



ISRO dreams big, *delivers big!*

PSLV has become a reliable, bankable and precision launcher that makes India an attractive destination for countries looking for a cheap and reliable option to launch satellites

text | Pallava Bagla

India's success story in space technology seems to defy gravity, considering Indian Space Research Organisation's (ISRO) string of spectacular achievements. The list includes completing India's very own satellite based navigation system, launching the country's pioneering mini space shuttle and making history by putting 20 satellites in

orbit in a single launch. A revisit to the moon is among the romantic outings India has on its anvil.

On June 22, 2016, exactly at 9:26 am, an Indian rocket lifted off from the island of Sriharikota on the coast of the Bay of Bengal in Andhra Pradesh and created history for the Indian space agency. The Polar Satellite Launch

Vehicle (PSLV-C34) put in orbit 20 satellites in 26 minutes. This is no mean feat. ISRO chairman Dr AS Kiran Kumar simply described the successful mission “a job well done”.

The PSLV in its 36th launch weighed 320 tonnes, and was as tall as 44.4 m, which is the average height of a 15-storey building. With this launch, ISRO achieved 35 consecutively successful launches of India’s smaller rocket. In 2008, ISRO launched 10 satellites in a single mission, using the PSLV, creating a world record. Today, the world record for successfully launching maximum number of satellites in a single mission is held by Russia, which in 2014, put in space 37 satellites.

In this record breaking mission, ISRO lofted 17 satellites from foreign vendors out of which 13 belonged to the US and others from Germany, Indonesia and Canada. According to Dr Jitendra Singh, Minister of State in the Prime Minister’s Office and in-charge of space affairs, “through launch of these 17 foreign satellites, Antrix Corporation Ltd has earned revenue of 10.24 million Euros and 4.54 million US\$.” This was the single largest number of satellites to be launched by an Indian rocket for America. Interestingly, for the first time India orbited a Google-owned satellite. Terra Bella, a Californian company part of the global behemoth, Google, launched a 110 kilo high-tech Earth viewing satellite SkySat Gen-2. This Google owned satellite, the company says will be used for mapping inventories.

Foreign vendors are increasingly opting to launch their smaller satellites using Indian launchers; this is not surprising since it is estimated that it costs up to 50 per cent less to launch satellites through ISRO. The PSLV has become a reliable, bankable and precision launcher which makes India an attractive destination for countries looking for a cheap and reliable option to launch satellites. Till date, ISRO has launched 113 satellites of which 74 came from 20 different countries. In the bargain, ISRO has earned over \$120 million in revenue for the country.

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ISRO finally grows wings!

The calm of a hot and sultry morning at Sriharikota was shattered exactly at 7 am on May 23, 2016, when India’s brand new rocket that carried India’s mini space shuttle into space blasted off from India’s rocket port.

For the time in its history, ISRO grew wings as it embarked on a never before space flight that made history. The Indian space agency undertook the maiden launch of its very own indigenously made version of a “Space Shuttle”, a fully Made in India effort.

Congratulating the scientists, Prime Minister Narendra Modi said “the dynamism and dedication with which our scientists at ISRO have worked over the years is exceptional and very inspiring”.





Two solar panel deployment test at Bengaluru

Yes, the big powers abandoned the idea of a winged reusable launch vehicle but India's engineers believe the solution to reducing cost of launching satellites into orbit is to recycle the rocket or make it reusable. Scientists at ISRO believe they could reduce the cost of launching stuff into space by as much as 10 times if re-usable technology succeeds, bringing it down to \$2,000 per kilo.

Re-usable Launch Vehicle – Technology Demonstrator (RLV-TD) was the first time ISRO launched a space craft which had delta wings and after launch it was glided back onto a virtual runway in the Bay of Bengal after its nearly 13 minute flight.

The only countries that have attempted operational flights of a space shuttle are America, which flew its space shuttle 135 times and then retired it in 2011. The Russians made

only a single space shuttle called it Buran. It flew into space just once in 1989. After that the French and Japanese have made some experimental flights.

Signalling success!

Recently, ISRO made a special dash to complete India's NAVIC – "Navigation with Indian Constellation" when the last of the seven satellites was successfully placed in the orbit by the PSLV on April 28, 2016. The Indian satellite constellation is already providing day and night coverage of the

navigation signal throughout the Indian region. This is a unique achievement by ISRO.

PM Modi took forward a germ of an idea from former Prime Minister Atal Bihari Vajpayee's tenure when during the Kargil conflict with Pakistan, New Delhi was

Indian engineers believe the cost of launching satellites can be reduced by recycling rocket



ISRO has launched 74 satellites commercially for different countries. India is now proposing to increase the frequency of the launches by having more Polar Satellite Launch Vehicle (PSLV) missions

denied access to the best quality satellite based navigation system signals it desperately sought to annihilate with pinpoint accuracy the reinforced bunkers on the high hills made by the Pakistanis. The first round of the National Democratic Alliance government laid the foundation for the swadeshi GPS which Modi has fulfilled. Other than India, globally, satellite-based navigational signals over South Asia are provided only by the American constellation of the Global Positioning System (GPS) and the Russian constellation that uses a system called GLONASS. It is ISRO's claim that the Indian navigation system is superior to both these systems for the South Asian region. Moreover, the American and Russian systems use 4 times as many satellites for their systems, making NAVIC (like a lot of ISRO's technology) frugal, operating with seven satellites. It must be clarified that the

India's footprint can also be made global by augmenting the number of satellites

Indian NAVIC provides a regional signal while the American and Russian systems have global footprints. When required India's footprint can also be made global by augmenting the number of satellites.

NAVIC's assured signal coverage extends over the country and about 1,500 km beyond Indian borders, and experts explain the rationale for this as being based on the current threat perception that exists for the country.

Later this year, ISRO is all set to test India's monster rocket - the Geo-synchronous Satellite Launch Vehicle - Mark III - capable of putting up to eight tonnes in low earth orbit. Next year if all goes as per plan, the country's second mission to the moon Chandrayaan-2 will lift off, which will among other things soft land India's Tricolour on the lunar surface, India reaching for the stars!