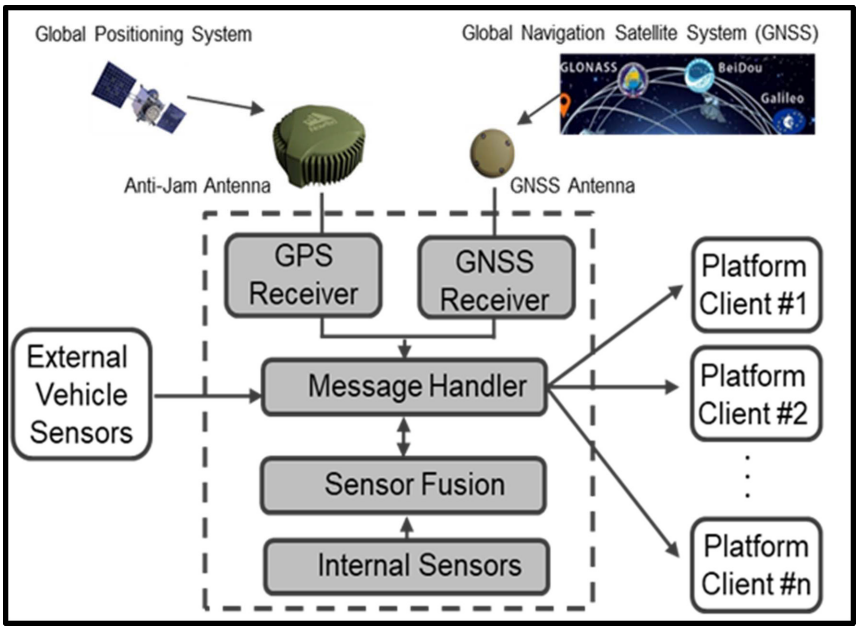
Assured — Positioning, Navigation, & Timing (Assured – PNT)

Executive Summary

- In 2019, the Commanding General, Army Futures Command issued individual Directed Requirements (DR) for the Dismounted Assured Positioning, Navigation, and Timing (A-PNT) System (DAPS), the Mounted A-PNT System (MAPS), and Alternative Navigation (ALTNAV) programs, directing the rapid prototyping, operational assessment, and limited fielding of advanced PNT technologies. The DRs outlined a "buy, try, and decide" process to inform an enduring requirement and follow-on programs of record.
- Throughout FY19 and FY20, the Army Test and Evaluation Command (ATEC) and Program Manager (PM) PNT conducted several test-fix-test cycles with each of the MAPS, DAPS, and ALTNAV solutions, supporting selection to phases I, II, and III of the prototyping efforts.
- In August 2020, the Army conducted the MAPS Operational Technical Demonstration (OTD) with the MAPS Generation (GEN) I.X and GEN II systems at White Sands Missile Range, New Mexico. Following this test, the MAPS GEN II system provided by Collins Aerospace was selected to enter production maturation under phase III of the Other Transaction Authority (OTA) contract.



System

- PM PNT is developing technology and fielding A-PNT products that are intended to provide the Army ground maneuver forces with access to trusted PNT information (PNT-I) under conditions where GPS signals may be degraded or denied.
- A-PNT products improve the soldier's ability to determine the validity and accuracy of their PNT-I.
- A-PNT consists of four primary products:
  - MAPS – Vehicle-mounted system providing PNT-I to multiple onboard client systems.
  - DAPS – Soldier-worn system providing PNT-I to Nett Warrior for dismounted operations.
  - PNT Modernization – Transitioning alternative and complementary PNT technologies for integration into MAPS and DAPS systems. The first ALTNAV-capable product is identified as DAPS GEN 1.1.
  - Resiliency and Software Assurance Measures – Software upgrades to legacy military GPS receivers.
- PM PNT is supporting the Army's transition to Military-Code GPS through the integration of Military GPS User Equipment in the MAPS and DAPS.

Mission

- A unit equipped with MAPS or DAPS will use their trusted PNT-I to conduct operations in conditions that impede or deny access to GPS signals, such as operations in dense vegetation, built-up urban and mountainous terrain, and in the presence of electromagnetic interference or enemy jamming and spoofing of the GPS.
- A-PNT directly enables positioning of forces; navigation across the operational environment; communication networks; situational awareness applications; and protection, surveillance, targeting, and engagement systems that contribute to combined arms maneuver.
- A-PNT supports Army multi-domain operations by mitigating the impacts of anti-access/area denial capabilities, allowing synchronized maneuver and precision fires from tactical, operational, and strategic distances in order to close with and destroy enemy forces with sufficient combat power, tempo, and momentum.

