

## **DRDO Chief hints at national panel for collaborative effort in quantum tech**

Pune: Defence Research and Development Organisation (DRDO) chairman G Satheesh Reddy on Monday hinted at forming a special committee at the national level for coordinating a collaborative effort in research and application of quantum technology (QT), an emerging field of physics and engineering which relies on the principles of quantum physics in the defence sector.

Reddy was addressing the inaugural session of a four-day meet on 'Quantum Information Technology' jointly organised by the Defence Institute of Advanced Technology (DIAT) and the Joint Advanced Technology Centre (JATC) here. He emphasised the need for a roadmap to promote the use of QT.

"The country is committed to taking QT forward. Many organisations like the DRDO, Council of Scientific and Industrial Research, Indian Space Research Organisation, Tata Institute of Fundamental Research, Indian Institutes of Technology, private industries and institutes are working in this field. We need to collaborate to bring out specific solutions. If required, we may form a special committee which will operate nationally to bring synergy in this niche research domain," said Reddy.

He said quantum computing, communication, sensing, radar, cryptography etc are the key areas which will play a crucial role in the coming years across the globe. "The DRDO's Advanced Numerical Research and Analysis Group is working on quantum communication project," he said, adding that working closely with foreign experts and institutes is the need of the hour.

Eleven experts from different countries will address the meet over the next four days. "They will deliver lectures on various subjects of QT. We need to discuss, deliberate and formulate future strategies in this area," Reddy said.

National Cyber Security Coordinator Lt General Rajesh Rant (retired) said that China has made huge progress in QT over the last four years, which is a matter of concern for India. Currently, China is building multi-satellite quantum network, he said. "In fact, developed countries have made significant investment in QT. But India doesn't have a roadmap for QT. We lack required skills," said Pant.

About 2.5% GDP of the world is lost to cybercrime, he said. "The country wants to become a 5trillion-dollar economy by 2024. It would be difficult to achieve it unless we have a full proof cyber security measure, which can be achieved through quantum cryptography," Pant said.

<https://timesofindia.indiatimes.com/city/pune/drdo-chief-hints-at-national-panel-for-collaborative-effort-in-quantum-tech/articleshow/72339651.cms>

# Light Combat Aircraft for Indian Navy: DRDO updates Naval aircraft's progress

*Speaking on condition of anonymity a senior officer of the Defence Research and Development Organisation (DRDO) explains more about the aircraft including the challenges, technologies as well as by when will it be ready for the Indian Navy*

*By Huma Siddiqui*

New Delhi: The Light Combat Aircraft (LCA) for the Indian Navy is 100% indigenous and is being made in India. Speaking on condition of anonymity a senior officer of the Defence Research and Development Organisation (DRDO) explains more about the aircraft including the challenges, technologies as well as by when will it be ready for the Indian Navy. Following are excerpts:

## **Which version is being tested?**

The indigenous Light Combat Aircraft (LCA) Navy is a Short Takeoff but Arrested Recovery (STOBAR) configuration aircraft designed to suit the Indian Navy's aircraft carriers. The Shore Based Test Facility (SBTF) built at INS Hansa, Goa specifically as part of this programme represents features available onboard carrier.



The naval version of the aircraft is being tested at SBTF to takeoff from a ski jump ramp with a short runway and also for arrested landing as on-board the carrier.

The tests being carried out include — Carrier fixed wing aircraft mainly fall under three main categories: STOVL (Short Take-Off & Vertical Landing); STOBAR; CATOBAR (Catapult Take-Off But Arrested Recovery).

## **Challenges faced?**

The challenges in doing a ski jump takeoff, in terms of the aircraft behaviour for a few seconds until wing borne flight takes place is critical to achieving a successful launch (takeoff) from the carrier. For LCA an automated ski-jump takeoff mode has been successfully implemented. The LCA is a highly unstable platform and the fly-by-wire flight control system not only provides stability but also helps to achieve an optimal takeoff through the automatic ski-jump takeoff mode. About 50 ski jump takeoffs have been carried out so far with various possible combinations that are likely to be done by this aircraft onboard carrier.

