MY LIFE

AN ILLUSTRATED AUTOBIOGRAPHY

A.P.J. Abdul Kalam

Illustrated by **Prabhjyot Majithia**

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I Will Fly

I am born with potential.

I am born with goodness and trust.

I am born with ideas and dreams.

I am born with greatness.

I am born with confidence.

I am born with wings.

I am not meant for crawling,

So I won't, I have wings,

I will fly, fly and fly.

Chapter One

Have you ever seen a beautiful sunset? I have, when I was a little boy, standing near the sea at Rameswaram, the town where I grew up. As the sun goes lower and lower, the sky turns a vivid red and golden. The sea reflects this beautiful play of colours, and as you keep watching, the sun dips further till it seems to disappear into the water.

This is one of my favourite memories of my boyhood—of standing by the seashore, watching the sun go down, and then racing home to my mother. Our house was in a street called Mosque Street, and it was built by my father. I was born in this house on 15 October 1931. In fact, I am told that I was the first child to be born in this house! I was the youngest of all my siblings. There were so many of us living in that house! Some of you may know what it is like to live with brothers and sisters and aunts and uncles and grandparents. We, too, lived like that—always surrounded by elders and children, old and young. We had so much fun, playing games, studying and going to school together.

This does not mean that we were very rich. My father had some land where he grew coconut and other plants. He also had a boat that was used to ferry pilgrims. We were comfortably off and I went to the local school with all the other children. My mother, Ashiamma, was a wonderful cook. I may be old now, but I still remember the taste of the sambar and chutney she made for us that we ate from banana leaves sitting on the kitchen floor.

My father would visit his coconut grove frequently. On the days he went there, he woke up very early and walked to the plantation which was some distance from the house. I loved to accompany him but could go only on some days, when I didn't have school or classes to attend. We would set out from our home before the sun was up and the light was only beginning to appear in the sky. It was usually cool and there would be a breeze coming in from the sea. I would hold his hand and walk quietly by his side for he would be saying his prayers under his breath. Then, something interesting would catch my attention, and I would forget to be quiet.

'Appa, did you hear how loudly that crow just cawed?'

'Appa, why does the sky change in colour so many times from morning to night? Do you think it likes to change clothes like us?'

'Appa, why does it rain? I like rain because then my friends and I can splash in the puddles in school and Amma makes special *bhajjis*.'

My father would listen to all this chatter patiently, with a smile on his face. We walked to the end of the road, went by the mosque, past the famous Rameswaram temple and then took a route to his coconut grove. There, I sat by his side and listened to him talk to the caretaker about soil and manure and rains. I loved standing under those tall trees and looking into the swaying fronds. The light would flicker in and out between the leaves, teasing my eyes. I would close one eye and the light would seem even brighter, as if the morning sun was winking back at me, telling me to have fun through the day.

It was thrilling when someone climbed up right to the top of the tree to cut the coconuts. This could only be done by skilled climbers. They climbed up the straight trunk as easily as if they were walking up a gently sloping hill. With a cleaver tucked in his belt to cut the coconut with, the man hugged the tree with hands and feet in a swift practiced pattern. Once at the top, he cut the coconuts and they fell below the tree with loud thuds. For a while, before I wanted to be a pilot, I was sure that being one of the tree-climbing men in the coconut grove would be a wonderful occupation when I was older. After all, no one can climb higher than that and you could look far into the distance from the top of the trees.

Carrying a few coconuts back with us, I would hurry on ahead as we neared our home, eager to tell my mother and elder sister all about the things I had seen. They, too, would listen to my stories as I got prepared for the day.

Other than my parents, we were many brothers and sisters in that house. My sister Zohra used to take special care of me. I think she was especially fond of me as I was not as naughty as some of the other children. I was quite dreamy and loved to spend time on my own, either by the seaside watching the birds fly around or looking for patterns in the clouds. My mind was always full of questions like why can birds fly and not us? How does the beating of the wings keep the birds up in the sky? Does the sun really fall into the sea at the end of the day? Where do the waves come from and where do they go? I asked these questions to my elders, and when I didn't get the replies I wanted from them, I looked for them in books.

At the time, there were very few books available for children to read. Adults, too, mostly only read the newspapers. However, there was one person in that small town who had many books and who made sure anyone who wanted to read could do so. His name was S.T.R. Manickam and he was a freedom fighter. After dinner, I was allowed to go to his home library and look through his many books. His house was on a main road, and I felt a thrill each time I entered it. What book would I get to read today? Manickam himself helped me choose books that I could read. They were fairytales and biographies and books that explained everyday occurrences in simple language. Sitting there, among the tall bookshelves, the light coming feebly from some lamps, I would look at the flickering shadows of the cupboards on the walls, see my own wavering shadow among them, and then lose myself in a world of words and knowledge and imagination. That little library was my first introduction to the wonderful world of books.

Yet, I was not always lost in the pages of a book. I remember, during the World War II days, there was a severe shortage of everyday items. Things were available only in small quantities. I decided that if I earned some extra money it would help my parents. So I started gathering tamarind seeds. For some reason, there was a demand for this, and if I collected a substantial amount, I would get paid 1 anna from a shop that took these from me. So while I was in school or out anywhere else, I kept an eye out for tamarind seeds. I collected those little blackish brown seeds in a piece of cloth and when it felt nice and heavy I would go and present it to the shopkeeper. Once I had the money, I would run as fast as I could back home to give the anna coin to my mother. She put it carefully in the little box where she kept all her household money. To see the small amount of money I earned kept there to be used to buy some small item gave me so much pride and joy! You may be wondering what is an anna. It was a denomination of money used in India till about 1957, and one anna had four paise.

The most exciting job that I had as a child was that of collecting newspapers. Rameswaram had a tiny railway station, but the train that passed through did not stop there during the days of the War. But this train also brought the town's newspapers. So the only way for the newspapers to get collected was for someone to stand at the door of

the chugging train and throw the bundles on to the platform. I had the job of standing on the platform to collect these bundles of newspapers and taking them to my cousin Samsuddin who distributed them across the town.

In the morning, I could be found waiting at the railway platform, my ears tuned to hear the whistle or clattering of the wheels of the train. Then it would come into view, rushing up busily, puffing smoke and making a lot of noise. Waiting to catch the first glimpse of the train's smoke, I started thinking about how steam engines work and the complex machinery required to turn steam into locomotion. This was where my fascination with engines and with the story of the invention of the steam engine began.

I would be hopping from one foot to another, anticipating the newspaper bundles getting thrown out of the moving train. Then there they would come, landing with big thuds near my feet. The person inside would wave at me as the train chugged away whistling and puffing steam. I would pick up the bundles and take them away. They would be heavy but in my youthful excitement, that didn't matter.

In the evenings, when school was done, I went to meet Samsuddin again. Then, he and another cousin would read from the newspaper, telling about all that was happening in the world outside our town. How I longed to go out and see parts of this world for myself. They read aloud about the War, the unfolding freedom movement in India, little snippets of local news, the prices of various commodities. Everything seemed so big and important and faraway. Jalaluddin, a relative who had moved to Rameswaram on work and with whom I shared a special friendship, would tell me, 'See, Abdul, you too will go out there one day and see more of this world. You must study hard and go to a big school and then college.'

With Jalauddin's words in my ears I would lie back and look up at the twinkling stars and the moon. My dearest wish was to reach for the sky. I actually wanted to be out there, up in the sky, among those stars, studying them, flying close to them, learning where they had come from. The wonders of the sky held a special fascination for me and if I knew then that my work as an adult would have me building satellites and rockets that travelled far above the earth and studied the sky and the land below, how happy I would have been!

Jalaluddin was one of the first people to inspire me to think beyond life at Rameswaram. He himself had studied more than most others in the family and recognized the love of books and learning that ran in me. He became a friend to me, inspiring me by telling me about famous people's lives, or how the world was like. At the same time, he also helped my father out in his work.

Our family had a ferry business and our boat took pilgrims who came to Rameswaram to Dhanushkodi by sea. I, too, used to sit in the boat sometimes and go to Dhanushkodi and back with all the pilgrims. But one day, there was a terrible cyclonic storm. It started getting windy in the evening and by sunset the waves had become bigger and wilder. The wind picked up by the minute and howled over our homes. The rain was fierce and started coming down in sheets. We were all safely inside our houses, sitting in the light of the lamps, trying to be the closest to our mother as the thunder rolled and the lightning flashed. All through the night the storm continued and we fell asleep still sitting close to one another.

In the morning, we woke to a world turned topsy-turvy. Trees lay uprooted and some houses had lost their roofs. Everything was under water. Our school was closed for the day so we could all help out our parents in cleaning up around the houses. We had an additional damage. The boat that we used to take pilgrims across to Dhanushkodi and back had been swept away into the sea. My father was upset and at the same time calm as he planned to get a new one. In the days that followed Jalaluddin helped him build a new boat that lasted many years.

In this way, the days of my earliest childhood went, filled with many moments of happiness and some sad days. I kept the faith in my parents and teachers and looked forward to days of hard work and learning. I realize now that it was a happy and contented time.

Chapter Two

'Vanakkam, Aiya! I have some good news for you!'

It was my Mathematics teacher from class 4 and he was standing just outside the house and calling out to my father. He looked quite excited, so we all rushed out to greet him and invite him inside. My father offered him a seat and then looked on expectantly.

'Abdul, come up here, to me,' my teacher beckoned to me. I was standing with all the other children, peeping from behind my elder brother. I came up shyly to him. He pulled me close affectionately, then turned to my father and said, 'Abdul has scored full marks in Mathematics in the exam! And not only in Mathematics but in Science as well, and he has done very well in English and Tamil too! We teachers are very proud of him.'

I was so pleased to hear this result. But I was even more pleased because my teacher had taken the trouble to come all the way to my house to tell us about this. He had finished his work at the school, and then instead of hurrying back home he had come here, to share his pride and happiness with my family. Our school was small, but it had many such teachers like him. They taught us with love and care and felt the same joy in our achievements as we did.

That evening, my mother made special *poli* (a flat chapatti-shaped sweet) to celebrate. We all loved polis and ate many helpings till we were told we'd had enough and sent off to bed in case we got tummy aches! My love for this sweet endures to this day, and when I travel in south India, I have friends who make it at home and bring it to me wherever I am. I make sure to steal a few minutes from my schedule and enjoy this sweet dish that carries so many memories of childhood for me.

As a child, my day started very early. It began with my mother gently shaking me awake very early in the morning, before sunrise. 'Abdul, wake up *kanna*,' she would call affectionately and I got up, wiping the sleep from my eyes. I had two places to go to before school. One was the Arabic tuition class that all of us attended. There, we learnt to read the Koran. After it was over, I went to my Mathematics teacher's house. He took a special class for students who showed promise in the subject. I have always loved learning about numbers and their rules and patterns. Addition and subtraction and multiplication and all the other basic functions I had learnt very quickly. Now I was raring to know about more complex problems. My teacher had started the class for students just like me and I enjoyed going there and grappling with number problems in the early hours of the day.

I ran back home once the class was over. My mother would have a hot meal ready. We all ate our fill. In our school, children did not carry tiffin boxes and water bottles so I ate the mid-morning meal hungrily, enjoying the rice and vegetables and chutney and dal. Some days she would make piping hot dosas and I still remember their thick crispy texture and the spicy powder smeared on them.

The children all walked to school together. Our school was the Rameswaram Elementary School and the only one in the town then. We walked along the cobbled roads together, chatting and playing little games. We had to carry only a few books with us and no one took schoolbags. The school building had rows of classrooms and a small playground. In the class I sat with Ramanadha Sastry, my best friend. We had known each other from the first day we came to school and been friends ever since. He and I loved to chat and somehow we never ran out of things to say to each other and do together.

One day, we decided we would build boats made of leaves and keep them ready in case it rained. Whenever we got a break between classes we took up our pile of leaves and made little boats out of them. Imagine our joy when it actually rained that day! Our whole fleet of boats set sail on the many puddles. If I saw an ant or some other insect I carefully made sure it got a ride on my boat to safety. I don’t know if the ants were any grateful for this unexpected joyride, but we were thrilled to see them clinging on to the flimsy leaf boats and sail away.

Ramanadhan and I sat next to each other in class too. Once it so happened that a new teacher joined our school. As soon as he entered the class, he saw from our attire that Ramanadhan was a Brahmin and that I was a Muslim. These were divisions we had never thought of earlier but the teacher was not happy that a Hindu and a Muslim boy were sitting together. He made me get up and go sit elsewhere. I was shocked and heartbroken. I remember crying because I had been made to give up my seat next to my best friend. And, who knew that a Muslim and a Hindu boy could not sit together?

That evening, Ramanadhan's father, who was also head priest at the Rameswaram Shiva temple, heard about this and told my father about it. Together, they spoke to the teacher and told him that he should not have brought the divisions of religion into the classroom. Children should grow up together, studying and playing, without their faiths coming in between. The teacher understood this and Ramanadhan and I went back to sitting together as usual.

However, our time together was not indefinite. Soon we had to go our separate ways. The school in Rameswaram had classes only till the secondary level and to study

beyond that one had to go to the bigger towns nearby. I had another teacher called Sivasubramania Iyer. He, too, was very fond of me and like Jalaluddin, kept encouraging me to think about higher studies.

Sivasubramania Iyer taught me when I was ten years old and in the fifth standard. He was a great teacher and all of us loved to attend his class and hear him. One day, he was teaching how birds fly. He drew a diagram of a bird on the blackboard depicting the wings, tail and the body structure. He explained how birds create the lift and fly. He also explained to us how they change direction while flying. For nearly twenty-five minutes, he gave the lecture with various information such as lift, drag and how birds fly in formations of ten, twenty or thirty. At the end of the class, he wanted to know whether we had understood what he had been teaching. I spoke up and said I had not understood. When I said this, he asked the other students whether they had understood or not. Many students then said that they too had not understood. Our response did not upset him at all.

When we were scheduled to have our next class with him, he had a wonderful surprise. He said that he would take us to the seashore that evening! The whole class went to the seashore of Rameswaram. We enjoyed looking out at the roaring waves. In the sky, there were many birds flying around. He pointed out the birds that were flying in formations of ten or twenty numbers and we observed the marvelous flight formations they made. He asked us to watch how they looked when they were in flight and how they flapped their wings. He then told us to look at the tail and see how they used the combination of flapping wings and twisting tail in their flying. We noticed closely and found that the birds were able to fly in the direction they wanted to by using both tail and wings.

Then he asked us, ‘Where is the engine in this bird? Do you know what is the engine that powers each bird?’ He explained that each bird is powered by its own life force and the motivation of what it wants. In the space of fifteen minutes, he explained the concept of flight dynamics in birds and we understood everything. He gave us a theoretical lesson coupled with a live practical example available in nature. This was real teaching.

For me, that evening, I did not merely understand how a bird flies. It went much deeper. I felt as though the bird’s flight entered into me and created a special feeling. From that evening, I was sure that my future study had to be with reference to flight and flight systems. My teacher’s teaching and the event that I witnessed decided my career path.

