporarily removes it from the SCN during that period. The program selects which antennas will be upgraded based upon their geographic location and how many other antennas are already undergoing improvements. According to Space Force officials, they must keep at least 13 antennas operating at any given time to ensure that needs of SCN users are met. SCN sustainment officials noted that as of May 2022, they have improved the electronic core of all the SCN antennas and seven of the 19 antennas have received an improved ground station. As of December 2022,

[9]Obsolescence refers to a lack of availability of a part due to its lack of usefulness or it no longer being current or available for production.

improvement of two ground stations is ongoing, according to Space Force officials.

In the summer of 2022, Space Force initiated a second modernization project to replace the now obsolete electronic cores installed as part of the remote tracking station block change project. This project, referred to as modular transitional remote tracking stations, will include replacements for modems, tracking receivers, and high power amplifiers. The modernization, according to Space Force officials, will also allow SCN operators the flexibility, through software virtualization, to communicate with multiple antennas with one suite of electronics whereas the SCN currently can only talk to one antenna with one suite of electronics. The modernization will also allow operators to interface more easily with the longer-term projects that Space Force is currently developing, according to Space Force officials. The modernization includes stationary as well as mobile antennas. According to Space Force officials, the mobile version can deploy to an SCN site if a stationary antenna breaks and they need to maintain the continuity of operations. Space Force plans to deploy 11 transitional tracking stations across the SCN network, seven stationary versions at each of the existing SCN locations and four mobile versions.

The modular transitional remote tracking stations will also address other common sustainment and operational problems and move toward a common baseline across all the ground stations to make sustainment manageable in the future. According to Space Force officials, while the physical footprint of the antennas will stay the same, the core set of electronics associated with the antennas will be reduced. For example, according to those officials, the modernization will allow the SCN program to reduce the footprint of electronic equipment by about 80 percent by reducing the number of modems, decoders, and data processors. The removal of the old hardware also allows Space Force to reduce the amount of spare parts they need to procure and store. It also reduces heating and electrical costs because of less equipment to power. Additionally, the move away from older hardware to a virtual environment is intended to improve SCN operations and reduce maintenance. According to Space Force officials, the modernization will provide more available capacity on the SCN by reducing planned and unplanned maintenance time by 20 to 25 percent.

Space Force is in the process of procuring both versions of the transition tracking stations. Space Force prioritized procurement of the mobile version by modifying an existing contract associated with other space control systems in January 2022. Space Force officials said that it will

deploy the first mobile station at Diego Garcia—a key location from which SCN supports launches—in order to replace the current system which program officials said is ailing and unstable. According to SCN sustainment officials, Space Force awarded the contract for the first stationary modular transitional remote tracking system in June of 2022. Space Force intends to deploy it at the ground station in Oakhanger, England.

Space Force Has Not Updated SCN Life-Cycle Sustainment Plan to Address Program Changes

Space Force's Life-Cycle Sustainment Plan (LCSP), which was issued in September 2017, to govern the management and execution of the SCN has not been updated to address recent program changes. The LCSP includes all the operations and support operations from the time of SCN's inception to the time of its disposal.[10] The 2017 LCSP includes information key to maintaining and sustaining SCN systems and presents a long-term sustainment strategy for the SCN. This includes information about sustainment costs and risks, the consolidated sustainment contract, integration of SCN systems, and disposal planning. The LCSP also contains information about management of the SCN and measures of SCN performance.

Since the LCSP was issued in 2017, however, the SCN program has had significant changes related to sustainment which are not reflected in the plan:

- Space Force has initiated new SCN upgrades that are not included in the current LCSP. For example, the current LCSP does not include sustainment planning for Space Force's modular transitional remote tracking station upgrade to the SCN network. In addition, Space Force has recently initiated acquisitions and other developmental efforts that are planned to be transitioned to the SCN sustainment office from elsewhere in Space Force. The 2017 LCSP predates and, therefore does not include, these efforts.
- Space Force has undergone significant organizational changes as a result of being stood up as a separate service, but these changes are

[10]Air Force Systems Engineering and Integration Program, *Air Force Satellite Control Network Life-Cycle Sustainment Plan* (Sept. 12, 2017). For official use only.

not included in the current LCSP.[11] The LCSP was last updated when the SCN was under the purview of the Air Force. As a result, many of the organizations that are delegated responsibilities for sustaining components of the SCN are listed under the Air Force. For example, the government program office structure that supports the SCN lists several Air Force offices including the Air Force SCN Director of Operations, Portfolio Manager, Chief Engineer, and Acquisition Logistics. In addition, many of the roles and responsibilities identified in the LCSP having to do with cybersecurity for the SCN are assigned to Air Force offices.

According to DOD instruction 5000.91, which prescribes procedures for effective lifecycle management for DOD systems, and the 2017 LCSP, the document should be updated every 5 years or when there is a change in the product support strategy for the system.[12] The Instruction states that the LCSP should contain information about: methods to identify individuals responsible for sustainment planning; actions for achieving supportability and sustainment requirements; metrics to assess compliance with the LCSP; predictive analysis; and modeling tools to improve materiel availability and reliability, increase operational availability, and reduce operations and sustainment costs.

During SCN's transfer from the Air Force to the Space Force and transition of the sustainment office to SSC, Space Force has not prioritized updating and finalizing the LCSP. Space Force officials noted that one of the ongoing challenges of their reorganization is delineating responsibilities between headquarters staff and the field commands in terms of who has responsibility for the overall SCN architecture, how those responsible can make assessments about effects of new systems on future operations, and how those responsible can the augment the existing architecture of the SCN.

According to SCN sustainment officials, they are currently working on updating the LCSP. The officials stated that these updates will include information on new metrics for the reliability, maintainability, and availability of the SCN; updates to the sustainment risk management

[11]The Air Force issued an update to the 2017 LCSP in August of 2019. However, this update consisted of one page and was a result of an Air Force office being restructured. The change notes that as a result, certain offices within the 2017 LCSP would now be referred to by new titles although the programs under the restructured office were still active.

[12]DOD Instruction (DODI) 5000.91, *Product Support Management for the Adaptive Acquisition Framework* (Nov. 4, 2021).

process; new information on the sustainment costs for the SCN; and insight of the sustainment and modernization efforts Space Force has underway. However, Space Force officials have delayed the timeframe by which they hope to have the updated LCSP completed several times. Space Force officials initially estimated the LCSP to be completed in fall of 2022; but as of January of 2023 have not yet completed the LCSP. Space Force officials cited various reasons for these delays including updating SCN budget information and an unclear process to finalize the LCSP. For example, SCN sustainment officials stated that the review and approval process necessary to finalize the LCSP is in flux due to SSC's ongoing reorganization. The program is in the process of determining the exact coordination process and who will be the final approving authority on the SCN LCSP. Without updating the LCSP for the SCN in a timely fashion, Space Force will not have sufficient information to appropriately plan and budget SCN sustainment efforts in the future.

