

## INDIAN SPACE REFORMS : PROVIDING ADDED THRUST THROUGH ENHANCED PARTNERSHIP WITH THE PRIVATE SECTOR

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India's Space Sector is getting ready to experience major changes. In a historic decision on June 24 of this year, the Union Cabinet approved significant reforms in the country's space sector [1]. The Indian government believes that these reforms will boost private sector participation in the country's space programme besides providing new energy and dynamism to it. They are aimed at tapping the potential of the entire country for unlocking it by enabling private enterprises and start-ups to undertake end-to-end space activities. In Government's view, an open and inclusive space sector will result in accelerated growth, job creation as well as innovations and will enable Indian Space Industry to become a significant player in global space economy.

The opening up of India's space sector is part of the larger vision of the Government to transform India to become self-reliant and technologically advanced 'Atmanirbhar Bharat' through a set of socio-economic reforms [2]. It is hoped that these reforms will make space-based applications and services more widely accessible to everyone in the country.

As part of these historic reforms, the private industry will be offered opportunities to undertake R and D activities and be co-traveller in advanced inter-planetary missions. This is planned through a series of Announcement of Opportunities. Earlier, such opportunities in Human Space Flight Programme had been announced.

These reforms are also aimed at mitigating the large investments required to set up facilities by the country's private sector for undertaking space activities. The government intends to achieve this through sharing of such existing facilities under the Indian Space Research Organisation (ISRO). Functioning under the Department of

Space (DOS), ISRO has exclusively planned and implemented the Indian Space Programme during the last five decades [3].

### **IN-SPACE: The Facilitator**

Specifically, for permitting and regulating the activities of private industry in the space sector, an autonomous nodal agency called Indian National Space Promotion and Authorisation Centre (IN-SPACE) is being established by the government under DOS. IN-SPACE will act as a national nodal agency to support, guide and promote private endeavours in space sector. In this regard, ISRO will share its technical expertise as well as facilities with the private industry. IN-SPACE will have its own independent Directorates for Technical, Legal, Safety and Security, Monitoring as well as Activities Promotion for assessing the private industry requirements and further coordinating the activities [4].

### **Re-orientation of NSIL**

Following the Government's historic decision, DOS also announced that the role of NewSpace India Ltd. (NSIL), a Central Public Sector Enterprise under DOS established in March 2019, is being re-defined to transform the approach of supply driven model to demand driven model for space-based services [5]. NSIL will be strengthened and empowered to off-load operational activities of the Indian Space Research Organisation (ISRO) in the areas of launch vehicle and satellite production, launch services as well as space-based services, Dr K Sivan, Secretary, Department of Space as well as Chairman, ISRO, announced during a briefing. He added that NSIL will execute these activities through Industry Consortiums.

All these developments will allow ISRO to allocate more time and resources for R and D endeavors. But, ISRO will continue to carry out its present activities with greater emphasis on development of advanced technology, missions and capacity building besides supporting private endeavors in space sector, Dr Sivan said. He also emphasized the importance of these far-reaching reforms and said they would put India in a league of few space faring countries with efficient promotional and authorisation mechanism for private sector space activities.

### Changes on the Policy Front

Another important and interesting aspect of the reforms is on the policy front. In this regard, a new Navigation Policy is also being proposed and suitable changes in Remote Sensing Data Policy as well as SATCOM policy are also on the anvil, DOS announced. These changes are aimed at aligning these policies to an open and inclusive space sector, it added [6].

In the past, space sector has played a catalytic role in the country's technological advancement, besides facilitating the expansion of our Industrial base. It is hoped that the proposed reforms would further enhance the socio-economic use of space assets like satellites and activities like satellite building and the utilisation of satellites for such important tasks like communications, earth observation and navigation.

In this context, it appears that being the facilitating and regulating entity, IN-SPACE will work on the mechanism for ISRO's engagement with private industries to meet their demands in the country's space programme. Thus, it will act as an interface between ISRO and private parties, and will assess as how best to utilise India's space resources and increase space-based activities. It will also assess the needs and demands of private players besides exploring ways to accommodate these requirements in consultation with ISRO.

This apart, IN-SPACE, an autonomous body, will broadly lay the road for private companies to take up research and development of space missions including rockets and satellites. Thus, provision of government's careful support and guidance to industries during the crucial period of learning and change looks secure.

At the same time, the government's reforms signify that NSIL would now give importance to the needs of clients and concentrate on fulfilling those through ISRO

rather than marketing ISRO's offer, as it did in the past. In the government's opinion, this would ensure optimum utilization of the country's space assets.

