

**Purpose:** (NIST) is requesting information from the public about the broad use of positioning, navigation and timing (PNT) services, as well as the cybersecurity risk management approaches used to protect them.

The order notes that “the widespread adoption of PNT services means disruption or manipulation of these services could adversely affect U.S. national and economic security. To strengthen national resilience, the Federal Government must foster the responsible use of PNT services by critical infrastructure owners and operators.”

**AGENCY:** National Institute of Standards and Technology, U.S. Department of Commerce.

**ACTION:** Request for information.

**DATES:**

Comments must be received by 5:00 p.m. Eastern time on July 13, 2020. Written comments in response to the RFI should be submitted according to the instructions in the **ADDRESSES** and **SUPPLEMENTARY INFORMATION** sections below. Submissions received after that date may not be considered.

**ADDRESSES:**

Comments may be submitted by any of the following methods:

- *Electronic submission:* Submit electronic public comments via the Federal e-Rulemaking Portal.
  1. Go to [www.regulations.gov](http://www.regulations.gov) and enter NIST-2020-0002 in the search field,
  2. Click the “Comment Now!” icon, complete the required fields, and
  3. Enter or attach your comments.
- *Email:* Comments in electronic form may also be sent to [pnt-eo@list.nist.gov](mailto:pnt-eo@list.nist.gov) in any of the following formats: HTML; ASCII; Word; RTF; or PDF.

Please submit comments only and include your name, organization's name (if any), and cite “Profile of Responsible Use of PNT Services” in all correspondence. Comments containing references, studies, research, and other empirical data that are not widely published should include copies of the referenced materials.

**SUMMARY:**

The National Institute of Standards and Technology (NIST) is seeking information about public and private sector use of positioning, navigation, and timing (PNT) services, and standards, practices, and technologies used to manage cybersecurity risks, to systems, networks, and assets dependent on PNT services. [Executive Order 13905](#), Strengthening National Resilience Through Responsible Use of Positioning, Navigation, and Timing Services, was issued on February 12, 2020 and seeks to protect the national and economic security of the United States from disruptions to PNT services that are vital to the functioning of technology and infrastructure, including the electrical power grid, communications infrastructure and mobile devices, all modes of transportation, precision agriculture, weather forecasting, and emergency response.

Under [Executive Order 13905](#), the Secretary of Commerce, in coordination with the heads of the Sector Specific Agencies and in consultation, as appropriate, with the private sector, is directed to develop and make available, to at least the appropriate agencies and private sector users, PNT profiles. Responses to this Request for Information (RFI) will inform NIST's development of a PNT profile, using the NIST Framework for Improving Critical Infrastructure Cybersecurity (NIST Cybersecurity Framework), that will enable the public and private sectors to identify systems, networks, and assets dependent on PNT services; identify appropriate PNT services; detect the disruption and manipulation of PNT services; and manage the associated cybersecurity risks to the systems, networks, and assets dependent on PNT services.

This RFI outlines the information NIST is seeking from the public to inform the development of a profile of PNT services that will strengthen national resilience of U.S. critical infrastructure and other industries that rely on PNT services.

### **Request for Information**

The following questions cover the major areas about which NIST seeks comment. They are not intended to limit the topics that may be addressed. Responses may include any topic believed to have implications for the development of a PNT profile, regardless of whether the topic is included in this document.

When addressing the topics below, commenters may address the practices of their organization or a group of organizations with which they are familiar. If desired, commenters may provide information about the type, size, and location of the organization(s). Provision of such information is optional and will not affect NIST's full consideration of the comment.

Comments containing references, studies, research, and other empirical data that are not widely published should include copies of the referenced materials. All submissions, including attachments and other supporting materials, will become part of the public record and subject to public disclosure. NIST reserves the right to publish relevant comments publicly, unedited and in their entirety. All relevant comments received in response to the RFI will be made publicly available at <https://www.nist.gov/itl/pnt>. Personal information, such as account numbers or Social Security numbers, or names of other individuals, should not be included. Do not submit confidential business information, or otherwise sensitive or protected information. Comments that contain profanity, vulgarity, threats, or other inappropriate language or content will not be considered.

**Authority:** Exec. Order No. 13905, Strengthening National Resilience Through Responsible Use of Positioning, Navigation, and Timing Services, [85 FR 9359](#) (Feb. 18, 2020).

