IN FOCUS

12 MAY 2014

ENCOURAGING NEWS FOR INDIGENOUS DEVELOPMENT OF WEAPON SYSTEMS

Gp. Capt.Vivek Kapur

Senior Fellow, CAPS

Background

India today is the largest importer of arms in the world. This dubious distinction has been attained by the combination of a genuine need for equipping the Indian armed forces and a lack of the ability of domestic industry to deliver suitable weapon systems. Import of arms from foreign sources serves to support the gross domestic product (GDP) of the countries the arms are sourced from to the detriment of local industry. Being forced to rely upon foreign vendors also compromises strategic and geo-political independence as external entities can control availability and serviceability of imported weapons. Attempts by the government controlled defence research and development organisation to develop arms failed in most cases except for a few notable successes such as the HT-2 Trainer, HJT-16 "Kiran" trainer, Advanced Light Helicopter (ALH) "Dhruv", Light Combat aircraft (LCA) "Tejas", some types of naval warships, and the ballistic missiles developed under the Integrated Guided Missile Development Program (IGMDP). Despite setbacks the domestic research and development (R&D) organisations led by the state owned Defence Research and Development Organisation (DRDO) have achieved significant milestones in the recent past. On 04 May 2014 (Sunday) the indigenous Astra beyond Visual Range (BVR) air-to-air missile (AAM) was successfully test fired from a Sukhoi Su-30MKI fighter. these offer hope for reducing dependence on foreign vendors for critical equipment for the armed forces. A little earlier on DRDO tested a new interceptor missile able to intercept longer range, more than 2000 km range, ballistic missiles at altitudes of 150 km. The earlier Prithvi Air Defence (PAD) and Advanced Air Defence (AAD)

missiles used in earlier tests could carry out exo-atmospheric and endo-atmospheric interception of incoming.

Recent Test Firings of Newly Developed Missiles and Analysis

New Interceptor Missile: Testing of the new interceptor missile, called the Prithvi Defence Vehicle (PDV), showcases capability to detect, accurately track and target longer range ballistic missiles than had been possible earlier. Interception at altitudes of greater than 120 km would ensure low likelihood of remnants of the destroyed missile falling on territory to be defended.[1] Moreover this capability adds another layer to the original two layers of engagement available through PAD (interception at 50-80 km altitude) and AAD (interception at 15-30 km altitude) missiles; which have been successfully flight tested at least six times in the past.[2] Both PAD and AAD were able to deal with only relatively short range ballistic missiles. The new interceptor with its associated technologies is expected to confer the ability to intercept ballistic missiles with ranges of more than 2000 km. Further work on enhancing the capability of the new interceptor technology could be expected to expand the ability of this new weapon system to take on even larger range targets. DRDO's new PDV missile is slated to replace the PAD missile due to the former's superior performance. The main factors in the interception of larger range targets are detection and accurate tracking of the target, ability to attain required speeds and altitudes by the interceptor and its ability to accurately home in on to the target. The final stage is the correct functioning of the interceptor missile's fuse and warhead combination. The test firing of the new interceptor missile on 27 April 2014 has demonstrated the progress in

ARTICLES BY SAME AUTHOR

GLONASS FAILURE: IMPLICATIONS FOR INDIA

PROGRESS TOWARDS INDIAN SELF SUFFICIENCY IN SATELLITE NAVIGATION TECHNOLOGY

CONCENTRATED FIREPOWER VS NUMBERS IN WARFARE

TECHNOLOGY FOR FUTURE WARFARE: MECHANICAL ENHANCEMENT

MODERN COST EFFECTIVE FLIGHT REFUELLING SOLUTIONS

More Articles

achieving expansion of capabilities in all these areas except the warhead operation.[3] Press reports indicate that the interceptor missile's warhead detonation was not carried out in this test.[4] The fuse and warhead combination is expected to be tested in later tests. The successful working of all other stages of the test is a commendable feat; especially in context of the problems faced by major American weapons manufacturers in successfully demonstrating their own ballistic missile interception systems. This test more than anything else shows that India does not lack technical abilities and engineering skills required to develop cutting edge weapons technologies. Proper leadership and guidance along with end user support could enable greater self sufficiency in development and manufacture of advanced weapon systems within the country. Such an outcome could be expected to have a favourable outcome for the economy, political freedom of action and combat readiness of the armed forces of the country.