### Increasing Demand for Space Based Services

As ISRO Chairman remarked in his address, the demand for space-based applications and services was growing with in India, and ISRO was unable to cater to this. The need for satellite data, imageries and space technology is strongly felt essential in various domains, from agriculture to weather forecasting to transport to urban development. Globally, an increasing number of private players are taking over space activities for commercial benefits. ISRO is principally a scientific organisation whose main objective is exploration of space. Thus, there seems to be sound commercial reasons for providing importance to the private involvement in the space sector.

Dr Sivan said that there were several Indian companies waiting for making use of the opportunities in the space sector. And there were a few companies that were in the process of developing their own launch vehicles that carry the satellites and other payloads into space, and ISRO would like to help them do that. At present, launches from India happen from its spaceport at Sriharikota on ISRO launch vehicles PSLV, GSLV and GSLV MkIII. Dr Sivan said ISRO was ready to provide its facilities to private players whose projects had been approved by IN-SPACE.

Today, India is a major space faring nation along with the United States, Russia, China, Japan and Europe. During its six-decade long space endeavor, India has acquired the end-to-end capability to design, develop, build, test, and more importantly launch satellites as well as to manage them in orbit and even to utilise them for various essential tasks. Today, indigenously built and launched satellites are an integral part of our economic infrastructure.

Besides, over the past two decades, the country has provided many commercial space-based services globally. These include launch of satellites, building of satellites for international customers, leasing of communication transponders, provision of remote sensing satellite imagery and training of personnel [7]. In this regard, the successful launch of 101 customer satellites (96 from the US, one each from Netherlands, Switzerland, Israel, UAE and Kazakhstan) and three of its own satellites (totalling an incredible number of 104 satellites) in a single launch

of its workhorse launch vehicle PSLV in February 15, 2017 enabled India to achieve worldwide fame [8] (Fig.1).

In the past, private companies capable of providing a variety of services like satellite building and launching have played a major role in the space programmes of the United States, Europe and Japan. The successful launch of the Falcon 9 rocket carrying Crew Dragon spacecraft with two NASA astronauts on May 31, 2020 signified the beginning of a new era in space exploration since the Crew Dragon capsule was both built and launched by the private American company Space X. This was the first time such a development occurred in the domain of human space-flight and it underscored the significantly enhanced role of private sector in the American space programme [9].

Today, the leading space-faring nations such as the US, European Space Agency and Japan have been encouraging private companies to play an enhanced role in their space programmes. But ISRO has till now kept the major activities in the country's space sector for itself while outsourcing the manufacture of components, parts and subsystems for rockets and satellites to private companies [10].

### Partnership with Industry

Nevertheless, involvement of India's public as well as private sector industry was willfully encouraged in the Indian space programme right from its inception and several hundred domestic industrial houses - large, medium and small - have made notable contributions to our space programme. In this context, it is interesting to note that material for India's first indigenous sounding rocket Rohini RH-75 casing and propellants were sourced from the nascent Indian industry during the 1960s itself [11]. Later, as the experimental era of the Indian space programme began in the 1970s, Indian industry began supplying components and parts to the India's first experimental Satellite Launch Vehicle SLV-3 and for experimental satellite programmes like Aryabhata, Bhaskara and APPLE [12].

Then, during the 1980s, the contribution of Indian industry took a significant leap as Indian space programme began to tend towards the operational era. In those crucial times, ISRO, in partnership mainly with Public Sector Industrial units like MIDHANI and Rourkela Steel Plant as well as private sector industrial concerns like Larsen and Tubro and Walchandnagar Industries, successfully realised the M250 grade 'Maraging Steel' (a special steel alloy) casing for the first stage of India's maiden opera-

tional launch vehicle PSLV [13]. Similarly, Godrej and Boyce as well as MTAR significantly contributed to the liquid second stage of India's workhorse launch vehicle PSLV. Today, the Public Sector Undertaking Hindustan Aeronautics Limited (HAL) is significantly contributing to GSLV and GSLV MkIII vehicles [14] (Fig.2 and 3).

Besides, the Indian industry has made significant contributions to satellite integration and testing as well as for the essential ground support infrastructure like Launch Pads and Ground Stations. With time, the participation of domestic industry in the Indian space programme has been progressively enhanced [15]. Today, a large part of the manufacturing and fabrication of Indian launch vehicles and satellites now occurs in the private sector. Similarly, the role played by the country's research institutions like CECRI, NAL, CMTI, BEL and GTRE and academic institutions like the Indian Institute of Science and Indian Institute of Technology in the Indian space programme is also important in the past [16, 17] (Fig.4).

