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INCHING TOWARDS CREDIBLE DETERRENCE

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A news report in the *Indian Express*[i] says that India is all set to test launch its longer range Submarine Launched Ballistic Missile (SLBM) K-4 from an underwater platform by the end of next month (January 2014). The missile with a range of 3500 km will be a launched from a submerged pontoon off the Vizag coast. This missile is solid propelled and has a payload capacity of two tonnes.[ii] The missile was supposed to be tested last September as reported by '*IHS Janes 360*' in August 2013[iii] but was postponed due to technological issues.[iv] Meanwhile, the indigenous SSBN INS Arihant is undergoing sea trials and will be inducted into the Navy after it successfully completes these. Once the K-4 is integrated with the SSBN, it will complete the Indian nuclear triad in the real sense.

At present, the K-15 (B05) SLBM which has been successfully tested several times is reported to have a range of 700 km when launched in the conditions under which it has been tested so far. The missile is reported to have attained an apogee of around 40 to 50 km, which is extremely depressed. This indicates two aspects. Firstly, the actual range of the missile is much more than the declared one. The range could be further increased by payload (one metric ton) trade-off.[v] This limited range (even if launched in a Minimum Energy Trajectory (MET) wherein the range could be around 1100 km) poses a serious constraint. For example, this missile cannot reach Islamabad or Lahore even when the boat positions itself close to the Pakistani shore. The only major city that the boat can threaten from a safe distance is the port city of Karachi. For strikes against China, the boat will have to position itself inside the first island chain to get within striking distance of Shanghai.

Worse, to reach within striking distance of Beijing, it would have to operate in the Yellow Sea or Bohai Sea, which is close to one of the Peoples Liberation Army Navy's (PLAN) bases, which is also a base for its submarine fleet.[vi] This will be a highly risky endeavour as the boat will have to operate in a tactically live area at the time of launch. Hence, as a sea based deterrent, this missile would be of relatively very limited value.

In the first test launch of the K-4, it is reported, that the missile would be tested for a range of only 1500 km[vii], which means that the missile will be launched in a heavily depressed trajectory. There are two ways to depress a trajectory of a ballistic missile. One is to effect burn cut-off at an early stage when the required velocity is imparted to the missile for it to reach the designated range. The second method is to constantly alter the vector of the missile using aerodynamic controls or reaction control motors or heavy thrust vectoring to achieve the required apogee. The first method can only be effected in liquid fuelled missiles and hence, in the forthcoming test the second method would be adopted which would involve some high G vectoring. As per the report the missile can be characterised as a hypersonic cruise missile as it will travel within the atmosphere. The apogee could be expected to be around 100 km and the trajectory would be more or less flat with most of the distance covered under a powered flight.

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Regarding integration of the K-4 in INS Arihant, one missile can be fitted in each of the four Vertical Launch Station (VLS) tubes in place of 12 K-15s. The size and weight of the K-4 might necessitate some modification to be made to the submarine like adjustment in the Centre of Gravity (CG), centre of buoyancy, acoustic signature and power. The length of the missile is reported to be 12 meters and according to *Jane's Fighting Ships* (2011) the height of the submarine is 14 meters. Now considering the launch tube, gas generator and the space that will be left from the bottom of the hull to the beginning of the launch tube, it

appears that a portion of the missile might be popping out of the outer hull. If this is the case, then a hydrodynamic outer envelope might be needed which will increase the broadband acoustic signature of the hull. Almost all of the Russian and Chinese SSBNs have this outer envelope due to the extra length of the missile. In the Jin Class submarine for example, the outer envelope can be observed. DRDO should work towards reducing the length of the missile by increasing the burn rate performance of solid booster stages.

Few vital things to be noticed on the testing of the two SLBMs (B05 and K-4) is that, firstly, the test range is not the missile's full range, Secondly, the trajectory being 'flat *depressed*' resembles the characteristics of a cruise missile but at hypersonic velocity. Thirdly, DRDO claims that it is trying to achieve near zero CEP (there are doubts on this claim). These test parameters convey certain capabilities of the missiles. The combination of hypersonic speed and depressed trajectory can defeat any missile defence system which exists today. A BMD system usually tracks and predicts the trajectory of a ballistic missile, which is normally near parabolic, to intercept it. The low trajectory of these SLBMs helps to avoid early radar detection and also may confuse the missile defence fire control algorithm from identifying it as a threat, while the hypersonic velocity reduces the reaction time of the defence systems.[viii] The focus on very low Circular Error Probability (CEP) indicates that it could also be used for point targets. However, the number of weapons required to perform nuclear counter-force strikes will be quite high. Moreover, the yield of some of India's nuclear weapons would be in sub-kilotons which makes them more suited for counter-force role. It is to be noted that three of the five weapons tested by India in 1998 were of sub-kiloton yield.[ix] If number of SLBM's put to sea matches the number and accuracy required to strike the adversaries land based nuclear forces then the role of the SSBN fleet might also be for counter-force strikes. However, India is unlikely to do this as it would run counter to its nuclear doctrine. But if the test is successful and if the CEP is less than 40 meters (both at full range and Short Time Of Flight (STOF) launch) then in terms of technology India will have the capability to perform counter-force strikes.

(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)

Endnotes

[1] Hemant Kumar Rout, "Longest Range Ballistic Missile All Set for Undersea Launch", http://www.newindianexpress.com/states/odisha/Longest-Range-Ballistic-Missile-All-Set-for-Undersea-Launch/2013/12/10/article1937718.ece, 10 December 2013, accessed on 18 December 2013.

[2] No.1

[3] David C Isby, "India's K-4 SLBM awaits first launch", http://www.janes.com/article/26334/india-s-k-4-slbm-awaits-first-launch, 27 August 2013, accessed on 19 December 2013.

[4] No.1

[5] From an article by the same author which was published in IPCS website on 04 April 2013. Available at: http://www.ipcs.org/article/india/k-15-slbm-where-does-it-stand-3870.html

[6] Ibid

[7] No.1

[8]No.5

9 "Nuclear Weapons", http://www.fas.org/nuke/guide/india/nuke/ , 08 November 2008, accessed on 24 December 2013.