



September 2022

# NATIONAL SECURITY SPACE Actions Needed to Better Use Commercial Satellite Imagery and Analytics

Accessible Version

# GAO Highlight

Highlights of [GAO-22-106106](#), a report to congressional committees

## Why GAO Did This Study

Commercial remote sensing satellites have transformed the way the U.S. approaches critical national security issues. With the commercial space industry expected to grow significantly in the coming years, the IC and DOD have emphasized that they must team with commercial GEOINT providers.

The House committee report accompanying a bill for the Intelligence Authorization Act for Fiscal Year 2021 and the Senate Select Committee on Intelligence requested GAO to assess IC and DOD plans for commercial satellite imagery capabilities. This report assesses, among other things, the extent to which the IC and DOD have (1) established roles and responsibilities for the acquisition of commercial satellite imagery, (2) incorporated emerging satellite capabilities, and (3) developed performance goals and measures to enhance the use of commercial satellite imagery.

GAO reviewed and assessed IC and DOD plans and interviewed officials from NRO and NGA, services, combatant commands, and select commercial vendors.

## What GAO Recommends

GAO is making four recommendations for DOD and ODNI, including clarifying roles for commercial satellite imagery, assessing approaches to emerging capabilities, and developing performance goals and measures. DOD concurred with the recommendations. ODNI did not state whether it concurred with the recommendations addressed to it.

View [GAO-22-106106](#). For more information, contact Brian M. Mazanec at (202) 512-5130 or [mazanecb@gao.gov](mailto:mazanecb@gao.gov).

September 2022

## NATIONAL SECURITY SPACE

### Actions Needed to Better Use Commercial Satellite Imagery and Analytics

#### What GAO Found

The U.S. intelligence community (IC) and the Department of Defense (DOD) have not clarified roles and responsibilities for the acquisition of commercial satellite imagery. The National Reconnaissance Office (NRO) is the central acquirer of commercial satellite imagery for IC and DOD components; however, multiple DOD organizations have acquired commercial imagery over recent years. There is no guidance that addresses organizational roles and responsibilities across the IC and DOD for these acquisitions. Further, two key changes—the expansion of the commercial sector and the increased reliance on space—could significantly increase demand for commercial satellite imagery (see figure for recent commercial image of the Russian war in Ukraine). Without clarifying roles and responsibilities, the potential for unnecessary overlap will only increase as interest in commercial imagery grows across the IC and DOD.

Commercial Satellite Image of Russian Military Convoy Outside Kyiv, 2022



Source: Copyright © Maxar Technologies Inc. | GAO-22-106106

The IC and DOD have established requirements for future commercial acquisitions focused primarily on foundational intelligence but have limited ability to incorporate emerging commercial satellite capabilities in a timely manner. Although they have explored utilizing emerging capabilities, the IC and DOD have not developed an effective approach to bring these capabilities into geospatial-intelligence (GEOINT) operations. Without doing so, the U.S. may lose ground in space to competitors such as China, and the U.S. commercial industry may be limited in their ability to compete with foreign competitors.

U.S. government policy is to maximize the use of commercial space capabilities, but the IC and DOD have not developed performance goals and measures to assess progress toward that strategic goal. Until IC and DOD stakeholders identify specific performance goals and measures, the IC and DOD risk missing commercial opportunities they need to maintain their advantage over competitors such as China and cannot ensure that the intent to maximize commercial satellite imagery is met.

This is a public version of a classified report that GAO issued in July 2022. Information that DOD deemed classified has been omitted.

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**Abbreviations**

CSPO	Commercial Systems Program Office
DIA	Defense Intelligence Agency
DIU	Defense Innovation Unit
DNI	Director of National Intelligence
DOD	Department of Defense
GEOINT	Geospatial Intelligence
IC	United States Intelligence Community
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NGA	National Geospatial-Intelligence Agency
NRO	National Reconnaissance Office
ODNI	Office of the Director of National Intelligence
OSD	Office of the Secretary of Defense
SOC	Statement of Capability

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September 7, 2022

Congressional Committees

Commercial remote sensing satellites and the data they produce have transformed the way countries approach climate change, their economies, and critical international security issues, among other things.<sup>1</sup> According to the *United States Space Priorities Framework*, space underpins our national security, and the information collected from space informs national decision makers about evolving threats to U.S., allied, and partner interests, and enables the protection and defense of the homeland.<sup>2</sup> The commercial space industry is expected to grow significantly in the coming years—based on recent trends—and may be able to address more of the U.S. Intelligence Community’s (IC) and Department of Defense’s (DOD) geospatial-intelligence (GEOINT) needs.<sup>3</sup> Commercial imagery provides an advantage over IC imagery in that it is all unclassified and therefore may be licensed to be shareable with all allies and partners. Media coverage of Russia’s invasion of Ukraine shows the critical role commercial satellite imagery can provide to the public, showing the locations, movements, and activities of Russian forces (see figure 1 below). According to DOD officials, commercial imagery is also being shared by the U.S. government with the Ukrainian government to support their defense against Russia. In an era of strategic competition and with Chinese investments in space accelerating, the IC and DOD have emphasized that they must team with commercial

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<sup>1</sup>For the purposes of this report, remote sensing satellites refer to those satellites obtaining information about an object or area via a remote distance, normally from an orbit around the earth. We are not focusing on communications satellites or space situational awareness capabilities in this report, but we have ongoing work on space situational awareness.

<sup>2</sup>White House, *United States Space Priorities Framework* (Washington, D.C.: December 2021).

<sup>3</sup>*Department of Defense Dictionary of Military and Associated Terms* (as of November 2021) defines GEOINT as the exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on or about the Earth. GEOINT consists of imagery, imagery intelligence, and geospatial information. See also 10 U.S.C. § 467.

GEOINT providers, including in the remote sensing arena, in order to maintain and grow the U.S.'s competitive advantage.<sup>4</sup>

**Figure 1: Commercial Satellite Image of Russian Military Convoy Outside Kyiv, 2022**



Source: Copyright © Maxar Technologies Inc. | GAO-22-106106

In 2017, the National Reconnaissance Office (NRO) assumed responsibilities for serving as the IC and DOD lead for the acquisition of commercial remote sensing data from the National Geospatial-Intelligence Agency (NGA) and later established a Commercial Systems Program Office (CSPO).<sup>5</sup> The House Intelligence Committee report accompanying a bill for the Intelligence Authorization Act for Fiscal Year 2021 included a provision for us to review CSPO, and the Senate Select Committee on Intelligence later requested that we expand to review more broadly NRO and NGA plans for commercial satellite capabilities.<sup>6</sup> This report assesses the extent to which the IC and DOD have (1) established roles and responsibilities relating to the acquisition of commercial satellite

<sup>4</sup>National System for Geospatial Intelligence, NSG Enterprise, *Commercial GEOINT Strategy* (2021).

<sup>5</sup>In this report, we reference the acquisition of commercial remote sensing data, or commercial satellite imagery, which involves IC and DOD components entering into licensing agreements with commercial vendors to support the sharing of this imagery. According to DOD officials, the U.S. government does not own commercial data, but acquires commercial imagery with associated license agreements that define how the government can use and share the data. See appendix I for more details on licensing.

<sup>6</sup>See H.R. Rep. No. 116-565 at 21 (2020).

imagery, (2) incorporated emerging satellite capabilities, (3) developed performance goals and measures to enhance the use of commercial satellite imagery, and (4) coordinated on commercial analytic services that use remote sensing data.

This report is a public version of our July 2022 report.<sup>7</sup> DOD deemed some of the information in the prior report as classified, which must be protected from public disclosure. Therefore, this report omits classified information relating to current and historic funding for commercial imagery and commercial analytic services as well as some details regarding specific needs for or capabilities provided by commercial vendors. Although the information provided in this report is more limited, the report addresses the same objectives as the classified report, uses the same methodology, and includes the same recommendations.

For this review, we collected information from five commercial satellite imagery vendors contracted by NRO, as of July 2021, on their experiences working with the IC and DOD.<sup>8</sup> We also selected a non-generalizable sample of three out of approximately a dozen vendors with analytic services contracts and five area experts in the space domain to discuss industry and historical perspectives on the government's approach to commercial satellite imagery and analytic services that use remote sensing data.<sup>9</sup> We also interviewed IC and DOD officials, as well as reviewed and assessed IC and DOD documentation on: the roles and responsibilities for the acquisition of commercial imagery, approaches to acquiring emerging satellite capabilities, performance goals and measures relating to this imagery, and commercial analytic services that use remote sensing data. Additional details on the report's methodology can be found in appendix II.

The performance audit upon which this report is based was conducted from March 2021 to July 2022 in accordance with generally accepted government auditing standards, which require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a

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<sup>7</sup>GAO, *National Security Space: Actions Needed to Better Use Commercial Satellite Imagery and Analytics*, GAO-22-105072C (Washington, D.C.: Jul. 22, 2022). (SECRET//NOFORN)

<sup>8</sup>We selected these companies to show examples of how the IC and DOD are incorporating commercial satellite imagery into its operations.

<sup>9</sup>We selected three vendors from about a dozen that have analytic services contracts with NGA to provide perspective into companies that use satellite imagery as an input in their analytic service offerings to the IC and DOD.

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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. We subsequently worked with DOD to prepare this unclassified version of the report for public release from July 2022 to September 2022. This public version was also prepared in accordance with these standards.

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## Background

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### Growth of the Commercial Satellite Industry

Over the past decade, the commercial satellite industry has grown rapidly. The total number of satellites in space increased from 801 in 2005 to 2,990 in 2020—according to the Aerospace Corporation—with much of this growth occurring overseas.<sup>10</sup> The Union of Concerned Scientists satellite database showed further growth to approximately 5,000 active satellites orbiting Earth as of December 31, 2021.<sup>11</sup> According to a Satellite Industry Association report, services in this industry generated total global revenue of \$118 billion in 2021, with satellite remote sensing services accounting for \$2.7 billion of this amount.<sup>12</sup> In the U.S., the commercial sector owned approximately 200 satellites in 2005 and nearly 1,200 by 2020.<sup>13</sup> In the remote sensing realm—the focus of this report—the number of U.S. commercial satellites

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<sup>10</sup>The Aerospace Corporation, Center for Space Policy and Strategy, *Leveraging Commercial Space for National Security*, (November 2020), pg.2. The Aerospace Corporation is a federally funded research and development center that advises the government on complex space enterprise problems.

