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The PakDef E-Reporter is a Bi-monthly production and is made possible by the contributions of our forum members. It is the sincere hope of the PakDef E-Reporter editorial staff that our members will continue to come forth with quality content in the future and will contribute to this worthwhile effort in order for us to be able to raise the awareness about the Pakistani Armed Forces.

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## Pakistan Army Museum, Rawalpindi

Rawalpindi has always been a military town. Long before the British arrived in South Asia it had military importance. The British Indian Army comfortably ensconced itself in Rawalpindi bestowing upon it the status of the headquarters of the Northern Command, and giving it the largest British Indian Army base in South Asia. After Partition the Pakistani Army naturally set up home, and when the time came for a museum to be set up, there was no better place than Rawalpindi.

The entrance of the museum is suitably guarded by an impressive statue of Subedar Khudadad Khan VC, the first South Asian recipient of the Victoria Cross. The inscription on the plinth upon which the statue of this brave warrior stands

reads as follows:

*'The first South Asian soldier of the British Indian Army to get the highest gallantry award "Victoria Cross" at Hollbecks, Belgium during World War One, on 31st October 1914.*

*Subedar Khudadad Khan belonged to village Dabb Tehsil (Now Distt) Chakwal. He died at CMH Rawalpindi on 8th March 1971 at the age of 94 years and was buried in his native village.'*

Inside the exhibits are on the whole very impressive, and span the whole period of Pakistan's existence. These are every day items that were used by the army, from radios to medical equipment and motor-bikes. The crests that adorn the walls tell a history of their own, either displaying the change from a British dominion to an Islamic republic, or still displaying the roots of some of the regiments that date from the time of the British Indian Army. The flags and colours of the various regiments are a testament to the fact that the British Indian Army was defending the Empire in nineteenth century, whilst the British Army in Europe mercilessly pounded parade grounds. A number of displayed items were captured during the decade-

long struggle against the Soviet occupation of Afghanistan. Some of these items were turned on their former owners by the Mujahideen, others such as the parts of Afghan government and Soviet aircraft, were suitable for nothing more than trophies after they met their fate. Though not itself present, a model of the 'Zamzama Gun' forever enshrined in literature thanks to Rudyard Kipling, is also displayed inside. More commonly known to Pakistanis as the 'Rani Top', the monster cannon and its history, is perhaps indicative of the relationship between present-day India and Pakistan. Unsurprisingly after three wars with India, there are a significant number of captured Indian weapons and related 'militaria'. This should not cheapen their worth as all the wars were hard fought affairs, especially on the ground.

Of note is the uniform jacket of Field Marshall Sir Claude John

Eyre Auchinleck, (GCB, GCIE, CSI, DSO, OBE), the Commander-in-Chief of the British Indian Army from 1943 onwards. He is incredibly underrated as a military figure but was a very competent leader, respected by his troops and enemies, (at least those in opposing armies if not the cut-throat and treacherous world of the British Army officer corps). In personal terms he was a self-made man having been born into poverty in the home of the British Army, Aldershot, but through sheer hard work and determination he rose to the top of his profession. He laid the groundwork for Montgomery's victory against Rommel at El Alamein, though neither Montgomery (who resented Auchinleck for being a British Indian Army Officer – an honour he was denied due to his poor performance at RMA Sandhurst) nor his supporters would have ever admitted to that. After becoming the C-in-C of the British Indian Army in 1943, he en-

gineered the logistical supply that allowed General Slim, (another officer of the British Indian Army) to eventually defeat the Japanese in Burma. After the war he helped prepare the Pakistani and Indian armies for independence, despite opposing the manner in which Partition was handled. In this he clashed with Mountbatten the last Viceroy of India, (who was no friend at all of the fledgling Pakistan), and retired. Standing next to his uniform he was by no means a tall man, but he more than made up for his lack of stature by being inherently competent, (despite the slandering). To see his uniform displayed in the museum is a reminder of a great and honourable man, who played a significant role in establishing the Pakistani Army. In some respects he is the father of the army, so to have his uniform on display is all the more significant. Another touching item on display is a Pakistani flag that survived the fall of Dhaka in 1971 during the third Indo-Pak War. It was kept safe by a railway worker through his imprisonment by the Indian Army until he was repatriated back to West Pakistan. The efforts he went to, to ensure the flag remained safe, are recognised by it being displayed in the museum. Two other inter-

nal exhibits of note are the limousines of ex-Presidents General Yahya Khan and Field Marshal Ayub Khan. They were both were in office during the 1965 and 1971 wars with India respectively. Both are American Cadillac cars and in virtually mint condition. Visitors should not be surprised to see the museum staff painstakingly removing every speck of dust on these immaculate vehicles. Along with the Nishan-e-Haider gallery, which celebrates the bravery of those that made the ultimate sacrifice for their country in exceptional circumstances, these exhibits are perhaps the things that should be of particular interest to a visitor. One final curiosity is the hunting bow and arrows of Tipu Sultan 'The Tiger of Mysore'. Though Mysore is in modern day India, Tipu Sultan's ferocity in battle, religious piety, and high standard of governance and tolerance (despite propaganda to the contrary), have proved an exceptional ex-

ample ever since. The intrepid WWII British agent Noor Inayat Khan, who was captured, tortured and executed by the Nazis in France, is said to have been one of his descendents. Whilst these are just some of the items related to the great men of history connected with Pakistan, the external exhibits are no less arresting.

The external exhibits again span a time well before Pakistan was even a notion. There are a number of cannons that date from the 'Indian Mutiny' of 1857, but on the whole exhibits from the post 1947 period, especially from the 1965 and 1971 Indo-Pakistani Wars, dominate the grounds. Medium to large calibre artillery guns are arranged in front of the museum, having long since been replaced in service. There is a good selection of tanks and the Sherman, Chaffee and Patton tanks that took part in the 1965 war are well represented. These were used in the

fierce battles of Chawinda and Assal Uttar in the 1965, the two largest and fiercest clashes of armour during the war. The loss of irreplaceable Pattons was so great at Assal Uttar that they were replaced by the truly horrendous Chinese Type-59s shortly after, but Pakistan required tanks and they were the only option. Also present are the Sexton and Priest SP artillery vehicles that equipped the Pakistani Army, (and indeed the Indian Army) during the wars. In PA service they have long since been replaced by the M-109 and M-110, but these WWII vintage weapons gave a good account of themselves in 1965 and 1971. There is also a Bell-OH-13 observation and liaison helicopter plus a Cessna OH-1 Bird Dog, on display. The diminutive Ferret armoured car near the main gates, was actually used by the Frontier Corps to check smuggling along the Pakistani/Iranian border. A look inside the open hatches adequately demonstrates just how cramped the car was for its two-man crew.

Of note though are the captured Indian vehicles that date from both wars. The captured Indian Mahindra jeep is particularly interesting as the manufacturer's plate is still clearly visible, and shows it

was captured by the 6<sup>th</sup> Baloch Regiment, in 1971, the year of its manufacture. Some of the captured jeeps were fitted with recoilless rifle anti-tank weapons which proved deadly to tanks in the cultivated fields of the Punjab. The antiquated looking, WWII era T-6 APC was despite its age, still a fairly competent 'battle bus'. It was captured in the Lahore sector in 1965, the scene of fierce fighting. The AMX-13 and Sherman were both captured during the Battle of Assal Uttar, a clash most often remembered for the needless loss of a great many Pakistani Patton tanks in the cultivated fields of the Punjab plain. Though like most of the displayed vehicles the AMX-13 has been given an all-over coat of olive-drab, the Sherman has been spared, allowing it to be positively identified as belonging to the 9<sup>th</sup> Horse, and allotted to the 4<sup>th</sup> Mountain Division during that battle. If the Pakistani thrust that led to Assal



Uttar proved to be the graveyard of Pakistani Patton tanks, it did one other thing, it stalemated the war in Lahore sector and forced the focus of Indian efforts north. This led to the fiercest and largest tanks battle of the war, the battle of Chawinda, and it was during this period of the war that the Indian Centurion on display was captured. The Centurion is probably the best British tank ever made, but that did not stop them being decimated in terrain that was more akin to Normandy's Villiers Bocage in 1944, than an open plain normally desired for tank warfare. Opposed largely by Sherman and some Patton tanks, as well as infantry wielding anti-tank weapons, the Centurions were stopped dead in their tracks. Though it cannot be known for certain what knocked it out, the turret side penetrations and shell that ricocheted into the engine compartment, effectively brought the career of the captured example

to an abrupt end.

The museum may in the future be moved to Ayub National Park in an effort to make it more 'visitor-friendly'. As it is, it is a very well run museum that does credit to the Pakistani Army. The only real criticism that can be made is that the application of olive-drab over the vehicle's markings has taken away some of the essence of the exhibits if not spoilt them somewhat. Thankfully not all have had an additional light-grey camouflage pattern very roughly applied. All in all, the museum should be on the list of places to visit for anybody in Rawalpindi.

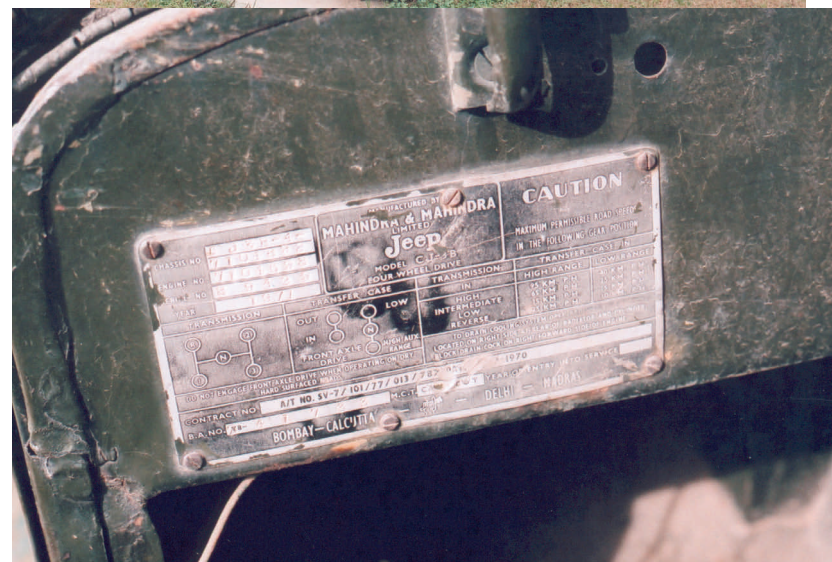


*Museum images on next five pages*



**Top left:** The resident AMX-13. The fine layer of moss can be seen quite well as can the exhaust pipe. Though it is not possible to see inside the tank, there does not appear to have been much room in the turret. Many were captured by the PA and hence can be found displayed throughout Pakistan. **Top right:** A Indian Centurion which was captured during the 1965 war. **Bottom left:** A close-up of the penetration of the round that knocked out the Centurion. The round penetrated the side and ricocheted into the engine compartment, bringing the Centurion's fighting days to an end. The crew would most likely have survived the impact and bailed out. **Bottom right:** The M-24 Chaffee light tank in its unusual and non-standard camouflage pattern. There are some small areas of rust here and there but the tanks is likely to have been immobile for a number of years so restoration would be possible but prohibitively expensive.





**Top left:** The diminutive Ferret near the gate is not ex-PA but most likely ex-Frontier Corps. It was used to combat smuggling along the porous Iran-Pakistan border. An open hatch allows visitors to see the very cramped interior. **Top right:** A Willys jeep (CJ-3B) that was captured in 1971. Once armed with an M-401 106mm recoilless rifle it was a formidable combination of small size, mobility and firepower. Both sides used them to great effect. **Bottom left:** Looking rather worse than the other exhibits this jeep was produced by Mahindra Ltd of Madras India. It was brand new when captured by the 6<sup>th</sup> Baloch in 1971 but does not seem to have stood the test of time. **Bottom right:** The plate identifying the captured jeep to be an Indian produced copy of the ubiquitous Willys jeep. It was manufactured by Mahindra Ltd of Madras and accepted into service the year it was captured (1971), by the 6<sup>th</sup> Baloch Regt'.





**Top left:** Captured HMG **Top right:** A Japanese mortar captured by Allied troops during WWII. **Bottom left:** A 75mm recoilless rifle of the type used in the closing stages of WWII. **Bottom right:** 'Model of the Rani Top' - The model of the Zamzama Gun or Rani Top that was woven into the fabric of the history of the Punjab.





**Top left:** The sole M-47. The Pakistani service of the M-47 was overshadowed by its successor the M-48. The rather distinctive turret was actually that from a T42 medium tank. Iran used the type in considerable numbers setting up a re-build factory in 1970-2. 147 PA M-47s were up-graded to the 'M' standard in Iran. Some M-47Ms may survive as turret-less AVLB vehicles. **Top right:** The M-48 with its 'Dalek' like turret. Its 90mm and thick armour were a good combination. Sadly for the PA it never lived up to the exaggerated esteem in which they held it mainly due to the battle of Assal Uttar in 1965. Iran helped Pakistan modernise 145 M-48A1s to M-48A5 standard in the 1970s. Some were converted to AVLB vehicles and may yet survive. It was replaced in service by the Chinese supplied 'T' series tanks. **Left:** Russian Aircraft Trophies - during the war against the Russians a number of Soviet aircraft were shot down by PAF fighters. Some parts were taken to display as trophies and are present at the Army Museum.





**Top left:** The museum's second Sexton has had its 25-pdr removed and the opening plated over. It may have been used as some form of command vehicle but there is no indication of this to be found on the vehicle itself. **Top right:** A frontal picture of the IA Sherman. The multiple hits are clearly visible with a distinct scar on the turret front. The type of weapons used to inflict the damage is uncertain but the large turret side penetration may well have been another tank. **Left:** The rather awkward and antiquated looking T-6 was still effective in moving infantry about the battlefield in 1965, but the protection was by then totally inadequate. Its top speed of 37mph meant it could still keep up with heavier armour though.



## Opportunity Missed due to political Wrangling

*A series of seminars on the Kashmir War of 1948 was sponsored by ISPR during 1990. These seminars provided an opportunity to the veterans of the past wars to recount their valuable experiences, along with various politicians who voiced their opinions on the subject matter. The first seminar was held in Rawalpindi on 30th June 1990, and transcripts of this seminar were published by ISPR in a special publication. These transcripts are being reproduced here for the readers who are interested in learning more about the 1948 Kashmir war."*

**SEMINAR** at Lahore held at a local hotel with Lieutenant General Retd Mohammad Azam in the chair and Dr. Mohammad Rafiq, former Vice Chancellor Punjab University as chief Guest.

Brigadier ( Later Major general ) Riaz Ullah gave an introductory talk about the ISPR Writers, Forum on Development of Military Literature. He said that our adversary in the past wars was bigger than us in size and would remain bigger in the future also. To face such an adversary we would have to associate the general public with defense matters. Literature could play an important role in inspiring and motivating the people to rise to the occasion when need be. Brigadier Riaz ullah also presented an overall view of various operations of Kashmir War.

### ROLE OF THE 'LASHKARS'

Brigadier mohammad Ishaq was the next speaker. He participated in the War of liberation in most all major sectors of Kashmir except Tetwal. He also had the honor of having under his command Lashkars belonging to all main tribes of Mahsud, Waziri, Dir, Suleman Khel, zardan Orakziri, mahmand, Ghilzai and many more. He did not agree with those who thought that Lashkars were just a liability, achieved nothing and took away most of their ammunition back home. He admitted that there was some truth in the complaint that the tribesmen took some of

their ammunition out of Kashmir but, he added, " at least some portion of it was certainly used against the enemy and with this they achieved result which were satisfactory. If a regular soldier inflicted one casualty per hundred rounds expended, it was considered a good average. The tribesmen on the other hand, usually fired from such a close range and with such care and accuracy that he often inflicted one casualty in just 10 rounds fired out of a hundred. If then he saved 90 rounds for himself we in fact lost nothing thereby. The other point which made the tribesmen some what unpopular was his reluctance to behave like regular troops. He avoided like poison getting himself involved in long drawn-out actions such as deliberate defense or a set-piece attack against well-fortified defensive positions held by the enemy.

The superiority of tribesmen

lies in his independence and mobility. Therefore he roams around and patiently watches until he finds a suitable target and then pounces upon it with lightning speed. In their own country, the tribesmen fought as snipers and raiders, harassing enemy by their deadly sniping. They were masters in the art of ambushing troops and transport. They could also attack isolated posts/pickets. While handling Lashkars in operation I kept their basic traits, qualities and technique of fighting in mind and made best use of them and achieved reasonably good results. In spite of these limitations, by and large lashkars proved to be of great value to the Azad Kashmir freedom fighters in their struggle to liberate their homeland. The territory liberated, which is now incorporated in the Azad Kashmir, could not have been liberated without the active support of tribal lashkars".

Brigadier Mohammad Ishaq quoted examples from various sectors and narrated events which spoke of the usefulness of the lashkars in the Kashmir War. He recounted that after taking over command of the Nowshera sector from Major Rakhman Gul on the 28<sup>th</sup> Feb 1948, he developed small groups of lashkars and raiding parties to ambush and attack the advancing enemy towards Jhangar. The Indians were forced to disperse their troops for mounting pickets astride their route with the result that it took them twenty days to cover a distance of ten miles from Nowshera to Jhangar. It allowed Azad forces enough time to organize defensive positions around Jhangar to prevent further advance towards Mirpur and Kotli.

Concluding his speech, Brigadier Ishaq said: "As a matter of interest I may mention here that with the exception of the tribal lashkar no volunteers came from other provinces to participate in the Kashmir Jihad. A group of 200 men, consisting of ex-servicemen from Rawalpindi, came to Uri Sector. They did not feel comfortable and left the area after 3 days without even informing the local commander. A battalion consisting of 500

men, raised by Ahmedis came to Bhimber. Instead of fighting they started indulging in converting locals to their faith, thereby creating serious resentment among the local people. The battalion had to be disbanded and sent back to Pakistan.

## ATTITUDE OF BRITISH COMMANDERS

Brigadier Amjad Ali Khan was serving as brigade major of 7 Division Artillery in 1947. He recalled that all the key positions in the Pakistan Army at the time were held by British Officers. Even the unit commander were British. When Indian Army was busy grabbing the territory of Kashmir, Pakistani officers were being warned that they could be court-martialed if they went across the borders or sent any ammunition for the Kashmir war. Brigadier Amjad Chaudhri opined that a lot of time was wasted in political discussion and since no



firm decision was taken by the civil authorities and high-ranking British officers the opportunity to liberate Kashmir was missed.

Major General Retd Khadim Hussain Raja was a captain in 1948 and serving with 8 medium Artillery Regiment. He also had the opportunity to command 800 men of Mahsud lashkars. Later on, he assumed duty at his guns and provided fire cover to infantry in many operations. He related an interesting event. " It is a matter of routine procedure that observation posts are established ahead of the guns during War. In Kashmir, the sector I was operating in, was mountainous and the terrain dictated new terms and conditions. I reversed the procedure and took the guns ahead of the observation post which was located on the hill-top from where a better view of the enemy activities could be obtained.

## CEASEFIRE A SETBACK

General Khadim gave details of artillery actions during Pandu operation and said that the orders for ceasefire came at a time when the morale of the troops was at its peak and they were all set to go in attack as part of " Operation Venus". The ceasefire orders created unrest and disturbance among the army. The Rawalpindi conspiracy Case was the off-shoot of those feelings. Major General (retd.) Sarfraz Khan was commanding 2/14 Punjab in 1947 at Peshawar. Speaking on the occasion he bitterly criticized the role of the British officers and opined that the fate of Kashmir War would have been different if any of the C-in-C was other than a British officer. He said that there was a tacit understanding between the Cs-in-C of both the countries and that took advice from Lord Mountbatten who had an inclination towards India. General Sarfraz narrated the operation of a Swati Lashkar at Sabaz kot feature and paid rich tributes to them for demonstrating miraculous bravery by overpowering the Indians with the help of swords and daggers only.

## Capt. Zafar 'Shaheed'

General sarfraz also mentioned the courageous deeds of Captain Zafar Iqbal who was the first martyr of his unit and was awarded Hilal-e-Juraat posthumously. He was commanding a company and attacked the enemy a day before Eid with a view to presenting to his colleagues the "gift of liberated area ". General Sarfraz talked of one Kashmir Khan who according to him, was a mysterious character. Donned in green clothes, he always rode a white horse and traveled with lightning speed. Gen Sarfraz proposed that details about Kashmira Khan and such-like characters be collected and published for information and motivation of the coming generations.

## RECOMMENDATIONS DELAYED

Brigadier Mohammed Shafi was quite young in 1947-1948. He

participated in Jihad-e-Kashmir zealously and still taking active interest in the struggle for the liberation of Kashmir. While addressing the seminar, he termed Jihad-e-Kashmir 1947-48 as a war of survival for Pakistan which was fought without any planning or recourses. He wondered why Pakistani Commander-in-Chief took three months to submit his recommendation about Kashmir after the Indian Defense Minister had declared in the parliament that the Indian army would clear the situation in Kashmir very soon. By the time Pakistani C-in-C submitted his recommendations the Indian army had started its summer offensive, already captured Rajauri and advanced in both the North and the South. Lieutenant General Mohammad Azam Khan Retd, who was the chief guest of the seminar, said that the inordinate delay in holding seminars on the Kashmir War had caused great

loss to the cause of defense. People did not know what sacrifices their elders had made during the early years of our history. He congratulated the ISPR for taking steps to preserve the memories of Jihad-e-Kashmir for onward transfer to the coming generations. He said that Pakistan was a blessing for the Muslims of the sub-continent. They could lead a prosperous life in the country of their own. Had there been no Pakistan, the Muslims would have been suppressed under the sheer weight of Hindu majority. He termed the Pakistan Army as the best in the world and hoped that it would continue serving the nation and keeping its banner flying high.

## NEED FOR RESEARCH

Dr. Mohammad Rafiq, former Vice Chancellor of Punjab University and Chairman South Asia Study center, in his presidential address praised the ISPR for arranging seminars on Kashmir War. He termed the seminar “ a high-powered gathering of civil intellectuals and military experts” even seen together. He pointed out that the main reason for lack of literature of facts and figures. He was of the view that existence of controversies

never proved to be impediment at arriving at the truth. Controversy always led to debate and discussions which in turn brought to the limelight many facts which otherwise would remain hidden. Dr. Rafiq said that it was high time scientific research on historical, political, social, national and international affairs was arranged so that proper guidance could be provided to the people concerned. He revealed that according to a survey conducted by UNESCO, seven lac books are published every year in this world. In India forty to fifty thousand books published while in Pakistan the number of books published annually is not more than seven hundred. He emphasized the need for encouraging programme for writers on various issues which, according to him would be of great help in cementing the ties between the various cultural units of the country.



## Of a Hero and a Traitor

The historic decision by the government to handover the remains of Flt Lt Mati-ur-Rahman, of Pilot Officer Rashid Minhas Shaheed Nishan-i-Haider fame, and the hero's welcome given to Pakistan's traitor in Bangladesh has undoubtedly brought out a lot of emotion to the forefront, in both countries. A debate in true sense of the phrase 'one nation's traitor is another's hero' has ensued. For many Pakistanis, allowing such facilitation for a traitor is simply absurd and having his grave here was an important part of Pakistan's military heritage and a trophy of sorts to remind of a traitor's failed mission. Pilot Officer

Rashid Minhas' younger brother Anjum Minhas, a senior banker, expresses his family's reservations and says "I don't think the government made the right decision in agreeing to return his remains. They gave back a traitor! It seems the government is trying to befriend everyone regardless of self pride". However many Pakistanis are of the view that it was a good decision and better relations with Bangladesh and leaving the past behind is more significant than where Mati is buried. Moreover many feel it was the right of Mati's family and his nation to honour him as a hero and bury him in their homeland. A senior ISPR official told this writer that "Even according to the Geneva Convention, it was their right to demand the remains and our obligation to return them".

