Defence/Technology Update

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Technology drives innovation and innovation drives technology—an apt observation in today's fast changing security environment where traditional threats have become blurred due to the emergence of non-state actors and exploitation of technology as a vital instrument of warfare. As the Indian armed forces continue their quest to keep pace with the modernisation of their hostile neighbours, it has become quintessential to persist with acquisition and technological advancement. This article looks at some of the latest technological updates being undertaken indigenously in Indian defence.

Agni-V: Launch Successful

India's integrated missile defence programme achieved another milestone with the successful test flight of the indigenously built intercontinental surface-to-surface nuclear capable ballistic missile, the Agni-V, on January 31, 2015[1]. The three-stage, solid propellant missile was test-fired for the first time from a mobile launcher. Having a strike range of over 5,000 km, it can carry a nuclear warhead of over one tonne. This was the third developmental trial of the long-range missile. The high accuracy Ring Laser Gyro-based Inertial Navigation System (RINS) and Micro Navigation System (MINS) enabled the missile to reach the target point successfully.

Agni IV and Agni I: Successful Tests Boost Deterrence

The Strategic Forces Command (SFC), along with the Defence Research and Development Organisation (DRDO), successfully test-fired the surface-to-

surface missile Agni IV, on December 02, 2014 and the short range Agni I missile on September 11, 2014, from Wheeler Island, off the coast of Odisha.[2] The Agni IV, the two-stage missile, has a range of 4,000 km and is capable of carrying a nuclear warhead up to one tonne. Now, India has in its armoury of the Agni series the Agni-I with a 700-km range, Agni II with a 2,000-km range, Agni III with a range of 2,500 km and Agni IV with a 4,000-km range.

Pinaka Mk-II Enables Enhanced Range

The Armament Research and Development Establishment (ARDE), a Pune-based DRDO laboratory, successfully test-fired the Pinaka Mk-II artillery rocket during December 09-12, 2014.[3] The Pinaka Mk-II is an advanced version of the unguided Pinaka multi-barrel rocket system wherein the firing range has been enhanced to 60+ km from the existing 38 km. The rocket incorporates a high performance solid rocket propulsion system and advanced stabiliser system with six flat fin configuration. The Pinaka Mk-II uses in-service warheads and fuses and existing ground systems with minor modifications in the Launcher, Loader-Cum-Replenishment (LCR) vehicle, Replenishment Vehicle (RV) and Battery Command Post.

Imperial Eagle, Panchi and Rustom: Adding to UAV Capabilities

The Aeronautical Development Establishment (ADE), DRDO and National Aerospace Laboratories (NAL) are carrying out advance tests to add the Imperial Eagle, Rustom-1 and Panchi to the Unmanned Aerial Vehicle (UAV) inventory after successfully testing the three unmanned vehicles.

The Imperial Eagle is a 2-kg class Mini Unmanned Aerial Vehicle (MUAV) that can fly in divergent weather conditions. It is designed to be carried in a soldier's backpack, be hand-launched and is recoverable through a soft landing. It is completely autonomous and can be programmed with navigational waypoints, which can be changed in-flight by the ground control. With a ground tracker system, it is capable of providing continuous imagery of the onboard camera, irrespective of the altitude of the aircraft.[4] The MUAV can fly at an altitude of more than 300 m and autonomously cover a range of 7km from the airfield in low cloudy conditions.

The Panchi, the wheeled version of the UAV Nishant, became the latest addition to the family of indigenously developed UAVs after it completed 20 minutes of its maiden flight on December 24, 2014.[5] Capable of taking off and landing using small airstrips, the Panchi gives 'mission advantage' to operators as the turnaround time between sorties can be significantly reduced. The Panchi has all the surveillance capabilities of the Nishant, but it can stay in the air longer because it does not have to carry the airbag and parachute systems of the Nishant. It is also a light vehicle with its body made of composites, and has a high degree of stealth because it has a low radar cross-section signature.[6]Having an endurance of four hours, it can track ground targets over an area of 165 km.

The Rustom-1, the Medium Altitude Long Endurance (MALE) UAV, underwent a successful endurance flight on September 20, 2014.[7] It is one of the three variants of the Rustom UAV, with the other two being the Rustom-H and Rustom-2. The Rustom-1 is a medium-altitude version with 12-hour endurance, range of 220 miles and a ceiling height of 26,000 ft. It has a maximum speed of 225 kmph and can carry a payload of 95 kg.

