DYNAMICS OF PAKISTAN'S MISSILE PROGRAM: AN ANALYTICAL STUDY

M. Umair Rafique*

Abstract:

The introduction of nuclear arms into the national defense structures of Pakistan and India in 1998 has not brought an era of peace and stability as some analysts had predicted. Full-scale war was only barely evaded in 1999 and 2002. It is true that nuclear weapons play an important role as deterrent but without any reliable nuclear delivery system the deterrence would be inadequate. Therefore, missile technology has been seen as the most important variant of today's modern warfare. As we know that missile technology could be use for both offense and defense purposes thus every nuclear or non-nuclear state specifically generates funds for the development of its missile program. The objective of this study is to understand the dynamics of Pakistan's missile program, particularly in the scenario when India is advancing its missile program for both offence and defense proposes. The article discusses the objective of Pakistan's missile program with capabilities and specific usage, proposes and importance on the concept of minimum deterrence for Pakistan. Within this context, the study also analyzes Pakistan's strategic thinking about the role of different missile series.

Keywords: nuclear arms, national defense structures, peace and stability, full-scale war, warfare, conventional freefall, loft bombing, toss bombing, low-level lay down attack techniques

* M Umair Rafique, Research Scholar, Department of Political Science, University of Karachi

Introduction

In this golden age of technology and advancement battlefields have became much smaller as fighter planes and missile systems can destroy their targets in a very short time. Missile system plays a key role in contemporary war games based on scientific strategies. It is now an essential element in the defense and offence planning of a nation. Moreover, it is an effective and reliable deterrent. The United States and Russia acquired the most advance technology for their nuclear delivery systems, most importantly the Inter-Continental Ballistic Missiles (ICBMs) which can target any region around the globe. All other nuclear powers also possess reliable and up to date nuclear delivery systems as well. There are two types of nuclear delivery systems, warfare aircrafts (bombers, jet fighters) and missiles. These systems ensure the security of the possessing states and also work as a reliable deterrence. Pakistan is the world's seventh nuclear power and like other nuclear weapons states it needed a reliable nuclear delivery system to fully secure its borders. Thus it has two types of delivery vehicles for nuclear weapons: aircraft and surface-to-surface missiles controlled by the Pakistan Army. Pakistan's missile program is important for two reasons. First, Pakistan is a nuclear weapons state. Missiles give Pakistan the means to deliver its nuclear warheads further and with more certainty than it could with aircraft. Second, its opponent state India has rapidly developed its missile delivery system, which has created security concerns for Pakistan. Ballistic missiles are necessary to Pakistan's official policy of upholding a credible minimum deterrence against India. The importance of these systems has grown in large part because for more than fifteen years, the expansion of the Pakistani Air Force has been constrained by the U.S. sanctions, which have prevented Pakistan from obtaining advanced U.S. warplanes (Peter R. Lavoy, 2007). According to former Pakistan Army Chief General Jahangir Karamat, Islamabad's emphasis on ballistic missiles is due to the disparity in air power with India, especially after 1990, when the United States imposed these sanctions under the Pressler Amendment, barring further military assistance and sales to Pakistan because of its acquisition of nuclear weapons (Jehangir Karamat, 2004).

Pakistan's Nuclear Delivery Systems

Aircrafts

Initially Pakistan adopted the simplest path for its nuclear delivery system and modified its combat aircrafts to use them as nuclear delivery vehicles. During 1983-1990 period, the Pakistan Atomic Energy Commission's (PAEC) Wah Group worked besides the Pakistan Air Force (PAF) to evolve and perfect delivery techniques of nuclear bomb using combat aircraft including 'conventional freefall', 'loft bombing', 'toss bombing and 'low-level lay down' attack techniques. Today, the PAF has perfected all four techniques of nuclear weapons delivery using F-16, Mirage-V and A-5 combat aircraft.

