The name of Dr Sitaram Rao Valluri, who passed away on 23 January 2019, aged 94, will forever be linked with the National Aeronautical Laboratory (NAL; now National Aerospace Laboratories), Bengaluru.

Valluri had many stellar accomplishments in his distinguished career, but his 19 long years (1965–1984) as Director of NAL were so intense, passionate and momentous that everything before and after those two decades pales somewhat in comparison.

Valluri was born in Eluru in Andhra Pradesh (AP) on 25 June 1924, as the first child in a family of ten children. From his father, a doctor, he inherited a liberal attitude, the virtue of being truthful, and a short temper, which, he candidly admitted, was always a trifle embarrassing.

**Student days at BHU and IISc**

The young Valluri, who apparently ran behind a light aeroplane while in school, was sure he wanted to become an aeronautical engineer. This was not going to be easy for someone staying in the middle of nowhere in AP, but help came from an unlikely benefactor: India’s future President Sarvepalli Radhakrishnan. Then Vice-Chancellor of Banaras Hindu University (BHU), Varanasi, Radhakrishnan offered Valluri admission in BHU’s Engineering College in 1942, after reassuring himself that the young man had the requisite ability.

After obtaining his B Sc (Engineering) from BHU, Valluri spent a few valuable years (1946–1949) at the Department of Aeronautical Engineering in the Indian Institute of Science (IISc), Bengaluru where he had the opportunity to interact with stalwarts like V. M. Ghatage, and O. G. Tietjens. Then came the big moment: obtaining the Pauley Scholarship and joining the Guggenheim Aeronautical Laboratories at the California Institute of Technology (Caltech), USA in September 1949.

**Valluri at Caltech and Douglas**

Caltech, and more generally USA, impressed and overwhelmed Valluri. There were opportunities to meet the aeronautics master and high priest Theodore von Karman; be a student of the brilliant Hans Liepmann; establish a lifelong friendship with Anatol Roshko; bond with that ‘extraordinary human being’ Satish Dhawan (those days in Caltech) and suddenly realize that the person sitting next to you at the lunch table is Richard Feynman.

Valluri’s Ph D adviser at Caltech was the well-known Chinese scientist Y. C. Fung, but it was Ernest E. Sechler’s work, on design practices for aircraft structures, that excited Valluri the most. Sechler went on to become a mentor of sorts: he also probably opened doors that allowed Valluri to work as a design consultant for Douglas Aircraft Company, USA, during the late 1950s and early 1960s.

It was during this phase that Valluri established considerable reputation as an expert in aircraft fatigue and fracture. His research interests were also getting more diverse: he enjoyed designing complex experiments with high-speed cameras, making intricate measurements, pondering over the parameters that influence fatigue crack propagation, worrying about factors that could lead to catastrophic fatigue failure, etc. It was, therefore, not a surprise when Valluri won the coveted Wright Brothers Medal in 1963. He would later describe this as the ‘most satisfactory research period’ in his life.

By the end of 1962, Valluri had logged in enough years with his ‘green card’ to become eligible for the US citizenship. Before taking the final leap across the Atlantic Ocean, Valluri decided to spend some time in India to test the waters back home. Not surprisingly, he received a lot of attractive offers: IIT Kanpur and IIT Madras wanted him; NAL’s first Director, P. Nilakantan, wanted Valluri to start a new division on aircraft materials and structures, and Satish Dhawan, now back at IISc, encouraged Valluri to join him and Krishnamurty Karamcheti (they were all together at Caltech) to do something truly worthwhile and valuable for Indian aeronautics. This ‘strong compulsion to try to do something for the country that nurtured me’, eventually persuaded Valluri ‘to tear up (his) US green card’. He accepted the IIT Madras offer to be a Senior Professor.

Within months of joining IIT Madras, Valluri started getting disillusioned, and even considered the idea of returning to the US. But a series of events intervened to completely change the course of his life: NAL’s Director Nilakantan passed away suddenly on 18 April 1964; Karamchetti, who was the first choice to succeed Nilakantan, did not wish to give up his US citizenship, and Jagan P. Chawla, who was the next choice, requested terms of appointment that were considered untenable. Eventually, the committee—of which Dhawan too was a member—picked Valluri, not yet 41, to become NAL’s second Director. It was an inspired choice: Valluri suddenly found himself with an enormous empty canvas that he could paint any way he liked. It helped that his boss, CSIR’s Director-General S. Husain Zaheer, was personally fond of Valluri (Zaheer’s relation with Nilakantan had been frosty). It helped even more that the Chairman of NAL’s Executive Council was the legendary J. R. D. Tata (JRD) himself.

