**SUPARCO – THE FORMATIVE YEARS 1961 - 1967**

*(Pakistan entered the Space Age, ahead of all Islamic, in fact, all developing countries, on 7th June 1962 with a bang, when its first two stage rocket named REHBAR-I rose up into the night sky over the Baluchistan Coast rising to a height of 80 miles, releasing an Orange coloured trail of sodium vapour lit up by the rays of the setting sun which could be seen from Karachi and hundreds of miles along the coast of Pakistan.)*

What led to this significant development, with the help of the National Aeronautics and Space Administration (NASA) of USA is being told, for the first time, by the only surviving member of the group which included President Ayub Khan, his Chief Scientific Advisor Professor Abdus-Salam, Chairman PAEC Dr Ishrat Hussain Usmani, Cabinet Secretary N.A.Faruqi, Economics Minister at our Washington Embassy Wazir Ali Shaikh, and the young PAEC Senior Engineer Tariq Mustafa.

 Following is a personal perspective written by Tariq Mustafa, now Federal Secretary (R) who led the team which established Pakistan’s first Rocket range at Sonmiani in Baluchistan in 1962, followed by the subsequent construction of Suparco’s Rocket Plant for the indigenous manufacture of such rockets and their propellants in 1967. The aim is to bring on record a glorious chapter in laying the foundations for the development of advanced Technology in Pakistan.

An Instrumentation Laboratory was also established in this plant to acquire technology of Telemetry, Communications, Guidance and Control of rockets leading to Earth Satellite studies and experiments. Salim Mehmud, an indefatigable worker who drove himself and everyone around him very hard, did a fine job in setting up this laboratory. Later Salim became Chairman of SUPARCO from 1980-89 and developed it into a strong institution. Another member of the original team Sikandar Zaman also rose to serve as Chairman SUPARCO from 1991 to 97.

In mid September 1961 I was posted at the US Atomic Energy Commission Laboratories at Oak Ridge, Tennessee, as a US AID fellow from Pakistan, when I receive a call from Washington DC. The person at the other end identifying himself as no other than Prof Abdus Salam said “Look Tariq it might come as a surprise but you have to reach Washington earliest and join me tomorrow morning in an important meeting”. He made it clear that he did not care how I get there, whether by running or hitchhiking, but I better get there soon. So next morning at 10 am I joined Prof Salam and found ourselves going into the spanking new Headquarters of NASA the newly formed National Aeronautics and Space Agency of America.

Our meeting was with a dynamic young Director of International Relations Mr. Arnold Frutkin who came straight to the point after welcoming us and told Professor Abdus Salam that luckily you are accompanying President Ayub Khan who was on an official visit to the USA. And President Kennedy of US had, a short time before, announced that he was committing the US to land a man on the moon and return him safely to earth before the decade of 60s was out i.e. by end of 1969. NASA was directed to complete this program and they had already started in real earnest. Mr Frutkin explained that this was a program that will encompass the whole earth because their rockets will have to be placed in Earth orbit before being propelled towards the moon and this required knowledge of the properties of the Earth’s upper atmosphere, particularly the wind speeds and directions at the higher levels. He explained that NASA scientists had found that the area around the Indian Ocean was a black hole of data since practically no data was available on the upper atmosphere in this entire region and this was crucial for NASA’s program. The British in India had done a good job of collecting meteorological data on the surface up to around 100 feet and the weather balloons could go up to 30,000 ft. or so, but very little was known above that height. Thus NASA had invited selected countries of the region to set up rocket ranges and carry out scientific experiments. US side would supply free launching equipment and rockets in lieu of sharing of raw data obtained from the experiments. He wanted to know if Pakistan would be interested.

Prof Salam looked at me and said in Punjabi, his favourite language “Tariq ki khyal ai” (Tariq, what do you say) I replied to him also in Punjabi “kay ye to jee hamara khawab pura ho jai ga” (That this will amount to our dream coming true). Mr Frutkin who was watching intently, caught on to it at once and said “ from his face it appears the young man is quite keen, am I right?”. Prof Salam nodded and Frutkin said that in that case we need not lose any time. He suggested that one of NASA’s airplane shuttles was leaving Washington National Airport at 1 pm for NASA’s Wallops Island Range which is about 150 miles southeast of DC on the Atlantic coast. I will arrange for the young man to be put on that flight and send instructions to keep the Rocket Range open. He will be shown around the site and the launch equipment, rockets and whatever else needed for the experimentation. The young man can then return tomorrow morning, catch the plane which leaves Wallops Island at 8 AM and he should be back in Washington around this time tomorrow when we can resume our discussions in light of the report which we expect the young man to write overnight and bring along.