For years the Bangladeshi nation had grievances about the fact that their hero lay in a foreign land and had reservations about the biased treatment to his grave. Some quarters coined a claim that Mati

was buried "in a graveyard meant for fourth class employees", of which there is no evidence since there is no concept of a separate graveyard for 'fourth class employees' in Islam, Pakistan or the PAF. His elder daughter Mahim along with her husband and son were allowed a visit to the grave at Masroor base in 1994. However, in Bangladesh the hope to have Mati's remains buried in his land kept growing and in 2004-5 turned into a complete movement when Mati's wife Milli Rahman appealed to the prime minister of Bangladesh. Coincidentally the government of Pakistan had already initiated efforts to improve relations with Dhaka, most openly since General Musharraf's visit to Bangladesh in 2002 when he had expressed his regrets for the events of 1971. Hence Khaleda

Zia on her trip to Pakistan in February this year formally appealed to the government to allow Bangladesh to take the remains of Flt Lt Mati-ur-Rahman to his homeland. And the government of Pakistan after slight contemplation agreed.

Therefore a delegation from the Bangladesh government's Ministry of Liberation War Affairs along with Mati's elder brother came to Karachi to receive the remains of their hero Flt Lt Mati-ur-Rahman and on the evening of 24 June flew to Dhaka where PM Khaleda Zia received them in a formal ceremony. Ministers and senior military personnel along with Mati's friends, wife Milli Rahman and younger daughter Tuhin were present and his coffin was taken to the National Parade Square where it was kept

for public viewing and funeral ceremony arranged for the next day. The burial took place at the Martyred Intellectuals' Graveyard in Mirpur with state honours. Milli Rahman, during an interview over the phone from her home in Dhaka was all praise and said, "I am extremely thankful to the government of Pakistan and General Musharraf, it was very kind to return my husband's body". And recollecting her memories of the city of Karachi she said, "It was very nice and we used to enjoy a lot!"

All this recent hype has undeniably refreshed the nation's memory of the legendary Rashid Minhas and his fateful final flight. The old questions regarding 'what really happened?' have been revitalized. 20 August 2006 would mark 35 years since that historic and controversial event at Pakistan's largest Air Force base, Masroor, in Karachi on a bright summer Friday morning. Young pilot officers undergoing jet conversion at the No. 2 Squadron on dual seater Lockheed T-33As were taking off

according to their flight schedules. 1130 Hrs was scheduled as take off time for 20 year old Pilot Officer Rashid Minhas, on his second solo flight on the fighter jet trainer.

The country had been suffering much turbulence in the Eastern wing since early 1971 and situation had become much worse after the Army operations in March. In spite of such political unrest in the background West Pakistan wasn't quite on a 'red alert' yet. Bengalis in various units of the army in East Pakistan had begun to revolt, and as precaution and a rather 'trigger-happy' decision, the PAF decided to ground most pilots of Bengali origin and assigned them ground jobs. Among such pilots at Masroor was one Flt Lt Mati-ur-Rahman, PAF-4367.

He had passed his intermediate from PAF College Sargodha, joined the PAF Academy and got commissioned in 1963, completed the jet conversion with No.2 Squadron and served at Risalpur and Peshawar before being posted to Masroor. With the paranoia among Bengalis growing each day and the government's attitude towards Bengalis and East Pakistan adding fuel to the fire, Mati must have nurtured revolting emotions for (West) Pakistan, its government, citizens, army, navy and the very air force which had trained and sustained him for a decade, and the attachment with his fellow Bengali people and their suffering, actual or exaggerated, overshadowed his devotion and patriotism to Jinnah's Pakistan, which was carved out by all Muslims of the subcontinent,

and he made up his mind to desert his service, take up arms, wage war against Pakistan and defect to India, the archrival then taking full advantage of the internal turbulence and supporting Bengali militants.

Air Vice Marshal (Rtd) Sadruddin Hossain (ex-PAF), and former Chief of Air Staff, Bangladesh Air Force, narrates to Usman Shabbir and Mazhar Jameel of [www.PakDef.info](http://www.PakDef.info) in an interview that, "After the 25th of March I came across late Matiur Rahman in Dhaka while late AVM (then Wg Cdr) M. K. Bashar and I were looking for Bengali Air Force men and officers willing to join the war of liberation. He was on leave from his unit at PAF Base, Mauripur, Karachi. Mati, without any hesitation whatsoever, instantly agreed to join us. That was 8th May, 1971 and we asked him to be present at a secret meeting in my house in Monipuripara near Tejgaon airport the following morning at 9 am. However, we were very surprised to see his father-in-law turn up in my house at the appointed

time instead of him, only to inform us that Mati had taken an earlier flight back to Karachi and that he would not be able to attend the meeting. We did not hear of him until the news of his failed attempt to hijack an aircraft to India. I was not surprised to hear about his attempt to get across to India and try and join the war efforts. I believe that his failure to attend the meeting on 9th May was, to a great extent, pressure from his in-laws' side who were probably more interested in his safety than anything else. But, by the way he had reacted to our proposal to join the freedom fight on 8th May, I was not surprised that he would make an attempt to join us. He was truly a freedom fighter. I do not think he had any contact with the Mukti Bahini at the time of his attempt to escape and that he



was acting entirely on his own.”

Having been grounded, Mati was designated as Deputy Flight Safety Officer. On 20 August he finally executed his plan to hijack one of the T-33s piloted by under training, young, inexperienced and subordinating pilot officers. Therefore when Rashid Minhas' T-33 appeared on the taxi way he waved and signaled him to halt. With the military training being such that a senior is to be obeyed at all costs, Minhas, although confused by an out of procedure act by a senior officer in charge of safety operations, must have obliged either out of trademark military subordination, or in true student fashion, paranoia regarding his flight procedures etc which are strictly assessed and add up to the performance record during a course. Within a moment Mati

managed to slip into the rear cockpit of the aircraft and prepared for take off without clearance from the ATC (Air Traffic Control). Before Rashid could conceive Mati's plan and brace himself to handle the surprising situation, the aircraft was ready for take off. Rashid immediately sent a signal to the ATC over the radio which confirmed his call sign 'Bluebird 166' and a single declaration "Hijacked!" Taken aback by the claim since 'hijacks' are a rarity at military bases, officers at the ATC requested confirmation and Rashid repeated the same message. That was all the contact Rashid Minhas was able to make with the ATC as the T-33 took off and made its way eastward. Following this two pairs of F-86s on ADA (Air Defense Alert) were scrambled to intercept the T-33, but returned unsuccessful.

Mati having the shock element to his advantage had managed to take control of the aircraft and tried to sever communication and during flight Rashid managed to repeat the same distress call once more. Hardly five minutes may have

passed since Mati's waving gesture on the tarmac to the time when they were airborne without permission to when Rashid was clear they were headed eastward, to India! Within seconds the young pilot assessed the situation, and made a quick definite decision. He wouldn't let the defecting traitor to Pakistan succeed in his plans. It was his aircraft and he was responsible for it, and it was his call whether he would take the T-33 forward, back, up or down. It wasn't possible to steer back to base and going forward meant becoming a POW, letting disgrace fall upon the nation and PAF for having an aircraft hijacked from an active base in broad daylight, thus making his enemy's plan successful. And above all, he was a soldier and was expected to put up a fight. He made up his mind to do his

best to prevent the aircraft from crossing the border.

They had taken off around 1130 Hrs and in less than ten minutes were merely 35 miles short of the Indian border. A travel of another few minutes would have taken them to India's Jamnagar airbase, Mati's destination. Rashid began trying to gain control but the more experienced Mati overrode his inputs each time and the struggle continued creating severe aircraft turbulence. Mati was flying at treetop level to avoid radars. It was at this point, some ten minutes into the flight that the final moments arrived which later left many jaws dropped, many brows raised, many questions unanswered, many eyes teary and many chests wide with pride, the T-33 (No. 56-1622) crashed in the marshy rural

areas near Shahbandar south east of Karachi. Rashid's younger brother Anjum Minhas recalls, "According to the PAF investigation team's findings eye witness villagers had revealed that the plane was shaking violently and went up and down rapidly before crashing into the ground". Gp Capt (Retd) Cecil Chaudhry SJ, hero of the air wars of 1965 and 1971, who had been a part of the investigation team under the then Commander PAFB Masroor Air Cdre Nazir Latif, confirms this and says, "The aircraft was traveling at very high speed, and Rashid was (apparently) trying to push it down while Mati-ur-Rahman tried hard to maintain control and pulled up, this created turbulence. And eventually Rashid succeeded in his courageous action". Asked if Mati's intentions were clear to the base authorities right after the crash he revealed, "Absolutely, no question about it. Being grounded he had no business taking off unauthorized with an aircraft. This made it very clear".

Popular knowledge regarding the incident

is based on the PTV drama by Late Shahzad Khaleel from the 'Nishan-i-Haider' series. However logic dictates that facts were slightly dramatized for screen and perhaps based only on the superficial meaning of the official citation. Certain highly regarded analysts with extensive research and analysis explain that Rashid must've initially fought valiantly for control fully aware that flying very low even slight turbulence could prove fatal. During the struggle whether the aircraft was pushed down by him on purpose realizing the efforts to gain control were in vain, or whether the crash resulted due to the heavy turbulence created by Rashid (trying to gain control), becomes somewhat synonymous. In either case Rashid is rightly credited with being responsible for the crash

of his aircraft in order to avoid crossing the border and to render Mati's hijack attempt useless. Rashid did exactly what was expected of a trained fighter pilot, acting bravely in the face of extreme danger and making a quick and correct decision regardless of personal safety while being fully aware that the decision could mean certain death. The fact that he was a boy of just 20 makes it all the more amazing. It's true Rashid's action made all the difference and we can well imagine how ridiculous things may have been had he given up without resistance. Rashid remains a hero for acting the way he did, making the sacrifice that he made and his Nishan-i-Haider is in no way any less deserving than any other. People often wonder how Mati might have managed to just 'hop into' the T-

33 and why Rashid didn't resist on ground right away. There could be a few possibilities, most obvious being the surprise element and extremely rapid unfolding of events, and there could be an intimidation angle. So again, it was Rashid's far sightedness and quick thinking that worked, getting overpowered on the tarmac would have still resulted in Mati taking off with the plane. Getting airborne bought Rashid time and opportunity to put up a fight and neutralize his plans.

For this, Pilot Officer Rashid Minhas, PAF-5602, born on 17 February 1951 in Karachi, schooled at St Patrick's High School and commissioned on 14 March 1971, martyred at age 20 and buried with full military honours at a military graveyard off Shara-e-Faisal in Karachi, was awarded the nation's highest award, the Nishan-i-Haider and to this day remains its youngest recipient. Meanwhile Flt Lt Mati-ur-Rahman, who was to be later declared a traitor to Pakistan, was buried in a graveyard at Masroor base amid confusion

regarding the actual circumstances under which the crash had taken place. During the phone interview Mati's wife Milli said that "I was fully aware of my husband's plans. But after he left on the 20th, when there was no news till much later, I thought that maybe he had been arrested and was under interrogation. But later I found out that he had crashed". Mati had sent her and their daughters to the Indian Consulate for refuge a day earlier and they returned to base only after receiving news of the crash. Asked whether the PAF and the base environment were hostile towards them after the incident she said "No, they were cooperative and I was also shown my husband's body. I stayed almost another month and left for Dhaka in late September". When East Pakistan



became Bangladesh after 16 December 1971, the new country honoured its 'liberation war' heroes and bestowed the country's highest military award the 'Bir Sreshtho' meaning valiant hero, posthumously on seven military personnel who had revolted against Pakistan to join the Bengali liberation efforts. Among the seven was Flt Lt Mati-ur-Rahman, henceforth declared a national hero of Bangladesh bestowed with their highest military award which ironically, in international terms, makes him stand in the same league as Pilot Officer Rashid Minhas Shaheed, in decoration.

If a hero is a person noted for courageous endeavors or nobility of purpose, or one who stands by ideals and acts bravely or has risked or sacrificed his or her life, then perhaps by definition of the

word both men have been heroes. Only national perspective adds the good and evil stamp. In either case, to us our heroes and to them theirs!

**Note:** *Special thanks to all unmentioned and mentioned analysts whose guidance & help was most vital for this compilation. A slightly modified version of this article was published in the August 2006 issue of Newslime magazine.*



*Pilot Officer Rashid Minhas*



*Flt Lt Mati-ur-Rehman*



*Grave of Mati-ur-Rehman at Masroor Air Base — 1994.*

## Memoirs of a Legend

The legendary name of G/C (retd.) Saif-ul-Azam is well known to PAF and Air Warfare enthusiasts around the world. He participated in the 1965 war as Flt Lt. and flew 12 strike missions, including one in which he shot down an Indian Air Force Gnat. He was awarded a well deserved SJ for his efforts. Deputed to Royal Jordanian Air Force (RJAF) during 1966, he also participated in 1967 Arab-Israeli War, wearing RJAF uniform, and this time bagged a Mystere-IVA. After the destruction of RJAF he was moved to Iraq where he flew from H-3 air base and shot down a Mirage-IIIC fighter and a Vautour bomber. This gives G/C (retd.) Saif-ul-Azam a unique distinction of having flown with multiple air forces and shooting down multiple types of aircraft belonging to separate air forces.

*PakDef is grateful to G/C (retd.) Saif-ul-Azam for providing us with this write-up, which will no doubt going to be a fascinating read for PAF enthusiasts.*

**Usman Shabbir**

### Gnat over Sialkot Sector – 1965 Indo-Pak War

The Indo-Pak War in September'65 saw No. 32 Wing Commanded by Wing Commander Masood A. Sikandar positioned at Sargodha designated as Strike Command for ground interdiction both defensive and offensive across the border into India. No. 32 Wing constituted of 16, 17 and 18 Squadrons from Mauripur. They were known as the "Mauripur Sabres" throughout the war. My posting at that point of time was with No. 2 Squadron as an instructor. I was seconded to the 32 Wing and came to Sargodha on the 8<sup>th</sup>.

Around midday 19<sup>th</sup> September I was sitting in the alert tent listening to accomplishments of pilots who had flown missions the previous day against Indian convoys of trucks, tanks and equipment on

trawlers, moving towards the Pakistan border in the Sialkot Sector.

I had also flown one such mission on 17<sup>th</sup> and wondered at their wisdom of sending such convoys without adequate air cover. The whole convoy was stretched along the road bumper to bumper. The spacing between vehicles was so small that one could destroy or damage up to 5/6 soft skin vehicles in a single pass! We flew several missions that day destroying or damaging many. Anti-aircraft fire was generally small arms fire, one could actually ignore it. At about mid afternoon a flight of 4 x F-86s was scrambled from Sargodha to an urgent army call for ground support in the Chawinda sector of Sialkot. I was #4 of this element led by Sqn Ldr Azim Daudpota with Flt Lt Mujtaba Qureshi #2 and my flight commander Flt Lt SM Ahmed #3. On identifying the target we carried out if I recall correctly a

total of six attacks, including two rocket attacks. As we were preparing to exit when 4 Gnats jumped us. I was still recovering from the dive of my last gun attack when I could make out calls from the leader to the formation members. The transmission was garbled and I could not make out what he said. A section of 2 Gnats had got behind #3 piloted by SM Ahmed. Just then I saw 2 Gnats coming from my left trying to position behind me. I gave a call "Leader from Four, I am breaking off to engage Gnats". There was no response from anyone! I made a hard Chandelle type left turn to engage the Gnats. The height was around 1000 to 1500 feet. As I gained height and crossed over the Gnats, instead of reversing I instinctively converted my chandelle to a barrel roll, inverted I could keep them in sight. When I recovered from the barrel roll I was comfortably placed behind the #2 of the pair.

I reduced power and used intermittent airbrakes to remain inside the turn of the Gnat. I quickly adjusted the gun sight settings to the wingspan of a Gnat, (I had mistaken them for Hunters) laid the "pipper" on the aircraft and fired a very short burst, perhaps  $\frac{3}{4}$  of a second and immediately observed hits on the aft section of the aircraft. I recall flashes and pieces flying off and saw the pilot gently pull up and mercifully eject.

As I pulled up, the combat had occurred around 500 feet, I unexpectedly found the first of the pair of Gnats bang in front of me, slightly to my left and closing alarmingly. The Gnat probably responding to calls from his wingman appeared to have slowed down and was in a 20 degree bank. I was less than 500 feet and closing fast, the pilot had his head turned looking back and I "felt" our eyes meet. I recall he did not have his smoked visors down. All I had to do was to make slight adjustment of the controls and fire. At that point, I still cant figure out, even after 40 years, what came over me! I banked away without opening fire. Could it be "looking" into the eyes of a fellow human being who appeared so helpless at that point, afraid of being hit by debris of an

exploding aircraft or being fearfully low on fuel. Today, I am a very happy man, completely satisfied with my action on that day, although many friends chided me for this decision.

I headed towards Sargodha at 500 feet. I could hear my leader asking other members of the flight if they had seen me eject. He repeated the call and said "I hope Azam had ejected and is safe". I was very moved by his concern for me and was desperate to inform him that not only was I safe but had also shot down an enemy aircraft. I heard #3 SM Ahmed's call telling the leader that he was hit and had lost his pressure instruments but as the aircraft was controllable he was heading for Sargodha. I also heard #2 Mujtaba give an all well call.

Low on fuel I decided to slowly gain height. While climbing I took off my mask to check on the microphone connection, the plug had come off. As I



reconnected the plug I had my transmitter functioning again. I joyfully informed my leader that I was fine and had shot down a Gnat. He was much relieved and directed us to land individually. At this point SM Ahmed requested me to give a chase up to the landing point, I declined politely, my fuel gauge was showing zero. I, however, had SM Ahmed on visual on his straight final. Suddenly I saw his left wing dip and the Sabre hit the ground short of the runway and explode in a ball of fire. I landed through the pall thick black smoke, parked the aircraft in the pen and declared to the ground crew that SM Ahmed was no more. Bad ending to a otherwise successful mission.

SM Ahmed had skilfully nursed a disabled aircraft only to crash a few hundred feet from the runway. I went to my tent without talking to anyone. In the evening I decided to go to the mess to try and forget the SM

Ahmed tragedy. As I approached the bar, I could not believe my eyes! The man, I thought had been killed in the crash was sitting on the bar stool nursing a broken wrist and a drink! It transpired that the ejection seat had somehow miraculously fired on impact and SM was thrown clear of the exploding aircraft.

The SM Ahmed incident had consolidated the belief in my faith that life and death is in the Hands of Allah and that death is predestined.

### **On deputation to R. J. A. F.**

It was in the month of November 1966 that I was sent on deputation to Royal Jordanian Air Force. Flt. Lt. M. Sarwar Shad was the second person with me. Our primary assignment was to organize fighter combat training for the young Pilots of the Air Force. The object was to prepare them for combat against the very professional pilots of the Israeli Air Force. The pilots of RJAF were very brave and willing to learn. So our task was much easier because, willing learners are mostly great achievers of success. The most benevolent King His Majesty (late) Hussein Bin Talal was a great inspirer

whose active interest in the Air Force, being a fighter pilot himself, generated courage and dedication to fight for the wonderful country.

During the period of our joining RJAF and the Arab-Israeli war of 1967 many interesting events took place which will take a long time to narrate. I will prefer to mention one, which pertains to Air Combat and briefly, speaks of the spirit with which the young Jordanians were armed with and the ease and comfort they enjoyed in pursuing their objective. Sometime in the month of February/March, I had a dream where I encountered a formation of Israeli Mirages. During this unusual dream combat I saw myself shooting down one of the Mirages.

The next morning, I narrated this to the pilots in our casual coffee break. Instead of laughing it out as a joke, as I expected, they took the event very

seriously and wanted to know and discuss the type and the manner of combat that had taken place. Obviously, I had no other option but to take up the subject for discussion. The subsequent half an hour or so was invested in revising various tactics of Air Combat and the whole subject of the dream nearly forgotten.

One of the pilots Lt. Ehsan Shurdom came to my office later the same day and said, "If you ever shoot down a Mirage I promise you a grand party and a very precious gift". This Lt. Shurdom had become the Commander in Chief of the RJAF later in his career.

Time passed and the operational training went on, the entire squadron was very enthusiastic and vibrant but for a few exceptions. By end May 1967 there was some talk about the military activities across the border in Israel. No one really paid serious attention because

such activities were regularly taking place anyway. On the 1<sup>st</sup> of June we were given some idea that there may be some trouble brewing in the Middle East.

## **"War Begins"**

Flt. Lt. Sarwar Shad and I were called by the Commander in Chief and asked what would be our position in case there was a war with the Israelis. We promptly volunteered our services while suggesting that opinion of the Government of Pakistan may be sought to regularize the matter. Jordanian Govt. obtained the opinion of the govt. of Pakistan. We were told that we could participate as volunteers and we should wear Jordanian uniforms. Obviously we were happy. Chance of a life time for a fighter pilot had arrived and we wanted to snatch this opportunity to put our hard earned experience and training to a real test.

The next five days passed with a lot of activities in preparing maps and profiles, all low level strike to known operational airbases in Israel. I was detailed to lead one "four aircraft" mission to strike Lod Airbase in Israel.

On the morning of 5<sup>th</sup> June I had reported

to the flight line and briefed my pilots, inspected the aircraft, strapped up and waited for the word "go". Here it seemed unusual to wait in the aircraft for a strike mission. I must mention here that the Jordan Forces were under the Joint command of the commander in Egypt and we had to wait for the decision.

It was about 09:00 hrs. I was asked to hand over the lead to a Jordanian Pilot and rush to the aircraft readied for Air Defense. I learned later that we were cleared by Pakistan to participate in air defense role only.

I rushed to the assigned aircraft and was strapped up in the Hunter on standby duties. There was excitement and also impatience. I had no information of what was happening other than the speculation of a war. About half an hour after I had strapped up,

there was a desire to do something. Sitting on the ground waiting for orders was really nerve wrecking. Then came the order for the strike aircraft to take to their mission. Two formations took off and headed towards the west. A few minutes later I saw six aircraft of Iraqi Air Force zoom past over our Airfield (Mafrak Air Base) heading towards Israel. Mafrak was probably the IP. The waiting seemed eternal. I was sure soon the Israelis would hit Mafrak as well.

### **First Mission: Shooting Down Mystere**

Soon came the hot news. We were ordered to take off. As many as we could, and as fast as we could. The enthusiasm that followed was worth recalling. Ever eager to get airborne, all procedures were given the back seat. My element was first to hit the sky. Four more followed. We heard the ATC give us the very bad news that Maj. Feras a very

close friend was shot right on the take off run and his aircraft caught fire. Later we learnt, he never managed to come out of the burning aircraft.

When airborne I was asked by the ATC to contact the radar for further direction. The radar station gave me a vector to intercept some enemy aircraft. Couple of more directions and vectors, then was told, there were too many aircraft in the battle and it was becoming difficult to identify the enemy from the lot. I was asked to be on my own. I understood the dilemma of the controllers and asked my wingman to remain close. The weather was hazy due to dust as it normally happens in the deserts. We could see with difficulty 2 or 3 miles around. I could not spot any enemy around us so I enquired from the controller if the Mafrak base was under attack. His reply confirmed my prediction. I quickly turned around and headed towards the base. As I reached about 4 miles from the base I spotted four aircraft in low level battle formation. The camouflage of the aircraft seen through the hazy weather reminded me of the Iraqi aircraft that had gone for the strike. I followed them for a while but soon I noticed they changed to loose echelon

preparing to pull up. I realized the blunder I had made, confusing Mysteres with Iraqi hunters. I quickly turned in to get behind the No. 4 and as he was turning right for an attack, I took a good burst when I had him snug into my sight. The 30mm had done the job. The aircraft caught fire, some debris started to fly and the aircraft crashed almost on the boundary fence of the base. To avoid the debris I had pulled up. When I turned, I lost the others. My wingman was very agile and he remained tight with me. I noticed some smoke on the west. With a second look I spotted two aircraft exiting with full power. I turned in hard but my wingman called bogey on the right. I asked him to break off and go after that while I took on to the two on my left. The enemy split and I was forced to go for the one at the rear. It only took me two tight turns (scissors) in full power to get behind the super mystere.



