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ISRO SUCCESSFULLY LAUNCHES GSLV MK-III WITH UNMANNED CREW MODULE

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Indian Space Research Organisation (ISRO) has successfully launched the much awaited GSLV Mk-III X/ CARE Mission (also called LMV-3) in a suborbital profile to demonstrate Crew Module Re-entry Atmospheric Experiment (CARE) on December 18, 2014.[i] With the success of its prototype crew capsule, ISRO is now one step closer to venture into a human space flight programme.

Launched at 0930 hours from the second launch pad at Satish Dhawan Space Centre, Sriharikota, GSLV Mk-III is the heaviest and most powerful rocket weighing at 630.5 tonnes with two active solid and liquid propulsion stages, S 200 and L 110.[ii] The rocket is equipped with a cryogenic engine C 25 X as a passive stage. The passive stage has been incorporated for future missions involving heavier payloads and replicates the CE20 engine with liquid nitrogen being used as simulated propellant in lieu of the liquid hydrogen and liquid oxygen propellants. With this launch, ISRO now is in position to launch heavier payloads in the range of 10 tonnes in the Low Earth Orbit (LEO) and in excess of four tonnes in the geosynchronous transfer orbit.[iii] The project has cost the Indian Government to the tune of Rs. 155 crore of which approximately Rs. 15 crore has been spent on the crew module.

File photo: GSLV Mk-III integrated with CARE being transported to Second Launch Pad - View III[iv]

The external configuration of the Crew Module (CM) flight tested in GSLV MK-III is same as that of manned flight.[v] As planned, the CM separated from the launch vehicle at an altitude of 126 Km and re-entered the Earth's atmosphere at an altitude of 80 Km. The CM thereafter followed an uncontrolled re-entry trajectory after the main parachutes were deployed successfully and the crew module impacted the sea at an approximate distance of 180 Km from the Andaman and Nicobar islands where it is slated for recovery with the help of Indian Coast Guard. The success of this experimental mission has paved way for the much envisaged re-entry technology for a manned module based on a parachute based deceleration system. The text book launch validated the complex parachute deployment and thus has built up ISRO's confidence to pursue the capability of re-entry manoeuvre for a crew module for a manned space flight. ISRO's chief K Radhakrishnan termed the success as a significant day in India's space history and congratulated the scientists associated with the project. The ISRO chief while addressing the 50th Foundation Day of Institute for Defence Studies and Analyses (IDSA), had expressed that India while developing the cryogenic engine indigenously needs to improve the capacity of its launch vehicles and is targeting to achieve 12 tonnes launch capability in the decades to come.[vi] Today United States, Russia and European Union can launch satellites weighing in excess of 10 tonnes while China has achieved launch capability of 5.5 tonnes.

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The year 2014 has been one of the most important one for ISRO in the decade with back to back successful orbital launches that saw successful flight testing of Indigenous Cryogenic Upper Stage onboard GSLV D-5 and successful insertion of Mars Orbiter Spacecraft in the Mars orbit. With four successful launches in year 2014, India now seems to be closing in to compete in multi-million dollar commercial launch market and has earned reputation which will help secure overseas contracts. This coupled with low cost production and reliable execution of projects makes ISRO a strong competitor in the international space market.

CARE experiment was important for validation of re-entry manoeuvre and while the Indian government has not approved any manned spaceflight, the possibility of the same cannot be ruled out in the coming decades. A manned space flight will help ISRO and the Indian Government to establish its presence in space and will also create new opportunities in terms of economic growth and improve on the satellite life cycles by augmenting of resources in terms of techno-logistic support. In addition, if required, the technology can be exploited to address the security concerns of the nation.

The second major evaluation for ISRO's near term future endeavours was the launch of passive cryogenic engine to test the capability of GSLV Mk-III to take it to the desired altitude wherein the active engine would have taken over. The GSLV is a three stage vehicle with the first stage GS1 comprising of 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

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Liquid Hydrogen has already been tested with GSLV-D5 on 05 Jan 2014[vii]. Now that the initial evaluation of indigenised cryogenic engine has been completed and GSLV's flight profile worked out, ISRO seems to be in a much comfortable seat to launch heavier payloads in geosynchronous orbits. However, much will depend on the success of orbital flight of GSLV MK-III that is planned in year 2016-17 using the indigenously built cryogenic engine.

(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] Accessed at http://www.isro.org/index.aspx on December 18, 2014

[ii] Accessed at http://timesofindia.indiatimes.com/india/Isro/launch/of/Indias/heaviest/rocket/liveblog/45557395.cms on December 18, 2014

[iii]William Graham, "India debuts GSLV Mk.III with prototype crew capsule", accessed at http://www.nasaspaceflight.com/2014/12/india-gslv-mk-iii-prototype-crew-capsule/ on December 18, 2014

[iv] Photograph accessed at http://www.isro.org/gslv-mkiii-x/Imagegallery/launchvehicle.aspx on December 18, 2014

[v] "Crew Module Re-entry Atmospheric Experiment (CARE)", accessed at http://www.isro.org/gslv-mkiii-x/care.aspx on December 18, 2014

[vi]"ISRO to conduct experimental flight of GSLV Mk III in December", accessed at http://zeenews.india.com/news/space/isro-to-conduct-experimental-flight-of-gslv-mk-iii-in-december_1497364.html on December 18, 2014

[vii] ISRO; http://www.isro.org/gslv-f01/gslv-f01.aspx accessed on 06 Jan 14