

U.S. Department of Transportation: GPS at 50, Results for Transportation and New Threats

Monday, January 8, 2024 3:45 PM – 5:30 PM ET

Convention Center, Ballroom A

Lectern | PDH

Robert C. Hampshire, U.S. Department of Transportation, presiding

- Good afternoon, and welcome to our panel discussion today. I'm Dr. Robert Hampshire, and I'm the Deputy Assistant Secretary for Research and Technology and Chief Scientist at the US Department of Transportation.
- Thank you for the opportunity to share my remarks with you today, and engage in a dialogue with some of the premiere leaders in the Global Positioning Systems, or GPS, and, more broadly, Positioning, Navigation, and Timing, or PNT.

<Introduction to each panelist>:

- I'd like to first introduce our panelists - thank you for joining us today:
 - LtCol Robert O. Wray, U.S. Space Force, Commander, Second Space Operations Squadron
 - Ken Alexander, Chief Scientific & Technical Advisor for Satellite Navigation Systems, Federal Aviation Administration
 - Gregory D. Winfree, Agency Director, Texas A&M Transportation Institute
 - Dana A. Goward, President, Resilient Navigation and Timing Foundation
 - Dr. Zak Kassas, UTC Director for the Center for Automated Vehicles Research with Multimodal AssurEd Navigation (CARMEN)+, The Ohio State University

Thank you all for committing your time here today.

- This past month marks 50 years since the Navstar Global Positioning System (GPS) was established as a program. With approval from the Defense Systems Acquisition Review Council, the US Air Force began development of a satellite system to provide Positioning, Navigation, and Timing.

- In December 1993, GPS achieved global coverage with a full constellation of 24 satellite vehicles. In 2003, the Federal Aviation Administration (FAA) under DOT declared the Wide Area Augmentation System (WAAS) for GPS fully operational.
- For over 30 years the Second Space Operations Squadron (2 SOPS) has provided uninterrupted GPS service to civil, commercial, and military users around the world. The domestic economic impact over these three decades is astounding – the National Institute of Standards at the Commerce Department estimates this to be at \$1.4 Trillion.

One of the goals of this session is to increase awareness and visibility of the importance of GPS to safety-critical transportation applications

- For civil use in transportation, it's hard to think about a world WITHOUT GPS.
- It is ingrained into so many transportation applications—ranging from aircraft, maritime, and vehicle navigation, to UAS, positive train control, and monitoring of dams and pipelines, but also integrated into areas such as surveying, the financial sector, machine control, precision agriculture, science missions, space applications, and more.
- In addition to longitude, latitude, and altitude, GPS provides a critical fourth dimension – time. Each GPS satellite contains multiple atomic clocks that contribute very precise time data to the GPS signals. GPS receivers decode these signals, effectively synchronizing each receiver to the atomic clocks. This enables users to determine the time to within 100 billionths of a second, without the cost of owning and operating atomic clocks.
- Precise time is crucial to a variety of economic activities around the world - communication systems, electrical power grids, precision agriculture, environmental monitoring, and financial networks all rely on precision timing for synchronization and operational efficiency.
- DOT is honored to serve as the civil lead for GPS in partnership with the Department of Defense, and especially the U.S. Space Force, to ensure accurate and reliable GPS service meets current and emerging needs across our nation and around the globe.

- GPS is enmeshed into so many aspects of life that it's often seen as the "silent" critical infrastructure utility.
 - We should not only celebrate the success of GPS but take this opportunity to increase awareness and visibility of the importance of Positioning, Navigation and Timing to the nation and to the entire world.
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- PNT capabilities and services being available, being precise and free from harmful interference, and advancing in a manner that continues to support new civil use cases is important now and into the future.
 - We recognize that PNT services are foundational and essential throughout many, if not all, sectors of the economy. More specifically, we recognize our civil leadership role in helping to ensure accurate and reliable sources of PNT systems, as well as ensuring these systems are available to meet current and emerging applications and supporting infrastructures.
 - So, I want to start by reaffirming our commitment to not only our role, but also to the PNT resilience framework. This work and this commitment come at a very important and pivotal point, especially for transportation.
 - Our mission is intrinsically linked to PNT and specifically to GPS capability as critical enablers. PNT technology research and development are vital to the safety and efficacy of all transportation modes—and also vital to not just our departmental goals and civil and critical infrastructure uses, but also to our Administration's goals and priorities.
 - We also know that as use of GPS technologies continues to advance, the number of threats to the system increase and we need to take the bullseye off GPS as the primary system. In order to do that, we must have BOTH a robust set of PNT services AND the adoption of those services by critical infrastructure operators.
 - Disruption, denial, and manipulation of GPS such as signal jamming and spoofing are threats that have become a reality in the Ukraine and Israel conflicts, as well as incidents in the U.S. primarily affecting aviation.
 - Recognizing these threats, Federal agencies - including DOT and the Department of Homeland Security - were tasked with making sure that disruption or manipulation of PNT

services does not undermine the reliable and efficient functioning of its critical infrastructure. I know we as an agency and within my department are reinforcing this through:

- Increased awareness and evaluation of the impact of vulnerabilities
- The need to protect spectrum from harmful interference and implement a nationwide GPS interference detection and monitoring capability
- Exploring complementary sources of PNT and facilitating adoption of these technologies into end user applications to increase resiliency for safety-critical transportation applications
- And coordinating research on new technologies to address emerging PNT needs across all modes of transportation
- All of which falls in line with the Protect, Toughen and Augment (PTA) priorities—which this Space-Based PNT Advisory developed and which DOT has embraced.
- In order to realize the benefits of a resilient, innovative, and more robust system, our priority is to ensure that the services continue to remain available and safe to an ever-growing community of users.

GPS is the foundation for our National PNT Architecture, we need to ensure that foundation is fortified. And with that, I look to this panel to engage and explore how PNT resiliency is needed to enhance safety, security, and ensure the flow of goods supporting the economy by protecting GPS spectrum from harmful interference.