<sup>11</sup>Union of Concerned Scientists, “UCS Satellite Database,” (Cambridge, MA: Jan. 1, 2022), accessed May 4, 2022, <https://www.ucusa.org/resources/satellite-database>. We followed the practice the Defense Intelligence Agency used in the 2022 Challenges to Security in Space report and analyzed the satellite database provided by the Union of Concerned Scientists. All data included in the UCS satellite database is publicly available from different sources, including corporate, government, and scientific websites. The database only includes active satellites; however, in cases where the status of a satellite is unclear, the entry reflects the best judgment of the UCS. Information should therefore be considered approximate.

<sup>12</sup>Satellite Industry Association, Bryce Tech, *State of the Satellite Industry Report* (June 2022).

<sup>13</sup>The Aerospace Corporation, *Leveraging Commercial Space for National Security*. Additionally, the Union of Concerned Scientists satellite database showed a total of 2,516 active, U.S. commercial satellites, as of December 31, 2021.



available increased sharply over the past 15 years, according to Aerospace Corporation and NGA.<sup>14</sup>

Foreign competitors are also growing rapidly in the commercial satellite industry. For example, China grew immensely, going from no commercial satellite companies in 2011 to 25 companies in 2018. Since 2011, dozens of start-up commercial satellite companies have emerged in China, according to the Institute for Defense Analyses.<sup>15</sup> According to an NGA assessment of global commercial imaging capabilities in 2021, the U.S. holds a tenuous technical performance lead in the commercial imaging market.<sup>16</sup>

### IC and DOD Component Roles Relating to Commercial Remote Sensing Capabilities

Within the IC and DOD, both NRO and NGA play key roles in the acquisition of commercial remote sensing imagery and related services, while other components also retain important roles. For a summary of IC and DOD component roles relating to commercial remote sensing capabilities, see table 1.

**Table 1: IC and DOD Roles Relating to Commercial Remote Sensing Capabilities**

Component	Summary of Role
Office of the Director of National Intelligence (ODNI)	Provide policy guidance and approve IC plans, such as the IC requirements for commercial satellite imagery and analyses.
National Reconnaissance Office (NRO)	Serve as the primary acquirer of both government and commercial satellite imagery for the IC and DOD. Disseminate commercial imagery to NGA once collected.
National Geospatial-Intelligence Agency (NGA)	Serve as the primary acquirer of commercial analytic services, which use satellite imagery, for the IC and DOD. Serve as the geospatial intelligence (GEOINT) functional manager, and provide DOD component requirements for GEOINT, including satellite imagery, to NRO. <sup>a</sup>

<sup>14</sup>The Aerospace Corporation, *Leveraging Commercial Space for National Security* reported—for the years 2005, 2010, 2015, and 2020—the number of U.S. commercial remote sensing satellites as 4, 11, 42, and 197, respectively. Using a different methodology, NGA reported the number of U.S. commercial remote sensing satellites in these same years as 2, 10, 112, and 314, respectively.

<sup>15</sup>Institute for Defense Analyses, Science and Technology Policy Institute, *Evaluation of China's Commercial Space Sector*, (September 2019), pg. iv. The Institute for Defense Analyses is a federally funded research and development center.

<sup>16</sup>NGA, *Commercial GEOINT Competition: Today and Tomorrow*, presentation (June 29, 2021). (TOP SECRET//SI//TK//REL TO USA, FVEY/FISA)

Component	Summary of Role
Defense Intelligence Agency (DIA)	Validate and recommend prioritization for national collection systems; also work to ensure defense intelligence requirements are registered in the appropriate collection management system and tasked for collection.
Office of the Secretary of Defense	Provide policy guidance and approve DOD plans relating to the acquisition and development of commercial satellite imagery and analyses.
Military Services	Determine service's operational needs and resource required capabilities that leverage commercial satellite imagery, such as space situational awareness capabilities and remote ground terminals for receiving satellite imagery. Services can also acquire commercial satellite imagery directly.
Combatant Commands	Compile and submit GEOINT and operational requirements, which include needs for commercial satellite imagery, to DIA and NGA.

Source: GAO summary of U.S. Intelligence Community (IC) and Department of Defense (DOD) information. | GAO-22-106106

<sup>a</sup>The NGA Director is the GEOINT Functional Manager for the IC and DOD GEOINT manager responsible for the end-to-end GEOINT process, which includes activities for: a) tasking national imagery and geospatial information collection, b) advisory tasking for theater and tactical assets, c) processing raw intelligence data from national and commercial satellites, d) exploiting geospatial information and imagery intelligence, and e) analyzing and disseminating information, knowledge, and intelligence to consumers in the form of GEOINT data and products.

## IC and DOD Have Not Clarified Roles and Responsibilities for Commercial Satellite Imagery

The NRO is the primary acquirer of commercial satellite imagery for IC and DOD components, which as noted previously involves the licensing of imagery from commercial remote sensing capabilities. The agency took over the lead role for commercial imagery acquisition from NGA based on a 2014 request by the Director of National Intelligence, who intended to avoid unproductive competition between NGA and NRO.<sup>17</sup>

Although NRO is responsible for the bulk of commercial imagery licensing, there is no law or regulation that prohibits agencies from acquiring their own commercial satellite imagery, according to NRO officials. Further, DOD officials stated that existing DOD guidance has not been revised or kept current with the change of roles and responsibilities

<sup>17</sup>Director of National Intelligence and Under Secretary of Defense (Intelligence), *Consolidated Intelligence Guidance for Fiscal Years 2016 – 2020* (2014) (SECRET//NOFORN) directed the development of an option to transition some, or all, of the responsibilities for the management of commercial satellite imagery data providers from NGA to NRO. See appendix III for a timeline of events around the transfer of responsibility for the acquisition of commercial satellite imagery from NGA to NRO.

resulting in uncertainty on when other organizations can acquire data outside of NRO. For example, current DOD Directive 5105.60 states that NGA serves as the DOD lead for all acquisition or exchange of commercial and/or foreign government-owned imagery-related remote sensing data for the DOD components.<sup>18</sup>

As result, multiple DOD components pursue commercial remote sensing capabilities to address their requirements or missions. For example:

- The Defense Innovation Unit (DIU), an entity within the Office of the Under Secretary of Defense (Research and Engineering), acquires commercial satellite imagery and facilitates the integration of new and nontraditional commercial capabilities to support DOD-wide requirements, according to DIU officials.<sup>19</sup>
- The Army is developing commercial remote sensing capabilities to support warfighters via the Army's Tactical Space Layer program.
- U.S. Southern Command officials acquire commercial satellite imagery from the Center for Southeastern Tropical Advanced Remote Sensing program.<sup>20</sup>

Additionally, two changes could significantly increase the IC and DOD demand for commercial imagery:

- **Expansion of commercial space capabilities:** the U.S. commercial space sector is rapidly expanding and introducing new capabilities (e.g., radar, radio frequency, and hyperspectral), improved imaging quality, and enhanced revisit rates—all developments that could address a wider spectrum of IC and DOD needs, according to DOD officials.
- **Increased reliance on space:** according to DOD officials, with the shift to peer and near-peer competition, the DOD could become increasingly reliant on the space domain to provide penetrating

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<sup>18</sup>DOD Directive 5105.60, *National Geospatial-Intelligence Agency (NGA)* (July 29, 2009).

<sup>19</sup>In the next section of this report, we discuss DIU's prototype contracts. DIU officials stated that they consult with NRO on their efforts on commercial satellite capabilities.

<sup>20</sup>The Center for Southeastern Tropical Advanced Remote Sensing is a satellite data reception and analysis facility with a DOD focus located near Miami, Florida. The facility includes a high degree of automation for satellite data tasking, reception, processing, exploitation, and delivery of imagery, according to a University of Miami fact sheet.

intelligence, surveillance, and reconnaissance capabilities that can help defeat an adversary's anti-access and area denial efforts.

The establishment of U.S. Space Force in 2019 could also affect the demand for remote sensing capabilities. For example, Space Force leaders have publicly announced their intention to consider expanding the service's roles and responsibilities to include acquiring commercial satellite imagery.<sup>21</sup> Further, in 2021, DOD endorsed Space Force's role as the integrator of joint space requirements.<sup>22</sup> Space Force officials told us this includes requirements for commercial space capabilities. Space Force has been studying DOD's existing operational needs for commercial space capabilities—including GEOINT needs that have not yet been well defined—according to these officials. The officials told us that they were doing so in coordination with key stakeholders, including NRO and NGA.

NGA, as the GEOINT Functional Manager, issued in 2021 the *2035 GEOINT CONOPS* as a roadmap to sustain the GEOINT enterprise, which states that clear roles and responsibilities among partners is an imperative for change to decrease unnecessary duplication and maximize results.<sup>23</sup> Specifically, NGA recommended the creation of a "decision priority framework" to consider roles and responsibilities, acceptable risk tolerance, and the contribution of current and future partners of the GEOINT enterprise.

However, the IC and DOD have not ensured the establishment of clear roles and responsibilities for the acquisition of commercial satellite imagery and have not communicated such guidance to all relevant stakeholders. NRO and NGA have memoranda documenting specific responsibilities among their two agencies, and officials from these components told us that they are generally satisfied with the agreements

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<sup>21</sup>For example, according to media reporting of a defense conference on May 12, 2021, the Chief of Space Operations, General Raymond, stated that there is a role for Space Force and tactical-level intelligence, surveillance, and reconnaissance and highlighted the service's intent to look at small satellites and commercial capabilities that can track moving ground targets. See Everstine, Brian, "Raymond: Expect the Space Force to Provide Tactical ISR," Air Force Magazine (May 12, 2021).

