NOT long ago, Indians gloated over the success of their Mars mission in the very first attempt and some two years later on becoming the first country in the world to send 104 satellites in one go. The Indian Space Research Organisation (ISRO) plans to land a rover on the other side of the moon, near its south pole a few months from now which none of the space faring countries has ever attempted. India truly deserves an honourable place among the top space powers of the world.

To know the full story of the Indian space programme, which is both enigmatic and inspiring, the book, ISRO – A Personal History is a must read. It’s not only informative but also makes for pleasurable reading. The authors are an ISRO pioneer, R. Aravamudan and his wife Gita who had been a journalist.

Indian efforts to develop indigenous space technologies have been a mixed bag of hope and despair, a saga of dedication and hurdles, smart decisions and lost opportunities. Since Aravamudan had witnessed almost all the phases of development from the very beginning, he could describe with unquestionable authority seminal milestones in India’s space programme.

In 1962, it was a bunch of forty-fifty young engineers in the entire space programme, all with dreamy eyes; today the ISRO staff is around 20,000. The author himself was a 25-year old engineer when he was picked up by the visionary Dr. Vikram Sarabhai who was looking for young, bright engineer-volunteers to accomplish projects amidst all kinds of constraints. There was no industrial capacity; young recruits had no experience, but the zeal was aplenty.

The first Indian launch pad was to be set up in Thumba, a fishermen’s beach in South Kerala, to send sounding rockets in the sky. Sarabhai sent a small batch of engineers to NASA for training in various aspects of rocket-launching and telemetry. The author was part of this pioneering batch.

It is interesting to note that the US had given similar treatment to Pakistan. Pak scientists’ basic capabilities were similar to those of Indians. They were also seeking to set up a sounding rocket launch pad at Sonmiani Beach near Karachi. In fact, Pakistan edged ahead of India by launching its first sounding rocket Rehbar-I on 7 June 1962 whereas India could send its first from Thumba on 21 November 1963. But where is Pakistan now in space technology vis-a-vis India? Aravamudan comments, “Without Sarabhai, India’s space programme might have ended in the same doldrums as Pakistan’s.”

What were the key decisions that made all the difference? Did the attitude of politicians of the time help? What had been the impact of cold war politics on the Indian space programme? Who were the heroes who dedicatedly built the backbone of Indian space technologies? How did India seek collaboration with major space organisations of the world? How the private sector was involved since the very beginning in developing components and supplies of raw materials? How labour unions became a big problem when a new management culture was being introduced in ISRO?

Answers to these questions and many others in the book give a holistic and lifelike view of the Indian space programme. The book does praise the achievements and dedication of engineer-scientists but does not keep various delays, failures and lost opportunities under wraps.

Technology development issues are interspersed with hundreds of general interest and revealing anecdotes. Public excitement was immense every time scientists sent a rocket in the sky. During one such launch, the Kerala Legislative Assembly was adjourned temporarily to have a look at the bright vapour trail in the western sky. Such an orange vapour light no one had seen before. Newspapers carried reports of how people came out of doors to see the miracle.

The only available transport to the launch station those days was a cycle and “APJ Kalam did not know how to cycle and had to hitch rides with others”. Rocket parts also used to be carried on pillion, and bigger equipments on bullock carts. Scientists working there had no fans, let alone ACs. They had to work often removing their shirts due to the hot weather.

International collaboration was important. The first launching station, TERLS (Thumba Equatorial Rocket Launching Station), being developed as an international facility, was supported by the US, USSR, France, UK and West Germany. “There was no monetary help but equipments and computers came as gifts or loan.” India repaid this debt beautifully when Indira Gandhi the then prime minister dedicated this facility to the United Nations as a goodwill gesture in 1968.
India attracted a couple of foreign scientists in some of the projects. The earliest ones were from the US and France. There was also one famous Japanese scientist Prof. Hideo Itokawa, known as Dr. Rocket, who had developed rocket technology in his own country from scratch.

The author rue that while we were inviting foreign scientists, Indian bright scientists and engineers with experience working abroad were not willing to come to India to help when it was getting quite difficult to set up the very first Space Science and Technology Centre in Thumba. Advertisements for this were placed in foreign newspapers and journals.