He maneuvered frantically turning hard and then reversing again and again. I had a difficult time holding my sight even for a second. I took four bursts with no sign of any hit. He was heading west towards Israel. On the fifth attempt, he loosened his turn and I had a clear sight on him. I was desperate. From about 600 ft. I squeezed the trigger for 2-3 seconds. The mystere caught fire on the right wing. He took off the bank and went down. The leader by this time had positioned to attack me. I was low on fuel and ammo. So I decided to disengage and turned away towards Mafrak. With so many aircraft milling around, "Discretion was better part of valour". I gave a blind call asking all aircraft airborne from Mafrak to head towards north of Mafrak. Ehsan Shurdom who was my wingman and had shot a mystere was close to me and joined up. Two more aircraft called in. One pilot Capt. Wasfi

ejected as he was shot.

*Joy stick of Israeli Mystere shot-down by Saif-ul-Azam*



*A panel of Israeli Mystere shot-down by Saif-ul-Azam over Mafrak Air Base*

I asked for permission to join. Mafrak cleared us to land and said the runway was fit for landing. Ehsan took to the R/T and spoke in Arabic to the controller. He wanted him to identify and also wanted to know if he knew the name of Ehsan's dog. The Jordanian controller then asked us not to land at Mafrak as the runway was badly damaged. The presence of mind and quick conversation on his dog's name probably saved us from the trap of the Israeli controller who cleared us for landing at Mafrak. Even at this height of tension Ehsan gave a call "You have won the gift, I promised". I responded "I have to shoot a Mirage". Shurdom insisted "Two mysteres are equal to one Mirage". I had to tell him to shut up.

We diverted to the International Airport at Amman, capital of Jordan. In the next hour or two we were surprised to meet His

Majesty King Hussein who came to congratulate us for the little part we had played. Air Marshal Rahim Khan also met us and asked us to “keep it up chaps”. The first day of the war thus ended with a heavy heart for the losses we suffered. We waited for further instructions.

### King's Decision

We remained at the Operation head quarters at Amman till evening. The Israeli aircraft came in several waves to bomb the International Airport. The runway was hit at several places. The aircraft also attacked and damaged some civil installations at the Airport.

During the raids I stood and watched the pattern of attacks by the Israeli aircraft. The bomb attacks were carried out in shallow dives, may be as low as 15 degrees. The bombs should have skipped but they did not. Though standing at a distance, I could appreciate that those

bombs must be some special types of bombs, which attained a near vertical position before impact. (In my report subsequently, among many other points I brought this to the notice of Pakistan and Jordan authorities).

In the evening I was surprised to see His Majesty again. He asked me to get into his car, which I promptly obeyed. We were on our way to the main hospital at Amman. Flt. Lt. M. Sarwar Shad was hospitalized and His Majesty wanted to see him. He personally went to his bedside and wished him fast recovery.

The next thing that happened is now a very fond memory of my life and will remain so for ever. His Majesty was on his way to Mafrak Airbase, nearly 50 km from Amman. Sitting next to him, I tried to remain calm and respectful. He treated me like his younger brother. He kept assuring me that a minor setback in a battle does not amount to the defeat in a war. His frank talks and encouraging advice inspired me so much that for a moment I was so moved that I felt it was worth fighting to the last drop of blood under his leadership. His leadership and his personality generated confidence, courage,

and hope. He informed me that he had already spoken to President Hassan al Bakr of Iraq to provide us with aircraft. So we should prepare to leave immediately for Iraq. Fresh hope was on the horizon. The war had not ended for us yet.

### Travel to Iraq

Late at night, may be at midnight, we loaded our gears in buses and trucks. The entire flying and maintenance personnel along with the compliments of other supporting branches were on their way to Iraq. The base where we were asked to report was called H-3, situated at the western border of Iraq. This place was once upon a time a pumping station of the oil pipe line that extended from Iraq to Haifa.

The night was cold as it always is in the desert. Cruising along, sometime awake and often dozing, it was a real rough ride.

The spirit was high and there was this anxiousness in most of us to get to the base and become a part of the war once again.

May be another hour or so short of our destination, H-3, the night seemed very long. But finally we could see the sun rising on the eastern sky. There was quiet in the desert and we could only hear the noise of our vehicles and time to time some Iraqi military convoys heading west. Most of us by now were preparing to take a break of packed breakfast that we brought with us. We saw ahead of us a considerable number of military transports dispersed on both sides of the road. These were Iraqi troops resting the night before their next trip to the Israeli border.

Suddenly we heard noises of aircraft engines and saw a formation of four Vatours (French light bombers) which flew right over our heads flying along the road to H-3. The

Vatours were in a low-level formation escorted by four Mirages just above, two on either side. We promptly vacated the transports and dispersed in to the desert so as not to allow large gathering targets, just in case the returning raiders decided to take a shot at us as targets of opportunity.

Twenty or twenty five minutes later that is exactly what happened. The exiting Israeli aircraft pulled up and carried out strafing attacks on three or four of the Iraqi transports along the road and continued on their westward exit. There were minor injuries of some troops and two vehicles caught fire.

It took us a while to gather around all the personnel. One senior commander argued that it was not very safe to travel during day and our destination was also under attack so we should make a 24 hour halt in the desert rather than proceed to our destination. The young pilots and some men did not like the idea at all. There was grumbling and arguments.

I being a lone foreigner tried to dissociate from their discussion and remained aloof. A while later two of the young pilots

approached me and wanted to know my intention. I had no choice but to take the position that I personally thought was correct under those circumstances. I suggested that since I was from Pakistan Air Force, I would have to continue my journey to H-3 as I had been ordered and I will take a ride with Iraqi transports plying up and down. As far as the others were concerned I could hardly comment more than just suggest to follow the orders of the contingent commander. During such a war situation they should remain disciplined. The young pilots, one of whom was Lt. Ehsan Shurdom, left frustrated and dissatisfied. It was a catch twenty two situation for me. On the one hand we should really waste no time in the desert on the other I could not interfere with the contingent commander's decision.

I was wondering and with my eyes closed thinking what to do.



Suddenly I saw a group appear, this time reinforced by several other pilots asking me to take over the command of the contingent. It was an embarrassing situation for me. How could I take over through a coupe d'état that too in the middle of a war, middle of a desert? I tried to argue out of it. But I was told firmly by them that they had decided to arrest or even shoot the commander and since I was the second senior most, I would automatically become the contingent commander. I requested them to keep their cool and do no such thing and allow me some time. They politely agreed.

I met the commander separately and was very lucky to be able to convince him that we must appreciate the emotion of the young pilots who were in high spirits looking for a return bout with the Israelis. I appreciated the genuine concern of the

commander for the safety of all personnel under him, and at the same time I explained, certain amount of risk had to be taken in a war situation. The commander was very fast at grasping the situation and he ordered all of us to board the transport for our destination. A serious situation was averted.

We reached H-3 safe and sound. The Iraqi Air Force people received us as if we were their brothers. We were treated with traditional Arab hospitality and fed profusely. The base commander took a decision to operate from Habbania Air base using the H-3 as a staging base. In the afternoon we left for Habbania which was about 80 kilometers short of Baghdad.

It took us quite some time to reach Habbania. I can not recall for sure how many hours it took. But it was very tiring especially after the hectic journey from Marfak to H-3 with an intermission of fun provided by the Israeli strafing on us as targets of opportunity. In the bus I was intermittently taking a nap and surveying the landscape. In the desert darkness all we could see from time to time, were clusters of lights in some villages where people probably did not bother to know

what was going on.

If I recall correctly, it was about 9 PM on the 6<sup>th</sup> of June that we finally arrived. Habbania was primarily a Hunter base with three squadrons of British Hunters. Two fighter squadrons and one squadron specially organized as operational conversion unit. There was another big runway a few kilometers away (better known as Plateau) where the "Badger" bomber squadron was housed. Both the bases were under the command of Col. Hamid Shaban (who later became the Commander-in-Chief of the Iraqi Air Force). We waited a good hour and a half or two before anyone could tell us anything about our disposal. I was terribly hungry. The shaking and bumping of the long ride seemed to have digested everything we had

during the day. More than the food, rest and sleep were the need of the hour. I went to my room, jumped in the bed and lay parallel to ground for nearly 30 minutes when a young Lieutenant of the Iraqi Air Force informed me that the food was ready and I should come with him. I was more interested in rest than food; still I reluctantly followed him to the officer's mess dining hall. There I learnt why there was long delay for our food and accommodation arrangements. We had arrived at the base with a large contingent of officers and enlisted men with a very short notice. The preparation of rooms, beds and food for a large contingent needed time. The sizzling food on the table was so attractive that we wasted no time to gobble up the meal to our heart's content. The officers of the Iraqi Air force whom I never met earlier were wonderfully hospitable and extremely friendly; true to the

tradition of the Arab people. We wanted to hit the sack (bed) so we begged apology and retired to our rooms. Hardly minutes elapsed; I was deep in sleep dreaming of a better day ahead.

A soft nudge and a whispering voice woke me up from my sleep at the early dawn. I turned to look "who could that be?". There he was, the same Lieutenant who came the night before. He said, I quote "Sir I have a message for you from the Base Commander. He needs four pilots to volunteer for the first mission to take off shortly and you are requested to lead". I had heard of such detailing of volunteers as party jokes in the Air Force before, but this was the first time, I was a part of it.

At the base we were hurriedly introduced to the senior commanders, Squadron pilots and other officers. No time was to be wasted. The need was to get familiarized with the maps, the operational areas, airfields and diversion airports. I suppose it is very easy for anyone connected with operational flying to imagine the tension generated by the shortcuts that we were thinking of. I was supposed to lead a mission of four aircraft to intercept a large formation of Israeli

airplanes planning to strike H-3. Intelligence had provided this information.

I immediately got down to brief the pilots. My formation of four consisted of 1<sup>st</sup> Lt. Ehsan Shurdom of Jordan, 1<sup>st</sup> Lt. Sameer and 2<sup>nd</sup> Lt. Mohammad of Iraq. A real International group with pilots from three different countries, meeting for the first time over a cup of tea. Not knowing anything about each other's experience and operational training standard, we committed to be comrades in arms. One thing was common in us. We were all prepared to engage the enemy, come what may. As Muslims we believed, life and death was in the hands of Allah and it was not necessary to worry about it. Empowered by this conviction we could launch our mission. Briefing finished, we sat down to get to know each other while breakfast was served.

The message finally came. We must immediately go to the aircraft and take off as soon as possible. The airmen were very quick and in minutes we were on our way to H-3. We climbed to about 25000 ft. in High-level battle formation. Strict radio silence was maintained, except for necessary calls to the radar controllers. "Expecting enemy attacks on H-3", said the controller as we approached H-3. I must confess here, that in spite of the zeal and desire to engage with the intruders there was an element of concern, some churning in the stomach, a bit of fear.

"Leader, there is a big formation pulling up over H-3, descend and engage them:", I heard the confident voice of the radar controller. We were just about 5 miles short of the H-3. I called for arming the guns and started to dive towards the Airfield. "Keep your eyes wide open and keep tails clear". We followed

the vector given by the radar controller. It was accurate. I spotted two Vatuors approaching from the west. "Right boys follow me and let us descend faster". I forgot that we were all carrying 230-gallon drop tanks. The aircraft was heavy and I was feeling a little uneasy. Soon I heard the voice of Ehsan Shurdom, "Sir how about punching the drop tanks?". I was relieved that the formation members were alert and I was being reminded of my mistake. Such a mistake should not have been made by the leader but I suppose I was more engrossed in locating other aircraft and forgot a very important procedure. I am grateful to the formation members for reminding me. That is the "team spirit and alertness" that must be displayed in difficult situations.

I was quite sure the Vatuors could not have come without escort. We had witnessed the previous day during our journey in the desert. Four Vatuors were escorted by four Mirages. My concentration on this matter resulted in forgetting to order punching of external tanks. This mistake had haunted me for many years. This could have resulted in

loss of our aircraft in combat. Anyway we jettisoned the tanks, charged our guns and dived towards the two Vatuors. As I was positioning behind the Vatuors, in came a call from 1<sup>st</sup> Lt. Samir "two Mirages behind you". I looked back. There they were about 4000 ft or so behind, turning in to me. I called for a "Split" and asked No. 3 and No. 4 to go for the Vatuors. I decided to go for the Mirages. Starting a hard right turn in to the Mirages I asked my wingman to remain deep. The Mirages could not keep inside my turn and decided to perform a "YO-YO" maneuver. The moment they vanished behind me I reversed and spotted one Mirage only still turning right. He had not engaged his after-burner and kept turning right. I could position myself behind him with some effort. Had he engaged his



after-burner, I could never have closed on him. This mistake cost him dearly. I had him in my gun-sight steady for about two seconds. Assessing visually as well, I was sure he was in my 30 mm gun range. "Bismillah", I opened fire for about one and a half seconds. The next thing that I saw was something I will remember all my life. The bullets landed all over both his wings as I could see very clearly the sparks that followed. I tried to follow him. Suddenly the Mirage exploded and resulted in a round ball of fire. Thereafter there was nothing. The pilot had ejected. Everyone will laugh to hear what happened next. My No.2, Ehsan who was still sticking with me in spite of my very harsh maneuvers, gave a call on the R/T "Roger Leader you have finally won the bet, It is a Mirage". "You bet it is but stop the fun and look out for more", I transmitted. He was only reminding of the bet he took in December 1966, on my

dream. In the middle of an air combat, only a very humorous pilot can give such R/T calls.

As we were turning right I spotted one Vatour coming head on to us about 1500 ft



*Saif-ul-Azam pulls-away after shooting down the Israeli Mirage*

or so below us. I would have lost him because the closing rate was extremely high so I performed a SPLIT-S with my throttles pulled back some what and kept him in sight.

I recovered from the dive at a high "G" and got behind the Vatour. I must have been doing more than 430 Kts. The rate of closure was so fast that before I could adjust the wing span on my gun-sight I was almost within 100 yards. I opened my airbrakes and brought power to idle. Before there was any effect, I was about 200 ft from the Vatour. As while back I had seen the ball of fire when the Mirage exploded in the air. I wondered what would happen if I shot this aircraft from so close a range. I hesitated for a moment then decided not to miss this chance. "Bismillah", I opened fire. I had given three bursts of my gun and I saw parts flying off. My aircraft juddered. I thought might be I was shot from behind. My wingman was missing. I cranked my neck to locate him but he was not visible.

The pilot of the Vatour ejected. It is cruel to rejoice at that

moment when some one's life is in danger. But then it was war and I must confess I was overjoyed and very happy indeed. I gave a call to the H-3 tower to look up and see the two capture the pilots. The tower replied enthusiastically for compliance. While I was busy, my No. 2 had broken off this time and claimed a Mirage. I was running low on fuel now and planning to exit to Habbania, when I heard a call from 1<sup>st</sup> Lt. Samir. "Leader, I have shot him, I have shot a Vatour, I have shot a Vatour". From his voice I could imagine how happy and excited he was "Shut up and look for more and don't block the R/T" I said.

I was asking the fuel State when I saw a Mirage chasing a Hunter. This was right over the Airfield and a short distance from the huge abandoned oil tanks. It was my No. 4

Mohammad. Smoke was coming out from his aircraft and he was in a shallow dive towards the oil tanks. "Eject. Eject" There was no response whatsoever from him. The aircraft crashed into the empty tanks. We had lost our youngest member of the formation. This sad incident overshadowed the entire joy of a very successful mission.



*Saif-ul-Azam looks on after shooting up the Vatour*

Samir called in to report he was very low on fuel. He could not have returned to Habbania in that fuel state. His decision was to land at H-3 in spite of some damage to the runway. He carefully landed and was safe.

For Ehsan and me, the fuel was absolutely marginal. Territory of Iraq was totally unknown to both of us. I climbed to 33000 ft. and planned to glide the last few miles if the engine starved and quit. The navigation to the base in Habbania was fortunately easier than I thought. The road through the desert to Habbania was conspicuously visible even from the height. I kept looking to the fuel gauge. Any time the engine could flame out due to fuel starvation. It would have been a pity if we had to eject due to fuel shortage. I spotted the Airfield from about thirty miles. I asked Ehsan if he had contact with the runway. He confirmed he had the runway in sight. There was no need to follow the standard landing pattern. I asked him to break off and land first as he had reported lesser fuel.

I decided to descend with power in idle. My object was to make a straight in approach. I asked the

ATC for the R/W in use and permission for immediate landing. The controller cleared me. After landing I taxied back to the apron from where I had started in the morning. I saw a large gathering of people of all ranks. They came to congratulate me. After alighted from the aircraft, I was literally mobbed. The men shouted slogans of victory. "Down with the Zionism. Death to Israel." I was lifted up and paraded in the flight line. I had tears of joy in my eyes. I could see the sense of pride in the eyes of the men who had prepared my aircraft that day. We shared the joy together thanking Almighty Allah for his kindness. My heart bled for Mohammad whom we lost in the fight. He was a very young and smiling personality, a great soul. I only knew him for half an hour during the pre-flight

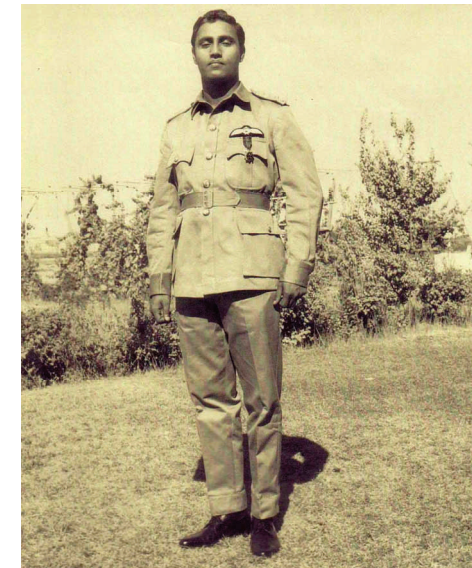
briefing. At that point in time I could hardly imagine that he was destined to lay down his precious life for a great cause.

As I reached the squadron I was told that two of the Israeli pilots had been captured. I was more interested to see Ehsan. He was supposed to have landed before me but I did not see him there in the rejoicing crowd. So I repeatedly inquired about him. "Where is Ehsan? Has he landed safely? Why is he not here? Is he injured?" No one was answering me. They would just smile and say, I should be patient. He would be here soon. I was suspecting they were hiding some information.

Ten or fifteen minutes later Ehsan arrived with a big smile. "Why so late? Did you not land before me?" I asked. Soon I discovered the truth. He had not landed a Habbania airfield. He landed at Plateau, just next door. It took him 15 minutes to drive back to Habbania. I breathed a sigh of relief.

Some parts of the Vatours had fallen off when I shot it at very close range. Both my wing tips were hit by those and some

pieces remained lodged in the fuselage. Some airmen thought I had rammed the Israeli aircraft when I ran out of ammunition. I had a difficult time in explaining that this was not true. I only picked up the debris because I was so close when I shot the Vatour.



*Saif-ul-Azam in RJAF uniform.*



## **Pakistan's Nuclear Journey - From Multan to Chaghi**

### **1 – The Beginning of the Quest**

The Multan Conference of January 1972 was a historic milestone in the history of nuclear Pakistan, and was indeed the birth of the quest for building Pakistan into nuclear power. It was here that President Zulfikar Ali Bhutto had successfully channeled his political ambition of building nuclear deterrent capability as a national goal after which every PAEC scientist, engineer and technician burnt midnight oil to develop Pakistan into a nuclear power. Bhutto had appointed a Pakistani nuclear engineer, Munir Ahmed Khan as chairman of the PAEC and head

of the nuclear program who had been serving as head of Reactor Engineering Division at the IAEA.

Under Munir Ahmed Khan's leadership, Pakistan's nuclear programme developed into a multi-faceted and dynamic center of science and technology, both on the peaceful and deterrence sides. He created a team that established the blueprint and developed the know-how for Pakistan's nuclear weapons capability. This includes the uranium enrichment and plutonium production and reprocessing facilities, nuclear fuel fabrication and heavy water production facilities, nuclear fuel cycle facilities, training centres, nuclear power reactors and nuclear weapon design, development and testing facilities. The PAEC also made formidable strides by developing new strains of rice and cotton that added billions to Pakistan's agricultural output. Nuclear medical centres across the Pakistan have treated hundreds of thousands of cancer patients. Today the PAEC is the largest Science and Technology organization in Pakistan, in

terms of trained manpower and the scope of its activities. It was again the PAEC that laid the foundations of indigenous capability for Pakistan's missile program.

Munir Ahmed Khan's team included such gifted scientists and engineers like Dr. Ishfaq Ahmad (chairman PAEC 1991-2001) Dr. Samar Mubarakmand (chairman NESCOM) Anwar Ali (incumbent chairman PAEC) and Pervez Butt ( chairman PAEC 2001-2006) , Sultan Bashiruddin Mahmood and Abdul Majeed Chaudhry, Dr. GD Alam and Dr. NM Butt, Dr. Muhammad Shabbir and Dr. Aminuddin, Dr. Riazuddin and Hafeez Qureshi, Dr. Inam-ur-Rahman, Dr. Khalil Qureshi and Dr. N.A. Javed to name only a few. After 1972, the PAEC was re organized into 15-20 directorates, each working on a

particular part of the nuclear programme. Each directorate had 700-800 scientists, engineers and technicians. They worked consistently, without greed for fame or money, in the utmost secrecy and without advertising their achievements. They realized the awesome burden of confidence reposed in them by the nation and demonstrated utmost nuclear responsibility, both in word and deed. While adhering to the policy of working in complete secrecy, away from the public eye, proved to be blessing in disguise whereby the programme succeeded against all odds, it allowed some other elements to establish sole monopoly over achievement.

After the 1998 nuclear tests, Munir Ahmed Khan revealed that "We were simultaneously running 20 projects and labs,

every one the size of the Khan Research Laboratories".

After 1972, the PAEC began work on various projects of national importance, each one forming a link that would ultimately result in the successful detonation of six nuclear devices in May 1998.

Soon after the Multan Conference of 1972, the first step for PAEC towards the development of a nuclear weapons program was to master the nuclear fuel cycle. The nuclear fuel cycle ranges from uranium exploration, mining, refining of uranium and production of yellow cake, conversion of yellow cake into uranium hexafluoride gas, enrichment of uranium hexafluoride gas, fuel fabrication for use of enriched uranium into nuclear fuel for power reactors to reprocessing the spent fuel to obtain plutonium and disposal of nuclear waste material.

The nuclear fuel cycle is the technical basis for any nuclear program, whether peaceful or military. In military programs,

the enriched uranium is converted into metal and then used as fissile material in a nuclear weapon, or the plutonium is used as a fissile material for a nuclear weapon.

Munir Ahmed Khan held a meeting with Prime Minister Zulfikar Ali Bhutto on February 15, 1975. At this meeting, Munir Khan sought the formal approval from the government for a \$450 million nuclear weapons programme that involved (a) the building of a centrifuge plant for the



*A view of PINSTECH*

enrichment of uranium, along with the Chemical Production Complex (CPC) at Dera Ghazi Khan for the production of uranium hexafluoride gas, the feed for enrichment (b) the development of a uranium mine at Baghalchor in Dera Ghazi Khan (BC-1) , and (c) the inception of a nuclear weapons design programme led by Dr. Riazuddin of PAEC.