**Director of National Aeronautical Laboratory**

Valluri officially took charge on 23 November 1965, ignoring his father’s plea not to join on the inauspicious amavasya day. His first task as NAL Director was to make sure that Nilakantan’s big unfinished task, to build the 4 ft trisonic wind tunnel, never lost momentum or steam. It was a special moment for Indian aerospace when the roar of the tunnel’s first blowdown reverberated across the (then clean and serene) Bellandur Lake on 29 May 1967. With characteristic candour and honesty, Valluri shrugged off all accolades: ‘I only had a small role to play here. Nilakantan had set everything up beautifully’.

Valluri then moved – just as Nilakantan had earlier requested him – to create the Materials Science and Structures R&D Divisions at NAL. To head the Materials Science Division, Valluri invited his colleague from IIT Madras, Sivaraj
Ramaseshan; and virtually gave Rama-
seshan carte blanche to grow the Divi-
sion exactly as he wished. Ramaseshan
was immensely capable and charismatic
and proved to be a formidable and popu-
lar leader.

Given his research and consultancy
experience in the US, relating to struc-
tural integrity of aircraft, one guesses
that Valluri intended to play a more ac-
tive personal role in the Structures Divi-
sion. But as he became aware of the
onerous responsibilities and challenges
of leading a national R&D lab, Valluri
consciously backed away from personal
technical work; indeed, he would, for
the rest of his life, vehemently argue that
hardcore research was inimical to the re-
 sponsibilities of a top-flight R&D man-
ger and leader.

By deliberately walking away from
serious personal research – which en-
tailed some risk, given how an individu-
 al’s worth is evaluated even now in
national labs – Valluri gave himself,
instead, the opportunity to become an
outstanding R&D leader and create
processes and mindsets that significantly
improved NAL’s performance.

**Valluri as a leader**

Valluri ran NAL in ways that directors of
most other CSIR labs – still practising
the prevalent bureaucracy of the times
– could not even have imagined. Just as an
example, he started embellishing the
NAL campus with a wide variety of
trees. When JRD expressed some unhap-
piness with NAL’s buildings, Valluri de-
cided that he would design new buildings
himself. As someone who spent two dec-
dades constantly stepping in and out of
these buildings, I can confirm that they
had pleasing and comfortable architec-
ture, functionality and aesthetics. It
seems so appropriate that NAL’s biggest
auditorium, conceived by Valluri, is
today named after him.

But arguably Valluri’s biggest game-
changer in his early years as Director
was to introduce project accounting at
NAL. The classical CSIR budgeting
scheme only had account ‘heads’ for sal-
aries, capital expenses, consumables,
maintenance, travel, etc. but did not re-
port expenses project-wise. ‘I had no
cue how much money we spent on each
project, or which was the division on
which we spent the most money. This
simply wasn’t on’, Valluri would later
explain. It would take CSIR 30 more
years to implement the project monitor-
 ing process that Valluri first introduced
in 1966!

Another remarkable facet of Valluri’s
leadership was his relentless resolve to
attract the best talent to NAL; equally, he
was intolerant of what he called ‘second-
rate’ persons. ‘If you appoint a second-
rate person today, you would inevitably
attract a third-rate person tomorrow, and
the first-rate person would tend to leave’,
he often used to say. Valluri’s bench-
mark for a likely first-rate person was
having a Ph D degree, and he packed
NAL with Ph D-degree holders (he often
exulted that NAL had more scientists
with a Ph D than all of DRDO and ISRO
put together). Considering the intellec-
tual ferment visible at NAL, especially
during the 1970s and 1980s, one would
have to agree with Valluri’s appraisal.
Better still, there was absolutely no bias
of gender, region or religion in any
appointment that Valluri ever made or
 permitted. CSIR – NAL’s parent body –
considered Valluri’s evaluation model to
be so effective that it asked him to draft
the CSIR-wide selection and appraisal
criteria for all scientific and technical
positions.