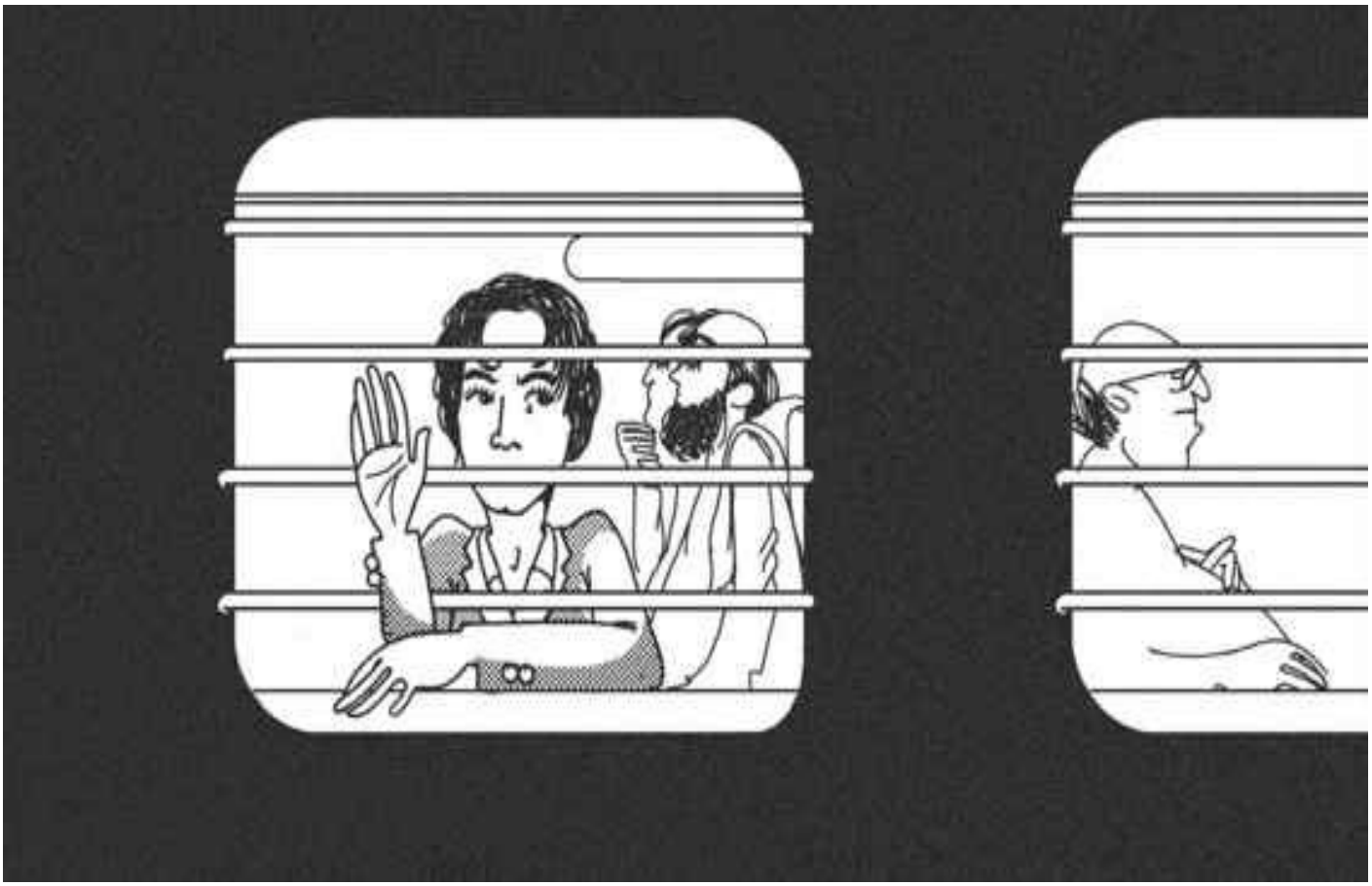
One evening after the classes, I asked him, ‘Sir, please tell me, how can I progress further in learning all about flight?’ He patiently explained to me that I should complete my eighth standard here, and then go to high school. After that, I should go to engineering college where I would be able to learn about flight. If I completed each step, I would be

able to do something connected with flight sciences. This advice and the lesson that evening by the seashore, gave me a goal and a mission for my life.

I spoke to my father about my dreams and ambitions, and as a result, at the age of fifteen, decided to move to the Schwartz High School in Ramanathapuram.

Saying goodbye to Rameswaram and the familiar old streets was difficult and I was a bit scared too of going away from this place where everyone knew me and where I knew every bend and corner and tree. I had never gone so far away from my family, and to leave my mother behind made me specially sad. She, too, shed tears and made boxes of food that would last me for a few days. Those polis that I was so fond of, went with me on my first trip outside Rameswaram.

We left by the train. Jalaluddin and Samsuddin came along with me to help me settle down in the new place. I remember waving goodbye to everyone till they were little specks in the distance. My eyes were threatening to water but I held back the tears. I was a big boy now and how could I cry for my mother in front of everyone? But whatever one's age, to live away from your parents for the first time, however exciting, can also be a bit frightening.



My first glimpse of my new school was of a plaque that was nailed to its entrance

that read: ‘Let not thy winged days be spent in vain. When once gone, no gold can buy them back.’ It meant that the best days of our lives were now, when we were learning, and we had to make the most of this time. Once gone, the time would run like sand between our fingers and we would never get it back again. The words filled me with hope and expectations and also helped me put aside my homesickness and look forward to all that I would learn at this new school.

And it indeed turned out to be a place that helped me grow as a student. After the first few weeks that I spent settling down, I got to love the pace of studies and classes here. The teachers were just as dedicated as the ones I had back home. I also made new friends. At the same time, my love for Mathematics and wonder about anything that had wings and could be airborne continued. In this, I was encouraged by my teacher Iyadurai Solomon. He believed that the best learning happened when we saw how things worked around us, rather than learning about them only from books.

I not only learnt new subjects at Schwartz but I also learnt to observe and question. Instead of a childish wondering about the world around me, I felt a thirst for knowledge grow inside me. All the questions that had crowded my mind back home in Rameswaram I now brought out and tried to explain by reading up books and asking my teachers. Many new discoveries and theories were being made at the time, for e.g., in the fields of Physics and Chemistry, and slowly these new vistas of knowledge got opened up for me too.

Yet what is school if funny and strange experiences didn’t happen there? Isn’t it true that on some days the most memorable occurrence happens when you are in school? For me, too, one such thing happened. One day, I was deep in working out a particularly difficult Maths problem and I got delayed in reaching the classroom. It so happened that the class that had started was the Mathematics class. The teacher was very upset to see me walk into the class late. In fact, he was so upset that he caned me! In schools now the practice of caning has been stopped and no one is happier about it than I. There is nothing as humiliating as being punished in front of your classmates. I was, naturally, very upset about it for days.

Soon after, we were set a very difficult test in Mathematics by this teacher. I happened to score very well in the test. My teacher was thrilled to see my marks and how I had grasped the topics he had been teaching us. He called me up to him in the assembly and said I was going to reach new heights of success—and whoever he caned was sure to be as successful!

By now I too had forgotten my pain and sadness at the punishment and in fact after I finished school I remained in touch with my teacher. Decades later, when I became the President of India, teachers and students celebrated in my old school by distributing

sweets! That is the love a good school lavishes upon its students—to correct when you are going wrong, to open new doors of knowledge and give experiences that we learn from all our lives.

Chapter Three

My time at Schwartz High School made me more confident and aware about the world. By the time I finished studying there, I knew what I wanted to do next. I decided to do B.Sc. in Physics. The nearest college that I could go to for this was St Joseph's College in Tiruchirappalli.

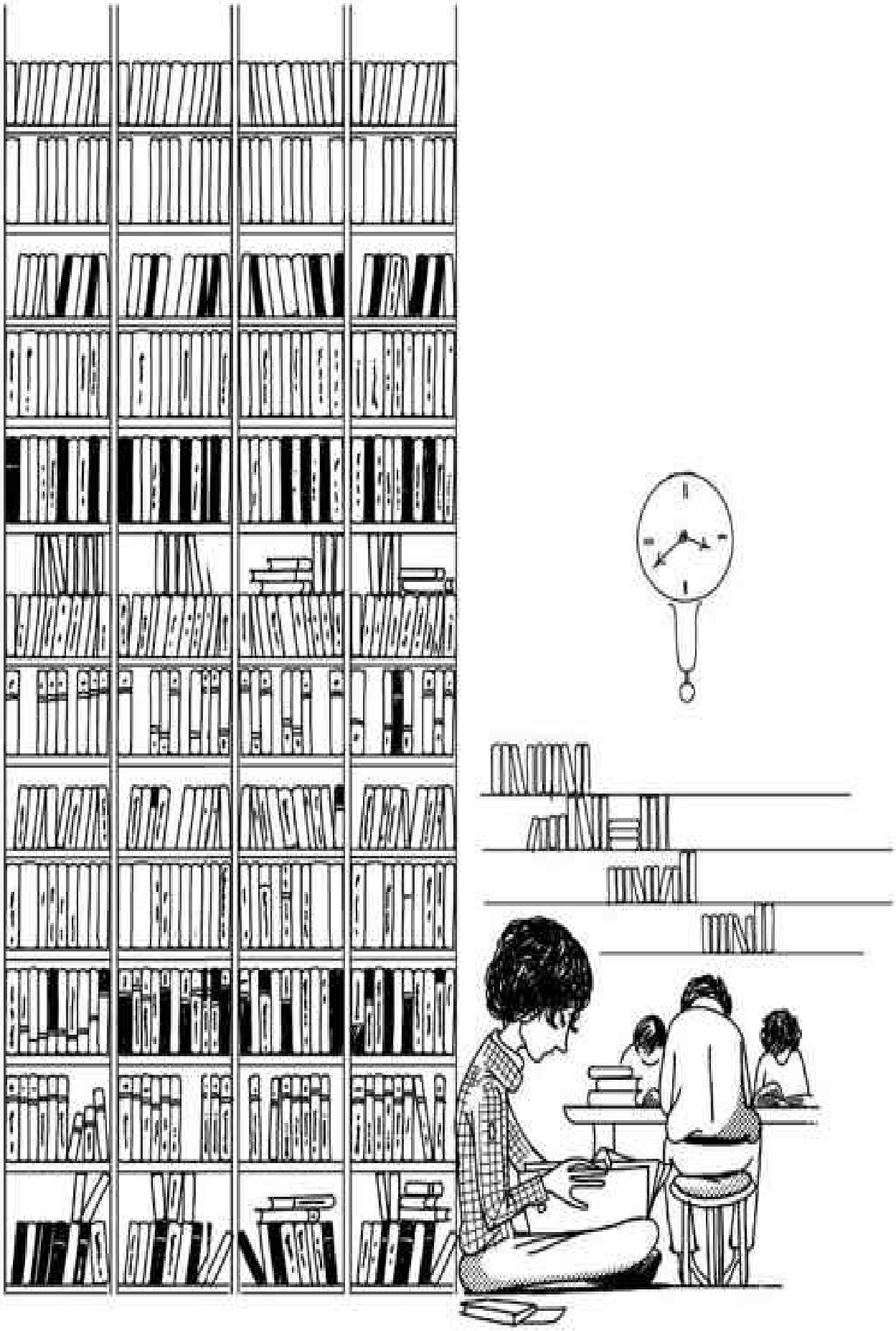
College life was very different. The teachers here gave us much more freedom to study the topics that interested us. I had some very dedicated teachers who encouraged my interest in Mathematics and Physics. One of the professors who had a deep impact on me was Professor Thothatri Iyengar. He taught Mathematics, and was held in great awe by other teachers as well as all the students for his deep knowledge of his subject. I remember the sight of him walking around the college campus, engrossed in his thoughts. My other Mathematics teacher was 'Calculus' Srinivasan. Professor Srinivasan and Professor Thothatri took a few joint classes where they talked to us about modern algebra, statistics and once on complex variables.

The reason why these teachers had an impact on me was not just the teaching of their subjects, which was, of course, exceptional, but also because they brought in many more interesting aspects about Mathematics into their lessons. Don't you enjoy it when your teachers move out of the textbooks and help you roam over different parts of the subject by telling you information you had not known before?

This happened to me at one of Professor Iyengar's lectures. He spoke to us about ancient Indian mathematicians and the discoveries that they had made. One day, in 1952, I still remember, he gave a one hour lecture on three great ancient mathematicians and astronomers of India. He spoke for nearly one hour and the lecture still rings in my ears. I was introduced to the pioneers in astronomy and mathematics from India like Aryabhata, Bhaskara and Ramanujam who gave to the world the number zero, who computed the orbit period of the earth around the sun and who discovered many stunning concepts in number theory respectively. Sitting there in that lecture hall and hearing about these great personalities, it was as if sunlight was streaming in and lighting up all corners of my mind. I started believing that even I or any of my classmates were capable of making discoveries and doing something new and fresh with all the knowledge we were gaining. This feeling of confidence and hope was one of the greatest gifts that my teachers gave me.

It was at St Joseph's that I was also introduced to the works of many new authors by my English teacher Rev. Father R.N. Sequeira. I started visiting the library often and my

teacher, noticing this interest, would give me lists of books and authors whose works I could look for over there. For the first time, I started reading authors like Thomas Hardy, Leo Tolstoy and Walter Scott.



Have you ever stood before a shelf of books that stretches from the floor to the ceiling, looking at the names on the spines of the books, running your hands over them, sometimes squatting down on the floor to look carefully at the books kept on the bottom shelf, and then bringing over a step ladder or stool to climb up and see the books that have been kept high up? Finding the copies of books I was searching for, or bringing down a dusty copy of a forgotten book that no one had issued in many years and taking it away with me to read was a thrilling new experience. Till today I read all kinds of books. Many authors send me their books just to hear what I will say, and I have come across so many interesting new voices in this way.

At St Joseph's, there was also the tradition of a Monday morning lecture by Rev. Father Rector Kalathil, the highest authority of the institution. In that one hour, he would talk about good human beings, whether in the present or from the distant past. He shared his thoughts on what makes a person good. He would tell us about personalities such as Buddha, Confucius, St Augustine, Califa Omar, Mahatma Gandhi, Albert Einstein, Abraham Lincoln and many more. He also told stories that made us understand the values of our heritage and taught us moral lessons. Father Kalathil would show how the greatest men and women became such. Even though these lessons were given to me in the 1950s, they inspire me till today.

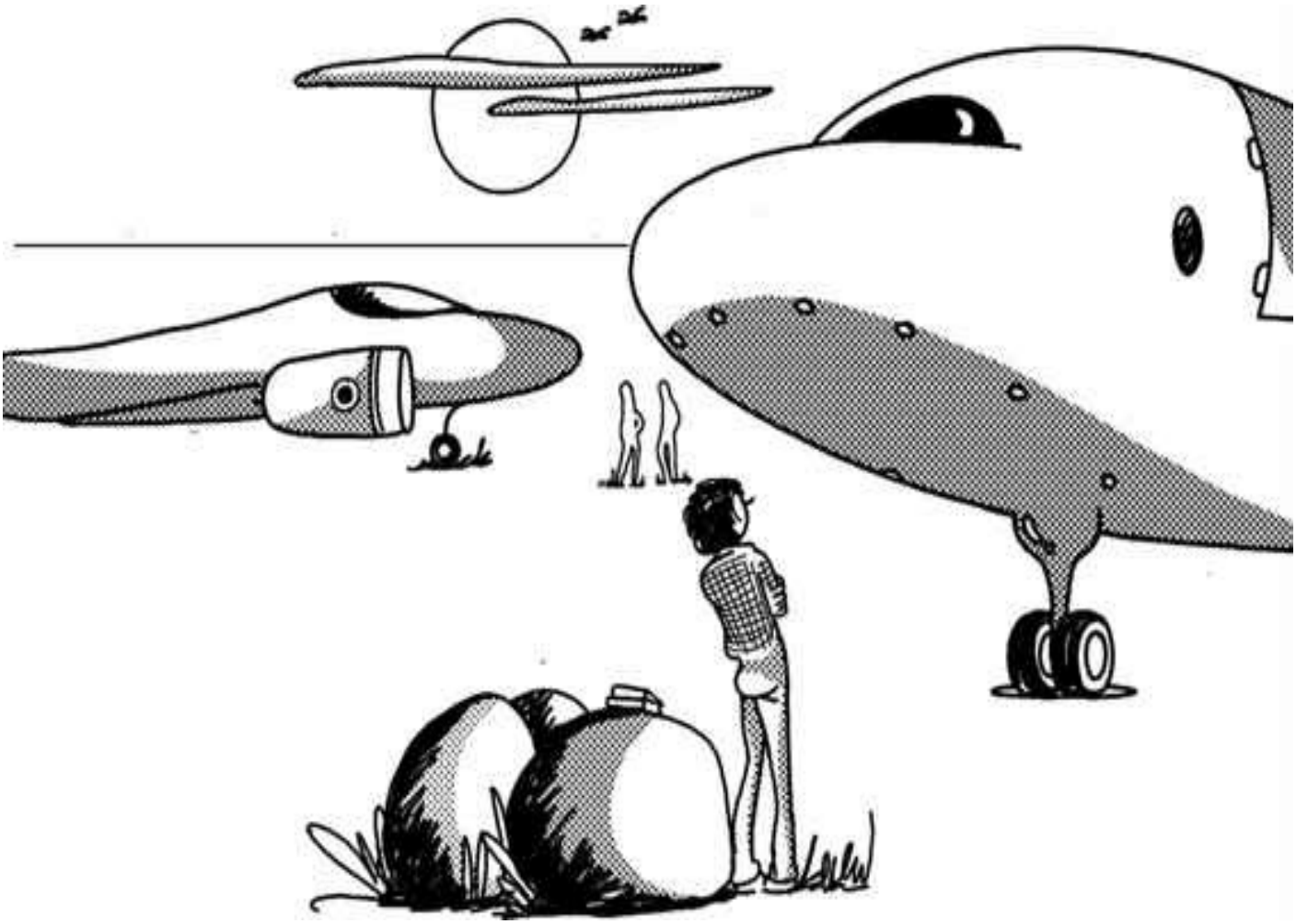
I strongly believe that teachers need to tell students about great lives and make children understand their history and heritage. It is only through this that a love for the country is born that is based on knowledge and understanding. This is how children not only know what is good and what is evil but also learn to judge for themselves the distinction between the two. They then know the best way to behave in many situations. These lessons can form the moral core around which our personalities are formed—something that no one can take away from us however old we get.