The Rustom-2, the new age Unmanned Combat Aerial Vehicle (UCAV), is the most advanced UCAV under development. It weighs 1.8 tonnes and will have a capacity payload of 350 kg, operating altitude of 36,000ft and an endurance of 48 hours. The payloads include the Medium-Range Electro-Optic (MREO) System, Electronic Intelligence (ELINT), Communication Intelligence (COMINT), Synthetic Aperture Radar (SAR), and Maritime Patrol Radar (MPR). The Rustom-2 can be deployed for military missions like reconnaissance and surveillance, artillery fire correction, maritime patrol, target acquisition, target designation, communications relay, battle damage assessment and signals intelligence. Comparable to the American 'Predator' drone due to its state-of-art capabilities, it will be built on a Public Private Partnership (PPP) model, with the government funding 80 percent of the project cost while private Indian defence companies will contribute the remaining 20 percent.[8]

Pakistan inducted its first fleet of indigenously developed strategic UAVs in 2013, namely, the Burraq and Shahpar UAV systems for the Army and Air Force.[9] The Shahpar is a tactical UAV with an endurance of seven hours. The Burraq, based on the Chinese Rainbow CH-3 UCAV, can carry around a 100 kg payload and has a 12-hour endurance. Its payload is two AR-1 missiles, or two FT-5 small diameter bombs.

Akash Missiles Undergo Successful Trials

The surface-to-air supersonic missile Akash is ready for induction in the Indian Army and Air Force after successful test trials in 2014. The Air Force launched three Akash missiles on the body target of the Lakshya (the pilotless target aircraft) moving at "low altitude far boundary" and ripple mode missions. The missiles intercepted the fast moving and manoeuvring small Radar Cross-Section (RCS) targets within a small interval of five seconds in the ripple mode.[10] The missile is guided by a multi-function phased array radar and has an intercept range of 30km. The Akash has completed its training user trials successfully, validating all mission parameters as set by the Indian Air Force.[11] The Indian Army also completed validation trials of the first off production models of Akash after the supersonic missile intercepted the very small unmanned fast moving Banshee aerial vehicle at 30 m altitude above sea level, proving the system's capability against subsonic cruise missiles.[12]

India Selects Israel's Spike ATGM for Infantry

India will procure the Israeli Spike Anti-Tank Guided Missiles (ATGMs) over the Javelin missiles offered by the United States.[13] Israel's Rafael Advanced Defence Systems will supply 321 missile launchers and 8,356 Spike ATGMs to India with the new missiles needed to replace the Milan 2 missiles locally produced in India under French licence. The Israeli Spike is a fourth generation missile, as it provides users both 'fire and forget' and 'fire and update' options, particularly useful in engagements in complex, urban terrains.

The Spike infantry system consists of a missile with a canister, a tripod, a command launch unit that contains the optics and a firing system and a battery. The Spike-Mr version is designed as an infantry-only weapon, weighs 26 kg when fully assembled and its effective range is 2.5 km. The Spike-Lr is a vehicle and infantry weapon that uses common systems, and has an effective range of 4 km. It can go from "off" to firing in less than 30 seconds, as the operator lays the cross-hairs on the aim point using either the 10x day sight, or the clip-on thermal imaging night sight.

Tejas Delivered to IAF

Delivering a major boost to the domestic defence industry, the first indigenously built Light Combat Aircraft (LCA) Tejas was handed over to the Indian Air Force (IAF) by Hindustan Aeronautics Limited (HAL) in January 2015, over two years behind schedule. HAL will build six LCAs by 2016 with an eventual construction rate of 16 aircraft a year. The IAF is likely to be equipped with two Tejas Mk 1 squadrons of 20 aircraft each by 2018. The single-seat fighter will, however, be combat-ready only by the end of 2015 when it will receive its Final Operational Clearance (FOC). The LCA employs composite materials for up to 45 percent of its airframe which make the aircraft lighter as well as stronger as compared to an all-metal design, and the LCA's percentage employment of composites is one of the highest among contemporary aircraft of its class.

