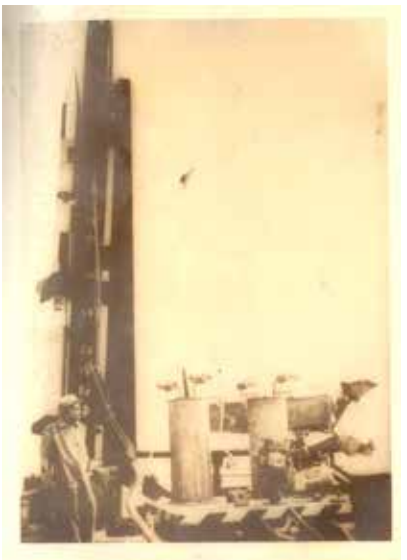
1. Dr Vikram Ambalal Sarabhai, father of Indian Space Programme, is the founder director of Space Science & Technology Centre at Thumba and the author's first boss in his professional career in India

2. St. Mary Magadelene church at Thumba where the first office was established for space engineers and scientists in 1966

3. Static test of 200 kgf thrust bip-ropellant engine at the horizontal test bed at Thumba beach

4. Static test of 600 kgf thrust bi-propellant engine at the vertical test bed at Thumba beach

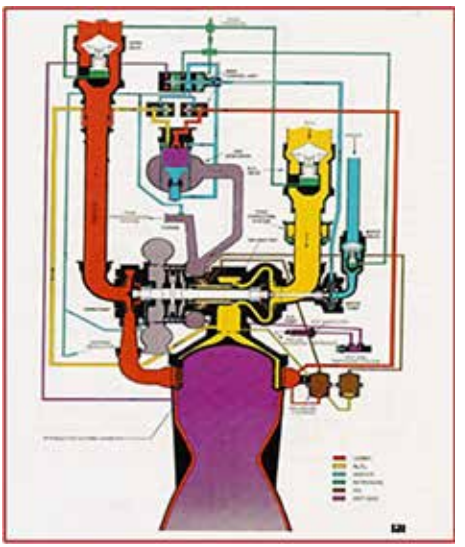


5. First bi-propellant rocket with 600 kgf thrust engine at the launcher for flight test at Shriharikotta launch pad

6. Static test of liquid stage with 3000 kgf thrust bi-prppellant engine stage at the engine-cum-stage test bed at Shriharikotta

7. First bi-propellant single-stage liquid rocket with 3000 kgf thrust bi-propellant engine on launcher (left) and in flight (right) at Shriharikotta launch station

8. Schematic diagram of the cross section of Viking engine with thrust chamber, turbo-pump, gas generator, valves and flow control system



9. Vikas liquid engine with improved performance, designed, developed and qualified for ISRO launch vehicle programme by the Liquid Propulsion Systems Centre (LPSC), in association with Indian industries, based on the Viking engine technology from Europe

10. Second stage of PSLV integrated with Vikas liquid engine for launch in PSLV- C10 flight.

11. Differential pressure developed by the Pressure Transducer Unit (PTU)

12. Thermocouple Temperature Transducer developed by PTU

13. 30-litre capacity, thin-walled propellant tank for Indian Remote Sensing Satellite with positive expulsion device

14. Director, LPSC and GM, PTU, inspecting the successful electron beam welding process for welding large expansion divergent nozzle made of a Columbium alloy, for the regeneratively cooled liquid engine for PSLV fourth stage

15. Professor Satish Dhawan, chairman, ISRO, T.N. Seshan, joint secretary, DOS, Dr A.E. Muthunayagam, founder-director LPSC, S. Nambinarayanan, Vikas-E&S, N. Gunaseharan, GM, PTU along with Rane Morin, commercial director of the French aerospace company SEP and his team after final review of transducer supply agreement between ISRO and SEP

