The Task force Report authored by well known analyst Youssef Bodansky, is considered as extreme, with some inaccurate data. Apart from the mistake about the Osriaq fuel, the allegation of "400 Scuds" being transferred to Sudan via Yemen is contradictory to other reports mentioned above including the UNSCOM report. At the very least, it must be admitted therefore that the allegations of CW activity at Al-Shifa is open to the most serious doubt, while the reports of other facilities being involved in such research with Iraq is not credibly substantiated.

LIBYA

Libya obtained Scud-B and FROG-7 missiles from the Soviet Union in the 1970's. Though every effort appear to have been made to buy missiles from China and North Korea, it is significant that neither of these otherwise proliferant countries have responded.

Indeed, the first assistance was from a West German firm OTRAG (Orbital Transport und Raketen Aktiengesellschaft) which shifted in from Zaire to Libya in 1979. Though German government pressure led to the firms withdrawal in 1981, nonetheless the test of a 300km range missile both in 1980 and later in 1987 was possibly due to the fact that the head of the firm continued to stay in Libya, seeing to the health of the programme\textsuperscript{63}. There were also reports that 100 German scientists continued to work there in a project to produce a 500 to 750km missile system. Another West German company Globesat was also involved in yet another project, while

Technical Oil Production assisted in exporting rocket valves for a missile called the "Al-fatah". Israeli sources noted that the AL Fatah was a 1,000 range missile, liquid fuelled, and in 1990 had undergone static engine tests. An attempt was also made to smuggle in ammonium perchlorate from Russia for solid fuels. The Ukrainians under US pressure impounded the shipment. After more than 15 years of development the AL-Fatah therefore is still not at the test stage. But if (or when) to come to fruition it could threaten parts of Italy, Sardinia, and Sicily (if based near Tripoli) or Greece, western Turkey and almost all of Egypt if based in Tobruk.

Libya is credited by some analysts, with having a highly successful WMD effort that has produced up to 100 tons of chemical agents. According to sources, Libya has had assistance from such diverse actors as China, Germany, and South Africa in the manufacture of sarin gas in 1996. Technicians are also apparent from Thailand, Pakistan and Germany who have worked at Rabta the first chemical weapons production facility, while the facility at Tarunah is said to be another, which if operational could produce some 2,500 tons of poison agents a year. German technicians are reported to be working on the AL-Fatah programme, and there are also reports of Ukrainian and Serbian agreements to provide missile engineers for the project. However as of December 1998, the status of the missile

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65 German engineers were arrested in 19 August 1996, while President Mandela promised to investigate the involvement of South African experts. See Dr. Joshua Sinai, "Ghaddaf'i's Libya: The Patient Proliferator", *Jane's Intelligence Review*, December 1998.pp.27-30.

66 Ibid. p.29.
arsenal was said to be maintenance plagued, while attempts to buy either North Korean or Ukrainian missiles had come to nothing.

However, if reports are to believed, this lack was being secretly corrected by Iraq. Though Libya and Iraq have not had the best of relations, Iraq may have been forced to transfer facilities as it became apparent that UN inspections were not to cease. At first, no complete projects were transferred, and only personnel were working at Libya’s facilities (which this report notes as abysmal). However cooperation was formalized, though Iraq continued to be extremely guarded about Libyan financial inducements of Iraqi scientists, and took extreme measures to prevent this.

In late 1994, as pressure mounted on Iraq, agreement was reached for the development of a long range basaltic missiles with a range of 1,000km. Ghaddafi agreed to pay the salaries of Iraqi experts – some $1,200 a month- as well as finance the acquisition of western technology. Iraq also offered to share biological weapons technology if Tripoli agreed to sustain and fund the revival of the Iraqi nuclear programme. Finally a cornerstone agreement was reported to have been reached on August 30, 1995 stipulated Libya's commitments regarding reviving the WMD programmes of Iraq. A Iraqi military nuclear project in its final stages was sent to Libya, spurred apparently by the “defection” of Kamal Hussein. A limited quantity of semi enriched fuel was also transferred by sea to Tripoli. A small nuclear “furnace” was to be located in the desert 380km south west of Tripoli. By the end of 1995, the experts began enriching the Iraqi nuclear material

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having successfully installed the small and medium kilns/furnaces there.\textsuperscript{68} The reports reference to "kilns" for enriching nuclear material is however not readily explainable, nor the reference to a nuclear furnace.

The biggest indication of the intimate strategic cooperation, according to the Report, was the transfer of Iraqi "assets" in terms of covert networks to the Libyans. Since the mid 1990's Iraqi intelligence had been directing purchases of dual use goods and sensitive technologies from Germany, Austria, Switzerland to Libya. Russian and other ex-Soviet scientists were given usually given South American passports and then sent on to Libya to work on the WMD projects. The results of this cooperation was that it apparently gave Libya a capability to produce a medium range missile that could hit the Mediterranean flank by 2006. (1,000 to 3,000km)\textsuperscript{69} Reportedly, Iraq also moved to upgrade Libya's chemical weapons production capabilities, and also her biological weapons abilities. For the latter around a dozen Iraqi scientists were said to be working on a project that was titled under medical facilities and was called General Health Facilities. The Libyan biological program is said to be code named "Ibn Hayam" which is directly controlled by the Ministry of Defence.

\textsuperscript{68} Ibid.

\textsuperscript{69} This assessment was reflected in NATO report MC 161/96. Ibid. p.12.
Table 5.2  
Libya’s Ballistic Missiles

<table>
<thead>
<tr>
<th>Missile</th>
<th>Mobility</th>
<th>Guidance</th>
<th>Range (km)</th>
<th>Warhead Type(kg)</th>
<th>Number of launchers</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>FROG-7</td>
<td>Mobile</td>
<td>Unguided</td>
<td>70</td>
<td>HE/C 435KG</td>
<td>40</td>
<td>Poor</td>
</tr>
<tr>
<td>SCUD-B</td>
<td>Mobile</td>
<td>Inertial</td>
<td>900-1000</td>
<td>HE/C 985</td>
<td>80</td>
<td>Poor</td>
</tr>
<tr>
<td>AL-FATAH (D)</td>
<td>---</td>
<td>---</td>
<td>950?</td>
<td>500?</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>


In the case of Libya, it is notable that neither of the two primary proliferators – China or North Korea – have passed on any technology or systems to this country, which speaks little of their alleged relentless quest for profits and/or strategic benefits. After all Scud-C range missile in Libya could effectively threaten parts of Europe. Indeed, the one country which has passed on technology regardless of geography are companies of German origin. As for the transfer of facilities from Iraq to Libya, the overwhelming number of reports point to the relatively sophisticated efforts by Libya in chemical weapons, while if the Bodnansky report is to be believed, Libya’s capabilities were crude. For a country with no aero-
industrial capabilities to speak of, the prospect of producing a missile even with substantial foreign assistance must remain a difficult task. Libya’s human resources in terms of technological capability and ability to absorb new technology is vital.

The level of threat felt by Italy – which is considered to be one the main targets for a future ballistic attack – is reflected by the fact that Italy supplied anti ship cruise missile to Libya (Otomat Mk-2), the longest range missile now in Libyan hands. While Libyan arms remain substantially of Soviet origin, there are significant inputs from the French, with Combattante-II class missile craft, and the Mirage-5 both in the arsenal.

SYRIA

Syria used once to be one of the Soviet Union’s staunchest allies in the Middle East, and also received the Scud-B and FROG-7 systems in the early 1970’s. In 1983, the Soviets delivered the SS-21 (120km/480kg) which has active radar bombing capabilities in the terminal phase to give it high accuracy to within 50 metre. The Scud-B can target almost all of Israel, northern and western Iraq, and the southern and eastern parts of Turkey and Cyprus. Syria is thought to have around 200 missiles with 18 launchers for each of the three systems70.

Missiles are central to Syrian strategy, especially as an insurance against Israeli superiority, and the experience of the inability of the Syrian air force to penetrate Israeli air space during the last war. Therefore Syria

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70 Seth Carus quoted in http://www.fas.org
would look for a missile with at least a 500km range that could act as a deterrent against Israeli nuclear strikes. The possibility of these being used in an offensive mode is remote, since the fear of reprisal would remain. A re-organization has been carried out of its SSM unites since 1982, so that by the end of 1988 the SSM forces were organized into three brigades, with perhaps another one formed if the North Korean missile have been inducted. It must be noted that Syria has no capability to build sophisticated warheads for its missiles, and needs foreign assistance.

Syria has therefore made a considerable effort to get more and longer range missiles. The SS-23 was refused by the Soviet Union in 1987, (which at this time was now looking for hard cash) and there are reports that North Korea parted with the Scud –C,(500km with a 700kg warhead) which would give Syria a capability to target the whole of Israel, northern and western Iraq, and all of sought eastern Turkey. Again North Korean Scuds were detected being shipped to Iran, with the ultimate destination being Damascus.71

Syria’s attempt to get the M-9 has already been referred to. This was reported by an Israeli sources as having been signed in December 1989 for $170 million for 140 M-9’s.72 However, since then US official sources have denied that China sold any M-9’s to Syria, while the Bush Administration received a pledge from China not to sell missiles to the Middle East.73 It is

72 Jerusalem Post, 12 December 1989, FBIS-China, 12 December 1989
note known if this pledge has since been kept. One source maintains that these were indeed transferred to Syrian in 1990-91, though China denies it.\textsuperscript{74}

Israeli sources point out that Syria has one of the most advanced programs in the developing world for chemical weapons. (a claim which is equally leveled at Libya) Production is said to take place at three sites, one near Damascus, the second near Hama, and the third centre in the Aleppo area. In 1985 it is reported that Syria began to manufacture large quantities of chemical warheads including Sarin nerve gas, for use with Scud-B and Scud-C missiles, as well as air delivered bombs with nerve gas. It is also said that Syria obtained the Soviet plant for type VX chemical warheads, which could be adapted to Scud missiles\textsuperscript{75}. This is likely since the design has been widely available in the developing world since 1970. It is said that West European and North Korean engineers play a crucial role in arming these Scuds, while there are also reports of Russian advisers, mainly in air defense. Advisers from Hungary, Bulgaria and China are also reported\textsuperscript{76}.

\textsuperscript{74} Aaron Lenner “Review of Syria’s Missile Strategy” Almashad Alsiasi (Israel) 23 October 1996.

\textsuperscript{75} “Syria most advanced in Chemical weapons” MA’ariv August 8, 1996.

Table 5.3  
**SYRIA'S MISSILE CAPABILITY**

<table>
<thead>
<tr>
<th>Missile</th>
<th>Mobility</th>
<th>Guidance System</th>
<th>CEP (m)</th>
<th>Range (km)</th>
<th>Warhead</th>
<th>Launchers</th>
</tr>
</thead>
<tbody>
<tr>
<td>FROG-7</td>
<td>Mobile</td>
<td>Unguided</td>
<td>500</td>
<td>70</td>
<td>HE/C?</td>
<td>18</td>
</tr>
<tr>
<td>Scud-B</td>
<td>Mobile</td>
<td>Inertial</td>
<td>900-1000</td>
<td>300</td>
<td>HE/C</td>
<td>20</td>
</tr>
<tr>
<td>SS-21</td>
<td>Mobile</td>
<td>Inertial/active radar homing</td>
<td>30 or 300</td>
<td>70</td>
<td>HE/C</td>
<td>18</td>
</tr>
</tbody>
</table>

EGYPT

Egypt has nuclear research reactors aimed at producing a steady supply of energy, but is not known to have the nuclear fuel cycle facilities. Egypt was one of the first to evince interest in missilery in the Middle East, with a program that dates back to the period immediately after the Second World War. Facing the same problems as the western powers, but with much less resources to back it, the program was naturally in difficulties, though it did have German engineers working on it for a while. Egypt 's arsenal consists of a few FROG and Scud-B and the indigenously produced Sakr-80 (which is more of an artillery rocket). Reports of collaboration with the North Korean to produce a 450km range variant of the Scud-B (Project-T) was planned and some sources note that this began
in 1990 and a 90 missile inventory was planned. Egypt is also in the market for the Scud-C and Scud-D (1,000km) which would allow a reach into Italy, and Greece. The “Condor” missile program that once saw Argentinian, Iraqi and Egyptian collaboration was terminated before any flight testing took place, but the indigenous programme continues under the code named “Vector”, but is understood to be poorly financed and prioritized.

Egypt's cruise missile “capability” is a mix of Italian, Russia, Chinese and American types (Ottomat, Styx, CSS-N-2, and the Harpoon) all are in the anti-shipping mode. After Israel, Egypt has the second largest technical infrastructure in the Middle East. Missile modifications are therefore possible, but a well equipped Air Force means that this would be the preferred form of delivery. Egypt also has at least one multirole RPV but these appear to be designed primarily for battlefield use rather than as a strategic land attack. This arm may be extended in future.

Table 5.4

EGYPTIAN MISSILE CAPABILITY

<table>
<thead>
<tr>
<th>Missile</th>
<th>Range</th>
<th>Warhead type(kg)</th>
<th>Source</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>FROG-7</td>
<td>70</td>
<td>HE/C 435</td>
<td>FSU</td>
<td>Obsolete</td>
</tr>
<tr>
<td>SCUD-B</td>
<td>900-1,000</td>
<td>HE/C</td>
<td>FSU</td>
<td>Ops/Obs</td>
</tr>
</tbody>
</table>


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77 Jane’s Weapons Systems Issue 12.

78 Lesser and Tellis, Note 48.
From the above it is clear that at present, none of the countries barring Israel and Iran, have anything like a capability in ballistic missiles that could threaten the European mainland. Those countries who form the Mediterranean rim similarly have cruise missiles supplied by European countries, and the capability to turn them into a credible land attack mode can virtually be ruled out, since none have anything approaching a aero-industrial capability.

In the Middle East, the only top dog in terms of missile capability is clearly Israel, which remains far above the level of technology that is apparent in the rest of the Arab world. The second most capable power was Iraq, and while it does retain a latent scientific and technical manpower base, and has the motivation to re-launch a missile programme, its actual capability is in fact unknown. The seizure of the gyroscopes as well as other instrumentation does point towards a regeneration of missile capability. However, as of now there is no clear picture. Iran has made a quantum jump in technology, moving from the most basic rocket technology to a MRBM capability. This offers the most evocative picture of the proliferation galloping out of control.

However Iran's capability seems to be an "off the shelf" buy, and if her ability to produce and improve upon these machines remains low, Teheran will remain at the mercy of the strategies of her suppliers for at least the medium term. The inputs from important "Islamic" allies like Pakistan is one that will ensure that the ties will continue. However in the long term, Iran may see become a rudimentary missile power in her own
right. Given the increasing power of Iran, regional dialectics demand that others in the vicinity will quickly try to "boot up" their own programmes.

In the medium to long term, a slow increase in missile capability can be predicted, though the rise in technological capability is tied to the kind of assistance that key regimes are now getting. A rise in defensive capabilities in the form of ATBM is already apparent in Israel, and these are likely to further increase the interest in horizontal proliferation.
CHAPTER - 6
MISSILE PROLIFERATION IN SOUTH ASIA

South Asia was not initially seen as a "threat" in the military sense, since prior to 1997 both countries were a confirmed nuclear power, and more importantly neither had tested intermediate range missiles. Nonetheless, the potential for proliferation from these countries, as well as the fact that they continue to be tied to each other in a "string bean" reaction to all regimes like the Non Proliferation Treaty, did mean that India and Pakistan are viewed as "hold outs". Pakistan with its close ties to West Asia is sometimes seen as part of the problem of missile proliferation in that area, and as has been seen in the previous chapter, there are indeed clear linkages with the region. Moreover, the fear of the "Islamic bomb" is generated from this area. The "clash of civilization" thesis apart, it must be noted that the press and leadership in that country have not scrupled to present it as such when it suits them. Indeed the man who first gave the go ahead to the nuclear programme in the early 1970's declared "We know that Israel, and South Africa had full nuclear capability. The Christian, Jewish and Hindu civilizations have this capability. The Communist Powers also possess it. Only the Islamic civilization was without it, but that position (is) about to change". India on the other hand was again a challenger to

1 Quoted by D.K Palit and P.K. S Namboodri, Pakistan's Islamic Bomb (New Delhi: Vikas, 1979) p.16.
the existing non proliferation order, rather than a military threat per se, and few documents presented India in a hostile light.

However, it must be noted that within this proliferation debate, India was seen by many as an "advanced proliferator" and the possibility that the Pentagon might one day see this country as a potential "rogue" was not ruled out. It must also be noted that both countries fall into the net of the threat assessment that was outlined in NATO's Alliance Policy Framework on Proliferation. Both countries are seen equally as "proliferators" though the term should not cover India, since it has neither accepted technology covertly from others in a systematic manner, nor encouraged others by selling her own. In this case, India stands alone among all the nuclear weapons states reviewed so far including Israel.

Following the nuclear tests, and the storm of disapproval from NATO countries, prominent analysts note that "Europe cannot remain immune to the emergence of two new nuclear powers, particularly since France and the UK are "official" nuclear – weapons states and Permanent Members of the UN Security Council. " going on to note" the tests have highlighted the fragility of the links between nuclear weapons and permanent membership of the Security Council." (in other words it might persuade Germany and Japan to go nuclear to claim its seat on the Council.) Yet another view point carries this point clearly. While noting New Delhi's desire to enhance

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its prestige and strengthen its claim to Security Council membership, it notes "Non proliferation norms could be weakened by the general perception that India and Pakistan have suffered few consequence for breaking them. States already inclined to seek nuclear arms could exploit Indian and Pakistani behavior to justify their choices. This would in turn exacerbate the insecurities of others, thereby increasing the likelihood of further nuclear proliferation". The study goes on to warn of an additional and more direct danger. It notes "The South Asian nuclear tests in 1998 gave Russia an opportunity to reinvigorate its links with India in response to the Sino-Pakistani entente...In some circumstances, Russia and India could threaten Allied interests and complicate or condition the types of missions which the US and some of its Allies might undertake outside the NATO area. Thus the Indian and Pakistani nuclear and missile capabilities could firstly, increase proliferation across the board, and secondly, could in the case of India could result in a more direct threat to Allied interests.

Additional proof that the tests have clearly increased the apprehension is apparent in the considerable gap between the estimates of the National Intelligence Estimate, and the Rumsfeld Commission findings, since the latter presented its findings just two months after the Indian and Pakistani nuclear tests. Thus the ripples caused by the tests, as well as by

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5 Ibid. p.33.
the appearance of new missiles, especially in Pakistan has brought home the fact that the nature of proliferation in this part of the world may allow a recipient state to rapidly acquire new and dangerous capabilities.

This chapter is not meant to be a narration of the two countries missile programmes, but once again seeks to examine the extent and nature of proliferation and the possible threats that might emanate from this part of the world.

Pakistan

Like Israel, Pakistan's road to nuclear capability was if nothing, at least overlooked by the US in her desire for a strategic ally in the region. The initial assistance for a nuclear capability came from France, with a reprocessing plant that also involved one of the largest financial groups the Belgian Societe General. This aid was suspended after France came under US pressure. Other countries that were involved included Libya (yellowcake) Holland (steel tubes for a gas centrifuge) Germany (reprocessed plutonium from Belgium) and Turkey (accessories of various types). Apart from this, Zulfikar Ali Bhutto is understood to have signed a deal with China in June 1976 that opened the doors to Chinese cooperation.  

Pakistan's initial step into the world of rocketry began in 1961 through the formation of SUPARCO (Space and Upper Atmosphere Research Commission) with American assistance (NASA) and later French (CNES) and the British national committee of Space Research. Most of these government to government transactions began in the early 1960's and 1970's. Analysts note that the real impetus may have been provided by Zulfikar Ali Bhutto's decision to go nuclear in 1972 (two years before the Indian nuclear test) Thus it was hardly surprising that a desperate search for technology began after this period. ORTAG of Germany, once involved in both Zaire and later Libya was reported to have been co-opted in the late 1970's, while others like Leypold AG (accused of assisting Iraq in a conspiracy to smuggle uranium) were also involved. This search however continued well into the 1990's with similar questionable deals unearthed in the US. A plan to transfer entire missile systems was reported with the "Khyber pass contract " being the most well known. This case involved citizens and companies, licit or otherwise, in US, Chile, South Africa, and Switzerland. However, none of this appears to have taken Pakistan very much forward, and the space programme lagged, as did her missile programme. The Hatf-1 and Hatf-2 which were apparently tested in April 25, 1988, were little more than artillery rockets, and was based on the

8 There appears to have been a collusion of interests since ORTRAG had just been pressured to move out of Libya, while Pakistan was beginning her space programme.
sounding rocket technology imbied in the earlier period. This assessment of the low technology of these missiles is done by a Pakistani military officer who noted that the Hatf were indeed nothing more than artillery rockets, and that Pakistan did not have the technologies to cross the Scud barrier\textsuperscript{10}. Further General Mirza Aslam Beg in effect consigned the Hatf into storage, remarking that it was hardly a match for the \textit{Prithvi} \textsuperscript{11}. The Hatf was displayed once in a vintage British gun trailer, causing terse remarks from the press that while Pakistan could apparently produce a "missile" it could not put together a launcher. However it did get considerable experience in solid fuels. It was not until the "Chinese connection" that matters began to move.

