Developing Indigenous Technologies: A Leap Forward

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The Indian defence research labs/ establishments have been slowly enlarging their footprint in amalgamation and development of critical defence technology to provide strategic offensive and defensive capability to the armed forces. A number of important advancements have been made and tests carried out in the recent months as India gears up to meet security challenges emerging from its belligerent neighbours. The major achievements in weapon development are listed below.

K-4, Long Range SLBM Test-Fired

The Defence Research and Development Organisation (DRDO) successfully flight-tested a Submarine-Launched Ballistic Missile (SLBM) called K-4 with a range of about 3,000 km on March 24, 2014. The launch took place from a pontoon submerged more than 30 m deep in the sea off the Visakhapatnam coast. After a powerful gas generator ejected it from the pontoon submerged in the Bay of Bengal, the K-4 missile turned towards the designated target, travelled a distance of 3,000 km before reaching its intended target location in the Indian Ocean. The 20-tonne two-stage missile with a one-tonne payload will also carry nuclear warheads, forming the lethal payload of India's nuclear-powered submarines, which are under construction. The test is of great significance as it was the K-4's maiden flight. India is the fifth country in the world to have underwater missile

launch capability. The K-4 is the successor of the K-15 underwater-launched missile with a range of 750 km which has been tested nearly 10 times.

India Launches First Military Satellite, GSAT-7

India's first dedicated military satellite was placed into orbit on August 30, 2013, by the Ariane-5 rocket, launched from Kourou, French Guiana. The satellite will be for exclusive use by the Indian Navy that so far had to share bandwidth on India's existing space platforms, including the INMARSAT family of satellites. The GSAT-7 was activated for operations on September 14 in a geo-stationary orbit 36,000-km above the equator. The Navy is inducting a series of network enabled platforms and the satellite is a major boost to its network-centric operations. It helps in tracking movement of hostile targets across the length and breadth of the Indian Ocean and maintaining seamless real-time communication with onshore facilities and surface and sub-surface platforms on the high seas to neutralise the threat.

According to the Indian Space Research Organisation (ISRO), the "GSAT-7 is an advanced communication satellite built by ISRO to provide a wide range service spectrum from low bit rate voice to high bit rate data communication. The GSAT-7 communication payload is designed to provide communication capabilities to users over a wide oceanic region, including the Indian landmass. The payload, configuration is compatible with I-2.5K bus of ISRO. The GSAT-7 payload design includes multi-band communication."

ASTRA: Beyond Visual Range Air-to-Air Missile

India's first indigenously developed Beyond Visual Range (BVR) air-to-air missile "ASTRA" was successfully test-fired by the Indian Air Force from an SU-30 MKI fighter on May 04, 2014 from a naval range in the western sector. The test achieved all the mission objectives. ASTRA, with a range of 60 km, is indigenously designed and developed by DRDO, possessing high Single Shot Kill Probability (SSKP) making it highly reliable. ASTRA is an all aspect, all weather missile with active radar terminal guidance, excellent Electronic Counter Counter-Measures (ECCM) features, smokeless propulsion and process improved effectiveness in a multi-target scenario, making it a highly advanced, state-of the-art missile. Work is already underway on the ASTRA-II with a range of 100 km which is planned to be tested by the year end. The next step is to test against an actual target and many more trials are planned before induction into the Air Force. Weapon integration with the 'Tejas' Light Combat Aircraft (LCA) will also be done in the

near future. BVR missiles give freedom for fighter aircraft to fire on targets from stand-off distance preventing them from getting close to the target, minimising risk. India currently imports BVR missiles from Israel and Russia which are very expensive. ASTRA will not only save precious foreign exchange reserves but also give technological independence in a niche area.

L&T Develops Torpedo-Tube AUV

L&T, the Indian conglomerate, has unveiled the "Adamya" Autonomous Underwater Vehicle (AUV) developed and built in-house by L&T Heavy Engineering, at the Defence Expo 2014. The Navy, which already has a stated requirement for AUVs, is very keen on this programme as its unique design allows it to be launched from the torpedo tube of a submarine.