<sup>22</sup>Vice Chairman of the Joint Chiefs of Staff, *JROC Strategic Directive for Information Advantage: Title 10/50 Interdependency*, JSD 003-21 (June 21, 2021). (SECRET//NOFORN)

<sup>23</sup>National System for Geospatial Intelligence, *2035 GEOINT CONOPS* (2021).

between their two agencies. However, there is no guidance that addresses organizational roles and responsibilities across the IC and DOD related to commercial satellite imagery, which NGA recommended in the *2035 GEOINT CONOPS*. Additionally, according to current and former IC officials, the Director of National Intelligence's decision to give NRO the primary role in these acquisitions was not supported by an analysis of alternatives or similar mission assessment that would evaluate the roles and responsibilities across the IC and DOD relating to commercial satellite imagery acquisition.<sup>24</sup>

Clarifying roles and responsibilities across the IC and DOD for the acquisition of commercial satellite imagery and updating guidance accordingly could decrease unnecessary overlap by helping to ensure that components know which agency is responsible for buying what commercial satellite data and services. This would contribute to a unity of effort—as called for in the *2021 Commercial GEOINT Strategy*—regardless of whether NRO acquires certain types of commercial satellite imagery while other components are responsible for other types. The lack of clarity and documentation on IC and DOD component roles and responsibilities may already be contributing to potentially overlapping efforts in the acquisition of commercial satellite imagery. For example, the Army, DIU, U.S. Southern Command, and NRO, as of January 2022, have partnered with the same commercial vendor to provide similar satellite imagery services, creating potential overlap. Without clarifying roles and responsibilities and communicating them to all relevant stakeholders, the potential for unnecessary overlap will increase as interest in commercial imagery continues to grow across the IC and DOD.

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## The IC's Approach to Commercial Imagery Has Limited Ability to Incorporate Emerging Capabilities

NRO has licensed commercial satellite imagery, and the IC and DOD have established an implementation approach for the acquisition of commercial imagery focused primarily on foundational intelligence—

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<sup>24</sup>The IC and DOD conducted an economic analysis of the industry for commercial satellite imagery capabilities in 2017 and 2018, but this analysis did not involve an evaluation of organizational roles and responsibilities for acquiring commercial satellite imagery capabilities across the IC and DOD.

intelligence that is a critical element in the planning for military operations.<sup>25</sup> However, the IC and DOD are not well positioned to fully incorporate emerging commercial satellite capabilities in a timely manner.

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### The IC Approach for Commercial Imagery Is Focused on Foundational Needs

In May 2022, NRO's CSPO signed three electro-optical operational support contracts with commercial vendors—BlackSky, Maxar, and Planet—satisfying a portion of current GEOINT requirements.<sup>26</sup> According to NRO, the contracts include a five-year base and multiple one-year options with additional growth through 2032. NGA had contracts with Maxar and Planet before transferring them to NRO after the latter agency assumed responsibility for the acquisition of commercial imagery in 2017. NRO also added an operational support contract with BlackSky before signing new contracts in May. CSPO's spending on commercial imagery contracts represents a small portion of the NRO GEOINT directorate's overall spending.<sup>27</sup>

In September 2021, the IC validated commercial space requirements in a document commonly referred to as the commercial Statement of Capability (SOC). As part of its development, the IC and DOD assessed electro-optical GEOINT requirements over the next decade, and the document identifies IC and DOD commercial satellite imagery requirements for this period. The commercial SOC addresses one layer of

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<sup>25</sup>Foundational intelligence—also known as foundational military intelligence—is all-source intelligence collected by the IC on other countries' militaries and infrastructure and is a critical element in the planning for military operations.

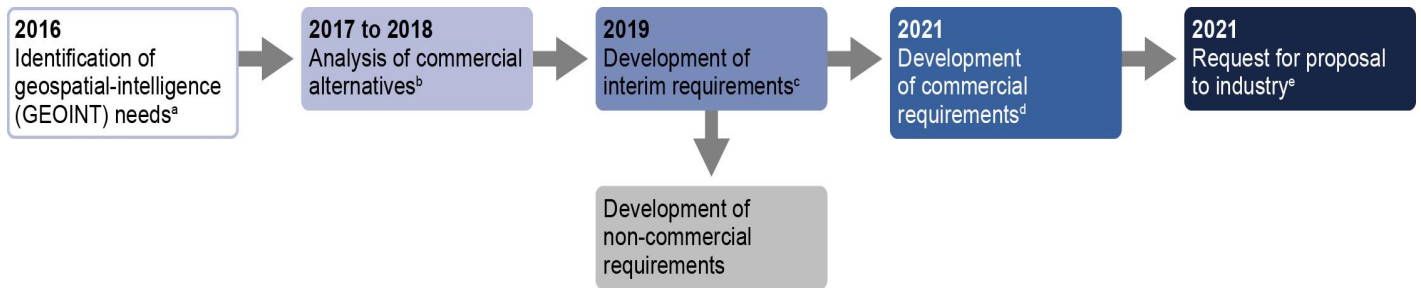
<sup>26</sup>According to NRO officials, operational support contracts are long-term contracts that are used in intelligence and other defense operations. Additionally, according to NGA's basic doctrine, electro-optical sensors derive data from the ultraviolet through the infrared portions of the electromagnetic spectrum. These sensors are normally passive and use natural energy sources such as the sun or emitted heat; they generate data by capturing the reflected or emitted electromagnetic energy from an object. Radar is a different category of sensor.

<sup>27</sup>An appendix with specific details regarding planned and historic spending on commercial satellite imagery and comparisons of CSPO spending to overall spending by NRO's GEOINT directorate were omitted because the information is classified.

electro-optical satellite capabilities—the commercial layer—needed to meet their overall electro-optical GEOINT requirements.<sup>28</sup>

According to officials, the requirements document was developed over a 5-year period using both the IC and DOD’s traditional requirements processes. Key steps in the development of this document are in figure 2.

**Figure 2: IC’s and DOD’s 5-Year Process Used to Develop Commercial Requirements**



Source: Summary of U.S. Intelligence Community (IC) and Department of Defense (DOD) information. | GAO-22-106106

<sup>a</sup>The National Geospatial-Intelligence Agency (NGA) identified their overall IC and DOD geospatial-intelligence (GEOINT) needs in the GEOINT Enterprise Capabilities Document starting in 2016 with the document released in 2017. See NGA, *Geospatial Intelligence Enterprise Capability Document (GEOINT ECD)* (March 2017). (TOP SECRET//SI//TK//RSEN/NOFORN)

<sup>b</sup>The IC conducted an Analysis of Alternatives exploring commercial capabilities and what they could provide to meet IC and DOD GEOINT requirements.

<sup>c</sup>The IC released an interim document that captured requirements for both government and commercially-sourced satellite capabilities.

<sup>d</sup>In September 2021, the IC released the commercial Statement of Capability (SOC) document that identifies IC and DOD requirements specific to commercial satellite imagery.

<sup>e</sup>In November 2021, the National Reconnaissance Office issued a request for proposal soliciting commercial imagery providers following the release of the commercial SOC in September.

The outcome of this process is a commercial SOC focused primarily on foundational capabilities, such as open ocean surveillance, environmental monitoring, and disaster relief, among others. NRO officials told us that this allows government programs to focus on more challenging needs the commercial sector is not addressing. IC officials also said that a benefit of formally allocating some requirements to commercial capabilities is that this provides more long-term stability in the requirements for these capabilities. According to senior NGA officials, commercial satellite

<sup>28</sup>According to NGA officials, this commercial SOC applies to electro-optical imagery. Officials noted that, although NRO was also exploring commercial radar satellite capabilities, there were no IC and DOD formal requirements at the time of our review and NGA had not developed the enterprise-wide ground infrastructure for this capability.

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companies meet nearly 98 percent of NGA's mapping mission requirements—the foundational intelligence needed for mapping, charting, and geodesy functions.<sup>29</sup>

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## The IC and DOD Use of Emerging Capabilities Has Been Limited

IC and DOD components have been exploring emerging capabilities offered by commercial companies; however, there has been limited incorporation and sustainment of these capabilities into GEOINT operations—the critical next steps after exploration.<sup>30</sup> Apart from commercial satellite imagery being collected to meet operational needs, NRO and other DOD organizations have explored these emerging capabilities through a variety of approaches. See Table 2 for a summary of selected approaches (see also appendix IV for more details on these approaches).

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<sup>29</sup>Geodesy is defined as the branch of applied mathematics concerned with measuring, or determining, the shape of the earth or a large part of its surface, or with locating exactly points on its surface.

<sup>30</sup>Emerging capabilities are new and emerging phenomenologies used for collecting imagery, such as radar and hyperspectral imaging.



**Table 2: Selected Approaches for IC and DOD Exploring Emerging Satellite Capabilities**

Approach	Example of Component Leveraging Approach	Summary of Approach
Study Contract	National Reconnaissance Office (NRO)	Agency explores commercial vendors' capabilities through small, short-term contracts that can potentially transition into larger, operational support contracts.
Broad Agency Announcement	NRO	Contracts are intended to aid the acquisition of research and allow for single or multiple, small, short-term awards. <sup>a</sup>
Prototype Contract	Office of the Secretary of Defense, Defense Innovation Unit	Contracts are competitively issued using Other Transaction Authority to find commercial solutions in response to specific problems or capability gaps identified by one or more DOD entities. <sup>b</sup>
"Pitch Day" Contracts	Space Force	Pitch Day is an annual event to identify, fund, and fast-track innovative new technologies in the space domain. Commercial vendors participating in the event are not guaranteed a contract, but officials noted that they intend to sign starter contracts immediately after the event.

Source: GAO summary of U.S. Intelligence Community (IC) and Department of Defense (DOD) information. | GAO-22-106106

Note: U.S. Intelligence Community (IC) and Department of Defense (DOD) components identified these approaches—and related contracts—in written responses to us and in interviews.

<sup>a</sup>48 C.F.R § FAR 35.016 provides procedures for broad agency announcements for the acquisition of basic and applied research and exploration and that part of development not related to the development of a specific system or hardware procurement.

<sup>b</sup>Other Transaction Authority refers to statutory authority to engage industry and academia for research and prototyping activities. Other transactions are legally binding contracts that are generally exempt from certain federal laws and regulations that apply to government procurement contracts. See 10 U.S.C. § 4021 and § 4022.