Space Force Is Integrating Multiple Acquisition Efforts to Increase SCN's Capacity

To meet SCN's future demands, Space Force is managing multiple acquisition efforts that are intended to leverage federal and commercial capacities, modernize the SCN antennas and scheduling systems, among other tasks. Space Force officials chose to pursue multiple acquisitions, as opposed to a single effort, to increase capacity and efficiency, diversify options for redundancy, and reduce long-term sustainment costs. Space Force is in the process of integrating these efforts.

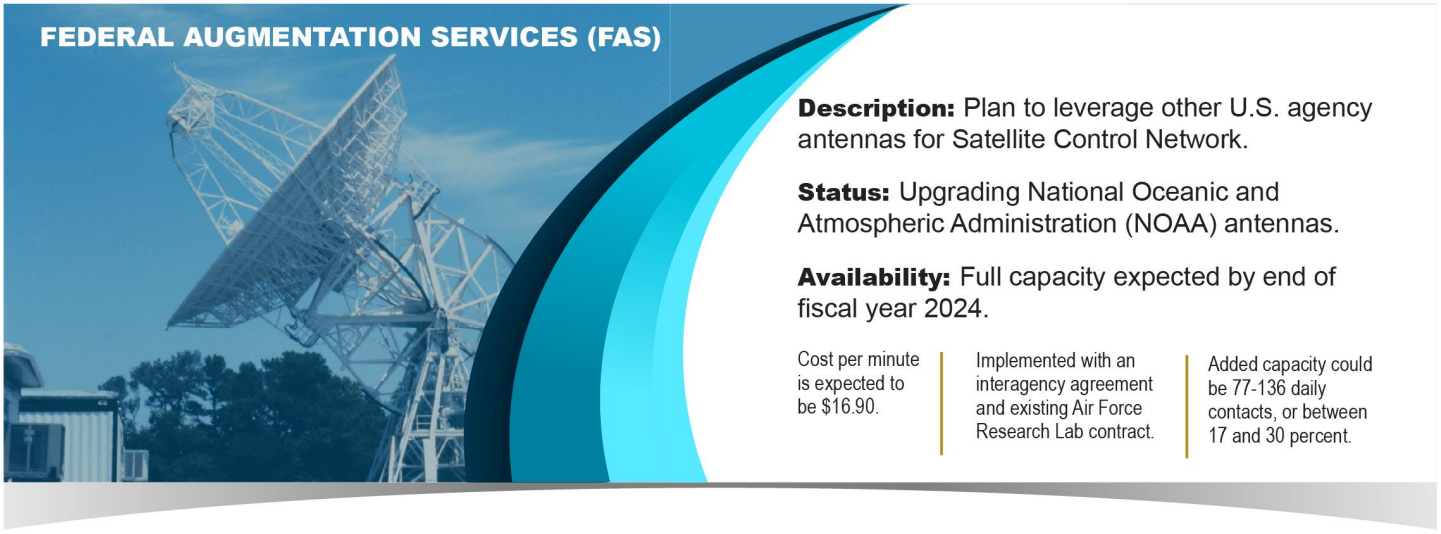
Space Force Is Managing Acquisition Efforts to Increase SCN Capacity Using Non-DOD Antennas

To meet SCN's future demands, Space Force is managing two acquisition efforts that will provide additional amounts of contact capacity using non-DOD antennas. In addition to adding capacity, both efforts have the potential to provide SCN with additional long-term resiliency by diversifying the antenna network.

Federal Augmentation Services (FAS): FAS is an effort to acquire capacity from existing U.S. government antennas to augment capacity for SCN. As part of this effort, Space Force has an interagency agreement

with the National Oceanic and Atmospheric Administration (NOAA).[13] The BCTI program office noted that various factors were considered for selecting the antennas to augment SCN. NOAA antennas were chosen primarily due to the available excess capacity. According to the FAS acquisition strategy, Space Force currently plans to upgrade and use five NOAA antennas to augment contacts for five satellite systems. Program officials noted that more satellite contacts for current SCN users could be offloaded to FAS in the future. However, one official also stated that the NOAA antennas will not be sufficient to address their high demand on SCN expected from new space capabilities coming onboard. Figure 6 provides information about FAS.

Figure 6: Federal Augmentation Services Effort for the Satellite Control Network



Source: GAO analysis of DOD documentation; Qeishara/stock.adobe.com. | GAO-23-105505

Use of NOAA's antennas for FAS requires some upgrades. Space Force and NOAA plan to upgrade the NOAA antennas to enable them to communicate on the SCN bandwidth as well as replace an obsolescent part for amplifying communication. Space Force officials said they are implementing the upgrades through a cost-plus-fixed-fee contract managed by the Air Force Research Laboratory. Based on Space Force budget documents, the total cost to upgrade all five NOAA antennas for

[13]Agencies may enter into support agreements with other Office of the Secretary of Defense or DOD components, other federal agencies, or state, local, or tribal governments for the effective performance of responsibilities and functions assigned to the Office of the Secretary of Defense or DOD component. See DOD Instruction 4000.19 (Dec. 16, 2020).

Space Force is estimated to be $16.6 million. Space Force and NOAA plan to share the cost for the effort, depending on whether the upgrade is Space Force specific or beneficial to the overall function of the antennas. Space Force officials said the use of NOAA's antennas also requires consideration of potential interference with commercial broadband use of the same frequency near FAS sites. They added that such interference could disrupt satellite contacts from FAS. According to program officials, the program is in the process of applying for spectrum bandwidth exclusions for FAS antennas where they do not already exist. The exclusion would prevent commercial entities from using the same bandwidth in the areas FAS operates and avoid disruptions.