Major Contractors

- DAPS GEN 1.0
  - Integrated Solutions for Systems, Inc. (IS4S) – Auburn, Alabama
  - L3 Harris Technologies, Inc. – Anaheim, California
  - Mayflower Communications Company – Bedford, Massachusetts

- ALTNAV (DAPS GEN 1.1)
  - NAL Research Corporation – Manassas, Virginia
- MAPS GEN I and GEN I.X
  - GPS Source Inc. subsidiary of General Dynamics Mission Systems – Colorado Springs, Colorado
- MAPS GEN II
  - Collins Aerospace subsidiary of Raytheon Technologies – Cedar Rapids, Iowa

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Activity

- In 2019, the Commanding General, Army Futures Command issued individual DRs for the DAPS, MAPS, and ALTNAV programs, directing the rapid prototyping, operational assessment, and limited fielding of advanced PNT technologies. The DRs outline a "buy, try, and decide" process to inform an enduring requirement and follow-on programs of record.
- The Army PM PNT is utilizing several OTA contracts and a phased prototyping approach to satisfy the DRs and ensure the Army is selecting the best vendor solutions available. In FY19, OTA contracts were extended to one ALTNAV, three DAPS GEN 1.0, and three MAPS GEN II vendors. This is in addition to an existing MAPS GEN I contract.
- Following FY19 testing, the MAPS program selected Collins Aerospace to move into phase II of the MAPS GEN II prototyping effort. To enhance competition during phase II, GPS Source partnered with L3 Harris Technologies and was invited to compete with their GEN I.X system.
- Throughout FY20, ATEC and PM PNT conducted several test-fix-test cycles with each of the MAPS, DAPS, and ALTNAV solutions to support future invitations to the next prototyping phases. This testing included chamber testing, systems integration lab testing, and open-air range testing.
- In August 2020, the Army conducted the MAPS OTD with the MAPS GEN I.X and GEN II systems at White Sands Missile Range, New Mexico. The OTD supported selection for phase III, product maturation, of the OTA contract. Since this test was conducted under the DR prototyping effort, the Army did not develop an operational test plan for DOT&E approval. Following the OTD, the MAPS program selected Collins Aerospace to move into prototyping phase III.
- The MAPS and DAPS programs were able to mitigate several coronavirus (COVID-19) pandemic test impacts and maintain their acquisition timelines. DOT&E was not able to observe the MAPS OTD due to COVID-19 restrictions.

Assessment

- Early testing of MAPS and DAPS prototypes revealed that software that fuses the GPS and other sensor inputs was not mature. Testing in late FY20 indicated improvement and PM PNT intends to address software maturity in upcoming test-fix-test cycles and prior to entering program of record status at Milestone C.
- MAPS will replace the existing GPS receivers and antennas in most of the Army's ground vehicle variants. The program is initially focusing on the tactical and combat vehicles variants that would be part of the Brigade Combat Teams supporting early entry phases of a conflict. Within these vehicles, there are approximately 30 client system variants that MAPS must interface with. Integration testing in FY19 and FY20 revealed that adhering to the GPS interface standard does not guarantee compatibility and software updates to the client systems will be necessary. Extensive integration engineering and testing is planned for FY21-23.
- ATEC and PM PNT conducted the MAPS and DAPS open-air testing in threat-realistic, GPS-contested environments, utilizing soldier operators to gain early user feedback. Due to the focus on selecting the best vendor solution and the complexity of integrating with the numerous vehicle and client variants, the MAPS open-air testing has been limited to Stryker vehicles and a few key client systems. Because of the limited integration, the test team has not yet been able to use a mission-based test design.
- DOT&E will be receiving and analyzing the test data from the MAPS OTD and late FY20 DAPS testing in order to gain insights into prototype system performance.

Recommendation

1. The Army should ensure that future open-air range testing includes the following:
   - A broader set of platforms and PNT-dependent client systems to confirm that integration problems not identified in systems integration lab and chamber testing are discovered as early as possible.
   - A mission-based testing design to ensure a cross-section of PNT-dependent missions and tasks are examined under operational conditions ahead of planned IOT&E events.