Pakistan's Missile Program

Strategically, Pakistan was aware that in terms of a missile build-up, it was running against time. Aircraft had limitations both in terms of range of delivery of nuclear weapons and so also penetration of India's air-defense systems. Pakistan was also

sensitive to the indigenous development of Indian missile program and its effects on the region. Initially Pakistan had established a modest facility in early 1960s known as Space and Upper Atmosphere Research Committee (SUPARCO) in Karachi to study weather patterns. In 1981 its status was changed from committee to commission. The Institute launched two weather rockets, Rahbar 1 and Rahbar 2 into the atmosphere for data collection and the tests were successful. At this stage the government of Pakistan was not interested to initiate missile development program. Also there was a shortage of appropriate technologies and lack of adequate funds. New Delhi launched a comprehensive missile development project, known as the Integrated Guided Missile Development Program (IGMDP), in July 1983 (Srivastava, Anupam, Asian Survay, March-April 2000). On the other hand Islamabad closely observed the situation and strategic implications were carefully assessed by the concerned authorities. It was soon clear that India was determined to build a nuclear arsenal and a compatible missile force. Till 1987 there was no sign of any kind of military based missile program. According to the International Institute for Strategic Studies' annual survey, Pakistan has very few missiles. Pakistan's Army possesses multiple rocket launchers; its Air Force is armed with air-to-air and air-to-surface missiles; the Navy has surface-to-air missiles (New York Times, 24 May 1988). When the threat of Indian missiles became apparent, Pakistan started to take initiatives for the development and procuring of missile technology. It was the same situation as in 1974 when India tested its first nuclear weapon and in its response Pakistan adopted a new nuclear policy and shifted its nuclear path from civil nuclear program to a military one to secure its ideological and national boundaries.

Pakistan's missile program was undertaken in early 1987 when, according to General (Retd.) Mirza Aslam Beg, who was then the Vice Chief of Army Staff under General Ziaul Haq, the missile program was initiated when 'explicit information was gained that India was on the road to pursue its missile as well as its chemical weapons program.' Its authenticity was checked and rechecked. He also stated that in response of Indian initiatives, General Zia took two crucial decisions in consultation with concerned departments:

(1) Pakistan would not develop chemical weapons

(2) Pakistan would develop missiles of short and medium-range capabilities, to be equipped with proper guidance systems (Matinuddin, Kamal, 2002).

India tested its Prithivi and Agni missile systems in 1988 and 1989. In particular, India's Prithivi missile was generally considered to be Pakistan specific, thus making a critical impact on the Pakistani Strategic calculation. Soon after Indian tests Pakistan exhilarated its missile program and in early 1989 Pakistan tested its short range, solid-propellant missiles known as Hatif-I and Hatif-II. When asked why Pakistan was developing ballistic missiles, Pakistan's then minister of state for Defense, Ghulam Sarwar Cheema, replied that Pakistan needed 'to have an antidote for what our enemy next door has'(Fronst, Roger, 1989). Hatif-I was a single-stage, solid-fuelled, unguided weapon system with a range of 80 kilometers and a payload of 400 kilograms. Initially, it was intended to carry high explosives, sub-munitions, and possibly chemical weapons (Jane's Strategic weapons Systems, July 2002). An upgraded version of Hatif-I was

tested in February 2000 with the range of 100 km. it was reportedly developed by SUPARCO. On 23 March 1989 it was publically displayed in the Pakistan Day parade. The other ballistic missile Hatif-II was a two-stage, solid-fuelled ballistic missile system. It has a range of 180 kilometers with increased payload of 500 kilograms. Like Hatif-I it was also a free-flight rocket and developed by SUPARCO. It was not as accurate to its target as Hatif-I because it didn't have any terminal guidance system. It was publically displayed in 1990. In 1989, Pakistan and China also signed a ten-year cooperation agreement in defense science, technology and industry, including joint procurement, research and development, production and technology transfer (http://www.wisconsinproject.org/countries/pakistan/miss-miles2005.htm).

After testing short range ballistic missiles Islamabad undertook new missile projects to counter Indian medium range ballistic missile Prithivi. Pakistan's then Chief of Army Staff, General Mirza Aslam Beg, stated that Pakistan had embarked on a new project to develop a missile with a range of 600 km that would enable his country to strike New Delhi (Hussain Musahid, 1989). In 1989, Islamabad concluded a deal with Beijing to purchase 34 solid-propellant M-11ballistic missiles. M-11 has a range of 300 kilometers and is capable of carrying both nuclear and conventional warheads. Through 1990s Pakistan signed many collaboration deals with China and North Korea for the assistance in ballistic missile technology.

