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## **India Successfully Tests New Ballistic Missile**

**By Franz-Stefan Gady**

India successfully test-fired the K-4 submarine-launched ballistic missile earlier this month.

The test-launch of an indigenously-developed, nuclear capable K-4 ballistic missile from a submerged platform in the Bay of Bengal, was a “roaring success,” according to an unnamed source within India’s Defense Research & Development Organization (DRDO), *The New Indian Express* reveals.

The missile was launched from a submerged replica of a submarine, from water 9 meters (around 30 feet) deep.

“The K-4 missile was fired at a depressed trajectory. Starting from successfully clearing the launch tube and breaking the water surface to stage separation and maintaining the ballistic trajectory, the missile achieved all parameters before zeroing in on the pre-designated target with high accuracy. The trial was stupendous and a copy book success,” the source explains.

This presumably confirms that the missile has been tested at its full-operational range. The K-4 is an intermediate-range nuclear-capable submarine-launched ballistic missile with an alleged range of up to 3,500 kilometers (2,174 miles). During a previous test in March 2014, the K-4 was only tested to a range of 3,000 kilometers (1,864 miles).

As I explained previously:

*Technical details on the top-secret K-4 remain scarce. It purportedly is 12 meters (39 feet) long, weighs around 17 tons, can carry a nuclear capable warhead of up to 2 tons, and is powered by solid rocket propellants.*

*DRDO scientists claim that the missile is highly accurate with a near zero circular error probability. According to publicly available information, the K-4 uses a Ringer Laser Gyro Inertial navigation system.*

*The missile, capable of cruising at hypersonic speed, also features an “innovative” system of weaving in three dimensions during flight as it approaches its target.*

The K-4 is capable of carrying a nuclear or conventional payload of more than 2,000 kilogram (4,400 pounds). According to DRDO officials the missile will have to undergo at least two more developmental trials before it will be test-fired from the ballistic missile nuclear submarine (SSBN) INS *Arihant*. INS *Arihant* is scheduled to be commissioned in March, although a delay seems likely. I reported previously:

*The vessel is based on Russian Project 971 Akula I-class nuclear-powered attack submarine. It is the lead vessel of the Indian Navy’s future fleet of four Arihant-class SSBNs.*

*The submarine is equipped with four vertical launch tubes, which can be armed with either four K-4 missiles or 12—three per launch tube—K-15 missiles, another member of the K-series of missiles with a maximum range of 750 kilometers (466 miles).*

DRDO is purportedly also working on another variant of the K-missile with a 5,000 kilometer (3,106 miles) range.

## **Make in India encouraging Canadian firms to set up plants in India: Jordan Reeves**

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Defence Research and Development Canada (DRDC) and India's Defence Research and Development Organization (DRDO) have inked a Statement of Intent (SOI) to explore collaboration in the areas of defence, security research and development. Canadian technology can also make an important contribution to the training and modernisation of India's defence capability – from remote sensing and surveillance systems, to wireless and radio communications, from aircraft simulation systems, to naval missile systems, from armoured vehicles to cold weather gear – among many other areas.

With an aim to take the defence relationship further and engage with the Indian Armed Forces to explore new areas of collaboration, the government of Canada is getting ten top defence manufacturers some of which are already present in India and the others will seek joint collaboration when they participate in the DefExpo 2016 later this month. The expo where the focus is going to be primarily on Prime Minister Narendra Modi's Make in India and skill India initiatives, the Canadian companies are expected to showcase a wide range of platforms and weapons systems where both countries can collaborate in the future. Huma Siddiqui spoke with Jordan Reeves, Consul General of Canada in Mumbai. Excerpts:

How many defence companies from Canada are participating in the DefExpo this year?

The breadth of products and services that they collectively will be offering really showcase Canadian capabilities. The companies at the expo include ANDRE HVAC International, CAE Simulation Technologies, General Dynamics Land Systems, General Dynamics Missions Systems, L-3 Communications MAPPs Inc, L-3 WESCAM etc.

