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Advances in Space-based Navigation Technologies (1)

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NAVIGA: MULTI PURPOSE EUROPEAN SPACE NAVIGATION UNIT

Abstract

The space transportation market is growing rapidly, demanding new products in a shorter time, which can be used for different applications and even reused (e.g. in re-entry systems). Addressing these market needs implies developing systems that can operate in different environments, with improved capabilities (SWaP, performances and reliability), while reducing the associated cost to be more competitive. NAVIGA is an electronic sensing/processing navigation unit that responds to these needs, nominally designed for its use in the VEGA-C launcher, but thanks to its modular configuration, NAVIGA can be adapted to the needs of other transportation systems. The NAVIGA development started in 2017, driven by the risk of obsolescence of the former VEGA navigation unit, its high recurring cost, and the potential orbital injection performance increase that could be achieved with a hybrid GNSS-INS system. The project is currently facing the testing of the Engineering Model (EM), the qualification of the manufacturing processes and the preparation of the Critical Design Review (CDR), before the start of the qualification phase. Since the beginning of the project, the main design drivers were the reduction of the recurrent cost and the modular design and growth capabilities, which allow adapting the unit configuration to different missions and providing different navigation solutions (GNSS, Inertial and Hybrid) in several reference frames. Part of this initial effort has recently been compensated with the extension of the NAVIGA contract to cover the needs of the Space Rider System, which is composed by the AVUM Orbital Module (AOM) and the Re-entry Module (RM). As result, the unit is now devoted to providing a complete set of reliable navigation data consistent with the GNC subsystem needs for three different types of missions: launcher, orbital flight and re-entry. In parallel, thanks to the existing I/F provisions, it is being analysed the possibility to incorporate additional capabilities (e.g. GNSS high altitude operation and STR hybridization) that permit increasing the missions portfolio of the unit. NAVIGA is a full European product that ensures the non-dependability from ITAR restriction nor from third party rights and obligations. This paper presents NAVIGA as a fully European navigation unit that responds to demanding performance requirements and recurrent cost for multiple purposes space vehicles, including the ones composing the VEGA Space Transportation System (VSTS), and the Space Rider Systems (SRS), with a flexible architecture that can be easily adapted to other environments and space transportation missions.