In 1993, the National Development Complex (NDC) was established. The NDC was constructed by the Pakistan Atomic Energy Commission's (PAEC) under the direction of Dr. Samar Mubarakmand. The NDC was set up as a center for solid fuel missile development using Chinese technology. The Shaheen ballistic missile program was initiated in 1995 and assigned to the NDC. This program was intended to develop missiles with ranges in the Medium Range Ballistic Missile (MRBM) class. The 750 km range Shaheen-I began development at the beginning of 1996, and the prototype was ready for test flight by the mid of 1998.

Shortly afterwards, Pakistan established a ballistic missile program at the Khan Research Laboratories (KRL) at Kahuta with similar objectives that competed with the NDC Shaheen project. This program was based on North Korean liquid fuel missile technology and amounted to a Pakistani effort to manufacture the missile under the name Ghauri.

Following table represents different Pakistani organizations which are involved in the creation and up gradation of different ballistic and cruise missile series.

Table 1: Pakistan's Missile Series and Manufacturer Institutes

Missile Series	***Propellant***	***Manufacturer***
HATAF	*Solid*	*SUPARCO/NDC*
GHAURI	*Liquid*	*KRL*
SHAHEEN	*Solid*	*NDC*
BABER	*Solid*	*NESCOM/AWC*
RA'AD	*Solid*	*NDC*
NASAR	*Solid*	*NDC*

SUPARCO = Space and Upper Atmosphere Research Commission; **KRL =** Khan Research Laboratories; **NDC** = National Defense Complex; **NESCOM** = National Engineering and Scientific Commission; **AWC =** Air Weapons Complex

In June 1997, press reports suggested that the Army version of Indian short-range *Prithivi* missiles had been deployed in Jullundur, an area which is very close to the Indo-Pakistani border **(**The Washington Post, June 3, 1997**).** There are two versions of the *Prithivi* missile systems. The army version with a 1,000 kilogram payload has a maximum range of 150 kilometers. The air force version, with a lighter 500-kilogram payload, has a range of up to 250 kilometers and can reach all important cities and army basis in Northern Pakistan (Chamka, Bhumitra, 2009). Although, New Delhi denied the deployment of *Prithivi* missiles, it admitted that a batch of missiles had been moved from south India to the north. Responding to this development, Pakistan tested a nuclear capable missile – Hatif-III (Ghaznavi). It highlighted Islamabad's determination to match India's expanding missile capabilities (The Nation, 6 July 1997). According to media reports the tested missile was developed by NDC and has a range of 290 km and is capable of carrying an 800 kg payload (The Nation, 6 July 1997).

On 6th April 1998 Pakistan successfully tested its first liquid-propellant surface-to-surface Intermediate Range Ballistic Missile (IRBM) Ghauri-I with an estimate range of 1,300 km and a payload capacity of 680 kg, to counter India's *Prithivi* missile. It was developed by KRL and formally inducted into the Pakistan Army's Strategic Forces Command in January 2003. According to Pakistani officials: the Ghauri compensates for Pakistan's lack of strategic depth it serves the strategic need of Pakistan to be able to hold India in a position of vulnerability similar to itself (Farooq, Umer, June 1998).

Following the May 1998 nuclear tests, Pakistan continued to upgrade its missile capabilities and develop a further advanced variant of Ghauri missile. Ghauri-II was tested on 15th April 1999 and one day after the test of Ghauri-II, Pakistan tested Shaheen-I. Ghauri-II is an upgraded version of Ghauri-I. It has an improved range of 1800 km and capable of carrying payload of 1500 kg. On the other hand Shaheen-I is a Solid-fuelled ballistic missile with the range of 650 km, it is capable of carrying 850 kg payload warhead, developed and tested by NDC. Pakistani officials stated that the test flights of Ghauri-II and Shaheen-I would ensure that Pakistan's minimum deterrent capability' was technically credible and would maintain 'strategic balance in South Asia' (Farooq Umer, April 1999). After these tests, Islamabad halted missile tests and called on New Delhi to join in a 'strategic restraint regime' in order to limit the development of missile and nuclear weapons technology and deployment (http://www.fas.org/irp/threat/prolif00.pdf).