From fiscal year 2019 through 2021, NRO spent some of its commercial imagery budget on emerging capabilities, but those efforts have not generally led to sustained funding. For example, NRO had awarded five study contracts as of July 2021 but to date has transitioned only one commercial vendor from a study contract to an operational support contract.<sup>31</sup> According to two of the five commercial vendors that had study contracts, the small dollar amount of this contract type limits the ability of vendors to expand and enhance service offerings.

Similarly, NRO has on two occasions used Broad Agency Announcements to explore emerging capabilities.<sup>32</sup> NRO officials stated that the contracts associated with the announcements are scalable in value and duration, and they can develop capabilities to a point where

<sup>31</sup>In 2021, NRO transitioned their study contract with BlackSky to an operational contract.

<sup>32</sup>48 C.F.R. § 35.016 states that Broad Agency Announcements may be used by agencies to fulfill their requirements for scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding rather than focusing on a specific system or hardware solution.

they are ready for an operational support contract. However, the Broad Agency Announcement approach is limited by regulation as it is designed to be a contracting tool focused on basic research and exploration and is not intended to support the development of systems or hardware procurement. NRO officials did not identify a separate process—one that could avoid a potentially lengthy requirements-related process—for transitioning contracts associated with the Broad Agency Announcement to operational ones.<sup>33</sup> Further, NRO's acquisition strategy supporting the commercial electro-optical SOC outlines the process it will use for evaluating and onboarding emerging capabilities, but notes that this process will be used to inform requirements for future SOCs, such as a future commercial radar SOC, and is not intended to incorporate or scale-up the use of emerging capabilities. Although the SOC has a required performance measure relating to emerging capabilities, the document does not provide specific details on how this measure will be implemented.

NGA also faces challenges integrating data from emerging capabilities acquired by NRO, according to NGA officials. For example, NGA officials reported that, although NRO has a number of study contracts exploring commercial radar capabilities, NGA does not have formal requirements to ingest and process this commercial radar data in their ground systems from these emerging capabilities. NGA can use commercial radar data to a limited degree, but the agency has no sustainable capability or means to scale up the use of this satellite radar data at the enterprise level, according to agency officials.

Key government and industry officials have acknowledged that the current approach to acquiring commercial imagery does not position the IC and DOD well to incorporate emerging commercial capabilities in a timely manner. Four of the commercial imagery vendors that had study contracts highlighted their frustration with the long lead time of the process, and also emphasized that the small study contracts rarely translated into larger government commitments.<sup>34</sup> As a result, commercial imagery vendors with promising new capabilities may lack the support they need to scale and sustain these capabilities. Space Force officials

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<sup>33</sup>See figure 2 and discussion earlier on how the IC and DOD took 5 years to develop electro-optical space requirements for the commercial sector.

<sup>34</sup>We interviewed four of the five commercial vendors that held study contracts with NRO, as of July 2021, to understand the perspective these vendors have on NRO's ability to incorporate emerging commercial capabilities into the national imagery architecture.

also emphasized that the current requirements approach for acquiring commercial imagery is not dynamic enough to leverage industry innovation that could address warfighter needs. Senior IC officials stated that the IC faces challenges in incorporating valuable commercial innovations for which there are no clear requirements. According to IC and DOD officials, the IC and DOD requirements processes are not dynamic or adaptable enough to incorporate these emerging capabilities. IC and DOD officials highlighted that the commercial SOC, which required 5 years to develop, is not an appropriate instrument for the acquisition of emerging commercial capabilities.

The *National Strategy for Space* requires DOD, in conjunction with the Office of the Director of National Intelligence (ODNI), to reform processes to eliminate impediments to the timely delivery of space capabilities and the strategy notes the importance of using emerging capabilities.<sup>35</sup> The *2035 GEOINT CONOPS* recommended the acceleration of the use of commercial capabilities in the DOD and IC, and also recommended fast-tracking the process for producing emerging capabilities from request to capability delivery.

ODNI officials were aware that the approach was not effective in addressing their need for emerging capabilities and stated that they added an exploratory component to the commercial SOC. However, there were limited details in the document on how this will be implemented or how effective it would be at incorporating commercial capabilities in a timely manner. IC officials also identified key considerations that make it challenging to more fully incorporate emerging commercial capabilities including limited funding and the lack of a defined requirement for these capabilities.

IC and DOD officials have discussed potentially effective approaches that could mitigate concerns regarding the timeliness of incorporating emerging capabilities. For example, Space Force officials identified a commodity-buying approach to commercial space capabilities as a possible model. Under such an approach, the government would support the development of a capability until it is a commodity, and then would acquire the satellite capability as a commodity. This allows government to build trust in industry as it grows, and this is the model used by the commercial office in Space Force. However, the IC and DOD have not yet implemented such an approach for commercial imagery. Further, in a

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<sup>35</sup>The White House, *National Strategy for Space* (Mar. 5, 2018).

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recent report to Congress, IC and DOD components proposed accelerating the use of commercial space-based capabilities, including the creation of two new commercial-focused boards and a more rapid requirements prioritization process, but there were limited details in the report on how this will be implemented.<sup>36</sup>

Meanwhile, foreign competitors, such as China, are rapidly advancing their own commercial capabilities, including emerging capabilities. The U.S. risks losing ground in the fight for space dominance to foreign competitors such as China, unless the IC and DOD develop an effective approach to incorporate and sustain emerging commercial satellite capabilities in a timely manner.<sup>37</sup>

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## The IC and DOD Have Not Developed Key Performance Goals and Measures to Maximize Commercial Use

Federal law and executive branch policy encourage the maximum utilization of commercial space capabilities, but the IC and DOD have not developed performance goals and measures to assess progress toward that strategic goal for commercial satellite imagery.<sup>38</sup> For example, the *2021 Commercial GEOINT Strategy* notes the need to leverage commercial capabilities to maintain and grow the U.S. competitive advantage in space. Also, section 1612 of the National Defense Authorization Act for Fiscal Year 2021 directed the IC and DOD to leverage, to the extent practicable, the capabilities of U.S. industry

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<sup>36</sup>NRO, NGA, and NSA, *Accelerating U.S. Government Support For Commercial Space-Based Capabilities* (Jan. 19, 2022).

<sup>37</sup>In the last year, NGA assessed global commercial satellite capabilities and found the U.S. holds a tenuous technical performance lead in the commercial imaging market.

<sup>38</sup>Our prior work described the relationship between strategic goals, performance goals, and performance measures. Whereas strategic goals are goals that set a general direction for a program's efforts—maximization of commercial space capabilities in this case—performance goals are specific results, or defined outcomes, an agency expects to achieve, and performance measures show concrete progress the agency is making in achieving those performance goals. See, for example, GAO, *Veterans Justice Outreach Program: VA Could Improve Management by Establishing Performance Measures and Fully Assessing Risks*, [GAO-16-393](#) (Washington, D.C.: Apr. 28, 2016).

including the acquisition of domestic commercial satellite imagery.<sup>39</sup> In May 2021, a senior ODNI official sent a letter to Members of Congress affirming that it was committed to ensuring the “maximum contribution” from commercial capabilities in the future.

NRO and NGA officials stated that they were committed to the expanded use of commercial capabilities and identified the commercial SOC as the mechanism to acquire commercial satellite imagery. The commercial SOC includes technical measures to track some aspects of commercial imagery use, such as coverage, timeliness, and accuracy, which lay out tactical and operational level expectations for commercial imagery providers.<sup>40</sup> However, it does not include performance goals and measures specifically aimed at maximizing the use of commercial capabilities. Rather, the commercial SOC allocates to commercial providers the portion of electro-optical requirements, which the IC and DOD determined commercial providers could best address, according to DOD officials.

The IC and DOD have issued guidance for the use of commercial satellite imagery, but it does not include specific performance goals and measures that would allow assessment of progress toward maximizing the use of this imagery.<sup>41</sup> Our prior work found that identifying specific performance goals and measures provides accountability for an agency to meet

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<sup>39</sup>Pub. L. No. 116-283, § 1612 states in part that the NRO and NGA Directors shall each consider whether there is a cost-effective domestic commercial capability or service available that can meet any or all of the GEOINT requirements of the DOD, the IC, or both, and if a cost-effective domestic commercial capability or service is available, they shall give preference to using such domestic commercial capability or service to meet requirements.

<sup>40</sup>NGA officials reported that the NGA Source directorate tracks technical and user metrics within the agency’s GEOINT Information Management Services, including imagery requirements that are met. Further details on commercial SOC requirements were omitted because the information is classified.

<sup>41</sup>According to NGA officials, NGA was directed by ODNI to produce a methodology in 2022 for measuring commercial imagery use and applications. This effort is ongoing so it is unclear if it will develop performance goals and measures to maximize commercial imagery.

defined, long-term outcomes.<sup>42</sup> Table 3 shows a range of documents without these goals and measures.

**Table 3: IC and DOD Documents without Specific Performance Goals or Measures to Maximize Commercial Imagery**

Document Title	Explanation
<i>2035 GEOINT CONOPs</i>	Develops a strategic vision for geospatial intelligence for the IC and DOD but offers no specific performance goals or measures to maximize commercial imagery.
<i>Commercial GEOINT Strategy (2021)</i>	Lays out vision for use of commercial imagery but offers no specific performance goals or measures to maximize commercial imagery.
<i>Commercial GEOINT Strategy (2018)</i>	Lays out vision for use of commercial imagery, including implementation imperatives and themes for commercial imagery, but offers no specific performance goals or measures to maximize commercial imagery.
<i>Acquisition Strategy: Electro-Optical Follow-On Base Capability-Commercial</i>	Develops strategy for National Reconnaissance Office (NRO) to acquire commercial satellite capabilities, but offers no specific performance goals or measures to maximize commercial imagery.
<i>Electro-Optical Follow-On (EOFO) Base Capability-Commercial Program Management Plan (PMP)</i>	Documents required goals for the Electro-Optical Follow-On program, including technical program requirements, but offers no specific performance goals or measures to maximize commercial imagery.
<i>Enhanced View Follow-On Performance Metrics</i>	Lists commercial vendor reported technical metrics NRO uses to assess Enhanced View program performance, but offers no specific performance goals or measures to maximize commercial imagery.