India-Israel Test-fire Barak-8

The Barak-8, the Long-Range Surface-to-Air Missile (LRSAM) jointly developed by the DRDO, Indian Navy and Israeli Aerospace Industries (IAI), was successfully flight tested against a flying target on a range in Israel on November 10, 2014.[14] The Barak-8 Air and Missile Defence System is designed for protection against a high number of aerial platforms and munitions, including aircraft, helicopters, unmanned vehicles and missiles, and has both maritime and land-based variants. This two-stage system has a range of 70 km and boasts of an advanced phased array multi-mission radar, two-way data link, and flexible command and control system enabling the system to be used as an area defence system, by integrating several fire units, sensors and command centres into an air defence 'networked mesh'. The Indian Navy is keen to induct the LRSAM for its four new Kolkata-class destroyers, seven proposed Project 17A frigates, and the INS *Vikramaditya*.

Successful Test of Nirbhay Cruise Missile

The Nirbhay, India's first indigenously designed and developed long-range subsonic cruise missile, was successfully test-fired on October 17, 2014.[15] A solid rocket motor booster developed by the Advanced Systems Laboratory (ASL) powers the two-stage missile, with a range of 1,000 km and the capability to carry nuclear and conventional warheads. With the ability to fly at treetop levels, the Nirbhay is difficult to detect on the radar and once near the target, it can even hover, striking at will from any direction. The inertial navigation system of the missile allows it to hit one target amongst multiple targets and a specially

designed variant for the Su30-MKI will further add to the aircraft's arsenal, which already includes the BrahMos supersonic cruise and the Astra. The Nirbhay is India's answer to the American Tomahawk missile and Pakistan's Babur missile, and can be launched from multiple platforms, including air, land and sea.

Astra Air-to-Air Missile Nears Induction

The Indian Air Force received a major boost after the Astra, the active radar homing Beyond Visual Range (BVR) Air-to-Air Missile (AAM), passed twin tests on June 20, 2014 as part of its air-launch trials.[16]Capable of engaging targets at varying range and altitudes allowing for engagement of both short-range targets (up to 20 km) and long-range targets (up to 80 km) using alternative propulsion modes, the Astra uses a terminal active radar-seeker to find targets and a mid-course internal guidance system with updates, to track targets. The onboard Electronic Counter-Counter-Measures (ECCM) capability allows it to jam radar signals from an enemy surface-to-air battery, ensuring that the missile is not tracked or shot down.The missile has a maximum speed of Mach 4+ and a maximum altitude of 20 km. The missile can reportedly undertake 40 g turns close to sea level, when attacking a manoeuvring target.[17]

1,000 kg-class Indigenous Glide Bomb Tested

The DRDO successfully test-fired a 1,000 kg class indigenously designed and developed guided glide bomb in the Bay of Bengal on December 19, 2014.[18] The complete avionics package and navigation system has been designed and developed by the Research Centre Imarat (RCI), Hyderabad. The test gives India the capability and self-reliance to launch heavy bombs for delivery up to 100 km away with high precision. A glide bomb differs from a conventional bomb in its aerodynamic surface that gives it a flatter, gliding flight path and does not require the aircraft to be close to the target to be dropped. The bomb is guided by its onboard navigation system that ensures hitting the target with high precision accuracy.

Procurement Plans

The Defence Acquisition Council (DAC) has in the last six months approved procurement of new equipment for the three Services which will enhance their operational capabilities. The major procurements planned are:

- 814 155mm/52-calibre mounted gun systems.[19]
- 363 new BMP-2/2k infantry vehicles to be built by the Ordnance Factory (OF) in Medak, Telangana.[20]

- Upgradation of the Army's 'Samyukta' electronic warfare system by Bharat Electronics Limited (BEL).[21]
- 1,768 critical rolling stock wagons used to transport equipment by the Army to replace the existing ones which are more than 30 years old.[22]
- Supply of 16 multi-role S-70B helicopters by Sikrosky for the Indian Navy for anti-surface and anti-submarine warfare.[23]
- Construction of six conventional diesel-electric submarines indigenously. These submarines will have air-independent propulsion for extended submergence, land attack missile capability and stealth features.[24]
- Repeat order of 12 Dorniers, with enhanced sensors, for the Indian Navy, to be built by Hindustan Aeronautics Limited (HAL).[25]

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Notes

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