### **Responding Company:**

Advanced Navigation & Positioning Corporation  
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NIST is seeking the following information from PNT technology vendors, users of PNT services and other key stakeholders for the purpose of gathering information to foster the responsible use of PNT services:

**1. Describe any public or private sector need for and/or dependency on the use of positioning, navigation, and timing, or any combination of these, services.**

### *ADS-B in the FAA National Airspace*

Automatic Dependent Surveillance–Broadcast (ADS-B), one of the foundations of NextGen, is a surveillance technology that helps pilots and air traffic controllers create a safer, more efficient National Airspace System (NAS). ADS-B Out relies on aircraft avionics, a constellation of GPS satellites, and a network of ground stations across the country to transmit an aircraft's position, ground speed, and other data to air traffic controllers. Its coverage area and position accuracy are greater than that of radar, and it can also be used as a more cost-effective surveillance solution in remote areas such as over the Gulf of Mexico or in certain mountainous regions.

The FAA has mandated that aircraft operating in most controlled U.S. airspace be equipped for ADS-B Out by January 1, 2020. ADS-B In, which is not mandated, offers additional situational awareness benefits to operators who equip with suitable avionics via in-cockpit display of nearby aircraft.

#### *ADS-B for General Aviation*

Aircraft equipage is vital to the success of ADS-B and NextGen. The FAA estimates that between 106,000–167,000 general aviation aircraft may need to equip with ADS-B. Approximately 60,000 aircraft have been equipped with ADS-B Out avionics and are ready for the 2020 mandate.

FAA and industry leaders represented in the [Equip 2020 partnership](#) continue to identify barriers delaying operators from equipping with ADS-B Out.

### *Performance Based Navigation*

Performance Based Navigation (PBN) is an advanced, satellite-enabled form of air navigation that creates precise 3-D flight paths. The FAA has published more than 9,300 PBN procedures and routes. These procedures and routes offer a number of operational benefits, including enhanced safety, increased efficiency, reduced carbon footprint, and reduced costs.

The FAA is beginning to monitor an aircraft's trajectory including its time at points along these 3-D paths so the agency can anticipate the timing of arrivals at major airports. The FAA, airlines and foreign air navigation service providers will exchange flight trajectory data in real time on all flights in progress as the agency moves to Trajectory Based Operations (TBO) over the United States and offshore. Under TBO, the FAA will use the aircraft trajectory to manage all phases of flight tactically and strategically.

- **RNAV Standard Terminal Arrivals (STAR):** RNAV STAR procedures can provide a continuous descent from cruise altitude using optimized profile descents (OPD) to save fuel and reduce emissions and noise. The FAA has published more than 860 RNAV arrival procedures.
- **Required navigation performance (RNP) approaches:** The FAA has published more than 7,000 of these procedures. They were previously identified by the FAA as RNAV (GPS) until the International Civil

Aviation Organization changed this nomenclature. RNP approaches are for aircraft equipped primarily with GPS or GPS enhanced by WAAS. RNP approaches permit aircraft with the required navigation performance to operate on any desired course within the coverage of the navigation signals in use. Tens of thousands of general aviation aircraft equipped with WAAS use more than 3,800 localizer performance with vertical guidance (LPV) approach procedures at more than 1,880 airports. The majority of these airports do not have an instrument landing system (ILS) procedure. The FAA has also published more than 650 localizer performance approach procedures without vertical guidance at more than 490 airports.

- **RNP approaches with authorization required (AR):** These highly accurate approach procedures enable qualified operators with equipped aircraft to fly with great precision on the same flight path every time near high terrain or in congested airspace. To fly these procedures, aircrews must be trained and authorized by the FAA to fly RNP, and aircraft must be certified. Some RNP AR approaches enable aircraft to fly a curved path to a runway even when other aircraft are approaching to land simultaneously on parallel runways. More than 390 of these RNP AR approaches are available in the NAS.
- **RNP approaches with LPV:** These provide minimums as low as 200 feet above the ground before a pilot has to see the runway to land, which is the same as a Category I ILS. LPVs serve more than 1,120 airports that do not have ILS. The FAA will seldom, if ever, install a new CAT I ILS, opting instead for PBN approach procedures.

### *UAV Flight Controls*

The Global Positioning System (GPS) is the core technology for unmanned aerial vehicle (UAV) localization. UAVs can fly autonomously based on GPS without any pilot and can be utilized for observation and surveillance.

### ***2. Identify and describe any impacts to public or private sector operations if PNT services are disrupted or manipulated.***

#### *ADS-B in the FAA National Airspace*

If Automatic Dependent Surveillance–Broadcast (ADS-B) services, one of the foundations of FAA NextGen programs, are disrupted then that would result in the loss of Air Traffic Information to controllers and administrators as well as aircraft operators. This increases risks associated with air traffic routings and separations that are supported by the ADS-B service.

Of greater risk is if services are manipulated then ATCs will have erroneous information upon which they have to make critical decisions regarding aircraft positioning and separations during air traffic operations. This equates to a very risky and problematic environment for aircraft to operate under and for controllers to administer directions and clearance coordination. Similarly, aircraft operators may have erroneous or incomplete information that they require to operate an aircraft safely within and amongst air traffic.