As per ISRO Chairman Dr Sivan, Indian industry had a barely three per cent share in a rapidly growing global space economy which was worth at least \$360 billion. Only two per cent of this market was for rocket and satellite launch services, which requires large infrastructure and heavy investment and the remaining 95 percent related to satellite-based services, and ground-based systems, ISRO Chairman was quoted as saying [18]. Indian industries do not have the resources or the technology to undertake independent space projects of the kind that US companies such as SpaceX, Lockheed Martin and Boeing have been doing, or to provide space-based services. Against this background, the proposed reforms would help Indian private Industry to venture into the space sector with confidence.

Mr AS Kiran Kumar, who steered the Indian Space programme as Chairman, ISRO and Secretary, DOS during January 2015 and January 2018, had said in mid-2017 itself that space privatisation was the trend globally and India should not be left behind [19]. Further he had stated that ISRO was making a natural progression towards privatisation in the space sector [20].

Now by proactively instituting reforms at this critical juncture to reorganise the country's space sector, the government has begun adapting to the unfolding changes in the global space business. After ascertaining the role of private sector in other space faring nations today, the Government has appropriately decided to give up its domi-

nant role in the space sector and has quickly moved towards the new framework of India's space activity [21]. This critical move would facilitate a regulatory environment that encourages a more dynamic role for the private sector and promotes innovation.

The next important step in this regard is the implementation of these reforms. Their timely implementation in earnest would definitely provide equal opportunity for private players and enable them to significantly enter the domain of space with new energy and dynamism to undertake various challenging space endeavors. This in turn would facilitate the country to ascend on a much steeper trajectory to the summit of much greater success in the domain of space.

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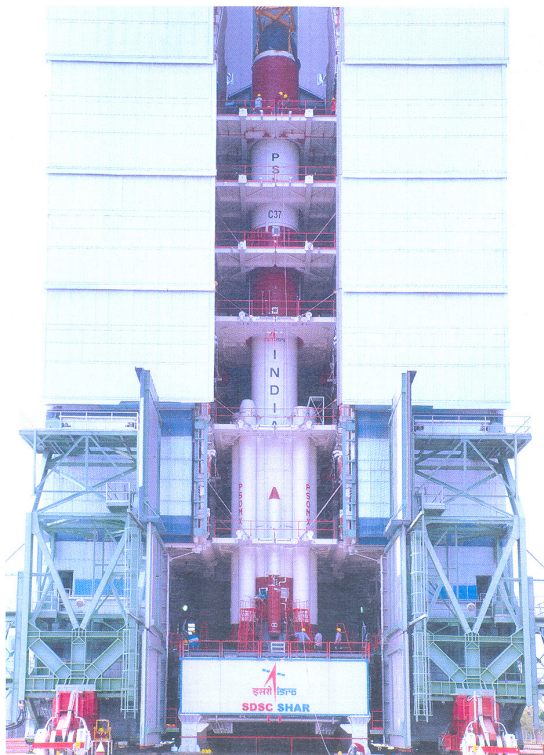
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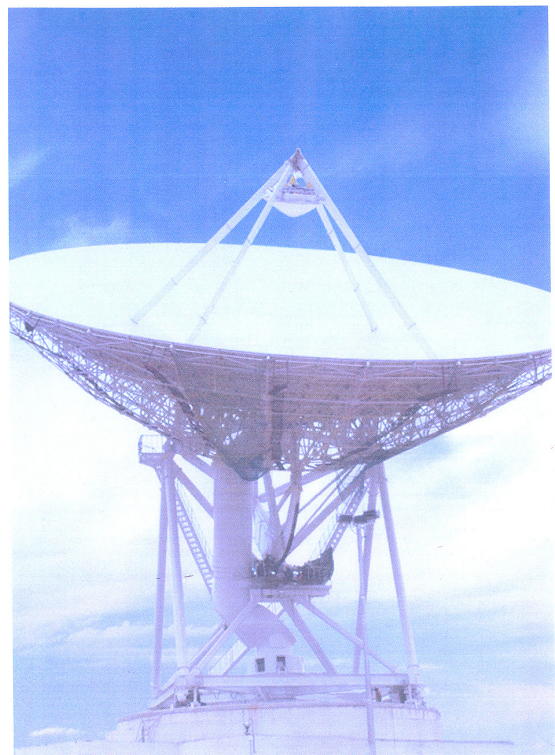
*Fig.1 PSLV-C37 Carrying 104 Satellites Lift-off  
(Courtesy : ISRO)*



*Fig.3 PSLV Second Stage with Vikas Engine at the Bottom  
(Courtesy : ISRO)*



*Fig.2 PSLV Stage Surrounded by Strap-ons during  
Vehicle Integration (Courtesy : ISRO)*



*Fig.4 32 Metre Ground Station Antenna of the Indian  
Deep Space Network (Courtesy : ISRO)*