16. Members of the PTU team at Bangalore

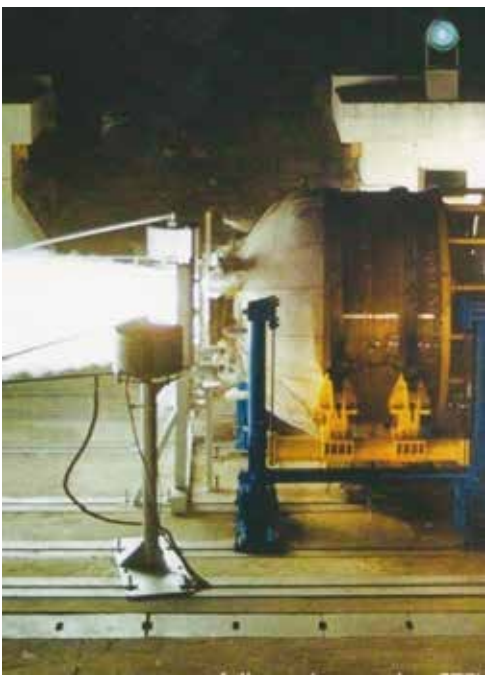
17. PSLV first stage S125 motor segment assembly: End surfaces inhibited to prevent burning

18. PSLV first stage S125: Integrated 5-segment vertical assembly.

19. PSLV first stage motor S125, at six component horizontal test bed at the static test and evaluation complex (STEX), Sriharikota Range (SHAR) for static test

20. PSLV first stage, integrated five segments, nozzle and core base shroud on the launch pad at Satish Dhavan Space Centre (SDSC)

21. PSLV third stage motor PS3 with handling fixture



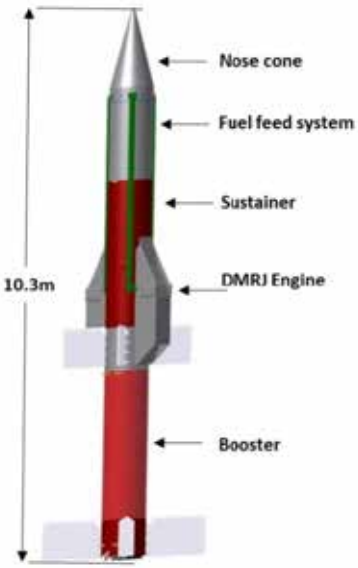
22. Static test of PSLV third stage motor PS3 at STEX, SDSC

23. PSLV strap-on motor PS0 with canted nozzle on test bed at STEX, SDSC

24. Static test of PSLV strap-on motor PS0 at STEX, SDSC

25. Spin Motor: Special purpose small solid motor for Chandrayaan 1 mission

26. De-spin Motor: Special purpose small solid motor for Chandrayaan 1 mission



27. RH 560 rocket modified for Dual Mode Ramjet Propulsion-Flight Technology Demonstrator DMRJ-FTD

28. DMRJ-FTD ignited on the launcher at SDSC

29. DMRJ-FTD in flight over SDSC Range

30. S 200: Biggest solid motor of ISRO with 3.2 metre diameter and 200 tonnes of solid propellant and flex nozzle control system, used in pair as strap-on in GSLV-MK-III is assembled for static test on the test bed at STEX, SDSC

31. Bi-propellant Reaction Control System (RCS) for the second stage of SLV 3 and ASLV

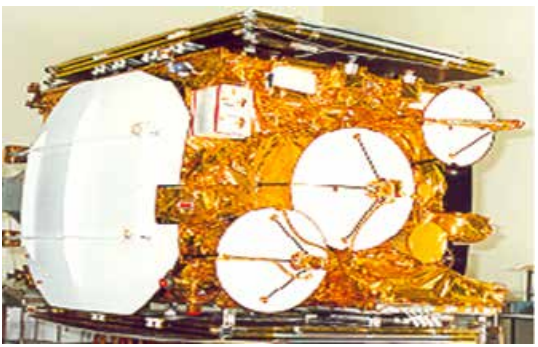
32. Mono-propellant Reaction Control System (RCS) for the third stage of SLV3 and ASLV

