

SPACE PROPULSION SYMPOSIUM (C4)
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DEVELOPMENT AND QUALIFICATION OF S200 SOLID ROCKET BOOSTER FOR GSLV MK-III

Abstract

S200 motors are employed as pair strap-ons of ISRO's GSLV Mk-III launch vehicle. With 207T of propellant loading and a peak thrust of over 6000kN, S200 is the largest solid rocket motor developed by ISRO. Being the sole providers of thrust during atmospheric flight, identical performance of both strap-ons is vital in ensuring controllability of GSLV Mk-III. The first static test of S200 motor (ST-01) was completed in January 2010. Based on the thermal and structural performance of the ST-01 motor, design and process improvements were implemented in the second motor (ST-02) which was successfully static tested in September 2011. The two static test motors were realized following all process and quality controls which a pair of flight strap-ons would undergo. Use of key propellant raw materials from the same batch, nozzle throat liners parted from the same block, use of igniters from the same batch, grain design to obtain gradual thrust fall-rate during tail-off phase etc are the measures taken to reduce dispersion in performance between the two strap-on motors. Key performance parameters including differential ignition delay, differential thrust during tail-off phase, pressure and thrust oscillation levels, design adequacy of subsystems and interfaces were confirmed through the two static tests. Based on the demonstration of flight worthiness in the two static tests, realization of S200 motors for the maiden flight of GSLV Mk-III was taken up without significant design changes. The first experimental launch of GSLV Mk-III was completed in December 2014 wherein pair performance of S200 motors in flight was demonstrated. Close to identical performance of the two motors was on view during the launch wherein less than 30 percentage of the nozzle vectoring capability was called for. Subsequently, a third static test (ST-03) of the motor with a modified Head end segment grain geometry was carried out in June 2015 with the aim of mitigating peak dynamic pressure on the vehicle for improving margins of the vehicular structures. This paper gives an overview of the development, evolution and flight qualification of S200 motor along with on-going improvement efforts.