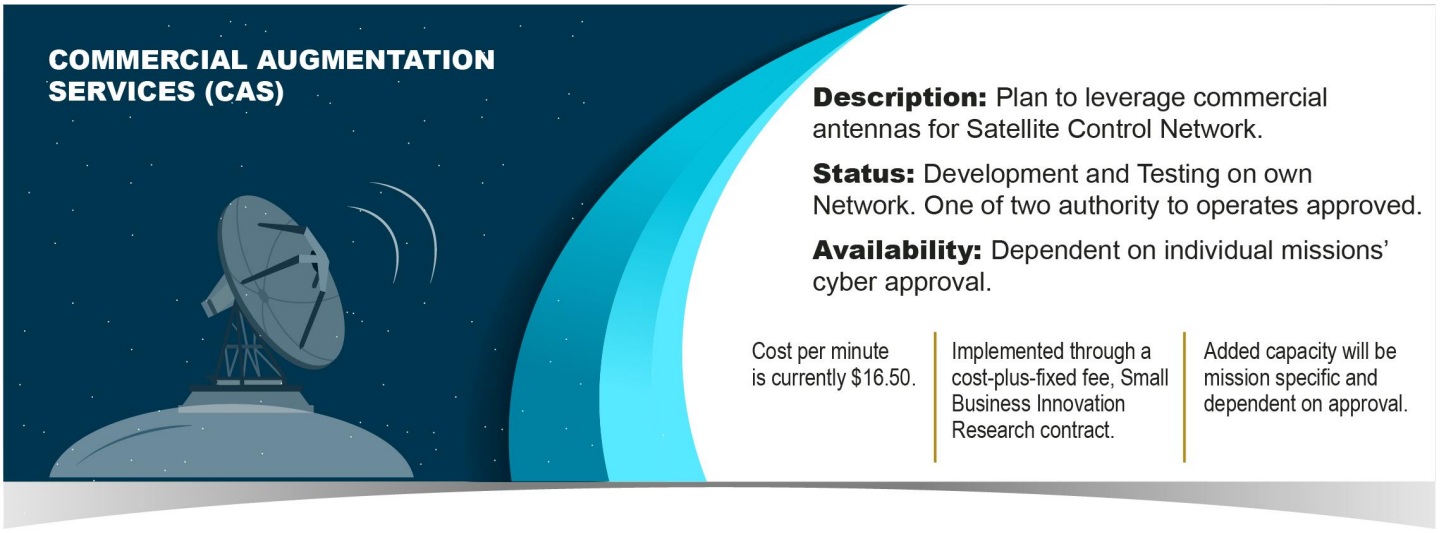
Program officials estimate that SCN will begin to use the NOAA antennas by the end of fiscal year 2024, once necessary upgrades are completed. BCTI program officials stated that when all five of the NOAA antennas are used, a total of 77 to 136 daily contacts, or 17 to 30 percent of SCN's capacity, could be made available to other users. According to Space Force officials, FAS is expected to have a higher operational cost than that of the current SCN, however, amounting to $16.00 per contact minute for FAS compared to $8.75, according to estimates provided by SpOC.[14] Space Force officials determined that FAS's potential to offload up to 30 percent of SCN's current daily contacts made the agreement worth the cost of both the upgrades and operations. Those officials said NOAA is the only federal entity Space Force has leveraged for FAS; Space Force officials have considered other government agencies. For example, Space Force officials determined that upgrading existing Army and Navy antennas from a different network to meet SCN specifications was not cost effective. Space Force officials also stated that the National Aeronautics and Space Administration might make its antennas available to other U.S. government users in the future, but no formal agreement is currently in place.

Commercial Augmentation Services (CAS): CAS is an effort to acquire capacity from commercial antennas to augment SCN. Space Force officials told us that the Air Force initiated the CAS effort in 2014 under a Small Business Innovation Research contract, leveraging multiple similar

[14]SpOC officials provided the estimated cost per minute for FAS from a MITRE study and provided additional context and updates for those costs as some underlying assumptions had changed. According to Space Force officials, the estimate cost per minute for FAS includes operations and sustainment.

contracts since then.[15] Officials added that once implemented, CAS could provide additional locations to communicate with satellites for increased contact opportunities where existing SCN antennas cannot contact satellites, but the effort needs to meet cybersecurity requirements before satellites supported by SCN can use commercial antennas. Space Force officials said that currently, no SCN supported satellites are connecting to or using CAS. Figure 7 provides information about CAS.

Figure 7: Commercial Augmentation Services Effort for the Satellite Control Network



Source: GAO analysis of DOD documentation; Qeishara/stock.adobe.com. I GAO-23-105505

At this time, Space Force officials plan to set up a network separate from SCN to enable SCN users to also access commercial antennas. They said this new network will also use a separate scheduling system, but Space Force may integrate CAS into a future SCN scheduling system. Additionally, they stated the effort has established a CAS control center to communicate with an operations center at Schriever Space Force Base.

The amount of SCN capacity that can be offloaded to CAS depends, in part, on how many users and commercial providers meet cybersecurity

[15]The Small Business Innovation Development Act of 1982 established the Small Business Innovative Research program. Pub. L. No. 97-219 (1982). This act amended section 9 of the Small Business Act, Pub. L. No. 85-536 (1958)(codified as amended at 15 U.S.C. § 638).

requirements. It is also dependent on the number of commercial providers capable of operating on the same spectrum bandwidth as the SCN.

- **Cybersecurity:** Space Force officials reported that in April 2022, CAS received authority to operate between a space operations center at Schriever Space Force Base and the CAS control center for 2 years. Individual SCN users will need to receive individual cybersecurity approvals to connect with CAS. Officials told us that SpOC is currently gathering information from SCN users regarding interest in using CAS as well as if SCN user cybersecurity requirements allow them to do so. The Space Force's 2022 Air Force Annual Force Assessment identified the transfer of SCN data with commercial sources as a continuing security concern. According to Space Force officials they will also need to receive certifications to connect for commercial antenna operators.
- **Compatible bandwidth:** A 2022 RAND study found that most commercial providers do not transmit in the same bandwidth used by SCN because commercial satellite operators do not use that frequency.[16] Thus far, Space Force officials conducting market research for CAS identified at least three commercial providers with five total antennas that are compatible with the SCN bandwidth. The officials said that other commercial antenna providers operate on different bands than SCN antennas and that, if selected for CAS, the 2022 RAND study suggests hardware modification will require additional funding.

According to Space Force officials, the CAS effort is operating using a cost-plus-fixed-fee Small Business Innovative Research contract. Space Force officials state that this contract ends in August 2023, but they are planning a similar follow-on contract to continue CAS development until Space Force awards a new competitive contract. The program office expects to award the new contract in 2024, and stated that it may include development work for commercial antennas. Space Force officials said that CAS providers may also need to pursue spectrum bandwidth exclusions similar to those for FAS. According to Space Force officials, the CAS program is conducting market research to continue to assess the market for potential commercial providers.[17] Officials stated that once

[16]RAND Corporation, *Leveraging Commercial Space Capabilities to Enhance the Space Architecture of the U.S. Department of Defense* (2022).