33. Secondary Injection Thrust Vector Control (SITVC) system for the first stage of SLV 3 and ASLV

34. Secondary Injection Thrust Vector Control (SITVC) system for ASLV strap-on motors.

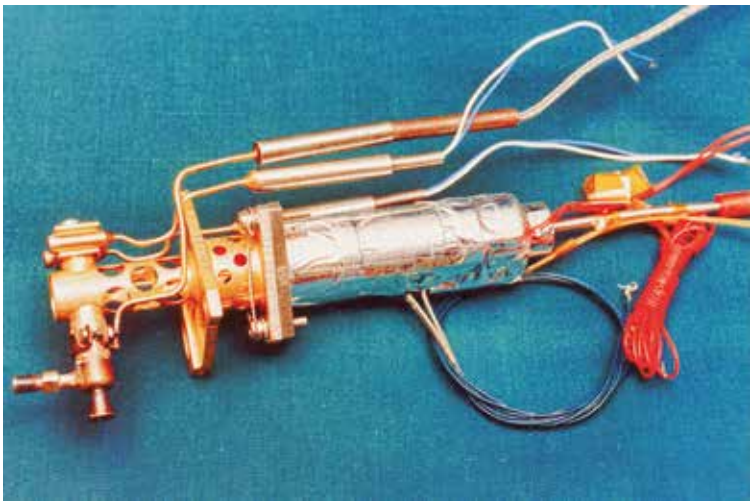
35. SITVC for PSLV first stage with twenty-four single pintle electromechanical injection valves, equispaced around nozzle

36. Indian Remote Sensing (IRS) spacecraft

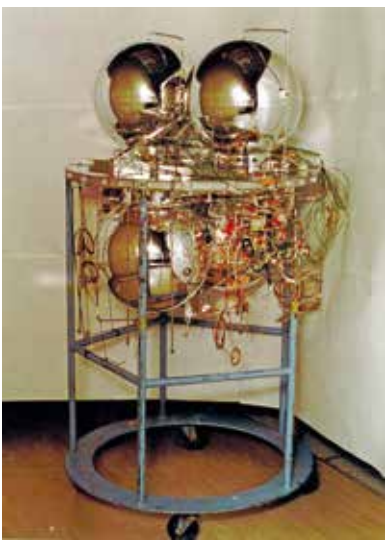


37. INSAT spacecraft

38. 1N Mono-propellant thruster for IRS



39. 11N Mono-propellant thruster for IRS



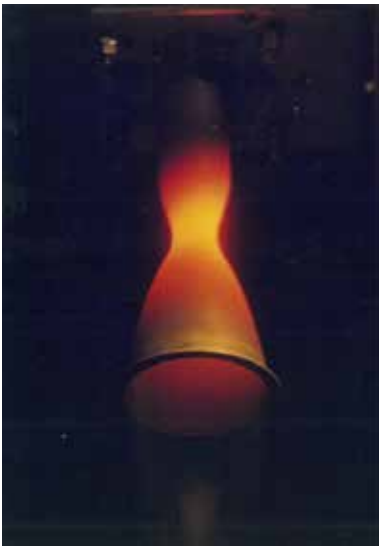
40. IRS Propulsion System

41. INSAT Propulsion System with Liquid Apogee Motor (LAM) firing

42. Liquid Apogee Motor (LAM) of 440N thrust

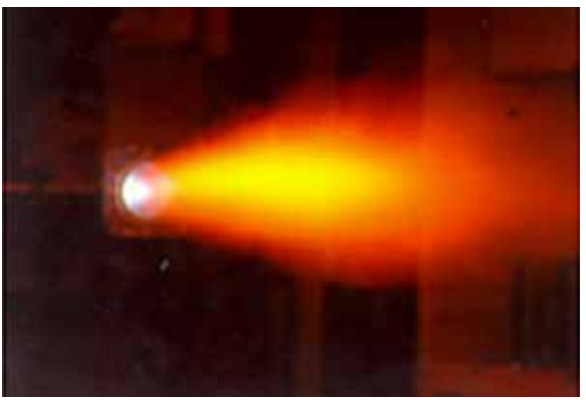
43. Attitude and Orbit Control System (AOCS) Thruster of 22N thrust