In July 1989, an unconfirmed report noted that China was trying to sell its M-9 missile to Libya, Syria, Iran and Pakistan\textsuperscript{12}. Three months later, General Aslam Beg reported the development of a 600km missile, where he termed it as a missile without a sophisticated guidance system.\textsuperscript{13}. Given descriptions of this tallies with that of the M-9, which has inertial guidance and a range of 600 km with a 950kg payload. It must be remembered that the M series had been designed for launching from a Scud TEL, and this was the period when Pakistan now had access to the

\textsuperscript{10} Here he refers to difficulty in reentry technology, inertial guidance, and extend burn time engines. Lt. Gen. (retd.) Talat Masood in an article in \textit{Dawn} (Karachi) , July 5, 1997.

\textsuperscript{11} This is quoted in \textit{News} , March 17, 1996.

\textsuperscript{12} This is noted by Kak. Note 75 .p.292.

TEL's left behind in Afghanistan by the withdrawing Soviet army. Intriguingly, a few months later, the press, deriding the appearance of this missile as a “flashy new toy” noted that a multi million dollar deal had been signed with a US firm to install the missing launching and guiding systems, and to train Pakistani engineers. Whether this deal in fact went through is unknown.

However, a year later he led a delegation to China for negotiating the purchase of CPMIEC (China Precision Machinery Import Export Corporation) manufactured shorter range missiles, transfer of technology and co-production spanning a probable ten year period. The first batch of these missiles could have been delivered in early 1991, but nothing at all was heard of a test until nearly six years later, (July 1997) confirming perhaps that the emphasis was on local production and assimilation of technology. At the same time, Pakistan's missile and space programme were being further integrated, with the army stepping in to give a greater direction to these efforts. The space agency announced the testing of a two stage rocket, apparently testifying to the ability to master staging technology. (the Shahpar) even as the US State Department in 1991 assessed that SUPARCO had “engaged in missile technology proliferation activities” a range of anti air missiles were being developed, all based on Chinese designs. These initial reports turned the attention of the non

proliferation community as well as journalists to Pakistan, and it was only in June 1991 that China’s US Ambassador admitted that Pakistan had indeed been given a “tiny number” of short range tactical missiles. The confusion about what constituted a “tactical” missile, and General Beg’s statement that it was a “two stage” missile, was compounded by another report of a new transfer of missiles, this time the M-11.

In April 1991 definite press statements emerged about the actual transfers of M-11 missiles, substantiated (the very next day) by reports that US satellites had spotted a number of launch vehicles for the M-11 in Pakistan. In 1992, a second batch was reported to have been shipped in, for which Pakistan paid a reported $83 million to China.

The Bush Administration imposed sanctions on two government owned Chinese companies denying licenses for the export of U.S satellites, missile technology and equipment, and high speed computers. Following China’s written agreement to adhere to MTCR guidelines, these sanctions were waived (March 1992). Nine months later, a report emerged that two dozen M-11 had been delivered to Karachi, a fact admitted by the former Pakistani Chief of Staff Mirza Aslam Beg. In spite of this however, only category 2 sanctions were imposed, (as against category 1 which bars the transfer of complete missile systems). Even these were waived by the US.

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on another promise not to export "ground to ground" missiles. However by November 1992, press reports continued to come up suggesting that Pakistan now had more than 30 missiles, and had developed nuclear warheads for them, and that these missiles were capable of being launched in 48 hours.\(^\text{19}\) China also claimed that the M-11 did not come under the MTCR as it was only of 280km in range and carried an 800kg payload. In 1993, the sale was confirmed by Prime Minister Bhutto.\(^\text{20}\)Reportedly a payment of $15million was made by Pakistan as part payment to CPMIEC for an unknown number of missiles, launchers, and support equipment. Later it was reported that Chinese engineers were sent to check components and train Pakistan soldiers\(^\text{21}\). In September 1994 China announced that it would adhere to MTCR guidelines\(^\text{22}\) and restrict supplies of missiles. In 1996, a report confirmed that a factory had been set up in Pakistan, (Tarwana) for which the blueprints had been supplied by China, would be able to make key missile components in two years. Other reports noted that it was a turnkey factory to make the complete system – solid fuel propellants included\(^\text{23}\). Yet another report was of the attempt to bring in 10 tons of ammonium perchlorate rocket fuel without a license from Xi'an in


\(^{20}\) Reuters, 29 December 1993.


China. The shipment was seized by the Hong Kong authorities. Robert Einhorn, Deputy Assistant Secretary of State for Nonproliferation testified in 1997 that China's commitment to abide by the MTCR was under serious question. In June 1997, the DCI reported that in the last half of 1996, China was a major supplier of a "tremendous variety" of technology and assistance to Pakistan's ballistic missile program, which sought to have an indigenous capability.

The same year, Gordon Oehler, head of the CIA's Non Proliferation Centre revealed on November 19, 1997 that Pakistan was developing an MRBM called "Ghauri". Reports also noted a secret test in February 1998, noting that the missile program had been initiated during the tenure of Ms Bhutto (second term 1993-96). Meanwhile there were reports of Pakistani and North Korean engineers working together in Iran, even as a joint effort was made to get nuclear and missile technology from Germany. The North Korean input began to grow from this stage, with Pakistan trading nuclear know how with the North Koreans for missile assistance. In July 1992, North Korea's Deputy Foreign Minister visited Pakistan, reportedly to discuss the sale of Scud Mod C and the Nodong. In May 1993, both Iranian and Pakistani specialists were alleged to have watched the firing of both these classes of missiles. In December 1993, Prime

26 Ibid.
Minister Bhutto visited North Korea, and this possibly set the seal for missile cooperation. Intelligence officials note that China’s input may have been in guidance, though the Jane’s Defence Weekly analyses “It is also likely that North Korea served as a conduit for Chinese ballistic missile components transfer to Pakistan.”

On the 6th of April 1998 Pakistan successfully tested a new medium range SSM called “Ghauri” with a reach of 1,500km. Developed by the Kahuta Research Authorities (KLR) under the stewardship of Dr Abdul Quadeer Khan, the possibility of it being a throw back to the Nodong −1, which is a liquid fuelled one stage missile appears surprising since Pakistan has little experience with liquid fuels. Press reports noted a tested range of 1,100km, with a reported full range of 1,500 km. Later reports also note that the Ghauri can be extended to its “Full range” of 2,300. The missile was tested overland flying from the test site at Jhelum to Balochistan, and according to sources Pakistan which has begun serial production, would have in March 1999, a total of 10 complete missiles. Dr. Khan noted that “we are working on an on-board computer so that accuracy to hit the target may be increased, we are working to improve its electronic system so that it can effectively jam (an) enemy’s radar and to add a a capability for evading (an) anti-missile system of the enemy...” Dr

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Khan was also quoted as saying that Pakistan had a good stock of missiles — described as “plenty”\(^32\) — thus in less than a year and one test later, Pakistan was supposedly ready for serial production.

On 14th April 1999, Pakistan again tested the missile (called the Ghauri-2), again overland from Tilla Jogain in the district of Jhelum 160km east of the capital of Islamabad. The tested range was not divulged, but this was said to have a longer range 1,700km. Pakistani sources noted that the range enhancement had been achieved by altering the missile configuration to carry a nuclear payload in place of the 700kg conventional warheads.\(^33\) Other sources put the range at 2000km (1,240 miles) with a payload of 1000 kg(2,2 pounds)\(^34\). Analysts note that the missile body may have been changed to aluminum (instead of steel like the Scuds), and appears to be somewhat smaller than the Nodong. Moreover it also appears that actual tested range was around 700km, which makes it appear that the missile was actually a “lofted" Hatf -3 or the M-9\(^35\). The missile was apparently launched from a launch pad, instead of a TEL, though it is thought that the missile would eventually be road mobile. Analysts note the possibility of the Ghauri being the DF-25, which was developed as a conventionally armed missile, and was assessed to have a

\(^{32}\) A quote of 24 November 1998 in http://www.cdiss.org


\(^{34}\) Kathy Gannon " Pakistan Missile Launch Triggers Arms race fears" Associated Press April 15, 1999.

throw weight of some 2,000 kg and an unknown range. However since it is understood to be almost exactly like the DF-21A which was nuclear armed, the range might be 1800km with a 600 kg warhead. A heavier conventional warhead would reduce the range to around 1,100km.\(^{36}\) The DF-25 was abruptly terminated around 1996 for unknown reasons. Pakistani scientists have been predicting an even longer range missile to be called the “Ghaznavi” at a 2,000km range.

On April 15, 1999, Pakistan tested a 600 km range 1000 kg payload missile the “Shaheen” (Eagle) off the coast of Somniani. Produced by the National Development Complex, and headed by Dr Samar Mubarik Mund, the missile is understood to be the resurrected and now locally produced M-9 missile\(^{37}\) which China is assessed to have passed on in 1991, but was kept under wraps. According to the head of the project, the missiles can carry all types of payload including nuclear warhead to a range of 750km, and was three times more powerful than the Indian Prithvi (who’s range is only 350km) More importantly he noted that the missile was a solid fuelled missile – thus making the Ghauri the only liquid fuelled design in the Pakistani stable – and could hit a target in a radius of 10 metres within seven minutes of firing.\(^{38}\) This again was said to be superior to Prithvi (which can take up to 5-6 hours of fuelling). A follow up Agence France report noted that the missile would be ready to fire in 30

\(^{36}\) This range is from the data put out by the Federation of American scientists. Http://www.fas.org

\(^{37}\) This assessment is given John Pike http://www.fas.org

\(^{38}\) In an interview to Nation (Lahore) 2 December 1998 (internet edition.)
minutes. *Nawai-l-Waqt* noted that an earlier test had failed for reasons unknown\(^{39}\). Oddly enough, the "Shaheen" is also said to be capable of 2,000km according to its designer\(^{40}\), and flight testing was due to start. If so, Pakistan is the only country which has two separate but identical range missile programmes.

Later reports have noted that Pakistan may test a new IRBM of a range of 4000km – the "Tipu" – (length of 40ft/12m) and in capable of either conventional or nuclear payloads. This was supposed to be tested on 28 May, but has since been postponed. This is also said to be developed by the Pakistan Atomic Energy commission\(^{41}\). The Urdu language press meanwhile reported that Pakistan had decided to equip its Navy with a nuclear capability\(^{42}\).

Additionally Pakistan is also known to be developing a short range missile called the "Tamruk"\(^{43}\), with a range of 500-600km. Details of this are unknown.

Pakistani scientists were reported to be studying components salvaged from a cruise missile that fell to earth in southern Pakistan. Scientists noted that they can unlock technological secrets that will aid

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\(^{39}\) *Nawai-l-Waqt* 19 January 1999.

\(^{40}\) This was reported on 1 June 1998. Monterey Institute data base, April 1999.

\(^{41}\) *Frontier Post*, 11 May, 1999.

\(^{42}\) *Jang*, 18 May 1999.

Pakistan's missile program. In particular they are examining the guidance systems, onboard computer, and propulsion systems of the Tomahawk missiles which was fired August 20, 1998 on terrorist camps in Afghanistan. "Sources" were also quoted as saying that the information would be shared with China. Speaking on a condition of anonymity a Pakistani official termed the find as a "jackpot".

**Table - 6.1**

**Pakistan's Missile Capability**

<table>
<thead>
<tr>
<th>Missile</th>
<th>Range</th>
<th>Payload</th>
<th>Fuel Type</th>
<th>Parentage</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hatf-1</td>
<td>80</td>
<td>500</td>
<td>Solid</td>
<td>French</td>
<td>Out of use</td>
</tr>
<tr>
<td>Hatf-2</td>
<td>300</td>
<td>500</td>
<td>Solid</td>
<td>French</td>
<td>Out of use</td>
</tr>
<tr>
<td>Hatf 3 /M-11?</td>
<td>300</td>
<td>500</td>
<td>Solid</td>
<td>Chinese</td>
<td>Tested Jan-Feb 1989*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Scud TEL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N-capable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Received 30 in 1992</td>
</tr>
<tr>
<td>Hatf-4</td>
<td>600-800</td>
<td>500</td>
<td>Solid</td>
<td>Chinese</td>
<td>Tested July 1997</td>
</tr>
<tr>
<td>M-9?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ghouri</td>
<td>1,500-2,000</td>
<td>5-700</td>
<td>Unknown</td>
<td>Chinese/North Korea</td>
<td>Tested 6 April, 1998, Ten procured up to 1998.</td>
</tr>
<tr>
<td>Shaheen M-9?</td>
<td>6-700km</td>
<td>1000</td>
<td>Solid</td>
<td>Chinese</td>
<td>N-capable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tested April 15, 1999</td>
</tr>
</tbody>
</table>


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44 The missile was found near Kaharm, 370 miles south of the targeted camps. Kamran Khan "Pakistan dissecting U.S cruise missile that misfired" Washington Post, August 28, 1998.
Pakistan as Proliferator

As noted above, Pakistan is suspected of having passed on technology to North Korea, as well as physically been part of the Iranian and Iraqi nuclear programme. In the case of Iraq, U.N inspectors working to dismantle the Iraqi nuclear programme after Desert Storm reportedly discovered diagrams of the Iraqi nuclear weapons that were very similar to the drawings Pakistan received from China.\(^45\) According to a German report citing western intelligence as its source Dr. A.Q. Khan is credited as being the mastermind behind the Iraqi bomb.\(^46\). Similarly, the driving force behind the establishment of a Pakistani nuclear assistance programme to Iran seems to have been General Beg. Based on the special report that President Clinton provided to President Yeltsin in May 1995, Pakistan is believed to have provided Iran with the list of foreign companies which it used to obtain the infrastructure and weapons components necessary for a nuclear weapons programme (Iran had approached the same suppliers as the Pakistanis did)\(^47\). This co-operation may have been further spurred by a reported December 1992 Iranian offer to pay Pakistan $3.5 billion if it would share its know-how\(^48\). This is bolstered by the fact that Prince Turki ibn Faisal, head of Saudi Arabia's secret service asked Bhutto to halt all

\[\text{\(^45\) "Can the US rely on China's Export Promises" Risk May 1996, p.8.}\]

\[\text{\(^46\) Thomas Scheur "Pakistani called Mastermind of Iraqi nuclear Program" Focus (Germany) translated in FBIS-TAC-96-003, January 29, 1996.}\]


\[\text{\(^48\) This offer was repeated in 1995. "Iran with Pakistan, 12/21/95"Non Proliferation Review, Fall 1995, p.113.}\]
contacts with Iran. In May 1995 General Beg claimed that Pakistan had cancelled 11 production agreements with Iran under US pressure. Given the fragmentary nature of Pakistani society, and the level of corruption, and of course the amounts of money involved in the Iranian offer, the possibility of continued cooperation cannot be ruled out. The arms bazaar of Peshawar occasionally also offer smuggled nuclear components, missile parts, steel alloys, and purportedly radioactive material of unknown types. Iranian major and colonels are reported to walking around Peshawar with suitcases full of $100 bills, selecting materials, so much so that Peshawar is now known as the world nuclear arms bazaar.

In the case of North Korea, US and South Korean officials speculate that Pakistan may have provided it with valuable test information from its Ghauri missile tests. This information would allow North Korea to slip tests for its Taepo-dong missile and deploy it directly. However, while test data would undoubtedly benefit the Nodong, it is difficult to see how the test would assist in the fine toning of the two stage Taepo dong unless the Pakistanis did test a two stage missile.

51 Non Proliferation Review Fall 1996, p.117.
India's "road to Pokhran" publicly began after the Chinese nuclear test at Lop Nor in October 16, 1964. Responding to this development, a few days later, Dr. Homi Bhaba was quoted as saying that the country could produce nuclear weapons in 18 months, the cost of each being Rs 18 lakhs. Following demands from within the party and without for a reconsideration of the path of remaining non-nuclear, Prime Minister Lal Bahadur Shastri gave the green light for the consideration of a "subterranean nuclear explosion". The 1971 unstated threat of nuclear weapons, by the US with the sailing of the U.S.S. Enterprise into the Bay of Bengal is usually quoted as the final reason for what was termed a "peaceful nuclear test" (PNE) in 1974. It must be noted that PNE's were being conducted at that time by the superpowers, and was covered by the Non Proliferation Treaty. The 1,5000kg plutonium bomb was basically the research effort of the Bhaba Atomic Research Centre, as well as other bodies like the Atomic Energy Commission. In 1982-83 Prime Minister Indira Gandhi cleared more tests, and this remained simply a "capability" until 1998, when Pokhran II set the non-proliferation community by the ears. While the exact period of time it took to achieve this capability is not known, it is clear enough that weaponising that capability has been more

53 Quoted by Srinivas Laxman "And we had a blast!" Times of India (New Delhi) may 16, 1999.
difficult, with more than two decades leading to little in terms of technological progress.

Initial efforts began in the early 1960's with the setting up of a Special Weapons Establishment in Hyderabad, under the aegis of the DRDO (Defence Research and Development Organization). Its Chief Controller's account of the early years\(^{55}\), notes the efforts of Air Force technologists at experimental rocketry. As the country's infrastructure grew to more than 33 laboratories and universities, assistance in ballistics, propellants and other inputs began to grow even as allied research continued in various other institutions that were struggling to give the newly independent country the wherewithal it needed for defence. Initially however funds for missile research was low, and the first hand account reveals the struggle to keep the programme going. A deal with Contraves of Switzerland was said to have been signed for a joint development programme which could proceed alongside the original programme, with Contraves providing technicians and ground facilities for producing a missile of “intermediate range”, to deal with threats of 10-40,00 feet" – this assumes that the plan was for an surface to air missile. The extent of actual cooperation however remains unknown, but the Annual Ministry of Defence Report noted that a number of two stage missiles had been fired from Hyderabad\(^{56}\).

\(^{55}\) See Major General B.D Kapur, "Building a Defence Technology Base" (Lancer: New Delhi, 1990)

Side by side grew a Space research programme, that while part of the same research area, concentrated on keeping itself exclusively confined to areas related to peaceful research and rocketry. This organization was soon tying up with Sud Aviation (as did Pakistan) and in 1963 the first sounding rocket range was established at Thumba. Soon the Indians made propellants were proving to be more efficient than that supplied by the French, and a Rocket propellant plant was commissioned. In November 1967, the Indian built *Centaure* was tested. The Space Organization continued to tie up with the French and other agencies in developing the *Viking* rocket engine, and the study of high thrust liquid motors. Other countries involved included the German, UN, the US and the USSR. The fact that the space programme was kept away from the missile programme is obvious from the fact that the next phase of the latter was engaged in practically re-inventing the wheel by re-engineering a Soviet made liquid fuelled missile.

Following the 1962 war and a serious defence review, the Soviets were approached for assistance in surface to air missile development. The Soviet transferred the first SAM-s(SA-2) with technicians sent to train the Indians in setting up air defence stations. The Soviets were also reported to have set up a plant to manufacture the guidance components for the

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57 Department of Space "Annual Report 1977-78, Government of India.

58 Mohan Sundara Raja notes that the propellant produced by the Indians had a higher specific impulse rate than that of the French. See "India in Space" (Publications Division, Ministry of Information and Broadcasting, Government of India, 1976).
SAM. A two stage missile with a range of 30 km, and an intercept altitude envelope of between 450-25,000 metres, it had been made famous for its shooting down of the U-2 over the USSR, and its subsequent export to various other countries in the Middle East. A decision was made to re-engineer the SAM into a SSM mode, (Project Devil), but the project failed as much due to intra personnel wrangling as lack of synergisation. It was cancelled in 1978, but considerable attention had been paid to liquid propellant technology that was to stand the Indians in good stead in later years.

In 1972 noted analyst K. Subramanyam warned of the consequences on an increased super power rivalry in West Asia, and its negative effects on Indian security. In 1979 the Soviets invaded Afghanistan, even as the US have expanded its base facilities in the Indian Ocean Region with the formation of the Rapid Deployment Force, even as the President declared that the security of the area was a "vital interest" of the US. Pakistan as a frontline state began to receive considerable aid with TOW missiles, Harpoon anti ship missiles and the Vulcan Phalanx air defence systems.