[17]Commercial services, as defined by the FAR, include services of a type offered and sold competitively in substantial quantities in the commercial marketplace based on established catalog or market prices. FAR § 2.101.

market research is completed, they plan to determine whether to award a contract for commercial services or for another type of product or service.

The 2018 acquisition strategy stated that the goal for CAS was to augment 10 percent of SCN's current capacity. Program officials noted, however, that at this time a pre-determined target for off-loading to CAS would be premature prior to the identification of potential users. SpOC officials stated that, like FAS, at this time CAS is expected to have higher operational costs than those of the current SCN. SpOC officials also said the cost per minute to utilize CAS would depend on the rate at which Space Force uses CAS. According to the estimates provided by SpOC with updated information from an official, the cost per minute for CAS could range from $3 per minute to $16.50 per minute compared to the current SCN cost of $8.75 per minute.[18]

Space Force Is Taking Steps to Acquire Capacity and Automation Enhancements for Its Existing Ground Stations

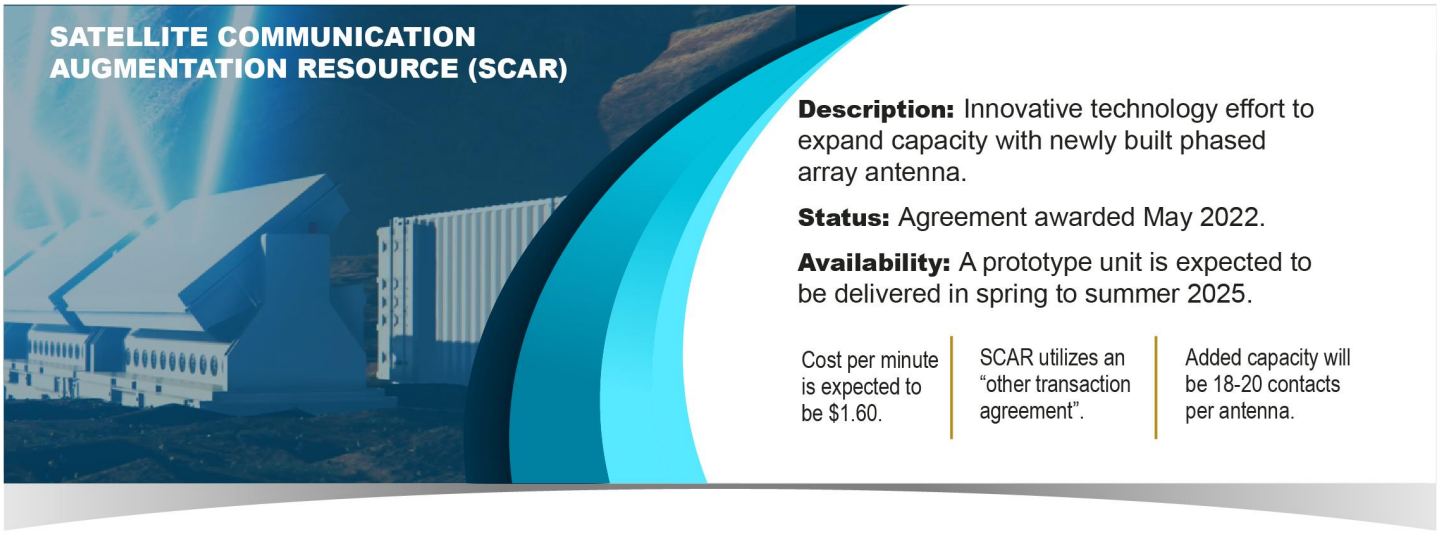
To address SCN's need to meet future demands, Space Force is acquiring new antennas for additional contact capacity and two new scheduling systems to first maintain existing scheduling, and then automate it.

Satellite Communication Augmentation Resource (SCAR): SCAR is an effort to acquire phased-array antennas to significantly increase SCN capacity. Space Force officials said that each SCAR antenna is designed to make contacts from 18 to 20 different satellites at the same time rather than one at a time as with current parabolic SCN antennas. Space Force officials also expect that maintaining and operating SCAR will be less expensive than the current configuration because the phased-array systems have no moving parts. Space Force officials expect the cost projected to operate SCAR will be significantly less than the current SCN antennas, with an estimated per-minute rate of $1.60 compared the current SCN cost of $8.75 per minute, according to the estimates provided by SpOC.[19] Figure 8 provides information about SCAR.

[18]Similar to FAS, SpOC officials provided updates to the cost from the MITRE study.

[19]SpOC officials provided this estimate based on updates to the cost from MITRE study noted above.

Figure 8: Satellite Communication Augmentation Resource's Effort for the Satellite Control Network



Source: Space Operations Command, United States Space Force; Qeishara/stock.adobe.com. I GAO-23-105505

Space Force officials stated they plan to develop, procure, and deploy 12 phased-array antennas over the next 9 years. Space Force is using an authority known as an "other transaction agreement" awarded in May 2022 to execute the effort.[20] Development and delivery of the first prototype antenna is on a cost-plus-fixed fee basis while the remaining antennas are expected to be procured on a firm-fixed price basis. While the components that SpRCO is integrating into the prototype are mature and commercially available, SpRCO officials noted that SCAR is a new use of phased array technology that requires further development. SpRCO officials identified the use of SCAR technology for TT&C as a novel concept, which GAO's leading practices classify as an immature technology.[21]

According to program officials, the authority to proceed for the prototype antenna is expected in March 2023 and will reflect the terms of the

[20]Other transaction agreements are agreements other than procurement contracts, cooperative agreements, and grants. Other transaction agreements are not subject to certain federal acquisition laws and requirements. See GAO, Other Transaction Agreements: DOD Can Improve Planning for Consortia Awards, GAO-22-105357 (Washington, D.C.: September 2022). This agreement does not include sustainment costs.

[21]GAO, *Technology Readiness Assessment Guide: Best Practices for Evaluating the Readiness of Technology for Use in Acquisition Programs and Projects*, GAO-20-48G (Washington, D.C.: January 2020).

agreement for the prototype to be delivered between spring to summer 2025. The remaining antennas will be divided into two separate orders that can be exercised as options. The schedule of their delivery will be based on the date of the prototype's authority to proceed. Program officials noted that they expect these deliveries to occur on a continuous basis between late 2026 and late 2030 to maintain the manufacturing line. According to Space Force, the cost to acquire all the antennas for SCAR is $1.4 billion.