Pakistan's quest for nuclear deterrence is a journey of trials and tribulations, of hope and despair, of setbacks and miracles, of courage and devotion, of commitment and teamwork. This journey can be seen in the various projects and initiatives undertaken by the PAEC, in which the nuclear fuel cycle was mastered and the nuclear weapons development was initiated and brought to its logical conclusion.

## 2- Uranium refinement and conversion facilities

As a first step towards mastering the nuclear fuel cycle, further exploration of uranium deposits was undertaken by PAEC and projects initiated to refine the uranium discovered in the 1960s. The discovery of uranium and its refinement was a massive, manpower-intensive job. Thousands of tons of uranium ore had to be recovered and dug up from the ground to produce enriched uranium for a nuclear bomb.

On 27 December 1973 PAEC chairman Munir Ahmed Khan announced that large uranium deposits had been discovered in southern Punjab province.

### *i) BC-I and CPC*

Beginning in the mid-1970s, a uranium refinement plant at Baghalchor called BC-I was established by PAEC in a series of smaller plants along with the Chemical Plant Complex (CPC) which was also established in Dera Ghazi Khan. Without

abundant supplies of uranium hexafluoride gas, there could be no enrichment, because it is in this form that uranium is enriched through the gas-centrifuges to weapon grade at KRL.

The CPC is perhaps the second best kept secret of Pakistan's nuclear program along with the Directorate of Technical Development, and was developed in arid DG Khan with a landing strip of its own, frequently visited by Munir Ahmed Khan when work on it was in full swing. It was here that Dr. Muhammad Shabbir and Dr. Aminuddin along with their team made their contribution in making Pakistan self sufficient in the production of large quantities of uranium hexafluoride gas or UF<sub>6</sub> , which is enriched through the gas-centrifuges at KRL. This UF<sub>6</sub> is



also the "Feed" for KRL without which the centrifuges would be useless. CPC started full scale production of UF<sub>6</sub> in 1980 and since then had been meeting the entire "Feed" requirements of KRL.

The technology involved in production of uranium hexafluoride gas was as challenging as the centrifuge plant itself. It was at BC-1 and CPC that PAEC's scientists and engineers mastered the front end of the nuclear fuel cycle.

BC-I comprises several units such as a uranium ore storage mill, a ball grinding mill, a sulphuric acid plant, a solvent extraction plant and a tunnel drier through which the yellow cake is passed through for drying. Almost all these units of BC-I were developed within Pakistan. In addition to the

uranium refining plants, following plants required for the production of the uranium hexafluoride were also developed, each of them being a full fledged independent chemical plant.

a) Uranium Mill which extracts uranium in the form of yellow cake

b) A plant to refine yellow cake to produce Ammonium Diuranate (ADU)

c) Conversion of ADU to uranium dioxide

d) Plant to produce Hydrofluoric Acid

e) Plant to produce fluorine gas

f) Plant to convert uranium dioxide to uranium tetrafluoride (UF<sub>4</sub>)

g) Conversion of UF<sub>4</sub> to Uranium Hexafluoride (UF<sub>6</sub>)

A by-product of UF<sub>6</sub> was depleted UF<sub>6</sub> which was harnessed by PAEC for making aluminum clad natural uranium metal fuel

for its research reactor at PINSTECH.

Almost half the steps towards the building a nuclear bomb were completed at the PAEC facilities at CPC and BC-I.

## ii) Uranium Metal Laboratory

At the same time BC-I and CPC were being developed by PAEC, a Uranium Metals Laboratory (UML) was also developed as part of the CPC so that when the enriched uranium would be received from KRL, it could then be converted into metallic form and given the right shape to be used in the core of a nuclear weapon. According to Dr. Muhammad Shabbir, "Uranium metal, the metallic core form in which enriched uranium is used in a nuclear device made its first appearance at CPC, DG, Khan. Zircon billets and ingots, metal

from depleted U-238 for the tubing of fuel and shielding of tanks and missiles are also built at CPC".

### 3 – Uranium Enrichment Facilities

Munir Ahmed Khan initiated the uranium enrichment programme of PAEC as Project-706 in October 1974 when a nuclear engineer Sultan Bashiruddin Mahmood was recalled to Islamabad from Karachi Nuclear Power Plant and asked to prepare a feasibility report regarding various techniques used in uranium enrichment.

Bashiruddin till then had been working in the Karachi Nuclear Power Plant (KANUPP) where he developed a technique to detect heavy water leaks in steam pipes and set up a laboratory to manufacture spare

parts for the plant. He had read scientific reports of the Manhattan Project during his training at Birmingham University, where he also had an opportunity to discuss enrichment technology with scientists from South Africa, who were then exploring the jet nozzle process of enrichment. After examining gaseous diffusion, gas centrifuge, jet nozzle and laser enrichment processes, Bashiruddin advocated the gas-centrifuge route. He then prepared a report for the development of a centrifuge enrichment plant that envisaged its completion by 1975.

Within days a feasibility report was prepared and a project approval proforma called PC-1 finalised. The project was to begin production in 1979. To maintain secrecy both the feasibility and the PC-1 were handwritten documents. In early December 1974, the project proposal was personally hand carried by the PAEC chairman, Munir Ahmed Khan direct to the Prime Minister's hometown of Larkana for his approval. No intermediate offices

were involved. Munir Ahmad Khan was driven to the Chaklala Airbase by the project director-designate, Bashiruddin Mahmood, where a special military aircraft was waiting to take him to Larkana. The same evening he returned to Islamabad with the approval of the Prime Minister. Again Bashiruddin Mahmood received Munir Ahmed Khan at the airport.

Munir Khan had obtained the government's formal approval for the enrichment project, in a meeting with Prime Minister Bhutto on February 15, 1975, and the uranium enrichment programme was formally launched under the name 'Directorate of Industrial Liaison' in the barracks of Chaklala airport under the leadership of the nuclear engineer Sultan Bashiruddin

Mahmood. The project was divided into 100 separate components, so as to maintain secrecy and involve local industry in R & D on each component. PAEC and Bashiruddin Mahmood was driven by a passion for indigenization and involving local industry was a manifestation of this endeavour.

Munir Ahmed Khan had selected the site for Kahuta Enrichment Plant in January 1975, completed procurement of vital equipment, construction of its civil works, and recruitment of staff for it by 1976.

Munir Ahmed Khan had vast international contacts that he had cultivated at the IAEA. In 1975 Munir Khan had managed to acquire detailed and comprehensive drawings of centrifuge machines from an

experimental centrifuge program that was being developed in Italy. These drawings also included complete process engineering of centrifuges and proved to be of great help to the PAEC scientists and engineers working on the enrichment project. Based on these drawings, PAEC scientists and engineers were able to successfully develop the first cascade of 20-50 centrifuge machines in the pilot centrifuge facility in the barracks of Chaklala airport in Rawalpindi and at Sihala in early 1976. In April 1976 the first centrifuge was rotated by the PAEC team headed by Bashiruddin Mahmood at the Chaklala site. The experience gained at these pilot centrifuge plants by PAEC scientists and engineers proved to be critical to the success of the production-scale centrifuge program at Kahuta.

Italy began centrifuge research and development in 1969, and by 1973 had done some separation work using a relatively simple, so-called Zippe-type centrifuge. This type was pioneered after World War II by the German engineer

Gernot Zippe, and provided the engineering and physics bases for both Italian and Urenco machines.

The team of scientists and engineers who made the enrichment project a success had been formed in 1975-76 under Bashiruddin Mahmood. They included Dr. GD Alam, Anwar Ali, Dr. Javed Arshad Mirza, Ijaz Khokhar to name only a few. The entire technical staff comprising scientists, engineers and technicians from various disciplines were transferred in 1975-76 to the enrichment project from PAEC/PINSTECH. Dr. GD Alam headed the centrifuge design and development team at KRL as Chief Scientific Officer till 1983 after which he along with Anwar Ali returned to PAEC.

These scientists and engineers



also developed mass spectrometers used for measuring the levels of enrichment, balancing rotors, new generations of centrifuge machines, and much more with PAEC technical help always at their side. The procurement of essential materials and machines for this project also began in earnest in 1975 by the PAEC's main procurement agent in Europe, S. A. Butt, who began shopping for critical equipment for the enrichment project such as high frequency inverters, maraging steel and flow forming machines.

Dr. Samar Mubarakmand said in 2003, "the initial work of setting up of Kahuta Research Laboratories was done under the stewardship of Munir Ahmed Khan who was the over all incharge of the project and who selected its site and put in

place the basic infrastructure of manpower, machines and materials for it".

### **3 - Plutonium production and reprocessing facilities:**

Together with Dr. Abdus Salam, Munir Ahmed Khan had the privilege of preparing a proposal for the establishment of nuclear fuel reprocessing plant in Pakistan in late 1960's. Ayub Khan deferred the matter on economic grounds.

The centerpiece of the PAEC weapon's programme in the early 1970s was the effort to acquire a reprocessing plant to separate plutonium from the fuel of KANUPP and future nuclear power plants envisioned by the PAEC.

The technology for KANUPP was the same natural uranium/heavy water technology used in the Indian Cirus and later Dhruva reactors used by India for producing weapons plutonium, therefore pursuing the plutonium route was the "logical" option given Pakistan's nuclear infrastructure at that time. KANUPP was a

Heavy Water natural uranium reactor which could be refueled continuously, without any need to shut down the reactor, which would make it more difficult for outside observers to know how much fuel was used, thus enabling spent fuel to be diverted to military applications for reprocessing, if the need arose. KANUPP was under the IAEA safeguards, but Munir Ahmed Khan was not unduly concerned, as he himself had spent 14 years at the IAEA.

For the first few years of its operation KANUPP used Canadian fuel, which had come under IAEA safeguards before it left Canada. The IAEA therefore knew at that time precisely how much uranium was being shipped from Canada to be loaded into KANUPP. However, after Canada broke off supply of nuclear fuel in 1976, PAEC was

able to provide its own fuel and, and unless additional safeguards measures were applied, the IAEA would not be able independently to verify – to know with a reasonable degree of assurance – how much fuel was being loaded into and irradiated in KANUPP. Moreover, the design of KANUPP did not require the reactor to shut down for refuelling. Therefore, the diversion of spent fuel for reprocessing was a theoretical possibility, which however did not take place. Pakistan objected, however, to the additional safeguards measures proposed by the IAEA on the grounds that they were not foreseen in the safeguard agreement covering the KANUPP reactor. Eventually the Pakistani fuel for KANUPP was also placed under IAEA

safeguards in the early 1980s.

In March 1973 the French firm SGN was asked to prepare the basic design for a large scale reprocessing plant, one with a capacity of 100 tons of fuel per year, considerably more than KANUPP would generate. The Chashma plant, as it was known, would have the capability to reprocess 100 tons of used reactor fuel and produce about 800 kg of weapons grade plutonium a year, if sufficient fuel were available to feed it. It would have provided Pakistan with the ability to "break safeguards" and quickly process accumulated fuel from KANUPP and other future nuclear power plants, when it decided to openly declare itself a nuclear-armed state. The final detailed design and construction contract was signed on 18 October 1974, which followed the initial design contract. The original contract for this project did not include significant safeguards to discourage diversion of the separated plutonium, or controls on the technology.

The French government, under American influence began to show increased concern about the Chashma plant during 1976. A safeguard agreement for France brought the plant before the IAEA in February 1976, which was approved on 18 March and signed by Pakistan. This at least ensured that the plant would have monitoring so that diversion to military purposes could not be made. Despite Bhutto's overthrow in 1977 by General Zia, the latter continued the project unabated, and continued to press the French to fulfill the Chashma contract. But France had begun gradually turning against the reprocessing plant.

The initial plan, as revealed by Munir Ahmed Khan year later, was not to divert or misuse foreign-supplied reactors and a

reprocessing plant to produce nuclear-weapon fuel, but rather to use the know-how gained from this cooperation to indigenously produce parallel capabilities that could yield a bomb. This was proven in the case of the Khushab reactor.

Munir Ahmed Khan was fascinated by high technology and he wanted to get hold of whatever technology that could be acquired by any means.

The Chashma reprocessing plant seemed to be too ambitious back then, but it was envisaged as part of the long term nuclear power programme of PAEC whereby it was planned that eventually Pakistan would be able to build its own nuclear plants indigenously, outside the IAEA safeguards system that would yield large amounts of spent fuel for reprocessing. A

plan for the construction of more than 20 nuclear power plants by the year 2000 was prepared and presented to the government in 1972-73 by Munir Ahmed Khan, but could not be fulfilled due to acute resource constraints, international sanctions and embargo against Pakistan, and Pakistan's persistent refusal to join the NPT from a position of weakness and under any discriminatory regime.

It is probably more accurate to say that Pakistan was planning to use whatever assistance it could acquire and develop acquire material for a bomb, and if it could be done via the French-supplied plant, it would, and if somehow material could not be diverted, then Pakistan would use the knowledge and contacts gained to build their own means later.

Despite the French back stabbing of the reprocessing contract in 1978, the PAEC went on to develop its own plutonium reactor at Khushab in the mid-1980s, and it was a totally indigenous project of PAEC.

Before the French government cancelled the reprocessing plant contract in August 1978, the French firm SGN that was supposed to build the plant at Chashma transferred 95 % of the drawings and other technical details of the plant to PAEC.

In March 1973 a team of three PAEC nuclear scientists and engineers comprising Khalil Qureshi, Zafarullah and Abdul Majid Chaudhry were sent to the headquarters of Belgonucleaire at Mol to participate in the designing of a pilot nuclear fuel reprocessing facility as well as gain training in reprocessing spent fuel.

### *i) New Labs*

The PAEC also went on to complete its indigenous 'pilot' reprocessing plant by 1981, called the "New Labs" at



PINSTECH, which gave Pakistan the capability to reprocess enough plutonium for at least one nuclear weapon a year. "New Labs" is an experimental, pilot-scale plutonium reprocessing plant that has the capability to reprocess 8-10 kg of plutonium each year, work on which had begun in 1976. "Cold" tests were conducted at New Labs as early as 1982, and in 1987 West German sources claimed that the facility previously conducted "hot" tests. As of 1998, New Labs has been expanded to handle upto 20 kg or more of spent fuel for plutonium extraction since the commissioning of the Khushab-I reactor.

A critical element in the manufacture of boosted fission devices and thermonuclear or Hydrogen bombs is tritium. In

1985, Germany licensed for export to PAEC a tritium plant by the firm NTG Nukleartechnik GmbH (NTG), preferring to call it a 'heavy water purifier' instead of -- as the U.S. preferred -- a 'tritium recovery facility' in the interests of complying with German regulations on sensitive nuclear exports. While heavy water purification technology was not subject to export controls in Germany at that time, technology for the recovery of tritium was controlled. The PAEC was also able to procure from NTG in 1987, a tritium gas storage and purification plant. In order to obtain significant amounts of weapons grade tritium gas, the PAEC needed to irradiate lithium-6 targets, perhaps in an unsafeguarded research reactor. The plant provided by NTG was capable of purifying this tritium gas to 98%. In amounts of about 4 to 5 grams, tritium, the heaviest hydrogen isotope, is used as a booster in a fission nuclear weapon.

By 1986-87 the PAEC had also procured 'tritiated targets' which could be used at

the Pinstech plant in Nilore to extract pure tritium.

## *ii) Khushab-I*

Work on the indigenous 50 MW heavy water Khushab Reactor (KCP-I) was also initiated in 1986 which is the source of plutonium and tritium. Khushab-I was conceived and planned by Munir Ahmed Khan. This reactor was completed in 1996 and became operational in 1998 when Dr. Ishfaq Ahmad was PAEC chairman. The project director of Khushab-I was Sultan Bashiruddin Mahmood. The late Afzal Haq Rajput also played a key role in designing the reactor along with Bashiruddin Mahmood.

Building a nuclear reactor is more challenging and technologically more important

than building a nuclear bomb. The timely completion of this indigenous project by PAEC engineers was a dream come true for the hundreds of scientists, engineers and technicians who worked tirelessly to make the project a success against all odds and a testimony to the ability of Pakistani manpower to plan and build their own reactors, given the right technical and political leadership and the resources. Another outstanding feature of this project was the fact that the share of local industry in this gigantic challenge was 82%.

Munir Ahmed Khan said that Khushab was the greatest technological achievement for Pakistan.

### *iii) Heavy Water Plant*

A heavy water production plant

was also constructed at the Khushab Nuclear Complex site which was completed by 1980 and has an annual capacity of 13 metric tons. Dr. N.A. Javed played a key role in the setting up of this heavy water plant.

### *iv) Khushab-II*

Based on the success of Khushab-I, Pakistan has embarked on a much larger plutonium production reactor adjacent to the Khushab-I. This is testimony to the fact that Pakistan has embarked on the logical next step of further building the plutonium programme as plutonium bombs are smaller and compact in size than uranium weapons, and have greater yields, due to which they are ideal for missiles and aircraft and for building miniaturized devices for tactical or battlefield use. Khushab-II when complete is speculated to be able to produce enough spent fuel for reprocessing enough plutonium for anything between 30-50 nuclear weapons or more, depending on the actual size of the reactor.

There were rumors that the sixth nuclear test conducted by PAEC on 30th May 1998 at Kharan was a plutonium weapon.

It is also pertinent to mention that it takes only about 4-5 kg of weapon grade plutonium (PU-240) to for one nuclear weapon as compared to 20-25 kg of U-235 or Highly Enriched Uranium (HEU) required for the same.

### **4 - Nuclear Fuel Fabrication facilities:**

When in 1976 Canada cut off supplies of nuclear fuel and spare parts for the Karachi Nuclear Power Plant in the wake of the Indian nuclear test of 1974, PAEC scientists through indigenous efforts were able to manufacture nuclear fuel for the Muslim world's first nuclear power plant. In 1980, PAEC indigenously produced nuclear

fuel for KANUPP and the first Pakistani nuclear fuel bundle was loaded successfully in the reactor core, while PAEC made all-out efforts to create the technical infrastructure, industrial resources and personnel expertise necessary to support station operation. The Design & Development Division (Mechanical), Computer Development Division, In-service Inspection Laboratory, Control & Instrumentation Application Laboratory, Quality Assurance Division and in 1973 the Karachi Nuclear Power Training Centre were established within the plant. In 1990 the complete loading of the Kanupp reactor core with all Pakistani fuel bundles took place.

Munir Ahmed Khan, in a press conference on August 31st, 1980 announced that Pakistan had

achieved self-reliance in the manufacture of nuclear fuel from uranium and a nuclear fuel manufacturing plant had been built at Chashma by Pakistani scientists.

The PAEC also developed a nuclear fuel fabrication plant at Kundian, with the capacity to process 24 MT of natural uranium per year. This facility manufactures fuel for KANUPP. Also known as the Kundian Fuel Fabrication Plant /Kundian Nuclear Complex I. Kundian is a reactor uranium fuel fabrication facility with an annual production capacity of 24 tons, the facility has been manufacturing fuel for the KANUPP reactor since 1978. The Nuclear Fuel Plant is now known as KNC I - Kundian Nuclear Complex I. Kundian fuel fabrication facility is an important part of the nuclear fuel cycle facilities of the PAEC.

In a two-part article in the English Daily "The Nation", Munir Ahmed Khan, on 7 February 1998 and 9 February 1998, explained the history of Pakistan's quest to

make nuclear fuel indigenously. His analysis begins in 1965 when Canada and Pakistan signed a contract for Canada to build the Karachi Nuclear Power Plant (KANUPP). At this time, Canada also offered to sell Pakistan a nuclear fuel fabrication plant, but Pakistan was not interested and refused.

Canada began helping Pakistan build KANUPP in 1972. The plant was kept in operation for the first four years with technical support from Canada. During this time, Pakistan began to re-start negotiations with Canada for the fuel fabrication plant. The chairman of the PAEC went to Canada in early 1973, attempting to persuade the Canadian government to agree to supply Pakistan with the plant. Canada had two objections: first, Canada would lose the revenue earned



previously by exporting fuel. Second, supplying Pakistan with its own fuel fabrication plant would, in turn, make Pakistan more independent in nuclear technology, which could indirectly contribute to nuclear proliferation.

In 1973, the President of Atomic Energy of Canada Limited (AECL) decided to support the supply of a fuel fabrication plant to Pakistan, since Canada had also supplied such a fabrication plant to India. Pakistan's KANUPP was also already under IAEA safeguards, and those could be extended to the new plant. A formal contract was signed with Canada's Westinghouse Company, which expected completion of the fabrication plant by 1975. Fuel was to be co-manufactured in Pakistan under Canadian supervision for an initial period

of approximately two years, after which Pakistan would be on its own.

With the explosion of a nuclear device by India in May 1974, Canada's view on nuclear exports changed dramatically. Canada changed its attitude toward nuclear exports, adopting a new and strict nonproliferation policy. This policy "demanded that any country receiving nuclear technology or facilities from Canada either sign the NPT or accept full-scope safeguards on all its facilities" as well as not to use Canadian supplies for nuclear explosions. This new policy effectively punished Pakistan for India's misuse of Canadian nuclear exports.

Pakistan refused to subscribe to the new condition. During this time, Pakistan continued construction of the fuel fabrication plant, expecting that all equipment needed for the fuel plant would be shipped from Canada by late 1974. However, just before the shipment was to leave for Pakistan, Canada placed an embargo on the equipment. Canada

decided to place an embargo on the equipment for two reasons. Pakistan had signed an agreement with France in the meantime to build a nuclear reprocessing plant under safeguards, which Canada did not like. With such a plant, Pakistan would be capable of reprocessing fuel from KANUPP and producing plutonium, which was contrary to Canada's new nuclear nonproliferation policy. Pakistan also continued its unwillingness to sign the NPT.

Therefore, on 23 December 1976, Canada unilaterally cut off all nuclear cooperation with Pakistan. Support abruptly ceased when Canada halted all supplies of nuclear fuel, heavy water, spare parts, safety and other technical information, and sent all Canadian experts

stationed at KANUPP home. Pakistan was "left with no choice, but to find a way to make nuclear fuel on its own."

Uranium is an essential raw material for nuclear fuel. Pakistan uses natural uranium rather than enriched uranium as fuel for KANUPP because it is a heavy water reactor, which is a better medium for facilitating a nuclear chain reaction than light water. Finding mineable quantities of uranium was a challenge for Pakistan. Reasonable quantities were found in the Siwalik Hills, west of Dera Ghazi Khan. Pakistan, however, had no experience in mining uranium. A team of young engineers from the Atomic Energy Minerals Center (AEMC), which was established by Dr. I.H. Usmani, carried out the necessary exploration and

mining operations. Even skilled labor was scarce, and the drillers and miners trained were "among an illiterate labor force" available in the region.

The uranium ore indigenously mined by Pakistan was of relatively low grade and consisted of only a few kilograms of uranium per ton in contrast to uranium ore from Canada, which has a higher concentration of uranium per ton. Therefore, Pakistan's uranium extraction plant had to be designed more carefully, in order to reduce impurities and extract more uranium. Pakistan's uranium extraction was done entirely by chemical, mechanical, and electrical engineers from AEMC, with the assistance of Pakistani industries. As a result, Pakistan was able to complete its uranium yellow cake plant within a year. A full scale refining plant was built to turn concentrated uranium yellow cake into a pure uranium oxide usable in a nuclear reactor.