59 "The Diffusion of Combat Aircraft, Missile and their Supporting Technologies", For the Office of the Assistant Secretary of Defence (International Security Affairs), Browne and Shaw Research Corporation, 1966,

60 Kapur, Note 54.

In 1982, an attempt was made to synergise the research base of the country by setting up a new Directorate of Planning and Resources Management, and a team was set up to report on the types of missiles that the country would need. The decision was made that the country would need four types of missiles, and recommended the setting up of an integrated organization to go about it. In July 1983, the IGMDP (Integrated Guided Missile Development Programme) was set up with a budget of Rs 380 crore with the specific task of producing the Trishul a short range SAM, the Akash a medium range SAM, the Nag an anti tank missile, and the Prithvi a tactical SSM. The long range Agni was meant to be a technology demonstrator (dem-val only) and not a full fledged development and deployment system\(^6\). The IGMDP farmed out projects to various other universities and institutes, targeting indigenous production in vital areas like carbon composites (reentry vehicle technology) sophisticated sensors for guidance, and computerized fluid dynamic models. While the all important ammonium perchlorate (oxidiser) began to be manufactured from the 1970's onward, while the liquid propellant technology (fuming nitric acid mix and later Unsymmetrical Dimethyl Hydrazine) was tested in the first test of the staging rockets (RH-25) and clustering was studied in the space organization. The testing of regeneratively cooled engines was being studied for the Viking programme, (1985) and Polar Satellite Launch Vehicle programme had led to the

\(^6\) *India Today* 15 April 1994 p.73.
testing of flex nozzle control and the RESINS (redundant Strap Down Inertial navigation systems) 63

The Prithvi first tested on 25th February 1988, eventually emerged as a single stage two chamber missile using light aluminum alloys for the body, and magnesium based material for the wings. Liquid fuelled, and using a cluster of two rocket engines with programmable pulse, this allowed a certain flexibility in range and other flight characteristics. The independently gimballed engines allowed it to be steered in all three axis, with the thrust vector control used for range correction. The launcher is a Tatra eight wheeled truck produced under license within the country. Though the pedigree of the missile may be traced to the SA-2, the twin engine configuration and guidance systems led in effect to a new missile. The missile however, being liquid fuelled would be serviced by a convoy of vehicles, and would need a minimum of 7 hours for fuelling and readying before launch According to Dr Kalam, some 30 key institutions were involved in its design and conception 64. Six years after the initial test, and nearly three decades after a maiden effort at rocketry, the first missiles were said to have been delivered to the 333rd Missile group 65.

64 This includes the IIT Madras, the National Aeronautics Laboratory and others. Times of India 6 December 1994.
65 However it may be noted that additional tests continued with the Army often dissatisfied with the performance. In an interview with a senior Army officer of the Artillery Corps. January 24, 1999.
The missile subsequently emerged as a "family" of missiles, with the 250 and 350km on the cards. The launcher, control and end user version of the ground system were validated and it achieved the extended range of 250km and by February 1993 had been tested ten times with a reported CEP of 1.5km. This version supplied to the Indian Air Force may have a 650kg payload and an order of 25 air launched may have been placed. Various warheads were developed for this missile – pre-fragmented, high explosive and three other types. The extended range Prithvi can cover nearly half of Pakistan, while the Prithvi-350 would be a naval version according to the Defence Minister. The Ministry of Defence's Annual Report noted that the Prithvi-150 had moved to serial production, though it denied that reports that the missiles had been moved to the border near Punjab. The Army has reportedly projected a requirement for 75 Prithvi's, to be base – in non operational status – at Jullundur in the state of Punjab.

Following the path of gradual progression, the Prithvi was used as the second stage of the Agni, while the first stage is said to be the first stage of the Space Launch Vehicle, thus making it a solid-liquid combination. Agni is the only missile that is not specifically targeted for

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70 The first stage used a HTPB Hydroxy Terminated polybutadine binder as a fuel. The second stage was a shortened version of the Prithvi. See Ministry of Space, Annual reports of 1987, 1992.
use by any service. The programme was sanctioned in July 1983 with an allocation of Rs 35 crores for testing three launch vehicles, thus giving it a certain finality and allowing it to be called a "technology demonstrator". The first of the series was launched after 6 years of efforts by 5,000 engineers and staff, on May 29, 1989. The 600 second duration of the flight tested re-entry technology, and guidance package. The second test took place on 29 May 1992, but proved to be a failure when the missile began to veer off course. The problem was apparently due to weight increase and changes in vibration characteristics. Success was achieved only on February 19, 1994 with Agni tested to its shorter range of 1,200 km. The test demonstrated a successful staging separation process, an ablative heat shield, and a fin stabilized or maneuvering warhead that had the potential to evade defences.

In 1995 DRDO (Defence Research and Development Organization) sources noted that the Agni test program had cost $11 million to date and the next phase would cost an additional $16.6 million. It was said that the missile could be used with HE Warhead or a nuclear warhead, and that at full range of 2,000 km it could carry a 1,000 kg warhead. Considering that this was the first time that a direct link had been established between the Space and Missile Organizations (which had always been held to be kept apart by a wall of bureaucracy), it seemed to

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72 The Hindu (Madras) 21 February 1994.
73 Whether this covers all five missiles is not clear Defense News 17 March 1996.
point towards a "make-do" missile that was yet to be anywhere near completion. Thus the period of quiet that followed was not surprising.

The government was accused of giving in to "pressures", while other noted that the research was on to develop a fully solid - solid combination with a better CEP. However the former theory seemed to be accurate, when the Ministry of Defence noted that the tests had been completed and that the decision would be reconsidered "at an appropriate time consistent with the prevailing threat perception, and global or regional security environment."

Sources claimed that an investment of 6 billion rupees ($151 million) was made to pursue the Agni-II with a view to increasing its range to 2,200km. The carrying out of three underground nuclear tests on May 11, and two more on May 13 1999, underscored the readiness of the nuclear establishment to provide warheads for a wide range of delivery vehicles, with both the hydro nuclear bombs and sub kilotonne explosions tested successfully. Sources noted that while the "strategic" deterrent had been tested in the form of the thermonuclear device, the smaller weapons cold provided the warheads for tactical missiles, ad air delivered precision guided weapons. While BARC is assessed to have provided the fissile

76 See text of Prime Minister Atal Bihari Vajpayee statement in the Lok Sabha, May 27 1999.
material and fabricating the cone, the systems interface, engineering and integration was done by the DRDO77.

Immediately after, the head of DRDO Dr. Kalam indicated that he had been given the go ahead for a solid-solid fuelled missile development78. Eleven months later, the so-called Agni II was tested on April 12, 1999. The missile was reported as being of a solid-solid configuration, carried a payload of a 1000kg (as before) and over 2,500km range, and was said to be road mobile79. Little is known about the CEP, which was not revealed officially. Foreign sources noted that a follow on missiles with a greater range of 3,500km was in the offing, with the core of the "minimum nuclear deterrent" being formed around the Agni-II, the Trishul, Akash and the Russian S-300V air defence systems80.

The Akash low to medium altitude radar guided SAM which has a 25km range and an engagement height of 12,000 metres. Terminal homing is derived from a radar fitted to the nose cone. General characteristics appear to be similar to the SAM-6. The system is mobile, with a sub unit comprising one tracked vehicle with three missiles, the radar vehicle, and a fire control vehicle. A modified BMP-2 Infantry Combat Vehicle has been modified to launch three SAM's, with a rotatable launcher, which has a SAM

77 "Weaponisation now Complete" Hindu (Madras) 18 May 1998.
78 Ibid. The yield was stated to be 43 KT in a thermonuclear blast, 12 KT in a fission blast, a low yield .2kt explosion on May 11, all of which took place simultaneously. On May 13, a sub kilotonne tests of May 13, had yields of .2KT to .6 KT.
mounted in the ready to launch position. The integrated rocket (booster)-ramjet(sustainer) technology used by Akash was developed indigenously, and reportedly, tests in February 1994, validated the ramjet technology, making India the third country to achieve this capability. The ramjet principle utilizes atmospheric air to obtain enormous energy from a low volume in weight (turbo jets use an oxidiser thus increasing the weight). The IAF is expected to induct some 75 of these systems in the first phase. When inducted into the IAF, the Akash will replace the Pechora SAM's (35 squadrons), which were first inducted in 1974. The phase out could take over a decade. The missile derives its accuracy and improvement in present systems from the Phased array radar (Rajendra), which according to Dr A.P.J Kalam, it can track up to 64 targets at a time. It is also incorporates a very high level of ECM capability. The firecontrol system has mast mounted directional antennae for communication with a long range surveillance radar. One missile group (with four such subunits) will give an area coverage around 120 sq kilometers, when deployed in a square formation. With the army, the system would replace the SAM-6, giving the advantage of uncompromised electronics, and improved target tracking ability.

The Trishul short range low altitude SAM, has a range of 9 km and is a fully mobile system, and mounted on a tracked vehicle (TCV) it is a

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81 The Hindu 5 Feb 1994.
82 The Hindu, 2 March 1993.
fully autonomous system. The missile was priced at Rs 25 lakhs\textsuperscript{83}, but may have been increased as developmental costs mount. A surveillance and tracking radar, a fire control radar, and a bank of six missiles are integrated into mounted onto the same chassis. As a point defence system it will accompany mechanized columns. Trishul also comes in a naval version, where a modified platform will use a tracking radar and an altimeter to keep the missile 7m above sea level. This missile is reported to have been given high agility - with the rate of turn quoted as 90 degrees per second and adequate range of 9 km with a 5.5 kg prefragmented warhead fitted with a proximity fuze\textsuperscript{84}. Essentially it would be a close-in combat weapon system, using its “sea skimming capability” against aircraft coming in low or against missiles.

American intelligence sources have reported that India is conducting “experimental design work” on an air launched missile\textsuperscript{85} The crucial engine development has been carried on at Indian space facilities with the ABR-200, an air breathing, ramjet engine which reportedly reached Mach 2.3 in a test involving the firing of two suborbital sounding rockets launched from SHAR\textsuperscript{86}. Space agencies report that the Boosted Ramjet Vehicle tests were carried out, for vehicle size of 300mm in diameter and 400mm diameter at velocities of 750 and 800m/sec. The ISRO chairman however

\textsuperscript{83} India Today, 15 April 1994, p.75.
\textsuperscript{84} Deccan Herald, 8 June 1994, p.9.
\textsuperscript{85}Aviation Week and space Technology 1 March 1993, p.25.
\textsuperscript{86}Flight International 3 February 1993, p.6.
is reported as saying that the air breathing engine has suffered from
diversion of funds to the ASLV and GSLV projects\textsuperscript{87}. Another report of
"radar absorbing coating" being developed for missile and launch vehicles,
gives the possibility of these UAV's being used for deep penetration. The
coating was developed by DRDO's Composite Material Research
Laboratory at Hyderabad\textsuperscript{88}.

The "Lakshya" PTA (Pilotless Target aircraft) is to initially replace or
augment the Northrop Chukker target training drones, for giving pilots
training in air to air combat and air defence gunners. The PTA has zero
length launchers, with rocket assisted take off and can be land/ship
launched. It's controllable upto 100km and has a portable control station.
As of August 1996, around 45 launches have been done, and 18
development prototypes built. It is powered by the PTAE-7 engine, and
estimated cost of 6 PTA with associated equipment (launchers, support
stations etc) is estimated to be around RS 24 crores.(some 20\% cheaper
than the competition). The HAL will be the prime contractor for the PTA and
it is planned to market it abroad. A first test flight of the indigenous engine
was reported in May '95 though the type is unclear.

A second UAV, the "Nishant" is reported to be powered by a 38h.p
Limbach engine, and launched by hydro pneumatic means. It is recovered
by parachute, which indicates persistent recovery problems. Intended for

\textsuperscript{87} Space News 20 Mach 1995-26 March 1995.
\textsuperscript{88} Defense News 23 October 1995.
use as a battlefield surveillance vehicle, it has been developed by the Aeronautical Development Establishment at Bangalore, which in turn had subcontracted a private company to build the airframes. The sensors, which is the main input to provide necessary data, are said to be capable of providing day or night capability using electro-optic and electronic sensors, which is being made by Bharat Electronics, while the launch vehicles are being made by BEML. Recurring problems in recovery and guidance, may have led to procurement of the Israeli Seeker and Hunter UAV’s to aid development of these two projects. Official sources pointed to the acquisition from abroad of UAV’s, indicating the continued preference for “buy off the shelf” by the army. Reportedly army officers evaluated the Hunter and Seeker RPV’s in Israel, and a $50 million contract for the “Harpy” the anti radiation drone, appears to have been signed. A DRDO source was reported as saying that the MOD will buy 32 Searchers to conduct real time intelligence gathering to unsure the optimum performance of the Prithvi. Some technology transfer is also sought in Israeli help in producing the Nishant which has apparently failed to meet the Army’s requirements. The Nishant’s first flight was in July 1995.

90 MOD “Annual Report 1995-96”
An ATBM capability?

The search for a ATBM capability is said to have begun sometime after the first Pakistani tests of the M-11. It began by pursuing two methods of getting a anti -missile capability - buying it off the shelf or creating an indigenous system. In the end they went for both, with the Army reported to have ordered six S-300 ATBM’s systems from Russia at a cost of some $ 1 billion under a 10 year bilateral agreement with Moscow valid till 2001\textsuperscript{92}. The DRDO plans to merge this with the Trishul and the improved Akash the whole teamed with the Rajendra Phased Array Radar. However the improved system is aiming at a far larger range, to develop a defense against not only the Ghauri but also the DF-21’s deployed in south western China. India has also shown in interest in acquiring the Phalcon AEW from Israel, with reports that it was also eyeing the Arrow ATBM.

In 1998, the government sanctioned a DRDO project which would integrate a the S-300 V and S-300 P systems with an Israeli fire control radar and battle management system. Estimates (at current prices) pegged this at roughly Rs 2,000 crore, but sources noted that the final bill was likely to be ten times as much, that too for protecting only the national capital\textsuperscript{93}. This also seemed to speak poorly about the indigenous efforts. The Akash missile touted as an Patriot clone failed to intercept a slow flying

\textsuperscript{92} Reportedly the S-300 have not yet been delivered under pressure from the US. Ibid. p.27.

\textsuperscript{93} Manoj Joshi “Dubious Shield”, India Today, October 19, 1998, pp 76-77.
RPV at tests in September 1998. However DRDO officials said that this was the first test of the Indian radar, and the results had been encouraging. Pakistani officials were quoted as saying that such a deployment by India would push the country into horizontal proliferation.\(^{94}\)

In sum, the impact of the proliferation climate has been differently felt in South Asia. While it has allowed Pakistan to make leaps and bounds in technology in less than eight years, the Indian missile programme has had a long and painful process spanning more than sixteen years, together with a healthy and productive space programme. The above chart demonstrates the immense strides made by Pakistan between 1992 (when

the M-11 presence was first admitted) to that proposed 4000km “tipu” that was to have been launched in May 1999. This may be compared to the chart below, which clearly brings out the fact that in 17 years of continuous development India has produced two SSM’s, one of which is still under development. This is as clear an illustration of the difference caused by the proliferation strategy of the Chinese, and underlines the essentially tri-cornered missile proliferation tangle and threat perceptions.

Table 6.2

INDIA: MISSILE CHRONOLOGY

| Decision for missile programme – July 1983 |
| First test of Prithvi – February 1988 (150km) |
| Delivered to Army – more than 12 tests later – 1994 |
| 1997 – first test of Prithvi -250 |
| AGNI – first test – February 1994 – 1,200/500 kg - stopped tests |
| AGNI – 2- first test?- April 12, 1999 – |
| (Family of SAM’s under development) |
| TOTAL TIME TAKEN – 17 years – capability – SRBM, IRBM (yet to reach production stage) |

It is noticeable that the pace of missile proliferation has noticeably increased after 1990, with Pakistan testing two types of IRBM’s and India testing her long dormant Agni. That these events occurred after the testing by India of a subkilotonne nuclear test has alerted observers to the
possibility that India may now have fully weaponised her deterrent. However there are dissenting views, with at least one important source noting that it would take India several years to actually do so. The Russian Missile Strategic forces Headquarters are reported aslo to have noted that the India had only 5 “Operational tactical “ Prithvis, and that India’s aircraft in service (the Su-27, Su-30, MiG-23, MiG -29 Jaguar and Mirage-2000) were none of them nuclear capable.95

An input into this is also the first movement of ATBM technologies into the subcontinent, a development that is on a par with the Middle East. The probability of India being able to afford even a point defense of important cities like Bombay or the capital could further the proliferation cycle.

95 Alexander Konavalov” It will Take India Several Years to Put Missiles with Nuclear Warheads on Operational Duty”, RIA –Novosti, 15 May 1998 in FBIS(Internet Edition) Doc.code: 8333.
CHAPTER - 7
PROLIFERATORS AND CAPABILITIES

Previous chapters have noted the main actors in proliferation activity. In this is apparent that while a variety of countries like South Africa, Israel, and Ukraine have sometimes played a crucial role in diverting critical technology, in recent years it is China, Russia and North Korea who appear to have had a considerable role to play – a role which is undoubtedly highlighted by a western dominated media eager to inquire into the new threats. On the face of evidence (not reports) it is apparent that China and North Korea acting perhaps as a subsidiary, have had a critical role in the missile programmes of both Pakistan and Iran. Previous chapters have brought out that neither of these would have had any conceivably effective missile programme without outside assistance. with North Korea itself perhaps simply a conduit of Chinese technology. However China, while no doubt a country with a creditable R&D, herself has benefited considerably from Russian and American technology to keep her on the upwardly mobile line of technology. Some of this (as noted in chapter –4) is available from open sources. However, when not available in such sources, China has apparently been able to get the technology through covert means, though this has certain curious overtones which appears to hint at the fact that the US government may well have turned a blind eye to these covert efforts.
Similarly, Russia is also alleged to have a covert "proliferation strategy", towards countries like Iran, and perhaps Iraq. In a sense, this is a repetition of history, when powers traded technology, arms or munitions for strategic purposes, and also for profit. This chapter traces the proliferation patterns of the "big three" as well as North Korea, and also assess the capabilities of the two major recipients – China and North Korea.

*China as a recipient*

China's herself was a beneficiary of the first phase of proliferation. Sino-Soviet cooperation in the development of nuclear research facilities began in 1953, and in the following year they established a joint organization to study the military applications of nuclear research. While the technology capability was closely tied to Soviet assistance, however the intellectual core of the programme was as much due to Chinese scientists who spend considerable time in the west as students. A central figure in Chinese rocketry was Dr Qian Xueshen, who obtained his degree from the Massachusetts Institute of Technology in 1938. During World War II he was director of the rocket section of the United States National Defense Advisory Board. In 1945 he was sent to Germany with the rank of colonel in the US Army Air Corps to study German rocket technology. When he and others like him returned to China they formed the core of the PRC's missile effort. Thus as Godwin notes, the Chinese missile program

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1 For an excellent review of Strategic Forces development in China see Paul Godwin, "Development of the Chinese Armed Forces" (Alabama: Air University Press, June 1988).
was an amalgam of Soviet technology, western experience, and Chinese ingenuity.

China joined the nuclear and missile club with her first explosion on 16 October 1964, and her first Dong Feng-2 missile test fired on 29 June 1964. Oddly enough, the actual rockets first fired in China (the R-2, a copy of the German V-2 with a range of 270km) were carried out under Soviet prodding and extensive assistance, and previous to the nuclear test. It was only after a successful nuclear test however, that the Fifth Academy (created on 26 May 1965) were tasked to create a complete family of four missiles, with the range designed to target Japan, (DF-2) the Philippines(DF-3) Guam(DF-4) and continental USA (DF-5). As relations with the Soviets palled, the targeting included Soviet cities. This was a complete reversal of relationships, the only case where a former patron turned into a hated enemy. For a while China even became an avid supporter of NATO, and insisted on pointing out that the primary threat was to Europe in the west and Japan in the east. The Zhenbao/Demansky island dispute that flared in March 1969 and continued to simmer till 1970, was at least conducive to US-China rapprochement. More to the point it was also a prod to Beijing to push manufacturers and design laboratories towards increased Chinese missile manufacture. This naturally required more resources, and at a time when China was passing through an

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economic decline and shortage of funds, the first tentative moves to access the international markets are made.

It is difficult to trace the development of the Chinese ballistic missile program since it was closely linked to the space programme, with even the three primary launch sites\(^3\) the same for both programmes. The first guided missile launched was evidently a Soviet booster, but the announcement stated that the propellant was Chinese. The fuel used was storable liquid fuel\(^4\). The first Chinese missile launched, the Dong Feng – 2 was possibly a modified SS-3 (range 600km with a nuclear warhead). Like the Indian Prithvi it was transportable (but not tactically mobile) with a long caravan of vehicles for support facilities.

The DF-3, first tested in 1969 was designed to be the first "modern" missile. Though it used the same fuel, it was capable of carrying a 1-3MT warhead more than 2,500 km and was deployed in May 1971. The range was subsequently increased, and it remained the mainstay of the strategic forces. It eventually became the first stage in the space launch vehicle (Long March 1) and also the first stage for the upcoming DF-4 IRBM. Silo deployed, the DF-3 could be prefuelled reducing reaction time.

\(^3\) These were Shunagchengzi (Gansu provinces) Wuzhai (shanxi province) and Jingyu (Jilin province) Godwin, note 1.

\(^4\) The fuel used in Soviet missiles passed on to China – the SS2 derivatives- itself used a modified version of the German V-2 rocket fuel. Godwin states that the Chinese are understood to have used the commonly used combination of nitrogen tetroxide and unsymmetrical dimethyl hydrazine (N2O4/UDMH). See CNS data base. Monterey Institute.http://cns.miis.edu.
In 1970 China's first successful satellite launch used a solid fuel third stage, thus marking a full twenty years before China was able to come to solid fuel capability. The first ICBM, the DF-5 first made its appearance as a booster in launching satellites (as the Fengbao -1) before it began four partial range tests in 1979 (January-September). The final test of the ICBM followed in February 1980, while full range tests into the Pacific occurred a year later. (18, 21 May 1980) The second shot was assessed to be a failure. The missile was developed exclusively with the US in mind, and to reach the East coast targets. This missile incorporated many new technologies (larger rocket engines, a gyro stabilized platform, an on board computer). A month after full range test flight it was delivered to the military for operational training. In 1972, the visit of President Nixon signaled the (official) beginning of Sino-US rapprochement.

