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MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
Advancements in Materials Applications and Rapid Prototyping (9)

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LARES SATELLITE AND SEPARATION SYSTEM.

**Abstract**

The LARES satellite for the study of the Lense-Thirring effect predicted by Einstein general relativity has been launched on the 13th of February 2012 and injected in the nominal orbit with high accuracy. The Italian Space Agency (ASI) and the European Space Agency (ESA) provided the main support to the mission. The most important requirement of the satellite was the lowest possible value of the surface-to-mass ratio. That was achieved by constructing the highest mean density orbiting body in the solar system, that implied the use of a non conventional material for space. The prime contractor responsible of the LARES system is Carlo Gavazzi Space (now Compagnia Generale Spazio). The construction of the qualification and flight unit of the satellite has been performed at OMPM in Angri (Italy) using constructive drawings produced at the School of Aerospace Engineering of Sapienza University. The experience acquired on the bulk tungsten material used for LARES, during the manufacturing of breadboards, improved the knowledge on the machining of this material that was never used, at least as a main component of a satellite and with this dimension, in the aerospace field. The knowledge acquired suggested some improvements in the manufacturing strategy for the Flight unit resulting in even tighter tolerances than in the demonstration unit. Many challenges were faced during production. The main of such challenges were: the elastic behavior of the material during the machining, the brittle behavior of the material on thickness or diameter less than 3 mm, the low surface roughness required on some peculiar features like the interface cavities caves with the separation system and relevant tight tolerances. All those issues will be analyzed in detail in the paper.