Source: GAO analysis of U.S. Intelligence Community (IC) and Department of Defense (DOD) documentation. | GAO-22-106106

Officials within the IC and DOD have identified examples of potential performance goals or measures to achieve their strategic goal of maximum commercial use. Performance goals or measures could address affordability. For example, the IC could compare the cost of commercially sourced images to government sourced images with similar attributes and choose the best option.<sup>43</sup> Others have argued for a minimum level of funding to address the strategic goal of maximization.

<sup>42</sup>GAO, *Managing For Results: Key Considerations for Implementing Interagency Collaborative Mechanisms*, [GAO-12-1022](#) (Washington, D.C.: September 2012); GAO, *Managing for Results: Practices for Effective Agency Strategic Reviews*, [GAO-15-602](#) (Washington, D.C.: July 2015); [GAO-16-393](#); GAO, *Personnel Vetting: Actions Needed to Implement Reforms, Address Challenges, and Improve Planning*, [GAO-22-104093](#) (Washington D.C.: Dec. 9, 2021); GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington D.C.: September 2014).

<sup>43</sup>IC use of commercial imagery increased significantly in 2011 at the time when commercial imagery was shown to be less expensive than government-sourced imagery, according to a former NGA official. DOD officials noted that in some cases commercial imagery may not be less expensive so this factor may not increase the use of this imagery. Space Force officials we talked to also noted that affordability, along with effectiveness and resiliency, would be good measures to maximize the use of commercial imagery.

For example, the *State of the Space Industrial Base 2020* report recommended establishing a long-term performance goal of acquiring 50 percent of government space information services from commercial sources.<sup>44</sup> According to the report, such a performance goal could support a growing U.S. market and ensure U.S. global competitive advantage in providing space information services. Although CSPO provides significant funding for commercial imagery, we did not identify any additional IC or DOD guidance that this funding meets the strategic goal of maximizing commercial imagery use.<sup>45</sup>

Further, senior IC and DOD officials have promoted a “buy before you build” approach for commercial capabilities, where the government would build its own systems only if there are no commercial capabilities to satisfy the need. However, Space Force officials have highlighted the need for performance measures that take into account the dynamism of the commercial marketplace, which is constantly developing new capabilities. An effective “buy before you build” or maximizing approach, according to these officials, would incorporate measures to regularly assess what the commercial marketplace can provide. For example, according to NGA officials, “dynamic SOCs” or another mechanism updated annually or more frequently can be a potential way to gain efficiencies in the pursuit of commercial capabilities. DOD officials similarly stated that formal requirements are not intended to be dynamic and expressed a need for more agile means to integrate commercial capabilities.

The IC and DOD have affirmed their intent to maximize the use of commercial imagery. However, they have not ensured the development of specific performance goals and measures that could assess progress toward the strategic goal of maximization and reflect the dynamic nature of the commercial marketplace. Until they establish such performance goals and measures, the IC and DOD risk missing commercial opportunities they say they need to maintain their advantage over competitors such as China.

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<sup>44</sup>*State of the Space Industrial Base 2020* (July 2020) was authored in part by DIU and Space Force senior officials, but is not DOD official guidance or performance measures. This report provides a long-term recommendation that illustrates an example of a possible funding performance goal.

<sup>45</sup>Specific details regarding CSPO yearly funding were omitted because the information is classified.

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## The IC and DOD Face Challenges Coordinating on Commercial Analytic Services

NGA and other DOD components have begun in recent years to acquire some commercial analytic services that use remote sensing data.<sup>46</sup> However, IC and DOD components have not fully coordinated efforts on the use of such commercial analytic services due to a lack of understanding of the roles and responsibilities across the IC and DOD.

NGA serves as the IC and DOD lead for and primary acquirer of GEOINT-related commercial analytic services, including services that use remote sensing data.<sup>47</sup> NGA's GEOINT vision and commercial strategy identify how important these analytic services will likely become. The agency's *2035 GEOINT CONOPS* highlights that a massive influx of new data and sources over the past 15 years has affected how GEOINT is delivered to customers; the concept envisions that commercial, national, and partner platforms will blanket the globe in GEOINT coverage spanning the electromagnetic spectrum and will process near real-time data that serves the warfighter.

The NSG Enterprise's *Commercial GEOINT Strategy* lays out goals to apply automation, artificial intelligence, and machine learning to commercial data and to invest in commercial capabilities. These goals involve expectations that commercial industry will develop automated imagery exploitation algorithms and provide daily feeds and activity updates to the government. Making use of commercial analytic services that use remote sensing data could play an important role in processing and analyzing this significant influx of data.

In recent years, NGA has acquired a number of different commercial analytic services for various purposes that use remote sensing data, including services to monitor economic indicators and transportation networks, as well as to detect change. NGA's spending on commercial

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<sup>46</sup>For purposes of this report, we refer to "commercial analytic services" as those commercial services that take in remote sensing data, or satellite imagery, as an input and then process and exploit that data—such as through automated algorithms—to produce analytic outcomes.

<sup>47</sup>NRO and NGA, *Memorandum of Understanding Between the National Reconnaissance Office and the National Geospatial-Intelligence Agency on Partnership and Collaboration in Support of their Missions* (September 2017). (TOP SECRET//TK// NOFORN)



analytic services remains relatively small though when compared to NGA and NRO spending on commercial satellite imagery.<sup>48</sup>

Officials at DOD components stated that they understand NGA's general role in acquiring commercial analytic services. However, DOD officials in eight components reported that they were unclear about the specific responsibilities for commercial analytic services that use remote sensing data within the IC and DOD, such as the selection process or defined mission areas. For example, they stated they were unclear about the decision steps or processes they should use to choose these commercial services.<sup>49</sup> NGA officials acknowledged that there are no defined roles for commercial analytic services that use remote sensing data within the IC and DOD. Defined roles could include the Army buying GEOINT analytics relevant to ground warfare or the Navy buying GEOINT analytics on sea lanes which use remote sensing data. Such formal roles have not been defined.

Additionally, officials from nine different DOD components reported that they had a limited understanding of whether the IC or DOD have a mechanism to provide centralized visibility into resourcing for commercial analytic services that use remote sensing data. For example, officials in one combatant command noted the lack of centralized visibility into the supplier base for commercial analytic services. Officials in another command stated a need for a centralized tool or portal that provides visibility into analytic services available for combatant command use. Key NGA officials confirmed that their agency has limited enterprise visibility of IC and DOD components' use of commercial analytic services that use remote sensing data. These officials stated that—although the amount spent annually on commercial satellite imagery was generally known—the amount being spent on commercial analytic services across the IC and DOD was unknown.

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<sup>48</sup>Specific details comparing spending on commercial analytic services to NRO and NGA expenditures on commercial satellite imagery for operational use were omitted because the information is classified.

<sup>49</sup>Officials in one combatant command stated that there is not a good understanding of NGA and NRO and what the different roles and responsibilities are for commercial analytic services that use remote sensing data. Navy officials told us that they have little to no visibility into specific roles and responsibilities for these analytic services across the IC and DOD.

Further, officials from 11 DOD components reported that they had little or no understanding of whether the IC or DOD has performance goals or measures to enhance the use of commercial analytic services that use remote sensing data.<sup>50</sup> According to NGA officials, the agency has developed some internal performance measures to assess the return on investment of commercial analytic services NGA uses, but there are no enterprise-wide performance goals or measures for these services that would be visible to the IC and DOD. Once they have the metrics to support the need for these commercial services—according to NGA officials—they can then develop requirements for them, similar to the commercial SOC for imagery.<sup>51</sup>

Leading practices for government collaboration state that interagency efforts need clear roles and responsibilities, visibility into resourcing, and mechanisms for accountability and organizational outcomes, such as agreed-upon performance goals and measures to monitor and evaluate results.<sup>52</sup> The 2019 *National Intelligence Strategy* also states that the IC needs to increase collaboration to create a culture of innovation.

However, the IC and DOD have not ensured that NGA officials provide guidance that clearly explains the path forward with commercial analytic services that use remote sensing data—to include specific roles and responsibilities, resourcing, and performance goals and measures. Officials from 12 DOD components reported they were unaware of written guidance relating to these commercial services. OSD officials also told us that NGA does not actively encourage commercial analytic services from being transitioned to full operational use. NGA officials acknowledged that the mission area needs more documentation and maturity.

Without clear guidance on roles and responsibilities, the IC and DOD may face challenges in using additional commercial analytic services in their operations. Providing clear roles and responsibilities for, resourcing visibility into, and performance goals and measures for these services to IC and DOD components would help clarify an approach while also

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<sup>50</sup>Army officials stated that they were unaware of any measures to enhance commercial analytic services that use remote sensing data in the IC and DOD. Marine Corps Headquarters officials similarly reported that there are no measures to track the use of such commercial analytic services.

<sup>51</sup>NGA officials reported that they are developing a SOC for analytic services, and they are planning on releasing a draft of this document by the end of 2022.

<sup>52</sup>[GAO-12-1022](#). This report summarizes key features of collaborative mechanisms, which we used to assess IC and DOD efforts in this mission area.

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improving interagency coordination on these commercial services that the IC expects to grow increasingly important. Such actions could provide a number of potential benefits, including reduced costs to government and improved handling of the ever-growing volume of satellite data.

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## Conclusions

As evidenced by the public use of commercial remote sensing data regarding the Russian invasion of Ukraine, commercial companies can play a critical role in providing satellite imagery and related capabilities to address critical national security issues. The IC and DOD, however, continue to employ a potentially fragmented, slow, and cumbersome approach to incorporating these commercial capabilities into intelligence and defense operations. The IC and DOD have not ensured clear roles and responsibilities for acquiring commercial satellite imagery, have not developed an effective approach to scale emerging commercial capabilities into operational support contracts in a timely manner, have not identified specific performance goals and measures to assess progress toward maximizing the use of commercial satellite imagery, and have not provided guidance to establish specific roles and responsibilities for the use of commercial analytic services that use remote sensing data. Until the IC and DOD adopt an effective and unified approach to pursue emerging capabilities and hold themselves directly accountable for maximizing the contribution of commercial satellite capabilities, the U.S. risks losing ground to emerging competitors in the space domain as well as the ability to deliver technological advantages to the warfighter.