Other landmarks along the road were the first test of a solid fuel sea launched submarine the JL-1 (October 1982) with a range of only 1,700km (to the 4,600 and 7,400km of the American missiles like the Trident and the Poseidon which it resembled closely). Since at this range it could hardly be able to target important Soviet cities, it was decided that the "JL must go ashore". and so it did. The land based version was the DF-21, a two stage 1,700 – 2000 km missile first successfully tested on 20 May 1985. (Some sources note that its range was extended in 1986 with a

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5 Otfrid Ischebecn, Gitz Neuneck (eds.) "Cooperative Policies for Preventing and Controlling the Spread of Missiles and Nuclear Weapons: Policies and Perspectives in Southern Asia" (Baden-Baden,
600kg warhead and a range of over 1,700km. Other sources however cite the range as 1000 – 2,500km and report that it is a two stage missile using solid fuel. The missile is ejected from its container and ignited when airborne. Fired from a road mobile TEL, it had around 6 vehicles for its operation. The follow on was the DF-25 which was almost identical to the DF-21, but of which little was known. In November 1996, the Chinese announced that this was to be cancelled. Analysts announced that this "India specific" missiles' cancellation marked a turning point in Chinese threat perception. However, there is nothing to show that the DF-25 was not cancelled due to a reduction in threat perception from Moscow, besides which the DF-21 remained targeted at South Asia and stationed in Tibet.

The DF-21A, with added propellant and a boosted second stage became the mainstay of the Chinese arsenal. By US accounts only some 20 warheads out of 400 are targeted at the United States – therefore the remaining 380 are on IRBM's. The actual figures of missiles targeted on neighbours may be much more since, interestingly, at least some of these missiles are being reconfigured to the conventional role immediately after Desert Storm. The DF-21A if deployed along China's southern and north

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6 This range is provided by Hua Di note 2 and is supported by the Department of Defense Annual “Proliferation: Threat and Response 1997” Office of the Secretary of Defense, United State Government Printing Office, September 1997.

7 This range appears more realistic and is provided in “Ballistic and Cruise Missile Threat” National Air Intelligence Centre, NAIC-1031-0985-98

8 Eric H. Arnett China is no excuse”, Business Standard, 30 November 1996.


western borders can hit targets in Northern India, Central Asia, and most of Vietnam and Southeast Asia. As of late 1997 the PRC had about 40 re-fire capable launchers at six field garrisons and launch complexes. The DF-21 Mod 2 may eventually replace the CSS-2 completely from service. Ongoing improvements include sophisticated terminal guidance system, and according to Taiwanese reports cited, the new warhead will be similar to the Radar Digital Area Guidance (RADAG) system used by the Perishing II IRBM which has an accuracy within 50m. Taiwanese sources also noted in 1997 that China was working on a 2,800 and 3,000km missile variants of the DF-21.

Sometime in the mid 1980's China began to seriously pursue a MIRV capability, soon after President Reagan's "Star Wars" speech in 1983. (though it must be noted that the decision to go in for MIRVing may have been taken in the mid 1970s' when the US was first fielding this) China's first tests of its version of the DF-5/5A with a MIRV capability was reported in 1983, with tests continuing on the DF-5 and the DF-32/JL-2 till 1995. It is still not clear whether China has a MIRV or even a MRV capability.

In 1994-95, Russia returned once again as an input into Chinese missile program. In 1995 Russian space authorities sold China three of

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11 http://www.fas.org
Russia's most advanced upper state rocket engines in violation of the MTCR. Russians point out however that the sale did not go through the state owned NPO Energiomash, the only legal entity licensed to sell this engine. It is also said to be upgrading may categories of China's conventional and nuclear submarines, including the Kilos it brought from Russia. Russia is also assisting in developing a new generation of Chinese SSN's and SSBN's (the 093 and 094) attack and missile submarines. This assistance is primarily in the area of stealth technology (that is by covering the hulls with a layer of anechoic tiles). These submarines are understood to become operational by 2007. Blank also quotes reports of Russia selling China parts for its mobile SS-24 and 25's TEL's (transporter – erector – launchers), as well as technology to improve the missiles combat readiness. Sources indicate that Russia and China are now cooperating on some 100 odd defense projects.

Japanese sources watching the programme, noted that in June 1996, Russia had passed on computer simulation technology from Russia, which was however denied by the Russian Ministry of Atomic Industry spokesman.

Russia is also alleged to have sold control and guidance systems from the SS-18 and SS-19 to China for its DF-31 and DF-41, though this could also be from Ukraine. China has made no secret of the fact that it

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15 Ibid.
16 Ibid, p.9
17 Lamson and Bowen, note 10, p.267.
would like to buy SS-18 technology to upgrade its satellite launching capability. On 21 May 1996, US Defense Secretary Perry demanded that Russia and Ukraine refrain from the transfer of such technology. The SS-18 is a liquid fuelled, two stage missile, which can deliver either a single warhead or MIRV payload of up to 10 RV's. Reportedly, a group of Chinese were expelled from Ukraine for attempting to acquire classified designs on the SS-18.  

Most recently, Russia transferred its most formidable weapons, the "Sunburn" anti-ship missile, even before it underwent flight testing in Russia. Another buy is that of SA-N-12 Gadfly Surface to Air missile, together with a range of conventional weaponry that will considerably bolster Beijing's efforts to modernize its armed forces. The following chart gives a "broad picture" on the vitality of the foreign input clear.

**Chart - 7.1**

**China's Missile Programme – a time scale chart**

<table>
<thead>
<tr>
<th>Period of Russian assistance</th>
<th>1960's – 1970 (10+ years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First DF fired, (SS-3 types) decision to produce three versions,</td>
<td>1969, DF-3 fired.</td>
</tr>
<tr>
<td><strong>Period of no assistance.</strong> – 1970 -1980 (ten years) no major activity</td>
<td></td>
</tr>
<tr>
<td><strong>Period of exports</strong> 1980 – 1995 (fifteen years)</td>
<td></td>
</tr>
<tr>
<td>Solid fuel capability with ICBM launch, liquid fuelled SLBM, land based IRBM (DF-25), MIRV research begins, Series of MRBM's produced for export (Iran, Libya, Syria, Pakistan, Saudi Arabia)</td>
<td></td>
</tr>
</tbody>
</table>

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18 Ibid.
Period of Russian assistance, US space launch assistance: 1990 – the present
DF-25 cancelled, three stage, 8,000km DF-31, JL-2 under research, ICBM forces increased. RPV capability, guidance, alloys, warhead minaturaization capability?

China and proliferation: MRBM's and the international market

Around the time China was beginning to develop a strategic force, (mid 1980's) it also began the first cautious forays into the international market. The demand for tactical missiles was first recognized when the North Koreans came to Beijing for a missile of a longer range than the Scud -A in their possession.\(^\text{19}\) China had no such missiles at that time, since the military preferred to focus on long range systems. The period of economic reform that started after 1979, and the R&D crunch that followed led to a decision to reorganize and rationalize the policy of military sales. The Ministry of Ordinance was the first to set up the first arms trade organization called the China North Industries Corporation (NORINCO). Their example was soon followed by the others, and the Ministries of Space offered Satellite launching services, anti aircraft missiles, and anti ship missiles. The First Academy, which dealt with ballistic missiles decided to target this lucrative source by producing missiles exclusively for export, a decision that was helped along by the 2/3ds cut in R&D appropriation, and a fall in domestic buying. This started the first M series of missiles, and the

\(^\text{19}\) The data on early Chinese export sales is given by Hua Di in William Potter & Harold Jencks (eds.) "The International Missile Bazaar" (Boulder : Westview, 1994) pp.163-180.
M-9, a 600km single stage, solid propellant road mobile missile (capable of being launched from a Scud A Transporter Erector Launcher) was all that developing countries could want. The range (600km, single stage solid propellant road mobile, with inertial strap down guidance system) still meant it was a "Strategic" weapon for countries like Syria and Pakistan, and this interest in its utility soon led it to being incorporate in the Chinese Rocket Forces as the DF-15. The M-9 was immediately ordered by Syria even before tests had been completed. (1986) Cheered by the interest, the M-11 followed and was confirmed as having been supplied to Pakistan. (see below). The M-11 had a 300km range, solid propellant, and terminal guidance, and it was again targeted solely for export. Other sources also note that the DF-15/M-9 is said to have a separating warhead system, so that the incoming warhead is more difficult to intercept. The DF-15 was also used in the "missile tests" off Taiwan in July 1995 and 1997, and the report of the US Department of Defense noted that it achieved a remarkable accuracy.

Another of the M family was the M-7 (project 8610) SRBM which is a modified Russian SA-2 SAM with solid fuelled motors. China embarked on this after stealing SAM's destined for North Vietnam across the Chinese rail network in 1966 or 1967 and reverse engineered them as HQ-2. The DF-21 came into the news following suspicions that this may have been passed on to Pakistan with modifications, and it was certainly in

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This is stated in http://www.cdiss.org.
the news when the Chinese decided to use it in exercises in 23 July 1995 (though it was not used to its full range). The DF-21A is the improved version with the longer range of 1,800km with a 600kg warhead.

US analysts and policy makers conclude that China's motives in proliferation are many faceted. Firstly, it is very conscious of its rights as a sovereign power, and sees little benefit to itself in adhering to the MTCR. Second, it is very concerned with future energy sources, and its missile program and diplomacy are aimed at keeping all future energy routes open. Third, the so called "red princes" (the sons and daughters of the ruling elite's) serve on the boards of state industries including the defense sector. Their personal influence leads to the sale of sensitive technologies, this trend increasing as China's defense exports have continued to fall from a level of $3billion (1987-88) to around a fifth of this in 1994\(^\text{21}\).

These companies, apparently not state owned, were said to have conducted business worth $2million a year, a sum that was hardly likely to hurt China\(^\text{22}\). The Director of Central Intelligence noted that "conventional arms sales have lagged in recent years, encouraging Chinese defense industries to look to technology-related sales, primarily to Pakistan and


\(^{22}\) Sanctions were imposed under the Chemical and Biological Weapons Control and Warfare Elimination Act 1991 which forbids companies from exporting a variety of chemicals and equipment to states identified as state sponsors of terrorism. " The Proliferation Primer- A Majority Report " International Security, Proliferation, and Federal Services Subcommittee, United States Senate Committee on Governmental Affairs, January 1998.
Iran, to recoup" Noting that there has been "some signs" of improvement, however the CIA Director noted that "China's relations with some proliferant countries are long standing and deep."\(^{23}\)

**Strategic capability**

Missile forces today form the core of China's nuclear and conventional posture. Some 300\(^{24}\) to 400\(^{25}\) strategic weapons are structured in a "triad" of land based missiles, bombers and submarine launched ballistic missiles with ranges up to 14,500 km and longer range missiles in the offing.

The number of strategic warheads has been put at 400 warheads of two basic categories: some 250 to the "strategic" arsenal, and an estimated 150 for tactical weapons, - presumably lower yield bombs for tactical aircraft, artillery shells, atomic demolition munitions, and possibly short range missiles such as the DF-15(M-9) and DF-11(M-11)\(^{26}\). The strongest leg remains the land based missiles, with the submarine force catching up.

Information on Chinese tactical nuclear weapons is limited, and there is no confirmation of their official existence. Several low yield tests in the late 1970's, and a large military exercise in June 1982 simulating the

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\(^{23}\) Director of Central Intelligence "Hearing on Current and Projected National Security Threats Before the Senate Select Committee on Intelligence" 28 January 1998.


\(^{26}\) Ibid.
use of tactical nuclear weapons, suggests that they have been developed. Recently the Taiwanese Defence minister referred specifically to nuclear capable “M” missiles both deployed in the south.

Norris notes that the Chinese military will probably focus on three components in the future – small high tech forces for flexible use in regional contingencies, large low tech and medium tech forces for internal security and reinforcement in defense of the homeland, and modest levels of strategic nuclear forces to maintain a viable deterrent against other nuclear powers.

Currently China has five types of nuclear capable ballistic missiles (DF-21, DF-3, DF-4 and DF-5A, all of which are of the design of the 1960’s. The DF-3 was China’s first indigenously designed ballistic missile. The DF-4 is a multiple stage, liquid fueled, missile deployed at five main bases, and began development in March 1965, with the first successful full range test flight more than a decade later in August 1980. It is understood to be targeted at Moscow. The DF-5 was the only “true ICBM” and is liquid fuelled. The improved DF-5A had a longer range (8,000 miles) and a larger payload (4-5 megatons) and is currently deployed in hardened underground silos. A report of 1998 noted that 6 new DF-5’s had been deployed in the first four months, denoting a one third increase in its arsenal.

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27 Ibid. p.46
26 Economy and Okensburg. Note 24, p.329
Two new ICBM's are in the pipeline. The DF-31 and the DF-41. The DF-31, is reported to be ready for deployment by 2000. It is quoted as a mobile strategic missile, with multiple warheads, that posed a threat to parts of continental United States\textsuperscript{30}. Classified Air Force reports leaked to the press noted that the new missiles were observed at a launch pad at the Wuzhai Missile and Space Test Centre and was said to have a range of 4,960 miles, sufficient to hit targets along the entire West Coast of the US. The missile is said to incorporate “design aspects similar to those of current generation Russian missiles” the report said. This could include upgraded mobility for the TEL, advanced materials for the booster and payload, use of penetration aids such as decoys, chaff and an improved solid propellant. The missile is understood to have been tested simulating launch from a nuclear missile submarine tubes. In its mobile version, it could be launched from a TEL that incorporates some of the design features of the Belarussian six axle vehicle such as was used to launch the SS-20\textsuperscript{31}. Similarly the DF-41 is also in the pipeline with a estimated range of between 12,000 to 13,500km. these missile reflect the thrust towards more solid fuelled, and more mobile systems for the future.

The Chinese are said to have had less success with their submarine force. The single existing submarine which was launched in April 1981, is armed with the Julang -1 (JL-1)This Xia class SSBN and the five Han class SSN (which may also be nuclear capable) have never sailed beyond


\textsuperscript{31} Ibid.
regional waters. No additional Xia class submarines are planned apparently, but the testing of the DF-31 in a submarine mode would require an entirely new class of submarines. The Chinese bomber force is said to be based on 1950’s aircraft, according to one source. The main bomber is the Hong-6 based on the Soviet Yu-16 medium range bomber. However the purchase of more than 26 Russian SS-27 fighters at a cost of $1 billion may indicate a new purpose. Once production begins in China, this fleet would obviously be set to expand. Once again, the Chinese could be dependant on foreign technology to “boot” the missile forces, and diversify launch platforms. Analysts observe that the missile force at present is “technologically obsolete” with warheads far too large for tactical warfighting purposes. They also allege that the entire command, control, communications, and battle management system is either obsolete or non existent – in short the Chinese have not reached a “second strike” capability.

These assessments came under considerable pressure following the disclosure of the extensive spying allegedly undertaken by China at one of the most sensitive American weapons laboratories. Following the release of the so called “Cox’s Report” after the Chairman Representative Cox who headed the investigation, and the more technical Directorate of

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33 Schwartz. note 9.
34 The 700 page report was released on April 25, 1999. For the text of the Cox Report see http://cns.miis.edu.
Central Intelligence (DCI) Statement on Damage Assessment. (this is dealt with in more detail later in this section.)

However the end result was that China may have accessed nuclear test codes, computer design models and other data forms in three critical areas

- Nuclear warhead modernization
- Missile guidance and design technology
- Electromagnetic weapons technology.

The DCI report\(^{35}\), while it noted that the information accessed from the US did make a significant contribution to China's second strike capability, however noted that significant deficiencies existed in the Chinese weapons programme, and that to date the Chinese spying and information collection effort had not significantly (an unquantifiable word) resulted in any apparent modernization of the deployed strategic force (not mentioning anything however about the future force).

In warhead technology, China has had an ongoing programme to develop MRV/MIRV technology as well as nuclear warhead minaturization for a more mobile and lighter force. In September 1981, China successfully delivered three satellites with one launch vehicle giving it (according to some) an incipient multiple warhead capability. In May 1995 China tested the DF-31 with MRV's/ MIRV's, possibly to prove warheads in the 100-
200kt range and a large one in the 600 to 700kt range. Paul Dibbs estimates that by 2010 China will deploy 5—70 MIRVed solid fuel ICBM's with ranges of 8,000-12,000 km deployed either on mobile launchers or in hardened silos. Dibbs also states that China will deploy six SSBN (ship submersible ballistic nuclear) with 8,000 km range MIRVed SLBM's. Military sources are also quoted as saying that China is expected to produce MIRV technology in the near future, along with their miniaturized warheads. The systems in development (DF-31/JL-2, DF-41) are expected to have new warheads of 200-300kt, which is yet to be certified. This raises the question of whether China has received the technology for "cold testing". Recently, Sha Zhukang, the influential director of the Foreign Ministry's Arms Control Department, noted that China had no objection to computer simulation since it was only to check the safety of the existing stockpile, thus ignoring that computer simulation could mean also the designing of new warheads.

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Table – 7.2
Chinese Missile Capability

<table>
<thead>
<tr>
<th>Missile</th>
<th>Type</th>
<th>Number</th>
<th>Range</th>
<th>Fuel</th>
<th>Payload</th>
<th>FF/YOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF-3A CSS-2</td>
<td>Mobile, single stage</td>
<td>50-60</td>
<td>2,800</td>
<td>liquid</td>
<td>1-3mt</td>
<td>26 Dec 1966/1964</td>
</tr>
<tr>
<td></td>
<td>(Limited)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DF-4</td>
<td>2stage, fixed</td>
<td>10-20</td>
<td>4750</td>
<td>Liquid</td>
<td>3 mt</td>
<td>10 Sept 1971/1965</td>
</tr>
<tr>
<td>DF-5A</td>
<td>Two stage, silos</td>
<td></td>
<td>13,000</td>
<td>Liquid</td>
<td>4-5mt</td>
<td>10 Sept 1971/1965</td>
</tr>
<tr>
<td>DF-11 M-11</td>
<td>Mobile</td>
<td>---</td>
<td>3-400</td>
<td>Solid</td>
<td>---</td>
<td>1982</td>
</tr>
<tr>
<td>DF-9, M-9</td>
<td>Mobile Separating warhead</td>
<td>------</td>
<td>500-600</td>
<td>Solid</td>
<td>250kt</td>
<td>1990/1982</td>
</tr>
<tr>
<td>DF-21</td>
<td>Mobile</td>
<td>36</td>
<td>1,800</td>
<td>Solid</td>
<td>300 kt</td>
<td>1978/1988</td>
</tr>
<tr>
<td>DF-31(dev)</td>
<td>mobile</td>
<td>--</td>
<td>8,000</td>
<td>Solid</td>
<td>MIRV</td>
<td>Expected 2000</td>
</tr>
<tr>
<td>JL-1</td>
<td>SLBM</td>
<td>12</td>
<td>1,700-2,000</td>
<td>Solid</td>
<td>200-500KT</td>
<td>1967/1982</td>
</tr>
<tr>
<td>JL-2(dev)</td>
<td>SLBM</td>
<td>--</td>
<td>8000</td>
<td>Solid</td>
<td>2-300kt</td>
<td>Na</td>
</tr>
<tr>
<td>DF-41 (dev)</td>
<td>ICBM</td>
<td>--</td>
<td>12-13,000</td>
<td>Solid</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>


North Korea

North Korea has since the early 1990’s become the centre of non-proliferation efforts. Pyongyang became a significant exporter or arms in its own right in the later 1980’s and one source notes that arms had become the primary source of hard currency accounting for more than 50 percent of exports, and that she was exporting to nearly 50 countries worldwide.36

36 This sounds exaggerated but is given by Time, 25 March 1991.
North Korea's first supplies of rockets, FROG 5's and FROG-7A's came from the Soviet Union. A successful reverse engineering of the FROG-7A was the first attempt in the direction of missilery. The first Scud-B's arrived not from the Soviet Union but from Egypt, who supplied them in return for MiG-21 pilots to assist the war effort in 1973. Over the years a reverse engineered Scud copy (the Scud Mod A) was flight tested in 1984. This was never intended to be produced, but formed the test bed for a Hwasong 5 (Scud - mod B) which incorporated several new production and engineering improvements. These included slightly lighter structural material, and marginally more powerful engines which resulted in a range increase to 320km (from the Scud-A's 300km) with however a poor CEP of 500-1000 metres at maximum range. Chinese assistance in aerodynamic and Japanese assistance in electronics however helped them to improve both range and accuracy rapidly. Finance came from Iran, which signed an agreement by which nearly 90-100 Scud-B's were sent off to Iran during the war, (1987) Bermudez and Carus note that the Iranians received the Scuds prior to the North Korean forces, underlining the importance of Iranian financing. Other sources also noted that the Iranians may have received help for a chemical warhead to be fitted to the missile.

