

## Why GAO Did This Study

The Department of Defense (DOD) is developing space-based laser technology to support large constellations of satellites for missions, including missile warning and data transport. Laser communications could improve capabilities beyond traditional radio frequency communications that DOD has traditionally used, in part, because data can be transmitted faster. These constellations are expected to cost nearly \$35 billion through fiscal year 2029.

A Senate report includes a provision for GAO to assess DOD's efforts to develop these capabilities. GAO's report (1) describes SDA's efforts to develop laser communications technology, and (2) evaluates the extent to which SDA is following leading product development practices for its laser communications efforts.

GAO reviewed relevant documents; assessed SDA's schedule and plans against leading acquisition practices; conducted site visits to Air Force Research Lab, Naval Research Lab, and contractor facilities; and interviewed DOD, SDA, and Space Force officials and contractor representatives.

## What GAO Recommends

GAO is making four recommendations, including that SDA demonstrate laser communications capabilities before finalizing efforts in T0 and before making further investments in subsequent tranches. DOD concurred with our recommendations with comments.

View [GAO-25-106838](#). For more information, contact Jon Ludwigson at (202) 512-4841 or [ludwigsonj@gao.gov](mailto:ludwigsonj@gao.gov).

## LASER COMMUNICATIONS

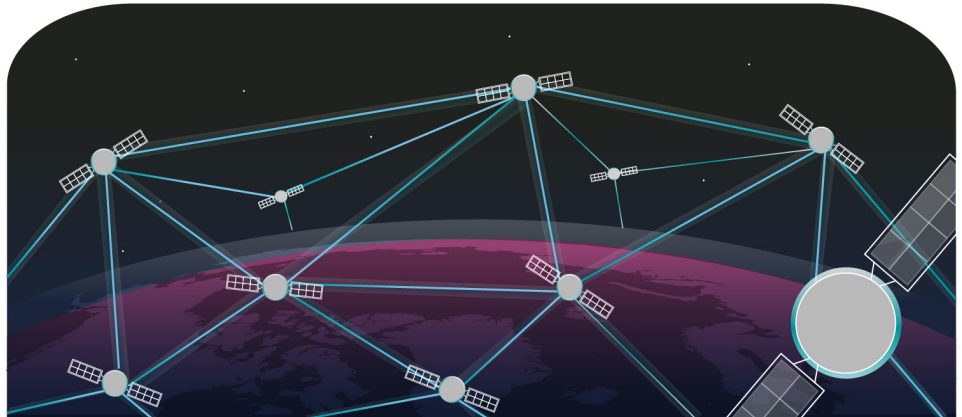
### Space Development Agency Should Create Links Between Development Phases

## What GAO Found

The Space Development Agency (SDA) has taken steps to develop laser communications technology but has not yet fully demonstrated it in space. SDA has planned for iterations of satellites and related systems to be launched every 2 years, referred to as tranches. SDA's demonstration tranche—referred to as Tranche 0 or T0—has faced development challenges and delays and has not fully demonstrated the capabilities expected from it. For example, SDA planned to launch the first T0 satellites in 2022 but launched them in 2023 and 2024. Further, this initial group of satellites has not yet fully demonstrated laser communications technology in space. Specifically, as of December 2024, SDA reported that one of its four prime contractors in T0 had demonstrated three of the eight planned laser communications capabilities while another contractor had demonstrated one of the eight capabilities. The remaining two contractors have not yet achieved any planned capabilities.

SDA's development approach thus far is inconsistent with the leading practices GAO identified. For example, although it has not yet achieved its requirements established for T0, SDA has now awarded contracts worth almost \$10 billion for Tranche 1 and Tranche 2 (referred to as T1 and T2). Further, these two new tranches are expected to include increased technology complexity and significantly more satellites. While T0 was planned with 28 satellites, T1 and T2 are to have 165 and 264, respectively.

#### Depiction of Space-Based Constellation Using Laser Communications



Source: GAO analysis of Department of Defense information; illustration. | GAO-25-106838

According to GAO's leading practices for product development, iterative development depends on demonstrating necessary capability in each iteration. SDA has described its efforts as iterative and noted that tranches need to work together to create the laser-based constellations. However, SDA officials also said that tranches are independent and delays in one will not delay the development schedule of future tranches. This approach means that SDA is proceeding through tranches and increasing the complexity of its development based on designs that have not yet met initial capabilities. As a result, SDA is at risk of unnecessarily investing in new efforts without yet delivering on promised capabilities intended to support critical missions.