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DEVELOPMENT STATUS OF CE20 CRYOGENIC ENGINE FOR GSLV LVM3 VEHICLE

Abstract

Development status of CE20 cryogenic engine for GSLV LVM3 vehicle *S.Somanath +Dr.V.Narayanan, @Jayan.N, $G.Remesh$Paul P George, $SridharPanigrahi, LiquidPropulsionSystemsCentre, ISROValiamala, Thiruvanc$ 695547$Email : v_narayanan@lpsc.gov.in$

GSLV LVM3 launch vehicle capable of launching 4 Tonne class spacecraft in GTO is a three stage vehicle. It is configured with a cryogenic upper stage designated as C25 stage powered by a CE20 engine operating on GG cycle using LOX and LH2 propellant combination. The major subsystems of the engine are thrust Chamber (TC), gas generator (GG), LOX and LH2 turbo pumps (TP), igniters, thrust and mixture ratio control systems, stored gas start-up system, control components and pyro valves. The Turbopump system consists of independent LH2 and LOX Turbopumps operating in series mode. The Gas Generator generates hot gas using LOX and LH2 tapped from respective pump outlets, for driving the turbines. A stored gas start up system using hydrogen is employed to start the turbo pumps. Since LOX/LH2 propellant combination is non-hypergolic, pyrogen igniters are used in thrust chamber and gas generator to initiate combustion. The engine is gimbaled 4 in 2 planes to achieve pitch and yaw control of the vehicle using a gimbal mount which connects the tank to the thrust chamber. The engine has passive thrust control and active mixture ratio control (MRC) systems to maintain the required thrust and mixture ratio. The engine subsystems are independently tested and qualified. The power head which consists of turbo pumps, gas generator and start up system is also tested. Two integrated engines with sea level nozzle are realized and successfully tested in a sea level test stand. First engine has undergone two cold flow tests and 10 hot tests. The second engine has undergone three hot tests. This engine will be subsequently tested along with a developmental stage. Third engine with full area ratio nozzle is in the final phase of integration and will undergo development tests in High altitude Test Facility(HAT). Two more engines, one with sea level area ratio nozzle and one with 100 area ratio nozzle are being realized for qualification tests and first flight respectively. This paper gives the development status of the CE20 engine.

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