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## Recommendations for Executive Action

The Secretary of Defense, in coordination with the Director of National Intelligence, should ensure that clear roles and responsibilities across IC and DOD stakeholders are established for the acquisition of commercial satellite imagery, such as through a broad assessment or evaluation of organization responsibilities, and then ensure that these roles are updated in DOD guidance and communicated to all relevant stakeholders. (Recommendation 1)

The Secretary of Defense, in coordination with the Director of National Intelligence, should ensure that NRO, in coordination with NGA and IC and DOD stakeholders, assesses various approaches to determine which ones are most effective in incorporating and scaling emerging commercial

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satellite capabilities into operational support contracts in a timely manner. (Recommendation 2)

The Director of National Intelligence, in coordination with the Secretary of Defense, should ensure that NGA and NRO develop specific performance goals and measures that would support progress toward the goal of maximizing the use of commercial satellite imagery. (Recommendation 3)

The Director of National Intelligence, in coordination with the Secretary of Defense, should ensure that NGA, in coordination with IC and DOD stakeholders, develops guidance to establish specific roles and responsibilities for commercial analytic services that use remote sensing data. The guidance should note the components responsible for addressing resourcing visibility and for identifying performance goals and measures related to commercial analytic services that use remote sensing data. (Recommendation 4)

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## Agency Comments and Our Evaluation

We provided a draft of this report to DOD and ODNI. DOD provided written comments, in which it concurred with our two recommendations addressed to DOD. DOD's written comments are reprinted in their entirety in appendix V. ODNI provided written comments, but it did not state whether it concurred with the recommendations addressed to ODNI. ODNI's written comments are classified and so are not reprinted in this report. DOD and ODNI also provided technical comments, which we incorporated into the report where appropriate.

DOD concurred with our recommendation to ensure that clear roles and responsibilities across the IC and DOD stakeholders are established for the acquisition of commercial satellite imagery, such as through a broad assessment or evaluation of organizational responsibilities, and then ensure these roles are updated in DOD guidance and communicated to all relevant stakeholders. The department stated that it will revise DOD directives for NRO and NGA to capture decisions related to the roles and responsibilities associated with commercial imagery acquisition. We believe that this is a good initial step and that DOD should also conduct a broad assessment or evaluation of organizational responsibilities across all relevant IC and DOD stakeholders, such as the military services, for the acquisition of commercial imagery to fully address the intent of our recommendation.

DOD concurred with our recommendation to assess various approaches to determine which ones are most effective in incorporating and scaling emerging commercial satellite capabilities into operational support contracts in a timely manner. The department stated that it will continue to assess if other approaches—apart from NRO's Strategic Commercial Enhancements Broad Agency Announcement—would afford greater ability for incorporating and scaling emerging commercial imagery. We highlighted in the report several challenges with leveraging the Broad Agency Announcement approach to scale up capabilities, including funding limitations and a requirement to focus on research. We continue to believe that the department should assess and carefully consider other approaches that may help scale up emerging capabilities in a timelier manner.

ODNI did not state whether it concurred with the recommendations addressed to it. ODNI instead noted its concerns that the findings, conclusions, and recommendations in the draft report are missing important aspects of the IC's efforts in this matter. Specific details on these concerns are omitted because the information is sensitive or classified. However, we believe we have fully addressed ODNI's concerns, to include a thorough description in the report of NRO and NGA roles and responsibilities for commercial imagery, as well as the identification of specific examples of performance goals and measures that could be leveraged. Further, ODNI did not address our finding that the IC and DOD requirements processes are not dynamic or adaptable enough to incorporate emerging capabilities in this mission area. We continue to believe that ODNI should ensure that NGA and NRO develop specific performance goals and measures that would support progress toward the goal of maximizing the use of commercial satellite imagery and that NGA develops guidance to establish specific roles and responsibilities for commercial analytic services that use remote sensing data.

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

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If you or your staff have any questions about this report, please contact me at (202) 512-5130 or [mazanecb@gao.gov](mailto:mazanecb@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 major contributions to this report are listed in appendix VI.

A handwritten signature in black ink, appearing to read "Brian M. Mazanec". The signature is fluid and cursive, with the first name "Brian" and last name "Mazanec" clearly distinguishable.

Brian M. Mazanec  
Director, Defense Capabilities and Management

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*List of Committees*

The Honorable Mark Warner  
Chairman  
The Honorable Marco Rubio  
Vice Chairman  
Select Committee on Intelligence  
United States Senate

The Honorable Adam Schiff  
Chairman  
The Honorable Michael Turner  
Ranking Member  
Permanent Select Committee on Intelligence  
House of Representatives

# Appendix I: End-User License Agreements for Commercial Imagery

The National Reconnaissance Office (NRO) developed a common family of end-user license agreements that will support sharing of commercial imagery across a broad user community and be used in future contracts. The end-user license agreements represent different levels of shareability. Table 4 shows NRO's five types of end-user license agreements for commercial imagery and the different sets of authorized users, as indicated by the check mark. The agreements range from least restrictive (Public Release) to most restrictive (National Security).

**Table 4: Types of End-User License Agreements for Sharing of Commercial Imagery**

	Public Release	U.S. Government Plus	U.S. Government	National Security Plus	National Security
<b>Authorized User Community</b>					
DOD and IC	Checked	Checked	Checked	Checked	Checked
Executive Office of the President and Congress	Checked	Checked	Checked	Checked	Checked
<ul style="list-style-type: none"> <li>DOD and IC</li> <li>Foreign Mission Partners for National Security Purposes</li> </ul>	Checked	Checked		Checked	
U.S. Federal Civil Government	Checked	Checked	Checked		
<ul style="list-style-type: none"> <li>U.S. Federal Civil Government</li> <li>Foreign Civil Partners for U.S. Government Purposes</li> </ul>	Checked	Checked			
U.S. State, Local, and Tribal Government	Checked	Checked	Checked		
Non-Governmental Organizations for Government Purposes	Checked	Checked	Checked		
Contractors and Grantee Organizations Associated with Government Agency	Checked	Checked	Checked	Checked	Checked



**Appendix I: End-User License Agreements for Commercial Imagery**

	<b>Public Release</b>	<b>U.S. Government Plus</b>	<b>U.S. Government</b>	<b>National Security Plus</b>	<b>National Security</b>
Public Release	Checked				

Source: NRO, Commercial Imagery End User License Agreement Fact Sheet. | GAO-22-106106

According to NGA officials, if commercial data were properly licensed for sharing, the unclassified nature of this data can help satisfy DOD demands for information for public messaging campaigns about adversarial activities on earth. Imagery associated with end-user license agreements that allow for wider distribution tend to be more expensive than imagery with more restrictive terms, according to NRO officials.

## Appendix II: Objectives, Scope, and Methodology

This report assesses the extent to which the IC and DOD have (1) established roles and responsibilities relating to the acquisition of commercial satellite imagery, (2) incorporated emerging satellite capabilities, (3) developed performance goals and measures to enhance the use of commercial satellite imagery, and (4) coordinated on commercial analytic services that use remote sensing data.

To address these objectives, we collected information from five commercial satellite imagery vendors contracted by the National Reconnaissance Office (NRO) to show examples of how the U.S. Intelligence Community (IC) and the Department of Defense (DOD) have been incorporating commercial satellite imagery into their operations. NRO officials identified the companies with which it has contracts. We selected a non-generalizable sample of companies with analytic service contracts that use satellite imagery as an input. We used this information to identify industry perspectives on the benefits and challenges of the government's approach to commercial integration and government processes to leveraging commercial satellite imagery and analytic services for geospatial intelligence (GEOINT). We also interviewed five area experts. These included:

- Three of three companies with operational support imagery contracts with NRO, as of July 2021, to provide insight into how NRO was working with its primary commercial imagery vendors. These included Maxar, Planet, and BlackSky. Each of these three companies also have study contracts and were included in our sample below of study contract vendors.
- Four of five companies with study contracts with NRO, as of July 2021, to provide us with perspectives on IC and DOD efforts to incorporate new vendors and commercial services. These included Capella Space, HawkEye 360, Maxar, and Planet. Both Maxar and Planet also have operational support contracts and were included in our selection above of companies with operational support contracts.
- Three companies from about a dozen vendors with analytic services contracts with NGA to provide perspective into companies that use satellite imagery as an input in their analytic service offerings to the IC and DOD. These included Alion, MapLarge and Ursa Analytics.

- Five area experts to provide us with a historical understanding of the government’s decisions and approach to commercial satellite capabilities and a current understanding of industry perspectives.

We used information obtained from discussions with these companies and experts to reinforce and corroborate information we heard from agencies, such as the National Geospatial-Intelligence Agency (NGA) and NRO, throughout our report and as independent evidence where appropriate, for our objectives. We collected documents and conducted interviews that included questions about each vendor’s experiences working with the IC and DOD and describing related challenges.

To assess the extent to which the IC and DOD have established roles and responsibilities relating to the acquisition of commercial satellite imagery, we reviewed IC and DOD documentation describing the roles and responsibilities for the acquisition of commercial imagery. Specifically, we reviewed memoranda between NGA and NRO identifying specific roles and responsibilities for the acquisition of commercial satellite imagery capabilities, and IC documents directing the transfer of acquisition authority from NGA to NRO and interim steps for the transition process, including the formation of a joint commercial GEOINT activity.<sup>1</sup> We also collected documents and interviewed IC and DOD components to understand what commercial imagery capabilities were being used and the extent to which the acquisition structure was meeting customer needs. We evaluated the current documentation and component perspectives and efforts against NGA guidance for GEOINT calling for clear roles and responsibilities to determine whether these roles and responsibilities—for acquiring commercial satellite imagery—were understood in the IC and DOD.<sup>2</sup>

To assess the extent to which the IC and DOD have incorporated emerging satellite capabilities, we interviewed NGA, NRO, and other DOD officials to describe current efforts and the process for pursuing

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<sup>1</sup>NRO and NGA, *Memorandum of Understanding between the National Geospatial-Intelligence Agency and the National Reconnaissance Office on Partnership and Collaboration in Support of their Missions* (Sept. 8, 2017); NRO and NGA, *Memorandum of Agreement between the National Geospatial-Intelligence Agency and the National Reconnaissance Office For Commercial Imagery Operational Roles and Responsibilities* (Apr. 26, 2021). (TOP SECRET//TK// NOFORN) The commercial GEOINT activity was a joint NGA and NRO initiative to ensure in part that the government takes full advantage of new and emerging commercial GEOINT capabilities. The activity was advisory in nature and disbanded in 2018.