### *Performance Based Navigation*

Performance Based Navigation (PBN) is an advanced, satellite-enabled form of air navigation that requires GPS signals to perform its operations in an accurate and effective control space. If the services the PBN rely on are disrupted, then all PBN based routings and approaches will be disrupted and unable to execute.

Of greater risk is if the services are manipulated in a way that the aircraft operators are being provided with information that affects their steering and inappropriately guides them into harm's way. PBN services are designed in environments where there are often routings through dangerous obstacles which require proscribed clearances to be safe. A manipulation of GPS location data could significantly impact the safety of those operations.

## *UAV Flight Controls*

Since Global Positioning System (GPS) is the core technology for unmanned aerial vehicle navigation, any disruption of the service would force the UAV to switch to Dead Reckoning techniques to coordinate return of flight operations in the uncontrolled environments. This means that operations are typically aborted and critical surveillance or other functions are lost for operatives during, what can be, critical moments.

In a condition where the GPS data is being manipulated, then the operational environment becomes severely problematic when incorrect information is either being passed to or from the UAV. This can mislead operations and can create unsafe data and conditions for actions to be based upon.

### ***3. Identify any standards, guidance, industry practices and sector specific requirements referenced in association with managing public or private sector cybersecurity risk to PNT services.***

1370.121 FAA Information Security and Privacy Program & Policy  
Responsible Office: AIS-1, Information Security and Privacy

This order defines the Federal Aviation Administration's (FAA) Information Security and Privacy (IS&P) Program and policy, and augments the Department of Transportation's (DOT) policies and guidance defined in DOT Order 1351.37, the Departmental Cybersecurity Compendium: Supplement to DOT Order 1351.37 Departmental Cybersecurity Policy (as amended), June 2015, Version 4, hereafter referred to as DOT Compendium, Cybersecurity Action Memos (CAMs), and other DOT policy documents with FAA-specific policy, Federal Risk and Authorization Management Program (FedRAMP), and guidance.

This order establishes FAA's IS&P Program and Policy and assigns organizational and management responsibilities to ensure the FAA IS&P Program and policy are implemented consistent with Federal statutes, laws, and regulations about information security management.

### ***4. Identify and describe any processes or procedures employed by the public or private sector to manage cybersecurity risks to PNT services.***

Unknown

**5. Identify and describe any approaches or technologies employed by the public or private sector to detect disruption or manipulation of PNT services.**

Unknown

**6. Identify any processes or procedures employed in the public or private sector to manage the risk that disruption or manipulation to PNT services pose.**

Unknown

**7. Identify and describe any approaches, practices, and/or technologies used by the public or private sector to recover or respond to PNT disruptions.**

Advanced Navigation and Positioning Corporation produces the Transponder Landing System (TLS) that combines a Secondary Radar Surveillance capability with a Precision Approach to ICAO Cat I performance requirement that can provide services in situations where GPS is disrupted or compromised. For the three profiles described the TLS has capabilities that can help to circumvent the issues associated with the types of disruptions this RFI is concerned with.

Networked components of the TLS sit behind a firewall and are protected through credential logins with encrypted wireless modems where required, but otherwise self-contained behind the firewall.

### *ADS-B in the FAA National Airspace*

If Automatic Dependent Surveillance–Broadcast (ADS-B) services, are disrupted then TLS services can be utilized to output ADS-B data while GPS is offline. TLS can output the same data as is required for ADS-B to the aircraft and to other Air Traffic facilities to keep the information accurate. It can also offer an alternative source of data for the systems to be able to detect GPS data manipulations. These types of manipulations are difficult to discern without another reference and ANPC's TLS can provide the source for that information. TLS is a rapidly deployable system that can be deployed in areas that are experiencing situational disruptions in order to shore up the data in those areas and make it safe for air vehicle traffic.

### *Performance Based Navigation*

In controlled air space where Performance Based Navigation (PBN) is implemented an TLS can serve as a backup during GPS disruptions. TLS can also contribute to the PBN solution by providing ground-based guidance that can be utilized and compared to the GPS solutions which would help to identify GPS manipulations and disruptions. TLS provides the capability to bring an aircraft all the way down to a Category I precision Landing just as PBN is designed to do.

## *UAV Flight Controls*

In the event of GPS disruption for UAV controls and Navigation, the TLS has shown that its surveillance data is of sufficient quality to provide replacement data to the UAV in order for it to recover its mission. TLS sensors reach out to 120nm and can provide data to the aircraft through uplink services designed by the UAV operations. As a rapidly deployable system the TLS can be placed operatively in a location that would give it the ability to be an immediate backup for the local UAV operations. The TLS can then be de-constructed and packed up for the next operations.

### ***8. Any other comments or suggestions related to the responsible use of PNT services.***

No other comments