

GAO Highlights

Highlights of [GAO-23-106018](#), a report to congressional committees

Why GAO Did This Study

The Air Force launched the first GPS satellite capable of broadcasting the jam-resistant M-code signal in 2005. However, continued delays to the ground and user equipment segments prevent widespread use of the technology.

Congress included a provision for GAO to assess the cost, schedule and performance of GPS acquisition programs. This report assesses (1) risks and challenges to transitioning to a planned next-generation ground control system and how Space Force is mitigating them; (2) the extent to which Space Force identified and addressed risks affecting the space segment and delivery of M-Code capability; and (3) the progress DOD made in developing and integrating the M-code user equipment.

To conduct this work, GAO reviewed DOD's plans for GPS, its data on satellite reliability and launch schedules, and interviewed DOD officials.

What GAO Recommends

GAO is making two recommendations to DOD: (1) assess the number of satellites necessary to meet operational needs, and (2) either develop a sound business case for the M-code capable Increment 2 handheld, or do not initiate the effort. DOD concurred with both recommendations.

View [GAO-23-106018](#). For more information, contact Jon Ludwigson at (202) 512-4841 or ludwigsonj@gao.gov.

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GPS MODERNIZATION

Space Force Should Reassess Requirements for Satellites and Handheld Devices

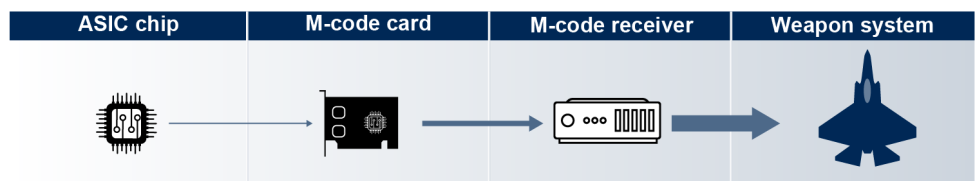
What GAO Found

GPS is the principal source of positioning, navigation, and timing information for the U.S. military and its partners. The Department of Defense (DOD) has worked for more than 2 decades to modernize GPS with a more jam-resistant, military-specific signal known as M-code. Space Force, part of the Department of the Air Force, is responsible for GPS modernization.

The GPS system consists of three segments that cooperate to provide M-code: a ground control segment, a space segment, and user equipment.

- **Ground.** In 2022, Space Force further delayed delivery of the ground control segment due to development challenges. This delay pushes delivery until December 2023 at a minimum. Space Force officials have not finalized a new schedule and acknowledged that remaining risks could lead to additional delays. GAO will continue to monitor Space Force's progress in adhering to its new schedule.
- **Space.** Space Force met its approved requirement for 24 M-code-capable satellites on orbit, but determined that it needs at least three more to meet certain user requirements for accuracy. Building and maintaining this larger constellation presents a challenge. GAO's analysis indicates it is not likely that 27 satellites will be available on a consistent basis over the next decade. Unless the Air Force assesses its operational need for satellites to establish a firm requirement for a 27-satellite constellation, other DOD efforts could take priority, leaving the warfighter with GPS user equipment performing below the required capability levels.
- **User equipment.** MGUE Increment 1 development progressed to the point where the military departments are ready to commence activities in support of testing and fielding it on the lead weapon systems. Delays and unexpected challenges could affect the fielding of capability for some systems. The figure below illustrates the integration process.

GPS User Equipment Integration



ASIC Application-Specific Integrated Circuit **M-code** Military code

Source: GAO analysis and representation of Department of Defense documentation. | GAO-23-106018

Space Force seeks to expand the use of M-code technology by developing a second increment consisting of an improved M-code chip and card, as well as a handheld receiver. Space Force lacks a major committed customer for the handheld receiver. The Army, the largest potential user of such a device, has its own plans for handheld receivers, and Marine Corps officials say the service is still considering its options. Without a sound business case for its proposed handheld product, Space Force risks expending significant resources without providing a benefit to military users.