



ICAO

*International Civil Aviation Organization*

**Twenty Fifth Meeting of the Communications/  
Navigation and Surveillance Sub-group (CNS SG/25) of  
APANPIRG**

Video Tele-Conference, 18 – 22 October 2021

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**Agenda Item 5:**            Navigation

5.4      Other navigation related issues

**COMPATIBILITY OF OTHER GNSS POSITIONING SERVICES WITH AVIATION  
SERVICES**

(Presented by Australia)

**SUMMARY**

Australian aviation authorities were challenged with the development of a GNSS augmentation services for road tunnel users. This paper shares the experience in ensuring compatibility for aviation safety and regularity.

**1.      INTRODUCTION**

1.1      The Global Navigation Satellite System (GNSS) has been adopted by aviation as the preferred technology for positioning, navigation, and timing. It must be recognized that aviation is not the only user and other services have different operating environments and may require different augmentations to achieve their mission.

1.2      In Australia an operational need has been identified to provide dynamic positioning services for vehicles operating in road tunnels. The key clients for this service are police and emergency services (fire and ambulance). It is also desirable that other road users equipped with off-the-shelf navigators can also use the augmentation service.

1.3      The challenge for aviation authorities is to ensure the integrity, continuity and availability of GNSS aviation application whilst not inhibiting the mission achievement of other users.

**2.      DISCUSSION**

2.1      Aviation has suffered harmful interference from GNSS augmentations that have been implemented to solve obstructed sky views such as in building, enclosed car parks and even our own industry's aircraft hangars. Augmentations have included repeaters and pseudolites and interference has been addressed by radiated power restrictions and custom signal formats and receivers.

**Agenda Item 5.4**

18-22/10/21

2.2 The road tunnel user requirements seek to have a dynamic positioning service in three dimensions comparable with performance of the existing positioning equipment in an open sky view situation. A seamless transition from the open sky to enclosed tunnel to open sky is also sought. The requirement to continue to use existing equipment including off-the-self telephones and vehicle navigators preclude a special and differentiated signal format. The dynamic positioning capability excludes the use of a simple repeater.

2.3 The road tunnel operator has identified a European solution which is best described as a translator. The translator observes the GNSS core constellation and transforms the signal to appear in the tunnel as an unobstructed sky view. Existing “leaky cables” are used to radiate the signals in the tunnel and propagation along the cable provide for simulation of the different pseudoranges to allow dynamic positioning.

2.4 The aviation starting point to assess compatibility was that the tunnel service cannot produce harmful or misleading information which would compromise the safety or regularity of aircraft operations. These criteria were accepted by the tunnel system proponent. Working with the proponent and the State Spectrum Agency, a European standard<sup>1</sup> was identified for the maximum field strength at the tunnel portals and ventilation ducts. Analysis confirmed that the field strength of the tunnel translator outside of the tunnel was below the minimum field strength of the core constellations.

2.5 As this will be the first use of this solution in Australia, the road tunnel operator is undertaking a trial to prove acceptable operation for their mission. Aviation authorities will monitor the trial to ensure no interference to aviation services is experienced. Protocols will be in place for aviation authorities to order the immediate shutdown of the trial if interference to aviation services is experience.

2.6 If the trial is successful in meeting the operational needs to the road tunnel operator and is compatible with aviation safety and regularity, then it is expected that this technology will become a standard feature of road and rail tunnel systems in Australia.

2.7 The early collaboration between other users of GNSS and aviation authorities has established the basis of a satisfactory outcome of all users.

**3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) Note the collaborative approach between aviation and other users of GNSS
- b) Share experience of the approval process of non-aviation augmentation systems.

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<sup>1</sup> ETSI EN 302 645 V1.1.1 (2010-03)