<sup>2</sup>National System for Geospatial Intelligence, *2035 GEOINT CONOPS* (2021).

emerging commercial imagery capabilities. We reviewed expenditures on commercial imagery provided by both NGA and NRO to understand how these imagery expenditures have changed in recent years, and how they compare to expenditures on emerging capabilities. To describe the IC and DOD approach to acquiring emerging capabilities, we reviewed the commercial Statement of Capability and related documents, including the commercial acquisition strategy and an analysis of alternatives exploring commercial capabilities. We examined press releases as well as agency solicitations to commercial vendors. We interviewed IC and DOD components to identify existing and proposed approaches for researching and incorporating emerging commercial capabilities. We also interviewed a variety of commercial vendors, as noted above, to understand industry perspectives on the approach to incorporating emerging commercial capabilities. We assessed documentation and component perspectives against IC and DOD direction in the *National Strategy for Space* and the *2035 GEOINT CONOPS* to determine the extent to which the IC and DOD were meeting the intent to reform and expedite their processes for emerging capabilities.<sup>3</sup>

To assess the extent to which the IC and DOD developed performance goals and measures to enhance the use of commercial satellite imagery, we interviewed IC and DOD officials and analyzed documentation to identify specific performance goals and measures for the use of commercial imagery and capabilities. Specifically, we reviewed strategy and other documents that may contain such goals or measures for commercial imagery, including the *2035 GEOINT CONOPS*, the commercial SOC, and the *Commercial GEOINT Strategy*.<sup>4</sup> We assessed whether these documents included performance goals or measures directly linked to factors specified in section 1612 of the National Defense Authorization Act for Fiscal Year 2021—directing the IC and DOD to leverage commercial imagery and capabilities over those of the government, if practicable—and in ODNI guidance to maximize commercial contributions.<sup>5</sup> Our prior work called for linking performance goals and measures directly to an entity’s strategic goals.

To assess the extent to which the IC and DOD coordinated on commercial analytic services that use remote sensing data, we reviewed

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<sup>3</sup>The White House, *National Strategy for Space* (Mar. 5, 2018).

<sup>4</sup>National System for Geospatial Intelligence, NSG Enterprise, *Commercial GEOINT Strategy* (2021).

<sup>5</sup>Pub. L. No. 116-283, § 1612 (2021).

IC and DOD documents and conducted interviews relating to commercial analytic services that use remote sensing data and the responsibilities for acquiring such services within the IC and DOD. For example, we interviewed officials from NGA to understand roles and responsibilities for the acquisition of analytic services; we also interviewed both NGA and industry officials, as noted previously, to collect documents and understand the IC and DOD's current use of commercial analytic services and associated challenges. We reviewed NGA budget numbers to examine the resources devoted to the acquisition of commercial analytic services compared to the acquisition of commercial satellite imagery. We then interviewed DOD components to identify what analytic services are acquired outside of NGA, and how these services are currently being used. We sent questions to DOD components and collected data on the extent to which IC and DOD are coordinating. Lastly, we assessed IC and DOD efforts in this area—from documents collected and DOD responses to our questions—against leading practices of interagency coordination, including participation in collaborative groups, clear roles and responsibilities, visibility into resources, and the existence of written guidance to determine the extent of interagency coordination on commercial analytic services that use remote sensing data.<sup>6</sup>

In assessing the extent to which the IC and DOD developed performance goals and measures for commercial satellite imagery and coordinated on commercial analytic services, we sent questions to and collected data from nearly every combatant command and all five services on performance measures, customer satisfaction, collection means, and elements of interagency coordination—including collaborative groups and tracking mechanisms for resourcing capabilities. We collected information from the following combatant commands and services:

- Combatant commands:
  - U.S. Africa Command
  - U.S. Central Command
  - U.S. European Command
  - U.S. Indo-Pacific Command
  - U.S. Northern Command

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<sup>6</sup>GAO, *Managing for Results: Key Considerations for Implementing Interagency Collaborative Mechanisms*, [GAO-12-1022](#) (Washington, D.C.: September 2012).

- U.S. Southern Command
- U.S. Space Command
- U.S. Special Operations Command
- U.S. Strategic Command
- U.S. Transportation Command
- Military services:
  - U.S. Air Force
  - U.S. Army
  - U.S. Marine Corps
  - U.S. Navy
  - U.S. Space Force

To document the growth in the number of active satellites in orbit, we used data from the Union of Concerned Scientists satellite database, which is updated several times a year. The database is an open source of data on active satellites that numerous government, academic, and think tank publications have cited. We assessed the database by reviewing database documentation and speaking with another government user of the database and determined that the database was sufficiently reliable for our purposes.

As a result of limitations on government operations in response to the Coronavirus Disease 2019 (COVID-19), our original timeline for issuing this report was delayed approximately 15 months because of effects to government and other operations related to COVID-19.

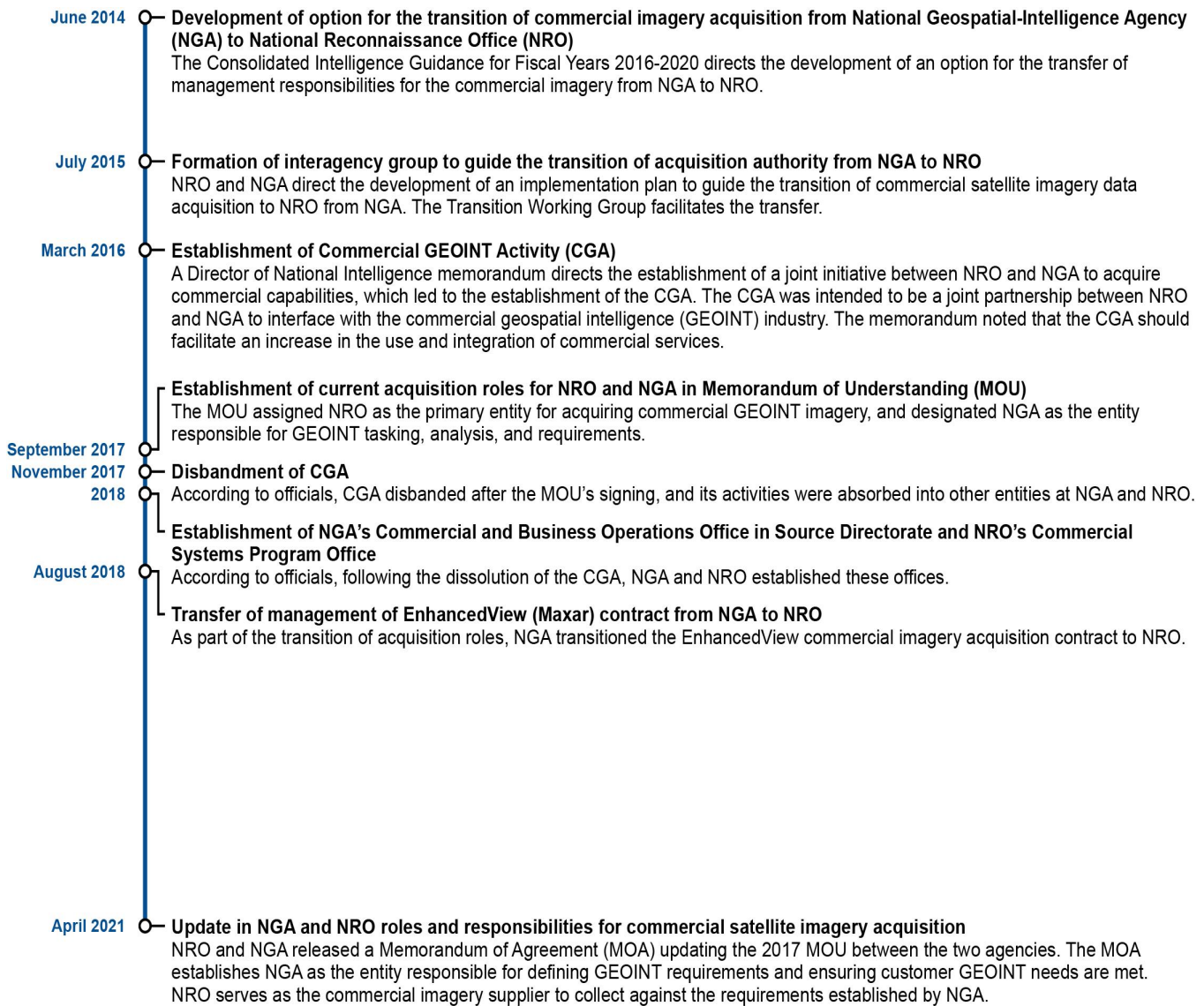
The performance audit upon which this report is based was conducted from March 2021 to July 2022 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for 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. We subsequently worked with DOD to prepare this unclassified version of the report for public release from July 2022 to September 2022. This public version was also prepared in accordance with these standards.

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## Appendix III: Timeline of Events

Figure 3 highlights the key events around the transfer of the responsibility for the acquisition of commercial satellite imagery from the National Geospatial-Intelligence Agency (NGA) to the National Reconnaissance Office (NRO), which includes the 2018 establishment of the Commercial Systems Program Office (CSPO) as the responsible NRO office.