39 This information is from Martin Navias, "Going Ballistic: The Build up of Missile in the Middle East", (New York: Brassey's, 1993), p.80.


41 Jane’s Defence Weekly 14 January 1989
Future development appears to have followed the requirements of targeting (see chart – 7.2), thus leading to the missile program being divided into four distinct but interrelated projects. A longer range version *Hwasong 6* (known in the west as Scud C), Nodong-1, Taeop dong 1 and Taepo dong 2. Iran was to financially back these efforts.\(^{42}\)

The Scud – C was apparently more capable than the Iraqi attempts, and after work began in 1988, it was test fired in 1990 with a 550km range, achieved through a reduction in warhead weight according to sources (1000 to 770 kg)\(^{43}\), and a slight increase in size and thus propellant capacity. It is also assessed to have an improved guidance package. In November 1990, an IGRC commander from Teheran finalised details in a deal worth a reported $500 million. Deliveries began soon after by air and sea, and a firing was reported to have taken place in Iran in May 1991.

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\(^{42}\) Joseph S. Bermudez, "Taepo -dong launch brings DPRK missiles back into the spotlight" *Jane’s Intelligence Review* October 1998, pp 30 - 32

\(^{43}\) Ibid.p.30
The Iranian connection proved to be advantageous in more ways than one. Using Iran as a transhipment point, some 60 Scud-C’s and 12 TEL’s began to arrive in Syria\textsuperscript{44}. This was after Syria had been rebuffed by the Soviet Union in its quest to get SS - 23’s. According to Cordesmann and Wagner, Syria tried to get the missiles including the SS-12’s and even the SS-25 ICBM after it was certain that the INF Treaty would go through\textsuperscript{45}. For some reason, China after being approached was also cautious about selling the Syrians the M-9. Soon after, the North Korean shipment followed. The Syrians are believed to have paid for these out of the $2 billion paid to them by the Saudis after the Gulf War\textsuperscript{46}.

Egypt was another beneficiary with North Korea proving Scud assembly facilities and the means to develop the Project-T, a Scud derivative with a range increased to 450 km (payload could be smaller). In mid 1996 North Korea is reported to have sent Scud-C’s related material to Egypt, which would enable Cairo to start production. This shift to providing production facilities may have been due to the Israeli and American tendency to intercept shipment that it considered as dangerous\textsuperscript{47}. Shortly afterwards Syria is reported to have conducted a Scud-C test. Another report noted that North Korea had been asked to reverse engineer the SS-

\textsuperscript{44} National Briefings : North Korea http://www.cdiss.org
\textsuperscript{46} Navias.note 36,p.81.
\textsuperscript{47} For instance the US is reported to have asked Israel not to intercept a shipment for Syria in October 1991 since it would have endangered the Madrid peace process. “ Let Cargo of Scud go through Israel told” The Independent 18 October 1991.
21 SRBM by Syria, to replace the aging FROG rocket. Clearly however, there were limits beyond which the basic Scud design could not be improved upon to increase capability.

The Nodong development had begun as a parallel program with the Scud-C. It is seen by some analysts as a completely new missile drawing up on the experiences of the previous programmes. The engine used four uncoupled Scud-B engines, or a new unified engine was developed that used four coupled thrusts chambers and a common turbo pump. Sources note that this design route was similar to the Russian designs and later Chinese ones. Analysts charge that this similarity is not coincidental, and that this was the same route taken by the Isayev Design Bureau during the late 1950's and early 1960's that designed the engines for both the R-17 (SS-1C and Scud-B) and the R-21 (SS-N-5). Therefore Russian assistance had begun well before the collapse of the Soviet Union with the Makayev design bureau closely involved. Iranian financial backing as noted, was crucial and facilitated the development of the Nodong, (which was then tested as the Shahab -3 on 22 July 1998.) Pakistan during the mid 1990's also signed several agreements with North Korea which called for the provision of Nodong I technology, components and perhaps missiles (possibly tested eventually as the “Ghauri” (Hatf-5) on 6 April 1998). The

48 Joseph S. Bermudez “Taeop-dong launch brings DPRK missiles back into the spotlight” Jane’s Intelligence Review October 1998. pp 30-32
49 Ibid.32.
50 This may be further collaborated by the fact that around 60 Russian missile scientists from Makayev DB were detained as they were about to board a flight to North Korea in October 1992. Missile Monitor Vol.4, No4. Fall 1998.
Nodong – 1 may first have been tested in late May 1990, though there is very little data on this. On 29th May 1993, North Korea tested four missiles, including the Nodong, together with two Scud-C's in to the Sea of Japan. This is thought to have been a demonstration for the visiting Iranian military officials. In April 1997, Japanese Foreign Minister Yukihiko Ikeda noted that there were “reports” that North Koreans had deployed a missile of more than 1000km range. This followed by reports in Japanese newspapers that US satellites had spied the deployment of three Nodongs 1's on the eastern coast. This was a surprising event since North Korea had been facing a famine and had been trying to get western food aid, and seemed a deliberately provocative act.

Sometimes in late 1993 or early 1994 Kim Il Sung ordered the development of a space launch vehicle (perhaps due to South Korea's launch of a second research satellite Urybol II in September 1993). The candidates for possible conversion were the Taepo Dong I and 2, IRBM both still at the design stage. The Taepo Dong (TP) I & 2 were clearly an ambitious development plan. Bermudez notes that while the two are clubbed together by most analysts, they are in fact completely different systems. The TP-1 uses the No-dong as the first stage and a Hwasong-6 as the second stage in a cluster, or as other sources note, the M-11 with the tail fins removed. The alloy used may be an aluminum magnesium alloy.

51 Sankei Shimbun (Tokyo), April 11, 1997.
52 Bermudez calls it Hwasong 6 while the cdiss web site reports it as a M-11. Note 53 and note 54.
alloy as used in the Nodong-2 which is under development. While the TP-2 is also a two stage system which appears to be constructed by employing a newly designed first stage and a Nodong-1 as the second stage. The length of this new missile and its other specifications are still contested with some claiming it as approximately 35 m long, with the first stage perhaps 18 m long and resembling the first stage of the DF-4. This missile has been assessed by the US intelligence as having sufficient range to reach Alaska, - that is a range of 4,000 to 6,000km with a 1,000kg warheads. This range with the existing configuration would be possible only if more advanced fuels have been used. This input of better fuel mixtures would signify a jump in technology in a period of less than eight years.

While earlier estimates of a possible test in 1998 had been analysed as too optimistic, the North Koreans surprised watchers by testing it on 31 August 1998 from its Hwadae gun Missile Tests Facility. The test demonstrated successful staging capability, and traveled east over Japan for a distance of approximately 1,400-1,600km and landed in the Pacific. This was put forward as a satellite launching effort, but there was apparently no confirmation on a new object in space by any agency. According to Charles Vick of the Federation of American scientists, the first stage was the Nodong booster, the second stage a modified Scud C or D, and that the third stage was a 15,000-45,000 lb thrust solid motor from an SA-2 anti aircraft missile system modified for the purpose. Others however disagree, and maintain that the North Koreans may have employed the Stromboli engine motor which Pakistan had been using for its Hatf-1 and
Hatf-2. However the Air Intelligence Report says that North Koreans may have used the Chinese M-11 as the upper stage of its TD-1. The TD-1 is estimated to come into operation somewhere around 2000-2005. The test was seen as a ploy to get a better bargaining position with the US, as well as to advertise North Korean capabilities just before the foundation day anniversary on 9 September 1998.

Meanwhile US spy satellites noted that three new missile bases appeared to be under construction. According to the Pentagon, the first site being built was a launch facility located approximately 50 miles south of the Chinese border at Yongo Dongo. The second (Chiha-ri) was a support base. Analysts noted that these sites were possibly for tests and commercial launch demonstrations, rather than a military build up.

Figure 7.1

TIME SCALE MAP

A new missile every three years?


TD-1, 1998 3Y Nodong-2, 1995 2Y Nodong-1993

3Y

TD-2 (2002 est)


54 "North Korea Tests Long Range Missile" Reuters, 1 September 1998.
There is clearly very little likelihood that the North Koreans were able to make the transition from Scud technology in 1984 to the staging technology and presumed satellite launcher of the Taepo dong-1 in 1998—that is less than 14 years without significant foreign aid. The fact remains that most of North Korean missiles are a hybrid of Russian and Chinese technology, with apparently other inputs thrown in. For instance, the TD-1 is assessed by the Monterey Institute to have benefited from Japanese technology acquired via other countries, Ukrainian missile experts, as well as experts from other former Soviet republics. The report, submitted by the Centre for Non Proliferation Studies at the Monterey Institute of International Studies, and the Centre for Contemporary International Problems at the Russian Diplomatic Academy also noted that China had expressed surprise at the TD-1 launch, and had flatly denied any assistance. However, some US experts note that the TD-1 is very close in many respects to the DF-3, and therefore see the Chinese passing on old technology for a price. The rapid development of alloys, fuel mixtures, and engine points to foreign assistance, particularly in the area of advanced engineering and human resource according to Bermudez who alleges that apart from Ukraine and Russian designer, Iran may have diverted Russian technology. Other sources however allege that China is assisting North Korea with SLV and satellite technology, comprising

56 "DPRK Missile development" Korea Times, 02 October, 1999.
57 Bermudez. Note 37.
exchange of both scientists and technology\textsuperscript{58}. This US report was naturally denied by China. Further assistance by China in areas of missile technology is the North Korean firing of a new anti-ship missile which is a derivative of the Chinese silkworm. Its range is approximate 120-160km.

North Korea's proliferation activities are apparent in the missile programs of Pakistan and Iran. North Korea finally admitted that it sold missiles abroad and would continue to do so in 16 June 1998. "We will continue developing, testing and deploying missiles," said a statement carried by the official Korean Central News Agency, adding significantly" Our missile export is aimed at obtaining foreign money we need at present."\textsuperscript{59}

Table - 7.4

<table>
<thead>
<tr>
<th>North Korean Ballistic Missile Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scud-A</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Range (km)</td>
</tr>
<tr>
<td>Payload (kg)</td>
</tr>
<tr>
<td>Stages</td>
</tr>
<tr>
<td>Length (met)</td>
</tr>
<tr>
<td>Diameter</td>
</tr>
<tr>
<td>Fuel (kg)</td>
</tr>
<tr>
<td>Exports</td>
</tr>
</tbody>
</table>


\textsuperscript{58} This report quoted US official sources. Washington Times 23 February 1999.

\textsuperscript{59} http://www.sightings.com
RUSSIA

The genesis of the Russian arsenal is well known (which like the US, was derived from German designs after World War II) and does not need further description. (Table -4.4) Russia one the one hand, is still a nuclear weapon power of considerable standing. Analysts note three distinctive threats that are perceived from Russia. One is the "unsanctioned" used of Russia's strategic arsenal by personnel within Russia, second a greater chance of triggering a nuclear response due to loss of control, and third, a deliberate or uncontrolled sales of missiles and related technology to countries that are "suspect" states. Before evaluating these "threats" it is as well to review the state of the Russian arsenal.

The stockpile of Russian strategic and tactical warheads is estimated to be around 20,000 - 25,000 nuclear weapons out of which some 7000 to more than 12,000 are non strategic warheads\(^{60}\). The unilateral initiatives declared by Gorbachev and and Yeltsin in 1991 and 1992 respectively obliges Moscow to firstly consolidate ground launched tactical warheads and eliminate all of them by 2000. The START agreements could also result in the retirement and eventual dis-assembly of some 7,000 strategic warheads, by which warheads should be reduced to 3-3,500 by December 31, 2007. Even if the START II is not ratified by the Duma, the decline will continue possibly to fewer than 3,000 due to economic constraints and systems obsolescence. AT the same time

production of additional warheads will continue into the 21st Century as new strategic missiles systems are deployed. It must be noted that START II does not specify that warheads have to be eliminated, and counts only the number of accountable warheads (that is, those that are assigned to that particular delivery vehicle). START II thus allows both sides to keep 3,500 deployed strategic nuclear warheads each, but says nothing about non-deployed warheads. The US plans to keep about 5,000 of these at various levels of readiness 61, while it is not known how many the Russians would keep. START II also does not limit non-strategic warheads. After the treaty is implemented the US and Russia will continue to possess 10,000 total nuclear weapons each 62—even though only 3,500 can only be placed on delivery vehicles. The actual distribution of warheads is largely left to the country, with no ceilings on the “mix” except that SLBM’s can have only 1,750. Since there is no ceiling on the total warheads each side may keep, the possibility of a rapid break out remains.

The Treaty however presents Russia with some serious problems, that has caused the Duma to resist ratification. To maintain parity the Russians have to “build up” and deploy more than 5000 new single warheads ICBM’s at the same time as they will be destroying their existing multiple warhead missiles. The following START III which seeks to further reduce deployed warheads to 2000- 2,5000 would be a step in the right

62 Ibid. p.35.
direction, except that with this any build up of an ABM shield by one side
would be seen as destabilizing by the other.

In July 1998, the Russian Security Council adopted the Programme
of Development of the Russian Strategic Nuclear Weapons Forces
covering plans till 2007. Though the programme details are unknown, at
least one analyst has noted that Russia might follow the US lead in
extending nuclear threats to cover a wider range of contingencies. The
insecurity engendered by a failing security cover is illustrated by the
statements of officials. The first Deputy Prime Minister Yuri Maslyukov said
that "in seven or eight years, Russia will be left without a single missile,
submarine, or bomber built during the Soviet times". Maslyukov also
estimates that by 2007-2010 Russia would not be able to afford more than
a few hundred warheads. However, at the moment Russia continues to
modernize her arsenal. Current plans indicates a building of 35-45 Topol
ICBM a year from 2000 and a force of roughly 7 Yuri Dolgoruky SSBN's by
2010. Russia is also developing a new battlefield missile to replace the
Scud. Russia's industrial base can support the full range of both solid and
liquid propellant ballistic missile and associated technologies. Russia
retains a strategic missile force of 1,200 operational ICBM And SLBM
launchers.

63 - Russian Minister calls for Nuclear Modernization, Deep Reductions" Disarmament
64 Ibid.
Russia has declared a chemical weapons stockpile that is the largest in the world: 40,000 tons of chemical agents, mostly weaponized. Russia continues to research this aspect, but says that labs are now concentrating on defense against these agents, an activity that is not banned by the Chemical Weapons Convention. In May 1997 President Yeltsin signed a federal law on the destruction of chemical weapons, but this is unlikely to happen in the near future for political and practical reasons.65

There are however hundreds of launchers and thousands of Scud and SS-21 SRBM's. Ukraine continues to manufacture some of the guidance and control components used in current Russian ICBM's and SLBM's. It also has the infrastructure to design, develop, and produce both liquid and solid propellant ICBM's and space launch vehicles and related components. Belarus produces the chassis for road mobile missile launchers.66

Table - 7.5

Table – Russian Operational Nuclear Forces

<table>
<thead>
<tr>
<th>Type</th>
<th>No</th>
<th>YoD</th>
<th>Range(km)</th>
<th>warheads</th>
<th>W x Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombers</td>
<td>70</td>
<td>1984-87</td>
<td>11-12,800</td>
<td>806</td>
<td></td>
</tr>
<tr>
<td>(Tu95M,Tu-160)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICBM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS-18</td>
<td>180</td>
<td>1979</td>
<td>11,000</td>
<td>1800</td>
<td>10x550/750kT</td>
</tr>
<tr>
<td>SS-19</td>
<td>165</td>
<td>1980</td>
<td>10,000</td>
<td>990</td>
<td>6x550kt</td>
</tr>
</tbody>
</table>

65 "Proliferation: Threat and Response" Office of the Secretary of Defense, November 1997. According to these sources, destruction of the stockpile may cost the equivalent of $5 billion.

66 Ibid. p.45.
<table>
<thead>
<tr>
<th>SS-24</th>
<th>SS-25</th>
<th>Topol-M</th>
<th>TOTAL</th>
<th>SLBM</th>
<th>SS-N-18</th>
<th>SS-N-20</th>
<th>SS-N-23</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>36</td>
<td>1987</td>
<td>10,000</td>
<td>460</td>
<td>10x550kt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>360</td>
<td>1985</td>
<td>10,500</td>
<td>360</td>
<td>1x550kt</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>751</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3610</td>
</tr>
</tbody>
</table>

Year of Development  

Warheads x yield  

Source: Robert S. Norris "Worldwide Nuclear Deployments 1998"

**The threat from Russia**

As noted earlier there are three distinctive threats that are perceived from Russia - the “unsanctioned” used of Russia’s strategic arsenal by personnel within Russia, a nuclear response due to a “hair trigger response” and third, a deliberate or uncontrolled sales of missiles and related technology to countries that are “suspect” states.

Quoting from a “secret” report of the CIA, the *Washington Times* noted that “The Russian nuclear command and control system is being subjected to stresses it was not designed to withstand as a result of wrenching social changes, economic hardship, and malaise within the armed forces...” It noted that “command posts of the Strategic Rocket Forces (SRF), the service in charge of nuclear missiles, and other units below the level of the general staff have the technical ability to launch without authorization of political leaders or the general staff. Controls over tactical nuclear arms - the battlefield nuclear arms and nuclear torpedoes – are also assessed to be poor. These appear to be the weapons most at
risk. Nuclear submarine crews in particular appear to have an autonomous launch capability for tactical nuclear weapons, it noted, that may extend to strategic weapons as well. It also notes that while only the President and the Defense Minister have the nuclear briefcases, the conservative Russian general staff had the final authority to either launch a pre-emptive nuclear attack during an international crises. Such a crises might be triggered by a severe political crises, which would exacerbate the divisions and factionalization within the military, and even splitting the nuclear commands. However, at present there is little to justify such a scenario. Moreover it is difficult to see how NATO perceives a military threat from an internal use of nuclear weapons within Russia.

On the other hand, it might well be argued that a "short fuse" of Russian reaction could be aggravated by the almost total loss of her early warning system that was once operational around the Soviet border. This was particularly evident when the launch of a Norwegian weather rocket in January 1995 triggered a tactical warning report that automatically activated President Yeltsin's "cheget" (or the nuclear briefcase). However, even this threat reduces as the reality of Russian nuclear weapons is considered. With a vastly reduced arsenal as outlined above, and two threats – NATO and China – on both sides, Russia's remaining nuclear arsenal would seen to be purely defensive. US Governmental sources seem to tell a different story. Ambassador Robert E. Hunter, Permanent

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U.S Representative to NATO at a press conference noted that members of the military who had visited Russian strategic rocket forces bases had been impressed by the tight security there, though the question of tactical nuclear weapons continued to be uncertain. It is this aspect that is sought to be reduced by the sharing of early warning data with Russia, as well as an ongoing effort by the US to keep Russia abreast of all NATO exercises, as well as joint space co-operation.

The third aspect however appears to be more realistic. Reports do seem to indicate that Russia has a certain "Proliferation strategy. Analysts note a newly invigorated push by Russia to increase exports, with the Ministry of Industry and Trade superseding players like Glavkosmos and Minatom. Also apparent is a return to "statism" evident in the struggle for control over the Rosvooruzheniiye, the state arms exporter. The Ministry of Defense had submitted a strategic plan to set up its own commercial venture and take a cut from arms exports. The pressure for increasing military exports was also evident with the Russian Union of Industrialists and Entrepreneurs asking for "targeted loans" (that is, direct state subsidies) for high tech exports including weapons exports. Lastly, the Russian armed forces faces an imminent block obsolescence of the weapons it now has, with no relief in sight without exports to countries like Iran and China.

At a lower level, regional governors are strong supporters of the export policy to fund factories and keep workers employed. Indeed whole factories are run for export only. Thus factories or arms companies often offer to the buyer weapons that are yet to reach the Russian arsenal. For instance, Russia now offers missiles for its S-300PMU (a hot item since it has no likeness in the western camp) which are designed to give users a fourfold increased in the number of missiles that can be employed by the system. The former Director of Rosvooruzheniya was (not surprisingly) calling for increased exports, that would assist Russia in regaining her lost status—especially in those countries where she had once had a strategic presence. Thus Russian exports have been reinvigorated to India and Iran.

Russian exports to China (addressed at the beginning of this chapter) does indicate a willingness to hand over some of the latest weapons in the Russian arsenal. This may however indicate a mix of a need for profit, as well as a possibility of keeping a leverage of a power that may emerge as a future threat. This is not unlike what the US herself appears to follow to allow national R&D to prosper and as an analyst notes, allows the US "to perpetuate other states" backwardness and dependence upon us.”

