Business Standard

*Wed, 17 April 2019*

# Research in areas of fundamental science needed for any country to prosper: Reddy

New Delhi (PTI): No country can prosper if research does not take place in areas of fundamental science, DRDO Chairman G Satheesh Reddy said Tuesday and urged the youth to work in that domain for a technologically stronger India.

He was addressing a house full of youths from high schools and colleges at a seminar held here on Mission Shakti, an anti-satellite (ASAT) missile test conducted by India.

Reddy in his address also reiterated that the Anti-Satellite (A-SAT) test India conducted on March 27 really boosted the morale of the scientist, and shared a few anecdotes to make his point.

"On March 28 morning, a DRDO scientist who lives in Delhi had a visit from a newspaper boy, who just wanted to meet him after reading the news. And, then another scientist from Vizag, who was in Delhi, had an unusual situation, when an auto-rickshaw driver gave him back the extra money he had charged beyond the due fare, after he saw him getting down at DRDO office," he said.

These two incidents really show how people reacted to the news, Reddy said.

Reddy recently had told reporters that India had chosen a much lower orbit of less than 300 km during Mission Shakti for "capability demonstration" and to avoid threat of debris to global space assets.

In his address, he also exhorted the youth of the country to give time to research in ares of fundamental science.

"No country can prosper if research does not take place in areas of fundamental science," he said, adding, the academia, research and development (R&D) and the industry are the three important components in promoting research.

*(This story has not been edited by Business Standard staff and is auto-generated from a syndicated feed.)*

*https://www.business-standard.com/article/pti-stories/research-in-areas-of-fundamental-science-needed-for-any-country-to-prosper-reddy-119041700006_1.html*

THE WEEK

*Wed, 17 April 2019*

# Nirbhay cruise missile to be tested with 'desi' engine in future

***Officials confirm that the developmental phase trials of the Nirbhay missile are over***

***By Anantha Krishnan M.***

The Defence Research and Development Organisation (DRDO) continued with its successful run of missions this year, when it successfully conducted a ‘textbook precision’ launch of the home-grown subsonic cruise missile Nirbhay on Monday.

Officials now confirm that the developmental phase trials of the Nirbhay missile are over, having completed all mission objectives. “The next set of trials will be as per the user requirements. We will

be also testing the missile with an indigenously-developed small turbofan engine (STFE) in future," an official said.

DRDO stated that the Nirbhay missile was launched from the Integrated Test Range in Chandipur, Odisha at 11:39am on Monday. This was the sixth launch of the Nirbhay (NGL-06) and was aimed at testing the reliability of the 'boost phase' and 'cruise phase' using waypoint navigation at very low altitudes.

The Bengaluru-bred missile took off vertically, then turned horizontally into its desired direction, separating its booster, following which the wings were deployed, enabling its engine to start and cruise towards its intended waypoints. (Waypoints are predefined points on the trajectory for a cruise missile to execute various mission profiles like turn, climb and descent.)

The Nirbhay missile is said to have demonstrated its sea-skimming capabilities while cruising at very-low altitudes over the sea. "It was an excellent launch. This is the first time ever an indigenously-developed missile cruised at 5-metre altitude," an official confirmed to *onmanorama*.

During Monday's mission, the Nirbhay missile covered waypoints as low as 5 metres to a maximum of 2.5km. DRDO said the entire flight was fully tracked by a chain of electro-optical tracking systems, radars and ground telemetry systems deployed all along the sea coast.

**15 waypoints**

Monday's mission was completed within 43 minutes, covering 15 waypoints. In its terminal phase, the Nirbhay missile is said to have travelled at a sustained altitude of 5 meters, which lasted about 10 minutes. "This is a very significant achievement that gives huge advantage for the weapon system," says an official.

The missile has a range in excess of 1,000km and Monday's mission saw it being tested in a low-altitude role, with the target being within the 650-700km range.

The target was a designated location in the sea.

**Sukhoi on chase**

Monday's mission saw an Su-30MKI of Indian Air Force doing the chase duties, tracking the missile during its cruise phase.

