



भौतिक अनुसंधान प्रयोगशाला, अहमदाबाद

Physical Research Laboratory, Ahmedabad

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PRL Ka Amrut Vyakhyaan-02

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**“REACHING THE SKY:
INDIAN LAUNCH
VEHICLES”**

Shri S. Somanath

Director, Vikram Sarabhai Space Centre
(VSSC), ISRO, Thiruvananthapuram



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Title: “Reaching the sky: Indian Launch Vehicles”

Speaker: Shri S. Somanath

Director, Vikram Sarabhai Space Centre (VSSC), ISRO, Thiruvananthapuram

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Abstract

The story of rockets in India started in a fishing village of Thumba near Thiruvananthapuram, where Thumba Equatorial Rocket Launching Station (TERLS) for launching sounding rocket was established. The first launch was on November 21, 1963, which carried a 20 kg payload to a height of 200 km using an American made Nike-Apache rocket. Indian space program so far developed five launch vehicles and has presently three operational vehicles with payload capability up to 4000kg. The story of the development of SLV-3 is a fascinating one, which is linked to the inspiring story of Dr. APJ Abdul Kalam. The multidisciplinary nature of the technology, technology denials, its strategic nature and dual use possibility made rocket technology a complex affair and to be mastered with hits and misses. The development of SLV-3 and ASLV were the learning grounds and the PSLV onwards became operational vehicles, as envisaged by Dr. Satish Dhawan in his famous Dhawan diagram. SLV-3 was successfully flown in 1980 and placed a 35 kg Rohini spacecraft in a low earth orbit. The development of ASLV was aimed at demonstration of the technologies needed for the launch vehicles in the operational phase. The PSLV programme which commenced during the ASLV period became the workhorse of ISRO and has recorded a series of successful missions with many evolutions to its credit. The development of GSLV enabled India to place operational communication satellites in GTO. Development of cryogenic technology was a landmark achievement which culminated in the realization of fully indigenous C25 stage for GSLV Mk-III. Today India is one among the few nations which has the capability to design and realize any class of satellites and launch from its own soil. The remarkable missions of Chandrayaan and Mangalyaan were achieved with PSLV and GSLV MkIII. This vyakhyaan will cover the evolution of launch vehicles, the key technologies mastered, present strengths in this domain, current developments and future programs keeping in view of the technological and industrial strength this nation has at present.

The Speaker

Shri Somanath Sreedhara Panicker is the Director of VSSC, which is the lead centre responsible for development of Launch Vehicles. In the 36 years of service in ISRO, Shri Somanath handled various responsibilities such as Director of Liquid Propulsion Systems Centre (LPSC), Associate Director (Projects) of VSSC, Project Director of GSLV Mk-III Rocket in its development phase and during the first experimental mission, LVM3-X/CARE and also as chief of different technology domains including propulsion, space ordnance and structures in VSSC. With a strong background in design, development and management of Launch Vehicle systems, he is presently serving as Chairman of the Management councils of Launch Vehicle programs, capacity building and human spaceflight program ‘Gaganyaan’, steering the technology development and management across ISRO centres. He is a fellow of Indian National Academy of Engineering (INAE), fellow of Aeronautical Society of India (AeSI), Astronautical Society of India (ASI) and a member of International Academy of Astronautics (IAA). Shri Somanath is awarded with many honours from ISRO including Outstanding achievement award and from professional bodies in India including National Aeronautics Prize, Honorary Doctorates, etc. Presently, Shri Somanath serves as one of the Vice-Presidents of International Astronautical Federation (IAF) in charge of the Technical Activities.



About PRL

The Physical Research Laboratory (PRL), known as the “cradle of space science” in India, is



one of the premier research institutes founded in 1947 by Prof. Vikram Sarabhai, a renowned Cosmic Ray Scientist, a great visionary and institution builder. PRL played a seminal role in producing a highly motivated cadre of space scientists and the technologists of highest international repute. The first scientific rocket launched from Thumba on 21st November-1963 and many other rockets launched thereafter contained payloads developed at PRL. Dr. Sarabhai initiated many of these scientific and technical activities at PRL which eventually led to the formation of the Indian Space Research Organization (ISRO). Therefore, PRL is known as the “cradle of space science” in India. Further, the research in the

area of Plasma Physics expanded to the formation of the Institute of Plasma Research (IPR).

As an institution PRL is unique in that it conducts fundamental research in a wide range of research areas from the Earth to the cosmos, and comprising Astronomy and Astrophysics; Solar Physics; Space and Atmospheric Sciences; Theoretical Physics; Geosciences; Atomic, Molecular and Optical Physics, Astrochemistry; and Planetary Sciences and Space Exploration. PRL is one of the rare research institutes of international repute wherein research in such diverse fields of sciences is carried out using several state-of-the-art experimental facilities that exist under one umbrella.

Along with the ongoing research, several new initiatives have been taken up during the last few years. The Multi-Application Solar Telescope (MAST) at Udaipur Solar Observatory has been operationalized. PRL initiated scientific programmes in frontier areas of research, which include a search for exo-planets, laboratory studies of interstellar grains, laboratory synthesis of cold astro-molecules and experimental studies in the field of quantum optics. PRL is also developing several scientific payloads as a part of ISRO’s larger vision and contributing to roadmap for competitive scientific exploration of the solar system and beyond. In particular, PRL has been contributing significantly not only in building instruments for space missions, such as Chandrayaan-1, Chandrayaan-2, AstroSat and upcoming Aditya-L1, Chandrayaan-3 and planetary and space missions, but also by bringing out new and insightful science results.

PRL contributes to several national and international research programmes and to human resource development through its Doctoral and Post-Doctoral Programmes, capacity building programmes, such as UN Course on Space Science, and science and engineering internship programmes. PRL contributes significantly to society through its Outreach Programmes by periodically organizing science exhibitions and Open Houses, planned visits of students of various school and college to PRL, and popular talks at various institutions to not only share the excitements of the advancements of contemporary scientific findings but also to encourage students to take up sciences as their research career.