My time at St Joseph's flew by and before I knew it, I was a bachelor's degree holder in Physics. However, by now I had also realized that I did not want to study Physics any more. I needed a career path before me and the more I thought about what excited me, the scene by the seaside with Sivasubramania Iyer came back to me—of looking up at the sky and wondering about the stars and how one can reach them; of watching in wonder the beating of the wings of the birds and later learning how objects can be airborne. I wanted to study about airplanes and aeronautical engineering.

One of the best colleges offering this course was the Madras Institute of Technology (M.I.T.). I had heard how difficult it was to obtain a seat here and filled in the application form with both hope and the fear of not making it in my heart. But as luck would have it, I soon got a letter saying that I had been accepted at M.I.T. and that I should pay the fees and join the next session.

My whole family and even my old friends and neighbours and teachers at Rameswaram were bursting with joy and pride at this news. It was as if a big dam of happiness had burst and swept over each one of us. But then an unexpected problem arose. The fee for the course was quite high. From where would we get the money? Like an angel, my sister Zohra came forward with her help. She suggested we pawn her gold jewellery for the loan and pay the college fees. I was also eligible for a scholarship and I vowed right then and there to make sure I earned enough money as soon as I was capable of doing so, and get the jewellery back for my sister.

I knew I had made the right decision by joining M.I.T. as soon as I walked in through the gates. For there, in front of the building, were two decommissioned airplanes. They had been placed there so students could examine how they work and the various features inside them from up close. It had been my dream to be near airplanes and here were two that I could look at whenever I wanted and even study their features! It so happened that after this whenever I got some time I would take my notebook and walk around the planes to study them. The structure of the wings and the body, the controls inside, the fact that these had at one time flown high above the earth and had been controlled with skill and precision by a pilot made it all the more interesting for me.



At M.I.T. too I had the good fortune of having some wonderful teachers. They not

only taught me my subjects in depth, they also made me more hardworking, dedicated and precise in my thinking. Remember the story about my kind Mathematics teacher who came home to tell everyone that I had scored well in the exams? Here, I met another kind of teacher, one who refused to listen to any excuse till my work was perfect and timely.

In the third year of my course, I was assigned a project to design a low-level attack aircraft together with six other students. I was given the responsibility of system design and system integration. I was also responsible for the aerodynamic and structural design of the project. The other five of my team took up the design of propulsion, control, guidance, avionics and instrumentation of the aircraft. Our design teacher Professor Srinivasan, the director of M.I.T., was our guide. Somehow, our progress was slow and we had a tough time getting our data and other requirements in order. One day, I got summoned to Professor Srinivasan's office. Have you ever been asked to appear before a principal or a headmaster? It is one of the scariest experiences for a student. That day, the professor was indeed not happy with me. He said the work we had done so far was not up to his standards and we were going too slowly. Then he said, 'Kalam, I expected better work from you. I want the completed project with me on Monday morning. Or else I will have to stop the scholarship.'

Those words shocked me into silence. Without the scholarship there was no way that I could continue at M.I.T. And for a good student to be told that the work has not been done well enough is like a bad dream coming true. I asked for more time, for it was already Friday, but Professor was adamant. It had to be done by Monday or else…

After that, the way I worked is something I have never forgotten. I didn't look up from my worktable, I hardly ate and I worked all through the day and night on Saturday and Sunday. By Monday morning my work was nearly complete. I found Professor Srinivasan standing behind me and looking over my shoulder at the work. He nodded and to my immense relief said, 'Well done, Kalam. I knew you were capable of much more when I called you on Friday. And you have proved me right.'

This incident taught me to always put in my best and also to never underestimate the power of hard work. Even if a task seems impossible, if you grit your teeth and set your mind to completing it by shutting out the entire world, you are sure to achieve what you set out to do. Professor Srinivasan taught each team member the value of time and brought out the best from the system design team. I realized that if something is at stake, the human mind gets ignited and the working capacity gets enhanced manifold. This is one of the techniques of building talent. It is important to work hard towards your chosen path—success is more a function of effort than anything else. A teacher has to be a coach like Professor Srinivasan and students should be prepared to put in their full energy behind the goal.

The days at M.I.T. flew by filled with studies and work and other interesting activities. I started writing and won a first prize in an essay contest. The topic I wrote on was 'How to Make Your Own Aircraft' and the prize was given by the Tamil weekly *Ananda Vikatan*.

Before we knew it, the day of our graduation was announced. We were all engineers now, ready to start working in the outside world. Our teachers had mentored and taught and honed our skills. This was the last threshold that we were crossing into adulthood. After this there would be no more assignments and tests and projects to submit. But neither would there be a Sivasubramania Iyer to take us by the hand and point out the flight patterns of birds. Or a Thothatri Iyengar to open new doors of knowledge. Or a Professor Sponder who would teach the basics of a subject so thoroughly that I would never forget them.

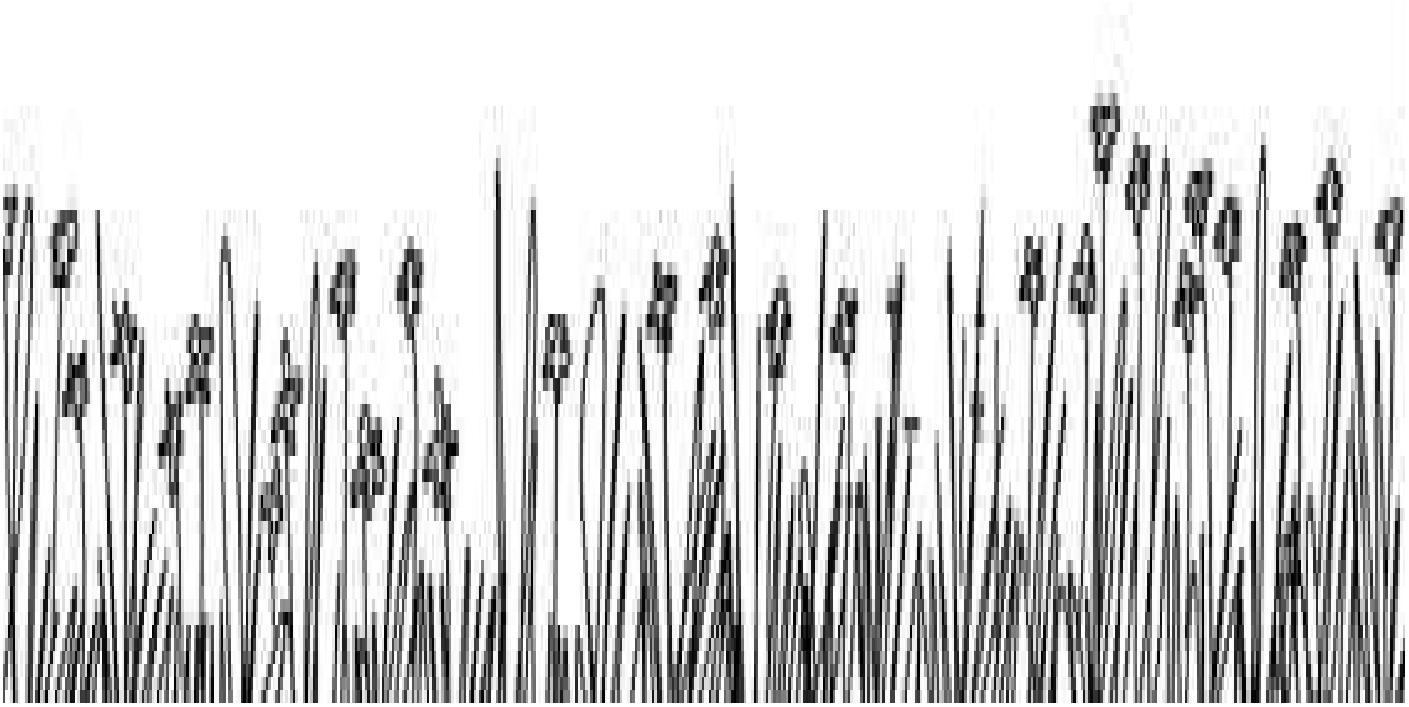
On the last day at M.I.T., we were supposed to have a class photograph taken. I stood thinking of all these teachers old and new as a photographer got ready to take a picture of the graduating students with the teachers. We were dressed neatly and our hair was oiled and combed. As we waited for the photographer to set up his camera, Professor Sponder started looking around. It seemed like he was searching for something. Or someone. He was looking for me. When he spotted me standing in the back row he beckoned. 'Come, sit by me, Kalam,' he said. So I went in front and sat next to him. I straightened my spine and smiled at the camera.

And that's what I see whenever I look at the photo even today—my professors sitting next to each other and there's me, sitting by one who had nothing but affection for me, looking ahead, as if I was looking not into the camera but into a brand new world that was awaiting me outside the gates of my college.

Chapter Four

The train had picked up speed. I was sitting by the window and watching the countryside rush by. Fields and villages and forests and rivers whooshed away as my train made its way up north. I looked out for a while, read my book, and dozed. The rhythmic swaying of the train was relaxing. But I was not very relaxed myself. I was on my way to Delhi to attend two job interviews. The first one with the Directorate of Technical Development and Production (DTD&P [Air]) was in Delhi, and the other, with the Indian Air Force, was in Dehra Dun. This was my first trip to the north of the country and I was already looking at landscapes and people so different from what I had seen till then.

I was very pleased that I had been asked to give the interviews. The call to appear for the interviews had come soon after I had finished my internship at Hindustan Aeronautics Limited (H.A.L.) in Bangalore and I had become a full-fledged aeronautical engineer.



After finishing from M.I.T., I still needed to do an internship and I chose to be at H.A.L. There, I had gathered a lot of hands-on experience of working with aircraft. I had done this by spending as much time as I could on the shop-floor. A shop-floor has no shops though! It is the area where work on machines is done in a factory. In this case, it was where aircraft engine parts were being overhauled. I learnt from and observed the many engineers and technicians there. Finally, all the bookish knowledge I had obtained in college was being put to use, and I was working on real aircraft engines! The people

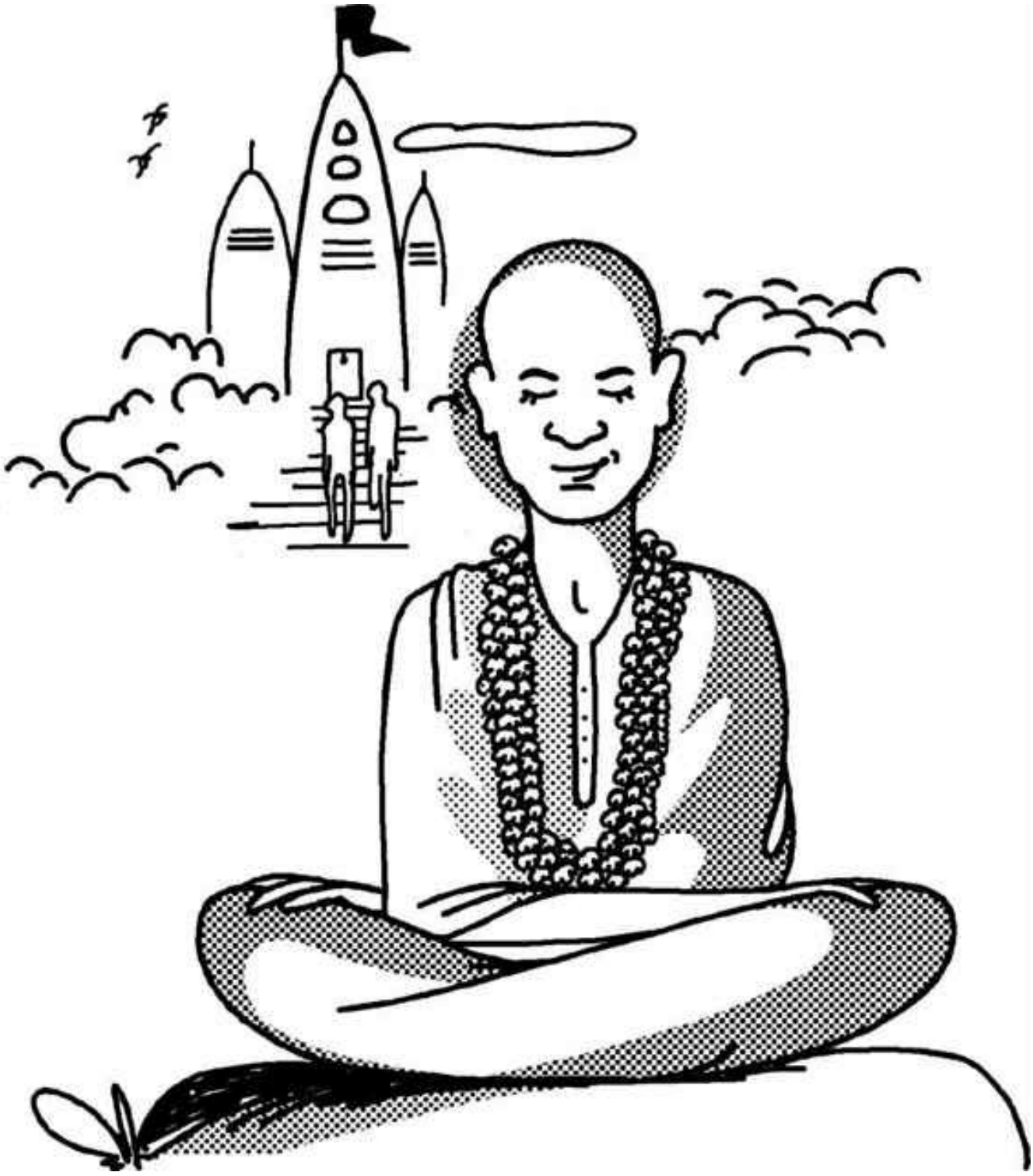
who worked there never tired of showing me how the engines worked or the problems they needed to tackle in them. I stood alongside them and watched what they did or followed their instructions and in this way I began to see these engines, these machines, as not just inanimate bits and pieces of steel and wire and wheels but as objects that gave life to the aircraft, powering them high up into the sky.

