



Global Positioning System Modernization

ISSUE

According to a 2011 economic study, 3.3 million U.S. jobs and \$96 billion in annual direct economic benefits are attributable to the Global Positioning System (GPS).¹ Truly, GPS has become an integral part of the fabric of our civil, commercial, and military daily operations and its current and future sustainability is essential to our nation.

It may come as no surprise, then, that potential adversaries are working aggressively to mitigate our GPS advantage. Recent conflicts illustrate the growing vulnerability of GPS to jamming and spoofing and this equipment is readily available in the international market. Further, other nations have recognized the criticality of space-based positioning, navigation and timing (PNT) and are now fielding their own systems.

In order to protect our civil, commercial, and combat edge in the future, it is essential to support ongoing GPS modernization efforts. Development of GPS III satellites, the Next-Generation Operational Control System (OCX), and Military GPS User Equipment (MGUE) are all well underway and need to be sustained to evolve U.S. capability to meet increasing user needs and emerging threats. GPS modernization is particularly important for military users, who will benefit from the increased anti-jam and anti-spoof capability available with new high-power encrypted M-code military signals.

Furthermore, the Federal Aviation Administration's NextGen blueprint for modernizing the Nation's air transportation system is dependent on a modernized GPS for transforming aviation from a ground-based system of air traffic control to a satellite-based system of air traffic management. New GPS civil signals will improve services to all GPS users and will open new areas of civil and commercial GPS applications. These new civil signals will also enable interoperability between U.S. GPS satellites and PNT satellites of international partners, greatly improving civil and commercial GPS accuracy for users worldwide, particularly in urban environments.

RECOMMENDATIONS

- Stable, predictable civil and defense funding for GPS modernization programs is essential to ensure all segments of the GPS enterprise - space, ground, user equipment - are replenished and upgraded.
- GPS civil requirements funding should be restored and maintained at the President's requested level to ensure the most accurate and reliable civil signals.

¹ The Economic Benefits of Commercial GPS Use in the United States and the Costs of Potential Disruption, Nam D. Pham, Ph.D retrieved from http://www.gpsalliance.org/docs/GPS_Report_June_21_2011.pdf on February 6, 2015.

- Because GPS positioning, navigation and timing is embedded in nearly all precision military operations and US National Critical Infrastructure, the system, including the significant improvements being developed in current modernization programs, should be protected against current and emerging threats, including cyber threats, interference with the GPS spectrum, and natural and human interference with GPS receivers.
- As users become increasingly dependent on access to multiple Global Navigation Satellite Systems, methods should be developed for verifying the trustworthiness of non-GPS signals and services, including non-satellite PNT sources, especially for US military and safety-of-life applications.

BACKGROUND

The Global Positioning System (GPS) is a space based positioning, navigation and timing system that meets validated Joint Service requirements for worldwide, accurate, common grid three dimensional positioning/navigation for military aircraft, ships and ground personnel as well as civil transportation, communications, finance, energy, agriculture, homeland security, commercial, and scientific users. The consistent accuracy of GPS navigation and positioning significantly improves effectiveness of reconnaissance, weapons delivery, mine countermeasures and rapid deployment for all services and a wide variety of applications for the global civil user community. GPS timing is critical to secure global communications and serves as the common time stamp for global financial transactions.

Significant investments over several decades have provided robust, unparalleled GPS capabilities that are essential to both national security and the economy. These capabilities must be sustained and evolved to provide greater capability and address emerging threats. Adversaries are working aggressively to mitigate our GPS combat advantage. By 2020, advancements by potential adversaries in jamming, spoofing, and cyber-attack make the current GPS system increasingly vulnerable under war fighting conditions. GPS modernization will help ensure billions in investments in U.S. National Critical Infrastructure, weapon systems and war fighting strategies leveraging space-based PNT will not be put at risk.

U.S. National Space Policy states that “the United States must maintain its leadership in the service, provision, and use of global navigation satellite systems (GNSS).” U.S. GPS Policy states that “The United States must continue to improve and maintain the Global Positioning System, augmentations, and backup capabilities to meet growing national, homeland, and economic security requirements, for civil requirements, and to meet commercial and scientific demands.” Title 10 of the U.S. Code, Section 2281, requires United States armed forces have the capability to use GPS effectively despite hostile attempts to prevent the use of the system by such forces. Section 218 of the Strom Thurmond National Defense Authorization Act for Fiscal Year 1999 (Public Law 105-261) requires enhanced Global Positioning System receivers and user equipment.

Over the more than 30 years since first launch and the 20 years since achieving full operational capability, GPS has evolved from a niche capability intended for a limited number of users to a global utility that provides benefits every day to nations around the globe, on every continent and body of navigable water. As many other nations develop and field highly capable augmentations and stand-alone space-based positioning, navigation and timing systems, GPS continues to be the cornerstone of the Global Navigation Satellite System (GNSS) and the world standard upon which most global applications are based.