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70 This includes the 9m96E and 9m96E2. Nezavisimaya Gazeta (Moscow), July 22, 1998 in FBlS-SOV-98-222, August 13, 1998


This is supported by the utterances of leading politicians like Prime Minister Primakov who said that increasing arms exports would be a priority. The charge that Russian arms exports are directly controlled from very high level sources appears to be substantiated in a few cases – notably that of the gyroscopes and accelerometers that were found on their way to Iraq (See Chapter-5). After initially denying that the gyros were Russian (in spite of serial numbers) the sale was acknowledged and a criminal investigation initiated on April 9, 1989. Two years later the case was abandoned, on the plea that the gyros had been sold as scrap metal. Other cases are the seizure of 21 tons of maraging steel in Azerbaijan on its way to Iran, on March 6, 1998. The companies concerned, Inor and Yevorplas 2000 and MOSO said that the steel was used for myriad other uses, and in any case they had clearance from authorities. In April 1998, a New York Times article reported that the Grafit State Scientific Research Institute which had developed graphite based materials and composites used in ballistic missiles and the nose cone of the Buran space vehicle, had attempted to ship this to Iran, a shipment which was intercepted in Austria. In May 1997, a report noted that the Russian Central Aerohydordyanamic (TsAGI) and Rosvooruzheniye had (the Russian export company) had signed a contract to construct a wind tunnel and related facilities for the Iranian missile program, and that The Irno

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Production Association had agreed to supply manufacturing equipment as well as missile components and special materials in the same $150,000 contract. This was denied by the Russians, though there were continued allegations that high officials in the arms export agency and the Space Agency had been involved in the deal\textsuperscript{75}. The following table however underlines that few of these deals have actually been intercepted.

\begin{table}[!h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
\textbf{Category} & \textbf{Status} & \textbf{Export} & \textbf{Manufacturer} \\
\hline
Materials and Components & Intercepted & 21 tons of maraging steel & Suspected INOR \\
& Intercepted & Composites for warheads (To Iraq) & NII Grafit \\
& Intercepted & Gyroscopes (To Iraq) & Mars Rotor Plant, Research and Testing Institute of Chemical and construction Equipment (NIKhSM) \\
& Alleged & Guidance system manufacturing equipment, technology transfer of two types of liquid propellant missile engines, complete rocket engine, and designs for a propulsion system for a communication satellite & Energomash Mars Rotor Plant \\
& Cancelled & Turbopumps for RD 214 rocket engines (To Iran) & Samara State Scientific and Production Enterprise, NK Engines \\
& Alleged & Components for RD-214 (To Iran) & NPO Trud and Energomash \\
& Alleged & Missile components & Polyus Scientific research Institute \\
& Alleged & 620kg special alloys and foils & Inor Rosvooruzhenny \\
& Alleged & Wind tunnel and related facilities & TsAGI As above \\
\hline
\end{tabular}
\end{table}


\textsuperscript{75} Fred Wehling "Russian Nuclear and Missile Exports to Iran" \textit{Non Proliferation Review}, Winter 1999.pp134-143.
Another worry that is being aired in western circles is that Russia has produced a new version of the Scud with a range of 300km and far more accurate than its predecessors. According to a *Jane's Defence Weekly* the new version of the 1950's classic missile can also carry submunitions to saturate a target areas. It is also unclear why Russia would again want a short range missile in the new scenario, unless it is seen as a hedge against NATO expansion. Another charge is that the SS-21 was for a while available for $1.7 million per missile and $3.3million for its launcher to anyone with the cash.

At another level are the charges of "loose nukes" or the covert diversion of the former arsenal. James E. Goodby of Stanford University noted at least three well known cases of smuggling, which he cites. One involved a chemical engineer from the Luch Scientific plant at Podolsk, who over time smuggled a little over 3.7 pounds of 90% enriched uranium. Goodby notes that a 100 pounds could make a simple bomb, possibly less for the technical man. A second instance was that of a Russian naval officer who stole three pieces of naval reactor fuel from a storage facility near Murmansk, Russia which had no real security to speak of. The officer was caught trying to sell 10 pounds of 20% enriched uranium for a price of $50,000. A third incident of theft involved a Czech nuclear scientist, a

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Russian and a Belarussian citizen. This seemed to point to first, an "insider" threat. Second, the thieves had been driven by nothing more than greed or privation. Fourth the range of possible routes were so vast as to make it possible to pass on the material to any customer to the south, east or west. However as the author notes, there was no case of an attempted smuggling of a warhead, and the quantities smuggled were extremely small\(^78\). As Indian analyst K. Subramanyam notes, nuclear smuggling has always carried on, sometimes for heating purposes, and other myriad uses. This fringe market however, is yet to be exploited by any country with a serious nuclear programme.

**The United States**

There is little doubt that while on the one hand the US sought to keep proliferation under tight controls, this was fine tuned by strategic interests. As previous chapters brought out, the US implicitly allowed the passing of nuclear materials and know how to Israel, and later ignored the Pakistani nuclear programme to retain that country as a strategic partner in the fight against the Soviets in Afghanistan.

At another level it can be argued that the very stationing of nuclear weapons and missiles in Europe was the biggest single step in proliferation in terms of scale. While this was propounded as the one way to make Europeans (especially Germans) stay non nuclear, however there is little to

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show that these countries did not singly still attempt to make their own nuclear weapons. Previous chapters noted that Sweden and Switzerland went on with their nuclear programmes for many years in spite of being NPT signatories. Germany and France had got together to plan a covert nuclear cooperation programme, which fizzled out more due to the French reluctance than any lack of interest by the Germans at the time. The French Israeli cooperation of the 1950's is another example of the “proliferation effects” of a restrictive export policy combined with a complete reliance on these weapons in war strategy.

However, the US has assisted proliferation on a more “traditional” scale as well. Being the nodal centre for scientific research into missilery, it was but natural that the US would be the target of those proliferant countries willing to bend the rules to get what they wanted.

On November 22., 1990 the New York Times published an article headlined "Chinese Atom Arms Spying in U.S Reported. It alleged that Chinese intelligence agents succeeded in stealing nuclear weapons secrets from the government's Lawrence Livermore National Laboratory in the 1980's, data which had been used by the Chinese to construct a nuclear device identified in some published accounts as an experimental neutron bomb. This bomb was said to have been detonated in September 1988. The suspect was a Taiwan born American scientist working at Los Alamos, and was fired but never arrested due to a lack of hard evidence.

The story did not pick up in the media, and the issue apparently died there. The *Wall Street Journal* picking up the same article nearly a decade later, noted that in the mid 1980's Peter Lee, another Taiwan born scientist working at Los Alamos, had "passed classified information to China about laser technology. The lasers according to officials could be used to simulate nuclear explosions for either weapons design or stockpile maintenance."  

In 1998, another story published the results of a House Panel investigation. This noted that the subcommittee investigated charges that China had bolstered its satellite launching capabilities through the acquisition of sensitive U.S technologies. Follow on stories noted that the House Panel, chaired by California republican Christopher Cox had also noted allegations that China had obtained "secret Design information " on the W88 warheads and that the FBI (Federal Bureau of Investigation) was conducting an investigation into the matter. The article noted "there is considerable debate about how much information was passed to Beijing. IT appears however, that China did not get any equipment, blueprints or advanced designs. Instead, officials believe, China was given general, but still highly secret, information about the warhead's weight, size and explosive power, and its state of the art internal configuration, which allowed designers to minimize size and weight without losing power."  

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82 Ibid.
Later reports however noted that senior nuclear weapons experts at Los Alamos had detected "eerie similarities" between the latest Chinese and US bomb designs and it was alleged that Beijing had tested a smaller and more lethal nuclear device configured remarkably like the W88. The W88 is the United States most advanced miniature nuclear warheads, and it sits atop the Trident II SLBM. Later reports noted that the W88 was to be placed on a new truck based mobile missile that my be operational in three or four years and would be able to reach the western regions of the US.

Following this, the FBI (Federal Investigation Bureau) launched in investigation into all those with access to the W88 designs, and reportedly narrowed it down to five possible suspects including Wen ho Lee, a Chinese American computer scientist. In April 1996, the DOE (Department of Energy, is said to have briefed CIA officials and National Security Advisor Sandy Berger for the first time on the theft of the W88. However the investigation appears to have faltered, and in April 1997, the FBI is said to have issued a report on improving security at the nuclear weapons labs. They also briefed National Security Advisor and noted that "there was evident of several other Chinese espionage operations that were still under way inside the weapons labs." Lee was subsequently fired from the labs on March 8, 1999.

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In another case, in 1993, the China National Aero Technology Import and Export Corporation (CATIC), a branch of the military, had decided to acquire an entire military aircraft plant from the firm MacDonnel Douglas which was facing financial extinction. Beijing demanded that the defense contractor throw in the plant as a condition of finalizing the $1.9 billion deal to manufacture 40 planes in China. It was agreed to sell the plant for $5.4 million. The Commerce Department allegedly rejected the protests of military and intelligence analysts and cleared the sale with stipulations that the machines could not be used for military production. Eventually McDonnell Douglas discovered that six of the machines had not been sent to the agreed upon plant in Beijing but 800 miles away to the Nanchang Aircraft Co.- a facility used to manufacture Silkworm cruise missiles.86

Most of this information came out at a time of Presidential elections, and this (it was alleged) was a reason why the Clinton Administration failed to act87. It was also alleged that large funds had been channeled to the party by sources within China. The most publicized case was that of the Liu Chaoying, daughter of Gen. Liu Huaqing, China’s most senior general and one of the seven members of China’s all powerful ruling party standing committee, who was said to have channeled over $35,000 to the Democrats political campaigns. This money is said to have come from

87 This allegation was made by most analysts as well as a Senate Republican Policy Committee See Wall Street Journal, editorial. 11 March 1999. Also see United States Senate, Republican Policy Committee, "China’s Theft of U. S Nuclear Secrets: The Public Record" March 12, 1999. http://www.Senate.gov
Chinese military intelligence. In turn it appears that Liu's company called Casil, a company owned by Chinese Aerospace Ministry with some 80 subsidiaries and joint ventures had benefited from these deals. Casil had been set up in 1975 to acquire and sell rocket systems\(^{88}\). It is alleged that two US firms, Loral Space and communication Ltd. And Hughes Electronics Corporation might have shared sensitive military information with China after a failed satellite launch that resulted in a crash and the destruction of the satellite in 1996. Engineers from Loral, assisted by engineers from Hughes Electronics, “charged forward” to correct the problems in the Long March satellite launchers, thus improving the capability of the Dong Feng series as well. A report of the senate subcommittee on proliferation noted that the kind of space technology that China acquired from the US was just what was needed to make an ICBM-stage coupling for extended range, accurate guidance, and system integration\(^{89}\). That serious breaches had occurred was also confirmed by the National Air Intelligence Centre\(^{90}\).

More serious in this was the role of the CIA (Central Intelligence Agency). The Agency was found to have close links to Hughes, and had leaked information on the scope of the impending Senate Select Committee investigation, enabling the company to anticipate the moves of congressional investigators. The firm, while one of the trusted contractors

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\(^{89}\) Rep. Dana Rohrabacher (R California), Chairman of the House Space and Aeronautics Subcommittee quoting from the Senate subcommittee report. Filed by Bill Gertz, National Review, June 1, 1998.

of the US intelligence community, has had intimate ties with the CIA for decades, and clearly it had much to profit in using Chinese launchers, which charges less than a fourth of major western launching firms.

The Administration reacted by pleading the need to keep China "engaged" in the effort to contain proliferation. John Holum, Acting Undersecretary of State for Arms Control and International Security, noted that while the South Asian tests and Iran's missile tests underlined the "looming threat" of non-proliferation, it merely showed that China was indispensable to effective nonproliferation policy. He also noted "Unquestionably China has been part of the proliferation problem..." and went on to outline the assistance to Pakistan's nuclear weapons programme. He noted that the tools for getting China to stop proliferation included incentives as well as sanctions. He also noted that the commercial satellite business had been removed from the ITAR list (International Traffic in Arms Regulations) which contains the US Munitions List. This change had been approved by the previous administrations following the insertion by Congress for loosening the list\textsuperscript{91}. However, other allegations of Chinese access to US technology continued.

The Cox investigation led to a serious review of the testimony of Gordon Oehler, former director of the CIA's Non Proliferation centre. The

\textsuperscript{91} The specific performance characteristics such an antenna capabilities, encryption devices, and propulsion systems were outlined in Category XV of the Munitions List, which would define which satellites would require approval by the US Department of Commerce or by the U. S Munitions List. Testimony of the Honorable John D. Holum, acting Undersecretary of State for Arms Control and International Security Affairs before the Senate Committee on Commerce, Science, and Transportation. September 17, 1998. http://www.usoia.gov

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Senate Sub-Committee heard Mr Oehler, who noted "There's no question in my mind, that China sold 34 M-11 missiles to Pakistan in November 1992" but that "intelligence analysts were very discouraged to see their work was regularly dismissed." It was alleged that the Clinton Administration, had held back from sanctions for fear of damaging US-Chinese trade. Later China was offered financial incentives and more US satellite launches, if China would vigorously inspect exports of missile components, production technology and machinery used to maintain or upgrade missile parts. In short, follow the export control lists of the MTCR. However, the answer was "a flat no" leading to a decision not to include it during the President's visit to Beijing.

The most spectacular instance of the leakage of technology was discovered in April 1999. It was reported that Me Wen ho Lee had transferred not just the details of the W88 warhead but also transferred huge amounts of secret data from a computer system at Los Alamos compromising virtually every nuclear weapon in the US arsenal. This was done in 1994 and 1995. American officials said that this was useful to any nuclear power trying to replicate the US atomic designs. This was discovered after Mr Lee was fired, and when they examined his office computer. Apparently, the data had been sent even as investigations on Mr Lee were ongoing. The information transferred were what is called "legacy

codes". According to John Browne, Director of Los Alamos, the codes consist of computer data used to design nuclear weapons, analyze test results and evaluate weapons materials and the safety characteristics of America's nuclear warheads. The legacy codes can be used as tools to help design nuclear weapons through computer simulation and are thus valuable on their own. But they become more valuable when combined with specific performance data, which would then enable someone to generate a computer simulation of American warhead designs. Mr Lee transferred both the legacy codes as well as specific performance data which was akin to a "scientific blueprint". This would be particularly useful to a country that had signed on to the test ban, and would provide valuable information for computer simulation. Most of Mr Lee's transfers occurred just before China signed the CTBT.

While the progress of events is fairly clear, less apparent was the reason why the investigation that had been ongoing since 1995, was stalled in 1997. The Department of Justice declined an FBI request to seek court approval to gain surreptitious access to Mr. Lee's office computer, while a request for a wire tap was similarly rejected. Ms Janet Reno, head of the Justice Department is accused of having been obstructive to attempts by the FBI to increase surveillance on Mr. Lee. The Washington Post noted that the warning on the W88 warhead had come at a time when

the administration was on the verge of the 1997 "strategic partnership" summit with Beijing. It was also facing congressional investigations into campaign funds.\textsuperscript{96}

Other accusations of Chinese access to American technology include that of high performance computers. A study quoted by a prominent analyst noted that the Commerce Department approved more than $154 billion worth of strategically sensitive equipment to China. This "dual use" equipment went to directly to nuclear missile and military sites. More than half this figure consisted of super computers which would allow that country to process the American nuclear codes and simulate the workings of US arsenal. The list of other exports include\textsuperscript{97}

- Equipment for uranium prospecting, which was sold to China's National Nuclear Corporation, by a California company. This technology was allegedly transferred to Iran.

- The China Precision Machinery Import-Export Corporation was allowed to buy a computer system useful for simulating wind effects.

- The Chinese Academy of Sciences was allowed to buy equipment from the Convex Computer Corporations for processing data from an experimental fusion reactor. This was also later exported to Iran.

- Other beneficiaries includes National University of Defense Technology, The University of Electronic Science and Technology (which in involved


\textsuperscript{97} The following is based on an alleged list of items that is given by Gary Milhollin "What China Didn't Need to Steal" \textit{New York Times} May 5, 1999.
in stealth technology) the Beijing University of Astronautics, (missile navigation, flight dynamic, and guidance)

- $241 million worth of machinery for making semiconductors that can go into missiles

- $131 million worth of high speed oscilloscopes which can record data from a nuclear test

- $111 million of precision machine tools

- $5.4 million of vibration testing equipment which enable testing of missile to handle shock, impact and rapid acceleration.

- An American scientist working for a defense contractor is reported to have sold information for an advanced radar being developed to detect submarines. Peter Lee, was not prosecuted because the Navy refused to let prosecutors disclose information about the technology in court.

Apart from this, reports allege that the Chinese have been issuing bonds in the US to facilitate their funding. More than $6billion worth of bonds have been issued in recent years, with the CITIC (China International Trust and Investment Corp.) heavily involved. (CITIC chairman Wang Jun was once involved in an operation to sell $4million worth of AK-47 to California street gangs). Financial institutions are used also, according to the analyst, by intelligence agencies for a variety of purposes.

99 Peter Schweizer "You, Too may be Funding China's Army" USA Today May 14, 1997.
Clearly the incentives to proliferation and technology theft is considerable, since it yields the individual profit, and the recipient country considerable time gained and money saved. Espionage in such areas is hardly new, with stories of the Soviet and CIA spying into each others secrets now the stuff of legend. However, this technology spill naturally occurs the most frequently from the technologically superior states to the lesser endowed ones, a process as logical as it is inevitable.

Of the four reviewed here, two (Russia and the US) are major exporters of technology, and arms, and have had these relationship's for strategic gain. China is a major “absorber” of technology from these two powers, and in turn disseminates it to various others for profit or power. Being a missile developer in her own right, her graph of capability has been low, with the country preferring to slowly indigenize technology, than go in for quick fixes. North Korea is clearly both a missile developer and again a limited absorber of technology. In that, if China receives technology that is considered obsolete in the US, she herself will pass on what is considered of limited strategic value only. North Korea therefore has to look elsewhere for more recent technology, as well as materials, scientific talent etc. This may account for the inputs from Ukraine and perhaps Russia though there is clearly a highly skilled and motivated work force in Pyongyang. Lacking the industrial and technological base that China has, Pyongyang’s missile prowess may remain shaky, and prone to sanctions. However, being a a clear actor in a sellers market in missilery enables the foreign exchange to flow in – which in turn sustains the programme.
The "capabilities" sections highlighted that for China and North Korea, much of the spiral of development has been speeded up by foreign technology inputs. For China these have come alternately from the US or Russia, and though there has been no sudden jump in capability (as in the North Korean case) yet the rise has been slow but steady to the level where they are now. North Korea's however has been relatively more spectacular, making a new missile apparently once in every three years.

Russia and the US may both have a proliferation strategy. However lacking any concrete information (and the overabundance of allegations and suspicions) there is little to go by except past practise. In this, the picture is far from reassuring. As previous chapters have brought out, the US has either overlooked, assisted or connived actively in the nuclear and missile programmes of Israel, France, UK, and Pakistan. The motivation here has been strategic, with the profit factor perhaps an added factor. The possibility therefore that China has received such "aid" cannot be ruled out. Russia may also be ruled by the same motives, though it must be admitted that very little can be said of the priorities of that country given the

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100 Apart from the historical factor, it now emerges that the US and France are currently trying to negotiate an agreement (for example) under which the two sides will begin to share sensitive computer codes that describe how bombs behave when they are detonated. The US has quietly offered France sophisticated facilities that are in the cold testing business, and that of weapon research. That this has occurred at the same time as the CTBT was being negotiated adds to the assessment that this overarching objective led the US to allow a degree of technology liberalization to both China and France. In addition France is also building a mammoth $4 billion laser facility near Bordeaux for weapons related research – said to be nine stories high and the size of three football fields – with the assistance of a scientist from Lawrence Livermore. DoD officials say that this is basically limited to ensuring safety of the French arsenal. William Drozdiak and R. Jeffrey Smith US Closely Linked to French Nuclear Weapons Development", Washington Post, http://www-tech.mit.edu
multiplicity of command and control centres overall, and the actors involved. The following figure outlines the patterns of proliferation. Here it is clear that “satellite” states while receiving technology have in turn passed it on to their allies for gain. While the gap between the US and China may be considerable (in that at present China is fielding largely 1960’s technology) the gap between Chinese and North Korea technical capability is considerably less, but prone to delay and perhaps a complete stoppage if patrons refuse to oblige. The third tier countries are almost completely dependant on the process of a continued flow of technology and the continued working of this cycle.

FiG - 7.2
The Proliferation Cycle

In the above figure, the dotted lines represent the second tier transfers to third countries. It is also acknowledged that there are a great many more transfers than that picture above. But the figure only takes into account the largest or the most dramatic transfers of technology.
SUMMARY AND CONCLUSIONS

It is evident, that the structural changes across Europe, and the systemic upheavals following the demise of the Soviet Union has caused a deep questioning of the role of the foremost security organization of the world. There is simply no gainsaying the fact that NATO countries face no imminent threat from any quarter to its immediate security. It has been noted that the most serious crises that affected NATO in the past, was during the period of détente when the Soviet Union remained quiescent in Europe, but seemed to be considerably active in what was then referred to as the "Third World". At that time, the US decried the Europeans as being mere regional actors, unable to perceive that the threat to NATO from without could be as serious as the threat from within. At the time, this argument was not one that was completely acceptable to most European governments, since the price of annoying the Soviets elsewhere, meant immediate tensions and increased defence expenditures within Europe. The problem was dealt with through the spirit of consensus that has always won through NATO disagreements. Thus though many analysts began to see intolerable strains within the NATO of that period, the organization survived the reduction of a threat, and a period of détente.