As NAL’s Director, Valluri had an
electric presence. He walked briskly,
talked rapidly and bristled with energy.
He took decisions and made things hap-
pen. Often big decisions required the
concur rence of CSIR HQ, so the impa-
tient Valluri would fly to Delhi to argue
his case and quickly close the matter.
There were occasions when Valluri’s
decisions evoked dismay or discord, but
he rarely flinched: ‘I’m here to run a na-
tional lab, not win a popularity contest’,
he would declare matter-of-factly.

Valluri also realized that, to succeed as
Director, he needed to be strongly con-
nected with NAL’s natural partners: IAF,
HAL, IISc and DRDO. In particular,
Valluri always hit off very well with the
IAF top brass, with the Air Chief often
becoming a personal friend. An outstand-
ing outcome of NAL and IAF working
together was the full-scale fatigue testing
facility that NAL created in the early
1970s. This facility allowed IAF to sig-
ificantly extend the service life of its
operational aircraft such as the Gnat,
Ajeet and, later, the MiG-21s.

As Valluri grew in stature and success,
awards and distinctions started coming
his way. He was elected Fellow of the
Indian Academy of Sciences in circum-
stances that can be best described as un-
usual. While speaking at the Academy
about crack propagation in 1970, C. V.
Raman suddenly asked Valluri to define
a crack. Raman was so impressed with
his reply that he remarked that Valluri
deserved to be a Fellow. The Fellowship
came in 1971, just after Raman passed
away. Valluri would receive the Padma
Shri in 1974 and the Vasvki Award in
1978.

**Valluri’s contributions to NAL**

Making NAL the best lab in CSIR was
not just Valluri’s endeavour; it was his
crusade. He created NAL’s grand foun-
dation; but, just as important, he also
created a formidable supporting infra-
structure. Visiting NAL’s library used to
be a thing of joy; NAL’s photo and print-
ing facility was led by arguably Banga-
lore’s best photographer of the time, and
NAL’s health centre offered excellent
medical care. It was in the fairness of
things that NAL’s doctors intervened
successfully to diagnose Valluri’s me-
ningitis as he collapsed into a deathly
coma in February 1989.

How would one rate Valluri’s perfor-
mance as NAL Director? Without a
doubt, it was exceptional, but, rather cu-
riously, the Valluri years overlapped
with a period when Indian aeronautics
itself went into a bit of a coma. After
the heady adventures of the 1950s and the
1960s, there was a lull in the 1970s fol-
lowing the HF-24 crash on 10 January
1970. NAL, however, continued to pros-
per: Valluri initiated the first moves to
develop composite technologies, built
remarkable capability for failure analysis
and accident investigations, created even
more testing and modelling infrastruc-
ture, and lobbied for funds so that NAL
could build its first small plane. This
prompted Dhawan to remark that NAL
looked like ‘a beautiful bride, all decked
up, but with nowhere to go’.

So where could this beautiful bride
go? The 1980s held great promise, and
Valluri was eager and excited. Having
been Director of NAL for over a decade,
and being actively involved in every
national initiative in aeronautics, Valluri
held the vantage position. His big dream
was to help create an Aeronautics Com-
mission, serviced by a Department of
Aeronautics, along the lines of the Space and Atomic Energy Commissions. The Aeronautics Commission would integrate aircraft research, design, development, manufacture and operations under a single umbrella.

It always seemed like a bridge too far. In an informal conversation at an award’s event, Roddam Narasimha, who would succeed Valluri as NAL’s third Director, asked the then Prime Minister (PM) Indira Gandhi why her government did not support programmes in aeronautics the way it supported programmes in space and atomic energy. The PM replied that she would ‘if everyone stopped quarrelling’.

While the Aeronautics Commission never happened – and Valluri would regret this all his life – the next best thing did happen. Narasimha, who had taken time off from IISc to spend a few years at HAL in the late 1970s, argued that it was both feasible and desirable to build an Indian light combat aircraft (LCA) in large numbers. His arguments achieved a rare resonance: IAF changed its perception, and Raja Ramana, then the Scientific Adviser to the Defence Minister (SA to RM), was sufficiently enthused to ask Narasimha to lead a team of experts from IAF, HAL and DRDO to visit Germany, France, Sweden and England to obtain more insights and data. The team returned with a unanimous verdict endorsing the LCA concept. For the first time all the principal actors in Indian aeronautics appeared to be on the same page.