Another challenging need of this aircraft is the landing onboard carrier. Unlike in the land-based aircraft, owing to the limited space available on board aircraft carrier, this is achieved through the arrested recovery of aircraft by a special arrangement with cables laid across the flight deck of the carrier. The process of the precise landing of the aircraft with the arrestor hook attached to it to pick up one of the cables (3 cables laid at 12m apart) onboard carrier requires advanced flight control laws to aid the pilot in the task. This also demands very high strength of the landing gear and the airframe. Several combinations of aircraft recovery with Arresting Gear System (AGS) at SBTF have been successfully carried out by arresting the aircraft and bringing it to a halt within 90 metres.

Till date, 28 arrested landings have been successfully achieved without ever missing the arresting wire. However, for the eventuality of a miss of the arresting wire, a “bolter mode” has also been developed. In fact, the bolter mode was tested thoroughly before attempting the first arrested landing.

The successful completion of these tests qualifies this aircraft towards carrying out the next phase of carrier-based testing. This would be done with the availability of the Indian Navy carrier for this purpose.

The naval version of the aircraft is a single-engine aircraft. The tests carried out at SBTF and subsequently onboard carrier will provide inputs for the design and development of Twin Engine Deck Based Fighter (TEDBF) aircraft sought by the Indian Navy.

#### **What parameters have been laid down by Indian Navy?**

Aircraft with STOBAR configuration to operate on Indian Navy carriers – INS Vikramaditya and INS Vikrant. And, mission performance defined with Air Defence as primary role.

#### **When will Mk2 be ready for the Indian Navy?**

LCA (Navy) Mk2 design and development was taken up with the primary objective of meeting mission performance requirements which was a shortfall in the Navy Mk1. A fresh design with a single higher thrust engine that meets the parameters laid down by the Indian Navy has been achieved. However, Indian Navy has expressed that with newly emerging requirements only a medium weight category twin-engine aircraft would be inducted for operations.

Currently, configuration design of a twin-engine naval aircraft as sought by the user has been initiated. The initial flight testing of this aircraft is scheduled to be carried out by 2026.

#### **Technologies being tested?**

Technologies of ski jump take-off and arrested landing to operate from a moving aircraft carrier within the constrained space onboard requires special aerodynamic features, flight control law for safe and precise operations, high strength airframe to withstand arrested landing loads transferred through a specially designed landing gear using indigenously developed special grade maraging steel and customized avionics towards the carrier based operations.

#### **How much is the indigenous content**

For the design of the LCA Navy, all the critical technologies like Aerodynamics, Flight Control, Aircraft Structures, Avionics, etc. are 100% indigenous. The Fixed-wing naval aircraft to be operated onboard the carrier is designed with ‘Carrier suitability’ as a very important constraint. Unlike land-based aircraft, that are generic in nature these aircraft are built as the adage goes – ‘Horses for courses’.

The challenges towards achieving an optimal aircraft configuration towards meeting this need to suit the Indian Navy carriers has been demonstrated at the SBTF. This would be followed up by flight trials on the carrier.

The automatic ski-jump take-off, flight control system for a precise approach for the demanding arrested recovery, improvements in aerodynamics, high strength airframe to withstand high sink rate, the landing gear and arrestor hook that enable the safe launch and recovery of this aircraft are completely developed indigenously. Qualification of the system components that experience arrested landing shocks while retaining full functionality has been an indigenous effort.

As far as the equipment on LCA, about 60% of the components are indigenously manufactured. This percentage would increase to beyond 70% in the Twin Engine Deck Based Fighter. This pioneering effort would chart the further course of indigenous naval aircraft in the country.

