THE WEEK

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India's next-gen anti-radiation missile set for trials

By Anantha Krishnan M.

India's maiden attempt to develop a New Generation Anti-Radiation Missile (NGARM) has finally picked up momentum.

Scientists with the Defence Research and Development Organisation (DRDO) are warming up to undertake the pending trials of this stateof-the-art missile without further delay.

Its user—the Indian Air Force (IAF)—feels that the DRDO must fasttrack the project.

Early this year, the DRDO had claimed that the NGARM was successfully launched from a Sukhoi-30 MKI for the first time over Bay of Bengal.

Parameters such as control guidance, aerodynamics and propulsion without a seeker were tested during this maiden trial held on January 18.

This is the first time an indigenous anti-radiation missile system is being developed within the country.

Story so far

Feasibility studies on NGARM were initiated during 2012/13 period. Based on preliminary studies and design iterations, a missile configuration was evolved. The missile configuration was planned to be developed fully indigenously with an aim to provide tactical air superiority capability to the user.

The crucial technologies to be mastered were development of a wide-band passive seeker, a milli-metric wave active seeker, radome for the seekers and development of dual-pulse propulsion system.

The top-3 anti-radiation missiles (ARMs) in the world are AARGM (AGM-88E) of the United States, Kh-31P of Russia and MAR-1 of Brazil. All these missiles have a range in the order of 100 kms, while India’s NGARM, too, is in the same range.

The IAF has Kh-31P in its weaponry and DRDO’s next-generation desi ARM promises to be better.

What is NGARM?

ARM is a specialised weapon and as the name suggests it is used to destroy or suppress radiation emitting sources like enemy surveillance radars or fire control radars.

The missile is approx 5.5 m with a cruciform wing surfaces to meet the manoeuvrability requirements. The all-movable tail control surfaces provide control in pitch/yaw/roll planes. The weight of the missile is around 600kg and is powered by a dual-pulse solid rocket motor system.

Mid-course guidance is accomplished through inertial navigation and PHH (passive homing head) seeker. The terminal guidance is through millimetre wave (MMW) active seeker.

What is a seeker?

Seeker is basically the eye of the missile. It transmits radio frequency pulses and receives the echo from the intended target object. Based on processing of the signal, the range of the target i.e. its position can be deduced. In the case of imaging seeker, we can literally see the image of the target.

DRDO says the missile can be integrated on to fighter aircraft under different combinations and it is tailor-made to be flight-tested from Su-30 MkI. In future, the missile could be flying on board the Mirages and Tejas, as well.

Currently, many home-grown weapons are under development with Su-30 MKI as the platform.

How does it work?

It is an air-to-ground weapon generally launched from a multi-role strike aircraft to provide tactical air superiority in warfare. The passive seeker in the missile is able to detect and lock on to a ground based radiation emitting source/radar. Key features of the radar and the direction of arrival of the RF

(radio frequency) emission are processed by the seeker. This information along with range to target is provided to launch computer.

Missile navigation and guidance towards the target during the midcourse is based on the continuous inputs from sensors like INS (inertial navigation system) and passive homing seeker. These are processed by an on-board computer to generate the autopilot commands and the control system steers the missile towards the target. During the terminal phase of the mission, the target location information is provided by MMW seeker.

Role in war

Anti-radiation missiles have come to play a crucial role in air-to-ground warfare against radar installations with the aim of achieving air superiority.

Suppression of the radar systems enables the strike aircraft to perform their missions without the perform their missions without the prospect of facing imminent threats from radar-guided surface-to-air missiles.

Historically, the first ARM, US AGM-45 Shrike entered combat during late 1960's, wherein the weapon was integrated with a specialized aircraft that was capable of detecting threat emitters and launching the missile for a 'hard' kill. Subsequently, upgraded versions AGM-88 (HARM) have been widely used by the US Air Force during Operation Desert Storm against Iraqi radar installations.

Project momentum

A young project team with an average age of 40-42 years have been hooked on to India's NGARM mission since 2014, the time project started to pick up momentum.

Hyderabad-based DRDL is the nodal agency for this missile project and its management, with DRDO's sister labs including RCI, HEMRL, ARDE, TBRL and DLRL playing their respective roles in the development of the weapon.

