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MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

Author: Dr. Pazhayannoor Venkitachalam Venkitakrishnan
Indian Space Research Organization (ISRO), India

TECHNO MANAGERIAL CHALLENGES IN DEVELOPMENT OF GSLV MK3 LAUNCH VEHICLE HARDWARES

Abstract

The GSLVMk3 vehicle is configured as a three stage heavy lift launcher capable of injecting payload of '4 ton class' into Geo-stationery Transfer Orbit (GTO) when launched from Sathish Dhawan Space Centre (SDSC) SHAR. The L110 Liquid stage forms the core booster which functions as the second stage propulsive unit with the two S200 solid strapons forming the first stage. Upper stage is a cryogenic stage with 27 t useful propellant. The three-stage vehicle has the following configuration definition. 2S200 + L 110 + C25 The overall length of the vehicle is 43.43 m with a gross lift-off mass of 636.5 t. It consists of two propulsive modules of S200 as strap-on motors, L110 booster, C25 upper stage, vehicle equipment bay (EB) encapsulated payload assembly (EA). The Payload adaptor and Payload Fairing with the spacecraft mounted inside forms the Encapsulated Assembly (EA). This review paper deals with the technical and managerial aspects of hardware realisation of GSLVMk3 vehicle in its developmental phase. There are 16 types of Light Alloy Structures in a total of 19 structures. Four of them are tubular truss type structures and two of them partially isogrid and partially closely stiffened. Three of the tubular truss type structures are made of cryo compatible Titanium alloy tubes. These closely toleranced seamless tubes are made out of a special process called pilgering. The conical isogrid panels for two of the structures namely Core Base Shroud and Strap On Nose Cone are realised for the first time in the country. The large diameter ring forgings of 4 and 5m class were also developed for the first time in the country and the ring configurations have been simplified to contain within 3 axis machine. This has enabled us to go for low cost machines as well us enhanced the availability of sub contractors. Modular fixturing with subassembly concepts were conceived for parallel processing and allowing flexibility for design changes in the developmental phase. The propellant tank domes for both the core stages were made common inner radius for enabling the use of common stretch forming die and common welding fixtures. Also cylindrical shell was made common inner diameter for facilitating the use of common tools. All the welding tools were indigenously designed and realised within the country in a most cost effective manner. The tooling concepts and realisation methodology are also dealt in this paper elaborately.