The uranium oxide was next pressed into small pellets of very high density to be

burnt after being sealed in zircaloy cladding tubes. Basic R&D facilities were created in the mid 1970's at PINSTECH. These R&D facilities helped in developing the know-how for making high purity uranium from yellow cake and converting it into uranium oxide and pellets. PINSTECH made valuable contributions, such as setting up uranium laboratories, through which precise chemical processes and quality control procedures were established. PINSTECH also helped train highly skilled manpower and developed special welding techniques and other procedures required for large-scale operations. Khan gave great importance to "having indigenous R&D facilities to support any production facility for commercialization." When Canada stopped its

nuclear exports to Pakistan, other problems in addition to making nuclear fuel arose. Pakistani scientists knew the overall measurements of the fuel but did not have the exact specifications of some of the key materials or the type of machinery needed, nor did they know certain manufacturing procedures or a source of supply for materials and machinery. Some special attachments had to be designed by Pakistan. Suppliers had to be located that were "willing to cooperate in spite of the negative atmosphere generated by the Indian explosion followed by the Canadian embargoes." Since none could be found, Pakistan relied heavily on local industries to make up for the lack of a foreign supplier.

In addition to uranium, technology, and machinery,

Pakistan had to also plan for indigenous production of special alloys and materials, such as zircaloy cladding tubes use to encase the small pellets of uranium oxide. Pakistan could not rely on imported cladding tubes for very long, so it began to manufacture its own. Pakistan found large deposits of zirconium-bearing heavy sands along the seacoast and in the riverbanks of Balochistan. PINSTECH worked together with experts from AEMC to set up a pilot plant, which gave Pakistan the necessary experience over several years in the removal of hafnium, an element of earth found in natural zirconium.

Not a single fuel pellet has failed since Pakistan began manufacturing fuel elements for KANUPP in the late 1970's. KANUPP was designed, however, so that even if a few bundles of pellets happen to leak, "the system can easily take care of it." Canada did not supply Pakistan with a test reactor, and although Pakistan approached certain west European countries about testing and certifying its

fuel, none agreed. Therefore, Pakistan set up test facilities outside the reactor to check fuel bundles for mechanical, pressure, temperature, and flow conditions. Other tests were also conducted to assure the fuel's strength to withstand the extreme conditions inside KANUPP. Pakistan then showed the results of the tests to "certain international experts and they were satisfied."

By indigenously making fuel, Pakistan gained many new technologies. Munir Ahmed Khan said, "Pakistan produced the first ton of purified uranium oxide and metal before it produced the first ton of copper or any other mineral using local ore and indigenously developed technologies." Further, it taught Pakistani scientists and engineers about precision



engineering, quality control, inspection, and design of complicated tools and machinery. "Nuclear technology is interdisciplinary," Munir Khan said, "which requires team work, and credit has to be given to and shared by all those who contribute and thereby took the country forward." Munir Ahmed Khan said that Pakistan's accomplishments in the nuclear field "are an excellent example of collaborative work by people who accepted a challenge and decided to respond to it collectively." Munir Ahmed Khan did not publicly reveal the names of the people who participated in the development of Pakistan's nuclear fuel cycle. He simply ended by saying that the participants, engineers, scientists, chemists, miners, and experts alike developed "a

system and an institution which is even more important than the product."

## 5 - NUCLEAR WEAPONS DEVELOPMENT AND TESTING

The PAEC under Munir Ahmed Khan began work on weapon design began even before the start of work on uranium enrichment and plutonium production and reprocessing. In October 1972 two Pakistani nuclear scientists, Dr. Riazuddin and Dr. Masud Ahmed temporarily working at the International Center for Theoretical Physics (ICTP), Italy, returned to Pakistan to begin theoretical work on a fission explosive device. They were posted at the Pakistan Institute for Nuclear Science & Technology (PINSTECH). In December 1973, PAEC scientists elected to develop an 'implosion' over the 'gun' type of nuclear fission device citing economy in the use of fissile material. Subsequently for developing explosive lenses for the proposed device, Munir Ahmed Khan tasked Dr. Zaman Shaikh, an explosive expert at the Defense Science Laboratories.

### i) The Wah Group and DTD

In March 1974, chairman PAEC, Munir Ahmed Khan called a meeting to initiate work on an atomic bomb. Among those attending the meeting were Hafeez Qureshi, head of the Radiation and Isotope Applications Division (RIAD) at PINSTECH (later to become Member Technical, PAEC), Dr. Abdus Salam, then Adviser for Science and Technology to the Government of Pakistan and Dr. Riaz-ud-Din, Member (Technical), PAEC. The PAEC chairman informed Qureshi that he was to work on a project of national importance with another expert, Dr. Zaman Sheikh, then working with the Defence Science and Technology Organization (DESTO). The word "bomb" was never used in

the meeting but Qureshi exactly understood the objective. Their task would be to develop the design of a weapon implosion system. The project would be located at Wah, appropriately next to the Pakistan Ordnance Factories (POF).

The work at Wah began under the undescriptive codename 'Research' and Qureshi, Zaman and their team of engineers and scientists came to be known as "The Wah Group". Initial work was limited to research and development of the explosive lenses to be used in the nuclear device. This expanded however to include chemical, mechanical and precision engineering of the system and the triggering mechanisms. The Wah Group procured equipment where it could and developed its own technology where restrictions prevented the purchase of

equipment. They had come up with a nuclear weapon design by 1978 that was subsequently tested in the first cold test in 1983.

In 1974, a Directorate of Technical Development (DTD) was established in PAEC to coordinate the activities of various groups engaged in R & D of different aspects related with the nuclear bomb.

The official go ahead to PAEC to build the nuclear bomb was given by Prime Minister Z.A. Bhutto at a meeting of Defence Committee of Cabinet, at the PM House in Rawalpindi, on June 15, 1974, immediately following the Indian nuclear test of May 1974.

The critical thrust towards the actual nuclear device was to set up a theoretical physics group that could work on the design of the bomb. It had to be a purely Pakistani effort and PAEC scientists on the theoretical side had the capability to design their own bomb. They studied the literature that was available and they

worked extremely hard, developed computer codes, acquired powerful computers to design this system and came up with the design that was to be manufactured.

Another facility that was set up in those days was a manufacturing facility for the bomb. Therefore at the PAEC, the finest experimental physicists, engineers, electronics people and chemical engineers formed a team to manufacture these weapons.

In 1973 Dr. Riazuddin travelled to the International Center for Theoretical Physics (ICTP), Italy, after which he proceeded to the United States to obtain open-source information on the 'Manhattan Project' from the Library of Congress and the National Information Center, Maryland. After his return from

the United States, Riazuddin was inducted into the Pakistan Atomic Energy Commission (PAEC) as Member (Technical). Dr. Riazuddin later worked as part of the team that worked on designs for Pakistan's nuclear explosive device. As he explained, "we were the designers of the bomb, like the tailor who tells you how much of the material is required to stitch a suit. We had to identify the fissile material, whether to use plutonium or...enriched uranium, which method of detonation, which explosive, which type of tampers and lenses to use, how material will be compressed, how shock waves will be created, what would be the yield." Since Pakistan found it difficult to manufacture beryllium reflectors, the first nuclear explosive device designed by

the 'Theoretical Group' used Uranium-238 as a reflector.

Moreover the PAEC had to develop its own explosive plants. The explosive used in a nuclear bomb is a very special type of explosive (HMX Explosive).

On 25 March 1974 Munir Ahmed Khan along with Dr. Riazuddin, and Hafeez Qureshi convened a meeting with the head of the Pakistan Ordnance Factory at Wah cantonment, Lt. General Qamar Ali Mirza, to set up a plant to manufacture His Majesty's Explosive (HMX) for use in the explosive lenses of the proposed implosion-design fission device. The project was codenamed "Research." It could not be purchased from anywhere in the world, and nobody would sell it to any other country. So the PAEC had to put up its own plant for this and the PAEC had to have chemical engineers who would operate this plant and make the explosives. Then the explosives had to be given the right shape according to the design that was delivered by the PAEC's

design team. The explosives had to be machined which in itself was a challenging task.

When a bomb is made, it has to be detonated and the detonation is not from one point. It is from several points on the surface of the bomb and the trick lies in this that the bomb is detonated from several points at the same time. This is called simultaneity and the simultaneity has to be of the order of 50 ns (nanosecond). A ns is 1/1000 of a micro second us and I repeat 1 us is one-millionth of a second. So you can imagine, in 50 ns, you have to detonate the bomb at several points so that the implosion takes place in a simultaneous fashion. This was a challenge for the PAEC electronics team as they had to develop the trigger mechanism.

Then after the bomb had been



manufactured, and the engineers had put the electronics in it, and it had got the explosives in it, in addition to the metallic uranium which was produced by Dr. Khalil Qureshi who converted the enriched uranium hexafluoride gas from Kahuta into metal and did all the coating and machining.

In order to get the maximum scientific data from the nuclear detonation, another Directorate known as the Diagnostics Directorate was established. This Directorate would play a key role in all the cold tests conducted by PAEC from 1983 onwards and the hot tests at Chaghi in 1998. In 1980 Dr. Samar Mubarakmand was appointed head of the Diagnostic Directorate. Advanced diagnostic techniques were required for carrying out

and measuring the results of cold and hot nuclear tests. To this end, state of the art facilities such as Computerized Numerically Controlled (CNC) machines for the precise and accurate measurement of the cold tests were developed, which provided confidence in the theoretical design. They were also used for measurements for explosion yields which were predicted by theory but not tested in cold tests".

The clocks for the trigger mechanism were developed by DTD. Krytons, high speed electronic switches, used in detonation of nuclear weapons and electronic triggering circuits for detonation of high explosives in a nuclear weapon were also developed by DTD.

The neutron source for the acceleration of a chain reaction in the bomb was developed by the "Fast Neutron Physics Group" headed by Dr. Samar Mubarakmand.

After the 1998 nuclear tests, he disclosed that after the first successful cold test of

1983, PAEC was faced with the strategic decision regarding future course of action to be taken on nuclear weapon design and testing.

He said, "Now we had a choice. What would we do next? Where do we go from here. Do we stop, should we go for a hot test, a proper hot test like we had in May this year (1998) and when we had positive results from that, we would carry out further work. That was one way of doing it. The second choice was that since our cold tests were successful, we believed our theoretical physicists. Okay, your design is fine and we go ahead and we develop more modern designs, which are smaller and more rugged and which are being capable of delivery by aircraft and missiles. For every country in the world which produces this bomb, the

first one is very large and very unwieldy and not suitable for deliverable weapons. Therefore, the miniaturisation of the weapon, should we do it now or wait for a hot test? We went to the Government and said we are ready and we want to do a hot test. The then President said no, it is not the right time and so we had to abide by that decision".

Dr. Samar said, "We decided to keep on working on better and better designs and since 1983, over the last 15 years, I must really confess and congratulate our theoretical physicists, led by Dr. Masud Ahmed, in that they designed one sample after the other. After every 18 months or 2 years or so, we would have a new design and would perform a cold test on that. The success rate in every cold test was 100 percent. Sometimes we started thinking that our diagnostic

people are giving us positive results all the time. At least we should fail some time. Maybe our electronics are faulty and giving us detected neutrons. Probably they are spurious counts but the success was so consistent that we started disbelieving our diagnostic people. Anyway, one design after the other kept coming out, we manufactured the bombs, tested them and were successful"

He said , "We came through a series of 4 or 5 designs and then we came up with a model which we would say, and our generation of people in the PAEC would claim that is the state-of-the-art. The real last word in nuclear fission design is a miniaturized nuclear device and here of course, the concept was different from earlier designs. It was very small, compact, high yield and small size. So you could see the efficiency was tremendous and we were all very proud of it. When the cold test was successful on it, we were all very happy and this was the last thing we did in the earlier part of the 1990's."

## *ii) Nuclear Testing*

The first cold test of a nuclear device was conducted in the Kirana Hills near Sargodha, on March 11th, 1983. A second cold test was also undertaken soon afterwards which was witnessed by Vice Chief of Army Staff, General K.M. Arif, Ghulam Ishaq Khan and Munir Ahmed Khan. Thereafter, PAEC conducted over 24 cold tests till 1990 in which new and improved nuclear weapon designs were tested. By 1987, PAEC had come up with a nuclear weapon design that was small enough to be carried by an F-16 and other PAF aircraft.

The first preparations for eventual nuclear tests also started early - in 1976. By 1976, the PAEC selected the sites in Chaghi and Kharan and PAEC

geologists went to work on these sites. In Kharan there is a desert and they went for a vertical shaft. It is like a vertical well that is 300-400 feet deep and at the bottom of the well there is a horizontal tunnel having an L-shaped configuration.

In Chaghi, where there was a mountain range, the Ras-Koh range, the PAEC went for an underground horizontal tunnel. The overburden available was about 400 feet. That was the height of the mountain available for containment of the explosion.

Dr. Ishfaq Ahmad, Member (Technical) and Dr. Samar Mubarakmand of the PAEC were dispatched by Munir Ahmed Khan to Balochistan to conduct helicopter reconnaissance of potential test

sites with the assistance of the Army Corps located at Quetta. The PAEC requirement was for a mountain with a completely dry interior capable of withstanding an internal 20 KT nuclear explosion. After a one-year survey of the site, completed in 1977, plans were finalized for driving a horizontal tunnel in the Ras Koh range for a future test. The tunnels for the tests were ready by 1980.

A statement issued by the PAEC Directorate of Technical Development said that it had fulfilled its mission by not only successfully producing a variety of potential nuclear devices, but also by performing perfect hot tests, which resulted in near expected yields, and providing invaluable scientific data.

The statement said: "The mission has, on the one hand, boosted the morale of the Pakistani nation by giving it an honourable position in the nuclear world, while on the other hand it validated scientific theory, design and previous results from cold tests. This has more than

justified the creation and establishment of DTD 20 years back. Through these critical years of nuclear device development, the leadership contribution changed hands from Mr. Munir Ahmed Khan to Dr Ishfaq Ahmad and finally to Dr Samar Mubarakmand (Member Technical). These gifted scientists and engineers along with a highly-dedicated team worked logically and economically to design, produce and test an extremely rugged device for the nation which enable the Islamic Republic of Pakistan from strength to strength. By the grace of Almighty Allah, the PAEC as an organization has proven to be the pride of the Pakistani nation".

After the nuclear tests, twenty-two awards were given to several scientists and engineers



from the PAEC for their contributions toward Pakistan's recent successful nuclear tests and the nuclear program. Never before in Pakistani history has one organization received so many awards of outstanding contribution.

## 6 - Establishing the Import oriented Procurement Network

S.A. Butt was sent by Munir Ahmed Khan in 1973, to Belgium as the PAEC's chief procurement officer from where he was transferred to Paris and later to Dubai. Till his retirement in the 1990s, he finalized deals worth tens of millions of US dollars, using front companies and third parties. It is evident that the excellent procurement network established by S.A. Butt in Europe from the early 1970s for the procurement of essential

items related to nuclear materials and technology, proved to be critical to the success of Pakistan's nuclear weapons program. Under Munir Khan's guiding hand, Butt would indeed organize Pakistan's surreptitious network in Europe, running the most successful foray into nuclear espionage since the Soviet Union set out to penetrate the Anglo-American nuclear efforts during and right after World War II.

He procured machinery for the Chemical Production Complex, special Aluminium and maraging steel for the centrifuges manufactured at KRL, frequency inverters, flow forming machines, high-vacuum valves for the enrichment project, gassification and solidification units to feed the uranium hexafluoride gas into the centrifuges and then to transform it back into a solid at the end of the enrichment process. SA Butt also procured equipment for the pilot reprocessing plant "New Labs" in PINSTECH, the heavy water plant at the Khushab Nuclear Complex and other projects.

The German newspaper Der Spiegel reported in 1989 that "There is no doubt that Munir Ahmed Khan, chief of the Pakistan Nuclear Authority, with whom Finke already had a cup of tea, has secretly developed his country into a nuclear power; the bomb puzzle is complete. He had many individual parts--ranging from transformer sheets to uranium conversion--supplied by small West German firms, using a network of agents to this end. The special pipes and supersolid (maraging) steel from Singen and Saarbruecken, the mass spectrometers and magnets from Bremen and Bonn were made-to-measure for Khan's programme which is carried out in a number of nuclear centers". Finke was the head of the German firm NTG that helped PAEC develop tritium

purification and recovery processes. Tritium is used to boost fission warheads and develop Hydrogen bombs.

Most of equipment and materials procured from Europe and elsewhere were essentially dual use items which were not specifically on the export ban list of many countries. Once a particular item was procured, it had to be understood in all its complexity and entirety and then either reverse engineered or replicated in house by Pakistani scientists and engineers. A classic example of this was when in 1977, the PAEC's main procuring agent in Europe, S.A. Butt placed orders for high frequency inverters to a British firm, Emerson Electric. The first shipment reached Pakistan in August, 1978, followed by two additional

orders. The British were not particularly concerned because they were convinced that the Pakistani engineers would never know how to operate such sophisticated equipment and the inverters would all sit in their packing cases until they rusted away. This was the British attitude until a few days after the first shipment reached Pakistan, when Emerson received a telex requesting a long list of extremely complex modifications. This meant that another 'Anglo- Saxon' prejudice against perceived Pakistani incompetence went down the drain.

Not everything was or could be procured from abroad. Quite a lot of indigenous R & D and in-house solutions to technical problems and challenges were the result of the innovation and expertise of Pakistani manpower. One of the first steps taken by Munir Ahmed Khan after becoming chairman PAEC was to institute a detailed survey of Pakistani industry which was utilized in many important projects of PAEC.

## 7 - Training and Research & Development facilities

In 1999, Munir Ahmed Khan revealed, "We were not just making the bomb, but building science and technology".

The backbone of any nuclear programme is its human resource, the trained manpower, and to this end, the PAEC developed made Pakistan's nuclear programme self reliant by building institutions. These institutions became the fountain of nuclear science and technology with its enormous spin off effects for socio-economic development.

The PAEC's Institute of Nuclear Science and Technology (PINSTECH) is the premier nuclear research and development establishment which dates back to the days of

Dr. I.H.Usmani and proved to be the backbone of most of the PAEC's projects and the entire nuclear programme. The Nuclear Engineering Division was established at PINSTECH during Dr. Usmani's tenure which played an important role in research and training of PAEC scientists and engineers in the field of nuclear power and reactor operations.

PINSTECH has played an unassuming and a subtle role in the success of the nuclear programme of Pakistan. All the leaders of civil and classified nuclear programmes were provided by PINSTECH from time to time during the execution of the projects. PINSTECH has been a storehouse of R & D capabilities and has been a source of great academic strength of Pakistan in a similar manner as that

provided by good universities in Europe.

The extensive programme of the nuclear fuel cycle initiated by Munir Ahmed Khan is the back bone of the nuclear technology in Pakistan and the basic R & D, leading to pilot plants and later adopted on factory scale, was done at the two research centres, the Atomic Energy Mineral Centre (AEMC) in Lahore and PINSTECH in Islamabad which has also acted as a supplier of high quality human resource to almost all the main civil and nuclear defense projects in Pakistan.

Some of the most important departments of PINSTECH proved critical to all areas of nuclear programme. Munir Ahmed Khan established nuclear Materials Division (NMD) of PINSTECH, in 1973. At present, this Division is one of the most prestigious technical Divisions of PINSTECH, which has contributed significantly to the development of PAEC's indigenization programme. It has the distinction of accomplishing several projects of strategic importance and has

played a key role in the efficient running of these projects by solving scientific and engineering problems.

Munir Ahmed Khan also established the Radiation & Isotope Applications Division (RIAD) in 1972 along with the Nuclear Materials Division in 1973 and a full-fledged Computer Division in 1980 in PINSTECH.

PINSTECH also houses two small reactors, the Pakistan Atomic Research Reactor (PARR-1), being a 10 MW high-flux, pool-type research reactor supplied by the U.S in 1965, which was upgraded from 5 MW to 10 MW and PARR-2 which is a 27 KWt pool-type light-water research reactor that was supplied by China in 1989. Both these research reactors like KANUPP are under the IAEA



safeguards. In 1988, PAEC started work on its swimming pool-type research reactor at PINSTECH, changing it from 5 MW to 10 MW and converting its core from 90% enriched uranium to 20% enrichment. The reactor was modified to keep pace with new requirements and because the US had refused to provide fuel of such high enrichment. Earlier each fuel load of PARR-1 consisted of three Kg of 90% - 93% enriched uranium, according to IAEA data. PARR-1 has been used for research, training, and radioisotope production.

The redesigned and upgraded PARR- 1 went critical on 31 October 1991 and this upgrade extended the life of the reactor for another 25 years beyond its original 25-year design life. The cost of the overhaul was \$2.5

million. The 20%-enriched uranium fuel used by PARR-1 is designed by PAEC and could be made by Pakistan, but Pakistan buys it from China because it is cheaper.

On 27 July 1990, the PAEC announced that Pakistan had commissioned its second atomic research reactor, which was built with assistance from the Peoples Republic of China and was designed by the PRC. The research reactor is located at the Centre for Nuclear Studies (CNS), which was part of PINSTECH. It is a 27 KWt pool type light water reactor that uses highly enriched uranium fuel provided by the Peoples Republic of China.

## *i) Centre for Nuclear Studies / PIEAS*

Munir Ahmed Khan set up the Centre for Nuclear Studies (CNS) in 1975, by upgrading the Reactor School, which was established in 1967 by Dr. I.H. Usmani. CNS has catered to the technical manpower needs of all areas of the nuclear programme at a time when the world had closed its doors to Pakistani students. The CNS has so far produced over 5000

nuclear scientists, engineers and technicians who were the backbone and the human resource for the nuclear programme.

A long standing dream of Munir Ahmed Khan of transforming Centre for Nuclear Studies into a university has been realized with the establishment of the Pakistan Institute of Engineering and Applied Sciences (PIEAS), which today is one the leading research and training institutions of Pakistan's in the field of nuclear science and technology. The Departments of Nuclear Engineering, Chemical and Materials Engineering, Vacuum Technology, Process Engineering, Systems Engineering, Electrical Engineering, Optics and Lasers Physics, Mechanical Engineering and Nuclear Medicine, Physics and Applied

Mathematics and Information Technology, in CNS/PIEAS has been conducting one of the most advanced masters and post-graduate training programmes along with Ph.D programmes in these disciplines for over 34 years now.

Today PIEAS bears a "Dr I. H. Usmani gold medal " in Nuclear Engineering and a " Mr. Munir Ahmed Khan gold medal" which is awarded to distinguishing students in the field of M.Sc Systems Engineering.

The story of the development of PIEAS is one of organic growth. Over the years, it has undergone several metamorphoses, each of which has radically changed many of its outward physical characteristics, while maintaining a basic continuity in its academic traditions and

fundamental objectives. It is an old institution with a new name. The seeds for this institution were sown more than 32 years ago in 1967.

By 1969, this training programme had been imparted sufficient depth and breadth for Quaid-i-Azam University (then called the University of Islamabad), to accept it for the award of a Masters' degree in nuclear technology, with Reactor School being formally affiliated to the University through its Physics Department.

To broaden participation and encourage greater competitiveness in this programme, a Fellowship programme was instituted in 1972, under which engineering graduates and M.Sc. degree holders in the physical sciences were invited to compete directly for the award of attractive fellowships for the duration of the course.

With its expanding activities, additional space became of paramount importance and therefore a separate building was

constructed, and CNS shifted to it in 1978. In its continuing evolution, almost a decade later, its affiliatory relationship with Quaid-i-Azam University underwent a major change and CNS was granted much greater academic autonomy. The expansion of training facilities at CNS was to be an important component of this general objective.

To accommodate the new laboratories, lecture-halls and other facilities which were mandated by this expansion programme, several new blocks of buildings had to be constructed and laboratory equipment acquired. This process is still continuing. The enhancement in its infrastructure that created the capability for offering programmes in many different fields meant that the institution

had outgrown its old name and a new one was needed. Therefore, its name was changed to "Pakistan Institute of Engineering & Applied Sciences" (PIEAS), in 1997.

It has always been a stimulating challenge for the faculty to begin with a group of people with diverse backgrounds and travel with them towards the unified goal of understanding the complex systems and processes involved in nuclear technology. In all the projects and working plants of PAEC, and indeed in all modern industrial undertaking, computers, instrumentation and control systems play a central role. With the breathtaking rate of development in these fields, their importance is increasing rapidly. To train manpower requirements in this vital area,

the M.Sc. (Systems Engineering) programme was initiated here in 1988.

