

POSITION, NAVIGATION AND TIMING (PNT) – NEXT GENERATION SOLUTIONS

BACKGROUND

Telespazio UK (TPZ UK) is an experienced consulting, technology, engineering and space operations and service development business with a pedigree in space reaching back over 40 years. TPZ UK has built its first-class reputation by exploiting technology developments in Earth Observation, Communications and Satellite Navigation, where it has pioneered innovative services in space operations and applications. Position, Navigation and Timing (PNT) is a growth area for the Telespazio Group, and TPZ UK has a growing offering and legacy in wide-ranging Resilient and Alternative PNT services and applications.

PROJECT OVERVIEW: NEXT GENERATION NETWORK-ASSISTED PNT ASSURANCE (NG-NAPA)

NG-NAPA will design and develop a proof-of-concept demonstrator of a PNT assurance system to protect against malicious threats to Global Navigation Satellite System (GNSS): it will provide PNT assurance through reference-assisted GNSS and Signals Of Opportunity (SOOP) or SOOP only PNT.

The reference network capabilities of the NG-NAPA will be enhanced by the Iridium LEO Communications system, 5G cellular phone signals and GNSS encrypted signals as potential SOOP to contribute to PNT assurance.

The SOOP will complement, or possibly replace, GNSS positioning in order to provide assurance to PNT users, especially when GNSS open services are disrupted. The system concept is adaptable for deployment at user terminals; moreover, it is suitable for both static and dynamic operation. NG-NAPA will be effective against malicious threats such as GNSS signal spoofing and its design flexibility will ensure that other SOOP signals can be incorporated in the future.

TPZ UK is the prime contractor for this ESA-funded project and will be working with a very strong and well-structured consortium, consisting of Thales Services Numériques (France), M3 Systems Belgium (Belgium) and Chronos Technology Ltd (UK).

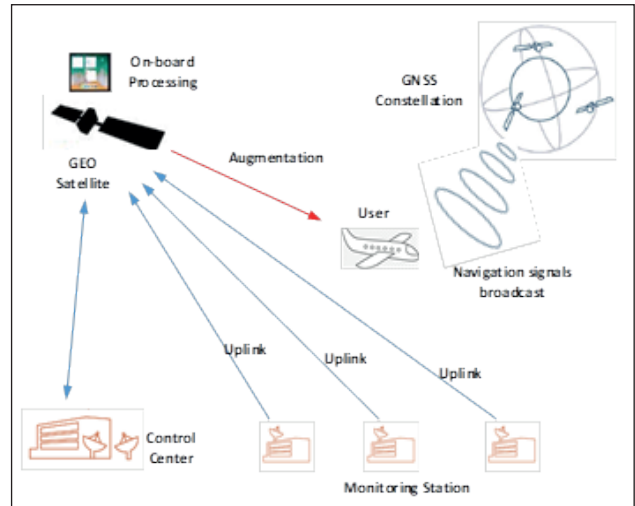


ALTERNATIVE SPACE-BASED PNT DATA LAYER

In recent years, there has been fast progress in satellite on-board computing achieved by the satellite telecommunication industry. On-board processors now have better performance, with less mass, volume and power consumption.

Current and evolving space-based PNT data layer services (e.g. private or public GNSS data augmentations), usually retransmit data computed on-ground via satellite and their architectures do not exploit the benefits that technological innovation in on-board processing could bring against new

threats and challenges. These benefits may range from the reduction of latency for data collection, processing and broadcast, to increased robustness against physical and cyber-attacks.



The main objective of the Alternative Space-Based PNT Data Layer project was to study new, innovative concepts and trade-off main design drivers for a PNT data layer system based on on-board processing, alternative to conventional on-ground computation-based systems.

Alternative architectural concepts consist of up-linking Monitoring Station data directly to satellites where PNT data layer messages are processed on-board and broadcast to users. Some advantages of this concept are:

- > No real-time terrestrial network to transmit data to a central processing facility on-ground
- > PNT data layer messages and signals are processed and generated on-board, with up-link data received through a spot beam antenna

The outputs of this study included an assessment of the interest in alternative architectures based on on-board processing, with insight in the main architectural trade-offs and identification of areas where technology evolution is a requirement.