



## Centre for Air Power Studies

### CONTINUING EVOLUTION: TOMAHAWK TLAM

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Recently, two Block IV versions of Tomahawk missiles were successfully test fired back to- back to validate a new software upgrade which will enable the operator to retarget the missile in mid-flight and to test its performance in the high altitude regime.<sup>1</sup> The Tomahawk cruise missile programme is one of the most successful missile programmes of the United States. Despite the budget cuts announced for the programme this year by the US administration<sup>2</sup>, the Navy and Raytheon continue to invest in up grading the missile. The missile has been used as the first strike weapon in most of the conflicts starting from the Gulf War to 'kick the door open' to clear the way for further operations in a lesser restricted environment.

Ever since the first Gulf War the Tomahawk missiles has continuously been improved upon to provide better capability to its operator. The Block II version came with much better accuracy of less than 10m owing to the addition of the DSMAC guidance. The Block III upgrade incorporated jam resistant GPS, improved engine to make it more fuel efficient and produced more thrust, and also gave the missile a better warhead.<sup>3</sup> The latest variant is the Block IV version which comes with several improvements compared to the block III variant and has been test fired over seventy times since 2006.<sup>4</sup> This version is fitted with an electro-optical sensor capable of damage assessment as it can loiter over a target area and beam back live images via a two way data link. It can also receive updates and commands from a nearby platform like a UAV or an aircraft. This live transmission of image frames would help in reducing the Over the Target Requirement (OTR) as the salvos

fired against the same target (If the required damage is achieved) can be redirected towards other targets.

The other capability add-on which was tested last year by Raytheon is a new homing seeker that is capable of locating and tracking fixed and moving radar emitting targets. The tomahawk will be upgraded with this new seeker possibly by 2017.<sup>5</sup> This indicates that the US Navy envisages DEAD and SEAD operation as a primary role for the missile. Mention may be made, in this regard, of the anti-access and area denial strategy of China and Iran where an Integrated Air Defence System (IADS) is one of the key challenges to any adversary.

In the recent test, one missile was fired from an SSGN while the other was fired from a surface warship. The missile fired from a missile cruiser performed pre-programmed high altitude manoeuvres and a vertical dive impacting a target. The objective of this deep dive might have been to generate higher kinetics possibly for a bunker busting role. The US central command recently sponsored development and testing of a new, more penetrating Tomahawk warhead called the Joint Multiple Effects Warhead System, or JMEWS.<sup>6</sup> With this capability the missile will be more effective against Hard and Deeply Buried Targets (HDBT). The vice president of Raytheon Air Warfare Systems remarked that "These flight tests demonstrate how Raytheon and the U.S. Navy are working together to enhance this already sophisticated weapon".<sup>7</sup>

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The Tomahawk cruise missile project is a perfect example of how an existing and proven weapon platform could be enhanced over time to suit the requirements of the modern battlefield condition. The continuing capability enhancements reiterate the utility of designing systems based on the open architecture concept which would allow for future upgrades to the system. The advantage of this concept would be the short development and up gradation time to meet urgent requirements. Moreover, existing stocks of older variants could also be upgraded to the latest standard.

This method would hugely cut on the investment in Research and Development (R&D) thereby reducing the development and production cost while at the same time meeting the requirements of the buyer. Further, this model minimises the financial risks for the investor in case of developmental or performance failure.

This programme also serves as proof that proper coordination between the user i.e the armed forces and the industry could result in delivering a better product that perfectly suits the requirement of the user. Proper interaction and coordination between the two in the development process is proven to be essential which helps the industry know the exact needs of the user while the later will be made aware of the capability of the industry in meeting his needs, based on which he draws up realistic and achievable requirements. Further, it serves as a model for how a government institution can coordinate with private industry to meet its requirements of advanced military hardware. It also shows the efficiency of the profit motivated private players in building their capability to meet future needs of the armed forces.

*(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])*

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### **End Notes**

<sup>1</sup> <http://ottawacitizen.com/news/national/defence-watch/tomahawk-cruise-missile-improved> , 13 September 2014, accessed on 22 September 2014.

<sup>2</sup> <http://freebeacon.com/national-security/obama-to-kill-tomahawk-hellfire-missile-programs/> , 24 March 2014, accessed on 22 September 2014.

<sup>3</sup> <http://missilethreat.com/missiles/tomahawk-variants/> , accessed on 23 September 2014.

<sup>4</sup> [http://investor.raytheon.com/phoenix.zhtml?c=84193&p=irol-newsArticle\\_Print&ID=1965103&highlight=](http://investor.raytheon.com/phoenix.zhtml?c=84193&p=irol-newsArticle_Print&ID=1965103&highlight=), 9 September 2014, accessed on 23 September 2014.

<sup>5</sup> <http://www.janes.com/article/28396/raytheon-tests-new-moving-target-seeker-for-block-iv-tomahawk-missile>, 14 October 2013, accessed on 23 September 2014.

<sup>6</sup> <http://defensetech.org/2014/02/14/navy-wants-its-tomahawks-to-bust-more-bunkers/>, 14 February 2014, accessed on 23 September 2014.

<sup>7</sup> No 4.