The commencement of the M.Sc. (Nuclear Medicine) programme in 1989 has been a major departure for the institution from its original base of engineering and physical sciences.

PIEAS now has nearly 30 laboratories in different areas for conducting students' experiments as well as for R&D work. Besides the regular academic programmes, PIEAS has conducted a large number of courses on various specialized topics. The length of these courses has varied from 2 to 18 months and the areas covered have included reactor supervision and operation, health physics, medical physics, laser technology, vacuum technology, computer applications and advanced reactor safety. PIEAS is engaged in manpower development programmes at many levels and in many directions, but the major thrust of PIEAS's efforts is directed towards postgraduate academic work. At this level, research and

development activities become an integral part of the educational process. PIEAS tries to ensure that all of its Masters' graduates get some experience of independent work on an R & D project relevant to their background and interest.

PIEAS faculty members have published more than 400 papers in international journals.

A large part of the R&D work has also been reported in the hundreds of Masters' dissertations and technical reports that are regularly prepared. The Ph.D. programme has been instituted relatively recently here, but is now receiving much more attention as the avenues for education at the highest level in technical fields are being increasingly blocked by the industrialised

countries. Currently there are more than 12 doctoral candidates registered in the Ph.D. programmes in Nuclear Engineering, Systems Engineering, Nuclear Medicine and Computer Science.

Some of the research facilities available to students at PIEAS include:

## *a) Research Reactor*

The Institute has a 27 kW under-moderated tank-in-pool type Nuclear Reactor for training and research. It is used for neutron activation analysis, radioisotope production and training of manpower. A 10-MW swimming pool type research reactor at PINSTECH is also available for research and training.

## *b) PWR Simulator*

The pressurized water reactor

power plant simulator was developed indigenously by the scientists and engineers of PAEC. It is used to provide the students and trainees hands-on experience of reactor operation. It is also used for study and analysis of transients encountered in the actual power plant operation.

The importance of CNS/ PIEAS can be gauged from Dr. Samar Mubarakmand's statement in 2003 said "today all the major key scientific organizations linked to the country's security like the PAEC, the Kahuta Research Labs and the National Defence Complex are being run and operated by Pakistani professionals produced by the policies of the PAEC both under Dr. Usmani and Munir Ahmed Khan of producing indigenous trained manpower."

## *ii) National Defence Complex and HMC-III*

In the last years of Munir Ahmed Khan's tenure as chairman PAEC, some important developments took place that saw the

laying of the foundations of the National Development Complex and Heavy Mechanical Complex-3, Taxila. These projects of national importance were completed and expanded under the new PAEC chairman Dr. Ishfaq Ahmad.

By 1987, the PAEC completed cold tests of a nuclear weapon design that could be delivered by an F-16 and other PAF aircraft. The next step was to develop delivery systems that could have greater reach and survivability. In the late 1980s (most likely late 1987 or 1988), PAEC signed an agreement with China for the purchase of M-11 and possibly a small number M-9 ballistic missiles. China also agreed to aid Pakistan's ballistic missile efforts by building a turnkey facility where such missiles could be built in



Pakistan, including a solid fuel propellant plant.

An important development in this regard was the appointment in 1990 of Dr. Samar Mubarakmand as Director-General of the National Defence/Development Complex (NDC), concurrently with his position as a PAEC Director and then as its Member (Technical). The NDC was formally established in 1993 and began extensive Research and Development in the production of solid fuelled Shaheen missile systems and other defence related equipment for the armed forces. NDC began work on the Shaheen missile system in 1995 and other short and medium range solid fuelled ballistic missiles.

Heavy Mechanical Complex-3, Taxila, was originally conceived

by the PAEC in the 1980s as a project of PAEC's Scientific and Engineering Services Directorate to cater to the needs of producing spare parts for KANUPP and other projects of strategic importance. Mr. Pervez Butt, chairman PAEC played a key role in the establishment and development of HMC-3.

The establishment of HMC-3 was aimed at the development and application of latest know-how and up to date manufacturing & testing facilities for nuclear power plants and to produce thick walled pressure vessels, sophisticated & complex process equipment, precise mechanical components, heavy steel structures, etc., in conformance with the international codes & standards. HMC-3 has broadened the design, engineering & development base of Pakistan. It is providing engineering support to the projects of national importance since 1994. For manufacturing the most precise & high-tech components & equipment, HMC-3 caters to the national needs as well as international requirements.

### *iii) NCNDT*

The Non-Destructive Testing activities have been carried out by PAEC since 1974, The National Centre for NDT was established in 1985, and has been serving the country in maintenance evaluation of materials under Scientific and Engineering Services Directorate of PAEC.

### *iv) International Nathiagali Summer College (INSC) on Physics*

Since its inception in 1976, the college has traditionally been held at Nathiagali except for the period 1981-1984 when the venue was temporarily shifted to Islamabad.

The idea of organizing a college on regular basis came from distinguished Nobel Laureate, Professor Abdus Salam who

suggested in 1974 that an international forum for scientists from developing countries be organized to encourage greater communication and flow of ideas among them. He also offered the assistance and co-sponsorship of the International Center for Theoretical Physics (ICTP), Trieste.

Munir Ahmed Khan was the first person with whom Prof Dr. Abdus Salam discussed the idea of setting up the ICTP in 1960, therefore when the idea of organizing the Nathiagali Summer College was floated by Dr. Salam, PAEC readily accepted Professors Salam's idea and started work for its implementation.

The First College of the series was held in the summer of 1976 at Nathiagali which lent it the name. The idea proved to be a

big success and the College has now evolved into an institution and become a prestigious event in the scientific calendar of this part of the world.

This College is perhaps the only one of its kind to be organized in a developing country, covering a wide range of topics of science and emphasizing their applications to the contemporary needs of the society. It aims at breaking the intellectual isolation of the scientist in the developing countries; keeping pace with the rapid progress in science and contemporary needs by promoting higher science education; placing due emphasis on the interaction of modern trends in physics and their applications in current technological development with special reference to the needs of the countries of the third world; promoting a scientific dialogue and provide opportunity and opening avenues for cooperation and joint research programs; and broadening the outlook of the participants, to re-orient their scientific activities in addition to indicating the areas where research could

be carried out with limited facilities of developing countries.

The College has been purposely designed to cover in a synoptic manner the modern trends in physics and their application in current technological development with special reference to the needs of the developing world. It therefore encourages an interdisciplinary cross-flow of ideas and applications and such interactions help the scientists from less developed countries to cultivate direct contacts with those fortunate enough to be working in well equipped laboratories and research centers in the advanced countries- the mainstream of modern scientific activities.

The most important factor in the success of such colleges are the speakers. INSC has had over 200 foremost scientists drawn from universities, research centers

and industries of advanced countries to lecture at INSC. The faculty has many leading lights in their fields of specialisation including six Nobel laureates in addition to other renowned scientists and outstanding speakers.

The truly international character of scientific activity has been under-scored by the multinational participation in these colleges. The general atmosphere of the College reflects a true picture of international fraternity. During the last 18 years of INSC, nearly 500 foreign scientists from as many as 60 countries have participated in the proceedings of the College. INSC has served as a forum for people of different countries whose main problem is scientific isolation.

Physics, energy and natural resources was the major theme of the scientific program of the Fourth College. In the inaugural

lecture, Munir Ahmed Khan, chairman PAEC, put the energy needs of the developing countries in the perspective and importance of the role of nuclear energy in these countries as well as the constraints which they face on this account.

Here is how he put forth his ideas:

"The developing countries of the third world need to acquire nuclear technology for essential diversification and augmentation of their energy supplies and to ensure their development and progress. Since nuclear technology is interdisciplinary in character, its advantages overflow into many other areas of industrial development. Their depleting oil resources, limited development and rising population call for immediate action to radically alter economic development prospects."

## 8 - Pakistan's Nuclear Power Program

Pakistan's nuclear power programme could not be developed as envisaged by PAEC primarily due to three reasons.

Indian nuclear explosion of 1974 after which the West imposed discriminatory

embargoes and sanctions on Pakistan. Soon after in 1976, Canada had imposed sanctions on the supply of nuclear fuel and spare parts for KANUPP, even though it was under complete IAEA safeguards.

Resource constraints as nuclear power plants require huge sums of capital investment. Given the shortage of funds, which were entirely utilized in the nuclear weapons program, very little was left for the nuclear power programme.

Pakistan's persistent refusal to sign the NPT or to accept discriminatory safeguards attached with any potential nuclear reactor deal from any western country.

Successive governments' chronic lack of appreciating the importance of nuclear technology for power generation despite repeated initiatives of PAEC in this regard.

## *i) KANUPP*

On May 24, 1965, PAEC under Dr. I.H. Usmani signed a turnkey project contract with Canadian General Electric for the design, supply, construction, and commissioning of a 137 MWe nuclear power plant to be built in Karachi

Civil construction of the Karachi Nuclear Power Plant (KANUPP) began in September 1965 and was completed by July 1971. The reactor attained criticality on 1 August 1971 followed by generation of electricity for the first time on 18 October 1971. Full power generation (137 MWe) was achieved for the first time on 4 October 1972. The plant was formally inaugurated on 28 November 1972 by the President of Pakistan Z.A. Bhutto and the new Chairman of the PAEC, Munir Ahmed Khan.

The plant has faced numerous challenges during its over two

decades of operation. Following the withdrawal of vendor technical assistance and imposition of embargoes by major nuclear countries in 1976, the plant some times has been shutdown for longer durations to carry out maintenance, modifications or repair. A committed self-reliance programme by PAEC, however, kept the plant operational throughout the difficult period.

In 1980, PAEC successfully produced nuclear fuel for KANUPP while it made all-out efforts to create the technical infrastructures, industrial resources and personnel expertise necessary to support station operation. The Design & Development Division (Mechanical), Computer Development Division, In-service Inspection Laboratory, Control & Instrumentation Application Laboratory, Quality Assurance Division and Nuclear Power Training Centre were established within the plant. At about the same time, the Technical and Health Physics Divisions were strengthened to provide necessary backup for technical and radiation control support.

Such technical support does not form part of nuclear power plant operation in

developed countries but in the case of KANUPP there was no other choice. Incidentally, KANUPP is the only nuclear power plant in the world which has been operating without technical support from the vendor which is vividly indicative of PAEC's commitment to self-reliance.

In spite of problems of sorts, KANUPP faithfully adhered to its original safety and public risk targets.

The safety records have been extremely satisfactory as testified by regular testing and reliability analysis. Average personnel radiation exposure has been well within the prescribed limits of International Commission on Radiological Protection (ICRP).

Release of radioactive material through gaseous and liquid effluent has remained within 4% of the maximum permissible limit.



In-depth analysis of the Plant's operational safety was conducted in 1985 and 1989 by an International Atomic Energy Agency (IAEA), Operation Safety Review Team (OSART). On both occasions, the IAEA team found the Plant operation to be in conformity with laid down limits and prescribed original safety standards.

The complete isolation of KANUPP from international channels of communication partially ended in 1989 following the Three Mile Island (TMI) and Chernobyl incidents which aroused an instant realization among the nuclear community to promote global safety in nuclear power plant operation. The Candu Owners Group (COG) and, later, the World Association of Nuclear Operators (WANO) were formed to provide a forum for promoting closer cooperation among nuclear utilities in matters relating, to operational

experience feedback and plant safety. KANUPP joined COG and WANO in 1989 and has now access to public domain information from nuclear utilities the world over.



*A view of KANUPP nuclear power plant*

After over two decades of operation, signs of normal ageing and obsolescence are becoming apparent. Many critical components are reaching the end of their designed life and need to be replaced. An IAEA "Assessment of Safety Significant Event Team (ASSET)" was invited in 1989 to undertake a safety review of reactor components. Based on its recommendations, an Integrated Safety Review Master Plan (ISARMAP) for safety

enhancement project "Safe Operation of KANUPP (SOK)" was prepared in 1991 for managing age related problems and full scale assessment of reactor fuel channels. Assistance from the vendor country has been acquired through IAEA in the execution of this project. WANO conducted peer reviews in 1994 and then again in 2000.

Recommendations of these reviews are being implemented in the plant.

KANUPP has also undertaken the replacement of its obsolete Computers, Control and Instrumentation under the technological Up-gradation Project (TUP). A contract with a reputable international company was finalized in September 1992, under which most of the critical C&I loops and computers are being replaced.

Under a comprehensive Balancing, Modernization and

Rehabilitation (BMR) project, KANUPP is planning to upgrade its conventional equipments, such as Building Chillers, Service Air Compressors, Power Cables, Condenser Tubing etc.

With the replacements of its obsolete informatics and refurbishing of the nuclear island as well as conventional equipment, the operating life of the Plant is expected to be extended to 2012, i.e. 10 years beyond its designed life of 30 years.

## ii) CHASNUPP-I

In 1972 Munir Ahmed Khan began work on an ambitious nuclear power plan as part of a larger IAEA assessment of the potential role of nuclear power in meeting the energy demands of developing countries. This led the IAEA and PAEC to produce the 1975 Nuclear Power Planning Study for Pakistan. The plan proposed building

eight 600 Mwe nuclear power plants between 1982-1990, and nine 600 MWe units plus seven 800 MWe units between 1991-2000, with Pakistan having nuclear power amount to 60% of its projected installed capacity by 2000.



*CHASNUPP nuclear power plant*

Chashma was identified as a site for some of these nuclear power plants. In this new environment, an emboldened PAEC resumed its search for nuclear power plants. In 1982, after a study by the Spanish engineering and consulting company Sener, Pakistan approved a \$1.5 billion plan for a 937 MWe nuclear power plant to be located at Chashma, to be completed by 1988.

It was to be the first of a proposed six 1000 MWe reactors at the site.

Several major nuclear engineering companies initially expressed interest in bidding for the planned reactor, including Westinghouse, General Electric, Framatome, Kraftwerk Union, and Hitachi. This interest did not mature, despite the prospect of future orders for more reactors. The deadlines for the bids had to be postponed five times. When after 16 months there had been no bids, the deadline for bids was postponed indefinitely. Pakistan's effort to acquire the reactor was raised at the highest levels; President Zia-ul-Haq met with Chancellor Kohl of Germany and had discussions with France.

Despite Pakistan's major role in supporting the United States against the Soviet Union in Afghanistan even the Soviet Union was asked to supply

reactors. But to no avail. The Western reluctance to supply a nuclear power reactor to Pakistan, despite the financial incentives, was attributed to US pressure on suppliers and concerns about Pakistan's nuclear weapons program, as well as on Pakistan's unwillingness to accept full-scope safeguards.

It was against this background that in the late 1980s Pakistan turned to China for a larger nuclear power plant to be built at Chashma. The agreement between Pakistan and the China National Nuclear Corporation (CNNC) for the supply of the Chashma reactor was reached in November 1989, with the final contract signed in Beijing on 31 December 1991.

Munir Ahmed Khan said that this reactor deal with China for a 300-MW PWR had broken an international embargo against Pakistan.

The Peoples Republic of China (PRC) Prime Minister Li Peng agreed in November 1989 to supply a 300 MW PWR and enriched uranium to Pakistan during a four day visit to Pakistan. The deal followed a 1986 agreement for nuclear cooperation between the two countries. Technical and financial details will be ironed out in meetings over the next few months. The deal was first hinted at in August 1989 when an official Pakistani delegation visited the PRC for bilateral talks, which included areas of nuclear cooperation.

The plant was built at Chashma , near a heavy water reactor fuel fabrication facility. It is also the site where the PAEC had unsuccessfully attempted to set up a French reprocessing plant and a 900 MW PWR.

Civil work on Chasnupp-I began with the ground breaking ceremony held on 26 Dec. 1992 and the first concrete was poured on 18 Nov, 1993. The plant became went critical on 3rd May 2000 and began commercial operation on 15th September the same year.

In March 1992 China acceded to the NPT and the Safeguards Agreement for Chashma between Pakistan, China and the IAEA was approved on 19 June 1992, and signed on 24 February 1993.

Unlike Western suppliers, China did not insist on fullscope safeguards -- which would have covered Pakistan's entire nuclear complex, including its nuclear weapons facilities.

The Chashma site was one of the 12 possible sites identified in the 1975 PAEC Nuclear Power Planning Study for the 24 reactors the study proposed should be built in Pakistan over a period of 18 years. These sites were characterized as desirable on the basis of there being access to water for cooling, ease of transport of construction materials and components,

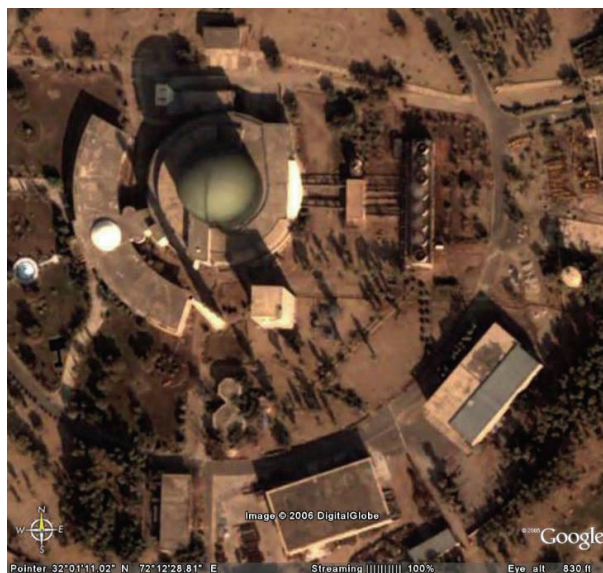


proximity to transmission lines and areas with potentially high demand for electricity, and appropriate geological conditions and levels of earthquake activity.

Chashnupp-I is a pressurised water reactor (PWR), a design originally developed in the mid-1950s by the Westinghouse Corporation from a reactor it had built to power submarines for the US navy. It is now the most common type of nuclear power plant around the world.

### iii) The West German Reactor Plan

The PAEC asked a West German firm and a firm from France to combine forces and supply a 900-MW reactor to Pakistan in the early 1980's. On 20 September 1982, then-US Secretary of State George Shultz raised proliferation concerns in a letter to the West German Foreign Minister Hans-Dietrich Genscher. The note warned



*Aerial view of Khushab*

Genscher that Pakistan was building an unsafeguarded military reprocessing plant and asked Bonn to export any further nuclear reactor technology under full-scope safeguards. The Foreign Minister agreed to consult with the US on further exports to Pakistan but insisted that the FRG had never agreed to a blanket position requiring full-scope safeguards for exports.

The US position on German exports was shared by the UK and the Netherlands. In November 1982, the British Foreign Office

told Bonn that the US was doing everything possible to prevent Pakistani proliferation but its efforts have only served to escalate PAEC's weapons program. UK intelligence information at that time revealed that Pakistan would have a workable bomb by 1983.

As a result, by 1985, the West Germans stiffened its nuclear export policy. When in 1985, Rasheed Ahmad, Pakistan's ambassador to the West Germany, requested a reactor again for the PAEC from officials in the German Economics Ministry, they insisted on full-scope safeguards. The US reminded the West Germans of "proliferation concerns" at this time. By July of 1985, the Ambassador's request was denied because the West Germans claimed its firms couldn't export in light of Pakistan's economic problems.



## *iv) The French Reactor Deal*

In December 1986 Pakistan's Foreign Secretary Abdul Sattar, visited France to meet with the French foreign minister and to discuss the possible supply of a 900 MW French unit at the Chashma. In May 1987 French Foreign Minister Jean-Bernard Raimond discussed French cooperation with Pakistani Foreign Minister Sahabzada Yaqub Khan. France agreed to cooperate with Pakistan in order to meet Pakistan's energy needs. A French official said that the nuclear power plant that might be constructed in Pakistan will fall under International Atomic Energy Agency (IAEA) safeguards, but did not insist that Pakistan sign the NPT before the deal is finalized.

In February 1990, President Mitterand of France authorized a reactor sale bid for a proposed 937-MW Pressurized Water Reactor (PWR) to be built at Chashma in Pakistan, thus

defying a western embargo on nuclear sales to Pakistan. Mitterand ignored US and European objections who wanted Pakistan to accept full safeguards for all its nuclear installations. In June 1990, an official delegation from Pakistan, led by Munir Ahmed Khan, held two days of talks with France on the technical and financial aspects of the reactor sale bid. Two working groups were set up to handle the technical and financial issues. The reactor from France was likely to be built at Chashma in Pakistan. Framatome and other firms from France were likely to be involved in construction of the reactor in Pakistan.

In September 1990, Shahehyar M. Khan, the Foreign Secretary of Pakistan, said that Dr. Tanveer Ahmad Khan, Pakistan's new ambassador to France, will launch negotiations in coming weeks to discuss a financing formula proposed by France for a 937 MW nuclear power plant. Shahehyar Khan said that Pakistan may not be able to afford the projected \$1.5 billion, that the plant will cost for construction, due to the economic downturn that was caused by the Gulf crisis. Shahehyar Khan said Pakistan would be unable to conclude a financial agreement until after talks are

held on compensation for a reprocessing plant deal that France cancelled in 1978. However, in early 1991, Pakistan claimed that the US was pressuring European countries neither to export nuclear technology to Pakistan nor to allow Pakistani students to enroll in technological disciplines. France delayed negotiations on loans for the proposed supply of a 937 MW PWR to Pakistan.

International lending agencies were also not providing loans to Pakistan for the purchase of the estimated \$1.5 billion PWR. French sources said that France had delayed discussions on the plant since the ouster of former Pakistani Prime Minister Benazir Bhutto in 1990. By August 1992, France had also signed the NPT, and the reactor deal with Pakistan was effectively scuttled.

## 9 - NUCLEAR MEDICAL CENTRES:

PAEC operates over two dozen nuclear medical centres throughout Pakistan where hundreds of thousands of patients have been given medical care by utilizing nuclear medical techniques, especially for cancer patients.

### *i) MINAR*

Established by Dr. I.H Usmani, Multan Institute of Nuclear Medicine and Radiotherapy (MINAR) is one of the 13 Medical Centres run by the PAEC. It is located in Multan.

MINAR is ideally located within the premises of Nishtar Hospital campus. It serves a population area of over 14 million and the catchment area includes the southern Punjab, adjoining areas of Sindh, Baluchistan, and NWFP. From a humble start in 1968 as AEMC, Multan, it has made a tremendous progress, and became an Institute in 1995,

with the name of MINAR.

Initially it was providing only nuclear medicine services with a rectilinear scanner and an uptake system. The first gamma camera was installed in 1981 and subsequently new gamma cameras were installed in 1989 and 1994.

Presently it provides a wide range of services in the field of nuclear medicine, RIA and radiotherapy on outdoor as well as indoor basis. Besides this, allied services being rendered to patient include ultrasonography and mammography.

### *ii) NORI*

Nuclear medicine, Oncology and Radiotherapy Institute (NORI), Islamabad, was established eighteen years ago by PAEC under Munir Ahmed Khan . It provides diagnostic and treatment facilities to patients suffering from a wide range of pathologies. The Institute is catering to a population of about 10 million people coming from various parts of Pakistan

### *iii) IRNUM*

Institute of Radiotherapy and Nuclear Medicine(IRNUM) was established by

Munir Ahmed Khan. It is located in Peshawar within the premises of Peshawar University on the main Jamrud road leading to the famous Khyber Pass(which is a Gateway to central Asian Republics). It became November 1975 and is the only hospital of the Province where Radiotherapy and Nuclear Medicine facilities are available under one roof. IRNUM is playing a pivotal role in diagnosis and management of cancer and allied fields.

### *iv) INMOL*

Institute of Nuclear Medicine and Oncology - INMOL is one of the twelve medical centers established by PAEC across the country. INMOL was established by Munir Ahmed Khan and is located in Lahore.

