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UNITED STATES EYEING NEW GENERATION SOLID STATE LASER WEAPONS FOR STRATEGIC ADVANTAGE

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Since its invention, laser technology has made a big headway in support of military operations and has evolved considerably in the last few decades in various facets of warfare applications like communication, target designation, target ranging, precision guidance of smart munitions, blinding and dazzling. Use of laser as means of delivering lethal power in support of military operations has been recognised from the period of 1960s when experiments revealed that a short burst of high energy pulses could burn a hole in metal placed over considerable distance. The initial achievements in laser development encouraged the United States to steer and spearhead the research in technology to beget decisive military advantage over the adversaries. As on date, while a number of nation states are investing in the research and development of laser technology, the United States is the forerunner in its approach with a number of laser weapon projects. Due to the unique characteristics offered in terms of capability, speed and reach, laser technology has increasingly fascinated the likes of military researchers and planners for use of weapon grade lasers for strategic advantage. This, coupled with the capability to control the lethality and avoiding collateral damage with its precision and unlimited ranges, has raised widespread interest in design, development, deployment and employment of laser weapons directed towards and from airborne and space systems. Of particular interest is the distinct advantage proffered by high energy lasers in tackling of threats of ballistic missiles.

The continued efforts and substantial investment in laser generation techniques by United States from 1960 to 2000 resulted in generation of weapon grade lasers; however, these much hyped projects could not advance beyond a point of being showcased as technology demonstrators.

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Generation of high power weapon grade laser faced multitude of challenges in terms of high power consumption, low power output, atmospheric attenuation, colossal size of equipment and economic viability.

The United States, in the past decade, has intensified the research and development in the field of high powered solid state laser weapons and has succeeded in refining the technology to improve the power output while reducing the weapon dimension and weight. Furthermore, they have designed the solid state laser system as a modular concept where output from multiple sources can be utilised for generation of scalable high power paving way for a controlled measured output.

After successful testing of its Tactical High Energy Laser (THEL) demonstrator from 2000 to 2005, the United States has moved forward and in the last five years has introduced low range weapon systems like Maritime Laser Demonstrator (MLD), Gamma (FIRESTRIKE series of laser), Mobile Active Targeting Resource for Integrated experiments (MATRIX), Joint High Power Solid State Laser (JHPSSL) and Laser Area Defence System (LADS). All these weapon systems based on solid state technology and have been tested in varied configurations aboard sea based and ground based platforms; the technology is being upgraded for airborne operations.

One such recent ambitious project in the series of laser weapons is the High Energy Liquid Laser Area Defence System (HELLADS). Monitored and funded by Defence Advanced Research Project Agency (DARPA) and the Air Force Research Laboratory (AFRL), the project has been under development since 2003 by the General Atomics Aeronautical Systems. As per latest reports, HELLADS has successfully completed the beam quality and power output test and is now ready to undergo field trials.[i] HELLADS is a light weight and compact third generation solid state laser which is ten times smaller than the existing laser systems envisaged to deliver similar output. With a high power to weight ratio, the liquid cooled thermally efficient system is expected to provide a power output in the range of 150 kilowatts using a multi-modular concept. On completion of field trials on a ground based platform, the system will be further developed for integration with airborne platforms

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to include tactical aircraft and drones. The system aims to counter the threats from Rockets, Artillery, Mortar (RAM) and airborne targets.[ii]

Compared to conventional weapons in use, the potential advantages of laser weapons also make them an ideal choice for use in the space domain. Laser weapons can be based on earth or in the space and take on a target irrespective of its basing, as long as the target is in line of sight. The option of using various types of lasers with controlled intensity has enabled development of non-destructive weapon systems capable of interfering with target equipment to degrade its functioning over a period of time. While the details of all these projects are closely guarded, they have enriched the US research and scientific community with the advances in laser technology and will prove to be stepping stones for airborne and space based laser platforms.

Laser weapons in the near future will open up the possibility of delivering lethal power over considerable distances. The realisation of required potential will result in a new grade of weapon system and would proffer for dramatic transformation of the United States military. Encompassing a wide array of technologies that bequeath unique capabilities in all domains of future warfare, they would provide for delivery of scalable destructive power over diverse distances in support of tactical and strategic operations.

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[i] Graham Warwick, "Aviation Week and Space Technology", April 20, 2015 at http://aviationweek.com/technology/general-atomics-third-gen-electric-laser-weapon-now-ready accessed on July 22, 2015

[ii] Mark Prigg, "Star Wars comes a step closer: US military bosses reveal successful tests of airborne death rays", at http://www.dailymail.co.uk/sciencetech/article-3096369/Star-Wars-comes-step-closer-military-bosses-reveal-success-tests-airborne-death-rays.html accessed on July 22, 2015