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Ballistic Missiles and India-Pakistan Strategic Balance

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Amid heightened tension between India and Pakistan, recent reports suggest that Pakistan has moved its ballistic missiles closer to the Indian border. This has raised the fear that ballistic missiles may be used in the war between India and Pakistan thereby widening the scope of the conflict. It is, therefore, pertinent to discuss the Indo-Pakistani missile capabilities and the role these missiles could play in a war between New Delhi and Islamabad. At the very outset, it is important to mention that ballistic missiles are unmanned, self-guided and self-propelled weapons delivery platforms with a range of many kilometers. They carry their own-fuel and oxidizer propellants as opposed to aircrafts and cruise missiles, which must stay in the atmosphere and get their oxidizer-oxygen from it.

Ballistic missiles possess certain characteristics that make them valuable military assets. They have a short flight time between launch and target. They can deliver the warheads to greater distances. They are particularly difficult to defend against and cannot be recalled once they are launched. They are potential delivery platforms for weapons of mass destruction, be it nuclear, biological or chemical. The military significance of ballistic missiles led India to begin a comprehensive missile development programme known as the Integrated Guided Missile Development Programme(IGMDP) in 1983. With an initial budget of Rs.380 crore, the programme envisaged "to take up simultaneously the design and development of five missiles which would provide the nation a comprehensive missile-based defence umbrella within ten years". The five missiles include: the short range surface-to-air missile Trishul, the surface-to-air missile Akash, the smokeless high energy anti-tank guided missile Nag, the surface-to-surface missile Prithvi and the intermediate range missile Agni.

Of the five missiles, only Prithvi and Agni are ballistic missiles. Prithvi is a single stage, road mobile, liquid fuel battle-field support missile. This 8.5 meter short-range ballistic missile costing Rs.5 crore a piece, was first test-fired in February, 1988. Powered by liquid propellant, the state-of-the-art Prithvi has the latest on-board computers as well as an advanced inertial navigation system. It uses two radars: one for guidance and the other for targeting. Prithvi has a unique three stage trajectory— the initial powered phase, the plain cruise phase and the steep descent phase of nearly 80 degree that makes it almost impossible for the radars to get time (it can cover 75 kms. in just 4 minutes) to pick up a signal and counter it. Several variants of the missile have been developed. Prithvi-I or the Army version has the maximum range of 150 kms. and a payload capacity of 1000 kg. This missile has been produced and inducted into the Army. Prithvi-II or the Air-force version has a range of 250 kms. with a warhead weight of 500 to 700 kg. The development work on this missile has already been completed. The Prithvi -III is meant for the Navy. This missile also called Dhanush has a range of 350 kms. and a warhead weight of 1000 kg.

The Dhanush is now under development. The intermediate range Agni is India's second ballistic missile available in two versions: Agni-I and Agni-II.
Agni-I is a two stage IRBM with a length of 18.4 meters and 1.3 body diameter. It has a range of 1000 kms. and a payload capacity of 1000 kg. It is based on first stage solid and second stage liquid fuel configuration. As an IRBM, Agni-I provides many battle-field advantages such as better interception rate, speed, night operation capability, pre-launch survival ratio etc. It has a remarkable Circular Error Probability (CEP) figures (which determine a missile's strike accuracy). It excels in crucial operational areas like reentry, long-range maneuvering and two staged propulsion and stage separation. This missile has been thrice test fired from the ITR, Orissa in May, 1989, May 1992, and Feb. 1994. These three tests were done at the cost of about Rs.55 crore.
Agni-II is the extended version of Agni-I. First test fired on April 11, 1999, this IRBM has a range "in excess of 2000 kms." which it can cover only in 11 minutes. Other features of the 20 meters long and sixteen tones weighs Agni-II include: mobile launch capability, solid-solid propulsion system, features designed to carry special pay-load of over 1000 kg, state-of-the-art navigation, guidance and control systems and sophisticated on-board packages including advanced communication interface. This missile has been last test-fired in Jan. 2001.