"The Su-30 MKI was chasing the missile equally at a low altitude. Since the Sukhoi is a long-endurance platform, it is the first choice during such missions," an official said.

DRDO had in the past used Jaguars, Mirages and Su-30MKIs for chase duties. Normally, to enable smooth capture of video footage of a missile in motion, the pilots are briefed in advance about the launch time, duration, flightpath, speed and other parameters.

**The story so far**

Nirbhay's first launch was a failure owing to the output from one of the sensors of the navigation system getting frozen for a brief period.

Taking range safety in account, the mission was aborted by destroying the missile after 15 minutes of flight.

The next launch was a major success and the Nirbhay missile met all mission objectives after travelling about 72 minutes and covering 1,050km. The missile failed in the third trial after a malfunction of the control system during the flight. DRDO's quality checks came under severe criticism following this incident.

The fourth flight too flopped after the wing deployment was delayed for few seconds, taking the missile out of control. The missile was remotely destroyed.

In the fifth test, the Nirbhay missile was successful and met all expectations of its makers. The near-50-minute flight saw the missile travelling close to 650km.

And, Monday's success during the sixth flight is sure to up the confidence of scientists to work on different variants of the missile in the future.

Interestingly, the DRDO seems to have 'dropped' the name 'Manik' given to the desi engine earlier, though an official word on this couldn't be gathered.

The missile makers at Aeronautical Development Establishment (ADE), a DRDO laboratory based out of Bengaluru, too, were in a celebration mood soon after the news of the successful Nirbhay mission trickled in.

"Perhaps, it's a perfect farewell to M.V.K.V. Prasad (ADE director), who is retiring at the end of this month," a scientist said.

*https://www.theweek.in/news/india/2019/04/16/nirbhay-cruise-missile-to-be-tested-desi-engine-future.html*

FINANCIAL EXPRESS
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***Wed, 17 April 2019***

# What is Nirbhay missile? All you want to know about India's indigenous 1,000-km nuclear-capable missile

***Made in India nuclear power! Nirbhay is an indigenously designed and developed long range sub-sonic cruise missile***

***By Debjit Sinha***

Nirbhay missile: Another Made in India nuclear boost! Defence Research and Development Organisation (DRDO) has recently successfully test fired the Nirbhay missile from Integrated Test Range (ITR) on Abdul Kalam Island off Odisha's Chandipur coast. This was the sixth test for the Nirbhay missile. The missile successfully met all the mission objectives. According to DRDO, the Nirbhay missile also showcased its sea-skimming capability to cruise at very low altitudes. The successful test of the nuclear-capable cruise missile adds much-needed strike and deterrance power to India's defence preparedness.

The missile took off vertically and subsequently turned horizontal into the desired direction. Its booster got separated, wing was deployed, the engine started and cruised all the intended waypoints. The first test of the Nirbhay missile was conducted in 2013.

**What is India's Nirbhay missile?**

Made in India nuclear power! Nirbhay is an indigenously designed and developed long range sub-sonic cruise missile. It is a nuclear-capable cruise missile and can carry warheads of up to 300 kg. With this test, India has also sent a stern message to Pakistan and China as the Nirbhay missile is capable of targetting any object within 1,000 km range. The Nirbhay missile is capable of loitering and cruising at 0.7 Mach at an altitude as low as 100 metres. It covered the designated target range in 42 minutes and 23 seconds, PTI reported quoting DRDO sources.

The two-stage missile is 0.52 metre wide and 6 metre long. It has a wing span of 2.7 metre. The Nirbhay missile can carry warheads at a speed of 0.6 to 0.7 Mach. During the launch time, its launch weight was around 1500 kg. The state-of-the-art Nirbhay missile can eventually be deployed from multiple platforms – sea, land, aircraft and underwater. The latest test was conducted from the land. DRDO is also planning to develop ship, aircraft and submarine-launched version of this cruise missile. Su-30 MKI fighter planes will be equipped with such missiles once they are ready. DRDO wants to increase Nirbhay's range to 1,500 km.