In response, the Government invited Valluri to head a high-level committee, which included all the big aeronautical players such as IAF, HAL and DRDO, and of course Narasimha, to make the final recommendation on the LCA concept. The earlier Narasimha committee had concluded the LCA could be done; the new Valluri committee had to decide if the LCA should be done and how. After a detailed feasibility exercise, the Valluri committee gave the formal ‘can-go-ahead’ verdict – again unanimously. It took the Defence Minister R. Venkataraman just two minutes to clear the LCA programme!

There was never any doubt who would lead the LCA programme. It had to be Valluri. A new entity, Aeronautical Development Agency (ADA), was created to fund, manage and monitor the LCA programme, and Valluri would be its Director-General (DG-ADA).

**Director-General of Aeronautical Development Agency**

Valluri assumed office as DG-ADA on 2 July 1984, after receiving a fond and emotional farewell from NAL. Valluri had transformed the contours of NAL during his 19 years.

ADA, which was to build India’s first supersonic fighter, did not even have four walls when it started its existence. Valluri operated out of an NAL office – that we used to fondly call the ‘blue room’ because of its somewhat hideous blue carpet. I have memories of some truly enjoyable conversations with Valluri in the blue room: he could be at his eloquent best when he talked of self-reliance in aeronautics or of Caltech’s ‘horor code’. I also became familiar with Valluri’s favourite expressions: ‘apparently’ was a word that he truly relished; then there was ‘high-science–high-technology’, and, above all, the most intriguing ‘Hobson’s choice with a Faustian bargain’. It was hard to kick-start ADA – it is very hard to kick-start any new establishment with public funding – but Valluri invested all the energy and passion that he could, and NAL, now under Narasimha’s tutelage, responded with commendable alacrity: The Advanced Composites Unit was off to a promising start (today’s LCA, now called Tejas, has almost 45% composite structures), the wind tunnels started preparing in right earnest for the impending avalanche of tests, and ‘fly-by-wire’ soon became a buzzword in NAL’s corridors.

However, all was not well with ADA’s (and Valluri’s) interactions with DRDO and its leadership. It would be pointless to talk, at this juncture, about events in 1985 that led to Valluri and Raj Mahindra’s exit from ADA. Valluri felt hurt and aggrieved – and even privately speculated how the story would have panned out if he had accepted the Government’s offer to become SA to RM in 1981. Mahindra, on his part, cheerfully moved on to the next aircraft design adventure involving NAL’s light transport aircraft (LTA, now SARAS).

**Retirement**

Valluri’s early retirement years were not the most comfortable; he must have felt like a batsman hoping to hit a century but being suddenly given out lbw for 62. To make things harder, his pension was meagre, and would stay meagre till his US Social Security benefits kicked off in early 1988.

However, Valluri plunged headlong into other interesting ventures: Realizing that Bengaluru’s HAL airport would soon start choking, He prepared a comprehensive plan for how and where a new airport should be (one of Valluri’s recommendations was indeed an airport beyond Yelahanka at Devanahalli; another was ‘ take over’ the runway at Yelahanka Air Force Base and move the IAF base elsewhere).

Valluri also proposed a scheme to revise Bengaluru’s house numbering. Alas, this scheme never took off and he lived all his life horrified how his house number 659 on Indiranagar’s 100 Feet Road was barely 100 ft away from house number 284.

For some years into retirement, Valluri also readily accepted invitations to speak at public functions. His talks were always scintillating: he had great stories to tell, a commendable turn of phrase, a twinkle in the eyes, and unabashed honesty. Most of all, he had a phenomenal memory, both for names and numbers. All his life Valluri championed ethical professional practices and personal honesty. His criterion to judge the integrity of every action was to ask: ‘Would Sathish (Dhawan) approve?’ Valluri would be outraged every time he saw a lapse, digression or failure, and spoke out (and wrote) loudly against the misplaced reliance in aeronautics or of Caltech’s...