Today the threat is not just reduced, but almost completely absent, and though much is made of Russian nuclear weapons, there is no likelihood of that country emerging as a threat in the short or medium term. There is little a country can do (offensively) with nuclear weapons alone.
when conventional strength has practically collapsed. While Russia could revive in the long term, the problem of keeping NATO "alive" over a period of more than a decade without losing its preeminence and operational readiness is one that is central to the problem that policy makers have had to deal with, since a vibrant military organization has to be continually honed towards a specific set of objectives. The solution was clearly to "centralize" the threat from third world missile proliferation as a primary threat to the security of NATO countries.

This study sought to examine the process that led to this decision making, and its eventual result. In so doing it examined this process by asking the following questions – what is the role and relevance of NATO today? As an instrument of common security, what is it's major threat and what is the extent of it? What has been NATO's response to this threat and how would this response impinge on regional and global security. The findings of the study to these related but diverse questions are presented below.

It is as well to note that the definition of "security" in Europe, now has diverse dimensions, and provides some justification to those analysts who see the international situation as fraught with "unknown and unpredictable" dangers. European countries (not the US) have had to confront the problem of ethnic conflict, refugees fleeing these, and the instability engendered by the spread of violence and light weapons. Europe, together with the US continues to have to consider the possibility
of the collapse of the economic and political order in Russia and perhaps in some Central and East European states, and the multifaceted effects this might have on the European order. However, firstly, these are not roles ideally suited for what is essentially a military organization. Secondly, European and multilateral organizations exist to deal with these problems – most of which are at any rate under the “control” of the major industrial powers. A military alliance must have a military threat or at least something that requires a response with the tools of offense or defence. In arriving at a conclusion to our first question, we consider first, certain continuing aspects of NATO's role, that exists independently of the “core objectives” and indeed many be called the continuing “underlying objectives” of the Alliance.

**A Continuing Role: NATO as An Instrument of Non Proliferation in Europe**

It had been brought out that NATO functioned quietly as an instrument of non proliferation within Europe itself. This role clearly continues to be as relevant today as before. As such, it has had moderate success, since no other country other than France and the United Kingdom have felt it necessary (though many are eminently capable) to go nuclear. The “guarantee” provided by the continued presence of US nuclear weapons in Europe, ensures against a German decision to develop her own nuclear deterrent, and thus simultaneously ensures security to Europe. Since the advent of German unification, the need to “contain” German power, and the observations that Germans continue to see a
nuclear deterrent as a distinct possibility should the US nuclear umbrella and presence be withdrawn denotes the fact that at least on this one "threat" NATO continues to be as relevant today, (if not more) than it was before Germany unified. As brought out in Chapter three, the new generation of German politicians and policy makers are not at all averse to a nuclear role for Germany should conditions change. Given that the initial attempts by Germany covered in chapter one, to ally with France and Italy to give the country the tremendous power of nuclear weapons is indicative of the fact, that this analysis of what Germany might need in the future, is hardly a drastic departure from past perceptions.

The link to proliferation has been convincingly formulated by western analysts who saw the Indian and Pakistani nuclear tests as an input that would threaten to unravel the whole non proliferation regime that keeps Germany and Japan non - nuclear. Equally it is a threat as well to the casteism of the Security Council structure which is based on the nuclear power structure. Though few mention this explicitly, nonetheless the threat of a "break out" by the only two states who have both the capability as well as the strength to withstand international condemnation and sanction, is one that is fraught with the most dangerous consequences - or so they believe. Thus proliferation has a direct effect on Alliance cohesion if not its very existence.

Arising from this - as well as notions of retaining the "pecking order in Europe" and a desire for prestige - is the clear fact that Europeans are
not at all desirous of giving up their nuclear weapons – a fact brought out
during the era of “disarmament” when it seemed that Presidents Reagan
and Gorbachev were signing treaty after agreement consigning entire
systems for destruction or removal. Equally, neither will Germany accept a
European nuclear deterrence without a clear German role. However
nuclear weapons by their very nature are not ones that can be “shared”.
That is ultimately there can be only one hand on the nuclear button. While
the debate on a “Euro-deterrent” remains outside this paper, what is
relevant here is that US nuclear weapons in Europe, by their mere
presence, serves to underwrite the basic logic of NATO – that of
“leadership” from outside, and not from within Europe. In short, as long as
European nuclear weapons remain, the US will continue to station some
nuclear weapons in Europe. This is the “link” that is constantly referred to in
NATO documents.

NATO As An Instrument of Non Proliferation Outside NATO

However, clearly, the need to keep a “hedge” against German
rearmament, is hardly likely to be used to justify the need for a continued
existence of an organization that is on the scale of NATO. The problem of a
Russian threat that cannot emerge at least for a decade or more has
already been dealt with. Neither, can the role of peacekeeping and/or
peace enforcement reason enough to justify the retention of large and well
equipped rapid reaction forces, or the huge logistics and air assets that
made them operational. Peacekeeping could be a side show but it could
never feature as the “main billing”. It is clear that the first projection of the threat of uncontrolled missile proliferation, began in the United States, as part of a process which brought together the Pentagon, State Department, leading politicians, and industry at one common meeting ground – the need for a clear and unambiguous threat which would allow the release of billion of dollars for continued funding of old programmes and money for researching the new. This is not to suggest that Congressmen advocating the need for a missile defence were motivated solely by industrial concerns. Their assessments and those of the Pentagon appeared to be convincing – US forces would clearly find it difficult to operate in an environment where chemical or biological weapons might be used against them in a third world conflict. The obvious question of why NATO or US forces find it necessary to be there at all is obfuscated by the predominantly “moral” tone of the argument - the ever present and almost all pervasive conviction that non proliferation as a goal serves a public good. Unstable regimes in the Third World were better off without such weapons, is usually the argument, and it was only those who had lived with them for over forty years who could reasonably be expected to “control” them. The spectre of rogue state running amuck with dangerous weapons was thus in line with the dominant dialogue on non proliferation.

Across political parties and academics, there was an across the board agreement that third world proliferation was dangerous, but there was a wide gap between the perception of what was and what there was projected to be. This is apparent not just in the realm of public debate, but
also in the conflicting assessments of national intelligence reports. This
gap in perception is important since is the perception of threat that should
logically shape the response. However, as will be brought out, the
response appears to be totally disproportional against the stated threat of a
few hundred third world missiles.

As observed in Chapter two, the enunciation of a threat began just
before the invasion of Kuwait by President Saddam Hussein. This event,
was extremely fortunate for American policy and their allies in Europe. The
threat of use of chemical weapons and the subsequent use of missiles by
the Iraqis set the tone for the debate that was to follow, and made the
casting of a non proliferation role for NATO that much simpler. In 1991, the
Alliance in fact did a complete volte face by acknowledging that wider
issues of security could affect the well being of NATO countries - in fact
almost the exact wording that had been demanded by the US a decade
ago and which had sparked such a crisis. NATO members though
unwilling to put Europeans at risk at that time, proved to be more amenable
to change once that threat was removed.

In Europe, the enunciation of the threat was slower and less public.
European policy makers were hardly unaware of a groundswell of debate
on the “peace dividend” and the need to retain a security organization that
apparently had no role whatsoever. This was also the period when France
was at the forefront of pushing for a European defence identity, that would
tie in Germany into the larger French and British forces, and thus finally
give the fast uniting European Union a creditable security role. It seemed that by 1992, NATO had arrived at a cross roads. It had the choice of simply existing at much lower levels of readiness and size in readiness for an unknown emergency; it could simply disinvent itself and leave the Europeans to continue fighting over leadership in Europe; or it could energise itself in a new role. This last option came to be most widely known by the Rand Corporation study which warned that NATO could go “out of area or out of business”. Thus this option sent NATO cautiously into former Yugoslavia, in a UN mandated role of first policing an embargo and later a more robust role of delivery of humanitarian aid. But not even the use of air strikes in a punitive role, or the use of ground troops for limited objectives could alone justify the call for the massive restructuring and force projection needs that had been identified by the strategic doctrine of 1991. Nor could it justify the continuing role of nuclear weapons. Thus by 1994, Alliance leaders were carefully writing in the “counterproliferation” role into NATO policy. With a non proliferation role “outside” NATO, it remains to clarify just what is the terms and extent of the present NATO area, and it’s future role outside that area.

**NATO “Area”: Ambiguous and Ambitious**

Even less clear is the actual area of operations for NATO. Having included around 47,6359 sq km in its natural membership area with the inclusion of three new members, it’s “area” is now to be seen in the light of the definition as provided after the Washington Summit of April 1999 which
refers to NATO as a pivot of a "Euro-Atlantic" security area. Not satisfied with the increased in membership and in defined enlarged area, it also now had committed itself to operations beyond even this area. At Washington (1999) the summit leaders agreed that NATO could go out of area in non Article 5 roles. The more specific Defence capabilities Initiative that was agreed to, noted that these may entail NATO operating in areas where access to existing NATO infrastructure may be limited or altogether missing. It also notes that such operations may be taken together with Partners and non Allied countries. This apparently means a very long reach indeed, since NATO’s partner could include Japan (with whom NATO has an ongoing security dialogue), or even Russia who is a member of PfP and has a "special relationship" through the Founding Act.

Even less apparent is whether NATO will at all feel constrained to go to the Security Council for action against non proliferation, or the wide variety of threats that are now identified as being a threat to international peace and security, which has led to some unusual resolutions sanctioning intervention for various reasons. These have included protection of humanitarian relief (Bosnia, Somalia, Iraq), military protection to populations under siege (no fly zones, safe areas etc. -Bosnia, Iraq) Enforcement monitoring of agreements (Bosnia, and to an extent Cambodia) and intervention to rebuild a collapsed state - Somalia. The Security Council also acted in the case of cross border refugee movements (Iraq) while Resolution 748 identified the Libyan refusal to extradite suspects of the Lockerbie bombing as a international offense. More and
more international actions is now possible under various clauses, leading to the slow erosion of Article 2.7 of the UN charter which upheld the barrier to interference in the internal affairs of states. Clearly, a UN dominated by the NATO Partnership countries would have considerable leeway in deciding on intervention for a variety of reasons. In the case of such an intervention, the number of countries offering to join (or alternately offering their air bases or ports) to a "coalition of the willing" would present a powerful deterrent to a dissenting state.

The case of the present ignoring of the UN sets an ominous precedent. However, resistance to bypassing the UN may be growing, even as Germany and Japan present strong cases for inclusion. Without doubt, the UN as a fig leaf for intervention has not proved to be the most propitious, beset as it is with red tape and delay. Though the Washington Summit does note the centrality of the UN, there is little likelihood of any military commander assenting to a command under UN auspices. Thus the potential extent of "area" of operations is difficult to arrive at and is being kept vague and open, thereby giving sufficient flexibility to decide on whether the strategic interests of the larger members of NATO are involved, or alternatively that of a group of states.

This vagueness in defining the actual area of operations, is a continuing facet of NATO that once caused considerable unease. This hinged on the fear that any unilateral engagements by one partner might result in dragging in allies into a conflict with an ally or proxy of the Soviet
Union. Today, the dangers of unilateral intervention are now behind, and this is implicitly recognized by the creation of the CJTF – which allows the Europeans a separate but not separable European defence identity. This is another continuity that must be recognized. The United States has still no intention of letting go the reins of NATO to facilitate European adventures. Given the vastly improved status of Europe today, the need for some sort of “independent “European defence structure has been accepted, and the conclusion is that is if Europeans have to intervene, they had far better do it within the NATO decision making processes. In short a continuation of the advice of the “three wise men” after the Suez crisis, when national interests were recognized, but unilateral intervention without so much as a “by your leave” frowned upon.

Thus NATO could operate at two levels and two areas. The French, the Dutch, Italy, Spain and to some extent Switzerland, are more inclined to the Maghreb and the African countries where most of their strategic resources lie, as well as some captive markets. Keeping in mind that Europe is still a regional power, these will possibly be limited forays carrying with it the possibility of a US veto. German and Nordic interests however are to the east, and the former was one of the main players in ensuring a European/NATO role in Bosnia early on in the conflict. Germany, Italy and Turkey are also some of the largest investors in Central Asia. Note should also be taken of the separate Agreement with Ukraine, which gives it a special status among former Soviet States.
Keeping this in mind the necessity of US agreement, what will emerge is protracted bout of bargaining between the two (which is in actuality what "consensus" is all about). Thus by the same logic, the US will be clearly in a position to demand European assent to her own adventures which are "global" and which are primarily to do with non-proliferation objectives, and maintaining her status as the "sole superpower". Trouble spots most expected to simmer are the Middle East (where US forces continue operations against Iraq and maintains a watching brief over Iran) and the North East, where the US had in 1998, set forth a "enhanced security dialogue" with Japan. The objective is said to be a way of allowing Japanese forces to assist the US in operations in the Taiwan straits, the Korean peninsula, and other areas surrounding Japan.

In conclusion it may be said that NATO is now a tool which may be used in pursuance of the strategic objectives of any or a few of its members states, anywhere in the world. As a military alliance therefore, it's contribution towards could be

- The role of peacekeeper/ peacemaker/ peace enforcer
- A tool for swift and limited intervention /persuasion
- As the dominant part of a multilateral alliance on the lines of Desert Storm, against a rogue state/states
- Unilaterally, against a "rogue state" who had violated non-proliferation "norms".
It must be noted here, that while each of these role would be closely linked to NATO’s interests, the declared intention may be humanitarian, or "in support of global norms"/human rights etc. Additionally, in each or any of these roles, according to NATO assessment, the Alliance could be confronted by an enemy armed with WMD.

Since the new threat has been identified as "missile proliferation" it now remains to identify the extent, sources, and nature of proliferation, and the threat thereof to NATO’s security.

Assessing the Extent of the Threat

The question then arises as to just how "dangerous" is the spectre of missile proliferation, and its threat to NATO. While the nature of NATO threat perception was examined, a linked objective was to be able to dispassionately arrive at a conclusion of this important question. Chapters four, five and six therefore studied the extent threat. The observations are presented below.

• All six of the "new" missile powers (that is those who have tested missiles after 1990) are in an arc from West to East Asia - Iran, Israel, Pakistan, India, North Korea, South Korea, (with a much reduced seventh in Iraq).

• Established powers like Russia and China are also in this continent, while Japan has the technology and the ability to quickly become one.
• Out of these nine powers, all except two, (South Korea, Iran) are declared or presumed nuclear weapon powers. Iran is also said to be in the quest towards one, while again Japan has the largest plutonium reserves in the world.

• An additional three (Libya, Syria, and Egypt) can be classed on a separate list of "possibles" with a potential for creating regional instability.

• Out of this list of nine missile powers, five are US allies or in partnership with it (Israel, Pakistan, South Korea, Japan, Russia,) one (Iraq) is in the hands of a punishing force dominated by the US, leaving Iran, India, North Korea, and China in the dock.

However, this threat analysis which leaves just four countries in the limelight. While this is one conclusion that needs to be kept in mind (especially since most NATO documents are almost painfully careful never to mention China) it does not stand up to scrutiny. After all China is a member of the non proliferation order, and a part of the UN Security Council. India can hardly be classed as a threat. This picture hardly offers a threat across the full spectrum of proliferation. Therefore another bandwidth has to be used to home in on the threat. It would be useful in the present study, to re-examine the NATO concept of a rogue state or a potential proliferation problem. To reiterate briefly the Alliance Proliferation Framework identified the "types" of states who pose a proliferation threat.

a) States anywhere that have not complied with or even willfully disregarded their international non-proliferation commitments.
b) States in the periphery of the alliance who attempt to develop or acquire such a capability

c) Proliferators anywhere who might seek profit or gain political benefit by selling WMD

This list become more specific when the military threat to NATO is outlined. A threat would be faced (a) if opponents were armed with WMD and ballistic missiles in areas where NATO troops were involved with peacekeeping/enforcement with or without a UN mandate. (b) a direct threat to Alliance territory in "retaliation" of a given NATO action, or as a threat to deter such action. (c) NATO interests may be threatened by shifts in regional power balances due to acquisition of WMD and missiles (d) Regional instabilities involving conflict and use of WMD may indirectly affect NATO member states' security.

Thus the "threat list" now includes (1) signatories to the non-proliferation treaty who are however assessed to have flouted them, (or wish to withdraw) (2) any state that seeks to acquire such a WMD capability especially along the periphery of the Alliance, (3) any state that has or seeks to have the capability to target Alliance territory /peacekeeping / peace enforcing troops (4) any state that seeks to sell or make political or diplomatic use of WMD. From this assessment it is apparent that – proliferation anywhere is the main threat, and therefore any new missile power should consider itself as a potential "hostile" to NATO interests. Thus while Russia cannot attack NATO, Israel has no reason to, and Pakistan has no such capability at present, each is a
threat in a different fashion - in that they act as an aid to proliferation. Additionally, these countries, as well as others on the list may constitute a threat in any of the categories outlined above. These elements are brought out in the summary presented below.

From Whence the Threat?

Moving from west to east, out of the countries identified above, Israel is one of the most capable, and appeared to be a proliferation threat since it is alleged to have passed on technology to a variety of countries when it suited its purposes. Since there has been no let up in Israeli-US cooperation, the possibility that at least some of this may have been with US agreement cannot be ruled out. Israel cannot in any likelihood pose a direct threat to NATO countries, but it is in a position to escalate a regional crises, and still remains the nodal point for regional hostility that could instigate a terrorist action of a conventional one. In such a scenario, Israel would be most likely to try to draw NATO in by threatening to use nuclear weapons, (which is has done twice in the past) thus leading to an escalatory situation with uncertain end results. Due to it's own nuclear capability and more importantly high conventional ability, Israel herself is not readily controllable.

Iran is in the midst of one of the most strategically important areas. Iran's acquisition of even a rudimentary nuclear capability would immensely change the pecking order in the Middle East. Iran could also involve itself in a regional conflict, where the use of nuclear weapons would
may threaten "Alliance interests" (that is, control of the oil wells). Here again, the capacity of Iran to hit Europe or Israel would be enough to put brakes on any adventurism or intervention by NATO or Israel. Iran's desire for missilery however is hardly surprising given her strategic position in the Middle East, and the major intervention that has already taken place there in the form of "Desert Storm". The virtual bifurcation of Iraq is one that has caused unease in much of the Arab world. However while Iran has a considerable chemical weapons arsenal, none of it is at all comparable to the capabilities of those who might oppose her in NATO. Therefore at least as far as NATO countries are concerned, Iran should logically be seen as developing a missile programme for defensive purposes. However, the use of missiles in the past in interstate warfare leaves open the possibility of such use again in the future.

North Korea appears to be the main challenge to the US. Yet it hardly seems to deserve such a status. Its stocks of plutonium has been put at around 5-10 kg, a pathetic amount when compared to the more than 550 tonnes of highly enriched uranium (HEU) in the United States. The chemical or biological weapons capability of North Korea remains unknown, but is highly unlikely to be anywhere even approaching the arsenals of the US or other NATO countries. Yet North Korean capability has persuaded the South Korean and Japanese to be more open to a soft approach to solving the issue. A similar situation to the problem faced during Desert Storm could well operate here. That is, Japan could become the target for retaliation against a US punishing attack, something that is well
understood by Japan. North Korea also clearly is a primary point for proliferation into other countries. Shutting off North Korea however is not easy, as long as China continues to aid her, nor while the international missile bazaar remains healthy.

Pakistan has exploited its position as a "frontline state" to get its own nuclear programme going. Pakistan's assistance to Iran and possibly Iraq in missile technology has already been noted. Its new IRBM can threaten parts of West Asia, including Israel, parts of Russia, and nearly the whole of Central Asia and of course India. Pakistan can hardly emerge as a threat to NATO countries in the conventional sense. However, the possibility of uncontrolled proliferation out of Pakistan in conditions of severe internal stress remains a strong one. Already there have been calls from within Pakistan that it should sell its technology, if it were put under sanctions as a terrorist state. The sectarian and religious violence that has been tearing that country apart may induce the leading experts to migrate to countries offering a better environment. Alternatively, technology and materials could be sold by diverse actors within Pakistan itself, for solely profitable motives. An unstable extremist government dominated by religious fundamentalists could well emerge in Pakistan, and in their hands an "Islamic bomb" could have wider implications. Also, the emergence of a terrorist group armed with crude nuclear or chemical weapons is most likely to emerge within the Pakistan-Afghanistan region.
India has an independent fledgling capability in missiles, which is far ahead of Iran, but well behind Israel or China. While India may not constitute a vital interest for NATO countries, the possibility that as a nuclear power, it may "align" with Russia and China against US objectives is one that has been aired by analysts, as noted in Chapter Five. While proliferation from India has never been an issue, it does remain a significant hold out against the non proliferation regime that underwrites relations between the missile powers and others. India and Pakistan's open testing has also challenged the structure of the UN Security Council which is built upon the notion of "accepted" nuclear states. The seriousness of this threat to the "international order" as seen from the capitals of the west cannot be underestimated.

