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# Pakistan's Shaheen Missile Family and its Implications for Pakistan's Security

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Following its 1998 nuclear tests, the leadership in Pakistan has emphasized the need to develop a minimum deterrent capability to meet the requirement of its national, flexible (medium range missile force).<sup>[1]</sup> It is a surprising fact that despite being politically unstable, Pakistan has continued a sophisticated ballistic missile development program. Pakistan's success is due in large part to assistance from China and North Korea. Pakistan claims that its missile program has been mostly India centric, and it does not aim at augmentation of strategic power for a political rationale.<sup>[2]</sup> The paper will address Pakistan's nuclear strategy and then examine the Shaheen missile system and its place in Pakistan's nuclear strategy.

## Understanding Pakistan's Nuclear Strategy

Strategy can be defined as a set of actions to be undertaken in order to achieve a goal. Nuclear strategy lays down a set of actions need to be undertaken for the





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development and the use of nuclear weapons. These plans of action aim to address the crucial issues pertaining to nuclear weapons, such as under what circumstance is it possible for the state to develop nuclear weapons; the issue of strategic and tactical nuclear weapons; and most importantly, the use of nuclear weapons - whether to use nuclear weapons against counter-value targets or against counter force targets or adopt a countervailing strategy, and the survivability options of nuclear forces.

For Pakistan, nuclear weapons have served as a vital component in its military strategy per se. Pakistan views its nuclear weapons as a counter-balance to the conventional inferiority it faces against India. Therefore, as India adopted a <sup>۲۷</sup>no-first use<sup>۲۷</sup> doctrine for nuclear weapons, Pakistan on the other hand, rejected the <sup>۲۷</sup>no-first use<sup>۲۷</sup> doctrine. For Pakistan, ballistic missiles form the best means of delivery of nuclear warheads. Nuclear capable ballistic missiles help to deter Pakistan's<sup>۲۷</sup> adversaries and thus comprise a psychological weapon. In February 2008, General Ashfaq Parvez Kayani, the then Chief of Army Staff in Pakistan, had stated that the Pakistan government is <sup>۲۷</sup>fully committed to retain a strong conventional and unconventional deterrence which will meet all needs of a strong national defence<sup>۲۷</sup>.<sup>[3]</sup>

### Need for missile systems

Ballistic missiles represent a state's<sup>۲۷</sup> technological progress and add to its power and prestige. Pakistan's<sup>۲۷</sup> Shaheen missile systems are sophisticated missiles representing Pakistan's<sup>۲۷</sup> advancements in state-of-the-art technology.

The Kashmir Telegraph lists three reasons why Pakistan's<sup>۲۷</sup> missile program contributes to its nuclear deterrent capabilities.<sup>[4]</sup>

1. <sup>۲۷</sup>Pakistan has been unable to augment its fleet of modern combat aircraft due to the past U.S. policy of military economic sanctions designed to arrest and slowdown Pakistan's<sup>۲۷</sup> nuclear weapons program.
2. The country's<sup>۲۷</sup> overall poor economic performance has prevented the Pakistan Air Force from undertaking major fleet expansion and modernisation efforts by making the switch from U.S. to European and Russian suppliers.

3. Finally, the unfolding and proposed advances in India's air-combat, air defence, and long range reconnaissance capabilities are channeling Pakistani investments into a ballistic missile-based capability.

However, it would be wrong to conclude that only India feeds Pakistan's threat perceptions. As Israel and Iran develop long-range missile capabilities, it is hard to believe that Pakistan eschews this threat. In fact conversely, some prominent Israelis and U.S. experts also view Pakistan's nuclear weapons as -- similar to the looming nuclear threat from Iran.<sup>[5]</sup> There are reports of Israel having planned to bomb Pakistan in the past, especially their nuclear facilities at Kahuta.<sup>[6]</sup> Israel's irritation with Islamabad is not surprising considering Islamabad's closeness with the Arabian states which were staunch adversaries of Tel Aviv.

Pakistan and Iran are also divided by the Shia-Sunni ideology. There is no doubt that Pakistan, a Sunni state, sees itself as a powerful nuclear weapon state in the Muslim world while Iran, a Shia state wants to become the major power in the Muslim world. Ideological conflicts can lead to arms races as seen by the example of the Soviet-American arms race during the Cold War. So it is possible that Pakistan's missile capability, as it keeps pace with India's, missile program, will also seek to keep pace with the missile program of another immediate neighbour, Iran,. Thus, with both Iran and Israel developing sophisticated missile technology, Pakistan has no other option but to follow the suit in order to maintain its nuclear deterrent posture not only against New Delhi but also against Tehran and Tel Aviv respectively.<sup>[7]</sup>