And now here I was sitting in a train that was going rapidly towards Delhi. The journey was long but as I read and prepared and looked outside at the contours of my country, time seemed to slip away fast and soon I found myself in Delhi. Right after my interview at the DTD&P, I made my way to Dehra Dun to appear for the interview at the Indian Air Force. Frankly, this was the job on which I had set my heart. At the Air Force I would be able to fly the planes I had been seeing and studying about. At last, that childhood desire to be one with the birds and to look down at the earth from high above would get fulfilled.

At the interview, I spoke passionately about the reasons why I wanted to be a pilot. I was also quizzed extensively on my technical knowledge. We were told to wait for a while before the results were announced. To my great disappointment, when the list of selected candidates was put up, my name was not on it. They had chosen eight people and I was told that I had been placed ninth. I had missed realizing my dream by a whisker.

I was overwhelmed by a deep disappointment and dejection. Sometimes one sets one's heart so strongly on a certain goal that on not reaching it, the sadness is overpowering. I wandered around Dehra Dun and then decided to go to Rishikesh to see the river Ganga and also visit the ashram of Swami Sivananda, about whom I had heard earlier.

At Rishikesh, I met the swami and his calm manner as well as soothing words gave me hope and the courage to get over my disappointment. He said that a lot of what happens in our lives is predetermined and that the only way forward is to accept what has happened and to move on. Who knew, perhaps what destiny had in store would be better than what one is grieving over now.



With this advice, I returned to Delhi to find that I had been accepted at the DTD&P. I had been offered the post of Senior Scientific Assistant. My first assignment was to design an aircraft that could reach the speed of sound. Once the project was over, I moved to Kanpur. Here I carried out studies for a fighter aircraft called Gnat. I also did work on the maintenance aspect of aircraft including overhauling damaged and worn out parts. Over the next three years I was assigned various projects and I enjoyed them all.

Yet, the dream of creating machines that flew ever higher and the fascination with space remained with me. It didn't matter if I was in Kanpur or Delhi or back home for a visit. The sky was vast and limitless everywhere. To stop every night after the work for

the day was done and to look up at the inky blackness, to spot the constellations that were once pointed out to me by Jalaluddin and whose names I now knew myself and to hope that I could one day take our country into the space age were thoughts that came to me often.

So it was very exciting when I heard that a new aerospace development centre had opened in Bangalore. I applied and got a job at the Aeronautical Development Establishment (A.D.E.). The A.D.E. was supposed to work on aeronautical research that would help the Indian Air Force. I started reading and researching the latest developments in this field. Then one day, Dr O.P. Mendiratta, who was the director of the establishment, decided to put me in charge of a team that would develop a hovercraft for the Air Force. I would be working on this with a team of scientists.

What is a hovercraft? It is a craft that flies a little above the ground using the cushion of air blown by it. It was thought that a hovercraft would be useful for the Armed Forces as the soldiers could move across any terrain using this. The then defence minister of India, V.K. Krishna Menon was very enthused by the idea and gave us a lot of encouragement. However, once we started our work, we realized that there was very little indigenous knowledge or research available on this. Our hovercraft was going to be fully Indian, yet we had little support by way of existing work to help us.

One person to whom we reached out and who gave us valuable lessons was Professor Satish Dhawan who was teaching aeronautics in the Indian Institute of Science, Bangalore. Professor Dhawan gave the entire team a few lectures on how to design a propeller for the hovercraft. But for the many other aspects of this job we had to search far and wide for information and also devise our own solutions.

Finally, after many months of research a prototype was built in our workshop. The entire establishment was excited about it and soon we heard that the minister would be coming to see it and also ride in it. On the day of the minister's visit we were both excited and a little bit nervous. I was happy to see Professor Dhawan had come to watch our progress too. The defence minister arrived and was escorted to the workshop to see the craft from up close. Our team explained how it would work and the various innovations we had had to think up to create it. He then said that he wanted to take a short ride in it.

We had expected this, and I was ready at the controls as the hovercraft was moved to a location outside the facility. However, just as the minister was going to take his seat, someone from the defence forces said it would not be safe for him to sit in a craft piloted by an untrained pilot. I was amazed to hear it. After all, this hovercraft had been created by me and my team, so how could anyone think that I was not competent enough to fly it? Thankfully, the minister decided not to heed the words of these people and chose to fly

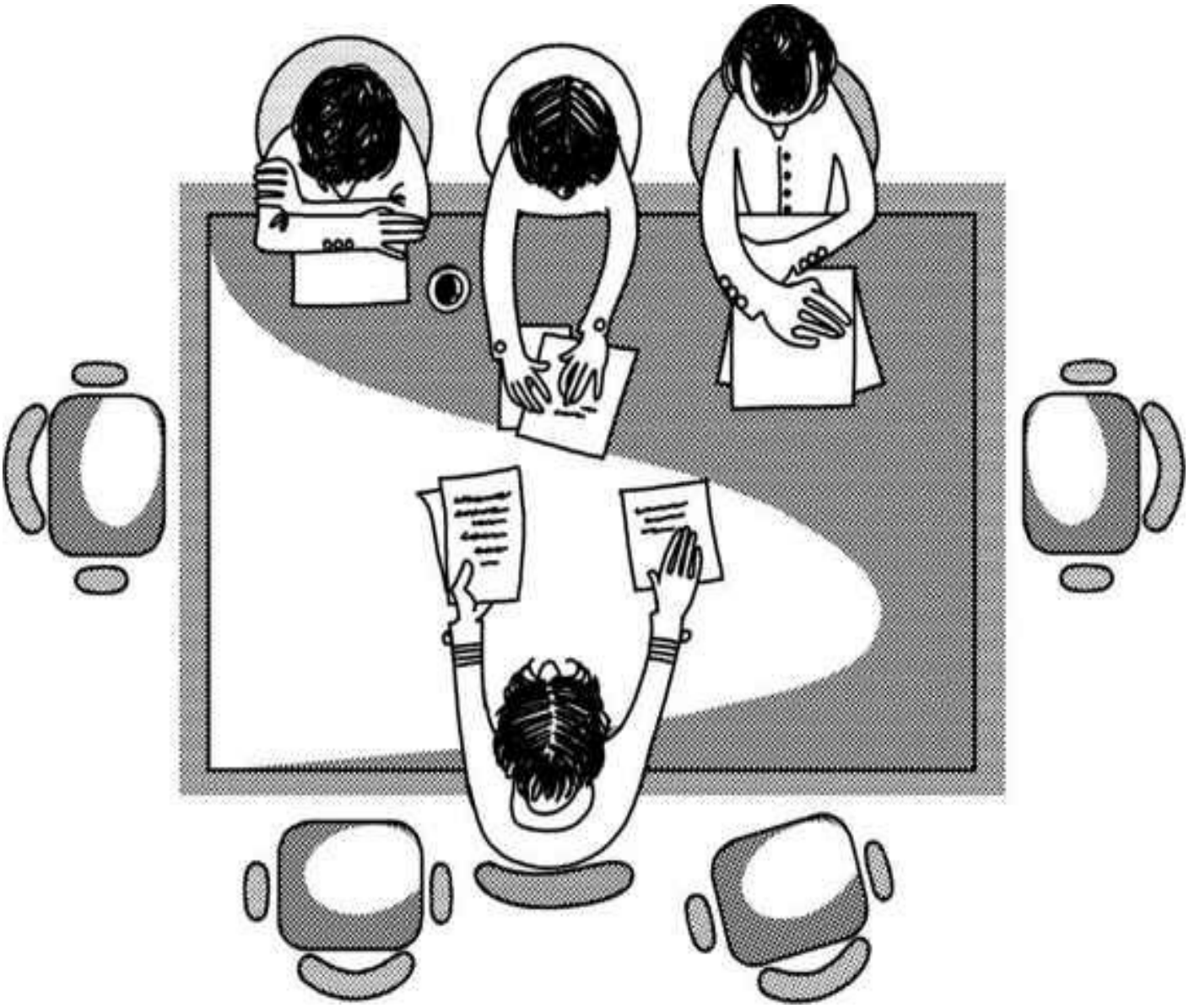
with me.

The flight was a success and everyone was happy with the way the project had taken shape. There was talk of us building a more powerful version next. However, to our great disappointment, Krishna Menon soon resigned as the defence minister and with that the support for the project decreased a lot. Yet, no effort really ever goes in vain. As we went about creating Nandi—that was the name given to the hovercraft by Krishna Menon—we learnt a lot not only about how to make a hovercraft from scratch, but also about research, and how to think with courage and originality when faced with problems for which only we could find the solutions.

The success of Nandi was appreciated in aeronautical circles, and some others arrived at our facility in Bangalore to look at it from up close. One person who not only came here, but also took a ten minute ride in it was Dr M.G.K. Menon who was the director of the Tata Institute of Fundamental Research (T.I.F.R.) in Mumbai. What I had thought was another visit by a respected person in the scientific circles actually held within it the seeds of the biggest chapter of my life.

A few days after his visit I got a call from the Indian Committee of Space Research (I.N.C.O.S.P.A.R.). They wanted me to come to Mumbai for an interview. The position was that of a rocket engineer!

I was delighted and overwhelmed at the same time. I had not applied for the position, but Dr Menon, after seeing Nandi, had been impressed and had thought I had the capabilities to work in the newly set up committee that would take India into the space age. I now made yet another journey, this time westwards, to Mumbai. There, I looked at the sea and felt the muggy coastal air on my face. I made my way to the T.I.F.R. campus where I.N.C.O.S.P.A.R. was housed. I remember standing there and just looking at the building and the surroundings for a while before I walked in. I knew that if I succeeded at the interview, I would be doing the most exciting work of my life.

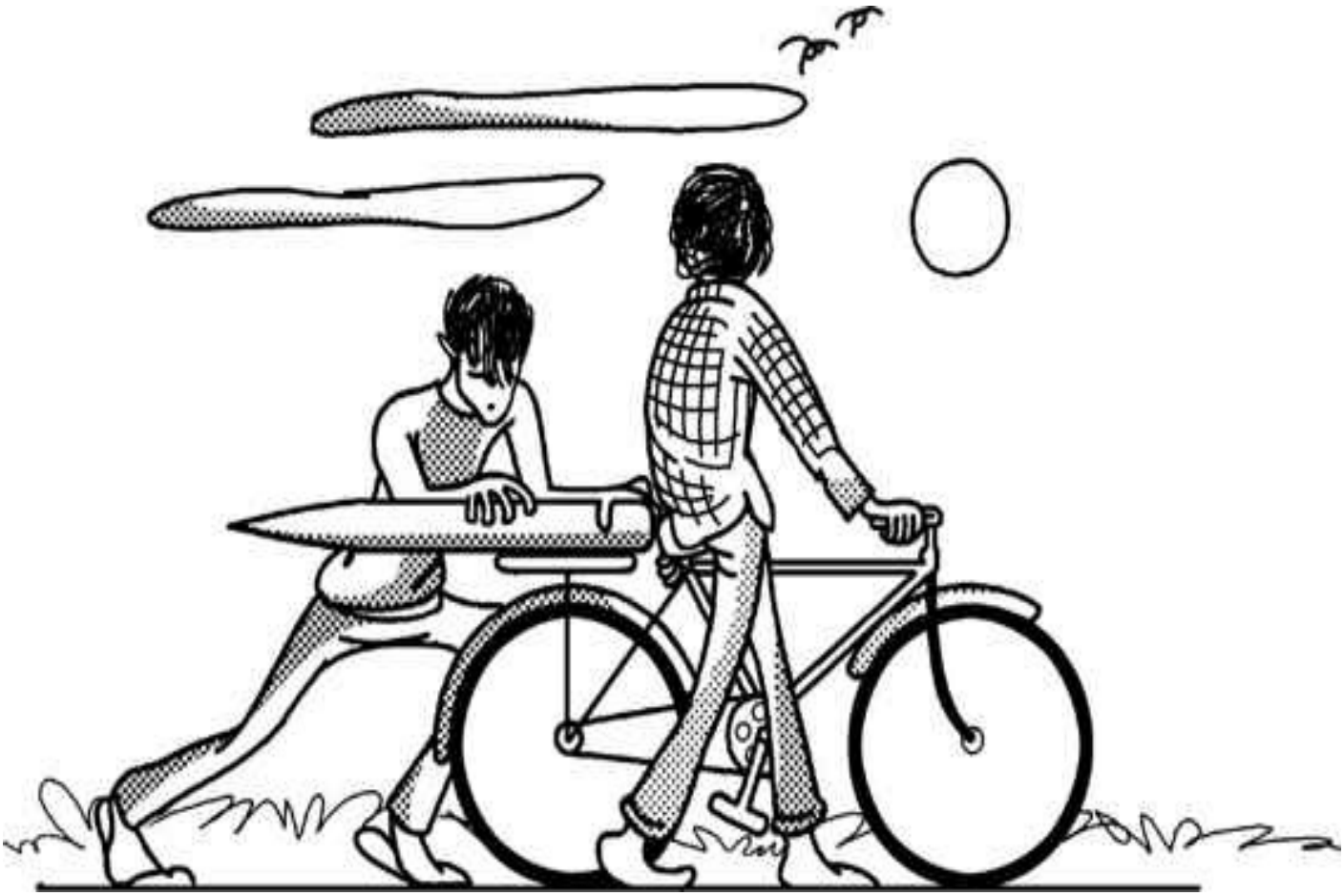


My interview was taken by Dr Menon, Vikram Sarabhai who was then laying the foundation of India's space programme and Saraf from the Department of Atomic Energy. I was asked many questions that not only tested my scientific knowledge but that were also designed to understand my ambition and desire to work in this field. In Vikram Sarabhai, I felt there was someone who could be a most understanding mentor.

The next day, I was told that I had been chosen to join I.N.C.O.S.P.A.R. as a rocket engineer. From a little boy looking up at the sky in Rameswaram to Mumbai, my journey so far had been exciting. But this was only the beginning. There was so much more that I needed to do. The sky was, literally, the limit for me from here on.

Chapter Five

I was carefully wheeling a cycle along a sandy road. It was a cloudy day and the skies were threatening to send a downpour any time. Yet I couldn't hurry. What I was carrying on the cycle was too precious and it would be a disaster if it somehow got ruined. My friend who was walking on the other side of the cycle, was holding the object so it wouldn't slide off. I glanced at the sky and picked up my pace a fraction. We needed to reach the assembly centre before it began to pour. On the cycle was a part of a sounding rocket that would be assembled along with all the other pieces brought in from the workshops.



A rocket on a cycle! It is perhaps unbelievable now. Now, we see our Indian Space Research Organisation (I.S.R.O.) send huge rockets that deliver satellites into orbits or go to the moon and to Mars. But the organization started small. It all began in a tiny fishing village called Thumba, and because the dreams were always big, it grew from there to become one of the world's successful space programmes. And I was a part of this from the beginning.

This story started in 1962. Dr Homi Bhabha, who was the person in charge of India's nuclear programme and Dr Vikram Sarabhai were looking for a place to set up I.N.C.O.S.P.A.R.'s rocket assembly and launching facility. They decided on Thumba, which is near the Earth's magnetic equator and therefore ideal for space research related activities. However, the village, which is near Thiruvananthapuram, had a population of fishing people living there and in fact, the only existing building available was the St Mary Magdalene church.

I had recently started working at I.N.C.O.S.P.A.R. as a rocket engineer, and I soon heard how the village of Thumba became the place from where we would do our first exciting projects. Dr Sarabhai visited Thumba in the hope of seeing how this area could be handed over to our organization. It seemed like an impossible and complicated task. But help came from an unexpected person. He was the bishop of Thiruvananthapuram, the Right Reverend Dr Peter Bernard Pereira. One Sunday, after saying the mass at the church, he explained to the worshippers that their place of worship and even where they stayed were required to house India's ambitious space programme. From here India would take a big leap forward in its goal of becoming a developing nation. The work done here would benefit everyone in the country, he said. But before that happened, they needed to give up their church and its surroundings. Were they willing to do so?

