India

Private sector contribution to Chandrayaan-3 mission

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Here is a list of the firms and their contribution: ** Tata Consulting Engineers Limited (TCE) engineered unique and indigenously built critical systems and sub-systems custom-built for the successful launch of space missions. TCE engineered the solid propellant plant, the vehicle assembly building and the mobile launch pedestal.

** Larsen & Toubro (L&T) has supplied various components for India's lunar mission, Chandrayaan-3. The company revealed that components such as the "middle segment and nozzle bucket flange" were manufactured at its facility in Powai, while the ground and flight umbilical plates were produced at its aerospace manufacturing facility in Coimbatore.

** Walchandnagar Industries manufactured components of the lunar mission vehicle, the first-stage booster and "flex nozzle control tanks" with a height of 80 feet and diameter of more than 12 feet.

** Godrej & Boyce has contributed to the manufacturing of L110 engine for the core stage and the CE20 engine thrust chamber for the upper stage on LVM3 (Launch Vehicle Mark III), ISRO's heaviest launcher.

** Centum Electronics provided more than 200 mission-critical modules and subsystems to the LVM3 M4/Chandrayaan-3 mission.

** Ananth Technologies (ATL) contributed to the launch vehicle (LVM3), in the realization of many of the avionics packages like on-board computers, navigation system, control electronics, telemetry, and power systems. Various interface packages, power switching modules, relay and balancing units, and others for the latest launch were also done by the firm. Many major satellite systems for the Chandrayaan-3 programme including telemetry, telecommand, power management systems, and DC-DC converters for the mission were realized by ATL.

** Omnipresent Robotic Technologies Ltd. designed the software used for processing images on the Pragyaan rover.

** Semiconductor Laboratory (SCL) fabricated Vikram Processor (1601 PE01) for LVM3 launch vehicle navigation and CMOS Camera Configurator (SC1216-0) flown on board for Vikram lander imager camera.

** Hindustan Aeronautics Limited (HAL) contributed metallic and composite structures, all propellant tanks and bus structure for rover and lander which have gone in Chandrayaan-3.

** Bharat Heavy Electricals Limited (BHEL) manufactured lithium ion batteries and titanium alloy propellant tank for lander module and propulsion module.

** MTAR Technologies supplied Vikas engines, cryogenic engine subsystems including turbo pump, booster pump, gas generator and injector head and electro-pneumatic modules for Launch Vehicle Mark-III (LVM 3).

** Mishra Dhatu Nigam (MIDHANI) supplied critical materials such as cobalt base alloys, nickel base alloys, titanium alloys and special steels for various components of the launch vehicle used in the lunar mission.

** KELTRON supplied 41 electronics modules and various power modules for the Chandrayaan-3 mission.

** Kerala Minerals and Metals (KMML) supplied titanium sponge alloys for critical components.

** Kortas Industries Pvt Ltd contributed several subassemblies for the S200 booster stage, the L110 crore stage, and the C25 cryogenic stage, including components for the CE20 cryo engine of the LVM3 launch vehicle.

** Vajra Rubber Products supplied the S 200 Thrust vector control flex seal for the LVM3 rocket. PTI SKU SMN