Pakistan observed the self-imposed moratorium on missile testing for the next three years and did not respond to India's test of the *Agni-2* in January 2001or the *Dhanush* in September 2001 with any missile test of its own. After terrorists' attacks on the Indian parliament in December 2001, India alleged that the attacks were carried out by terrorist organization based in Pakistan and started mobilizing its troops along the Pakistani border. During this course of crises, Pakistan tested three types of ballistic missiles Ghauri-1, Ghaznavi, and Abdali in quick succession. According to International Institute for Strategic Studies (IISS), three probable political messages underscored the Pakistani

missile test: first, they were intended to placate domestic critics; second, they were intended to increase pressure on India to refrain from launching military strike; and, third, they were intended to indicate that Pakistan was capable of using short and intermediate-range ballistic missiles with nuclear warheads and was prepared to do so, if required (IISS, The Military Balance: 2002—2003). Pakistani leadership believed that these missile testing determined the course of the crises and contributed to its de-escalation. According to then president of Pakistan Pervez Musharraf:

"By testing, with outstanding success, the delivery systems of our strategic capability, these men [scientists] validated the reliability, accuracy, and the deterrence value of Pakistan's premier surface-to-surface ballistic missile systems to the Hatif series, namely – Ghauri, Ghaznavi, and Abdali -- we need to ensure that the three basic ingredients of the deterrence – capability, credibility, and resolve – never get compromised" (The News, 18 June 2002).

In March 2004 Pakistan tested the Shaheen II, which was upgraded version of Shaheen-I the long-range ballistic missile has a range of 2500 km and can carry 1100 kg warhead. The nuclear-capable Shaheen-II is Pakistan's most powerful ballistic missile, bringing all of India within reach. During the year of 2004 Pakistan presented a proposal to India for nuclear and missile restraint. According to then Pakistan's High Commissioner to the United Kingdom Dr. Maleeha Lodhi, the proposal include: a moratorium on nuclear testing, non-deployment of nuclear capable ballistic missiles, maintaining nuclear weapons on a de-alerted status, and moratorium on acquisition and deployment of Anti-Ballistic Missile system (ABM) (http://www.nti.org/media/pdfs/pakistan_missile.pdf?_=1316466791).

In 2005, India and Pakistan signed an agreement requiring both parties to provide advance notice of any ballistic missile tests. The period between 2002 and 2006 marked a flurry of missile test-flights in a "tit-for-tat" pattern with India. Since 2007, testing activity of the Ghauri and Shaheen missiles has slowed down and the majority of new developments have appeared in cruise, rather than ballistic missile systems (Bokhari, Farhan, Jane's Defence Weekly, 23 December 2010). Potential causes for this include India's investment in a ballistic missile defense system, the Ghauri and Shaheen missiles acquiring sufficient range and payload to target strategic locations in India, international pressure against intermediate and long-range ballistic missile tests, and a shift in focus toward developing a tactical nuclear capability (krepon.armscontrolwonk.com).

Pakistan's Cruise Missile Development

Pakistan initiated its cruise missile program after massive Indian investment in a ballistic missile defense system. India signed an agreement with Russia in July 1997 to acquire the Russian made S-300v air defense and anti-ballistic missile system. The system was highly capable of targeting incoming enemy aircraft and ballistic missiles. The Indian's were happy that they could counter the Pakistani nuclear delivery systems and also regained the superiority over Pakistan. Pakistan's own security came on stake after Indian deployment of its defense system. It became crystal clear that in the case of military conflict Indian defense system could bring disaster for Pakistan. It clearly affects Pakistan's policy of minimum nuclear deterrence and triggered the new arm race

in the region. In this extreme scenario, Pakistan has no other choice than to initiate countering measures against Indian defense system to ensure its own security and restore the balance of power in the region.

Initially, there are two types of systems, which can counter the ballistic missile defense, cruise missiles and Multiple-Independent Reentry Vehicles (MIRVs). To offset Indian defense system Pakistani think-tanks decided to initiate a cruise missile program and the task was given to the National Engineering and Scientific Commission (NESCOM) and the Air Weapons Complex (AWC). It is also believed that Pakistani scientists and engineers are making swift evolution in the development of MIRVs. It is expected that Pakistan may use this technology for its Shaheen series of missiles, which would make difficulties for Indian Defense system to shoot them down. A MIRV missile permit an individual missile to carry a number of warheads directed at separate targets. When it reaches to its target, sends out several smaller missiles each armed with a nuclear warhead. One ballistic missile thereby achieves the result of several missiles hitting various targets and becomes difficult for any kind of missile defense system to target all missiles. On the other hand, cruise missiles are virtually undetectable and highly survivable, even in the face of modern missile defenses. The first few weeks of the 2003 Iraq War demonstrated that sophisticated missile defenses could shoot down ballistic missiles with relative ease, but faced a significantly more difficult task in preventing a cruise missile strike (http://www.ipcs.org/article/pakistan/pakistans-babur-and-raad-cruise-missiles-strategic-implications-for-india-3681.html). Nevertheless, these short-comings are superseded by the tremendous advantages cruise missiles have over ballistic missiles in defeating existing missile defenses.

