

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures I - Development and Verification (Space Vehicles and Components) (1)

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DEVELOPMENT OF H3 LAUNCH VEHICLE 1ST STAGE ENGINE SECTION STRUCTURE

Abstract

H3 is being developed as a Japanese principal rocket by MHI and JAXA. H3 can provide a lower price launch service than H-IIA. The maiden flight of H3 will be 2020. This paper summarizes the achievement of H3 1st stage engine section structure development especially for cost reduction approach.

As for the main structure (e.g. cylinder thrust panel), high cost factors for H-IIA were the manual assembly work (e.g. drilling, fastening) and the usage of expensive AL forging material. To reduce the cost of H3, automatic fastening machine is introduced. And AL PLT material is applied to the main structure by increasing the number of circumferential divisions of cylinder thrust panels.

As for the engine support structure, high cost factor for H-IIA was due to the application of cross beam structure (e.g. Saturn V) loading engine thrust by bending stiffness. To reduce the cost of H3, the truss structure is designed which can lead to a smaller cross-section structure than cross beam structure. Also, AL extruded product which has no material waste for cost advantage is applied to the truss structure. In addition, the truss structure enabled the flexibility of selection for the number of 1st stage engine (2 or 3) in H3, which contribute the launch on needed time.

As for the development status, in order to verify the validity of design and manufacturing process, the strength and stiffness test on a 1st stage engine section structure were performed and finished successfully.