The software labs of IAF are the key brains behind the project ensuring the smooth marriage between the missile and the mean machine, Sukhoi. The modication on Sukhoi has been carried out by HAL's Nasik division while Bengaluru-based National Trisonic Aerodynamic Facilities (NTAF) of National Aerospace Laboratories undertook extensive wind-tunnel tests.

Several private industrial partners too have chipped in towards realisation of various hardware sub-systems.

Trials so far

Carriage flight trials in several phases have been carried out to prove the mechanical/electrical integration and software interfacing of the missile with the aircraft. Based on the successful completion of these activities, the maiden flight trial of NGARM was carried out in January.

DRDO officials claim that the missile successfully impacted at the designated point with high accuracy. The point of impact was within 10 m of the circular error probability (CEP). In ballistic parlance, CEP is the measurement of the weapon's precision.

In the recent flight mission, aspects like auto-launch sequence, store separation, dual pulse propulsion system, guidance and inertial navigation, autopilot and control system, thermal batteries, aerodynamics and airframe were successfully proven.

The January trial was for a range of 100 km and scientists say the NGARM can strike at distances 'double the intended range' depending upon the altitude.

Looking ahead

The missile will now be heading for a series of carriage and release flight trials. The carriage flight trials will be conducted to evaluate the performance of seekers against a wide range of targets. Subsequently, release flight missions will be planned to demonstrate the mid-course guidance and terminal guidance using seekers.

Scientists tracking NGARM flightpath confirmed that the next flight will be a ‘seeker performance evaluation’ one. A desi passive seeker will be onboard the missile during the next trial, while the test after that will have an active seeker as well.

Trials of NGARM with both seekers together should be in July or August this year.

Plans are also afoot to develop future variants of NGARM. It would mean upgrades with higher versions of software with capability to handle larger variety of targets under various operational scenarios.

User feedback

An IAF official tracking this mission says NGARM is essential for war-fighting and a home-grown one gives more options on different fighter assets.

“But we need to get the missile on time. The DRDO getting into this is good news, but they have been at it for five years. They have not yet mastered the technology for the sensors, which is the most critical part,” the official said.

He said the first carriage flight was a setback as the missile control fins failed in carriage itself before release. “The next carriage and release test without sensor was okay. The DRDO takes one year between each test, which is a cause of worry,” the official added.

When missile scientists were confronted with IAF’s point of view, they refused to be pulled into a debate. “We are working closely with IAF. On sensors, the IAF wanted us to have a Plan-B, since developing a new system has its own challenges. This is not a standalone case of NGARM. Every Indian missile has gone through this phase. But in five years, we have come this far,” says a scientist.

With the changing scenarios of war-fighting post Pulwama, IAF wants DRDO to apply logic to projects than emotions. And, DRDO says NGARM will add an inspiring story to India’s missile history. “We will be able to prove all major technologies this year,” said a scientist.

(The writer is an independent aerospace and defence journalist, who blogs at Tarmak007 and tweets @writetake.)

https://www.theweek.in/news/india/2019/03/21/India-next-gen-desi-anti-radiation-missile-trials-ngarm-drdo.html

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Missile man of Switzerland, too!

Switzerland celebrates May 26 as 'Science Day' in honour of APJ Abdul Kalam

May 26 was declared as the ‘National Science Day’ in Switzerland to honour the former Indian President, late Dr APJ Abdul Kalam. The Swiss government, considering Abdul Kalam’s vast expertise in science and technology, announced this following his arrival in Geneva in 2006.

This is a source of inspiration for many Indian and Swiss scientists as Kalam was a science enthusiast and was even considered as the Father of Indian Missile Programme. Kalam was the first Indian head of State visiting Switzerland after a gap of more than 30 years. Former President late VV Giri’s was the last high-profile visit to the country.

Kalam first visited the CERN’s facilities situated in Switzerland and, then, crossed the border post to see the laboratory in France, where Indian scientists are doing research in Large Hadron Collider (LHC). CERN, the world’s largest physics laboratory, is jointly owned by France and Switzerland.

Kalam is well-known for his major part playing in the existence of Indian Missile Mission including ‘Agni’. He also served as the Chief Project Co-ordinator for the testing of Nuclear weapon — ‘Pokhran-II’.

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