Scheduling systems: Space Force officials have stated they are acquiring two scheduling systems for SCN, one to replace the current system that is approaching the end of useful life, and a follow on cloud-based system intended to provide more capability to automate scheduling and integrate with any antenna designed to connect to the SCN network. Officials said the existing scheduling system is a manual and labor-intensive process that uses hardware that will reach the end of its useful life in January 2024.

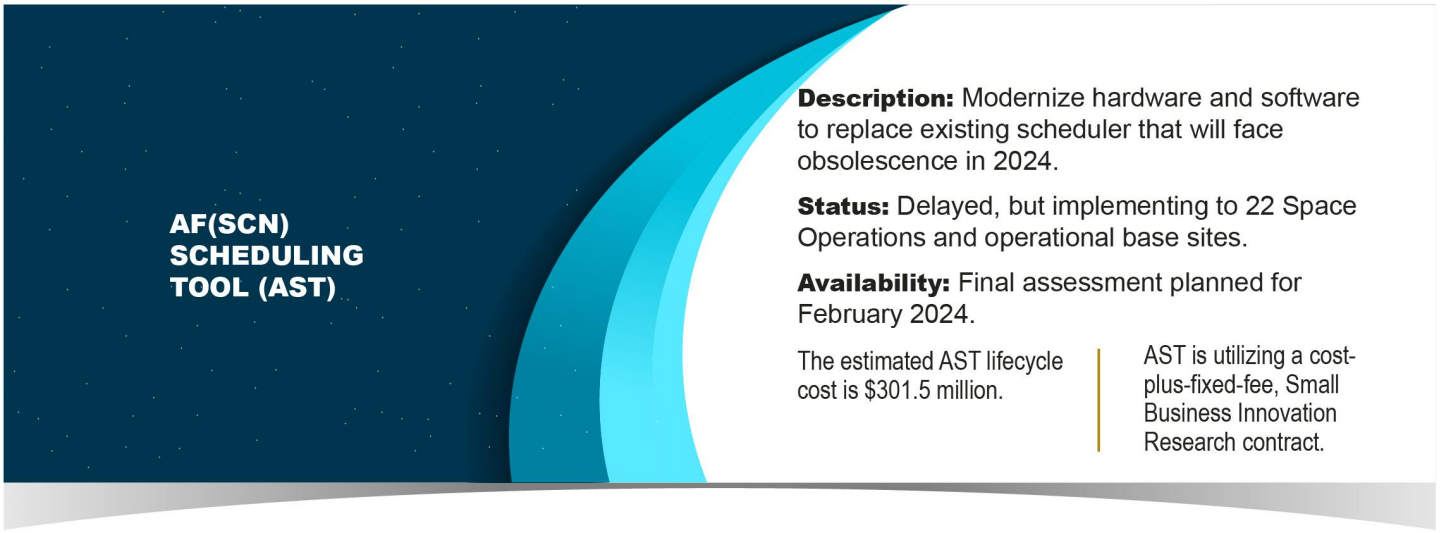
Program officials expect to replace the existing system in the short term with the Air Force Satellite Control Network Scheduling Tool (AST).[22] This scheduling tool is expected to operate more efficiently by providing limited scheduling automation and de-confliction of SCN satellite contact requests, but will require a similar number of scheduling personnel as the current system according to officials. Officials add that the scheduling program is also designed to schedule contacts with FAS. Space Force is currently developing AST using a Small Business Innovative Research cost-plus-fixed-fee contract. Space Force officials estimate the life cycle cost for AST at $301.5 million.[23] Space Force plans to connect AST to all Space Force SCN users, prior to the expected end of life of the current scheduling system in January 2024. According to program officials, other users of SCN, including NOAA, which is working with DOD to support

[22]SCN was called the Air Force Satellite Control Network until the Air Force transferred management of SCN to Space Force after Congress established Space Force in 2019 as a military department within the Air Force. See National Defense Authorization Act for Fiscal Year 2020, Pub. L. No. 116-92, §§ 951-961, (2019) (codified at 10 U.S.C. § 9081(a)).

[23]The $301.5-million lifecycle cost estimate includes both acquisition and operations and support costs for the program. Program officials stated that the total includes $174.3 million in acquisition costs to support a previous program that was supposed to replace the current scheduling system and was then merged into the AST program.

SCN through FAS, will connect in February 2024. Figure 9 provides information about AST.

Figure 9: AFSCN Scheduling Tool's (AST) Scheduling System



Source: GAO analysis of DOD documentation; Qeishara/stock.adobe.com. I GAO-23-105505

AST is experiencing schedule delays. For example, a program document provided by program officials indicated that AST delivery is estimated to exceed its schedule threshold in September 2023 by 5 months. The briefing noted that the delays would require the AST program to award another contract. It also noted the program will need to leverage funding from FAS and CAS over the next two 2 years to meet projected funding needs, potentially affecting those programs.

For the long term, Space Force officials are developing a new scheduling system called Enterprise Resource Management (ERM). Space Force officials expect this system to eliminate the manual processes. Space Force officials added that ERM is designed to include scheduling for any antenna that is designed to connect to the SCN network. Space Force officials expect ERM to enable the SCN to dynamically respond to real-time conditions and threats by configuring antennas and network resources automatically while also permitting upgraded cybersecurity. Space Force officials said, in addition to scheduling and automation, ERM is designed to replace the existing data system that collects and processes the SCN contact metrics Space Force uses to inform sustainment decisions and future needs.

As of December 2022, Space Force officials said they have not yet awarded a contract or other transaction agreement for ERM. Program officials stated they are finalizing requirements and developing an acquisition strategy for ERM. They anticipate releasing a request for proposals in January 2023. Space Force officials expect ERM to deliver in fiscal year 2028. Figure 10 provides information about ERM.