*https://www.financialexpress.com/defence/what-is-nirbhay-missile-test-2019-nuclear-range-of-india-pakistan-china-drdo/1549892/*

THE HINDU BusinessLine

*Wed, 17 April 2019*

# A-SAT test's success a proud moment for defence scientists: DRDO chief

***By TV Jayan***

Many precision technologies developed indigenously as part of India's ballistic missile defence programme, commenced around 20 years ago, have been critical in making the March 27 anti-satellite missile test successful, Defence Research and Development Organisation (DRDO) Chairman G Satheesh Reddy said on Tuesday.

"We have been one of the four countries in the world that have been actively pursuing a ballistic missile defence programme….The basic technologies and ideas emerged out of the ballistic missile defence programme gave the confidence to take up the critically complex mission like anti-satellite missile test, or Mission Shakti," Reddy said while participating in an event here.

The technological capability to carry out such critical mission that required accurate and precise equipment, sensors and systems emerged from the background of the technologies that had been developed for ballistic defence system. "That is how the discussions started 2-3 years ago and approval to go for the anti-satellite mission came in 2016," he said narrating the chronological sequence of the March 27 test.

Anxiety, enthusiasm, and tension that the scientists involved in the programme went through in those 3 minutes between the missile launch and the destruction of the target satellite were quite memorable and would last a lifetime, the DRDO chief said. Nearly 150 to 200 scientists were part of the mission. "Even for the scientists who have worked on the mission, imagining that type of situation was a dream," Reddy said. Explaining the nitty-gritties involved, he said the mission required a lot of precision as the relative velocity between the satellite, which was moving at nearly 7.8 km per second and the kill vehicle with a velocity of 3 km per second, was around 11 km per second. As there is no warhead involved, the seeker had to hit and destroy the satellite at its geometric centre, Reddy said. "This required centimetres of accuracy. That is the type of accuracy and precision, that is the type of timing and synchronisation and that is what our scientists have done and achieved," the DRDO Chairman said to the thunderous applause from the gathering, mainly consisting of school and college students.

According to him, the entire operation was an automatic operation, right from the missile launch to the satellite destruction and hence the algorithms need to be very precise. The scientists carried out nearly 1,000 simulations before the actual mission was conducted.

The entire mission was indigenously designed and built, with Indian industry contributing by developing around 2,000 subsystems used in the mission. Nearly 150 to 200 Indian firms have contributed to it, Reddy said.

*https://www.thehindubusinessline.com/news/science/a-sat-tests-success-a-proud-moment-for-defence-scientists-drdo-chief/article26856702.ece*

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*Wed, 17 April 2019*

# India's army approves 'emergency purchase' of 240 Israeli anti-tank guided missiles

***The Indian Army approved the import of 240 Spike anti-tank missiles and 12 launchers earlier this month***

***By Franz-Stefan Gady***

The Indian Army has approved the import of 240 Israeli-made Rafael Advanced Defense Systems Spike medium-range (MR) anti-tank guided missiles (ATGM) and 12 launchers as part of an "emergency purchase" to meet immediate operational requirements, according to media reports.

The decision to procure the third-generation fire-and-forget weapon system with a tandem-charge high-explosive anti-tank (HEAT) warhead and an operational range of up to 4 kilometers was taken at the during the five-day biannual Army Commanders' Conference in New Delhi that ended on April 13, official sources told *IHS Jane's* this week.

Following the February 2019 military standoff between India and Pakistan following the Balakot airstrikes, the Indian Army's vice chief of staff has been given authority to procure goods and materiel worth up to $72 million without prior approval from the Indian Ministry of Defense (MoD) under an emergency purchase provision.

According to Indian media reports, the Indian Army approved the purchase of 210 rather than 240 Spike missiles.

The Indian Army planned to conduct validation trials of the Spike MR ATGM in the summer of 2019 in India's western Rajasthan desert region before making a final decision on the weapon systems' procurement.

In December 2017, the Indian government scrapped a $500 million deal with Rafael for 321 Spike ATGM launchers and 8,356 missiles in favor of an indigenous ATGM system currently under development by India's Defense Research and Development Organization (DRDO). India's MoD had originally selected the Spike ATGM over the U.S.-made FGM-148 Javelin ATGM system in October 2014.