This episode exemplifies the hectic speed which NASA’s dynamic young Director set for this program. It was in keeping with NASA’s style of the day and was needed to fulfill the target laid for his people by President Kennedy. It is a source of great satisfaction, nay pride, that Pakistan not only kept this momentum, but in fact managed to pleasantly surprise the U.S. side by completing the project in 9 months by launching the rocket borne Sodium Trail experiments in June’ 62 from Sonmiani.

Next morning I was back in Washington, met Prof Salam and together we went over to NASA to meet Mr Frutkin with a positive report from our side. He clearly had received favorable signals from NASA people at Wallops Island. Based on that he seemed convinced that Pakistan side would be able to cope with such a demanding task.

Later on Prof Salam told me that the three section report covering the Design and construction of the Range, procurement and installation of equipment and the training of personnel was presented to President Ayub who seemed to be quite pleased with what he saw. He was happy that such a report could be produced by Pakistan in such hurry and he directed that work on the project should be started immediately.

How could Prof. Salam trust a young man of 27 years with such a demanding task? I had first met Prof Salam in UK in 1957 after finishing my graduation in Mechanical Engineering with first class honors from London University; The Pakistan Atomic Energy Commission (PAEC) had been formed around 1956. Abdus Salam, then a professor at Cambridge and an honorary Member of the PAEC, was in London to hire competent Pakistani scientists and engineers for the PAEC. The interview board consisted of Pakistan’s High Commissioner, Prof Salam, and a British Professor, who had just been given charge of the newly formed Nuclear Engineering Department at the Imperial College, London. Out of the 17 short listedi candidates I was the only one selected. Thus started my long and fond association over decades with Prof Salam and we became good friends. His family visited us in Paris in 1966 when I was working there on our next project.

Dr Ishrat Hussain Usmani an ICS officer first appointed member and later the Chairman of PAEC and Prof Salam developed a very good working relationship, so much so that many started calling them Usmani- Salam brethren. They decided to develop group leaders by sending PAEC staff on long courses; I was one of the lucky ones sent on 2 years hands on training to the USAEC Laboratories at Oakridge, Tennessee. It was during these few years from 1957 - 60 that I often had occasion to meet Prof Salam and my respect for him kept on increasing and we developed a very good relationship which I believe led Prof Abdus-Salam to have the confidence that I could handle this exacting project.

The next challenge was to hurriedly form the team and we put together a small but versatile team which included Salim Mehmud, a specialist in electronics and instrumentation that also happened to be in Oakridge. We were later joined by the other two members Sikandar Zaman and A.Z. Farooqi from Pakistan alongwith Mr Rehmatullah, a deputy Director at the Meteorological deptt. Our team was assembled at Wallops within weeks and started their work in earnest, which was no mean achievement. It was duly noted by the US side that Pakistanis meant business.

The six months between September 1961 and March 1962 were spent with feverish work at both ends, at Wallops Island in Virginia, the US end, where our team was undergoing intensive training and learning and the Pakistan end in Karachi where plans were developed for the design and layout of the Rocket Range and its infrastructure and buildings.

 Interestingly the selection of Sonmiani as the location was made by President Ayub himself. That range was a little close to Karachi about 40-50 miles but otherwise it met all the other requirements for that kind of a Rocket Range. The Military Engineering Service (MES) was assigned to urgently start construction work on the rocket range. I moved a number of times between Washington and Karachi to dovetail the work at both ends. NASA people told us that the launcher and the rockets were based on the Nike Ajax anti aircraft weapons system which had been declared surplus and its components were lying in some US depots in storage all over the US and that we were allowed to take the Nike Booster Rocket from that system along with some of the control instrumentation. Concerning the scientific experiment to be carried by the rocket as its payload, it was mutually decided that the first experiment would be the Sodium Vapour Trail experiment, which was to be procured from Pakistan’s own funds.