L&T has highlighted several features on the Adamya to the Navy, including the fact that the vehicle's modular design and depth-rated shells enable mission customisation as per the Navy's needs without having to resort to pressure-proofing of the internal electronic systems. Other qualities include short turnaround time and ability to be air-shipped conveniently. The Adamya is being pitched for naval applications that include hydrographic survey (the Hydrography Department is already looking for AUVs), mine counter-measures, Intelligence-Surveillance-Reconnaissance (ISR), offshore survey, clandestine monitoring, environmental monitoring and optional anti-submarine warfare. The 18.7 ft, 850 kg platform has an endurance of 8 hours at 4 knots (with maximum forward speed of 6 knots) with a customisable depth rating of 500 m.

Agni-V ICBM (2nd test)

The Agni-V Inter-Continental Ballistic Missile (ICBM), capable of delivering a 1.5-tonne nuclear warhead out to over 5,500-km was successfully tested on September 15, 2013, from India's Integrated Test Range (ITR) in the Bay of Bengal. The launch was the missile's second after its debut test in April 2012. The three-stage all solid missile can cover all of Asia and beyond. The missile's systems underwent a degree of fine-tuning after the first test, to give the weapon system a

far greater degree of accuracy. The next test is to be conducted by the year end or early next year in a canister-based version. This improves the ease of storing and transportation and also imparts stealth. The canister has already been tested and validated with a dummy missile.

Navy adds Punch with two Stealth Warships

In the second week of July, the Indian Navy has taken delivery of two indigenously built stealth warships adding significant punch to its surface warfare capabilities.

The INS *Kolkata*, is the first of the three guided missile destroyers being built by Mazagon Docks under the new class of P15A guided missile destroyers at a total cost of Rs. 11,662 crore. At 7,200 tonnes, the INS *Kolkata* is the largest destroyer in the Indian Navy. It packs significant all-round capability for anti-surface, anti-submarine and aerial targets. Its four Ukrainian gas turbine engines impart the vessel a maximum speed of 60 km per hour and an operating range of 15,000 km, complimented by a crew of 325. It has heavy armour plating to deflect the radar waves and impart stealth, making it difficult for the enemy to spot it.

The *Kolkata* has 64 Indo-Israeli BArak-8 Long Range Surface-to-Air Missiles (LRSAMs) which have a range of 70 km to tackle aerial threats. The most potent weapons are the 16 vertically launched Brahmos supersonic cruise missiles enabling striking of ships and land targets which are upto 300 km away. In addition, it can carry two Anti-Sea Warfare (ASW) helicopters, has two RBU-6000 ASW rocket systems, ASW torpedoes and sonar suite, making it well equipped for the anti-submarine role.

These three vessels, with their Active Electronic Scanned Array (AESA) radars and battle management systems will significantly improve India's area air coverage at sea as well as the strength of its multi-mission capabilities. Indian designed and built systems onboard include the HUMSA-NG (Hull Mounted Sonar Array – New Generation) and the Nagin active towed array sonar.

The INS *Kamorta*, an anti-submarine corvette, joins the Navy at a time when our own sub-surface strength is dwindling and our neighbours are rapidly augmenting their submarine fleets. It was built by Garden Reach Shipbuilders and Engineers (GRSE), Kolkata, and is the first of the four corvettes under Project 28. It displaces 3,400 tonnes and is 110 m in length, with close to 90 percent high indigenous content.

"The hull of the ship encompasses the bulk of the sensors and weapon systems that are also indigenously manufactured by various Indian industries," a release by GRSE said. Experts at the GRSE also pointed out that the corvette has a significant edge over existing platforms of other warships as it has a "rail-less" helicopter traversing system. It also has foldable hangar door.

Adding another feather in the cap, it is the first Indian warship to be built with indigenously developed special grade high-tensile (DMR249A) steel produced by Steel Authority of India and this steel will be used for all future warships. This is a significant technological breakthrough as so far India had to depend on imports.

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