There was some discussion among the people and then there was a loud rumble of 'Amen' from the congregation. They had agreed to give up their village to make India's space dream come true. They were, of course, provided with an alternate place to stay by the government. And that's how our space dreams started, in a church building where the main work was done. The bishop's house was where we had a workshop. And the prayer room became our laboratory to do the experiments on the building of sounding rockets!

I moved to Thiruvananthapuram and life at Thumba soon fell into a certain routine. We stayed at Thiruvananthapuram, which was a twenty-minute drive away from Thumba. The days were a bit chaotic as we worked without a break on the weekdays and often couldn't get our meals on time at the hotel where we were staying. Then we would have to go to the railway station where the cafeteria served meals late into the night. This was also where we got our breakfast from and would pack our lunch too. We would reach Thumba on a Kerala State Road Transport Corporation bus.

Work began at a frenetic pace to build the facilities we needed, like the launch pad, laboratories and workshops. After about a year countries like France, the US and Russia took notice of the work being done here. Still, the facilities were quite basic compared to what was there in those countries. As I have described, since the van we used for transport of material and personnel within Thumba was often busy, we used cycles to go around everywhere and even carry rocket parts on them!

By 1963, the complex at Thumba had come up well and now we had a launch pad, a mission control centre and other required facilities. It was called the Thumba Equatorial Rocket Launching Station (T.E.R.L.S.). We were also given our first big project—to launch sounding rockets. A sounding rocket is used mainly for atmospheric studies. It carries payloads to various altitudes ranging from 48 to 1,287 km. Once a sounding rocket is sent up, the payload detaches and flies further into the atmosphere to conduct studies. Once it is done, it enters the atmosphere again and comes back to a designated spot with the help of a parachute.

We had not yet developed a sounding rocket of our own but were going to launch one that had come from the US. We did that successfully on 21 November 1963. I was in charge of integrating the various parts of the rocket and safety operations. The first flight gave us the confidence and required knowhow to start building our own rockets. We began work on a series of rockets called Rohini. These rockets were used to study the weather and led to our current expertise in developing our own rockets.

Dr Vikram Sarabhai was the one who gave direction to our entire programme. It was he who had drawn up a visionary document on what India should aim to achieve in this area and he was the one who decided every new path to take. It was Dr Sarabhai's vision that India should start developing its own satellite launch vehicles. A nation with a strong base in science and technology is a nation with a strong backbone. By developing our own satellite launch vehicles we were also setting the ground for future rocket developments.

A satellite launch vehicle is a rocket that can place a satellite in orbit. Called SLV for short, it would place a satellite called Rohini in orbit. Once we were told about this new project, work started in earnest in coming up with a design or configuration for the SLV. It was exciting that such new technology was being developed in our nation which had become independent only two decades back. From a country that had been left ravaged by years of colonization, we had learnt to dream big and were working on fulfilling this dream fearlessly.

Dr Sarabhai was presented with four design configurations and he chose the third. Hence the vehicle being developed was called SLV-3. He now decided to create the teams that would be in charge of working on various stages of the rocket. Since there were going to be four stages, there were four teams, one for each stage. He decided to put me in charge of one such team that was responsible for the fourth stage. This is the upper stage which gives the final velocity to the rocket to place the satellite in the correct orbit.

My life now became an endless round of work with some breaks for sleep and food. Like the two days I had worked non-stop to finish my project on time while at M.I.T., I now worked almost as hard, and it was not for two days this time but for months together. I got to see Vikram Sarabhai from close and also observed his style of working and his leadership qualities. He had strong views about the way our project should be implemented or how the facility should be run. Yet, he also knew how and when to listen to the views of others. He respected their opinions and listened to them carefully. Whenever we were told that he was expected to visit us, we would get very excited and start preparing for the meeting. We wanted to present something new or an added improvement in our design to him. He certainly knew how to inspire us to give our best,

not only in terms of the time we spent on the work but also the quality. I was honoured that he had thought me capable of leading a team and saw a spark of a future leader in me.

At Thumba, while we developed SLV-3, I not only worked very hard but I also made many new friends. I still remember the days spent in and around Thiruvananthapuram taking the little free time we sometimes got to visit nearby beaches and taking a dip in the sea, or playing badminton, or drinking lemonades in the hot humid weather. When I meet them now we laugh about those old days when we were all young and had great dreams of building rockets and reaching for the stars.

At this time I also started thinking about the reasons on why we should explore space and what the purpose behind building these rockets was. After all, we were still a young nation with limited resources. When it is difficult to make ends meet on earth, should we be looking at the stars and beyond and reach out so high?

After hearing visionaries like Vikram Sarabhai and working at T.E.R.L.S. I began to understand that being self sufficient also meant developing our own technologies and using that for the good of the nation. Our satellites provide many benefits to the ordinary people of the country—from communication to information that is utilized by soldiers, fishermen, farmers, teachers, students and people from almost every walk of life. By making our own rockets that could go into space and put satellites into orbit or touch the surface of the moon or even reach Mars, we have become a nation that is respected for our technological capabilities. Our satellite launch vehicles and facilities bring in valuable revenue when they are used by other countries. It is important to dream and set big goals for oneself. I learnt that dreams should be those that keep us awake, they are ideas that become actions that lead to change. Perhaps one day we will be able to live on the moon or on other planets, perhaps we will be able to harness energy from space and make our planet even better. There are so many challenges that seem impossible at one time, but become a reality if we study them and figure out how to tackle them.

With Dr Sarabhai that is what we all started to learn—how to recognize challenges and work out the ways to overcome them. He would listen and participate in our heated technical discussions that went well into the night till some resolution was arrived at. It was an exciting time and I enjoyed every minute of it even though I was working harder than ever before in my life.

Then, all of a sudden, on 30 December 1970, Dr Vikram Sarabhai passed away. That day, I was in Delhi attending a Missile Panel meeting. After the meeting, I had called Dr Sarabhai and he had asked me to meet him at Thiruvananthapuram airport when I landed, as he would be on his way to Mumbai. That meeting never happened, for when I landed, I learnt that he had passed away from a sudden heart attack. Not only was

this a huge personal loss for me, for I had looked up to him as a mentor, it left all of us working at Thumba and every other space related station in disarray. We were without our guiding light.

Our work did not stop though. The completion of the project had become our mission. The government renamed the facility at Thumba the Vikram Sarabhai Space Centre (V.S.S.C.) and in 1972 we got a new chairman. He was Professor Satish Dhawan, whom I had first met in Bangalore while working on the hovercraft Nandi. Dr Brahm Prakash was appointed the director of V.S.S.C. and the one who now oversaw our work on a daily basis.

Professor Dhawan made some changes to the way the SLV-3 project was structured. He decided that there should be one project director for the entire operation. He chose me as that person. When I heard this I was overwhelmed. I knew there were others who were academically better qualified than me and yet others who were more senior. But Dr Brahm Prakash, on seeing my nervousness, told me that both he and Professor Dhawan thought I could bring a team together well. There would be many difficulties and obstacles in my way, and I had to find the resilience and the imagination to overcome those while keeping the team motivated. I still remember the words he said to me: 'The SLV mission will be accomplished with, and through, a large number of people. You will require a tremendous amount of tolerance and patience.'

The time had come to channel all my discipline and energy towards one goal—building the SLV-3. It was the rocket that would not only put satellites into space but also take us to a brighter, more confident future. I was sure I could create just such a future for my country.

Chapter Six

It was very early in the morning. Here, in the eastern part of India, dawn broke even earlier, but I was already awake. In the last seven years I had learnt to get by with less and less sleep. Work and making use of every waking hour and minute was all I thought about through the day. Not now, though. Now, in these early minutes of the day when the sun had not appeared fully, I liked to look out of the window and feel the cool, fresh breeze on my face. I liked to hear the birds waking up at the nearby Pulicat Lake and start their chirping and crying and flapping of wings. For them it was going to be a day of looking for food, finding the best grub and caring for their young. For me too, it was going to be a day of endless work. I could not wait to get started.

I began my day with a morning walk. The early morning with its unbroken promise for the day, its stillness not yet disturbed by voices gave me the time and space to gather my thoughts. As I walked, I remembered the long ago days of walking with my father, of coming home to my mother, of Jalaluddin holding my hand and pointing out the stars in the sky. All these people had gone in the last few years. Jalaluddin died suddenly, while still young, leaving my sister Zohra a widow. With him gone, I felt as if I had finally shut the chapter of my childhood days. Soon after that my father too passed away. He was over a hundred years old, but still fit. I visited my old town and said my final goodbye to the man who taught me to pray, to have faith in something larger than myself and the one who showed me that the person who is rich in spirit can never be poor. His death left my mother lonely and sad. The one whose side she had not left for over seventy years was gone. She too followed him soon after. With each passing I remembered what they had taught me, what I had loved about each person and knew that no one really ever dies. If you have been good and loving, you live on in the hearts of those who held you dear.

This hour or two in the morning was really the only time I had to reflect and look back. The rest of my day was taken over in making sure that we built the SLV-3 perfectly and on time. Since I had been made the project director for SLV-3, that was my one and only goal despite all the personal losses. My team was a close knit and united one. Every day I decided the goals and all of us worked towards achieving that. I learnt that patience and calmness can help you deal with all kinds of obstacles. To get the work done without becoming angry and frustrated but by setting achievable targets and ticking them off one by one was what we needed to do. It was as if there were not enough hours in the day for us to work. And even if there had been, who had the time to look at the watch! People worked tirelessly day and night till we were ready with the fourth and final stage of our rocket.

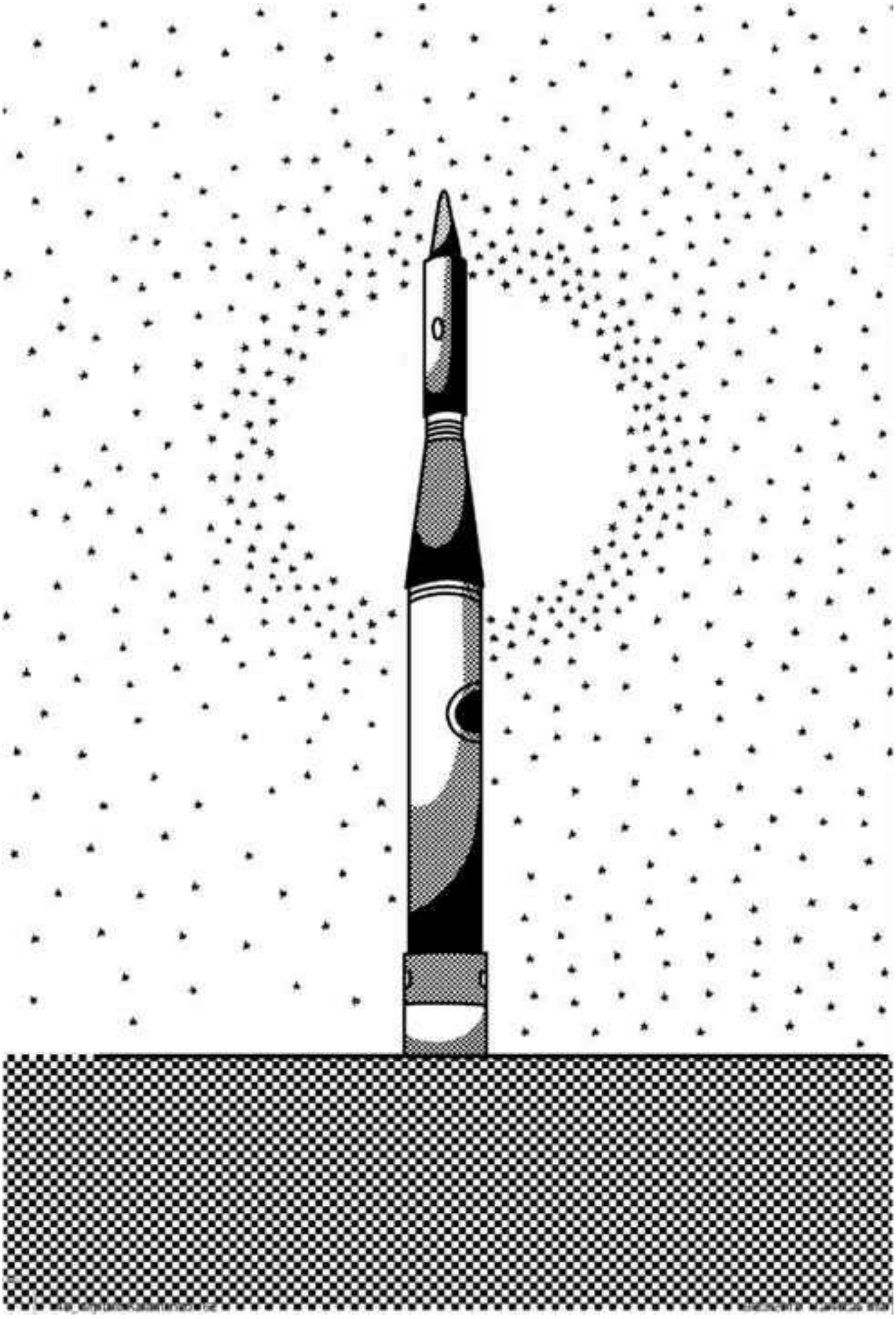
During this exciting phase I had the privilege of meeting Wernher von Braun. Braun

was the world's leading expert in rocket science. He came to India and having heard about our work wanted to see for himself what we were trying to do. I had the good fortune of escorting him from Chennai airport to V.S.S.C. at Thumba. There, he told me, 'Do not make rocketry your profession, your livelihood—make it your religion, your mission.' He appreciated that we had taken the long and hard route of developing our own capabilities in this area and told us that this is what we would pride ourselves on one day.

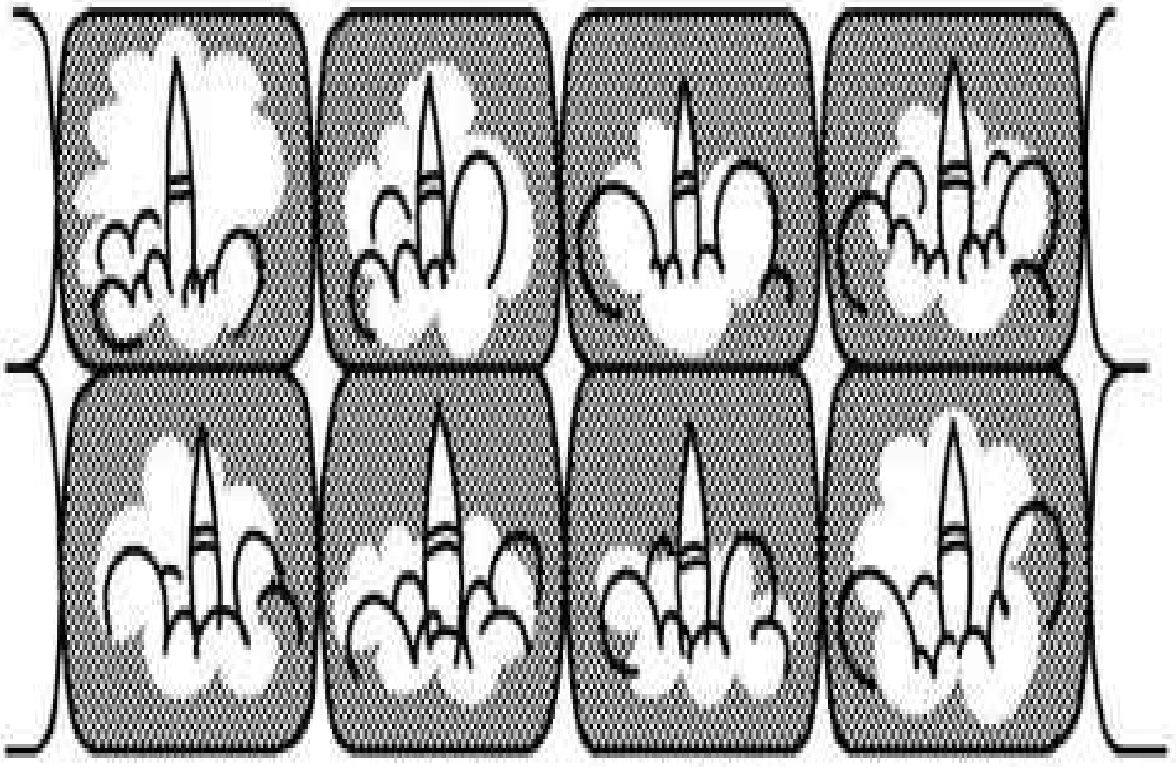
With such encouragement coming our way, we went about our work on the SLV-3 till the day came for us to launch it—10 August 1979. The launch was going to take place at Sriharikota where a new rocket launching facility had been constructed. Dr Sarabhai had decided that we needed a facility from where we could send rockets of various sizes and configurations into space and the Andhra Pradesh government gave the land. What was once a jungle had been converted into a launch facility.