The Project proposal was taken by Dr Usmani personally to President Ayub through the Secretary Cabinet Affairs Mr N. A. Farooqui and this was approved without going through the normal channels of examinations by the Ministries and their Financial Advisors. That was called for because of the urgency involved, the whole idea was that the Rocket Range should be ready and the experiments conducted before the onset of the next monsoon season expected to begin around early June 1962, according to the best estimates of the Meteorological Department.

It hardly gave us 9 months to establish the rocket range, train the people, purchase the equipment, ship it across to Karachi, install the equipment, commission and try it out. But I am happy to state that it was done well within the assigned time period and we could meet the tight schedule.

India started their project for the Thumba Range a few months after us but they could not launch the rocket before 1963 that was a year after Pakistan, because they followed normal bureaucratic procedures.

By March of 1962, our work at the US end had finished, the team members moved to Sonmiani, the equipment had been shipped, the delicate and sensitive equipment interestingly had been packed in the boot of my Rambler car which was again shipped by sea and work started in real earnest at Sonmiani Army ranges.

The notable thing about this effort was that we did not follow the usual office timings. The team actically worked day and night as required. It was a highly motivated team, time was very short, the job had to be done, the target being early June, and such things were being done in Pakistan for the first time.

One that fateful evening of June 7 1962, when Rehbar- I majestically rose into the night skies of Karachi both Prof. Salam and Dr Usmani were besides themselves with joy, they hugged the team members. Next day I received a hand written note from Prof. Salam in which he reiterated his pride in our achievement and stated “ that you have brought back memories of the glories of our early Islamic ancestors and there notable scientific achievements”. The day sticks out vividly for all the team members.

The US of the early sixties was still reeling from the unbelievable shock received from the “Beep Beep” of the Soviet Sputnik followed closely by the fantastic feat of the Yuri Gagarin’s launch into earth orbit. America however was quick to recover. President Kennedy marshaled his forces and challenged Soviets to a “Race to the Moon” resulting in his unilateral declaration of “Landing an American on the moon and bringing him safely back to earth before the decade was out”.

Personally speaking I found the Americans of 60-62 very open, welcoming and generous people. It was a forward looking society, confident of their capabilities to lead the world, despite the Soviet Challenge in space and the later economic one from Germany and Japan.There were no gun toting guards, even in NASA headquarters in the sixties. During my second five year sojourn, as Minister Technical at our Washington embassy during 1980-85, the scene had changed significantly. One needed all sorts of clearances to visit NASA and USAEC establishments. The supreme confidence of US of the sixties seemed to have gone, which I for one personally missed deeply. My two years at Oakridge and Wallops Island stand out in my memory as some of the best years of my life professionally and socially as they were most educative and gainful both for me personally and I believe for our beloved country.

Pakistan continued to carry out rocket borne Upper Atmospheric studies with the help of NASA adding other types of experiments based on exploding Grenades and tracking of radar reflective Aluminum chaff through the Judidart experiment in support of the Indian Ocean Programme in which Salim Mehmud played the leading role. Tracking radar technology again was a first for Pakistan.

This led to a decision to acquire the technology of Indigenous manufacture of such rockets and their propellants. Americans declined to help Pakistan in this area, questioning the need for local production of rockets, when NASA was willing to supply them free of cost. We explored the possibilities of procuring technology from Japan or France, both of whom turned out to be quite willing, in fact eager. A contract was finally placed with Sud-Aviation (Subsequently becoming Aerospatiale) of France for their Centaure/Dragon rockets and with the French “Service des Poudres” for their PVC type of rocket propellants. The French Space research Agency CNES was also very supportive. The team was augmented with Nasim Bhatti to oversee the plant and Hafiz Bhandari for the Propellants. French language knowledge had to be acquired and personnel trained in prestigious French specialized institutions.

A rocket manufacturing plant was established near Mauripur, Karachi using the services of Societe ENSA as the Consultants. This project was duly completed in 1967 within 3 years and within the projected cost of $3 million. (A Turkish group which visited the plant felt that they would estimate its cost at $10 mill.) Thus culminated yet another remarkable achievement when the first Pakistani built Rocket named the REHNUMA with the subsequent addition of the much larger SHAHPAR series was launched from Sonmiani from 1967 onwards on a regular basis.

A strong foundation had been laid for the acquisition of Rocket Technology by Pakistan in the early sixties, which has been ably and enviably built upon in later years.