### **A Brief Description of the Shaheen Family of Missiles**

Pakistan has emerged as the only Muslim de facto nuclear weapon state and wants the world to recognize it as a de jure atomic power.<sup>[8]</sup> This was reflected in previous Prime Minister Yousuf Raza Gilani's emphasis on the need for the world to recognize Pakistan as a de jure nuclear weapon state.<sup>[9]</sup> Pakistan surely has proven its ability to develop, test and build ballistic and cruise missiles that can deliver nuclear warheads. The Shaheen missile program was initiated in 1995 and assigned to National Defence Complex along with the facilities of country's national space agency, the Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), and industrial facilities of Lahore, Islamabad, Karachi, Gujranwala, Sialkot.<sup>[10]</sup>

Pakistan's Hatf4 and Hatf6 are called Shaheen1 and Shaheen2 respectively, and both are solid fuel propelled surface-to-surface ballistic missiles. Shaheen is said to use state-of-the-art technology because of its lightning-speed, terminal guidance and solid fuel.<sup>[11]</sup> A solid fuel propulsion system makes the missile less hazardous to be fuelled since the missile, does not require fuelling several hours prior to launch as opposed to liquid fuelled ones. Terminal guidance improves the accuracy of the missile system, while greater speed reduces the chance of the missile of being intercepted by missile defense system. During tests, it was observed that due to its powerful rocket motor, the speed of Shaheen-I was three times faster than that of Agni II.<sup>[12]</sup>

Shaheen 1 is a short-range ballistic missile (SRBM) ranging up to 750kms. There is also an improved ShaheenIA version SRBM which has a range of 900kms.<sup>[13]</sup> Both missiles are nuclear capable and are operated by the Pakistan Army Strategic Forces Command. Shaheen 1 was first tested in 1999 and first entered service in 2003.<sup>[14]</sup> It is reported to be similar to the Chinese M-11 missiles which were received by Pakistan in 1993. However, reports suggest that the Shaheen has a larger nozzle and an improved control system.<sup>[15]</sup>

Shaheen1 has a post separation attitude correction system which means that it is capable of high accuracy and maneuverability<sup>[16]</sup> to avoid missile defense. Shaheen1 has stealthy warheads which could delay detection and complicate missile defense targeting.<sup>[17]</sup> Brain Cloughley, a security expert raised concerns over the Shaheen1A's increased range since it would bring eastern India into the ring of vulnerability.<sup>[18]</sup> Shaheen IA could be fitted with lighter-weight plutonium warheads for improving range of the missile.<sup>[19]</sup> It is also believed to be more accurate than the Shaheen1 missile. The missile according to Khalid Ahmed Kidwai can hit a target as far as the Indian Ocean which would further strengthen and consolidate Pakistan's deterrence capabilities.<sup>[20]</sup>

Pakistan's Shaheen II is a medium range ballistic missile (MRBM) ranging up to 2500kms and is reported to be similar to the Chinese M-18 missile.<sup>[21]</sup> The missile uses two stage solid motor technology<sup>[22]</sup> and is inertial guided<sup>[23]</sup> This missile can probably be launched from either a missile transporter or wheeled Transporter Erector

Launcher (TEL)<sup>[24]</sup> as opposed to Shaheen 1 which uses a 8 wheel TELs.<sup>[25]</sup> To improve the accuracy and maneuverability of Shaheen 2, the missile is reported to have four large delta control fins at the rear of the payload area. This accuracy is important if the missile is to deliver conventional warheads. Some sources note the payload separates from the boost motor after the burn out but other reports note that payload separates after re-entry into the atmosphere.<sup>[26]</sup> The solid propellant for Shaheen 1 and 2 is cast directly into chamber using the case bonding technique.<sup>[27]</sup> Shaheen2 is at present Pakistan's longest range ballistic missile which can carry both conventional and nuclear warheads.<sup>[28]</sup> The missiles though nuclear capable, can also carry sub-munitions which could be best suited for soft targets. Islamabad is also working on Multiple Independently Targetable Re-entry Vehicle (MIRVs) for the Shaheen-II missile systems.

This obviously would strengthen Pakistan's first-strike capability along with improving its counter-force targeting capability, though MIRVs could reduce the range of the missiles. Road mobility enhances the survivability options of these missiles which further strengthen Pakistan's second-strike capability too. It also allows Pakistan to fire the missile from any part of the country. Pakistan probably depends on China for navigation systems and related electronics.<sup>[29]</sup> Shaheen-II gave Pakistan not only gave Islamabad a long range strike capability but also enabled Pakistan to acquire a space launch vehicle (SLV) called the Taimur which can transport a minimal payload to a Low Earth Orbit.<sup>[30]</sup>

In March 2015, Pakistan also test fired its Shaheen 3 missiles with a range of 2750kms.<sup>[31]</sup> Pakistan claims that the missile is developed to reach targets in India's Andaman and Nicobar Islands to deny India any retaliatory capability to a nuclear first strike.<sup>[32]</sup> Though Pakistan claims the missile to be indigenously developed, the missile could be a Chinese DF-26 version. There could also be a possibility that the Shaheen-3 has been test fired on depressed trajectory. Though there are no reports to back the argument, logically Pakistan could easily increase the range of Shaheen 2 missiles from 2500kms-2750kms by reducing the payload.