Figure 10: Enterprise Resource Management (ERM) Scheduling System

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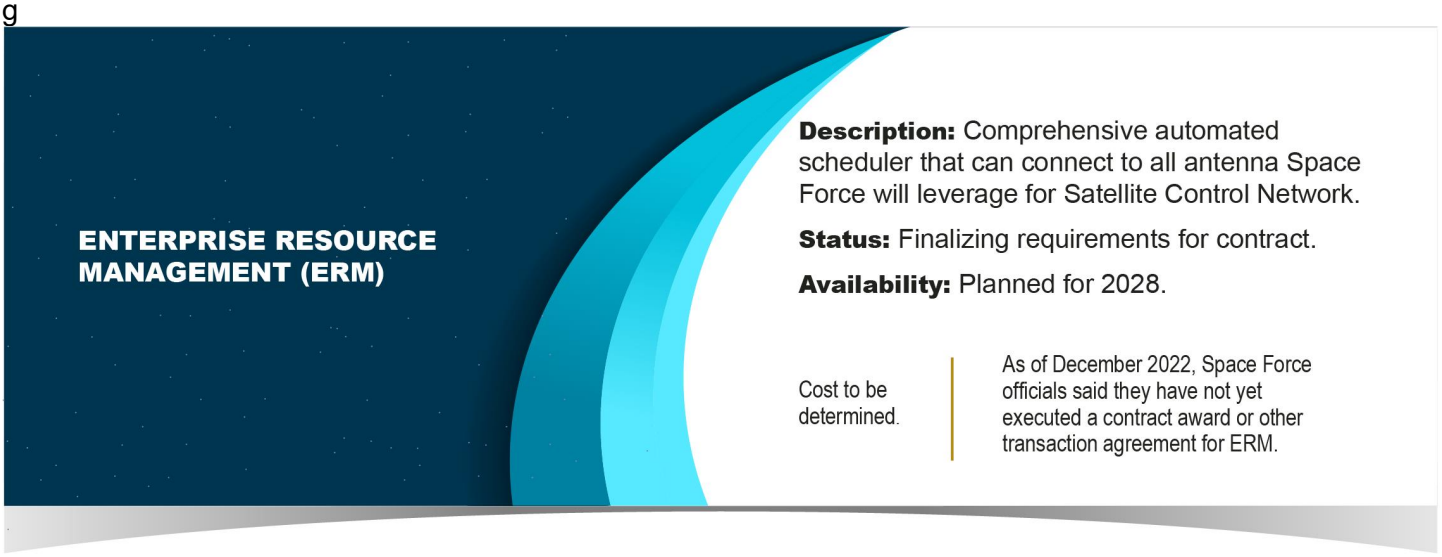


Source: GAO analysis of DOD documentation; Qeishara/stock.adobe.com. | GAO-23-105505

Space Force Is Taking Steps to Coordinate Its SCN Acquisition Efforts to Facilitate Effective Integration

Most of the acquisition efforts to address SCN's capacity needs are managed within one program office within SSC–-BCTI. BCTI's portfolio includes FAS, CAS, and the two SCN scheduling systems—AST and ERM.[24] Space Force chose this approach because it determined that having one program office manage its various efforts would increase capacity and efficiency, diversify options for redundancy, and reduce long-term sustainment costs. Space Force also noted that the advantage of managing these as a series of smaller efforts instead of one larger

[24]BCTI's portfolio also includes MeshOne-T, a secure, high capacity communication system BCTI is developing to transport data for systems such as the SCN. Since it will not be used exclusively for SCN, we did not include it in this review.

acquisition program is that it allows each acquisition effort more flexibility. According to SCN program officials, the structure can accommodate for the differences in project lifecycle phasing and timing and quickly allows for incremental capability deliveries to the warfighter. By managing the separate efforts independently, Space Force can also minimize the risk of challenges with one effort affecting the others and allows program office leaders to monitor the performance of these interdependent efforts as a group. For example, SSC conducts quarterly program management reviews of the BCTI portfolio of SCN acquisition efforts, to assess the cost, schedule, and performance status as well as efforts to integrate the programs. To coordinate with multiple SCN stakeholders, BCTI also meets regularly with other SCN stakeholders, for example in weekly operational meetings to assess SCN challenges and inform acquisition efforts. The meetings include SCN operators, officials from the SCN sustainment office, SpOC, and representatives of the Office of the Space Force's Chief Operating Officer responsible for the integration of space programs.

Currently, the SCAR program is not managed within SSC but within SpRCO. SpRCO implemented initial planning of the SCAR acquisition program, awarded the current other transaction agreement, and is continuing to manage the phased array antenna acquisition effort. SpRCO's mission is to expedite the delivery of critical space capabilities. It operates outside of SSC and reports directly to the Office of the Assistant Secretary of the Air Force for Space Acquisition and Integration. SpRCO policy and guidance provides a framework for program transfer after initial development. SpRCO's charter includes a key principle that a program initiated within SpRCO may be transferred to a program office for continued development and production or to an operational unit for sustainment. In September 2019, leaders of SpRCO and Air Force acquisition officials signed a memorandum of agreement that established guidelines for organizational collaboration between the two entities, including the transfer of SpRCO programs.[25] The agreement identifies responsibilities of various stakeholders within SpRCO, SSC, and the program office to enable transition such as:

- determining the process for transferring the authority for program execution;
- transferring authority for contract execution of the program;

[25]The memorandum of agreement was originally between the SpRCO and the Air Force Space and Missile Systems Center, which re-designated as SSC in August 2021.