The Canadian Commercial Corporation (CCC) will also be at DefExpo. The CCC is a federal Crown corporation mandated to facilitate international trade on behalf of Canadian industry, particularly within government markets. The Corporation's business lines are structured to support Canadian companies contracting in a variety of industries and sectors. CCC facilitates government to government contracting and plays a key role in the defence sector as it provides sovereign guarantee for performance. In fact 2014/15, CCC was active in 57 countries with 168 Canadian companies.

How does Canada plan to participate in PM Modi's Make In India initiative especially in defence sector?

Prime Minister Modi's Make in India initiative is encouraging Canadian and other international firms to set up manufacturing plants in India to spur job creation at home and become a low-cost alternative to China.

There are more than 300 Canadian companies that have a physical presence in India (eg Bombardier, McCain, CGI, Blackberry, Open Text, Sierra Wireless, Lea Assoc. Stantec, Hatch Assoc, Scotia Bank, TD and CAE). In fact, three of the Canadian companies, (CAE, L-3 MAPPs and RBH) participating in DefExpo have Indian presence. CAE currently manufactures simulators for the Indian military in Bangalore.

GD Land Systems Canada has tied up with Tata Motors to prepare a bid offering for light armored vehicles to Indian army. It will be a multi-billion dollar project involving over 2,500 tracked vehicles and 200 wheeled vehicles. If the bid is successful these vehicles will be made in India.

In which way can Canada participate in skill initiative?

The Education sector is an exciting area of Canada-India collaboration. India's rapidly becoming Canada's top source of international students. Over 46,000 Indian students were enrolled at Canadian universities last year, and the number is expected to be higher this year. In April 2015, during PM Modi's visit to Canada, education and skills development were identified as priorities. Thirteen MoUs were signed between India's National Skill Development Council and Canadian colleges and institutes to formalise skills collaboration in various sectors.

Institutions and programs such as Mitacs, IC-IMPACTS and the Shastri Indo-Canadian Institute (SICI) help foster academic and research ties between our countries. There are also over 400 MoUs signed between Canadian and Indian institutions covering academic collaboration, twinning agreements and articulations enabling student, faculty and researcher mobility.

## **DRDO's new thermal imaging radar can scan through walls**

The Defence Research and Development Organisation (DRDO) has developed a new thermal imaging radar called "Divyachakshu," which can scan through walls and is expected to help the Indian armed forces to ably deal with any hostage situation eventuality.

The Divyachakshu (Divine Eye) is a Through Barrier Imaging Radar, which was developed by Electronics and Radar Development Establishment (LRDE), a Bengaluru-based DRDO laboratory that specialises in developing radar systems and related technologies. Currently, the radar is undergoing development trails.

The Through Barrier Imaging Radar is able to look into walls that are of 20-30 cm thickness and it can also look through any material.

"The radar can produce images from the other side of the barrier up to a distance of 20 meters. It catches the thermal signatures and movements in a room can be clearly seen," IANS reported, citing a scientist who was working on the project.

The radar is able to give out real-time thermal images that can be beneficial to the Indian armed forces in conducting hostage rescue operations. The radar can reveal the movement of people inside, thus enabling armed forces to locate them without having any clear visuals on them.

The radar development started following the 26/11 Mumbai attacks where terrorists were holed up in the Taj Mahal and Oberoi Trident hotels along with the occupants.

The cost of the equipment is low. The device costs Rs. 35 lakhs each, whereas a similar one will cost Rs 2 crore in international markets. The DRDO is looking at the Army, the BSF and paramilitary forces as potential buyers. Currently, the armed forces have no such radar with them.

Presently, the device weighs 6-7 kg and the scientists are working to make it lighter.

Meanwhile, the upcoming DRDO Aeronautical Test Range at Chitradurga, Karnataka, is likely to be inaugurated around June 2016, the Hindu reported, citing a top DRDO official.

