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ANALYSIS OF GALILEO TECHNICAL INNOVATIONS ENABLING SUSTAINABLE FUTURE
SPACE TRAFFIC MANAGEMENT

Abstract

Space Traffic Management (STM) is a concept already well recognised by various countries and international Organisations. The STM is necessary to enable the safe and sustainable utilisation of aeronautical and space volumes to satisfy the growing needs of traditional and new actors in the commercial and institutional sectors. This work aims to investigate how the European Global Navigation Satellite System (E-GNSS), namely Galileo, may contribute to satisfy the required technical performances thanks to its innovative features and full interoperability with GPS. The diversity of users related to STM, in term of missions' types, duration, Service Volume occupation and interception of the aeronautical space, requires technical capabilities with corresponding flexibility to offer customized services while ensuring reliability, minimum performances and sustainability. The paper analyses the impact of innovative services of Galileo and verifies their potential contribution to future STM scenarios, with the objective to identify those representing an added value. A focus will be put on the services related to the Signal In Space (SIS) such as the Navigation Message Authentication (NMA) Open Service (OS), which is intended to offer a third party proof of Position, Velocity and Time (PVT) records, and services related to the Service Facilities of the Galileo Ground Segment, such as full real time monitoring of Galileo performances required for early warning and post-event investigations. The paper also intends to highlight the interoperability between GPS and Galileo for multi-constellations receivers with improved technical performances, and as dual source of radio-localization services to enhance PVT availability, reliability, continuity, integrity and safety in the STM domain. The analysis is not addressing the institutional and legal aspects of STM, that are well recognized and fundamental for the implementation of such services. Indeed, the future STM is assumed in place with the required international agreements and cooperation schemes as a baseline. This work will consider Satellite Telecommunications as complementary space assets enabling secure and continuative communications between all the ground infrastructures and the space vehicles. The paper will also verify possible commonalities with the Air Traffic Management (ATM) and Unmanned Traffic Management (UTM), at the present state of the art and foreseeing its future evolutions, investigating interoperable UTM/ATM/STM joint infrastructures and services including on-board equipment for telecommunications and navigation for Earth airspace, Terrestrial and Space Service Volumes, and envisioning an applicable model for future Earth-Moon STM in Cislunar and Lunar Service Volumes.