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MULTI-ENGINES CRYOGENIC STAGE LOW-COST STRUCTURES AND FLUID COMPONENTS FOR SMALL SATELLITES LAUNCH SERVICES

Abstract

Since 2020, SIRIUS Space Services has been developing a range of sustainable launchers, reusable in the long term, dedicated to the launch of small satellites. SIRIUS will allow operators of small satellites to benefit from the same launch services as those offered to operators of heavy satellites. SIRIUS cryogenic bi-liquid stages are mono and multi engines. The cryogenic stages team is working on both mechanical and functional aspects, using a very fast iteration process. From existing and new technologies, trade-offs, in-house sizing tools and numerical methods, the team was able to develop very low cost, light, and reusable tanks, thrust structures and skirts. The main purpose was to standardize these parts to decrease the launch services costs, as well for the first launcher assembly as for any part replacement after stage recovery. In parallel, concerning the functional cryogenic stage, several metallic additive manufactured systems have been studied: multi-engine fluid separators, antivortex, swirl gas diffusor, cold gas thrusters. This enables the systems to be very efficient, being very light with a complex geometry. A standardized production of both mechanical and functional stage parts will be decisive in the global launch cost decrease.