The author showers praises on his mentor, Dr. Vikram Sarabhai, characterising him as a leader who taught how to approach a problem, how to innovate, how to learn from one’s own mistakes and work as a team. His leadership style came in sharp contrast when ISRO was expanding and family-like relations were being replaced by formal business-like approach.

The new generation may be surprised to know that despite his doctorate in Cambridge, Sarabhai always wore khadi kurta-pyjamas and Kolhapuri chappals and wore an India-made HMT watch. On formal occasions he would wear a bandh-gala coat over pants and shoes. “His casual attire changed the dressing culture in ISRO and scientists left dressing in suits and ties. Wearing chappal became the norm.” The chapter on Sarabhai details many unknown incidents, rumours, controversies, also his much-whispered love for another woman, Kamala Chaudhary.

Sarabhai, ambitious and a scientist-in-a-hurry, prepared quite early a ten-year blueprint for creating indigenous satellites, rockets and rocket launchers taking cue from advanced countries. The blueprint, however, did not materialize in the given time frame.

After Thumba, there was need to set up a new launch station for bigger rockets. The chosen location was Sriharikota, a remote and difficult to approach island, off the southern coast of Andhra Pradesh.

The Sriharikota launching facility was ready by 1971 which was modest by international standards. Who could have imagined, the author writes, that a few decades later it would be one of the most important spaceports of the world.

Indian scientist-engineers used American Nike-Apache rockets during the early sounding rocket phase. Rockets indeed were available for a price from friendly countries, but technology transfer was a strict no-no. Indians built their own sounding rocket, Rohini-75 and used it first in 1967. They then developed more and more powerful rockets, finally showcasing their capability to send a 1982-kg payload in the geosynchronous orbit in 2014. Launch pad and rockets apart, the development of satellites has its own history which also is very well presented.

The chapter, ‘Early Learning Experiences from Around the World’ reads as an interesting travelogue. Sarabhai in order to garner relevant information sent scientist-engineers on a world tour to cherry-pick ideas from major space installations. A list of all space stations and facilities around the world working on systems relevant to us was prepared. “Whatever was proposed, Sarabhai gave his nod without asking a question.” And scientists visited Germany, Netherlands, France, Britain, French Guiana, the US, Hawaii and Japan.

In fact, in 1964 Sarabhai had signed an agreement with Sud Aviation, a French firm, to manufacture Centaure sounding rockets under licence in India and supplying them back to France – a pioneering ‘Make in India’ move.

The chapter, ‘Turbulent Times’ describes the sudden change in the environment and involvement of labour politics which was totally unknown during Sarabhai’s time. Aravamudan writes, “By early 1970s a variety of labour unions of various hues began to emerge. Known faces, working in the space organisations, suddenly turning hostile and leading to dharnas; and hartals became a common thing. To many scientists it was quite a frightening experience as there had not been attached toilets those days, and gherao means you would not be allowed to come out of your room to go to the common toilet or to drink some water.”

Successful development of satellite launch vehicle was an important milestone in the journey though developed five years later than the proposed deadline and that too crashed into the Bay of Bengal a few minutes after taking off. Kalam and his team was depressed. But there is no space organisation in the world that has not witnessed such failures. Scientists did not give up in despair. The errors in SLV-3 were identified, corrections were made and the second attempt a year later was successful.

The development of the Geo Synchronous Launch Vehicle (GSLV) with our own cryogenic engine was even more challenging. India could have started developing the cryogenic technology in the 70s. French collaboration was available. But ISRO did not consider this proposal seriously. This mistake wasted several decades.

Much later, the Russians offered to give two engines as well the technology at the fraction of the cost a US company was demanding. The deal was signed in 1991. But within a year the US claimed that the deal was in violation of the Missile Technology Control Regime. And “led by the US, embargoes began on components, even those which had been remotely connected. The Russian leadership was crumbling under US pressure and transfer of technology was denied to India.”

ISRO finally developed a GSLV coupled with its own cryo-engine to take off on 15 April 2010. Alas! It did not succeed. The first success came about on 5 January 2014 when GSAT-14 was put in a synchronous transfer orbit. What a meticulous, flawless mission! The world praised Indian scientists.

The book is a testament to Indian scientific ingenuity and prowess.

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