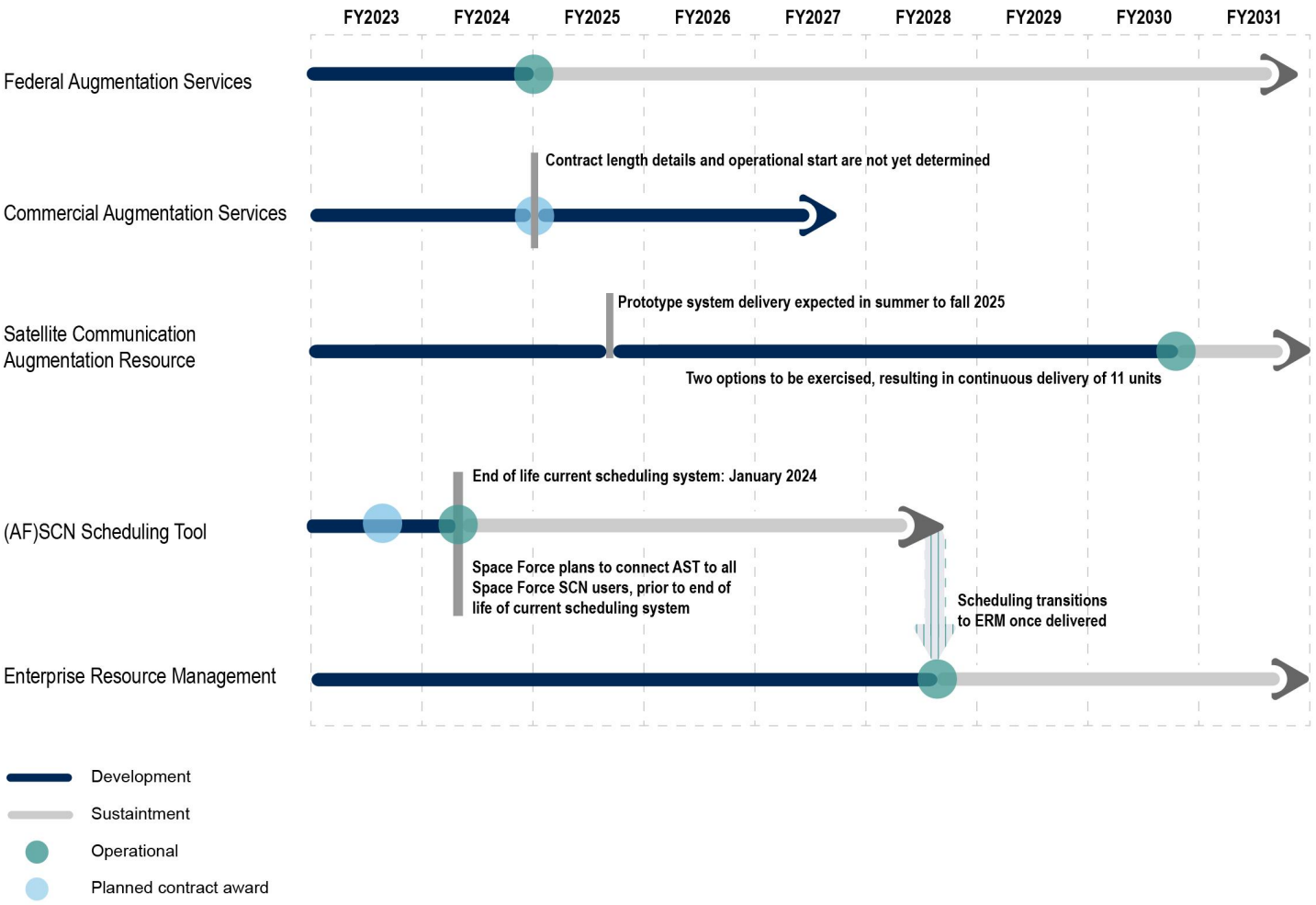
- communicating with the broader stakeholder community including the Office of the Secretary of Defense, Office of the Joint Chiefs of Staff, and Major Commands; and
- developing budget planning inputs for the program.

Space Force intends to transfer SCAR to SSC using the process outlined in the memorandum of agreement but has not yet developed transfer requirements with SpRCO specific to the SCAR effort nor determined when the transfer will take place. SpRCO and SSC recently initiated the planning process for such a transfer in August 2022, with the issuance of a memorandum to initiate transfer planning of several programs including SCAR. According to SpRCO and BCTI officials, Space Force has not yet determined when the transition will occur or exactly where in SSC SCAR will be transferred, but Space Force plans to coordinate with the recently established SSC Space System Integration Office to assist with the process. In September 2022, SpRCO officials said that they were developing the transition plan and are expecting a first draft to be finished in early 2023.

Space Force has implemented oversight measures for the transfer process. The August 2022 memorandum directs leaders from both SpRCO and SSC to provide joint quarterly updates to their respective program executive offices about the progress of planning and coordination of the programs being transferred, including SCAR. Space Force's oversight of the SCAR transfer process into SSC will be critical as the transition plan is implemented it moves forward to address SCN future needs.

Because the demands on SCN are rising rapidly, effective and timely integration of the multiple acquisition efforts for the SCN is critical to address the increasing demands on the network. In a June 2022 program review, the BCTI program office noted that it is working to integrate, manage, and automate the new SCN acquisition efforts designed to expand capacity, such as FAS and CAS, with the ERM scheduling system in order to most efficiently use the expected increase in antenna capacity. According to BCTI program officials, the program currently has limited information regarding plans to integrate SCAR into the new SCN scheduling systems. The transition of SCAR into SSC will allow Space Force to further integrate all critical components of SCN's efforts to meet future needs. See figure 11 for the proposed schedules of the SCN acquisition efforts.

Figure 11: Acquisition Schedule for Satellite Control Acquisition Efforts



Source: GAO Review of DOD documentation. I GAO-23-105505

Coordination of all SCN acquisition efforts with the SCN sustainment office is also critical for the long-term success of programs. In order to help facilitate a smooth transition to sustainment for all of its programs, program officials noted that BCS meets regularly with BCTI to discuss the progress and schedule of acquisition efforts. In addition, BCS uses a tailorable checklist of 280 or more questions based upon eight functional areas such as contracting, financing, product support, and program management. This checklist helps BCTI to assess the program's needs prior to the transition to sustainment.

Conclusions

SCN is a critical part of Space Force's control system for space assets, but it is facing obsolescence challenges and potential capacity gaps as DOD and other agencies launch more satellite systems that will rely on the network. The LCSP is a critical tool for planning and administering the sustainment of the SCN but the current LCSP, issued in 2017, has not been updated in accordance with DOD instruction. As a result, the LCSP does not contain updated information about SCN modernization programs and organizational changes within Space Force. Therefore, it no longer provides a viable plan for sustainment of the SCN. SCN sustainment officials stated that the program is in the process of developing an updated LCSP. Given the previous delays in completing the plan and that the program has not yet identified the process for approving the plan, it is not clear when the upgraded LCSP will be implemented Until then, Space Force will not have sufficient information to appropriately plan SCN sustainment efforts in the future.

Recommendation for Executive Action

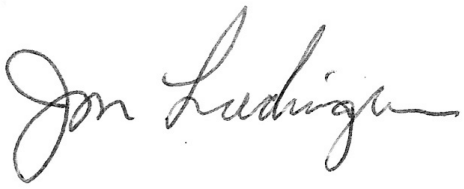
The Secretary of the Air Force should ensure that Space Systems Command updates or issues a new lifecycle sustainment plan that includes information about all the current sustainment strategies, related programs, the updated Space Force organizational structure, and other relevant information for the Satellite Control Network. (Recommendation1)

Agency Comments

We provided a draft of this report to DOD for review and comment. In its comments reproduced in appendix II, DOD agreed with the recommendation. DOD did not provide technical comments.

We are sending copies of this report to the appropriate congressional committees and the Secretary of Defense, and other interested parties. In addition, the report is available at no charge on the GAO website at https://www.gao.gov.

