

# POSITION, NAVIGATION AND TIMING (PNT) – AVIATION SYSTEMS AND NETWORKS



## BACKGROUND

Telespazio UK (TPZ UK) is an experienced consulting, technology, engineering and space operations and service development business with a pedigree in the space domain 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 priority and growth area for the Telespazio Group. TPZ UK has wide-ranging Resilient and Alternative PNT services and applications to offer, including solutions developed through a

number of European Space Agency (ESA) sponsored projects.

TPZ UK has wide experience in many sectors, but is most experienced in transport and timing.

Our offering includes:

- > Multi-systems, layered resilient PNT development
- > Alternative PNT
- > Technology Development:
  - DSP algorithm design
  - Software Receiver Development
  - FPGA development

# PROJECT OVERVIEW:

## PNT TIMING AND SYNCHRONISATION FOR AVIATION SYSTEMS AND NETWORKS

The exploitation of Global Navigation Satellite System (GNSS) time as a reference source for timing and synchronisation processes is fundamental for critical infrastructures like telecommunication networks, energy distribution grids, financial markets, and commercial aviation systems and networks.



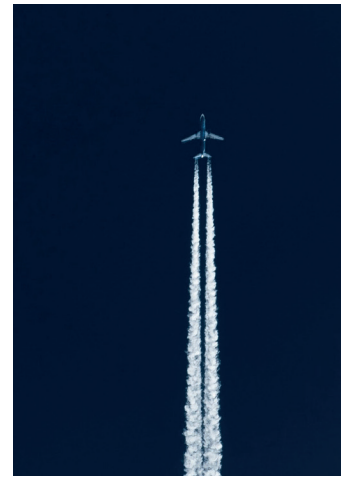
In the case of commercial aviation, GNSS time is used for:

- › Positioning and timing of on-board navigation purposes
- › Timing and synchronisation of datalink communications (on-board to ground and vice-versa)
- › Timing and synchronisation for ground systems used for Air Traffic Control (ATC), communication networks, airspace surveillance, and airport logistics coordination.

GNSS time is an integral part of GNSS services; it becomes unreliable or unavailable when GNSS system outages or signal anomalies occur. Nevertheless, dependency on GNSS for Communication, Navigation and Surveillance (CNS) systems is expected to increase. More and more aircraft are being equipped with systems like ADS-B, SBAS and GBAS that depend on GNSS being available. For some aircraft classes, GNSS is the only navigation equipment required to fly under Instrument Flight Rules (IFR) and no alternative means of navigation may be available on-board.

The Single European Sky ATM Research (SESAR) Joint Undertaking is introducing high-performance aviation for Europe through trajectory-based operations by defining, developing and delivering new or improved technologies and procedures, and allowing the ground infrastructure to be rationalised. GNSS is a key technology to achieve these objectives and may become the primary means of aircraft navigation in the mid to long term.

At the same time, other and independent timing sources may be available to backup or complement the GNSS timing and synchronisation service, e.g. atomic clocks, Low Frequency systems and Network Time Protocols (NTPs). Their suitability for usage may depend on various factors, including coverage area, phase of flight, and performance requirements of ground equipment for surveillance and communications.



The PNT Timing and Synchronisation for Aviation Systems and Networks project:

- › Assessed the criticality of the use of GNSS time in aviation
- › Defined and performed a demonstration of innovative timing concepts complementary to GNSS, in order to provide robust and secure timing and synchronisation services for aviation systems and networks
- › Provided recommendations to aviation stakeholders (CNS/ATM) to support their progress towards a safer Air Traffic Control.