Pakistan is perceived to have acquired missile capability in the late 1980's. Three major factors namely the easy availability of Chinese missiles and missile related technologies, its inability to obtain the delivery of all its F-16 fighters from the USA and the success of India's missile development programme proved to be the main reasons for Pakistan's missile acquisitions. Today, Pakistan's missile arsenal consists of: the Hatf-I,II ,III, IV, V,VI etc. The Hatf-I is a single stage solid propellant missile with a range of 60-80 kms and a payload capacity of 500 kg. It was first flight tested in 1989 and a larger 100 kms range variant was most recently test-fired in early 2000. It is believed to be in service in limited numbers. The Haft-II is a solid-propellant ballistic missile with a range of 300 kms. and a 500 kg. payload capacity. However, not much has been heard about this missile since its initial test-firing in February 1989 and apparently this project has been over-taken by other more advanced and more successful missile systems. The Hatf-III is a solid fuel short-range ballistic missile with a range of 600 kms and a payload capacity of 500 kg. This missile, which closely resembles with the Chinese M-9 missile was first test fired in 1997. The Hatf-IV, also called Shaheen-I, which has a range of 750 kms and a payload of 700 kgs. This solid fuel missile which is based on the Chinese M-11 missile design, was first flight tested in April 1999. Shaheen-I is reportedly to have entered serial production in mid 1998.

Hatf-V also named Ghauri is a single stage liquid fuel IRBM with a range of 1000 kms and a payload capacity of 700 kgs. This missile was first test-fired in April 1998. The Ghauri has another version called Ghauri-II. This is a liquid fuel, two stage IRBM with a claimed range of 2300 kms. The Ghauri-II was first flight tested in April 1999. The Ghauris are believed to be derived from the North Korean Nodong missile. A longer range two stage solid fuel missile Hatf-VI, also called Shaheen-II, was unveiled during the Pakistan Day Parade on 23 March 2000. This missile which is yet to be test fired is likely to have a range of 2500 kms with a 1000 kg. payload. Beside the Hatf series, longer range missiles named as Tipu, Ghaznavi and Haider have also been reported.

Now we can discuss the role of these missiles in an Indo-Pakistani war. It is worth mentioning that given Pakistans proximity with India and the limited depth of its territory, Prithvi (range: 250 kms) is sufficient against Pakistan rather than the Agni(range: 2000 kms). The Prithvi can carry both

conventional and nuclear warheads against Pakistan. In its conventional mode which includes high explosive, pre-fragmented, cluster munitions and fuel air explosives, Prithvi could be employed in areas against static targets such as the larger maintenance areas required by Pakistani Army Reserves, Command Centres, air-fields and fixed air defence sites. Such targets could include Pakistan's Kamra and Chakala air bases, the Lahore air-field and the command head-quarters and Bahawalpur. Prithvi might also be used as a 'close support' weapon against reserve formations moving up after armed penetrations.

Similarly, a nuclear armed Prithvi can reach virtually all of Pakistan's important strategic, industrial and population centres. Pakistan by using its Hatf-III could seriously endanger all of India's northern belt including the capital Delhi. Similarly, the IRBM Ghauris and Shaheens which when deployed along India's borders could strike at almost the whole of the Indian sub-continent except for perhaps some remote pockets of India's north- east region. However, before jumping into a war with Pakistan, Indian strategic planners need to calculate our disadvantages vis-à-vis the Pakistani advantages in the missile field. First, the Prithvi suffers from two serious battlefield limitations. One, its dependence on liquid fuel means that the weapon has to be loaded before use, a procedure that is both hazardous and time-consuming. Thus, the missile will have the disadvantage of a slow reaction time till a solid fuel version gets developed. Another drawback of the missile is its accuracy. The Prithvi lacks a proven terminal guidance system. Notwithstanding the claims made by the DRDO that the Prithvi has a CEP of 40 meter at its maximum range of 150 kms. and other estimates giving the CEP as between 150 to 200 meter, there is a strong need for better accuracy with its conventional mode.

On the contrary, Pakistan has certain advantages in this field. First, except Ghauri, all Pakistani ballistic missiles are run on solid fuel. The use of solid fuel is of crucial significance because of its operational advantages. Solid fuel is non-corrosive and easy to handle. Its user-friendly characteristics cut the down pre-launch preparation time and enable faster sequential firings. Besides solid fuel is compact and easy to store, the resulting storing advantages can help in beefing up the size of the ready-for-battle missile stocks and thus increase the overall missile punch. Second, the Pakistani missiles are mobile and hence would retain their operational flexibility and surprise. This would make the task of an Indian strike difficult. Finally, Pakistan has a lead over India in the overall missile field. For instance, while India has to 'test' and 'produce' its ballistic missiles, Pakistan has taken up the short- cut method of importing complete missile systems either from China and North Korea.