45. AOCS Thruster of 10N thrust



44. Long duration high altitude simulation test of 22N AOCS Thruster in vacuum chamber

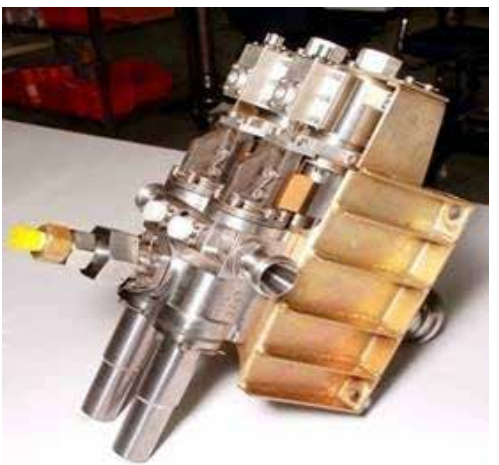
46. First regeneratively cooled thrust chamber of 12 tonne thrust cryogenic engine with Liquid Oxygen-Liquid Hydrogen propellants, assembled on the test bed at Mahendragri



47. First successful static test for 50 seconds duration of 12-tonne thrust cryogenic engine in 1998 at Mahendragiri

48. Command System Module (CSM)

49. Pressurization Module-Group I for PSLV first stage reaction control system RCS) and fourth stage

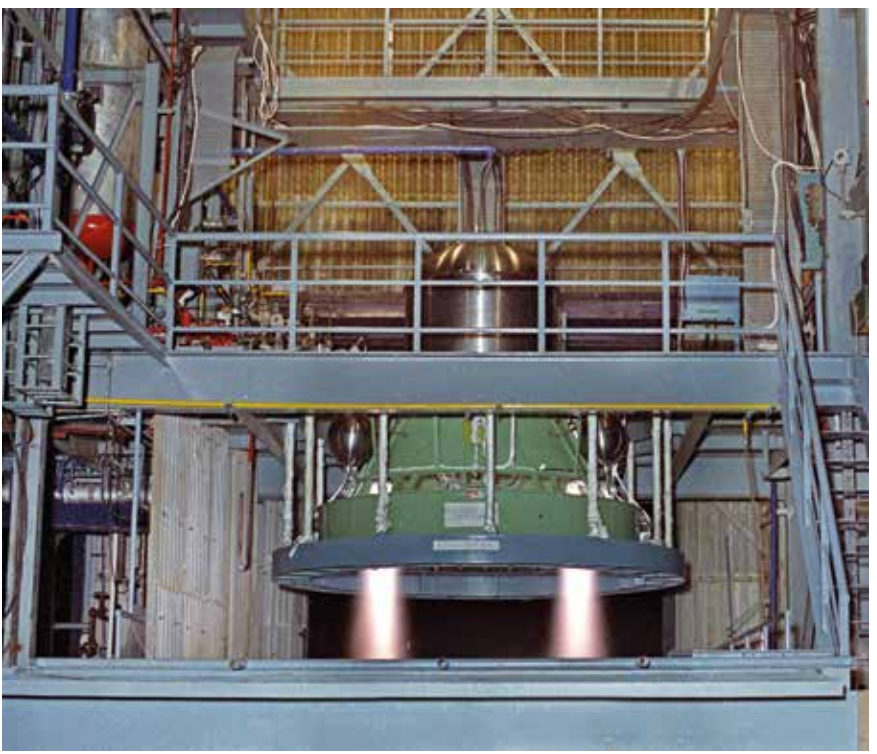


50. Hot Gas Roll Control Module (HGRCM)

51. Mahendragiri site

52. Principal test stand to test high thrust liquid engine, stage and turbo pumps. PSLV second stage is under test

53. Twin Test Bay for sea-level test and high altitude simulation test with air jets and supersonic diffuser to test and qualify PSLV fourth stage, INSAT Liquid Apogee Motor, INSAT AOCS thrusters



54. Static test of twin engines of PSLV fourth stage

55. SLV 3, the first experimental launch vehicle of ISRO, with a payload capability of 40 kgf in low earth orbit (LEO). Launched in 1980, with solid propellant motors for all four stages

56. ASLV, the second experimental launch vehicle of ISRO with a pay load capability of 150 kgf in LEO, successfully launched for the first time in 1992. SLV 3 is augmented with two identical first-stage motors with canted nozzle as strap-on. (Zero-eth stage).

