

SPACE PROPULSION SYMPOSIUM (C4)
Interactive Presentations (IP)

Author: Mr. V MAHESH

Indian Space Research Organization (ISRO), India, v_maheshnair@yahoo.com

Dr. ACHUTANANDA PARHI

Indian Space Research Organization (ISRO), India, achyutaparhi@gmail.com

Mr. A SHAJI

Vikram Sarabhai Space Centre (VSSC), India, shajpillai@gmail.com

Mr. Rajkumar A R

Vikram Sarabhai Space Centre (VSSC), India, ar_rajkumar@vssc.gov.in

Mr. Mohammad Ali

Vikram Sarabhai Space Centre (VSSC), India, mohammad_ali@vssc.gov.in

Mr. Levin G

Indian Space Research Organization (ISRO), India, g_levin@vssc.gov.in

Mr. Eswaran V

Indian Space Research Organization (ISRO), India, v_eswaran@vssc.gov.in

Dr. Jayachandran T

Indian Space Research Organization (ISRO), India, t_jayachandran@vssc.gov.in

DEVELOPMENT AND QUALIFICATION OF A HIGH PERFORMANCE SOLID STRAPON MOTOR

Abstract

The Polar Satellite Launch Vehicle (PSLV) has six solid strapon motors attached to the core motor. The baseline motor, S9 has 10m length 1m diameter segmented motor case loaded with 8.9T of HTPB based solid propellant. In order to increase the payload capability of PSLV for advanced missions like Chandrayaan and geosynchronous missions, a new strapon motor (S12) development with new design features was undertaken. The nozzle is a convergent-divergent type having 90 canting within-house processed carbon phenolic throat insert instead of imported graphite. Thrust vectoring is enabled with SITVC system with single pintle valve. The major features of the new motor compared to conventional PS0M are length increased by 3.44m to accommodate higher propellant loading, modified grain configuration, additional propellant loading of 3370kg, modified segment joint with the introduction of capture feature two O'rings, spherical nozzle convergent facilitating higher area ratio, truncated igniter adopting propellant formulation for standardizing propellant for all pyrogen igniters of all launch vehicles of ISRO improved motor / nozzle interface avoiding the asbestos phenolic ring. The new motor was successfully designed, developed and qualified through two successful static tests. Elaborate measurements were carried out during testing including motor and igniter pressure, thrust, strain on hardware, temperature and dilation of the hardware. Post test studies indicated all subsystem performance was normal all the objectives of the tests were met. The new strapon motor increases the payload capability of PSLV by nearly 160 kg in 615 km Sun -Synchronous Polar Orbit. Subsequent to qualification tests, the motor was inducted in PSLV in the coveted Chandrayaan mission as well as in the GSAT-12 mission. All motors performed as expected in eleven flights subsequent to the qualification tests. Further to the initial qualification tests during 2005- 2006 period, three more static tests were conducted recently to evaluate the performance of newly developed asbestos free inhibition, modified segment joint interface and modified igniter as well as qualification of new propellant processing plant. This paper provides details of the configuration, static test performance of subsystems and design modifications introduced.