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RECENT THERMAL DESIGN DRIVEN DEVELOPMENT ACTIVITIES AT MT AEROSPACE

Abstract

MT Aerospace is currently involved in many multinational space programs by developing and intended manufacturing of a variety of sub-systems and components. The aim of this paper is to outline and to emphasize the development activities driven by thermal aspects in terms of major design load or predominating physical effect during operational or pre-operational modes. The loads vary by levels and energy transportation mode covering the low temperature domain of cryogenics, the very high temperature level during re-entry from low earth orbit and the high radiative heat loading caused by the operation of space craft engines.

In the frame of the CUST (Cryogenic Upper Stage Technologies) technology development program, MT Aerospace is working on the design and dimensioning of a sandwich common bulkhead which uses a thermal barrier element for effectively reducing the resulting heat leak which occurs between the liquid reservoirs containing liquid hydrogen on one side and liquid oxygen at the opposing side of the structure. After the reference application is presented, the analysis activities are described along with experimental investigations used to support the modeling and simulation of the system. In view of improving the design and the performance of cryogenic upper stage tanks in launchers, a need for reliable methods exists to accurately predict relevant thermodynamic phenomena during various mission phases. Ongoing activities at MT Aerospace in CFD modeling of these thermodynamic phenomena and their associated tests are presented.

For the Intermediate eXperimental Vehicle (IXV) the thermally highly loaded MT Aerospace contribution to the thermal protection systems and control surfaces will be presented. This paper describes the MT Aerospace approach for the thermal protection system for the actuator as presented for applicable design of Phase D of IXV. The design is presented and described including all necessary performed analysis and intended qualification steps toward such design. Within the frame of the Vinci engine development activities MT Aerospace is currently developing a heat shield protecting parts of the engine and the near surrounding from the radiative heat loads of the nozzle. The paper will finally present the design concept and the related design and qualification activities toward the achieved design status.