Astra[5] BVR AAM Test Fired. DRDO has been known to be working on developing an indigenous BVR AAM called Astra. Development of this missile has had a chequered history. Initial designs were reported to suffer from poor aerodynamic design amongst other issues. After resolving such deficiencies the missile was test fired twice from a ground based launcher to test its rocket motor, airframe, navigation system, and control systems on 11 Jan 2010.[6] Following up on successful ground launch tests the Astra BVR AAM was test fired from a Su-30MKI fighter on 04 May 2014.[7] The launch from a fighter aircraft is an important milestone in development of the missile. This test serves to re-verify the aerodynamic design of the weapon, its airframe and control and navigation system. It proves safe separation from the Su-30MKI. It further proves that initial problems with the missile have been resolved to a great extent. The Astra is initially designed to have a range of about 44 km against an aerial target. This is about the same as that achieved with imported missiles currently in IAF service and should be regarded as the baseline for the design. Having established itself reliably at this range the DRDO plans to work on extending the Astra's range to about 100 km, which corresponds to the newer generation BVR AAMs in the world. DRDO has stated that except for the active radar seeker all components of the Astra are designed and made in India.[8] In view of the complexity of modern BVR AAMs this in itself is a remarkable achievement. It is expected that initially the Russian active radar seeker of the Russian RVVAE or R-77 missile is to be used on the Astra. DRDO says that it is working on developing its own seeker that could be expected to be integrated into later production models. Astra represents a major change in the aerial combat capability of the IAF. Pictures of

the astra test launch in contrast to similar pictures available online of the Russian R-73 missile launch from the Tejas fighter show that the Astra motor is less smoky than the R-73 missile's motor. A low smoke signature is desirable for ensuring a stealthier attack and is a plus point for the Astra and its development team. The smoke signature should be reduced further to achieve the desirable milestone of having a smokeless motor. The Astra should free IAF from the high cost of purchase and storage of imported missiles. These imported missiles are bought in batches which results in large numbers reaching the end of their shelf life near simultaneously. With indigenously manufactured AAMs purchases could be better staggered. Even in batches of the AAMs are reaching the end of their life, life extension could be carried out with more ease by an Indian manufacturer thus further reducing costs. Integration of the missile on more platforms would also be much easier in the case of an indigenous AAM. The Astra's electronics would also be more easily tailored to deal with emerging threats as the designers, who have a deep understanding of the missile's avionics, would be available in India for these tasks. The baseline Astra could form the foundation of a family of missiles. For instance the soviet era R-27 BVR AAM led to a family of missiles based on the original design. These are the R-27R1 (basic semi-active radar guided) variant, R-27T (thermal or Infra Red (IR) guided) variant, R-27ER (semi-active radar guided extended range) variant, and the R-27ET (extended range IR guided) variant. A similar development of the baseline Astra could deliver a family of weapons for use by various IAF, Indian Navy (IN) and Indian army (IA) platforms. It should be also kept in mind that while the program is behind its initial schedule and has suffered cost over runs it is still one of the lowest cost programs if compared with similar programs elsewhere in the world.

It should be remembered that it is still early days in the development of the baseline Astra. The missile requires to be tested further to establish its reliability and basic performance envelope. Thereafter, its compatibility with other aircraft such as the MiG-29, MiG-21Bison, Mirage-2000, LCA Tejas etc will require to be established before releasing it for regular squadron use. However, current indicators lead to optimism that the program will progress well. Though the reduced cost of the weapon as compared to potential imports is an advantage, there are more important issues relating to self reliance, technological flexibility (that could be achieved through innovative modifications to the basic weapon) strategic flexibility and freedom are more important gains from the success on this missile program. In future Astra could also be an earner of foreign exchange through sales to friendly countries.

Finally the two recent successful test firings renew the hope that India will, in the near future, lose its dubious distinction of being the largest arms importer in the world. It could also become a 'responsible arms exporter'.

Conclusion

Over the past few years India has replaced China as the world's largest arms importer. Import of arms leads to a loss of foreign exchange, loss of potential economy boosting activities as well as geo-political and strategic loss of independence due to having to rely upon external entities for spares and support for imported arms. India's development of weapons, since 1947, has not been a glowing success story save for a few notable exceptions. However, two recent successes achieved by DRDO, in tests of the PDV and the test firing of the Astra BVR AAM from a Su-30MKI hold out hope for development of an effective defence industry in India.

(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies CAPS)

---

[1] T. S. Subramanian, "Interceptor spot on, though without blast: DRDO", http://www.thehindu.com/news/national/interceptor-spot-on-though-without-blast-drdo/article5953934.ece, accessed on 05 May 2014.

[2] "DRDO Ballistic Missile Defence System, India", http://www.army-technology.com/projects/drdo-bmd/, accessed on 05 May 2014.

[3] N-1

[4] N-1

[5] This is a Hindi word written in Roman Hindi. In Hindi 'astra' means weapon, in the ancient Indian texts such as the puranas Astra was a supernatural weapon, and is not linked to the English "astral" etc.. Also see *dict.hinkhoj.com/words/meaning-of-ASTRA;-in-hindi*

[6] "Two Astra missiles successfully test fired", http://www.hindustantimes.com/news-feed/orissa/two-astra-missiles-successfully-test-fired/article1-496152.aspx, accessed on 05 May 2014.

[7] Rajat Pandit, "First successful Astra test gives boost to air missile technology", http://timesofindia.indiatimes.com/india/First-successful-Astra-test-gives-boost-to-air-missile-technology/articleshow/34652986.cms, accessed on 05 May 2014.

[8] N-6