As I reported last year:

The cancellation of the deal has led to severe disagreements between the Indian Army's senior leadership and the DRDO, as the service remains deeply skeptical of the DRDO-developed man portable anti-tank guided missile (MPATGM). The Indian Army leadership has reportedly stated that it does not think that the MPATGM will meet the service's operational requirements. It is also concerned about likely delays in the induction of the new weapon system.

The DRDO successfully test fired the MPATGM at the Ahmednagar test range in the western Indian state of Maharashtra in September 2018. The weapon system has been under development by the DRDO in partnership with Indian defense contractor VEM Technologies Ltd. since 2015, with mass production slated to begin in 2021.

As I reported previously, the Indian Army asserts that it lacks 68,000 ATGMs of various types and around 850 launchers. The Army has reportedly been pushing for a fast-track procurement of 2,500 third-generation shoulder-fired ATGMs and 96 launchers through a government-government contract.

The Indian Defense Acquisition Council approved the procurement of 5,000 French-made second-generation MILAN ATGMs on January 31.

*https://thediplomat.com/2019/04/indias-army-approves-emergency-purchase-of-240-israeli-anti-tank-guided-missiles/*

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BUSINESS INTELLIGENCE ABOUT SPACE ACTIVITIES

***Wed, 17 April 2019***

# Indian space wars: India's DRDO head outlines counterspace capability ambitions

Following its 27 March 2019 direct-ascent antisatellite (ASAT) missile test that destroyed a target satellite in low-Earth orbit (LEO), the head of India's Defence Research and Development Organisation (DRDO) – G. Satheesh Reddy – has outlined to Indian media his organisation's counterspace technology ambitions for the coming years.

Reddy's comments suggest that its March 2019 ASAT test was not a one-off, at least under the leadership of current Indian Prime Minister Narendra Modi. The next few weeks sees India go to the polls for a general election, and while Indian opposition candidates are unlikely to scrap Indian ASAT programmes altogether, the DRDO agenda seems to be dependent upon the political success of Prime Minister Modi.

"We are working on a number of technologies like DEWs (directed-energy weapons), lasers, electromagnetic pulse (EMP) and co-orbital weapons etc. I can't divulge the details, but we are taking them forward," Reddy told the *Times of India*.

Labeling these capabilities as "space deterrence" technologies, Reddy's DRDO will develop counterspace weaponry (budget and politics permitting) as part of India's quest to counter what it views as a growing Chinese space threat, and by extension, military dominance over its neighbouring adversary Pakistan.

"India has over five decades of experience with space capabilities, but most of that has been civil in focus. It is only in the past several years that India has started organizationally making way for its military to become active users and creators of its space capabilities. India's military has been developing an indigenous missile defense program that its supporters argued could provide a latent ASAT capability, should the need arise. India held such a kinetic ASAT test in March 2019 where it destroyed one of its own satellites. However, given how much investment the Indian military is making in its satellite capacity, India's continued insistence that it is against the weaponization of space, and the income that Indian rockets are making launching other countries' satellites, it is unclear whether they will move to actively create an official counterspace program and they may just stop at having proved an ASAT capability," Brian Weeden and Victoria Samson recently wrote in the latest edition *Global Counterspace Capabilities: An Open Source Assessment*, published by the Secure World Foundation (Disclosure: Secure World Foundation support *SpaceWatch.Global* with an annual grant).

Satheesh Reddy was quoted as saying that the government is to decide on the "weaponisation" of anti-satellite systems or the creation of an Aerospace Military Command, adding that India does not intend to carry out additional tests of its new "satellite-killer."

"Space has gained importance in the military domain. The best way to ensure security is to have deterrence," he added.

Satheesh Reddy described the missile as a "direct-ascent, kinetic kill weapon", adding that it is "feasible" to hit multiple satellites with multiple launches of such missiles, which can go as high up into space as 1,000 kilometres.

*https://spacewatch.global/2019/04/indian-space-wars-indias-drdo-head-outlines-counterspace-capability-ambitions/*