Attività ALM in Avio: Programmi di Ricerca, sviluppo del combustore M10, evoluzioni e sviluppi futuri

The future extension of the VEGA launcher family is the VEGA-E launch system, which accounts for an upper stage powered by a LOX-Methane 10-tons expander cycle called M10 rocket engine. Its combustion chamber and the injector head are realized by Additive **Layer** Manufacturing (ALM) technology, which allows for complex shape and internal geometry design. In particular, by ALM is possible to push the optimization of the cooling jacket of the combustion chamber. Similarly, the design takes the advantages of ALM for the realization of the injector head, characterized by several injectors with an optimized shape for the best propellant mixing. The heritage of AVIO on the combustion chamber design and manufacturing is based on several technology maturation activities, sustained by its internal self-founded research and development programs especially for ALM implementation and now it is growing at ESA level in frame of the VEGA-E program. The successful design and development carried out by AVIO was sustained by firing test campaigns with sub-scale ALM combustion chambers and finally confirmed by the firing test of a full-scale Thrust Chamber Assy (TCA) carried out in early 2020 at the Marshall Space Flight Center (MSFC) in Huntsville (USA).