**Figure 3: Events in the Transition of Responsibility for Commercial Satellite Imagery from NGA to NRO**



Source: Summary of U.S. Intelligence Community and Department of Defense documents and officials. | GAO-22-106106



# Appendix IV: IC and DOD Approaches to Emerging Satellite Capabilities

**Table 5: Selected Approaches Used by the IC and DOD in Exploring Emerging Satellite Capabilities**

Approach	Example of Component Leveraging Approach	Summary of Approach
Study Contract	National Reconnaissance Office (NRO)	Agency explores commercial vendors' capabilities through small, short-term contracts that can potentially transition into larger, operational support contracts. NRO initiated six study contracts in 2019 ranging from a hundred thousand to a few million dollars. The intent is to explore emerging capabilities such as radio frequency and synthetic aperture radar and also determine how to integrate them into NRO's architecture. <sup>a</sup>
Broad Agency Announcement (BAA)	NRO	Contracts are intended to aid the acquisition of research and allow for single or multiple, small, short-term awards. <sup>b</sup> NRO issued two BAAs in 2021 to explore emerging capabilities and in January 2022 the agency announced new contracts with Airbus U.S., Capella Space, ICEYE U.S., PredaSAR, and Umbra to explore commercial radar capabilities. <sup>c</sup>
Cooperative Research and Development Agreement (CRADA)	Army	Written agreements between one or more federal laboratories and a non-federal party under which the government provides personnel, facilities, equipment, or other resources with or without reimbursement. The Army announced in Fall 2021 two CRADAs with commercial vendors Capella Space and ICEYE to integrate synthetic aperture radar data, which will allow the Army to explore the capability's utility.
Prototype Contract	Office of the Secretary of Defense, Defense Innovation Unit (DIU)	Contracts are competitively issued using Other Transaction Authority to find commercial solutions in response to specific problems or capability gaps identified by one or more DOD entities. <sup>d</sup> In 2017, DIU awarded prototype contracts to three U.S. companies to explore the viability of commercial capabilities. <sup>e</sup>
"Pitch Day" Contracts	Space Force	Pitch Day is an annual event to identify, fund, and fast-track innovative new technologies in the space domain. Commercial vendors participating in the event are not guaranteed a contract, but officials noted that they intend to sign starter contracts immediately after the event.

Source: GAO summary of DOD Information. | GAO-22-106106

Note: U.S. Intelligence Community (IC) and Department of Defense (DOD) components identified these approaches—and related contracts—in written responses to us and in interviews.

<sup>a</sup>Specific details regarding study contracts were omitted because the information was classified.

<sup>b</sup>48 C.F.R § 35.016 provides procedures for broad agency announcements for the acquisition of basic and applied research and exploration and that part of development not related to the development of a specific system or hardware procurement.

<sup>c</sup>In October 2021, NRO released a BAA to explore emerging commercial capabilities, known as the Strategic Commercial Enhancement BAA. The announcement included a call for emerging technologies focusing on commercial radar, and offered a total of \$1.2 million over a period of four and a half years. Specific details on NRO's authorities relating to these contracts, as well as assessment categories, were omitted because the information was classified.

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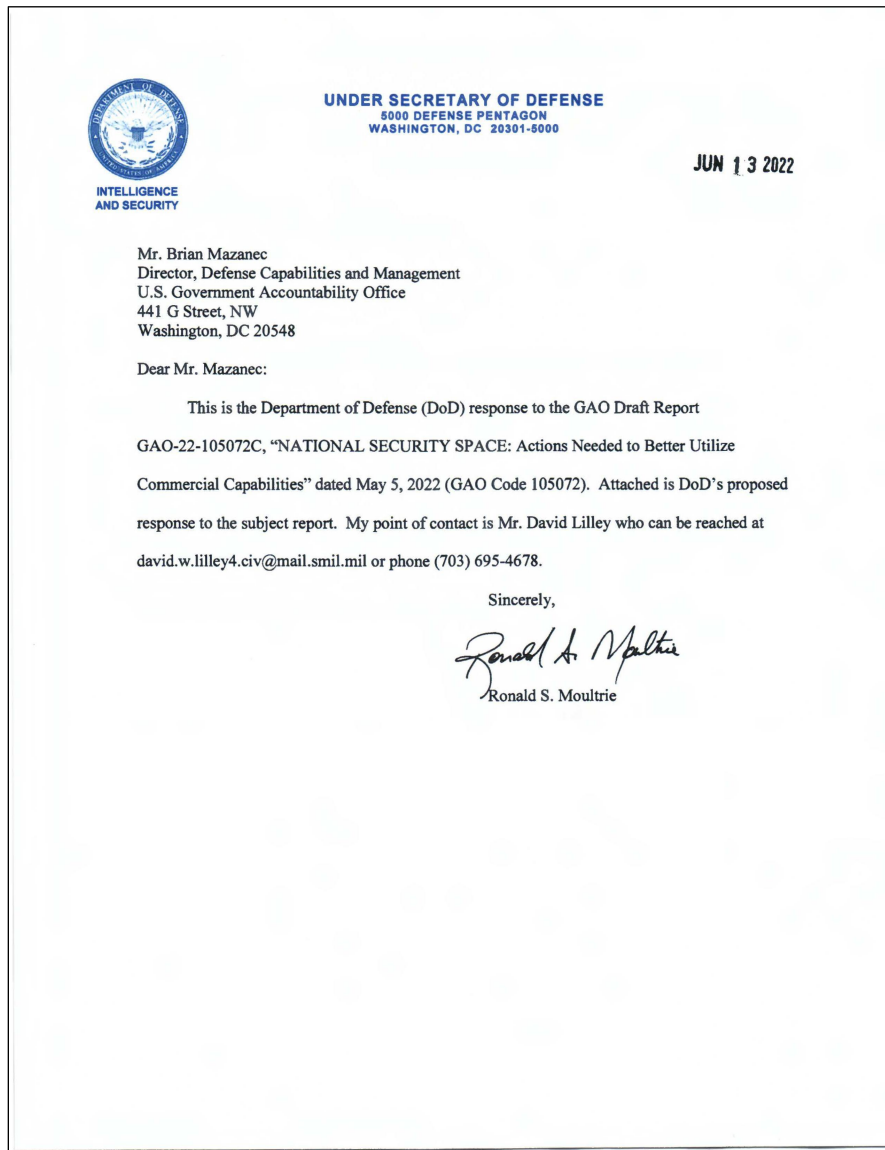
**Appendix IV: IC and DOD Approaches to  
Emerging Satellite Capabilities**

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<sup>d</sup>Other Transaction Authority refers to statutory authority to engage industry and academia for research and prototyping activities. Other transactions are legally binding contracts that are generally exempt from certain federal laws and regulations that apply to government procurement contracts. See 10 U.S.C. § 4021 and § 4022.

<sup>e</sup>DIU awarded prototype contracts to Planet, Orbital Insight, and Capella Space.

## Appendix V: Comments from the Department of Defense



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GAO DRAFT REPORT DATED MAY 5, 2022  
GAO-22-105072C (GAO CODE 105072)

“NATIONAL SECURITY SPACE: ACTIONS NEEDED TO BETTER UTILIZE  
COMMERCIAL CAPABILITIES”

DEPARTMENT OF DEFENSE COMMENTS  
TO THE GAO RECOMMENDATION

**(U) RECOMMENDATION 1:** Secretary of Defense, in coordination with the Director of National Intelligence, should ensure that clear roles and responsibilities across the Intelligence Community and DoD stakeholders are established for the acquisition of commercial satellite imagery, such as through a broad assessment or evaluation of organizational responsibilities, and then ensure these roles are updated in DoD guidance and communicated to all relevant stakeholders.

**(U) DoD RESPONSE:** Concur. DoD accepts the recommendation and will revise DoDD 5105.23, “National Reconnaissance Office (NRO)” and DoDD 5105.60, “National Geospatial-Intelligence Agency (NGA)” to capture decisions related to the roles and responsibilities associated with commercial imagery acquisition.

**(U) RECOMMENDATION 2:** Secretary of Defense, in coordination with the Director of National Intelligence, should ensure that the National Reconnaissance Office, in coordination with the National Geospatial-Intelligence Agency and Intelligence Community and DoD stakeholders, assess various approaches to determine which ones are most effective in incorporating and scaling emerging commercial satellite capabilities into operational support contracts in a timely manner.

**(U) DoD RESPONSE:** Concur. DoD accepts the recommendation. We believe that NRO’s Strategic Commercial Enhancements Broad Agency Announcement (BAA) is an exemplar of how the DoD can rapidly leverage/assess emerging commercial capabilities, while also serving as a bridge to operational support contracts. As recommended, the DoD will continue to assess if other approaches would afford greater ability for incorporating and scaling emerging commercial imagery.

UNCLASSIFIED

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## Text of Appendix V: Comments from the Department of Defense

Mr. Brian Mazanec  
Director, Defense Capabilities and Management  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, DC 20548

Dear Mr. Mazanec:

This is the Department of Defense (DoD) response to the GAO Draft Report GAO-22-105072C, "NATIONAL SECURITY SPACE: Actions Needed to Better Utilize

Commercial Capabilities" dated May 5, 2022 (GAO Code 105072). Attached is DoD's proposed response to the subject report. My point of contact is Mr. David Lilley who can be reached at david.w.1illey4.civ@mail.smil.mil or phone (703) 695-4678.

Sincerely,  
Ronald S. Moultrie

UNCLASSIFIED

GAO DRAFT REPORT DATED MAY 5, 2022 GAO-22-105072C (GAO CODE 105072)

"NATIONAL SECURITY SPACE: ACTIONS NEEDED TO BETTER UTILIZE  
COMMERCIAL CAPABILITIES"

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## Appendix VI: GAO Contact and Staff Acknowledgments

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### GAO Contact

Brian M. Mazanec, (202) 512-5130 or [mazanecb@gao.gov](mailto:mazanecb@gao.gov)

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### Staff Acknowledgments

In addition to the contact named above, key contributors to this report were Nicolaas Cornelisse (Assistant Director), Robert Breitbeil (Analyst in Charge), Usman Ahmad, Tracy Barnes, Carolyn Demaree, Christopher Gezon, Richard Horiuchi, Suzanne Kaasa, William Lamping, Matthew Metz, and Richard Powelson.

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*Military Space Systems: DOD's Use of Commercial Satellites to Host Defense Payloads Would Benefit from Centralizing Data.* [GAO-18-493](#). Washington, D.C.: July 30, 2018.

*Space Operations: DOD Efforts to Improve Space Control Shortfalls Underway but Longstanding Challenges Persist.* [GAO-22-530C](#). Washington, D.C.: November 8, 2021. (SECRET//NOFORN)

*Managing For Results: Key Considerations for Implementing Interagency Collaborative Mechanisms.* [GAO-12-1022](#). Washington, D.C.: September 27, 2012.



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