It is quite obvious that Shaheen will be the backbone of Pakistan's nuclear deterrence. The Pakistan Air Force's potentially tactical nuclear-capable F-16A/B, Mirage 3/4 fighters and new JF-17 multi-purpose fighters, would be vulnerable to

Indian air defense systems. The 70-100 km range Hatf-I, IA and IB categories, 180km range Abdali, and 290km range Ghaznavi are limited to tactical nuclear strikes, while the 1,300-1,800km range liquid fueled Ghauri is best suited for first strike. Moreover, Ghauri is an obsolete design that could in the future be replaced with the Shaheen systems.

### **Chinese Help**

Chinese entities have played a vital role in Pakistan's missile development program. The Chinese Precision Machinery Import and Export Corporation (CPMIEC) provided with missile components for the Shaheen-1 (M-11) missiles which included the missile gyroscopes, accelerometers, on-board computers, to name a few.<sup>[33]</sup> According to Nuclear Threat Initiative (NTI) Reports, CPMIEC currently markets missiles produced by successors of China's Ministry of Space Industry, the China Aerospace Science and Technology Corporation (CASC) and the China Aerospace Science and Industry Corporation (CASIC).<sup>[34]</sup>

### **Command and Control**

In 2009 Pakistan's Strategic Plans Division confirmed that command and control of its strategic forces was secure. Lt. General Kidwai stated that the control systems used two man rule and permissive action links and the missiles are in knocked down state and the warhead storage area is some distance away from the delivery systems.<sup>[35]</sup> It is indeed a three-tier system which is controlled by National Command Authority, Strategic Plans Division (SPD) and the three services- the Army, Navy and Air Force. The Prime Minister is the chairman of the NCA, while the SPD is headed by a director, appointed from the army.<sup>[36]</sup> Pakistan's missile components during peace-time is kept in semi-knocked down state and the missiles are de-mated from their warheads. In order to prevent any unauthorized launch of nuclear weapons, Pakistan is believed to have applied the two-man rule.

### **The future**

Pakistan is also working towards developing a sea-based deterrent capability in order to strengthen its second strike capability. In all likelihood, should Pakistan decide to develop the submarine launched ballistic missiles (SLBM), they could be the longer-

range Shaheen-2 versions probably derived from the Chinese Julang-1 SLBMs which could be either fitted with SSBN (which Pakistan does not possess) or with conventional submarines with Air Independent Propulsion system. Longer range SLBMs would enable the submarine to remain in deep sea and fire the missile rather than from somewhere close to enemy points of vulnerability. China is also working on Hypersonic Glide Vehicles (HGVs), which could be mounted atop ballistic missiles. These HGVs enable to evade missile defence systems and also provide longer range to the Chinese ballistic missiles. In future, Pakistan could avail of this technology from the Chinese once Beijing masters the technology.

To develop MIRVs on Shaheen II ballistic missiles, Pakistan has been developing lighter-weight plutonium warheads. MIRVs require miniaturized nuclear warheads which would require sophistication in nuclear and missile technology. Miniaturizing plutonium warheads is easier than to miniaturize uranium-enriched warheads, a reason why Pakistan has also paid heed to plutonium warheads. Pakistan's claim that it is developing a tactical nuclear capable missile called the Nasr also requires development of plutonium miniaturized warheads.<sup>[37]</sup> Miniaturized warheads would also enable Pakistan to develop sea-based nuclear deterrent since submarine launched missiles would also require similar warheads.

According to Dinshaw Mistry, an expert on missile proliferation, it is also possible that Pakistan could provide the Shaheen family of missiles systems to Saudi Arabia in order to bolster ties and gain economic revenues<sup>[38]</sup> and to assist a regional nuclear deterrent against Israel. In addition, Turkey aspires to develop long-range ballistic missile capabilities and it is possible that Pakistan could provide its technical know-how of the Shaheen missile system to further enhance their defence ties.

## Conclusion

Most analysts feel that development of nuclear capable missiles could be detrimental to the stability of the South Asian region since the region is believed to be anarchic. However, regional stability in the midst of two South Asian states advancing with their nuclear capabilities is strengthened when there is parity. Pakistan and China shape India's threat perceptions and hence, as a deterrent against both, India has to develop longer-range missiles. Pakistan, hence, follows suit to maintain the stability-instability paradox. At present, the Shaheen ballistic missile family enables Pakistan to

maintain this stability instability paradox viz-a-viz India by providing a nuclear deterrent capability that is advanced and survivable. This was best reflected in 2006, when following a test of the Shaheen 2 ballistic missile, Prime Minister Shaukat Aziz had pledged that Pakistan would continue to retain its deterrent capability to guarantee peace in South Asian region.<sup>[39]</sup>

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