The only power that comes close to a fitting challenge to NATO is China. China is both proliferator, and a missile power in her own right. The chart below demonstrates that China is now close to the French and surpasses the British capability, but is still nowhere near the United States in tonnage. The data is from the findings presented in Chapters Four and Seven.
<table>
<thead>
<tr>
<th></th>
<th>Warheads total</th>
<th>Warheads operational</th>
<th>Storage sites</th>
<th>Operational silos</th>
<th>Missile submarines</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>12,070</td>
<td>8425</td>
<td>24</td>
<td>550</td>
<td>18</td>
</tr>
<tr>
<td>Russia</td>
<td>22,500</td>
<td>10,240</td>
<td>90</td>
<td>350</td>
<td>23</td>
</tr>
<tr>
<td>UK</td>
<td>380</td>
<td>260</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>France</td>
<td>500</td>
<td>450</td>
<td>4</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>China</td>
<td>450</td>
<td>400</td>
<td>20</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>36,000</td>
<td>19,775</td>
<td>142</td>
<td>907</td>
<td>49</td>
</tr>
</tbody>
</table>

Neither is China at all close to the United States in conventional ability, and shows no signs of being able to reach there in the medium term. However, while China’s relatively rudimentary missiles cannot pose a threat to the United States in the way that Russian missiles did, Chinese nuclear capability does give her a freedom of maneuver that is well appreciated by the Americans. China may not be a global power, and perhaps is not even in the race to be one, but regionally she is a power to contend with. As China is imbibes new technology or steals it from the United States, that capability is set to increase. However even the present Chinese missile capability is good enough to deter the United States, and accord the Chinese a regional status.

Russia remains militarily weak, but has immense capability to do a good deal of mischief. Its proliferation strategy (if there is one at all) is
strange. As shown by the data tables in chapter four, Russia provides a good deal of technology to China, but also remains the primary supplier to India. A supply of missile technology to Iran could well cascade to Pakistan, and this can hardly be unknown in Moscow. The possibility of uncontrolled proliferation – that is supply by the state without any clear strategy – is high. The loss of Russia's outer air defence circle, as well as her low defensive capability overall, does mean a higher threshold of reaction – but the very fact that she has few capabilities at present makes the possibility of missile use in anything but a purely defensive mode extremely unlikely.

The threat from Japan is mainly a 'reactive' one. Japan has a thriving space programme, and remains technologically in the top bracket. While there is an increasing amount of hostility to American presence, the horror of nuclear war has so far effectively prevented Japan from moving to a missile force. However, an increase in threat perception could well push Japan into crossing the threshold, and the move to sign on to a "defensive" theatre missile defence is a step in this direction. As noted earlier, a spread of WMD globally, or a demand from a nuclear weapon state for Security Council status could lead to a reevaluation of Japanese options. German concerns about a "European deterrent" have already been dealt with above, and it may be noted again that these two state remain at the top of the charts in terms of capability. A missile capability by either would constitute the most serious shift in the balance of power in Europe and in Asia, and is a possibility that is feared (though not openly discussed) by the existing missile powers.
From the above, it is apparent, that even allies could be affected by the trends in proliferation world wide, and constitute a threat to "NATO interests" which are aimed at preserving the cohesion and the freedom of maneuver of the alliance. Viewed from this perspective, it does seem that the Alliance has good reason to be fearful of the slow spread of missile technology and capabilities. While none of the countries have anything like the capability that NATO is able to field, their missile programmes would constitute a significant deterrent to conventional intervention.

However, an assessment of the seriousness of the threat, changes somewhat when the nature of missile proliferation is viewed dispassionately. While the proliferation from Russia, Pakistan, North Korea and others have been dealt with in Chapter four, five, and six (and indeed are part of the dominant dialogue on proliferation) it is as well to outline some of the facets of proliferation which are seldom highlighted.

Some of these are outlined below.

The Proliferators

- Proliferation of technology began from 1945, when the US and Russia first accessed the secrets of Peenemunde. Since then there has been a slow flow of technology. Countries with a good industrial and scientific base were able to use this, (France, UK) while others could not (Egypt). This flow of technology was usually a controlled exercise for strategic reasons.

- A flow of technology and expertise continues between the major industrial powers, by agreement.
• Russia and the US continue to be primary suppliers, ( either through covert operations or through strategic interest ).

• China may have a clear proliferation strategy that functions at three level. Firstly, it does not supply for profit alone, since it appears to have refused urgent pleas from Libya and possibly has retracted from sales to Syria. Secondly, where it refuses aid (as it did to Iran) it may have created a proxy supplier (North Korea). At a third level, while it has no strategy of extended deterrence, it merely extends the sale and technology of its missiles to strategic effect. Pakistan now uses Chinese technology and missiles to keep India “contained”.

• Russia may have a similar “proliferation strategy” that seeks to recreate its zone of influence as well as to provide it much needed foreign exchange.

• Israel is a proliferator for similar reasons.

• China in her capacity as a growing power may follow the pattern set by others like France and Israel and proliferate further.

• No country in the west is completely independent in missile or aeronautic prowess. Thus there is a continuing and brisk trade in technology, components, and expertise, between missile and near missile powers (like Japan). Recently, this trade has shifted to that of TMD.

From the above it is immediately apparent that proliferation activity has been part and parcel of the actions of major powers at different points. If the US has made proliferation a primary sin today, it has not hesitated to pass on or ignore proliferation activities when it suited her. Pakistan is a prime example of the fact that the west chose to turn a “blind
eye" to the most sinister proliferation activity (being largely a covert exercise). A similar attitude was also apparent with the erstwhile Soviet Union (though not always expressed). Today, in need of friends and influence, Russia is less caring and a major proliferation actor herself. France, once a stand out against the NPT regime, is now a part of it. Thus it can hardly be wondered at that China has been part of the proliferation cycle—in fact it may be said that this is the logical path that it could be expected to follow. Once China feels she has gained her objectives, Beijing could become a champion of proliferation herself. Thus the motivations towards proliferation has not changed over the years, remaining on the one hand a profitable activity, and on the other a tool of foreign policy at the highest levels.

The question then arises as to what is different about the nature of proliferation today. Is the label of a "rogue state" at all justified? To answer this, we examine the profiles of the main recipients.

**Recipients**

- Proliferation undoubtedly moves at a faster pace today and with more remarkable results than the previous period. A case in point is that of North Korea which has apparently reached near ICBM status with very little testing. Pakistan is another case that has made giant strikes with no space programme to speak of, and no extensive testing. It is now possible to buy missiles "off the shelf" from North Korea, or fund a programme there.
• Funding may come through the sales of narcotics (as in Pakistan) or through proliferation activities (North Korea), or through outside "commissioning" of a programme (as Iran did in North Korea).

• Technology may come from a high level patron (China to Pakistan) negating the need for extensive testing and investment.

• Technology may be sold for ideological reasons. (Pakistan to Iran) or purely for strategic gain (China to Pakistan)

A clear conclusion that emerges is that the spectre of countries acquiring missiles over a short space of time, or alternatively contracting out such activities is unique to this period. That this trade is covert is without doubt, but it is also clear that this almost all trade in missile proliferation - and indeed in defence industry as a whole - is essentially a guarded business. While there is little doubt that missile proliferation as a whole, and in particular into the hands of unstable and war prone countries constitutes a danger to the international community as a whole, it is difficult to classify this or that state as a "rogue". If the term is to be used at all, it would of a necessity include all the missile powers, who, as we have seen, have indulged in such activity as and when it suited them to do so.

This assessment is even more apparent, when the focus is shifted to the various tiers of proliferation as covered in Chapter Three. It was brought out that there are four levels of proliferation. On the one hand is the inevitable flow of technology that has been seen even in earlier times.
This moves through diverse ways—through legitimate and open sources, (universities, internet, space technology, emerging information infrastructure and so on). But taking a historical review of proliferation through the ages, most of this has occurred due to deliberate state to state agreement. (France – Israel, US-Israel, Soviet Union – China, UK – US). While the agreement is itself official, the actual extent of technology transfer is highly classified, and is only apparent several years later. The primary source of this level of proliferation are the major industrial powers with the trade continuing between them and other European industrial powers. This tier is also responsible for speeding up the developmental path of the new missile powers like Pakistan, Israel, North Korea, and Iran. In most cases the transfer of technology has in exchange for some strategic benefit. Thus, this study clearly points to the fact that proliferation is pushed, sustained and increased by the continuing activity - which may include R&D activity, defence sales, strategic alliances and objectives - of the primary missile powers themselves.

The cycle of proliferation is undoubtedly also pushed by the secondary powers who depend on proliferation activities to sustain their own programmes, or to earn foreign exchange, or barter deals. Such states (like North Korea or even to an extent Ukraine) will find the going tough without a certain number of customers. They are not readily amenable to technology sharing, since this would mean a reduction of their own profits in the long term. These states also access the international highway of information and the underground market for expertise, and/or hardware.
Their capabilities are tied to a steady flow of technology of the type that sustained US or Soviet missile systems in the 1960's or later. Their capability is likely to remain at a constant 10 - to 20 years behind the leading powers. If North Korea has in truth broken the "Scud barrier" (there is a limit beyond which existing Scud engines and technology is not amenable to stretching) then it is apparent that these states are also able to move from stage to stage in technology, fairly quickly and with some assistance. China also comes into this category. China needs to proliferate not only for valuable foreign exchange, but also in pursuit of an emerging global role that requires China to have strategic partners to her rear.

The third tier - those who are the primary buyers from the second tier, even as they access what they can from the first - may clearly be stopped fairly easily if the technology inputs are denied. Pakistan, and Iran fall into this classification. Iraq demonstrates what a country can improvise with assistance, however it also remains dependant on imports for strategic material.

It is clear that it is the "demand" side that provides the funding and market for the suppliers. However, it is equally the suppliers willingness to part with technology that in turn fuels the demand. Thus it is difficult to separate the suppliers from the buyers in terms of culpability in missile proliferation. North Korea is hardly any less than a rogue than the missile powers themselves have been in the past, and in some cases in the present as well. The proliferation cycle is sustained, moreover, not just due
to the *availability* of expertise, but also by the *perception* that missiles and nuclear weapons constitute the major weapons of power - a perception that is underlined by the continued reliance on nuclear weapons and missiles in NATO countries' strategy.

**The Opportunities**

In addition to the strategic objectives and profit orientated activities that are inherent to missile proliferation, it is apparent that there are also other "opportunities" to NATO in adopting the new doctrine. This may be paraphrased as the following:

- A threat enunciation that does not impinge upon the interests of any of the allies would ensure a new consensus on NATO's "out of area" role.

- Technologically, the R&D spin offs from the missile defence programme can give an immense boost to civilian and dual use technologies, that ensures that the US in particular stays ahead of all competitors in most spheres.

- The thrust of research into BMD also means that the US is well prepared for a threat (from any quarter) that emanates from exploiting high end technologies that is inevitably leading aircraft into operating in Space. Research into this area is already apparent in the UK, Germany and France. This is something that the Chinese are well aware of, and they continue to oppose the militarization of space at the CD negotiations (Conference on Disarmament.)

- Co-operation in technology – particularly with the Japanese in BMD may restrict (or at least ensure transparency) in this direction even as it
means that the US reaps the benefits of Japanese expertise. Australia is also involved in research constituting another link in the chain.

NATO – the Response

Given the above threat scenario, it is clear that any response by NATO has to take into account not only the “deterrent’ value of relatively unsophisticated missiles, but also at another level, demonstrate that missiles are untenable weapons for true security. In short, it has to bring out a case that adoption of nuclear weapons by a state is likely to bring a state more security conundrums than solutions. This is therefore sought to be done at two levels. At one end is the threat of nuclear weapons that promises the ultimate response against such a proliferating state. At another level, the degree of deterrence achieved by a “rogue” with its own missiles is sought to be countered with missile defences.

As brought out, this has been done primarily by the US where the language clearly expands the deterrent functions of its nuclear arsenal to include strikes by chemical or biological weapons. This has been operationalised with an apparent search for usable nuclear weapons that appear to have had a specific path of development, that is, the targeting of the underground nuclear or NBC facilities of “rogue states”. Hand in hand was a move towards force projection, an increasing use of long range missiles, mainly launched by ships or airpower from ships, that was in tune with a policy for projecting power in two regional crises simultaneously.
The sum of nuclear doctrine in NATO has appeared to follow the US doctrine in broad terms in that both are reactive to events, and are structured as such. The deliberate decision not to review the “first use” doctrine (in spite of German proposals) is indicative of this centrality of nuclear weapons in deterring the actions of a state under threat of intervention. On an operational side, no treaty in Europe, has touched the role of air launched nuclear weapons, while the role and number of tactical nuclear weapons remains ambiguous. The true instruments of force projection – the SLBM also remains and indeed is now the primary “leg” of European arsenals. Policy makers plead that the arsenal has been reduced by as much as 60 per cent, but it is often forgotten that NATO no longer needs the kind of arsenal that was thought to deter the Soviet Union (in fact it is an open question that it ever did). The sum of NATO forces still exceeds that of even the most prominent actor – China.

As noted, NATO logistics – a clear and unambiguous outline shorn of political statements – makes it abundantly clear that the organization is preparing itself for operations anywhere, with a preference for operations off naval command centres at sea, obviating the need for troublesome host nation problems. Since the type of operations required are basically perceived as less manpower intensive, and more technology demanding, future operations against possible proliferators entails the use of stand off weapons, and heavy use of satellite assets for real time intelligence.
The other strand of NATO's response is that of missile defences. A defence against a ballistic missile is no longer considered the chimera that it once was. The ballistic missile can still get through, but a state determined to cause considerable damage or achieve a posture of deterrence on the strength of a small missile force will have to consider multiplying his capability "x" number of times depending on the scenario that he faces. In short a developing state would have the choice of either expending considerable resources on its deterrent force, or cave in to non-proliferation controls.

Admittedly, theatre missile defences are still far from perfect, and is apparently under some treaty constraints. But it is often overlooked that whatever the constraints that limit the US vis a vis the ABM Treaty does not impede the Israeli-US development of the "Arrow". Thus it must be assumed that defence is being considered both against the low trajectory "theatre" missiles as well as higher flying and faster intercontinental missiles.

Given that the present generation of TMD (Patriot, and S-300) do not offer a perfect defence, it would be assumed that a state under seige would naturally turn to nuclear/chemical/biological weapons tipped missiles, since even the entry of one or two missiles would be sufficient to cause havoc (at varying degrees depending on the sophistication of the warhead). This is where the threat of nuclear weapons comes in, since such an action would invite the possibility of national suicide. Thus the two
are interlocking strategies, with the nuclear threshold held high enough with the use of TMD, and the use of conventional forces by the intervening power kept low enough to ensure consensus and public acceptance of foreign “adventures”.

The fall out

There is a growing fear that rather like a rogue elephant, NATO has begun to trample on the sovereignty of small nation states – an appetite for which appears to grow the more it feeds on it. It is worth noting that the hesitation and public relations campaign that went into the war in the deserts of Iraq, is almost completely missing in the case of the former Yugoslavia. Apparently, NATO leaders no longer consider it necessary to even maintain a fig leaf of international sanction. It is also as well to remember that the trifurcating of Iraq continues, as does a fellow member Turkey’s bombing campaigns against Kurdish rebels across into the Iraqi border. As NATO grows in power with new members and a new role, the limitations of the past have been swept away. While this is not to suggest that NATO would rush into every conflict, the core question that arises is simply - who would be responsible for stopping NATO in intervening where ever or whenever it should decide to do so? Certainly not the UN, and not Russia for the medium term. Germany might, or perhaps Japan. Both however are suspect states, and continue to suffer some limitations. This raises the level of insecurity among states who are without any
credible defences, and thus would act as a spur to proliferation rather than otherwise.

The fall out of NATO's expanded deterrence strategy would first rebound on non proliferation efforts, since this expansion would be seen as violating the negative security guarantees that underpins the NPT (Non Proliferation Treaty) (since the NPT only refers to nuclear weapons states). The move towards a "usable" deterrent, that is, to see nuclear weapons as a "safe" option to be used against hardened military targets (like underground chemical complexes or missile sites) might again have the effect of causing more states to pursue a clandestine missile weapons programme – where perhaps various component tasks would be farmed out to other states. This in turn would cause a spread of proliferation technology.

States with a strong sense of grievance and unable to build up a strong defence may resort to a lower level of warfare – that of terrorism. As many an analyst has noted, this is the easiest and the most effective route for a nation desiring revenge. As a point of caution it must be noted here that terrorism cannot be a suitable method of deterrence, since the final objective is to avoid conflict or intervention in internal affairs, and not simply a revenge after the fact. However, it is also as well to note that there is simply no real defence against terrorism which has the ultimate advantage of all warfare – complete surprise. Nuclear terrorism, or biological terrorism can therefore be expected to increase, funded by known states, but
operating in relative safety from the "non states" like Afghanistan and Cambodia..

Regarding missile defences, it is apparent that the issue has reached a maturation stage. The politics of the missile powers, the interests of industry, the relative freeing of limitations on technology, and the need to continue with an institution that was "institutionalized" on collective defence, - means a bringing together of various separate initiatives and interests towards the encouragement of one of the largest programmes that could be on a par with previous path breaking ones like the Apollo mission. Though this paper has largely concentrated on theatre missile defences, nonetheless the National Missile Defence enthusiasts are fighting back, and it may well be that a "thin " ABM defence, once contemplated against China and the Soviets may emerge. At the time, there was little that China could do about it. Now the possibility that was outlined in 1969 by arms control experts – that an ABM system would actually encourage proliferation rather than limit it – appears to hold true, with the additional difference that the level of technology now available to the threshold states or to lesser nuclear powers is considerably higher.

There is simply no case, that China will not see both NMD and TMD as a threat to the effectiveness to what was considered a fairly satisfactory arsenal in terms of tonnage. As may be noted from the following graph, China’s numbers of missiles also have "plateaued",- in short China has refused to follow Russia’s example of being a challenge to the US or the
NATO combine. It is also worth noting that 95 per cent of her arsenal is targeted at her neighbours and not at the United States. This pattern may well change, pushing China into horizontal proliferation with increasing attention paid to "pen-aids". Whether China can sustain this at an acceptable cost must remain for economists to decide.

China has historical reasons to fear the Japanese and in the present is well aware of the potential of that country should Tokyo decide to bypass the 1% limitation of the defence budget that was to be spent only on defensive equipment. Japan's (reluctant) acceptance of a joint research project with the US, is based on the theory that these "missile defences" are in effect - defensive. While this is technically true, this hardly holds good in terms of TMD on ships which may operate offensively in (for instance) off Taiwan or North Korea. While the whole operation is aimed ostensibly at North Korea, it is China which is alarmed.

The result of a Chinese recourse to increased number of missiles, with enhanced penetration aids would have an immediate fallout on India, Japan and perhaps South East Asia as well. The range of Russian reaction would depend on how much Moscow is able to revive her economy and command and control measures. While neighbours would be forced to increase, or as in the case of Japan, reconsider their non nuclear options, there is also the danger of China exhausting herself in a proliferation mode just as Moscow once did. This exhaustion could exacerbate the prevailing tensions within China (largely a rural-urban divide, and an increased
regionalisation). Internal chaos in China again could have the most extreme consequences.

At another level it is apparent that there is now a proliferation of missile defensive systems, once again spreading at the behest of the major missile powers like the US, Europe, and Russia. Inevitably, these systems are primarily being deployed in Asian theatres, with 4 states in North East Asia (Taiwan, South Korea, China, and Japan) soon to do so, while some South East Asian states have also shown considerable interest. A further proliferation of TMD systems (though of a previous generation) is likely since firms would be eager to recover costs spent on R&D. This has considerable effects on the arsenals of the small missile powers, who have so far considered their arsenals as adequate to deter enemies from diverse quarters. However, the spread of ATBM technology could lead to a questioning of what is considered "minimal" and lead to an increase in arsenals. If the lessons of the past are to be learned, this would mean an increase of instability, eroding existing deterrent climates, and leading to the danger of war between two missile armed powers, especially if only one has the requisite systems, geographical size, and tactical situation to be able to implement it (a country with immense borders and flanked by enemies could find itself at a disadvantage. If one or both were nuclear powers, the input of TMD could have well nigh the same consequences once seen between the US and the Soviet Union. In an earlier period, stability was restored only after a deliberate limitation of defensive methods.
The present study shows that NATO has reached a new and dangerous stage of evolution. With its past rationale now no longer a relevant issue, many underlying objectives have been given a new vigour, at a time of immense change and flux in the international system. With a weakened United Nations, a greatly weakened Russia, and an unstable situation worldwide as new nations emerge, and old ones struggle to find a place in the sun, the introduction of a new mission for NATO can be fraught with the most dangerous consequences.

At another level is this study also brought out that the area of future nuclear or a missile war would be essentially in West, South or North East Asia. Missile proliferation in this arc is a reality, but is a problem that needs to be dealt with through diplomatic moves and a genuine redefinition of the international system to ensure a more "level playing ground" for nations. The right of a country to defend itself is immutable, just as NATO has every right of "defence" against new threats. However, one organizations defence cannot impinge on another country's rights. The richest nations in the world need to assuage the insecurity of developing nations, not worsen it. In the "global village" of today, the fall out could be as bad for them as their victims.