If you or your staff have any questions about this report, please contact Jon Ludwigson at (202) 512-4841 or ludwigsonj@gao.gov or Cathleen A. Berrick at (202) 512-3404 or berrickc@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.



Jon Ludwigson
Director, Contracting and National Security Acquisitions

Cathleen A. Berrick
Managing Director, Defense Capabilities and Management

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The Honorable Ken Calvert
Chair
The Honorable Betty McCollum
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

Appendix I: Objectives, Scope, and Methodology

This report assesses (1) Space Force's current and future needs for the SCN (2) The extent to which Space Force is addressing challenges in sustaining the SCN, and (3) acquisition efforts Space Force is implementing to support SCN future needs.

To identify current and future needs of the SCN, we reviewed DOD, United States Air Force and Space Force reports and briefings related to SCN operations and interviewed officials from Space Force offices such as Space Operations Command (SpOC), and the U.S. Space Force Headquarters Chief Operations Officer, Force Assessment and Space Integration Divisions. To determine the current utilization of SCN capacity, we analyzed data available from calendar year 2012 through 2021 from the Space Force's 22nd Space Operations Squadron's (22 SOPS) System for Network Analysis and Planning (SNAP) tool. To obtain more context, we contacted officials about scheduling and operations, reviewed the SCN priority matrix, and analyzed data available to quantify the number of denied requests for users from calendar year 2021 through June 2022 from 22 SOPS's Conflict Delete Tracker.[1] To provide context for future capacity we obtained information about the number of launches supported by SCN and analyzed data available from calendar year 2012 through 2021 from 22 SOPS's SCN Launch Tracking and Metrics Reporting. Further, 22 SOPS reported the calendar year 2022 total to GAO, which was added to the SCN Launch figure as reported. We assessed the reliability of the SNAP tool's data by interviewing the SCN operators at 22 SOPS and reviewing existing information about the SNAP tool and the data it collects and performed logic testing. We determined the SNAP tool summary–monthly and yearly–data that 22 SOPS officials "cleaned" was sufficiently reliable for the purposes of describing SCN's capacity utilization.[2]

To assess efforts to address challenges in sustaining the SCN, we analyzed Space Systems Command (SSC) SCN sustainment contract

[1]Officials stated they only recently started recording this data.

[2]Officials stated that schedulers from 22 SOPS review the raw data and remove duplicative entries where a planned contact from the schedule was not conducted but rather maintenance, solar interference, or other activity occurred.

information and other documents related to SCN sustainment and operations. To identify cost of SCN operations and maintenance, we reported Space Force budget execution data for the program. We interviewed Space Force officials responsible for SCN maintenance at the SCN sustainment office to determine how Space Force officials are addressing sustainment challenges in accordance with DOD policies and guidance. The primary documents reviewed included the SCN Life Cycle Sustainment Plan and DOD instruction 5000.91. We used a non-generalizable sample to select the four operators that rely on SCN to interview then interviewed officials representing the selected users about SCN operations. We sought a diverse group of non-classified operators in terms of their utilization of SCN that operate both inside and outside of DOD. The operators selected as part of our interviews included the:

- National Oceanic and Atmospheric Administration
- National Reconnaissance Office
- 2nd Space Operations Squadron operating the Global Positioning System
- 10th Space Operations Squadron

To assess Space Force's acquisitions to address SCN's capacity limitations, we reviewed related acquisition documentation, contracts and other agreements, and interviewed program officials at the Information Mobility program office within SSC and the Space Rapid Capabilities Office (SpRCO). This assessment included a review of acquisition strategies, requirement documents, the material development decision, program baseline, schedules, cost estimates, a program management review for all SSC efforts related to SCN, contracts, and an "other transactional agreement." We did not independently assess SCN contact-per-minute costs provided by SpOC. We also reviewed Space Force documentation on program management and interviewed officials to determine how Space Force is coordinating its acquisition efforts. For information about SCN coordination and program management, we reviewed Space Force memorandums and interviewed officials within both SSC's Information Mobility and SpRCO about plans and processes for transferring acquisition efforts.

We conducted this performance audit from October 2021 to April 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that

the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Comments from the Department of Defense

DEPARTMENT OF THE AIR FORCE
WASHINGTON DC

OFFICE OF THE ASSISTANT SECRETARY

22 March 2023

Mr. Jon Ludwigson
Director, Contracting and National Security Acquisitions
U.S. Government Accountability Office
441 G Street, NW
Washington DC 20548

Dear Mr. Ludwigson,

This is the Department of Defense (DoD) response to the GAO Draft Report GAO-23-105505, "SATELLITE CONTROL NETWORK: Updating Sustainment Plan Would Help Space Force Better Manage Future Efforts," dated February 9, 2023 (GAO Code 105505).

The DoD concurs with the GAO recommendation that the Secretary of the Air Force should ensure that Space Systems Command updates or issues a new life-cycle sustainment plan that includes information about all the current sustainment strategies, related programs, the updated Space Force organizational structure, and other relevant information for the Satellite Control Network.

Attached is DoD's response to the subject report. My point of contact is Maj Bradley Rigg who can be reached at bradley.rigg@spaceforce.mil and phone 571-256-0880.

Sincerely,

JANICIK.JEFFREY.L.1032636850 Digitally signed by JANICIK.JEFFREY.L.1032636850 Date: 2023.03.22 12:46:03 -04'00'

JEFFREY L. JANICIK, Col, USAF
IMA, Director, Capability Delivery
Assistant Secretary of the Air Force
(Space Acquisition and Integration)

Accessible Text for Appendix II: Comments from the Department of Defense

22 March 2023

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U.S. Government Accountability Office
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Y.L.1032636850
Date: 2023.03.22 12:46:03 -04'00'

JEFFREY L. JANICIK, Col, USAF
IMA, Director, Capability Delivery
Assistant Secretary of the Air Force
(Space Acquisition and Integration)

Accessible Text for Appendix II: Comments from the Department of Defense

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

Jon Ludwigson at (202) 512-4841 or ludwigsonj@gao.gov or Cathleen A.

Berrick at (202) 512-3404 or berrickc@gao.gov

Staff Acknowledgments

In addition to the contact named above, Nicolaas Cornelisse (Assistant Director); J. Kristopher Keener (Assistant Director); Matt Shaffer (Analyst-in-Charge); Emily Martin; Hunter Stephan; Jay Tallon; and Alaina Turnquist were key contributors to this report. Other contributors included: Pete Anderson, Claire Buck, Lorraine Ettaro, Christine Pecora, and Robin Wilson.

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