

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Launch Vehicles in Service or in Development (1)

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EVOLUTION OF INDIAN PSLV AS A VERSATILE LAUNCHER FOR PLANETARY EXPLORATION
SPACE MISSIONS

Abstract

Indian Polar Satellite Launch Vehicle (PSLV) developed primarily for injecting earth resource mapping IRS satellites into polar orbits has matured into a versatile work horse launcher capable of performing a variety of missions including Chandrayan I and the Mars Orbiter (MOM) deployment missions.

As on date, it has an impressive track record of accomplishing a string of 32 successive successful missions, many of them delivering multiple satellites.

PSLV a four stage launcher with solid booster, liquid second stage, a solid upper stage and a liquid fourth stage can deliver 1.2t in GTO. Employing PSLV for planetary missions demanded innovative payload mass optimisation approach to maximise overall mission goals while meeting stringent launch window constraints. The PSLV C25/ MOM launch met two important requirements on Right Ascension of Ascending node (RAAN) and Argument of Perigee (AOP) to have optimal departure conditions for trans-Mars injection of MOM spacecraft, minimising on board fuel requirement. This mission also called for nearly 30 minutes coasting before PS4 ignition, involving associated vehicle engineering provisions and mission management strategy.

The pressure-fed fourth stage with MON/MMH earth storable propellants and powered by two 700 kN thrust regenerative cooled engines, has the flexibility for propellant loading between 1.5 to 2.5t and also is capable of restart in flight to perform multi burns. This feature is expected to be exploited in future missions demanding injection of multiple space-crafts into different orbits. The added flexibility of optional solid strap-ons makes PSLV a cost effective launcher for a variety of missions.

The overall evolution of PSLV over the past two decades into a robust and reliable launcher and its current capabilities are presented. Specific aspects of vehicle engineering and mission management strategy for performing typical missions like MOM are highlighted. Forthcoming launch opportunities are outlined.