The official also said that the 5,000 acre test-range will see expansion in stages and it will start flight projects in about six months. The test-range is being developed near Challakere taluk of Chitradurga at a cost of Rs. 2,500 crore.

The testing range could be used to test some of indigenous products like the LCA Tejas, Rustom 1 and 2, unmanned air vehicles, among others.

## **A boon for hostage crisis: DRDO develops radar that can look through wall**

New Delhi: In what can prove to be a great aid for the Indian forces in dealing with hostage situations, India's premier government R&D body DRDO has developed a radar that can look through a wall.

The Through Barrier Imaging Radar, named 'Divyachakshu' (divine eye), has been developed by Defence Research and Development Organisation's (DRDO) Electronics & Radar Development Establishment (LRDE) based in Bangalore and is going through development trials now.

It can look through walls of 20-30 cm thickness made of any material, by using thermal imaging.

"The radar can produce images from the other side of the barrier up to a distance of 20 metres. It catches the thermal signatures and movements in a room can be clearly seen," a scientist working on the project told IANS on condition of anonymity.

The radar tracks heat on the other side of the wall and gives real time thermal image, which can disclose the movement, number of people and other important information about the situation on the other side of the barrier.

"In a hostage situation, the radar can help give an idea about the number of people inside the room and their movement," the scientists said.

According to experts, the nature of movements can help in locating the terrorists and differentiating them from the hostage.

The development of the radar was triggered by the Mumbai terror attack of November 2008, where terrorists took hostages at several locations, including hotel Taj Mahal, Oberoi Trident and Nariman House.

The device will also prove useful in situations such as the recent attacks in Gurdaspur, Punjab, where terrorists entered the Dina Nagar police station, or the Pathankot airbase and two of the terrorists went on to hide in a building.

The project was started in 2010 and the development trials are expected to conclude by the year end.

"We are looking at the Army, the BSF and paramilitary forces as the buyers," the scientist said.

The Indian Army at present does not have such an equipment.

Apart from the distinction of being indigenously developed, the equipment cost is low. The scientist said the device costs around Rs. 35 Lakh, while similar devices in the international market cost around Rs. 2 crore.

Efforts are also on to bring down the weight of the device from present 6-7 kg.

## **India successfully tests new K-4 submarine-launched ballistic missile**

India has reportedly conducted a successful test-firing of the K-4 submarine-launched ballistic missile, at its full range from a submerged platform in the Bay of Bengal off the Visakhapatnam coast.

According to a report by the Indian Express, the K4 missile was launched from a replica of a submarine submerged at a depth of 9m in the water.

Some of the critical parameters concerning the missile were reported to have been met during the exercise.

“The missile is equipped with a capacity to carry a nuclear or conventional payload of more than 2,000kg.”

An anonymous DRDO source was quoted by The New Indian Express as saying: "The K-4 missile was fired at a depressed trajectory.

"Starting from successfully clearing the launch tube and breaking the water surface to stage separation and maintaining the ballistic trajectory, the missile achieved all parameters before zeroing in on the pre-designated target with high accuracy."

Developed by India's Defence Research & Development Organisation (DRDO), the 10m-long two-stage missile has a launch weight of 20t and can hit a target at a distance of 3,500km.

A report by The Diplomat stated that the missile is equipped with a capacity to carry a nuclear or conventional payload of more than 2,000kg.

It features a ring laser gyro inertial navigation system and can cruise at hypersonic speed with a weaving system in three dimensions while it approaches a target.

According to DRDO officials, the new missile is set to undergo two more developmental trials prior to its test-firing aboard India's indigenously developed ballistic missile nuclear submarine (SSBN) INS Arihant.

DRDO is also reportedly developing the K-5 missile, which is said to have a strike range of more than 5,000km.

This month, India successfully tested the nuclear-capable intermediate range Agni-I ballistic missile off the Odisha coast, as part of a user trial conducted by the Indian Army.