Pakistan successfully tested its first cruise missile in August 2005. The Hatif-VII/Babur is a subsonic missile, which can carry both conventional and non-conventional weapons. It can be launched by Pakistani advanced aircrafts like F-16 and JF-17 Thunder and also from Pakistan's Agosta submarines. The mating with the Agosta is key to Islamabad's quest for a second-strike capability (http://www.nation.com.pk/daily/august-2006/16/columns5.php.). India recently acquired a nuclear submarine from Russia and is on the way of modernizing its navy; the presence of Indian nuclear submarines has strategic implications for Pakistan. Babur has heightened Pakistan’s strategic standoff capability at sea. In July 2007, Pakistan retested Babur with further modifications. According to the Pakistani military, the missile has "near stealth" capabilities. Since the last test, Pakistani engineers have extended the range of the missile from 500 to 700 km, increasing its ability to reach targets in India, including the capital, New Delhi, with ground-launched or air-launched versions of the system (The Australian, July 27, 2007). The test-flight of the Hatf-7/Babur cruise missile stunned many observers for its technological complexity and its undetected development.

On August 25, 2007, Pakistan successfully tested its second cruise missile, the Hatif-VIII, or Ra'ad, which is a nuclear-capable air-launched cruise missile (ALCM). According to the Pakistan military, the Hatif-VIII provides the Air Force with a "strategic standoff capability" (http://www.iht.com/articles/ap/2007/08/25/asia/AS-GEN-Pakistan-Missile-Test.php). The range of the missile is 350 kilometers. The Pakistan military further stated that like Babur the Ra'ad also has a "low detection

probability due to stealth design and materials used in its manufacturing." Some analysts believe that this specific cruise missile is likely to be deployed on Pakistan's F-16A fighter aircraft or its planned fleet of F-16C warplanes. The Ra'ad was indigenously developed by NDC.

Table 2: Pakistan's Missile Capabilities

Name	***Designation***	***Type***	***Propellant***	***Range/km***	***Payload/kg***	***In Service***
__	Hataf-1	BRBM	Solid	50-80	500	1992
__	Hataf-1A/1B	BRBM	Solid	50-100	500	1995
Abdali	Hataf-2	BRBM	Solid	180	250-450	2012
Ghaznavi	Hataf-3	SRBM	Solid	350-400	500-700	2004
Shaheen I	Hataf-4	IRBM	Solid	700-750	700-1000	2003
Ghauri I	Hataf-5	IRBM	Liquid	1300	700-1000	2003
Ghauri II	Hataf-5	IRBM	Liquid	1800	700-1000	2003
Shaheen II	Hataf-6	IRBM	Solid	2000-2500	700-1000	2010
Babur	Hataf-7	SLCM	Solid	500-700	500	2012
Raad	Hataf-8	ALCM	Solid	350	350	2013
Nasr	Hataf-9	SRBM	Solid	60	__	2014

BRBM = Battlefield Range Ballistic Missile; **SRBM** = Short Range Ballistic Missile;

IRBM = Intermediate Range Ballistic Missile; **SLCM =** Submarine Launch Cruise Missile;

ALCM = Air Launch Cruise Missile.

Sources: Official Pakistani data (various sources); Stockholm International Peace Research Institute (SIPRI), *SIPRI Yearbook 2011: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2011); International Institute for Strategic Studies (IISS), *The Military Balance 2012* (IISS: London, 2012); Jane's Strategic Weapons Systems, <http://jsws.janes.com/public/jsws/index.shtml>; and 'Pakistan's nuclear forces, 2011', Nuclear Notebook, *Bulletin of Atomic Scientists*, July/Aug. 2011.

Impact on Indian Policy Makers

Ultimately, Pakistan's nuclear-capable cruise missiles have the potential to cause difficulties in India's decision-making calculus and even restrain Indian strategic behavior. Most importantly, Pakistan's cruise missiles will pose a serious threat to India's fledgling missile defense system. They have tremendous advantages over ballistic missiles in defeating existing Indian defense system.