Sriharikota is near the town of Sullurpeta in Andhra Pradesh. Nearby is the beautiful Pulicat Lake where pelicans migrate every year and is rich with all kinds of bird life. I always liked how we remained so close to nature both at Thumba and at Sriharikota. For scientists and engineers building large complex machines it is very important to remember the beauty and power of nature.

The Sriharikota rocket launch facility had started functioning from 1971 when sounding rockets were launched from here. Eight years later, we were ready to launch the product of years of hard work from here—the SLV-3. The vehicle had been brought in parts by road under heavy security and had been finally integrated here. The night before its launch it stood ready on the launch pad, its metal body glistening in the moonlight. I too had come to Sriharikota a few days earlier to oversee the final preparations. I looked up at the huge structure dominating everything around it. I was confident that it would all work out well. But I also knew that the odds were great. In 1970, Japan had suffered four successive failures before they put their first satellite into orbit.



There was a great sense of urgency and expectancy in the air. Many visitors had arrived to witness the launch. Soon the morning of 10 August dawned. I had hardly slept the night before and reached the mission control centre very early. The visitors were seated in the visitors' gallery from where they could see the rocket taking off. My team and I were in the mission control centre where we went through all the last minute checks of the systems. The rows of computers in the mission room were flashing various data and all other health parameters of the rocket. We were monitoring them closely. Everything looked to be in order and was a go. Ten minutes before the launch the computer took over. Now we could only be spectators. The countdown had started twenty seconds before lift off. We waited with bated breath. The clock ticked down each number. Then, when only eight seconds were remaining, the computer flashed a warning. It had detected a problem and had halted the launch.



We put our heads together and analyzed what the problem was. The team felt the problem was a minor one and that we should go ahead with the launch. I agreed with them and gave the go ahead to proceed with the launch. The countdown started once more. The rocket took off with an earsplitting roar. We watched in awe as it rose higher and higher in the sky. We applauded but were still waiting to hear from the systems that all was okay before we announced the launch a success. And then disaster struck. When we activated the second stage the rocket became unstable and started to tumble. Within minutes, it fell into the Bay of Bengal.

I could not believe that so many years worth of work had gone to waste. A flaw in the second stage control system had washed away all our efforts. Everyone who had gathered to watch the launch was as stunned as us and I knew that next day the newspapers would be full of our failure. I felt a numbing sense of dejection wash over me. The men who had worked night and day along with me were also similarly downcast.

After we were able to leave the launch site, I went away to my quarters and fell into a deep sleep. Some time later, I felt a hand shaking me awake and someone calling my name. It was Professor Satish Dhawan. He had come looking for me knowing how I would be feeling. He made me get up and took me to the cafeteria to eat. Like a friend he watched over me and did not even bring up the failure of the mission into the conversation. After that, we had to face the people from the press. There, Professor Dhawan stood by me and answered the questions put by the media. He said such failures happen with rocket launches and have happened in other countries too. It was a temporary setback and that we would soon be back with a flawless launch. Dr Brahm Prakash too stood steadfastly by my side and we soon started getting words of encouragement from many others.

There was no time to sit and brood over the failure. We had to accept that something had gone wrong as things might when complex machinery is assembled, and we needed to analyze the failure and see that we didn't repeat it. Work started once again on the second flight of SLV-3. The launch date was fixed for 18 July 1980.

This time, there weren't as many people as the first time. The scientists too were on edge and hoping that everything went off without a hitch. At 8.03 a.m. the rocket took off with the satellite Rohini. We watched the glowing end go higher and higher up into the sky. Then the systems started reporting— the first stage had performed perfectly… the second stage too…the third stage was activated and all was going well…the fourth and final stage took over and gave the rocket just the correct thrust to put satellite Rohini into orbit. We rejoiced as each stage passed successfully. Finally I was able to announce— the mission was a success!

The few hours after that are a blur in my memory of thumping each other's backs, shaking hands and hugging each other in joy. In no time the news spread everywhere that our first satellite launch was a success. We had overcome all kinds of difficulties and setbacks and become one of the few countries in the world at the time to have put a satellite into space on our own efforts. This time, Professor Satish Dhawan said I should address the press conference.

There are two lessons that have remained with me from this episode. The first is about having the resilience and courage to get up after a setback and carry on with the task. And the second is about the role of a leader in managing failure. A leader should give the credit of the success to the team members. But when failure comes, leaders should absorb the failures and protect the team members. I learnt this important lesson in failure management not from any text books but by observing Professor Dhawan's leadership style.

Messages of congratulations poured in from India and abroad. The Members of Parliament praised us and so did almost every newspaper in the country. At each moment I gave thanks to all my mentors from Vikram Sarabhai to Satish Dhawan to Brahm Prakash who had guided me and kept their faith in me. Then one day I got a call from Professor Dhawan. I was to proceed to Delhi immediately. Why? Because Prime Minister Indira Gandhi wanted to meet and congratulate me personally. I didn't know whether to feel excited or a bit nervous. I was dressed in an ordinary shirt and on my feet were an old pair of sandals! When I said so to Professor Dhawan, what he replied has stayed with me always: 'You are beautifully clothed in your success.' Even today I remember those words and I don't own more than three sets of suits and five or six shirts.

My meeting with Indira Gandhi went well and soon I was back at the Indian Space Research Organisation working on the plans for the future. The satellite programme now needed to go to the next level and other types of vehicles were being planned like the Augmented Satellite Launch Vehicle (ASLV), the Polar Satellite Launch Vehicle (PSLV) and the Geo-Synchronous Satellite Launch Vehicle (GSLV). I was appointed the director of Aerospace Dynamics and Design group.

I was happy with all these new plans and strides that we were taking in the field when a sudden new turn occurred in my life. In 1981, I was invited to Dehra Dun to speak at the Defence Electronics Applications Laboratories on SLV-3. There, I met Dr Raja Ramanna, the eminent nuclear scientist and scientific adviser to the minister of defence. Over a cup of tea, he made an exciting new proposal. Would I want to head the country's Guided Missile Development Programme at the Defence Research and Development Laboratory (D.R.D.L.) in Hyderabad.

I thought long and hard on what to reply. I could stay at I.S.R.O. and develop rockets, or I could go to D.R.D.L. and develop military rockets or missiles. I decided that the time had come, after spending eighteen years at I.S.R.O., to take up a new challenge and to serve my country in a different field—defence. I decided to move to Hyderabad.

My years at I.S.R.O. and in the developing of SLV-3 taught me so many things—that problems will come with any endeavour. Your assignment could be to build a rocket or to do a school project, but the trick is to tell yourself that you are the captain of your problems and never let the problems become the captain; defeat the problem and succeed. Once you tell yourself: ‘I can solve this and I will do it well’, there is nothing that can stop you from doing so.

Chapter Seven

Why does man produce weapons? That is a question many thinkers and leaders have asked themselves over the centuries. Yet we keep going to war against each other, and the world keeps producing more and more sophisticated weapons. In this scenario, can our country afford to not have the latest technology to protect ourselves? For centuries, others were able to rule over us and dominate us because we refused to innovate with the times and adopt new means of protection. Did you know that at one time, we were the ones to have developed the technology to use rockets in war? Yet we didn't develop this knowledge further and it was the British who adopted the first rockets used as weapons in India and deployed them to win wars.

Weapons cannot buy peace, but they can help us to not repeat history.

These were some of the thoughts that ran through my mind as I prepared for my new assignment at D.R.D.L. in Hyderabad. The mission here was to develop India's indigenous missile programme. Along with us scientists, experts from various fields in engineering and defence as well as members of the Armed Forces would help us develop five indigenous missile systems. These were Prithvi Surface-to-Surface missile, Trishul Short Range Surface-to-Air missile, Nag Anti-Tank missile, Akash Surface-to-Air missile and Agni an Intermediate Range Two-stage Ballistic missile.

The project was flagged off on 27 July 1983. I had however moved to Hyderabad a year earlier and had started interacting with the scientists already working at DRDL. I had been astonished to find that they were quite demotivated. The missile programme had been awaiting the green signal and now that we had finally got it, we needed to start work round the clock to make it a success. I soon got to know most of the key people who would be working on it and we started developing our plans and goals. I spoke to everyone as often as I could, talking to them about the mission, encouraging them to take ownership and working out the most effective ways in which to go about fulfilling our responsibility. Soon the various teams came together well and we started working in a well planned manner. I had only one formula for my team to follow—goal-setting, positive thinking, visualizing and believing.

The government had set up a high technology research centre in Hyderabad's Imarat area and we called the facility Research Centre Imarat. At the same time we also needed a place to conduct missile flight trials. For this, space was found at Chandipur in the Balasore district of Odisha. Somewhat coincidentally, like the Satish Dhawan Space Centre in Sriharikota, which was near the Pulicat Lake with its rich bird life, Chandipur,

too, was near a bird sanctuary. The facility was designed in such a way that the sanctuary was not disturbed. For our nation to take flight into space or in becoming self reliant in missile technology, we needed to fly with the birds, not displace them and take over their habitat!

All our efforts and planning started to bear fruit and the Trishul missile was successfully launched. Then Prithvi was launched in 1988 and the world had to sit up and take note of the strides we were making in this technology. That meant there were more obstacles for us as some countries in the West thought it was dangerous that we were developing our own weapon systems. However, we had our sights trained on the next achievement—launching Agni. It was scheduled for 20 April 1989.

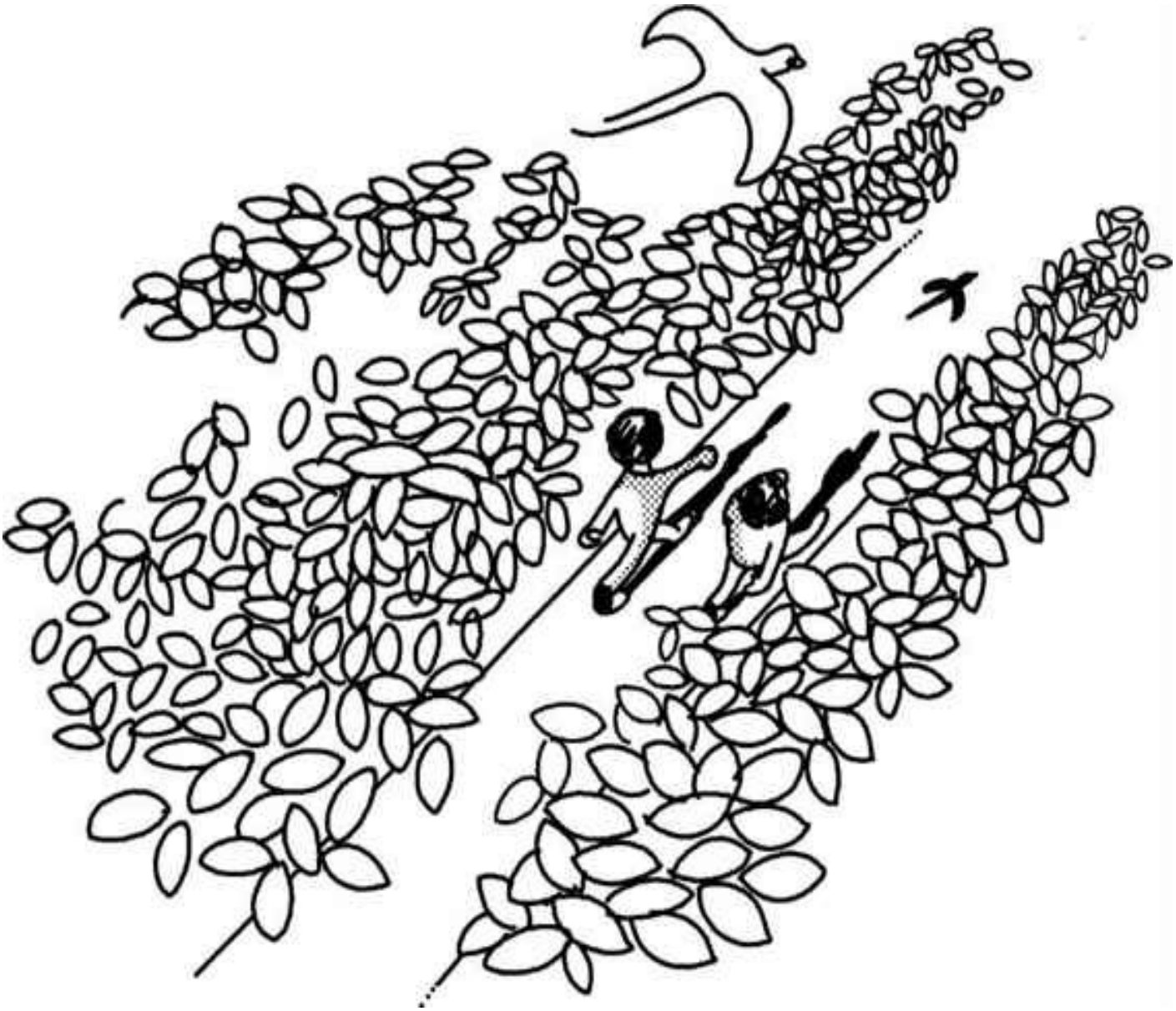
A missile launch is somewhat different from a satellite rocket launch and many more precautions need to be taken for the people living in the nearby areas. Our missile was ready and so were all the systems. By the time that day in April dawned, we felt we had travelled a hundred miles from where we had started just seven years earlier to come to this point. For a missile launch the countdown starts thirty-six hours earlier and we watched the clock ticking down with anxiety and growing excitement. However, with

fourteen seconds to go, the computer signaled that we should 'hold' as there was a problem. Soon there were more 'hold' signals and we had to abort the launch. It was greatly disappointing but by now I was more experienced in handling setbacks. I rallied our team together and we got back to work to launch the second time ten days later. However, that too did not happen because of some technical glitches.

I could see the morale of my team flagging and I had to work to pick them up before they started thinking of giving up. Like I had once been encouraged and supported by my mentors Professor Satish Dhawan and Dr Brahm Prakash, I now did the same to the team of scientists working on Agni. I knew what they were feeling and how to make them focus back on the job at hand.

We finally decided on a new date for launching Agni. It would be on 22 May 1989. In the meanwhile, we had faced a lot of criticism from the newspapers with cartoons making fun of our delays appearing in them. We remained focused only on our one aim—to create a successful Agni missile. Now that we were ready once again, I was sure we would be successful.

On the night before the launch, I was walking with the defence minister, K.C. Pant. He asked me, 'What would you like me to do to celebrate the success of Agni tomorrow?' I was happy to hear that he was so confident that we would succeed. I looked around at the lush greenery around me, and thought of the rocky barren area in Imarat where we had done a lot of the work on the missile projects. I wanted to bring this beauty and tranquility from nature into that facility too. I knew my answer immediately: 'We need 100,000 saplings at Research Centre Imarat.'



