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Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

Author: Dr. Thomas Sinn
HPS GmbH, Germany

Mr. Stephan Endler
HPS GmbH, Germany
Mr. Hugo Garcia Hemme
HPS GmbH, Germany
Mr. Dennis Hartmann
HPS GmbH, Germany
Mrs. Marina Ploeckl
HPS GmbH, Germany
Mr. Paolo Proietti Zolla
HPS GmbH, Germany
Dr. Ernst K. Pfeiffer
HPS GmbH, Germany

THE DEPLOYABLES OF HPS: LARGE ANTENNAS, DE-ORBITING DRAG SAILS AND ARTICULATED BOOMS

Abstract

The size of satellite subsystems is currently mainly constrained by the payload fairing of the launcher. A way to overcome this limitation is to make the structure deployable to enable a small storage volume for launch. HPS GmbH has been working on deployable structures over a decade now and this paper has the purpose to give an overview on the most recent developments. These are the European Commission Horizon 2020 Project LEA (Large European Antenna) were 15 European partners (including all European Large Space Integrators) have the goal to design, built and test the first European PFM reaching TRL 8 to be ready for integration by the end of 2020 and for flight in 2021. The PFM (Protoflight Model) of LEA's "Deployable Reflector Subsystem" would consist of two main building blocks: "Reflector Assembly" with a diameter of over 5m and "Arm Assembly". The second activity is the ESA GSTP funded activity ABDS with the objective to bring to TRL5 a large deployable system based on an articulated boom concept, which could be mission enabler for a number of future missions requiring deployable systems. The ABDS shall be modular and scalable extending up to 30m and shall be ultra-stable with a pointing accuracy of 0.1mm/m especially under the influence of in-orbit temperature loads. The third project is the ESA GSTP funded project ADEO which is a scalable drag augmentation device that uses the residual Earth atmosphere present in Low Earth Orbit applicable for passive de-orbit of satellites between 1 kg to 1000kg. Following a demonstrator activity concluded in spring 2017, the next step is now the development of a proto-flight model of the ADEO subsystem under a follow up ESA GSTP program. The activity will commence in May 2018 and will finish at the beginning of 2020 with the full qualification test of the de-orbiting subsystem PFM. The paper will give an outlook on the reference mission selection as well as the requirement definition leading to the design of each of these deployable structures and there validation through testing.