After the deployment of Babur and Ra'ad cruise missiles Indian theory of Cold Start became un-affective and non practical since both of the weapons can be used in

conventional or limited wars. It is widely believed that in the presence of these lethal weapons the Indian armed forces will avoid taking unnecessary risk, like penetrating deep into Pakistani territory, crossing the Line of Control, and the use of airpower. Babur and Ra'ad have caused the fundamental quandary in Indian defense planning vis-à-vis Pakistan into sudden relief. Clearly, cruise missiles make an existing challenge to Indian defense planning more complex (http://www.ipcs.org/article/pakistan/pakistans-babur-and-raad-cruise-missiles-strategic-implications-for-india-3681.html).

Indian Cold Start Doctrine and Pakistan's Tactical Nuclear Weapon

The lessons of the Kargil conflict and India's ineffective strategy against Pakistan in the 2002 and 2008 crises led to the genesis of the Cold Start Doctrine (CSD). It indicates Indian strategic philosophy on limited war under the nuclear umbrella while the notion itself has been put to the test in various exercises, close to the border with Pakistan. The CSD is designed for the destruction of major components of Pakistan's war-waging machine by launching joint air-land offensives employing conventional forces. According to the theory, all of these objectives can only be achieved if deep sledgehammer blows are launched jointly by the Indian Army and Air Force during the next war with Pakistan. During 2004 to 2011, the Indian armed forces have carried out eleven different military exercises to test the concepts of the CSD. These military exercises were held close to the Pakistani border in which Indian troops and equipment were tested in a Nuclear, Chemical, Biological (NCB) environment. One such major exercise ―Vijay Bhava engaged more than 50,000 troops, carried out only 70 km from the Pakistani border. Over 1000 artillery pieces, 250 tanks including the T-90 and T-72, participated along with fighters and ground attack aircraft from the Indian Air Force (http://www.weeklypulse.org/details.aspx?contentID=634&storylist=10). CSD appears to have been designed to explore and exploit gaps and options for limited conventional war below Pakistan's nuclear thresholds; Therefore, a perceived gap in Pakistan's deterrence posture was felt in the wake of India's interest in limited conventional war on its own terms, reflected through the CSD (http://www.isn.ethz.ch/isn/Digital-Library/Publications/Detail/?lng=en&id=142881).

In this situation, Pakistan decided to launch Tactical Nuclear Weapons (TNWs) program. It was widely believed that battlefield use of nuclear weapons is highly destabilizing, with potentially strategic consequences. It can be argued that in Pakistan's case, TNWs would nuance deterrence stability by denying India the incentive to pursue limited war by exploiting any weak spots in the country's defense (http://www.ispr.gov.pk/front/main.asp?o=t-ress_release&id=1721). In April 2011 Pakistan tested the 60 km range NASR, a tube-launched tactical ballistic missile on the heels of an earlier test of the 180 km range Abdali ballistic missile. After these tests official statements indicating that Pakistan had acquired an operational level capability. According to the Inter-Services Public Relations (ISPR) press release:

"The missile has been developed to add deterrence value to Pakistan's Strategic Weapons Development program at shorter ranges. NASR, with a range of 60 km, carries nuclear warheads of appropriate yield with high accuracy, shoot and scoot attributes. This quick response system addresses the need to deter evolving threats. The test was a very important milestone in consolidating Pakistan's strategic deterrence capability at all

levels of the threat spectrum. He said in that hierarchy of military operations, the NASR Weapon System now provides Pakistan with short range missile capability in addition to the already available medium and long range ballistic missiles and cruise missiles in its inventory"(http://www.ispr.gov.pk/front/main.asp?o=t-ress_release&id=1721).

Controversy about Foreign Assistance

A controversy has constantly dogged Pakistan's missile program with regard to suspected cooperation with China and North Korea. Despite repeated assertions by both China and Pakistan that they have not conducted any missile-related interaction in violation of the MTCR, the anti-Pakistan and anti-China lobbies in West constantly propagating to invoke strict sanctions against both states in the field of missile development and export. However, the facts are pretty different from perceptions. Pakistan's Space Research Program predates that of India's, although lack of requisite funding and the low precedence given the program by early Pakistani administrations meant that progress was less than satisfactory. Nonetheless, in the early 1960s, long before Sino-Pak missile collaboration became a controversial issue Pakistan had started experimentation with sounding rockets and weather satellites.