<https://www.financialexpress.com/defence/light-combat-aircraft-for-indian-navy-drdo-updates-naval-aircrafts-progress/1782008/>

## **Tamil Nadu defence corridor takes shape as govt identifies land**

*In an exclusive interview, DRDO chairman G Satheesh Reddy told Express that Tamil Nadu was taking proactive steps in pushing the defence corridor project forward*

*By SV Krishna Chaitanya*

Chennai: The Tamil Nadu Defence Industrial Corridor is slowly beginning to take shape with the State reportedly identifying suitable land parcels near five nodes - Chennai, Coimbatore, Hosur, Salem and Tiruchy - which form the 'Defence Quadrilateral'.

Reliable sources confirmed to Express that about 1,500 acres had been identified between Hosur and Nallampalli in Dharmapuri. Only on Saturday last, an MoU was signed between DRDO and the TN Industrial Development Corporation (TIDCO) in front of CM Edappadi K Palaniswami. The IIT-Madras was also roped in as knowledge partner.

In an exclusive interview, DRDO chairman G Satheesh Reddy told Express that Tamil Nadu was taking proactive steps in pushing the defence corridor project forward.

"TN being a manufacturing hub would be key for India's dream of achieving self-reliance in defence procurement. Several companies in Coimbatore, Tiruchy and Hosur are already working with us. This corridor project will create an ecosystem where industries will be encouraged to take up more defence projects. We are planning an R&D centre in the TN defence corridor, where industries will be hand-held and groomed by our scientists," Reddy said and added that in July, Defence Minister Rajnath Singh reviewed the progress of the corridor projects, both in Tamil Nadu and Uttar Pradesh.

Till date, six consultation meetings of stakeholders were held across various nodes of Tamil Nadu. At the Tiruchy meet held on January 20, an investment of over `3,100 crore was announced by the Ordnance Factory Board /Departmental Public Sector Undertakings and private industries for the TN Defence Corridor. Further, government has also appointed a consultant for the preparation of a detailed project report for the defence corridor.

Reddy said the DRDO had, of late, opened up different avenues for industries. "We have opened up our 1,500 patent portfolios, promulgated the new Transfer of Technology (ToT) policy and launched Technology Development Fund (TDF). We have signed more than 900 ToT agreements with industries. Over 1,800 industries have joined hands with the DRDO in delivery of various components, subsystems and technologies."

Under new ToT policy, there is no fee or royalty for industry partners, who join as Development cum Production Partners and Development Partners. Even for others, only five per cent ToT fee will be charged. While some industries have already achieved the capability and the capacity to become the lead system integrator in certain areas, some have become suppliers to global supply chain and have started exports of the DRDO-developed system to friendly countries. "Many friendly countries have shown an interest in the possibility of acquiring the DRDO-developed systems," said Mayank Dwivedi, Director, Directorate of Industry Interface and Technology Management, DRDO.

"This is the apt time when an Indian industry can take advantage of the latest policies of the government and join hands with the DRDO to deliver defence systems and technologies to the Indian defence forces," he said.

<https://www.newindianexpress.com/states/tamil-nadu/2019/dec/03/tamil-nadu-defence-corridor-takes-shape-as-govt-identifies-land-2070613.html>

## **HAL recorded profit of Rs 2,070 crore in 2017-18; revenue rose by 3%**

*In 2016-17, HAL recorded profits to the tune to Rs 2,606 but it declined by seven per cent, registering a profit of Rs 2,070 crore*

New Delhi: Hindustan Aeronautics Limited (HAL) recorded a profit of Rs 2,070 crore in 2017-18, seven per cent less than previous year, the government said on Monday.

In a written response in Rajya Sabha, Minister of State for Defence Shripad Naik said in 2016-17, HAL saw a revenue of Rs 17,950 crore from operations. It rose by three per cent in 2017-18 to Rs 18,519 crore.

In 2016-17, HAL recorded profits to the tune to Rs 2,606 but it declined by seven per cent, registering a profit of Rs 2,070 crore.

HAL manufactures aircraft, including helicopters, for the armed forces.

Replying to another question, Naik said the Defence Research and Development Organisation (DRDO) develops systems and equipments for the armed forces in various technology domains.

A total of 39 different systems, equipment worth over Rs 95,062.08 crores designed and developed by the DRDO, have been approved for induction into the services during the last three years.

