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RIPE TIME FOR INDIA TO EXPLOIT INTERNATIONAL SPACE MARKET

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Indian Space Research Organisation (ISRO) has achieved the long awaited milestone of the successful launch of its rocket Geosynchronous Satellite Launch Vehicle-Development 5 (GSLV-D5) on 05 Jan 2014 using indigenously built cryogenic engine after two back-to-back failures of the GSLV flights in year 2010. Seventeen minutes after the launch, the rocket successfully injected GSAT-14 communication satellite in its geostationary orbit. GSAT-14 is the twenty-third geostationary communications satellite launched by ISRO and weighs 1982 Kg[i]. With this launch, ISRO became the sixth space agency in the world after the US, Russia, Japan, China and France to achieve the feat using indigenous cryogenic engine[ii].

India is amongst a handful of nation's possessing the capability of manufacturing and launching of satellites. The Indian space industry is witnessing unprecedented growth with a vast array of achievements in satellite manufacturing and launching. ISRO has established its technological superiority and organising ability amongst the space faring nations with launch of successful space missions and more than 70 satellites for various scientific and technological applications. The two main satellite systems acclaimed worldwide are Indian Satellite system (INSAT) and Indian Remote Sensing Satellite (IRS). The Indian National Satellite (INSAT) systems which are placed in Geo-stationary orbits is one of the largest domestic communication satellite systems in Asia-Pacific region used for communication, television broadcasting and meteorological applications[iii]. IRS series of satellites are the largest civilian remote sensing satellite constellation in the world, providing imageries for varied applications covering agriculture, water resources, urban development, mineral prospecting, environment, forestry, drought and flood forecasting, ocean resources and disaster management[iv].

ISRO has two satellite launch vehicles, Polar Satellite Launch Vehicle (PSLV) and Geosynchronous Launch Vehicle (GSLV). PSLV is meant for launching earth observation satellites into sun synchronous orbit (SSO) and small satellites into low earth orbit (LEO), whereas, GSLV is used for launching telecommunications satellites into the 36,000 km geostationary orbit. While the PSLV project has been highly successful, launching of GSLV has been a challenge with two successes, four failures and one partial success of the seven launches.

The GSLV is a three stage vehicle. The first stage GS1 comprises a core motor with solid propellant and four strap-on motors each with hypergolic liquid propellants. The second stage GS2 uses the same hypergolic liquid propellants. The third stage GS3 is a cryogenic stage using Liquid Oxygen and Liquid Hydrogen[v]. This third stage has been a grey area for ISRO over past two decades as it did not have a proven design to manufacture the required cryogenic engine. India procured three cryogenic engines from the erstwhile Soviet Union in the year 1991 under transfer of technology agreement. However, after the disintegration of USSR, Russia went back on the pact in 1993 and, under pressure from the US, refused to part with the technology. But it agreed to provide four more fully made cryogenic engines, taking the number of such engines in India's kitty to seven[vi].

As further supply of cryogenic engines was doubtful, ISRO took up indigenisation and worked on the design to produce the engine. The first attempt to use an indigenised cryogenic engine in GSLV-D3 to launch GSAT-4 failed on 15 April 2010. ISRO suffered another setback same year on 25 December 2010 with the failure of a booster stage of GSLV F-06 while using one of the two remaining Russian supplied cryogenic engines. On 19 August 2013, a major mishap was averted and the launch of the GSLV with indigenously built cryogenic engine was aborted 74 minutes before lift-off after ISRO scientists found that about 750 kilograms of highly inflammable and explosive fuel had leaked out in the second stage[vii]. GSLV's much awaited success of designing and using of indigenous cryogenic engine finally came through on 05 January 2014 and has paved way for India's entry in the international satellite launch market. To gain mileage from this achievement, ISRO needs to substantiate the credibility of GSLV rocket further by proving its efficacy and reliability. One focus area for ISRO is to increase payload capacity of GSLV from an existing range of 2500 Kg to 7000 Kg to cater for the launch of heavier satellites.

The success of GSLV D-5 comes on the heels of another milestone when on 05 Nov 13, Mars Orbiter Mission (MOM), christened Mangalayan was successfully launched from SHAR, Sriharikota. MOM is slated to enter the Mars orbit on 24 September 2014 after a journey of nearly 700 million

kilometers. If the mission succeeds and the satellite sets in an orbit around the Red Planet, ISRO will become fourth space agency in the world to accomplish successful Mars mission after NASA, the Russian Federal Space Agency and European Space agency. ISRO's successful space missions and satellite launches expand India's scientific, security and economic objectives. Mars Orbiter Mission and GSLV-D5 showcase the country's low-cost capability in executing space projects, encouraging India's hopes to increase its market share in the multi-billion dollar global aerospace market, which includes launching satellites for other countries.