INMOL has been offering exemplary services in the fields of nuclear medicine and cancer management since 1984.

Equipped with modern instruments & state of art facilities in both nuclear medicine and radiotherapy divisions, it caters for about 60,000 patients per annum. The number of patients is however increasing with expanding repute of the institute. Highly qualified and professionally devoted physicians and doctors of Nuclear Medicine and Oncology are available at INMOL. It also extends free medical aid to deserving patients that range from 80-90% of the total patients attended.

The high quality diagnostic and treatment facilities have earned INMOL a good repute at both national and international levels. It has also been declared as the 'Center of Excellence' and a referral center for Asia-Pacific regional countries by the IAEA.

The Institute is also well known for its high quality teaching and training in the regional countries

from where there is a regular inflow of students for training in almost all the fields available at INMOL. The institute is at the forefront in the field of research also. The research work is being carried out mostly in collaboration with the IAEA.

Considering the high standards of professional and clinical practice at the institute, College of Physicians & Surgeons of Pakistan has recognized INMOL as the training center for FCPS students in the fields of Nuclear Medicine & Oncology.

#### *v) CENAR*

Centre for Nuclear Medicine and Radiotherapy (CENAR) is the first Centre of its kind in Baluchistan, commissioned by PAEC. It was established by Munir Ahmed Khan and its foundation stone was laid by Prime Minister Junejo, on 22nd April 1986. CENAR became functional in November 1987

The Center provides services in Radiotherapy, Medical Oncology, Diagnostic and Therapeutic Nuclear Medicine.

#### *vi) BINO*

Bahawalpur Institute of Nuclear Medicine & Oncology (BINO) is the 12th Nuclear Medical Center of PAEC established by Dr. Ishfaq Ahmad. BINO has been established to provide diagnostic and treatment facilities to the cancer patients of this remotely situated area. It became operational in August 1998. Since its inception, it has come up remarkably well to cater the needs not only of Bahawalpur Division but also to the Southern Punjab and adjoining areas of Sindh and Balochistan

## **10 - NUCLEAR AGRICULTURE AND GENETIC ENGINEERING**

#### *i) NIAB*

Use of ionizing radiations and radioisotopes offers an advantage over conventional techniques in agricultural and biological research, the absorption of nutrients, the resistance of plants to saline

water and sub soil brackish water and the induction of desirable mutations etc. In view of the importance of these techniques, the PAEC decided to develop expertise and facilities for utilization of nuclear and other modern techniques in agriculture and biology to solve the problems of crop production and conservation.

Nuclear Institute of Agriculture and Biology (NIAB) was sanctioned as a development project of the PAEC in 1967 under Dr. I. H. Usmani and started functioning under Munir Ahmed Khan. By producing advanced quality seeds of different varieties of rice, cotton and other crops, NIAB's seeds have resulted in a massive growth of production of cotton crop which is Pakistan's major export and is the source of billions of dollars in foreign exchange. Research activity

started at NIAB in 1970 and the Institute was inaugurated in 1972.

## *ii) NIBGE*

PAEC has always been on the forefront for acquiring new and emerging technologies. Hence, PAEC took the initiative way back in 1987 for establishing National Institute for Biotechnology & Genetic Engineering (NIBGE) which was formally inaugurated in January 1994 by the President of Pakistan. PAEC has always been generously supporting activities in bio-sciences involving use of nuclear techniques in agriculture and medicine. PAEC, in addition to NIBGE, runs three Agriculture Research Institutes namely NIAB, Faisalabad; NIA, Tandojam and NIFA, Peshawar. In addition, PAEC runs thirteen Nuclear Medical Centres all over Pakistan. PAEC intends to continue supporting R&D activities in all related areas of life sciences.

## *iii) NIA*

Nuclear Institute of Agriculture (NIA), Tandojam is the first Institute of Agriculture established by PAEC under Dr. I. Usmani. Its research activities are covering the fields of Plant Genetics, Plant

Physiology, Entomology, Soil Science and Biotechnology.

NIA has evolved and released 11 improved varieties of various crops viz; five of wheat, three of rice and one each of cotton, sugarcane and mungbean to cater to the needs of Pakistan in general and Sindh in particular.

## *iv) NIFA*

Established by PAEC in 1982 under Munir Ahmed Khan, the main objective of NIFA is to promote peaceful application of atomic energy in the fields of food and agricultural research. This institute is the third agriculture center of PAEC.

In NIFA the main focus of the research is on the development of improved techniques for increasing the yield of important food crops and the development of the package of technologies for conservation of agricultural produce in the country by the



use of nuclear and other relevant techniques. The institute holds the promise of making significant contributions towards improving agriculture production in the country, passing economic benefits to farmers and striving to share in the efforts to make the country self-reliant and self-sufficient in agricultural commodities. It is actively involved in research in the fields of Crop Breeding, Soil Science, Entomology, Food Science.

## Conclusion:

Dr. I.H. Usmani chairman PAEC (1960-72) had established a solid base for the civil nuclear programme with the establishment of PINSTECH and Kanupp. He had also trained a few hundred scientists and engineers of PAEC in various disciplines who provided a pool of trained manpower when the decision to go nuclear in 1972 was taken. This training was further expanded and

judiciously utilized under Munir Ahmed Khan.

At a reference held in memory of chairman PAEC (1972-1991) Munir Ahmed Khan, Dr. Samar Mubarkamand, Chairman NESCOM said, "As many as two dozen steps were involved in the making of a nuclear weapon ranging from exploration of uranium to the finished device and its trigger mechanism. The technological and manpower infrastructure for twenty three out of twenty four of these steps were provided by the PAEC under the leadership of Munir Ahmad Khan who led it for nearly two decades from 1972 to 1991." He said, "Munir Ahmed Khan was both a visionary and a doer who planned goals and targets 10 to 15 years in advance and would then set out in all earnestness to achieve those goals."

Dr. Samar recalled how Munir Ahmed Khan nurtured, guided and inspired his younger colleagues in the implementation of the nuclear program ranging from uranium prospection, mining, making of uranium gas, fabrication of nuclear fuel to the making of the nuclear device and to the selection and development of the test

sites at Chaghi in Balochistan so that when the time came, the actual blast could be carried out on a short notice. He further said that Pakistan's nuclear capability was confirmed on the day in 1983 when the PAEC carried out cold nuclear tests under the guidance and stewardship of Munir Ahmed Khan.

Due to the dynamic and visionary leadership of Dr. I. H. Usmani and Munir Ahmed Khan and Dr. Ishfaq Ahmad and the hard work of thousands of scientists and engineers, the PAEC has emerged as a centre of excellence and has given birth to new institutions like KRL, NDC, and finally NESCOM. PAEC and its affiliated organizations have proven to be the pride of the Pakistani nation, in the fields of national security, economic and industrial development, health and agriculture, human resource development and nuclear power

generation. The PAEC proved its worth at Chaghi in 1998 and is embarked on expanding the nuclear program , both in the field of nuclear power generation with the 300MW CHASHNUPP-II on its way to completion and plutonium production with Khushab-II and reprocessing with an expanded New Labs . In their footsteps, NESCOM scientists and engineers under the leadership of Dr. Samar Mubarakmand are also making rapid strides in the field of missile technology.

*The end*

## Pakistan's First Cyber War - Part II

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*Introduction: Please read Part I of this story in the first edition of E-Reporter to get a full context and continuity of ideas and storyline. Part III of this story will cover Pakistan's response to a cyber attack.*

In an obscure Rawalpindi neighborhood the first signs of war came early. Pak-CERT officially known as Pakistan Computer Emergency Response Team was established with official government funding only nine months prior. The team at Pak CERT was still not self-sufficient and relied heavily on the collaboration of private entities to provide for the skill-set deficiency. It was an effort that was slow but progressing in the right direction and it was an

effort that was about to pay dividends.

The first sign came when Pak-CERT began noticing IP traffic patterns with an abnormal increase in sourcing from Eastern European and Russian origination points. Destination for this source traffic was eerily being routed to financial institutions in Pakistan in what later became known as the sourcing or seeding event. This blip occurred only thirty days prior to the full Cyber attack, in an attempt to minimize chances for CERT and IT Security teams to correlate many of the events that only together could have foretold of the impending disaster. Through the seeding process the attackers were imbedding their Trojans and Worms on compromised systems in order to release their intended loads on IT infrastructures on the day of the Cyber attacks.

The morning after Pak-CERT had already logged over 3.9 billion cyber events occurring all over Pakistan's IT and Telecom infrastructure. Their systems too were reeling from a consistent barrage of "Spill-over" attacks. Somehow the initiation and setting up of Pak-CERT had been such a non-event within Pakistan

that it was inadvertently overlooked by the attackers and suffered no direct attacks. This would eventually be an oversight that would come as a God sent.

Pakistan Air Force in the early nineties developed a group of Cyber warriors. This effort was the step child in the force often driven more by the passion of the individuals involved than a strategic understanding by the force bureaucracy of its importance. Nevertheless it spoke volumes for the AVMs of that time that they somehow realized very early on that not understanding something should not diminish its importance and allowed the program to mature. In the twelve years since its inception the group grew from a motley bunch of six, to eighty full time cyber warriors. Though their mandate was eventually structured around providing systems and communications

security to the Air Force, the group called Unit 66 true to the PAF credo looked at the broader aspects of Cyber Warfare. It would be their efforts combined with skills and direction from Pak CERT that would eventually come around to providing the first salvo of return fire from Pakistan in her first Cyber War of 2011.

It was a simple attack. Three men approached the power relay station from opposing sides. The balls were meant to explode through a release switch mechanism in a silent puff releasing billions of fragments of carbon dust. As it descended onto the station it penetrated sensitive electronic sub-sections of the relaying grid shorting out critical electronic and control systems. Rawalpindi was thrust into darkness. All across Pakistan such team structures were devastating the electrical grid of Pakistan. These special commando teams were

going undetected and their methods of warfare unrecognized.

Siemens' victory for the PN conversion was a much heralded event. SINAVY was a critical component in the Military division of Siemens and contract victory for SINAVY's latest version made public news. An agreement was signed for the delivery of the latest generation of SINAVY that was still in the concept stage and had yet to be developed. Thus an opportunity presented itself to the Cyber attackers.

A sub-component for the electronic control system for SINAVY was eventually developed at the VLSI Labs in Madras, India. Of the thousands of transactions annually routed through India's massive offshore industry, Madras Electronic Foundation (MEF) elicited little notice by anyone. VLSI MEF Private Limited had been in business for seven years now and had delivered on some large projects for the Indian army along with many commercial contracts for IC Board manufacturers. By the time news came out regarding PN adoption of SINAVY, VLSI Madras had already developed a Trojan Microprocessor. Most

IT Security experts dwell in the much maligned Layer 4 and 7 of the ISO standard, known as the Network and Application layer, and disregard the microprocessor kernels and IC functions. This often has to do with the variance in the two technological areas which prevents individuals in the security space to develop an expertise that crosses over these domains.

Working closely with the Advanced Technology labs within RAW, VLSI MEF was able to imbed a dual purpose Microprocessor into the electronic sub-component for the master switching controller of SINAVY. A ticking time bomb that was only to be released and it was now a matter of how, when and where.

As army mechanics somewhere in North Eastern Sindh desert scurried around to figure out the sudden deaths of Pakistan



Army's much vaunted Main Battle Tank they had no idea that the task at hand was beyond their comprehension. The hum that was heard before the sudden seizing of the engines and ignition failures was the switch that heralded the attack. A low flying drone special purposed to emit radio frequencies. Though on peacetime exercises the unit had no idea that they were under attack. Little could they imagine that in the course of seven seconds the attackers had completed paralyzed the operations of their twelve brand new Al-Khalids.

The simplicity of this attack would shock the establishment. The forensic team would later discover that within a QC sticker thinner than a sheet of paper and of radius smaller than a rupee coin lay a simple circuit powered by an RFID type antenna. The circuit conducted and stored power by the

activated antenna which operated on 13.5MHz. The drone provided the radio signal at that frequency, the antenna was activated and powered up flowing current which was stored in a micro-capacitor and discharged when it reached its critical storage capacity. These stickers were found on almost every circuit board of the tank. Within seconds a lethal dose of minute electric charges literally fried the circuitry of the Tank rendering it completely useless. Welcome to war in the 21st century.

Like many financial institutions Westminster Investment Bank was reeling from the Cyber War. Almost all their systems were inoperable. The Cyber attackers were smart. It took them a total of 18 seconds to prime their victims, and they did it thirty days prior to the Cyber War. Just when Pak-CERT was seeing abnormal amounts of traffic emanate from Eastern Europe, Westminster was being seeded with a deadly worm. It was like no other worm developed before, the kind that people with a lot of money, time and effort could. Though it propagated like a worm once within an infrastructure it operated often like a silent Trojan. When Saleem Ijaz a trader at Westminster

downloaded a Britney Spears screensaver little did he know that he had begun the war by being a silent participant.

Almost three years prior to the Pakistan's first cyber war, agencies and warriors of a different creed began to develop a national fingerprint of Pakistan. They touched, probed, and talked with every logical node within Pakistan and within the course of three years had differentiated and segmented the entire infrastructure of Pakistan. They managed to differentiate the IT footprint of Pakistan in terms of critical infrastructure, tier-one economic, tier-one services and so on. This process enabled them to task their attacks against systems that yielded the maximum result. Westminster was a tier one financial.

Back to Saleem Ijaz. As he viewed the different images of Britney over the months little

did he know that the images were downloaded as encoded globs of data. This glob of data was not the image it was an instruction sheet. Till thirty days prior to the attack these instructions were innocuous requesting image transfers from image sourcing servers. But on the day that Pak CERT noticed the anomaly in traffic patterns the instructions requested a download with a far sinister payload. Around Pakistan thousands of computers were undergoing a similar process. Not all were running Brittney, as the Cyber attackers had a multitude of seeding mechanisms, disparate, hidden and difficult to correlate.

Forensic teams that eventually were called in to stem the tide extricated the download into a Sandbox and what they found was incredible. The worm was of a Warhol genome, and on the day of the attack it took less than 15 minutes to infect 33

million logical nodes within Pakistan. The payload was simple. Half of the systems or approximately 17 million nodes requested resources from 43 critical sources such as ISPs, Telecom IT services, PTA, PTCL, KESC, WAPDA, CAA, and others. The requests were as simple as a connection to a port. The concurrency of the requests in-effect brought down all services. The remaining 16 million nodes executed an internal command that exploited unknown vulnerabilities later identified as Intel's SUPER CORE Duo 9 Cycle Exploit. The vulnerability allowed for exponential processor clock cycling causing eventually a hard crash of the device. Westminster suffered from the later. So combined this cyber attack took out not only the ability of Pakistan to communicate with and from points outside of Pakistan but also caused internal mayhem to critical servers within thousands of organizations. The complete outage of everything from basic services like water pumping to sewage gates, to turbine operations, to railway services, air services, air traffic control, port operations, business and financial operations, schools, universities, highway and traffic control. It was as if someone

had carpet bombed every square inch of Pakistan and the irony is not a single bullet was fired.

A nation woke in amazement, hoping its defenders were ready and capable to protect the lives and aspirations of her people. What they saw in the next seven days reminded them of lores they often heard from their fathers and grand fathers about the time when a nation facing an insurmountable enemy responded with the courage unity and dedication. A day they celebrated on the 6th of September.

**Note to Readers:** The above story line is entirely fictional. Any similarities to actual persons, places or events are coincidental and unintentional.

## Bunker News

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### US defence team briefed about peculiarities of Fata

PESHAWAR (September 12 2006): A 12 member delegation of Defence Security Co-operation Agency of USA led by Lieutenant General, Jeffrey Kohler visited Corps Headquarters and called on Corps Commander, Lieutenant General Muhammad Hamid Khan.

According to a press release of Inter-Service Public Relations (ISPR) here, the visiting dignitary remained with Corps Commander for some time and discussed matters pertaining to professional interest.

Lieutenant General Jeffrey Kohler and members of his delegation were briefed about the peculiarities of Federally Administered Tribal Areas

(FATA), the customs and traditions of its inhabitants and massive uplift projects being undertaken by Pakistan Army for the socio-economic well being of the people of tribal areas.

Later the delegation visited Headquarters Frontier Corps (NWFP) where they were given detailed briefing about the multi-dimensional roles of Frontier Corps in the tribal areas.

*Copyright: Associated Press of Pakistan, 2006*

### Pakistan and Italy to enhance defence ties

RAWALPINDI (September 14 2006): Pakistan and Italy have expressed the desire to enhance defence co-operation between the two countries. This was discussed during a meeting between Senior Federal Minister and Minister for Defence, Rao Sikandar Iqbal, and the visiting Italian Chief of Defence Staff, Admiral Giampaolo DI Paola, here on Wednesday.

The meeting discussed the geo-political situation of the region and underlined the need for stronger co-operation between

the two countries. The Minister informed the visiting dignitary that Pakistan attached greater importance to its relations with Italy and wanted to broaden and deepen its relations with Italy in diverse fields particularly in the area of defence.

The meeting also discussed the developments taking place in Afghanistan. The Minister told the Italian Chief of Defence Staff that Pakistan was committed to fighting and curbing terrorism and extremism and had gained tremendous success in this regard. The Minister also appreciated Italy's prompt assistance for relief efforts in the quake affected areas.

*Copyright: Associated Press of Pakistan, 2006*

### Phalanx CIWS Contract Awarded

WASHINGTON (Reuters) - Raytheon Co. (RTN.N: Quote, Profile, Research) has won a

\$369.1 million U.S. Navy contract for Phalanx Close-In Weapons systems and spares, including some for Pakistan, the U.S. Defense Department said Wednesday.

Work on the contract is to be performed in Louisville, Kentucky and is expected to be wrapped up in December 2009, the Pentagon said.

A total of 12.8 percent of the order is for Pakistan. The lion's share is for the U.S. Navy and Army; 1.2 percent is for Australia. The system is a rapid firing, multi-barreled gun used as a last resort when anti-ship missiles have penetrated all other naval defenses. The U.S. Army is deploying a land-based Phalanx weapons system to guard installations.

## **Pakistan Buys Spare Parts for Mi-17 Helicopters**

General Dynamics - Ordnance and Tactical Systems, St. Petersburg, Fla., is being

awarded a \$5,286,000 not-to-exceed contract for the procurement of spare parts for the Pakistani Army's MI-17 helicopters under the Foreign Military Sales Program. The MI-17 aircraft parts are required to meet the operational requirements for the Pakistan Army in support of the Global War on Terrorism. Work will be performed in St. Petersburg, Fla., and is expected to be completed in October 2007. Contract funds in the amount of \$5,286,000 will expire at the end of the current fiscal year. This contract was not competitively procured. The Naval Air Systems Command, Patuxent River, Md., is the contracting activity

*Source: US Department of Defense (press release)*

## **Ukraine's munitions factory to renew military supplies to Pakistan**

Malyshev's Munitions Factory National Company will make a contract with the Defence Ministry of Pakistan on military supplies to the amount of \$100 million or more, Hennadiy Hrytsenko, Malyshev's Munitions Factory Director, revealed Friday.

"As for now, we have finalised

preliminary work with Pakistan's Defence Ministry. We cannot reveal any other details," stated Hrytsenko.

Malyshev's Factory is to deliver all utilities and optional equipment for the armoured technics supplied before to Pakistan. The new deal will give an opportunity to overcome the financial crisis, the factory's officials opine: "We are convinced that due to the contract, the financial state of the company will get stabilised in January-February 2007."

Note: since 2002, Malyshev's Munitions Factory has got \$7-10 million of annual losses. In 1996-2002 the factory was a profitable enterprise due to the military supplies to Pakistan.

## **M e m o r a n d u m     o n Understanding signed Ukraine and Pakistan**

Defence Minister Hrytsenko and Pakistani Senior Federal Defense Minister Rao Sikandar Iqbal



inked a Memorandum on Understanding between the Cabinet of Ukraine and Pakistan Government on Cooperation within Military and Defense Industry.

They also put their signatures under a Cooperation Plan-2007.

Ukraine's Hrytsenko mentioned that Pakistan is interested in cooperation with the Transport ministry within the aviation and space fields, machinery and military-technical sectors. Pakistan considers possibilities to get Ukrainian enterprises involved in development Pakistani railways and states its readiness to allot \$500 million for the implementation of this project. Hrytsenko outlined Pakistani interest in missiles, ammunition and radars.

## **Boeing Wins Two US Navy Contracts**

The Boeing Co.'s aerospace division won two U.S. Navy contracts worth a total of \$22.84

million, the U.S. Department of Defense said Monday.

The division was awarded a \$17.28 million firm-fixed-price contract for the procurement of Harpoon Ship Command Launch Control Systems upgrades, modifications and associated equipment and spares for the governments of Pakistan, Chile and Turkey. The Harpoon is a GPS-guided missile.

The contract combines purchases, under the Foreign Military Sales Program, for the governments of Pakistan, \$6.1 million; Chile, \$5.87 million; and Turkey, \$5.31 million.

Work will be performed in St. Charles, Mo.; Lititz, Pa.; San Diego; Baltimore; Cedar Rapids, Iowa; Kellyville, Okla.; and various other locations in the United States. Work on the order is expected to be completed in July 2008.

The Boeing unit also won a \$5.56 million order against a previously issued basic ordering agreement for wiring kits under engineering change proposal 270-R2 1760 to upgrade 30 AV-8B Harrier aircraft.

Work will be performed in St. Louis and

Samarate, Italy, and is expected to be completed in November 2007.

Chicago-based Boeing Co.'s (NYSE: BA) Integrated Defense Systems unit, its largest subsidiary, is based in St. Louis and is the area's second-largest employer.

*Source: St. Louis Business Journal*

## **Swiss defence team arrives**

ISLAMABAD (October 30 2006): A 7-member Swiss defence delegation, led by Swiss Defence Minister, Samuel Schmid arrived here on Sunday on a two-day official visit. Senior Federal Minister and Minister of Defence Rao Sikandar Iqbal and senior defence officials received the delegation at Chaklala Air Base, Rawalpindi.

*Copyright: Associated Press of Pakistan, 2006*

## Defence talks held with Australia

RAWALPINDI (November 08 2006): Chairman Joint Chiefs of Staff Committees General Ehsanul Haq, who is in Australia, held wide-ranging talks with senior military and political leadership.

General Ehsanul Haq, called on Foreign Minister Alexander Downer, and Defence Minister Brendan Nelson. Call on Defence Minister was also attended by Air Chief Marshal Angus Houston, Chief of Australian Defence Forces. These parleys are part of efforts by both the countries to take their evolving defence relationship to a mutually beneficial and meaningful level.

In a comprehensive review of existing defence ties, it was decided to expand the spectrum of co-operation and collaboration to include training, defence technology, intelligence

sharing and logistics.

*Copyright Associated Press of Pakistan, 2006*

## Production of arms with Germany, Korea soon

WAH, Nov 7: Pakistan will start co-production of arms and ammunition with Germany and Korea by January 2007. This was disclosed by Chairman Pakistan Ordnance Factories (POF) Lt General Syed Sabahat Hussain while talking to journalists after the inaugural session of a two-day seminar on "public-private partnership" here on Tuesday.

He said memoranda of understanding (MoUs) to this effect will be signed during the forthcoming international defence exhibition and seminar (IDEAS) 2006.

He said the POF will keep abreast with the current trends and actively involve the private sector in joint ventures. He said priority will be given to the domestic investors.

He said technologies which were once branded as "hush hush" were now being

offered to the POF as joint ventures for co-production and co-marketing.