These experiments were made possible through the bilateral cooperation extended by the United States under the auspices of the National Aeronautics and Space Administration (NASA), not only to Pakistan, but also to countries including Argentina, Brazil, and India (http://www.southasiaanalysis.org/paper148). Similarly, France provided production capabilities for the Mammoth propulsion system to India and Pakistan (Janne E. Nolan, 1990). In the 1980s, due to large-scale transfers, Russian Scuds proliferated around the world. Consequently, third world countries like Iraq, Libya, Iran, and North Korea affected modifications and developed modified versions of these missiles. In the 1990s, North Korea appeared as a new source of missiles and missile-related technology for many developing countries.

There have been many foreign reports, which claim Pakistani Ballistic missiles to be simply "copies" of Chinese and North Korean missiles. These sources also claim that Pakistan's Ghauri missile is based on the North Korean Nodong and that the Shaheen is a derivative of the Chinese M-9 missile. Unfortunately, most of the international community believe such reports blindly and accuse Pakistan of only performing the "Paint job". However, there is no doubt that the very basic origins of the ballistic missiles of Pakistan lie in China and North Korea. Responding to a question at Jane's Annual Ballistic Missiles Conference in London in October 2000, one of the foremost missile experts in the United Kingdom, Duncan Lennox, conceded that while the similarities may indicate that the design of the Pakistani systems may have been inspired by the aforementioned missiles, it does not definitively lead to the conclusion that the Ghauri and the Shaheen-1 are direct copies of the original North Korean or Chinese missiles, respectively (http://cns.miis.edu/npr/pdfs/92salik.pdf).

Although Pakistan gained some assistance in the development of its ballistic missile program but scientists from KRL and NDC played vital role in the production and advancement of Pakistan's missile systems. Today many military experts around the globe admitting that Pakistan's ballistic missiles are more capable and superior than

North Korean and Chinese made missiles. The information regarding different Pakistani missiles are falsified and made for misguiding the readers. For example several western reports claim that Shaheen-2 is a copy of Chinese M-18 and according to FAS, Missile threat and Global security, the M-18 is a two stage missile and has a range of 1000 km with a max payload of 500 kg. On the other hand Shaheen-2 carries twice the payload and has 2.5 times longer range. These facts negate the possibility of Shaheen-2 being even derived from M-18. This information shows the immense propaganda against Pakistani achievements in the field of missile development. Therefore the world should admire and recognize the skills and work of Pakistani scientists in the field of missile technology.

While Pakistan has been singled out and indicted for benefiting from foreign sources of missile technology, it is easily forgotten that the American and Soviet missile programs were established with the help of the German scientists who had worked on the V-1 and V-2 rockets throughout the Second World War. Ever since the desertion of the Sky bolt program in the early 1960s, moreover, Britain has been receiving first Polaris and then Trident missiles from the United States. Israel received Lance missiles from the United States, while French assistance in the 1960s helped Israel in producing the Jericho-1 missile (http://www.redstone.army.mil/history/lance/summary.html). Furthermore, the Israeli Arrow Anti-Ballistic Missile (ABM) program had assisted by U.S. through funding and technology. Furthermore Israel is now selling this ABM system to India. Similarly, South Korea converted the American supplied Nike-Hercules SAM into a surface-to-surface missile (http://www.redstone.army.mil/history/lance/summary.html). It clearly defies the logic of making so much noise on Pakistani missile program on its foreign assistance, while these states were also involved in obtaining assistance from other countries.

The Issue Regarding Export of Missile Technology

There have been unfounded concerns, based on speculation, that Pakistan may become a source of proliferation of missile technology to other countries specifically the Muslim realms in the Middle East. Pakistan has not only strongly denied any such claims but has also proceeded to institute measures and developed the essential mechanisms to prevent such activity from happening.

Prior to A.Q. Khan’s black market scandal, Pakistan's nuclear export control framework was governed by 'statuary regulatory orders and ordinances' issued by the Pakistan Commerce Division in 1999. After eruption of A.Q Khan Scandal in 2003–2004 Pakistan redeveloped the exports control laws. In 2004, Pakistan consolidated most of the previous regulations in a single legislation: the “Export Control on Goods, Technologies, Material, and Equipment related to Nuclear and Biological Weapons and their Delivery Means Act, was adopted in September 2004.”

