



SPACE-BASED POSITIONING  
NAVIGATION & TIMING  
NATIONAL ADVISORY BOARD

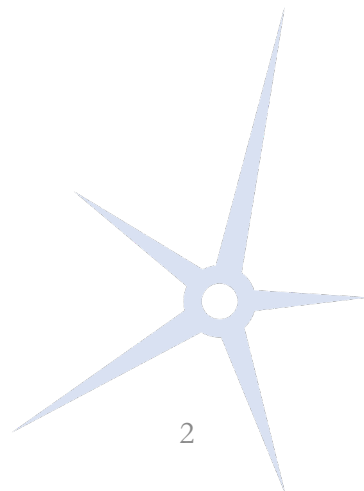
# Emerging Capabilities, Applications, & Sectors (ECAS) Subcommittee Fact-finding meeting

4:00 to 5:30 pm  
5 Dec 2023



# Areas of interest and discussion:

- GPS HARS (High Accuracy and Robustness Service)
- LEO for PNT
- AI in PNT
- Quantum technologies in PNT

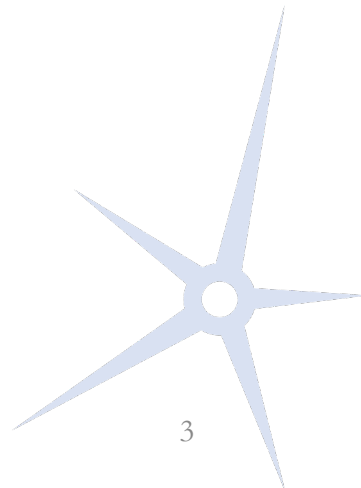


# Ex- and New members

## Members:

- Frank van Diggelen, Chair
- ~~Penny Axelrad, Vice-Chair~~
- Scott Burgett, Vice-Chair
  - John Betz
  - Renato Filjar
  - Dorota Greiner-Brzezinska
  - Matt Higgins
  - Vahid Madani
  - Terry Moore
  - Tim Murphy
  - Tom Powell
  - Eileen Reilly
  - Russ Shields
  - Todd Walter

New Vice-Chair: Bryan Chan



# GPS HARS progress

- White paper + Exec overview published and disseminated

<https://www.gps.gov/governance/advisory/recommendations/2023-05-white-paper-GPS-HARS.pdf>

- JPL has the expertise and GDGPS system to provide HARS corrections

See talk Wednesday by Attila Komjathy & Frank van Diggelen

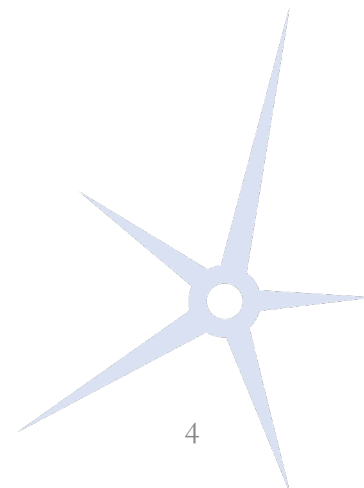
- Main goal now: find a government owner and operator for HARS



NATIONAL SPACE-BASED POSITIONING,  
NAVIGATION, AND TIMING ADVISORY BOARD

White Paper  
GPS High Accuracy and Robustness Service (HARS)  
May 5, 2023

This white paper was prepared by the board to support recommendation number PNT27-04-ECAS, to develop and implement a GPS High Accuracy and Robustness Service (HARS) delivered to users via the Internet, which was approved at the PNTAB-27 meeting (Nov. 16-17, 2022) and formally submitted to the National Space-Based PNT EXCOM co-chairs via Memorandum on January 27, 2023.



# LEO for PNT

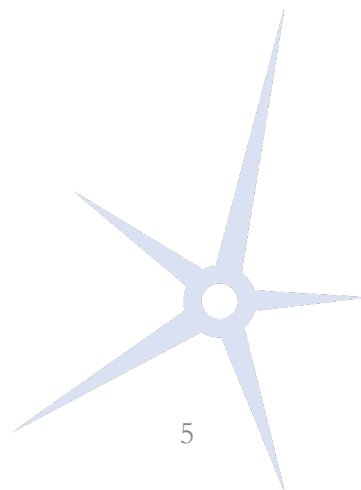
- This is an Emerging Capability, and of interest to this committee

- Talk by Bryan Chan (Xona)

- “Findings”:

Significant difference between SoOp LEO PNT and Dedicated designed LEO PNT systems.

Note: advance in radio and processing technology since 50 years ago and birth of GPS.



# AI in PNT

- Proposed future talk/white paper on state-of-the-art of AI in PNT.
  - including a breakdown by categories, such as: Machine Learning vs Generative AI.
- Takeaway of this for PNTAB and EXCOM?

Raise awareness of:

  - the qualitative difference between legacy math/physics based algorithms and AI models that learn in a way that is not always knowable even by the creators.
  - susceptibility to biases in the training data
    - e.g. 1: training data from mid-latitudes may fail at other latitudes.
    - e.g. 2: jamming training data that isn't rich enough to capture all forms of jamming detection.

# Quantum technologies in PNT

- Role of advisory board:
  - Create a briefing on the reality and state-of-the-art of quantum technologies.
  - Timeline of when we expect Quantum to be a core part of
  - Capture the different flavors of quantum, and applicability:
    - Quantum encryption
    - Quantum clock
    - Quantum accel/gyro/gravimetry

Next step: invite a speaker to future subcommittee meeting.