These systems include various types of platforms, sonars, radars, software defined radios, missile systems, gun systems, munitions, bridging equipment he added.

In response to a question on the status of the proposed Coast Guard Academy in Azheekkal, Naik said since the Ministry of Environment, Forest and Climate Change has denied grant of Environment and Coastal Regulation Zone (CRZ) clearances the project has been dropped.

[https://www.business-standard.com/article/pti-stories/hal-saw-drop-in-profit-in-2017-18-in-comparison-to-last-year-but-revenue-rose-by-3-pc-119120201371\\_1.html](https://www.business-standard.com/article/pti-stories/hal-saw-drop-in-profit-in-2017-18-in-comparison-to-last-year-but-revenue-rose-by-3-pc-119120201371_1.html)

## Stock Daily Dish

### **A-SAT debris will decay in 45 days, says DRDO Chief**

With the successful anti-satellite missile test, India is capable of hitting a target at a range of over 1,000 km in space and a lower orbit was chosen for the mission to avoid threat of debris to global space assets, Defence Research and Development Organisation Chairman G Satheesh Reddy said on Saturday.

On being asked whether multiple satellite targets can be hit, he said, "It is a question of how many launchers we have, and with multiple launchers, one can have multiple engagements. But, multiple (targets) is definitely feasible."

India shot down one of its satellites in space on March 27 with an anti-satellite missile to demonstrate this complex capability, joining the elite club of countries — the United States, Russia and China — which have such capabilities.



“The A-SAT test was successfully conducted with a new interceptor missile against a live orbiting satellite in the Low Earth Orbit in a hit-to-kill mode. The interceptor has the capability to hit target at a range of 1,000 km, which covers most of the LEO satellites,” he told a press conference at the DRDO Bhawan.

“An orbit of around 300 km was chosen for the test for capability demonstration and the purpose was to avoid threat of debris to any global space assets,” Reddy said.

His remarks come days after National Aeronautics and Space Administration raised concerns about the spread of debris from the A-SAT test India conducted under Mission Shakti.

“The debris created following the intercept will decay in a matter of weeks,” he added.

Addressing the media persons, Reddy also said, “For a similar application we don’t need another test.”

On Tuesday, NASA had termed a “terrible thing” India’s shooting down of its satellite, saying the hit-to-kill mission created about 400 pieces of orbital debris.

“Some debris going up could be a possibility, as per our simulation also. We don’t have information on that.. From our simulation, we can very clearly say that the possibilities of (debris) hitting the International Space Station are not there,” Reddy said.

He said the first 10 days since the test were critical and that have passed, and in 45 days all debris will disintegrate.

The ministry of external affairs too has said the test was done in the lower atmosphere to ensure that there is no space debris.

Prime Minister Narendra Modi had hailed the A-SAT test’s success as “an unprecedented achievement” that makes India a “space power”.

Some 150 scientists, including at least 40 women scientists, worked round-the-clock, and especially in the last six months on this project. About 2,000 components were sourced from 50 private industries. The idea began around 2014 and development started in 2016 with a go-ahead from the government.

The press interaction came days ahead of the first phase of the Lok Sabha polls on April 11 due to which the model code of conduct is in place.

He also said that earlier in the day there was a meeting with eminent scientists to inform them about the A-SAT test.

He also responded to a question on Congress leader P Chidambaram’s criticism of the government on the test, who had said that “only a foolish government” would reveal a defence secret.

“Mission of this nature after a test is conducted can’t be kept secret. The satellite is tracked by many stations across the world. All necessary permissions were taken, Reddy said.

<https://stockdailydish.com/a-sat-debris-will-decay-in-45-days-says-drdo-chief/>

## **The mastermind behind India's star wars**

*DRDO Chief G Satheesh Reddy is the first Indian to be appointed Fellow of the Royal Institute of Navigation and of the Royal Aeronautical Society*

*By Ajai Shukla*

Scientists of the Defence Research and Development Organisation are basking in the limelight after being publicly lauded by Prime Minister Narendra Damodardas Modi for successfully conducting an anti-satellite or ASAT test, a capability that only the United States, Russia and China had demonstrated so far.