*Source: www.Dawn.com*

## Raytheon Awarded Pakistani Contract

Raytheon Co., Tucson, Ariz., is being awarded a \$269,646,834 firm-fixed-price contract modification. This action is exercising an option to purchase 500 Advanced Medium Range Air-to-Air Missiles (AMRAAM) Air Vehicles (AAVs) Air Intercept Missile (AIM) - 120C-5 missiles and rehost. This effort supports foreign military sales to Pakistan 100%. At this time, total funds have been obligated. This work will be complete April 2011. Headquarters Medium Range Missile Systems Group, Eglin Air Force Base, Fla., is the contracting activity (FA8675-05-C-0070/P00028).

## **Kingdom of Saudi Arabia Interested in Buying Pakistani APC**

LONDON [MENL] -- Saudi Arabia has been mulling the procurement of an armored personnel carrier from Pakistan.

Pakistani and Saudi officials said the Royal Saudi Army has examined Pakistan's Saad APC. The Saad was based on the U.S.-origin M113 APC powered by a Ukrainian engine.

The Saad, with a maximum weight of 13.5 tons, can transport 14 soldiers with full combat equipment, officials said. They said the Saad, powered by a 500 horsepower engine, has a maximum speed of 75 kilometers per hour.

## **Air Defence Missile Carriers handed over to Pakistan Army Regiments**

ISLAMABAD, Dec 1 (APP): Chairman Joint Chiefs of Staff Committee General Ehsan Ul

Haq Friday said the govt was determined to provide a credible defence with all possible means at its disposal.

Speaking at the handing-over ceremony of indigenously built Air Defence Missile Carriers to regiments of Pakistan Army at the Heavy Industries Taxila, he said the govt was giving high priority to the operational preparedness of the armed forces and the Armed Forces Development Plan (AFDP) was a step in this direction.

General Ehsan Ul Haq said that rapid mobility with armour protection and integral air defence elements are the key areas of modernization of Pakistan Army.

He said today's ceremony marks yet another milestone in our indigenous weapons' capability. Self-reliance especially in the field of defence is a reflection of our national policy and Heavy Industries Taxila plays an important role in it.

He said with the induction of this first batch of air defence missile carriers, our air defence capability will be further augmented.

Earlier, Lt Gen Israr Ahmed Ghumman, Chairman of Heavy Industries Taxila (HIT) in his welcome address said that HIT is meeting the entire demand of tracked vehicles of Pakistan Army.

He said these air defence missile carriers have been designed and built at one of the HIT factories.

With the handing over of the first batch today, the production is progressing for the remaining vehicles.

He then invited CJCSC General Ehsan Ul Haq to hand over the symbolic scrolls to the commanding officers of the regiments receiving the first batch of these vehicles.

Among the four regiments to receive the new missile carriers, was a light Self-Propelled Air Defence Regiment in which General Ehsan started his military career as a second lieutenant and later commanded

the regiment.

After the handing over of the traditional scrolls, the regiments rolled past in their new vehicles and presented salute to CJCSC. The general also unveiled a commemorative plaque to mark today's ceremony.

*It is believed that these are the refurbished RBS-70 LG MANPADS installed on Talha APC.*

*Copyright Associated Press of Pakistan, 2006*

## **Northrop Awarded Pakistani Contract**

Northrop Grumman Electronic Systems, Linthicum Heights, Md., is being awarded a \$99,500,000 firm-fixed-price contract. This action provides for government furnished property for the Government of Pakistan for F-16 Block 50/52 new aircraft and modernization program. The procurement of 54 AN/APG-68 (V) 9 Radar

Systems will be accomplished under the firm-fixed-price portion of the contract. At this time, \$49,750,000 have been obligated. This work will be complete May 2010. Headquarters Aeronautical Systems Center, Wright-Patterson Air Force Base, Ohio, is the contracting activity (FA8615-07-C-6033).

## **Turkish Aerospace to update Pakistan's F-16s**

DATE: 28/11/06

*SOURCE: Flight International*

Turkish Aerospace Industries (TAI) has signed a memorandum of understanding (MoU) with the Pakistani air force to modernise up to 32 Lockheed Martin F-16A/Bs. Signed at the IDEAS 2006 Defence Exhibition in Karachi, the MoU calls for work to start in 2008. TAI began modernising Jordan's F-16A/Bs in August, and the first two aircraft are due to be completed by November 2007.

TAI general manager Muharrem Dortkasli says: "We will discuss with the Pakistan air force the number of F-16s and the costs. We believe TAI will become the new F-16 modernisation centre in the region."

TAI is preparing to perform a mid-life update on the Turkish air force's 117 F-16C/Ds. The service also seeks an attrition purchase of 30 F-16 Block 50s, and TAI wants to open a local assembly line.

## **Pak Navy Orders FAC From Turkey**

*According to the latest issue (Vol XXX, Issue 11) of Military Technology:* The Pakistan Navy has ordered two MRTP 33 120t Fast Attack Craft from the Turkish yard Yonca-Onuk. The boats, which will be delivered in February and March 2008, respectively will be capable of a maximum speed in excess of 47 knots and will be armed with four HARPOON Block II anti-ship missiles, a 30mm gun on a stabilized turret and two 12.7mm HMGs. The Pakistani Navy is expected to procure an eventual total of eight MRTP 33s. This is the launch order for the MRTP 33 design, which is



an enlarged version of the MRTTP 29 boats, nine of which are operated by the Turkish Coast Guard Command.

## **Second phase of the Jinnah Naval Base at Ormara approved**

ISLAMABAD: Prime Minister Shaukat Aziz Monday said that Pakistan is a peaceful country and will continue to provide adequate capability to its armed forces to ensure peace and stability in the region.

He said this while chairing the meeting of Defence Committee of the Cabinet at the Prime Minister's House this morning.

The Prime Minister said that Pakistan does not have aggressive designs against any country and believes in peaceful settlement of international disputes and willing to have good relations with all countries.

Pakistan's defence policy is in

conformity with the prevailing geo-strategic environment and measures up to its national inspirations, he added.

The Prime Minister said the government is fully cognizant of the country's defence needs and will make all resources available to modernize and upgrade its defence forces in view of the fast paced ongoing technological developments.

He said strong defence is the ultimate guarantee to peace.

The Prime Minister said the country is proud of its armed forces for ensuring peace in the region and also for their role in alleviating the sufferings of the people in the wake of October 2005's earthquake.

"Pakistan is keen to settle all disputes with India in a peaceful manner including the issue of Jammu and Kashmir," said the Prime Minister.

The Prime Minister said, "Without an early settlement of the Kashmir dispute in keeping with the wishes and aspirations of the Kashmiri people, abiding peace in South Asia will continue to elude us."

The Committee approved the second phase of the Jinnah Naval Base at Ormara and assured that necessary funds will be provided to complete the project.

The Foreign Secretary Riaz Muhammad Khan briefed the Committee about the geo-strategic situation and his recent visit to India and the ongoing process of composite dialogue with it.

The meeting was attended among others by Senior Minister for Broadcasting Muhammad Ali Durrani, Minister for Interior Aftab Ahmad Khan Sherpao, Advisor on Finance Dr. Salman Shah, Chairman Joint ChDefence Rao Sikandar Iqbal, Minister for Defence Production Maj. (Retd) Habibullah Warraich, Minister for Information and iefs of Staff Committee General Ehsan-ul-Haq, Chief of Naval Staff Admiral M. Afzal Tahir, Chief of Air Staff AVM Tanvir

Mehmood Ahmad, Vice Chief of Army Staff General Ehsan Saleem Hayat and senior officials.

*S o u r c e :    T h e    N e w s  
(www.thenews.com.pk)*

## **Pakistan Buys- Harris High Frequency/Very High Frequency Radio Systems**

WASHINGTON, November 13, 2006-- The Defense Security Cooperation Agency notified Congress of a possible Foreign Military Sale to the Government of Pakistan of Harris High Frequency/Very High Frequency radio systems for an estimated cost of \$160 million. The Government of Pakistan has requested a possible sale of Harris High Frequency/Very High Frequency radio systems, which include 1,558 20-Watt High Frequency (HF) Man Packs, 2,188 20-Watt HF Vehicular Systems, 175 150-Watt

HF Vehicular Systems, ancillary equipment, spare and repairs parts, support equipment, personnel training and training equipment, publications, U.S. Government and contractor engineering and logistics services and other related elements of program support.

This proposed sale will contribute to the foreign policy and national security of the United States by helping to improve the security of a friendly country that continues to be a key ally in the global war on terrorism. The radios will enable Pakistan to improve on its capability to provide current and updated intelligence between patrols and higher headquarters. Also, the radios will increase interoperability between Pakistan and the U.S. and coalition forces assisting in the efforts to curtail and eliminate terrorist activities. Pakistan will have no difficulty absorbing this equipment into its armed forces. The proposed sale of this equipment and support will not affect the basic military balance in the region.

The prime contractor will be Harris Corporation in Rochester, New York. There are no known offset agreements

proposed in connection with this potential sale. Implementation of this proposed sale will require the assignment of a contractor field service representative for up to two years to Pakistan. In addition, two contractor representatives will provide training and several U.S. Government and contractor representatives will participate in program management and technical reviews for up to four weeks.

*PakDef note:* Pakistan is buying 3,900 American military radios for its 520,000 man army. Most of these radios are 20 watt tactical radios (43 percent of them portable, the rest mounted in trucks). There are also 175 150 watt radios, for long range communications. The 20 watt radios have a range of about 20 kilometers (but this varies with antenna used, and how hilly the terrain is.) The 150 watt radios are often equipped with an

antenna that give them a range of 300 kilometers, or more. The Harris Falcon II series radios are sold to armed forces all over the world, cost about \$40,000 each, and include a full range of modern features (encryption, frequency hopping and the like.)

## **Death of another Unsung Hero**

Mr. Chaudhry Abdul Majid, died the night of September 15 after suffering a massive stroke a few days back. He was in the ICU for some days. His funeral was attended by a large number of his colleagues and friends. He served with distinction in the Nuclear Materials Division and Nuclear Chemistry Divisions of PINSTECH. He was appointed in charge of the pilot reprocessing plant project by chairman PAEC Munir Ahmed Khan and he completed the task assigned to him with distinction.

## **PAF raising new squadrons**

PAF is raising two new fighter

squadrons. The numbers are 27 and 29. Sqn 27 is almost raised at Rafiqui but for No 29 it will take 1-2 years. No 27 will be equipped with ROSE-3 upgraded Mirages.

## **Sri Lanka Buys Tanks & APC from Pakistan**

Pakistan and Sri Lanka have signed an agreement for an undisclosed number of Al-Khaleeds. The agreement is already done. The tanks will be shipped within the next months. Additionally, Sri Lanka has shown serious interest in purchasing in Al-Talha and Saad armored personal vehicles

## **Pakistan acquires capability to develop N-sub**

ISLAMABAD: Pakistan has acquired the capability of developing its own nuclear submarine. Pakistani scientists and the engineers have developed indigenous technology for building the nuclear submarines at the existing facilities. This capability will strengthen the naval defense of the country. President Gen Pervez Musharraf will discuss this matter

with the Chinese President during his visit to Islamabad in November this year.

Pakistan started exploring alternative sources and strategies to bridge the wide gap with India in conventional and strategic weapons/forces to sustain its independence and sovereignty. The gap was widening due to the United State's tilt towards India as compared to Pakistan. According to a military comparison, Indo-Pak conventional and strategic asymmetries until now are not primarily in favor of Pakistan.

## **France's Armaris Offers Sub to Pakistan**

*By PIERRE TRAN, PARIS*

French naval export company Armaris on Aug. 28 made a formal offer of three Marlin diesel-electric patrol submarines to Pakistan, a deal that would include MBDA Exocet SM39

missiles, a Pakistani official said Sept. 8.

The French government granted approval for Armaris to offer the Marlin SSK in May, after long hesitation for fear of upsetting India, which recently bought six French Scorpene submarines, also armed with Exocet anti-ship weapons.

MBDA declined comment. Armaris officials were not immediately available. Complicating the sale for France is the Pakistan Navy's preference for the Boeing Harpoon missile. The U.S. government has authorized the sale of 30 submarine-launched versions of the Harpoon to Islamabad.

Acquisition of the Harpoon would be a first for Pakistan, as its forces have only operated the air-launched and surface ship versions so far. The Pakistan Navy operates the French DCN-designed Agosta 90B Khalid

boat, armed with Exocets.

French business daily La Tribune reported Sept. 8 that Spanish and Germany industry were working on their offers to Pakistan.

The Marlin would be an updated, all-French version of the Franco-Spanish Scorpene boat and include air-independent propulsion. The sub deal is likely to be worth \$1 billion to \$1.2 billion.

Armaris is a DCN-Thales joint venture.

*Source: www.defensenews.com*

## **U.S. Conducting Joint Naval Exercises with Pakistan**

Training aimed at better proficiency, interoperability of U.S., Pakistani forces

Washington -- U.S. and Pakistani navies are conducting more than two weeks of joint exercises in the North Arabian Sea and in the territorial waters of Pakistan, a U.S. military source says. The exercises are aimed at building international counterterrorism preparedness and cooperation on the seas.

The naval operations are part of "Inspired Union 2006," which focuses on training in maritime security operations; amphibious operations; anti-submarine warfare; surface warfare; air defense; electronic warfare; explosive ordnance disposal and command and control, according to the U.S. Navy public affairs office at U.S. Central Command in Florida. The exercises began on September 4 and will conclude September 21.

The bilateral exercises are aimed at enhancing tactical proficiency and interoperability between coalition and regional forces, according to a Navy statement. If successful, these maneuvers may serve as the foundation for regional maritime security operations in support of the global War on Terror. The idea would be to deny international terrorists "use of the maritime environment as a venue for attack," as well as to transport



personnel, weapons, and other material, the Navy says.

Scheduled to participate in the exercises are the Pakistani naval vessels Shahjahan and Babur (both destroyers), Moawin (a tanker), and Saad (an attack submarine). The U.S. Navy has dispatched the USS Nicholas (a frigate), USS McFaul (a destroyer) and USS Albuquerque (a nuclear-powered submarine). Also taking part will be the 24th Marine Expeditionary Unit, and Explosive Ordnance Disposal Unit Six. Any necessary support will be provided by the USS Enterprise Carrier Strike Group, USS Iwo Jima (an amphibious assault ship) Expeditionary Strike Group, and maritime patrol aircraft from both nations, according to the Navy.

During this second annual bilateral exercise, participants will receive classroom training and take part in practical at-sea

tasks.

According to the Navy statement, these exercises give U.S. and Pakistani forces opportunities "to refine their conduct of combined maritime security operations," while also working on amphibious operations, anti-submarine, surface and electronic warfare, explosive ordnance disposal, and command and control. The exercises serve as "an excellent training opportunity" to become more proficient tactically and to improve the interoperability of U.S. and Pakistani forces to deter international terrorist organizations from using the maritime environment.

Coalition maritime forces regularly operate and conduct maritime security exercises throughout the international waters of the Northern Arabian Sea. Pakistan and coalition partners contribute maritime forces such as ships, boarding teams, maritime patrol aircraft, intelligence analysts and other staff to support maritime security operations.

Successful exercises benefit both nations, according to the statement. The United States improves its likelihood of success in

conducting coalition maritime security operations. And regional governments and coalition partners also benefit in interoperability, intelligence sharing and assisting with deterrence against international terrorist organizations that pose a threat to their countries.

*Distributed by the Bureau of International Information Programs, U.S. Department of State.*

## **Construction of First PN F-22P Frigate Begins**

SHANGHAI: The construction of Frigates represents a quantum leap in technology and addresses a long-standing operational requirement of the Pakistan Navy.

The ships being constructed here will not only add a significant combat potential but also build Navy's technical

and managerial prowess like never before.

This was stated by Vice Chief of the Naval Staff Vice Admiral Mohammad Haroon at an impressive ceremony while performing "Steel Cutting" of First F-22P Frigate at Hudong Zhonghua Shipyard at Shanghai China. The Steel cutting marks the commencement of construction phase of first ship being named as *PNS ZULFIQUAR*.

The collaboration in such a major project of F-22P Frigates has opened new avenues between two countries and is yet another milestone in defence cooperation.

The first Frigate will be delivered to Pakistan in 2009, second & third ships in 2010 and fourth ship which will be constructed in Karachi Shipyard & Engineering Works will be delivered in 2013 along with the Transfer of Technology. Beside

others AVM Shaukat Mehmood DGMP, Mr. Zafaruddin Mehmood Consul General of Pakistan at Shanghai and Mr. Zhou Jain Neng President Hudong Zhonghua Shipbuilding Group, Mr. Li Hongtao Vice President CSTC also witnessed the ceremony.

The Chief Guest Vice Admiral Mohammad Haroon has shown his complete satisfaction about the time schedule activities of the project and added that, "the reservoir of expertise being accrued through this project will be immensely beneficial for Pakistan Navy in many other undertakings as well".

### **PN Ships Visit Oman**

*Times of Oman - Wednesday, November 15, 2006*

MUSCAT — Pakistan Navy ship *PNS Tippu Sultan* is paying a goodwill visit to the Sultanate of Oman from Saturday, November 18.

The ship was commissioned on September 23, 1994 in Pakistan Navy. *PNS Tippu Sultan* is named after Sultan Fateh Ali Tippu who ruled Mysore, a sovereign state in south India, from 1762 to 1799.

The modernization of *PNS Tippu Sultan* was successfully accomplished by the dedicated efforts of Pakistan Navy Dockyard. During the modernization, state-of-the-art equipment/weapons/sensors like ESM Set DR-3000 S1X, an air/surface surveillance long-range radar DA-08, Surface to Air Missile SAM LY-60 (N), two manual/automatic 30mm Anti Air DS-30 (B) Guns, Active Towed Array Sonar (ATAS), Wire Guided Active/Passive Homing Torpedo System 43X2 and a modern Command, Control and communications (C3) system were installed.

*PNS Tippu Sultan* is a leading ship of 25th Destroyer Squadron of Pakistan Naval Fleet. The extensive sensor and weapons modernization of the ship and successful achievement of complex integration of various weapon systems is a direct reflection of dedication and professional excellence of

officers and CPOs/Sailors of Pakistan Navy.

The ship is currently holder of both Annual Safety Trophy 2005, as well as Overall Efficiency winner of Year 2005 and proudly displays 'E' on its funnel casing.

Captain Sajid Mahmood, who joined Pakistan Navy in August 1981 and was commissioned in the operation branch in December 1985, commands the ship.

## **Lockheed gets \$144 million deal for Pakistan F-16s**

Lockheed Martin Corp., Fort Worth, Texas, is being awarded a \$144,069,000 firm-fixed-price and time and materials contract. The procurement of foreign military sales F-16 C/D new aircraft for the (Pakistan) program for the F-16 Block 52 aircraft. The procurement of 12 operational single place F-16C Block 52 aircraft and 6

operational two place F-16D Block 52 aircraft will be accomplished under the firm-fixed price portion of the contract. This effort supports foreign military sales to Pakistan. At this time, \$78,431,000 has been obligated. This work will be complete by November 2010. Headquarters Aeronautical Systems Center, Wright-Patterson Air Force Base, Ohio, is the contracting activity (FA8615-07-C-6031).

*Source: Lockheed Martin & US Department of Defense (press release)*

## **Pakistan - TOW-2A Anti-Armor Guided Missiles**

WASHINGTON, December 07, 2006 - The Defense Security Cooperation Agency notified Congress of a possible Foreign Military Sale to Pakistan of TOW 2A Missiles as well as associated equipment and services. The total value, if all options are exercised, could be as high as \$185 million.

The Government of Pakistan has requested a possible sale of 2,769 Radio Frequency (RF) TOW 2A Missiles, 7 RF TOW 2A Fly-to-buy Missiles, 415 RF

Bunker Buster Missiles, 7 RF Fly-to-buy Bunker Buster Missiles, upgrade of 121 TOW Basic/TOW-I launchers to fire TOW II configuration for wire-guided and wireless missiles, TOW Data Acquisition Systems, gunner aiming sight, testers, cameras, spare and repair parts, technical support, support equipment, personnel training and training equipment, technical data and publications, U.S. Government and contractor engineering and logistics support services, and other related elements of logistics support. The estimated cost is \$185 million.

This proposed sale will contribute to furthering the foreign policy and national security of the United States by helping a friendly country provide for its own legitimate self-defense needs and to enable Pakistan to support U.S. operations against terrorist activity along its porous

borders. In addition, these missiles have most recently been employed in several global war on terrorism operations in the tribal areas of Pakistan and have allowed, when coupled with Cobra attack helicopters, the Government of Pakistan to employ new tactics, techniques and procedures that have proven highly effective against terrorists.

Pakistan will augment its land forces with these TOW-2A anti-armor guided missiles. Pakistan will use these missiles to increase its military defensive posture and will have no difficulty absorbing these additional missiles into its armed forces. Pakistan's existing inventory of TOW missiles will soon begin to be affected by its specified shelf life. While TOW missiles can be employed beyond their shelf life, system reliability and safety are eroded. Pakistan continues to expend TOW missiles in both training

exercises and combat operations. The proposed sale of this equipment and support will not affect the basic military balance in the region. The prime contractor will be Raytheon Company in Tucson, Arizona. There are no known offset agreements proposed in connection with this potential sale.

Implementation of this proposed sale will not require the assignment of any U.S. Government and contractor representatives to Pakistan.

There will be no adverse impact on U.S. defense readiness as a result of this proposed sale. This notice of a potential sale is required by law; it does not mean that the sale has been concluded.

*Source: US Department of Defense (press release)*

## **Pakistan - E-2C Hawkeye 2000 Airborne Early Warning Suite for P-3s**

WASHINGTON, December 07, 2006 - The Defense Security Cooperation Agency notified Congress of a possible Foreign Military Sale to Pakistan for refurbishment and modification of three excess P-3

aircraft with the E-2C HAWKEYE 2000 Airborne Early Warning (AEW) Suite, as well as associated equipment and services. The total value, if all options are exercised, could be as high as \$855million.

The Government of Pakistan has requested a possible sale for refurbishment and modification of three excess P-3 aircraft with the E-2C HAWKEYE 2000 Airborne Early Warning (AEW) Suite, spare and repairs parts, simulators, support equipment, personnel training and training equipment, publications and technical data, system software development and installation, ground/flight testing of new systems and system modifications, U.S. Government and contractor engineering and logistics support services, and other related elements of logistics support. The estimated cost is \$855 million.

This proposed sale will



contribute to the foreign policy and national security of the United States by helping to improve the security of a friendly country that has been and continues to be an important force for economic progress in South Asia and a partner in the global war on terrorism. The command-and-control capabilities of these aircraft will improve Pakistan's ability to restrict the littoral movement of terrorists along Pakistan's southern border and ensure Pakistan's overall ability to maintain integrity of its borders.

Pakistan intends to use the proposed equipment to develop an effective air defense network for its naval forces and provide an AEW surveillance and enhanced command, control, and communications capability. The addition of the AEW suites will provide Pakistan with search surveillance, and control capability in support of

maritime interdiction operations. These aircraft will also increase Pakistan's ability to support the U.S. Operation Enduring Freedom operations, and provide anti-ship and anti-submarine warfare capabilities; and a control capability over land against transnational terrorists and narcotics smugglers. The modernization will enhance the capabilities of the Pakistani Navy and support its regional influence and meet its legitimate self-defense needs. Pakistan will have no difficulty absorbing the AEW platform into its armed forces.

The proposed sale of this equipment and support will not affect the basic military balance in the region. The prime contractor will be Northrop Grumman Corporation, St. Augustine, Florida and Lockheed-Martin, Greenville, South Carolina. There are no known offset agreements proposed in connection with this potential sale. Implementation of this proposed sale will not require the assignment of any U.S. Government and contractor representatives to Pakistan. There will be no adverse impact on U.S. defense readiness as a result of this proposed sale. This notice of a potential

sale is required by law; it does not mean that the sale has been concluded.

*Source: US Department of Defense (press release)*

*Compiled by H Khan & M Rauf*