



27 January 2023

MEMORANDUM

FROM: Thad Allen, Admiral (USCG, Ret), Chair, National Space-Based Positioning, Navigation, and Timing (PNT) Advisory Board

TO: Honorable Kathleen H. Hicks
Deputy Secretary, Department of Defense
Co-Chair, National Space-Based PNT Executive Committee

Honorable Polly E. Trottenberg
Deputy Secretary, Department of Transportation
Co-Chair, National Space-Based PNT Executive Committee

SUBJECT: Summary Report of the 27th National Space-Based PNT Advisory Board Meeting held 16-17 November 2022

Madam Co-Chairs,

The National Space-Based PNT Advisory Board (PNTAB) held its 27th public meeting November 16-17, 2022, in Redondo Beach, CA. The meeting was held under the provisions of the Federal Advisory Committee Act (FACA) with appropriate public notification and documentation for the public record. This report summarizes the PNTAB's findings and recommendations, provides current lines of effort moving forward, and proposes a national level event later this year to mark the *50th Anniversary of the 1973 commencement of the Global Positioning System (GPS)* program.

PNTAB Chair's Bottom Line Up Front (BLUF)

The Board has made significant progress in organizing its efforts around a subcommittee structure that allows a more focused consideration of the many issues affecting civil users of GPS and other evolving Global Navigation Satellite Systems (GNSS) and other PNT "ecosystems." This meeting reflected a shift to a more pragmatic body of work following the challenging COVID-19 pandemic, and the ongoing drama associated with the ill-advised permitting of Ligado Networks by the Federal Communications Commission (FCC). As an advisory body whose membership includes numerous critical infrastructure users, we have made clear our position on this egregious regulatory mistake and its likely adverse consequences for GPS reliability. We are moving on.

Three major themes emerged in our deliberations:

- First, while we will continue to monitor the Ligado issue, it will be in the larger context of national GPS monitoring, disruption, public warning, and risk assessment as discussed below.
- Second, as GNSS/PNT end user devices are now more appropriately viewed as digital computers, not radio receivers, it is time to fully integrate threats to and protection of PNT technology within existing cyber security measures.

- Third, the current state of PNT, and evolving risks to civil use, urgently require a clarification of the role of the federal government, revision of existing response plans and policies, and increased planning to prevent, detect, and mitigate disruptions. This includes a reconsideration of existing export controls for technologies that can mitigate jamming and are already widely available from other countries.

As noted in the Board’s discussion, we believe GPS/PNT disruption would be an excellent candidate for a National Level or Senior Leader Exercise.

Summary of Recommendations

The following subcommittees were established at the PNTAB-26 session held 4-5 May 2022 in Annapolis:

- Communications and External Relations (CER)
- Education and Science Innovation (ESI)
- Emerging Capabilities, Applications, and Sectors (ECAS)
- International Engagement (IE)
- Protect, Toughen, and Augment (PTA)
- Strategy, Policy, and Governance (SPG)

At the PNTAB-27 meeting in November, the subcommittees presented results from fact-finding meetings in support of proposed Board recommendations. Those proposals are included in the public record. In addition, proposals to prepare White Papers on specific topics were accepted for development to support the Board’s goals and objectives. The recommendations and proposals, tracked by number and subcommittee designation, are as follows:

1. GPS monitoring, disruption, public warning, and risk assessment:

PNT27-01-CER: EXCOM is urged to develop a compelling, quantitative way to accurately express the economic damages to the nation attributable to extended disruptions to GPS services.

PNT27-02-CER: The Department of Transportation is urged to issue public warnings to GPS users as soon as possible after the beginning of significant disruption events.

PNT27-08-PTA: The U.S. Government (USG) should rapidly prototype a National GNSS Interference Detection and Reporting system based on mobile wireless technology. Such a system would have been very beneficial in responding to multiple interference events at major U.S. airports in 2022.

2. Fully integrate threats to and protection of PNT technology within existing cyber security measures:

PNT27-03-CER: PNT security should be made a prominent part of the National Cyber Director’s responsibilities. Departments and agencies should include PNT security in their cyber portfolios.