The next morning was the crucial day of the launch. The countdown had already started and we were once more waiting anxiously for the take-off time. At 7.10 a.m., Agni took off flawlessly from Chandipur. We watched it rise higher in the sky and scanned our systems to check that everything was in order. All systems worked perfectly. The flight lasted 600 seconds, just as we had planned. We had launched a missile that had a range of 1,500 to 3,000 kilometres and had the capability to launch a nuclear strike. Agni also had re-entry technology, which means that the warhead of this weapon, that strikes the target, can withstand very high temperatures while hitting the enemy target.

The messages congratulating us and the awards and accolades flowed in. I was honoured to be chosen to receive the Padma Vibhushan in 1990. The launches of the other missiles, Akash and Nag were also conducted successfully. With each missile that went thundering into the sky we gained in knowledge and power. We were no longer a nation that needed others to protect us.

Agni, for me, was a project very close to my heart. I had chosen the name for I felt it symbolized all the fire that we as a nation had lying latent within all of us. It was Agni not because it was destructive, but because it gave us strength and confidence and in developing it indigenously we made great strides in our own technological capabilities. The wings I had once dreamt of flying on were now a reality. They were wings that made dreams into reality, hard work into success, they were the wings of fire that can destroy ignorance and backwardness and fly us towards becoming a strong, developed nation.

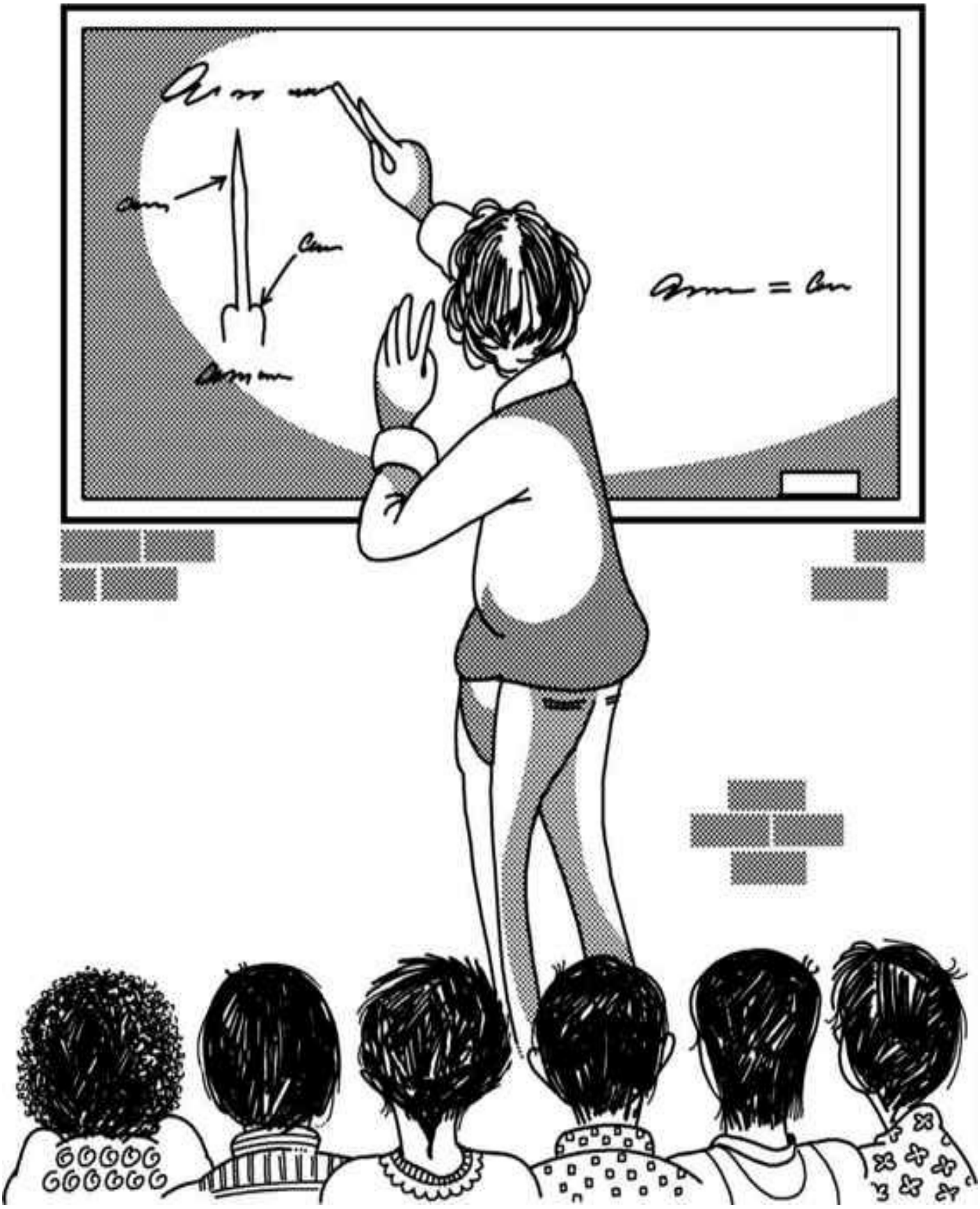
Chapter Eight

Once Agni took wings, my work too became more and more interesting. After some years I became the scientific adviser to the defence minister which meant that I had to have more discussions with people in the government about matters of science and technology in defence. It was a different world from the one of research and projects and timelines I had gotten used to at ISRO and DRDL, but I was always happy to learn new skills and take on new responsibilities. I also wrote my autobiography *Wings of Fire* at this time. It gave me a chance to relive the days of my childhood and youth and talk about the many influences and the people who have helped shape my life.

With the success of SLV-3 and Agni and the various other space-related and defence-related projects I had seen from up close, my biggest interest now was exploring how technology can help India become a developed nation by the year 2020. I came to understand that science and its benefits have to move out from laboratories, research facilities and become a part of government policies so that when they are implemented they help the common people of the country. From communication to farming to defence to new areas of employment, we needed to bring the benefits of the latest innovations to the people.

I also rediscovered at this time the deep love I still had for the profession of teaching. After Agni was launched, I was invited by many institutions, including schools and colleges to talk to the students. Each time I met a group of young people, I was filled with a new energy. I talked to them about how missiles and satellites are built, I told them to learn new things and to make all their dreams into reality. I wanted to open new windows of thought for them. In return, I was given so much love and respect that I was overwhelmed.

In 1997, the government honoured me with the Bharat Ratna, the highest civilian honour of the country. Prizes and awards are good to receive, but they cannot be the measure of one's success as a human being. Yet when I received the Bharat Ratna, I felt as though it was an acknowledgement of the dreams of every child of this country. Speaking at a press meet after the award ceremony, I spoke about how I remembered my parents and teachers who first shaped my dreams.



The work on the nuclear weapon programme started and picked up momentum. One day, in 1998, Vajpayeeji called a meeting where I was present in my role as scientific adviser and so was R. Chidambaram, chairperson of the Atomic Energy Commission. He asked how long it would take for us to conduct nuclear tests. My reply was 'T-30 days.' This means we needed 30 days from the date of takeoff once it was planned. A

decision was taken to begin the top secret Operation Shakti. The tests would be carried out at Pokhran in Rajasthan and would be jointly carried out by the Department of Atomic Energy (D.A.E.) and the Defence Research and Development Organisation (D.R.D.O.). The nuclear devices that were to be tested were being developed at the Bhabha Atomic Research Centre in Mumbai.

It was a massive undertaking that had to remain completely secret. We had to visit Pokhran often but that too had to be done with great care so that no unusual movements were tracked by foreign satellites. I, too, spent time at Pokhran overseeing the final preparations. Pokhran is 106 km from Jaisalmer in the extremely dry and arid desert region of Rajasthan. For miles one can see only sand and dunes with a few occasional scrubs. Desert snakes and scorpions are not uncommon here. Sandstorms can pick up at any time, especially in the searingly hot month of May, when we had planned the tests. To keep our work invisible, we worked in structures that were covered with sand and scrub so that from the air they looked like they were a part of the landscape.

The Army had dug deep pits in the ground where the nuclear devices were kept. Placed so deep, the radioactive fallout from them would be limited and contained within the pit. We were all given Army uniforms to work in while we were there and I was referred to as Colonel Prithviraj. This was because of my role in the development of the missile Prithvi and also a reference to the great Rajput warrior king Prithviraj Chauhan.

The date of the test was 11 May 1998. By now I had witnessed so many launches and takeoffs but the same feeling of apprehension and excitement flooded within me before each. I had also seen so many facets of the physical beauty of India when we planned these operations. Thumba with the sea lapping at the beach, Sriharikota with the beautiful Pulicat Lake not far away, Chandipur with its lush greenery and bird sanctuary. And now we were here, on the desert sands of Rajasthan, looking anxiously at the sky

and monitoring the wind situation. It was a windy day and if wind speeds picked up any further we would have a problem. We waited in the control room for the wind speed to drop. At 3 p.m., the wind had finally slowed down enough for me to inform the Prime Minister's Office that we were making the final preparations and that the devices would be tested in the next sixty minutes.

The final okay to go ahead had to come from me. I was completely focused on doing the job flawlessly. I gave the signal to proceed. Two officials from D.A.E. and D.R.D.O. turned on the keys that gave the signal to the pits where the devices were kept. The time was 3.45 p.m. and as we scanned the monitors closely we got the confirmation—the nuclear devices had detonated as planned. The tests were a success. The blasts had occurred 150 to 200 m below the surface of the earth and had released energy of 53 kilo tonnes of TNT. As we got confirmation of all having gone to plan, R. Chidambaram and I shook hands. We sent the news out to the prime minister and from there the news travelled swiftly all over the country and the world. The effect it had on the outside world was nothing short of a nuclear blast in itself. That we had managed to do all this secretly and successfully was unbelievable for many countries, specially in the West. The US spy satellites had mistaken our preparations for the tests as the setting up of another military outpost in the Jaisalmer area that is near the Pakistan border.

In India, our success was greeted with much enthusiasm. We were congratulated by the prime minister and many more messages poured in. It was not all unadulterated praise for us, though. Some pointed out that as a country with the concept of ahimsa or non-violence playing such an important role in our history, were we not abandoning that principle by becoming a nuclear-capable state? Many journalists asked me this, particularly in a press conference in New Delhi. I said that these tests had signaled to the world that we are a strong country. As a nation we would use them only for our security and as a deterrent for anyone who might attack us.

This is a question that I have been asked by many children too in the subsequent years. I understand children's confusion when they are told about our glorious freedom struggle led by Gandhiji and his doctrine of non-violence, and then they read that now we are a country that manufactures the deadliest weapon known to man. I tell them each time that we as a country have never invaded anyone in our history. Yet, we have also suffered a lot because we did not adopt the latest technological capabilities in our defence systems. We have been ruled over by outsiders for centuries because of this. So while we remain a country that is peaceful and will not be the first to use the weapons, we also need the security of knowing that we have the means to defend ourselves.

After the Pokhran tests were concluded, I was made the principal scientific adviser to the government of India in the rank of Union cabinet minister. At the time, I was also the chairman of Technology Information Forecasting and Assessment Council

(T.I.F.A.C.) under the Department of Science and Technology. At T.I.F.A.C. we were looking at advances in technologies all over the world and tracking how India could adopt them. We worked with experts from various fields as well as the government, industries and financial institutions. Our work was carried out over eight years and we created the vision document *Technology Vision 2020*. Its aim was to transform India into a developed nation by the year 2020 by working on various parameters.

At this time I also started touring the country widely to talk to students and people from various walks of life. I enjoyed this so much that once my work as principal scientific adviser was over, I went to Chennai and started teaching at the Anna University there. The lecture hall when I gave the lectures would be overflowing and I enjoyed every minute of talking and interacting with students.

In this way I settled into a different pattern of life. It was one of ideas and sharing those ideas and meeting and interacting with many people. Starting then and till date I have met more than a million young people and they are in my thoughts always, as I write my books or as I work on my vision for a developed India. I hope this mutual love and respect and affinity lasts forever.

Chapter Nine

I was at the Anna University campus, going about my day that had been just like any other till now. I had given a lecture on 'Vision to Mission'. It had gone well. Almost 350 students had come to listen, though the class was for about sixty students. The questions and answers had also gone on for a long time and my one hour slot got extended to two hours. After the lecture, I came back to my office and ate lunch with some of my students while we discussed their research projects. In the evening, I went for a walk after preparing for my class for the next day. That was my routine at Anna University. When I returned to my office, I was told that there had been numerous phone calls for me. At that moment the phone started ringing again. I picked it up and the voice on the other end asked me to hold as the prime minister wanted to talk to me.

I wondered why the PM was calling me. Was it something to do with the Vision 2020 document? Or another scientific mission? However, what Prime Minister Atal Bihari Vajpayee said to me next was something I had not anticipated at all. He said, 'We have decided unanimously that the nation needs you as its Rashtrapati. Will you agree to this?' He was asking if I wanted to become the president of the country. At once I started thinking of the various options that lay before me in the future. One was of continuing as a teacher, something that I loved doing. Having students and teachers around me was indeed enjoyable. At the same time, I thought of addressing Parliament and presenting my vision for the nation to them. As the president I could make my voice heard much more effectively on matters that I wanted to talk about particularly the Developed India vision. I needed to think about this some more. I asked Vajpayeeji for two hours to think this over and to give him my final decision.

In the next two hours I spoke to many friends from different areas of work. Some suggested that I continue in the academic life that I was in then and stay away from politics. Others said that this was the best way to make the nation know about the vision for India 2020. Finally, after listening to over thirty people, I made up my mind.

I called the prime minister back. 'Vajpayeeji, I consider this to be a very important mission and I would like to be an all-party candidate.' If all the parties agreed on my candidature for the position of president, I was ready to accept this proposal.

In the end, all the parties except the Left Front agreed. The election for the president was conducted on 15 July 2002. Before the election, I sent out a letter to all the Members of Parliament (MPs) and Members of Legislative Assemblies (MLAs) who would be voting. In the letter I put down my vision for a developed India.

The letter said: ‘It speaks for the power and vitality of India’s democracy that a poor boy from a small island in Tamil Nadu can travel far in the service of the motherland and now be considered for the responsibilities of Rashtrapati Bhavan.’ It then went on to outline my vision and mission.

The days leading up to the election were filled with meetings with journalists and schoolchildren and lots of other people. On 15 July, election day, I was quite relaxed. After the voting process got over, the counting began. This took about three days. On 18 July I was declared elected as the president.

If it all seemed a bit unbelievable to me, it was just as amazing and joyous for my family and friends back home at Rameswaram. There were many celebrations, I am told, over there. The temple and the mosque felicitated the news with special prayers. People came from many places to greet my brother who was eighty-seven years old then. I felt blessed to have received so much love and good wishes.

The date for the swearing-in was fixed for 25 July 2002. I had drawn up a guest list that consisted of thirty-seven people from Rameswaram, including my family headed by my brother A.P.J.M. Maraikayar. Also from Rameswaram I had invited Pakshi

Venkatasubramaniam Sastrigal, chief priest of the Rameswaram Temple, Imam Nurul Khuda of the Rameswaram Mosque, Rev. A.G. Leonard, from St. Joseph's College Trichy. I also invited my teachers Professor Chinnadurai and Professor K.V. Pandalai. Other than all the other friends, one hundred children from all the states of the country were invited too. I felt it was important that children are engaged in the democratic process from a young age. This way they learn to respect and value democracy and our Constitution.

At this time, I was staying at the Asiad Village in New Delhi. On 25 July, I woke up as usual and got ready for the day. I had my breakfast and then wore my new bandhgala suit. It was in my favourite navy blue colour, and it so happened that this was the first time I was wearing a bandhgala! I mostly preferred to wear trousers and shirts but then today was a special day. I set off for Rashtrapati Bhavan where, along with the outgoing president, K.R. Narayanan, I proceeded to Parliament House. The swearing-in was going to take place in the Central Hall of Parliament. I was greeted by the vice president, prime minister and the speaker of the Lok Sabha. At the Central Hall there were so many eminent persons including the cabinet of ministers, the chiefs of Army, Navy, Air Force, opposition leaders, governors, chief ministers, Members of Parliament, Members of Legislative Assemblies and my colleagues from the science fraternity along with industrialists and artistes.