A key role in this achievement has been that of DRDO chief G Satheesh Reddy.

An acclaimed navigation specialist, Reddy personally led the development of systems that guide a missile, itself travelling at hypersonic velocity, to a satellite 300 km away that is travelling through space at almost 30,000 km per hour.

Even so, the achievement remains a collective one, shared by hundreds of scientists and technologists who participated over decades in the Integrated Guided Missile Development Programme.

The IGMDP was kicked off in 1983 by the talismanic DRDO chief (and later President of India) A P J Abdul Kalam, and spearheaded by talented and hardworking young scientists that he personally selected.

Amongst those were propulsion specialist Vijay Kumar Saraswat, who headed DRDO from 2009 to 2013; and navigation systems specialist Avinash Chander who followed Saraswat as DRDO chief from 2013 to 2015.

Like Reddy, these pioneers masterminded the Prithvi and Agni programmes and the many strategic missile systems that flowed from the IGMDP, including the ballistic missile defence programme and now the ASAT system.

Reddy is, in a sense, a child of the Modi government's shake-up of the DRDO.

In August 2014, three months after coming to power, Modi publicly criticised DRDO's endemic delays, which he ascribed to a 'chalta hai' (lackadaisical) attitude.

Four months later, he sacked then DRDO chief Chander, terminating a service extension that had recently been granted.

Of the three posts that Chander held — DRDO chairman, secretary defence R&D and scientific advisor to the raksha mantri (SA to RM) — the first two went to radar specialist S Christopher, while Reddy was given the prestigious job of SA to RM.

In being elevated to that post, Reddy, then less than 55 years old, superseded an unprecedented number of seniors.

When Christopher retired last August, Reddy was given both his posts, making him the top defence R&D czar.

Even after taking over as SA to RM in June 2015, Reddy retained the crucial DRDO appointment of director general (missiles and strategic systems), overseeing the development of navigation systems by the research centre Imarat, the secretive laboratory he had earlier headed.

With propulsion systems development having more or less stabilised, most key advances in strategic and tactical missiles, guided bombs and drones are now taking place in the precision of navigation systems.

Many of the DRDO's key projects, such as guided glide bombs, guided rockets in the next Pinaka rocket launcher system, and the next-generation of strategic missiles such as the unacknowledged Agni-6 and the K-4 submarine-launched ballistic missile, fall squarely in Reddy's sphere of expertise.

The DRDO chief, savvy in New Delhi politics, clearly understands the imperative to share credit with the government.

Even though Saraswat had repeatedly stated, from as early as 2010, that the technology for an ASAT test was ready and developed, Reddy has prudently allowed credit to the Modi government.

"While we have been working on the technology for a while, as you know, serious work on it started about two years ago in 2016-2017. We went into mission mode only six months ago, from when we worked day and night. This is a new missile that has been developed although we have used some existing technology as background," Reddy told an interviewer.

Asked who he would credit for the test, Reddy replied: "The national security advisor (Ajit Kumar Doval) whom we report to on strategic matters gave direction to go ahead with the test and he had the concurrence from the prime minister."

In the often staid Indian scientific community, Reddy is a youthful star.

In 2015, he was awarded the prestigious Institution of Engineers (India) and Institute of Electrical and Electronics Engineers award.

The same year, he was awarded a medal by the prestigious Royal Aeronautical Society, London, which has recognised aerospace excellence every year since 1909, when Wilbur and Orville Wright came to London to receive the first gold medal.

Reddy is the first Indian to be appointed Fellow of the Royal Institute of Navigation in London, and of the Royal Aeronautical Society.

He is a foreign member of the Academy of Navigation and Motion Control, Russia, a Fellow of the Indian National Academy of Engineering, an Honorary Fellow of the Computer Society of India, and of the Sensors Research Society.

<https://stockdailydish.com/the-mastermind-behind-indias-star-wars/>