57. PSLV: First operational launch vehicle of ISRO using liquid stages for the first time

58. PSLV fourth stage integrated with control system

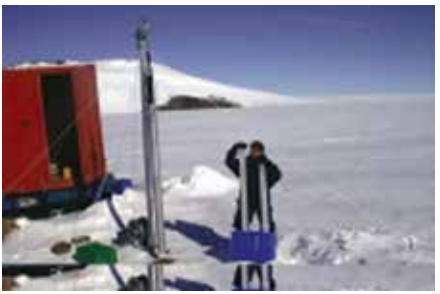
59. PSLV fourth stage liquid engine with regeneratively cooled thrust chamber with 45 triplet injectors along with equally spaced 36 orifices along periphery for film cooling and radiation cooled Columbium nozzle divergent with expansion ratio of 60 and mono-methyl hydrazin (MMH) and N_2O_4 propellants

60. Dakshin Gangotri: The first Indian Antarctic Station

61. Maitri Research Station: The second Indian Antarctic Station

62. Bharati: The third Indian Antarctic Station

63. National Centre for Antarctic and Ocean Research (NCAOR) main building, Goa, dedicated in 1998 to the nation by Dr Murali Manohar Joshi, minister for Ocean Development, GOI

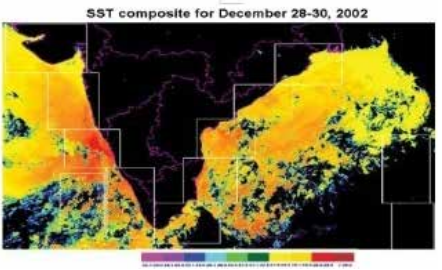


64. Ice-core sampling in Antarctica

65. Sea trial of underwater sand mining system, a joint venture between the National Institute of Ocean Technology (NIOT) and University of Siegen, Germany, on board ORV *Sagar Kanya* in 2000

66. The Antarctic krill (Euphausiasuperba), harvested during Indian Antarctic Krill Expedition in 1995 from Indian Ocean sector of the Southern Ocean

67. Culture of mud crab in cages in the Andaman and Nicobar Islands



68. Sea surface temperature composite to generate potential fishing zone (PFZ) advisories

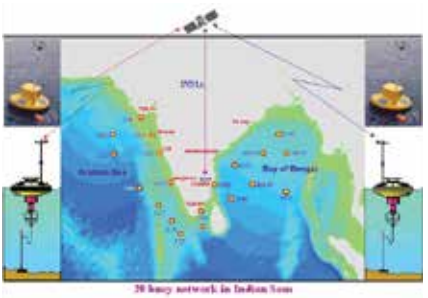
69. Oceanographic Research Vessel (ORV) *Sagar Kanya*

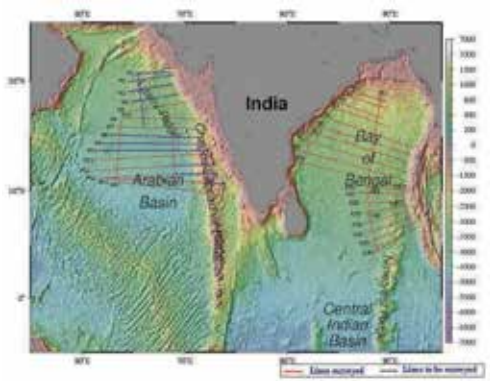
70. Fisheries Oceanographic Research Vessel (FORV) *Sagar Sampada*

71. Coastal Research Vessel (CRV) *Sagar Paschimi*

72. Coastal Research Vessel (CRV) *Sagar Purvi*

73. National data buoy programme (NDBP) of NIOT, deploying a 20-buoy network in Indian seas





74 Delineation of the outer limits of the continental shelf