The ceremony started exactly on time at 10 a.m. The home secretary read out the communication from the Election Commission that I had been elected and then I was administered the oath of office. I read out the words loud and clear. I was seventy years old, and now the eleventh president of India.

After the oath, in my speech I said that we needed a collective vision to tackle the challenges of the country. It was time to ignite the minds of the people to make India a developed nation. We cannot emerge as a developed nation if we do not learn to transact with speed. I also quoted a favourite *doha* by Kabir: What you want to do tomorrow, do it today, and what you want to do today, do it now.

Thus began a memorable and eventful period of my life. If I am asked now as to what being the president meant to me, I say that I became the president as I wanted to talk about a certain vision for the country. It was a plan to see India as a developed nation by 2020, it was about Providing Urban Amenities in Rural Areas (PURA) and it was about being a certain kind of citizen of this country—engaged, aware, compassionate and forward looking. This is what I wanted to say, and I said so too, at the various forums I was invited to—the Parliament, fifteen legislative assemblies, governors' conferences, the European Union Parliament, at my numerous meetings with people from all over the world.

I was clear in my mind from the very beginning that I wanted to be an 'Interactive President'. To me, this office meant an unprecedented opportunity to make contact with citizens across the length and breadth of India. It also meant that the Rashtrapati Bhawan should not be just a grand structure, but also a place where children, artists, thinkers and anyone else who had something important to say could visit and have access to me.

One of the first things we did at the Rashtrapati Bhavan was to initiate e-governance. We worked out a system where all the letters and documents that arrived at the president's Secretariat got digitized and bar coded. The paper files would be archived, and only the electronic file moved between various officers and if required, to me. This drastically reduced the time required to deal with all the correspondence and paperwork that came our way every day.

I organized a series of breakfast meetings with MPs from all the states and union territories. These meetings were not social calls but ones where we discussed our ideas for the development of a particular state and examined the unique problems and issues that it faced. I found that at every meeting, the MPs came fully prepared and were bursting with ideas to implement. I gave them my inputs, and we worked out concrete ways to improve the states' waterways, employment, public health system, connectivity and the education system.

Our Armed Forces are remarkable for their loyalty, courage and dedication. I felt, that as president, I should reach out to them and get to know the environment in which they did their work as closely as possible. For this, I visited a number of units of the forces. I went to the Kumar post on the Siachen glacier, the world's highest battleground. Our troops work here in conditions that are unimaginably inhospitable. Located at an altitude of 7,000 metres, when I landed at Kumar post, it was snowing and the temperature was minus 35 degrees. I was greeted by three soldiers on reaching the station—Naik from Karnataka, Williams from West Bengal and Salim from Uttar Pradesh. I still remember their names because I was astonished at how strong and fit they were. Their motivation and courage were due to the great leadership they received from their seniors. The time I spent there with them, seeing their patriotism, was incredibly inspiring for me.

While I was president, I finally fulfilled my long cherished dream to fly an airplane. It was a Sukhoi-30 MKI. Before flying, I received the appropriate training and instructions from Wing Commander Ajay Rathore. He taught me how to pilot it and also how to handle the weapons control system. On 8 July 2006, I climbed into the craft, strapped myself in and then we roared off. We reached a height of 7,500 metres at a speed of over 1,200 km per hour. I performed a few turns and maneuvers on Wing Commander Rathore's instructions. I experienced gravitational forces of up to 3Gs, though I was well protected by my G-suit. During my flight I was happy to see features developed by Indian scientists integrated into the aircraft. For thirty-six minutes I flew like a bird in this wonderful powerful machine. It was finally a culmination of the dreams first sown by Sivasubramania Iyer when I was a boy of ten and came to know about airplanes and how they worked.

My five years as president were fulfilling and humbling in equal measure. I met

people from almost every walk of life and age and gender and they told me the many ways in which the country can become a better place. I interacted with world leaders and politicians in India and understood their ways of thinking and solving problems. I invited artists and writers to the Rashtrapati Bhavan and saw the country from their viewpoint. Scientists, farmers, religious leaders, non-resident Indians, members of the judiciary and so many more people came forward to contribute to the vision of India 2020 that I presented before them.

Finally, on 24 July 2007, my five-year term as president got over. My day was packed with interviews and meetings and saying my farewells to the various callers. All my belongings were packed into two suitcases and ready to be taken away. In a life of so many farewells and new beginnings, this was yet another chapter that was about to close. It had been a remarkable chapter, no doubt. Who knew that the boy once running around the town of Rameswaram in faraway Tamil Nadu delivering newspapers would one day be bidding goodbye to the majestic Rashtrapati Bhavan.

Many people asked me what I was going to do next. Would I retire and lead a quiet life, away from the hectic activity of the last few years? I was seventy-five years old, after all. But in my heart I knew that was not going to happen. If anything, I was even more inspired to continue my work of planning a developed India. The unique experiences of these years had given me so many new viewpoints to learn from and absorb. I was certain that whatever I did in the next few years would involve teaching and talking to the youth and presenting this beautiful vision of hope and development to make it come true to many many more people.

In my last Republic Day address to the nation in January 2007, I put down many of these thoughts.

> Developed India by 2020 is a mission of a billion people. Every one of us has a role to play. It will be a reality if everyone 'Gives what one can give', through individual, societal and nationwide participation in a national movement facilitated by the Government. My interactions with our citizens in India and abroad, particularly the youth, demonstrate to me the positive energy flowing from individuals which make them eager to give all they can to make India developed. The attitude of giving by every citizen and each group will definitely be an enriching factor for the whole nation leading to an accelerated development process.
>
> When the nation marches towards its missions, many challenges will come on the way. Courage is a very important trait for all sections of society in overcoming these challenges. I would like to narrate one incident.
>
> On 8 June 2006, I was in the flight of Su-30-MKI. The captain of the aircraft was Wing Commander Ajay Rathore. The duration of the flight was forty

minutes. I participated in all flight actions. When I landed, there were many youth and media personnel. One young man asked me a question, 'Mr President, please tell me, since you have flown in the supersonic fighter aircraft at the age of seventy-four, were you afraid anytime during the flight?' I told the young man, 'All the forty minutes of the flight, I was busy on the controls and instruments and experiencing the "g" build up. I was advised by the captain to track targets and also look at the ground using the synthetic aperture radar. In addition, I was observing the performance of the instruments developed indigenously. I was continuously busy in the flight operations and I didn't have time to allow fear to enter into me.'
Now, dear young friends who have assembled in front of me and the nation, I have a message of Courage for you.

COURAGE TO GIVE

Courage to think different,

Courage to invent,

Courage to discover the impossible,

Courage to travel on an unexplored path,

Courage to share knowledge

Courage to remove pain

Courage to reach the unreached

Courage to combat problems

And succeed,

Are the unique qualities of youth.

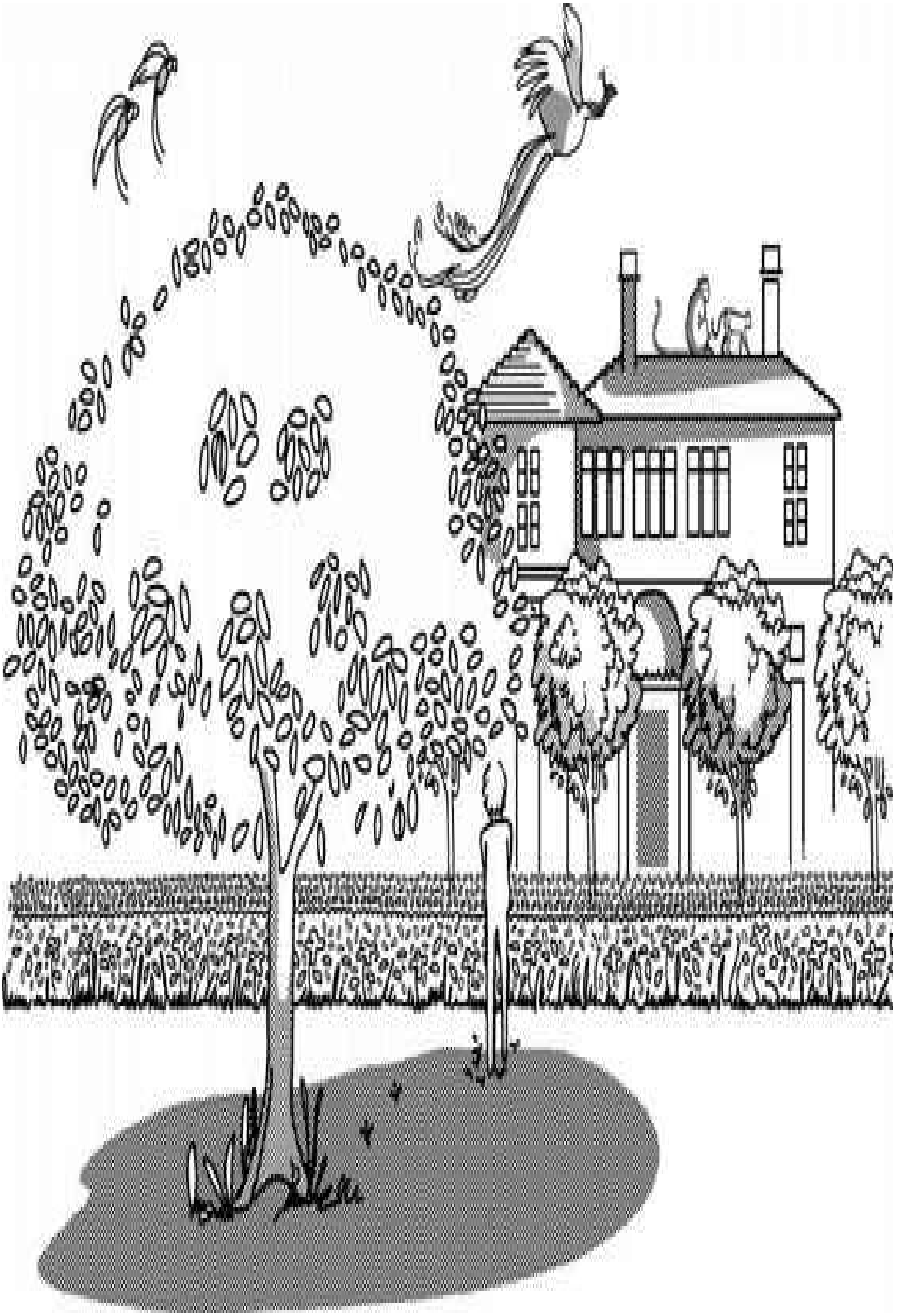
As the youth of my nation, I will work and work with courage to achieve success in all my missions.

May God bless you.

Jai Hind.

Chapter Ten

I am standing under the majestic Arjuna tree at my residence 10 Rajaji Marg in New Delhi. The government allotted me this house to stay in after I demitted the office of the president, and it is now filled with my collection of books, the comings and goings of innumerable visitors, and the sweet mild smell of jasmine and rose that grow in the garden. I hear the busy calls of the parrots and peacocks in the early mornings and late evenings as they come and go in the various nests they have built in the large trees in this garden and those all around this leafy part of the city. One morning, I was standing at a window and spotted a most unusual visitor. I looked at it carefully and recognized it to be a hornbill bird! I often see monkeys raid the garden and wrestle with each other on the lawn. On occasion I have been told that they have entered my kitchen too and made off with a tasty tidbit or two. All these rhythms of daily life ebb and flow around me as I go about my days.



My schedule now is perhaps even more packed than before and for most days in a week I travel to various parts of the country and abroad talking to children and the youth in schools and colleges, to professionals at conventions and at conferences and lecture invitations. I am invited to teach at the IITs and IIMs in different cities regularly. I have written a number of books and with each book being published I feel I have sent out a messenger of hope and knowledge into the wide world.

Yet, I continue to learn from every person I meet and also learn to love my country a bit more. I am not unaware of the various challenges that governments and common people deal with every day. But I keep my faith. I keep the faith because I know that this country is great and that its citizens are the key to its greatness. I know that our resources and capabilities, if managed intelligently, can support our ambitions and aspirations. I know that we are a courageous, innovative people and this world can only be better as we realize our potential.

The story of my life has become intertwined with the story of this country. And somewhere along the way, as I met a million children living in all kinds of conditions across this land, I too learnt from a million minds. This book was not written to only tell my story. I want every young reader to think that this book is his or her story too. And therefore, I will end this book with a few words that I feel will be useful lessons for every young person The youth are the voice of the future; they are the ones who will fly with wings of fire and turn dreams into reality.

Aim in Life

Behind every successful venture and every inspiring career you will find an unflinching aim that was set early in life. Having an aim in life gives purpose to every action and orientation to every result.

Acquire Knowledge

Having an aim in life is incomplete until you are able to acquire the right knowledge needed to accomplish that aim. It is your duty to make the best use of the resources, people and networks provided to you at your schools and colleges to acquire the optimal knowledge needed to propel you towards your goal. Knowledge will give you greatness, and will help you accomplish difficult missions in life.

Work Hard

In order to achieve great aims one needs to work relentlessly towards the goal. Constant effort with application of proper knowledge can help overcome difficulties and to scale great heights.

Managing Failure

Difficult missions will bring difficult challenges which may sometimes produce temporary setbacks. The test of a human being is in accepting the failure and going on trying until he or she succeeds. Managing failure is the essence of leadership.

Task that Leads to Bliss

Take up whatever challenge that comes your way but also find that one task that gives you bliss. Let me explain. When we launched the first indigenous satellite launch vehicle SLV-3 in 1980, it gave me a lot of happiness. When Agni reached the target at 2,000 km in 1989, it gave me a different kind of happiness. When our team successfully tested the nuclear weapon in Pokhran desert in 1998, it gave me great joy. When our team prepared the Vision 2020 document for transforming the nation into an economically developed nation, it gave me a good sense of happiness. But what gave me bliss? During my visit to one of the hospitals in Hyderabad, I found many children who were affected with polio struggling to walk with calipers that weighed over 4 kg on their legs. At the request of Professor B.N. Prasad of N.I.M.S., the Head of the Orthopedic department at that time, I asked my Agni missile friends why we can't use the composite material used for the Agni heat shield to fabricate calipers for polio affected patients. They immediately said it was possible. We worked on this project for some time and came up with a caliper for children that weighed around 400 gm instead of 4 kg. The doctors helped us fit the new lightweight caliper on the children and they soon started walking and even running around. With the lightweight device provided by the hospital they could run, ride a bicycle and do all sorts of things which they had been denied for a long time. The removal of the pain and the freedom attained by the children gave me a state of bliss, which I never experienced during any other achievement in my life.

Read Good Books

Books are our companions. Coming into contact with a good book and possessing it, is indeed an everlasting enrichment of life. Sometimes, they are born before us; they guide us during our life journey and continue to provide guidance for many generations.

Ask yourself, what I will be remembered for?

You have to evolve yourself and shape your life. Ask yourself this question 'What will I be remembered for' and write it on a page. That page may be a very important page in the book of human history. You will be remembered for creating that one page in the history of the nation—whether that page is the page of invention, the page of innovation or the page of discovery or the page of creating societal change or a page of removing poverty or the page of fighting injustice against voiceless citizens or giving good governance to the citizens.

Oath for Youth

1. *I will have a goal and work hard to achieve that goal. I realize that small aim is a crime.*
2. *I will work with integrity and succeed with integrity.*
3. *I will be a good member of my family, a good member of the society, a good member of the nation and a good member of the world.*
4. *I will always try to save or better someone's life, without any discrimination of caste, creed, language, religion or state.*
5. *I will always protect and enhance the dignity of every human life without any bias.*
6. *I will dream to become a great writer or great poet of the world.*
7. *I will always work for a clean planet Earth and clean energy.*
8. *As a youth of my nation, I will work and work with courage to achieve success in all my tasks and enjoy the success of others.*
9. *My national flag flies in my heart and I will bring glory to my nation.*