The global space market is growing at a phenomenal rate of 10 percent yearly and satellite industry revenue[viii] stood at $189.5 billion in 2012 witnessing a growth of 7 percent in spite of global recession. The sub segments of satellite services, satellite manufacturing, launching services and ground equipment each have shown a consistent growth rate and space industry is likely to boom like telecommunication sector in next decade. Euroconsult's "Satellites to be built and Launched"[ix] estimates that 1,145 satellites will be built for launch till the year 2020, fifty one percent more satellites than the previous decade. Revenues from the manufacture and launch of these 1,145 satellites will be worth $196 billion worldwide, of which seventy percent can be attributed to government demand.

India has established a firm footing in the space programme but it seen to be lacking in the field of expanding the space industry. In spite of owning one of the largest constellations of communication and remote sensing satellites in the Asian subcontinent, India is yet to exploit the international space market in terms of securing overseas contracts. The advantage of low cost production and execution of projects coupled with reliability makes India a strong competitor in the international space market. In spite of this, we are faring poorly in securing overseas contracts. This is because, the focus of the Department of Space and Space Commission seems to be restricted to research and development programme. The Indian government needs to exploit ISRO's achievements and push itself to market the product and services.

The government needs to eye the huge satellite manufacturing and launch market and review its outlook of space policies to acquire global projects. The call of the day is to open up the space industry to the private sector, introduce reforms and declare incentives for cutting edge manufacturing technology. Presently, private sector participation is limited to manufacturing of parts for satellites and launchers. The decentralization of space industry can be undertaken in a phased manner by involving private entrepreneurs in basic design, satellite manufacturing, provision of launch services and meeting of peripheral requirements. The government can

encourage competition and participation of corporate companies by transfer of technology and subcontracting projects at a cost.

Privatisation in space sector will enable ISRO to focus on new projects while continuing with its research and development. ISRO could consider outsourcing of manufacturing of proven satellites like INSAT, IRS and small satellites. The PSLV rocket designs have been proven and thus outsourcing these will earn foreign revenues for each launch. Satish Dhawan Space Centre is the only place in India at Sriharikota range from where the satellites are launched. This in itself restricts the number of launches that can be affected. If the space market is to be expanded, it is imperative to build additional launch facilities with multiple launch pads catering to various rocket types.

Opening up private participation in the aerospace industry in civil and defence sector would contribute to the economy and result in additional job opportunities. The foreign revenue earned can be rotated to finance newer projects. The resulting competition will ensure lowering of product and service costs in similar manner as witnessed in the telecommunications sector. Focus on international collaboration while maintaining intellectual property rights will be beneficial in the long run.

To establish India as a global aerospace hub is a challenge which cannot be ignored and requires immediate attention in terms of major policy changes on the part of the government. What India needs to promote itself in space market is to use diplomatic ties and bilateral agreements to garner overseas contracts, incorporate changes in trade policies, imbibe competition within the country by introducing lucrative schemes for industry and adopting an aggressive marketing strategy, making its commercial interests evident

(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies CAPS)

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[i] ISRO; http://www.isro.org/satellites/gsat-14.aspx accessed on 06 Jan 14
[ii] http://ibnlive.in.com/news/isros-indigenous-cryogenic-engine-a-success-gslvd5-launches-gsat14/443535-3.html accessed on 06 Jan 14
[iii] ISRO; http://www.isro.org/satellites/geostationary.aspx accessed on 06 Jan 14
[iv] ISRO; http://www.isro.org/satellites/earthobservationsatellites.aspx accessed on 06 Jan 14
[v] ISRO; http://www.isro.org/gslv-f01/gslv-f01.aspx accessed on 06 Jan 14
[vi] 'Naughty boy' GSLV makes Isro parents proud with successful blast-off http://timesofindia.indiatimes.com/india/Naughty-boy-GSLV-makes-Isro-parents-proud-with-successful-blast-off/articleshow/28456824.cms accessed on 06 Jan 14

[vii] http://www.ndtv.com/article/india/isro-s-large-rocket-gslv-to-be-launched-from-sriharikota-shortly-467101?curl=1388988457 accessed on 06 Jan 14

[viii] State of the Satellite Industry Report - June 2013 prepared by Tauri group for Satellite Industry Association; accessed on 27 Dec 13 from http://www.sia.org/wp-content/uploads/2013/06/2013_SSIR_Final.pdf

[ix] Satellite Industry Growth To Continue Despite Challenging Environment; accessed on 30 Dec 13 from http://www.spacedaily.com/reports/Satellite_Industry_Growth_To_Continue_Despite_Challenging_Environment_999.html