3. Risks to civil use dictate greater role clarity in the federal government, revision of existing response doctrine, plans, and policies, together with increased planning to prevent, detect, and mitigate disruptions:

PNT27-04-ECAS: USG to develop and implement a GPS High Accuracy and Robustness Service (HARS) delivered to users via the Internet, with performance initially comparable to that provided by other GNSS such as the European Union’s Galileo High Accuracy Service

(Galileo HAS). The service would provide corrections to support better than one-meter position accuracy, while providing cryptographically-protected satellite navigation data bits for integrity monitoring and spoofing resistance.

PNT27-05-ESI: USG to invest in the future of U.S. PNT education and training. There is a definitive shortage of geodesy experts being trained in relation to competitor nations such as China.

PNT27-06-PTA: There currently are wildly diverse opinions concerning the likelihood and extent that the GPS infrastructure could fail to provide useful signals in different time frames. Those making risk management decisions, and those investing in Protect, Toughen, and Augment, lack the information needed to select the appropriate approaches, and how urgent it is to implement them. Therefore, the USG should establish, publish, and maintain estimates of the likelihood that GPS would not provide sufficient useful civil signals, due to failures of the GPS infrastructure (GPS Ground Segment, GPS Space Segment, and GPS user equipment) from any cause.

PNT27-09-SPG: Convene a White House summit to recognize and celebrate U.S. achievements with GPS and to launch an initiative to regain U.S. PNT leadership and ensure resilient, reliable PNT for critical infrastructure and the larger economy. GPS's capabilities are now substantially inferior to those of China's BeiDou.

PNT27-10-SPG: The Executive Office of the President should undertake an Administration-wide review of domestic radio spectrum regulation processes.

White Paper Topics Assigned for Development

These papers are intended to reinforce what should be on-going USG efforts. Board members working on each may be available to assist the government on a fact-finding basis between meetings. As the papers are being developed by volunteers, subject to their availability, I strongly urge you to not delay action on these issues pending receipt of these efforts.

Celebrating GPS 50th Anniversary & Regaining U.S. PNT Leadership: To highlight how essential GPS services have become to the U.S. and the world and to plan for regaining U.S. PNT leadership over the next decade. A White House summit should be convened on or around December 17, 2023, to commemorate the 50th anniversary of the start of the GPS program and to celebrate its achievements and the immense economic benefits to the nation. The outcome of the summit should be a statement of national resolve to regain U.S. global leadership of PNT technology, and a plan to achieve it.

Addressing Shortfalls in PNT Education & Science: To ensure the U.S. maintains its leadership, funding should be increased to enhance PNT Research & Development, including Geodesy, and to strengthen education and training across U.S. academia and research institutions.

Implementing a GPS High Accuracy and Robustness Service: To augment GPS and overcome some inherent limitations of space-based PNT, the USG should provide a service comparable to the European Union's Galileo HAS that provides signal corrections that enable better than one-meter level accuracy, as well as cryptographically-protected satellite navigation message data bits for integrity processing. The U.S. should develop and implement GPS HARS, based on the capabilities developed by the Jet Propulsion Laboratory (JPL) for the Global Differential GPS System (GDGPS), to be made available to users over the Internet.

Modifying U.S. International Traffic in Arms Regulations (ITAR) on GPS Commercial Users: To toughen GPS and enhance user access and reliability, the USG must modify export control regulations that are restricting commercial use of adaptive anti-jam antenna systems

protecting GNSS receivers. The original intent to mitigate proliferation of this technology has been superseded by development and fielding of this technology by U.S. competitors.

Sincerely,

A handwritten signature in black ink, appearing to read "Thad Allen". The signature is fluid and cursive, with a large initial "T" and "A".

Adm (USCG, ret.) Thad Allen, Chair, PNTAB

CC:

- Bill Nelson, Administrator, NASA
- Pamela Melroy (USAF, ret.), Deputy Administrator, NASA
- Badri Younes, Deputy Associate Administrator for Space Communications and Navigation, NASA
- James J. Miller, Executive Director, PNTAB, NASA
- John Sherman, Chief Information Officer, DoD
- Fred Moorefield, Deputy Chief Information Officer, DoD
- Robert Hampshire, Deputy Assistant Secretary for Research and Technology, DOT
- Karen Van Dyke, Director, PNT & Spectrum Management, Office of the Assistant Secretary for Research and Technology, DOT
- Chirag Parikh, Executive Secretary, National Space Council
- Harold "Stormy" Martin, Director, PNT National Coordination Office – for distribution to all PNT EXCOM departments and agencies