The Export Control Act was established to strengthen controls on the export, re export, trans-shipment and transit of goods and technologies, material and equipment related to nuclear and biological weapons and missiles capable of delivering such weapons. The Act extends to whole of Pakistan and maintains a control list which is consistent with the Nuclear Suppliers Group (NSG), the Missile Technology Control Regime (MTCR),

and the Australia Group (for biological agents). The Controlled items list was issued in 2005 and a revised control list was published in 2011. Exporters are required to maintain detailed inventories and records and to notify the relevant authority if they are aware or suspect that goods or technology are intended to be used in connection with weapons (http://www.issi.org.pk/publication-files/1299650081_87535106.pdf). Offenders face strong consequences, which include detention of up to 14 years, a fine of up to five million rupees, and the abduction of all assets and property.

The Export Control Act led to the creation of a Strategic Export Control Division (SECDIV) in 2006. The foreign minister is the head of this division, but it is multidisciplinary organization and comprises personnel from the Customs department; the Ministries of Foreign Affairs, Commerce, and Defense; the Central Board of Revenue; the PAEC; the PNRA; and the SPD. The SECDIV was established in 2006, to devise and enforce rules and regulations for the implementation of export controls in accordance with the Export Control Act 2004 and also to act as a licensing body.

Although Pakistan is not a state party of MTCR which is a multilateral export control arrangement consisting of 34 members, aimed at controlling the proliferation of missiles and related technology through the implementation of certain export control guidelines. Pakistan's export control regime is compatible with the guidelines of MTCR. In February 2013, Pakistan hosted a delegation of the MTCR for talks at the Foreign Office in Islamabad. The MTCR delegation appreciated the steps taken by Pakistan for bringing its exports controls at par with the best international standards (http://www.mofa.gov.pk/pr-details.php?prID=35). Both sides also exchanged views on a broad range of issues and decided to continue their interaction in near future. Also, Pakistan is firmly loyal to the non-proliferation of WMDs and their delivery systems on a non-discriminatory basis. Therefore, Pakistan welcomes the fact that MTCR and other international export control regimes have begun a process of engagement with it to advance the shared objectives of global non-proliferation.

Conclusion

From the day of its existence, Pakistan was always challenged and pressurized by India. Pakistan took only necessary steps to preserve its national security. Like nuclear weapon program, its missile program was also the consequence of Indian missile tests and programming. Pakistan's missile program, like its nuclear program, is purely security-driven. Unlike India, Pakistan does not harbor any affectations for the status of a regional or overall power. Another forceful reason for Pakistan to embark upon the development of a missile capability of its own was the adverse impact of 1990s American sanctions and denial on the conventional military balance vis-à-vis India, which prevented Pakistan from modernizing its advanced conventional capabilities. The decade of 1990's was known as Pakistan's missile developing era. Pakistan developed its major ballistic missile systems in this decade. After the May 1998 tests, it was felt that the pursuit of Pakistan's nuclear deterrence has reached its logical end with the declaration of its explicit posture of deterrence. But, the audit of the decade long Indian modernization reveals the threat of decaying nuclear detergency is looming for Pakistan, unless it does not restore its credibility by demonstrating matching response to the

emerging threats from the deployment of Indian missile and air defense systems, positioning of her surveillances and intelligence systems, and stockpiling of nuclear weapons so on and so forth (http://www.qurtuba.edu.pk/thedialogue/The%20Dialogue/2_4/1_Qadar_Baloch.pdf).

Pakistan continues the policy of a credible minimum deterrence and this posture is dynamic, not static, and sensitive to the threat originating from India‘s military potential. Pakistan's cruise missile and tactical nuclear missile systems are simply countering measures for the Indian BMD and Cold Start doctrine. Pakistani missile systems have been developed by skilful, diligent and dedicated Pakistani scientists and engineers. It contributes enormously to the military strength of the nation. It is also widely believed that Pakistan possesses more reliable terminal guidance systems then India. Its missiles can reach their targets with an accuracy of within millimeters and inches and because of solid-fuel capability many of the Pakistani nuclear missiles can travel faster than Indian arsenals. It clearly indicates that Pakistan is armed with capable and more sophisticated missile delivery system then its enemy and in any type of Indian offence Pakistan can retaliate with an effective force. Furthermore Pakistan also took all necessary measures to address international concerns on the security and proliferation issues of its missile technology and implemented international standard export control laws to prevent any kind of nuclear or missile technology proliferation.

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