Paper ID: 85260
oral

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Interactive Presentations - IAF SPACE SYSTEMS SYMPOSIUM (IPB)

Author: Mr. Domenico Scopelliti
Redwire Space, Belgium

Mr. Valerio Fogliano
Redwire Space, Belgium
Mr. Raphael Rougeot
ESTEC, European Space Agency, The Netherlands
Mr. Sergio Tiraplegui Riveras
SENER Ingenieria y Sistemas, S.A., Spain
Mr. Teodor Bozhanov
ESTEC, European Space Agency, The Netherlands
Dr. Jonathan Grzymisch
European Space Agency (ESA-ESTEC), The Netherlands
Mr. Daniel Serrano
SENER Ingenieria y Sistemas, S.A., Spain
Mr. Yann Scoarnec
SENER, Spain
Mr. Oliver Desenfans
Belgium

PROBA-3 MISSION: HOW TO SUCCESSFULLY TEST SPACECRAFT FORMATION FLYING ON GROUND

Abstract

The Proba satellite family boasts long and solid experience in delivering successful small satellite missions. Proba-3 offers the opportunity to further push the space scientific research and defines new level of technologies, raising even further the bar by demonstrating precise Formation-Flying in highly elliptical orbits in a completely autonomous way, to achieve large virtually rigid structure in space with two spacecrafts: the Occulter Spacecraft (OSC) and the Coronograph Spacecraft (CSC). Other than the technical demonstration aim, the Formation-Flying (FF), will enable the scientific study of the Sun's corona up to unprecedented accuracy in the region very close to the solar limb. The on-board autonomy reached by single spacecraft missions is usually managed by the SC service, present in the GNC S/W, interacting with the Platform S/W (PFSW), which manages the requests from Ground. However, when an autonomous formation needs to be designed, the level of on-board autonomy required by the new system increases its complexity and requires a new layer: the formation layer. This layer has roots in both the GNC S/W and the PFSW, and imposes a new hierarchy for the tasks management. Within the mission phase D (AIT/AIV) framework, the current phase of the project development, the challenges reside in finding new solutions and methodologies to successfully test and fully qualify the FF metrology units, interacting with the GNC S/W, replicating Proba-3 nominal and contingent mission scenarios in different locations along the designed orbit. In particular, the content/aim of the paper focuses on the fundamental role of the satellite-level test setup considered and the high-level test sequences planned. The two mission-characteristic tests presented here cover the two main orbital arcs relevant for the formation operations: the apogee arc and the perigee arc. The apogee of the orbit is the selected location where the Proba-

3 satellites will fly in precise formation to perform scientific observations or formation reconfiguration maneuvers by means of the Visual Based System, the Fine Lateral and Longitudinal System and the Shadow Position Sensor. Meanwhile, in the perigee orbital scenario, the SCs, through the on-board relative GPS algorithm, will finely estimate the relative position of the formation to locate each other even at high altitudes where no more GPS signal can be acquired. Eventually, the above mentioned scenarios successfully verify the use of the Inter-satellite link, which represents a vital metrology for the execution of all the FF activities along the whole orbit.