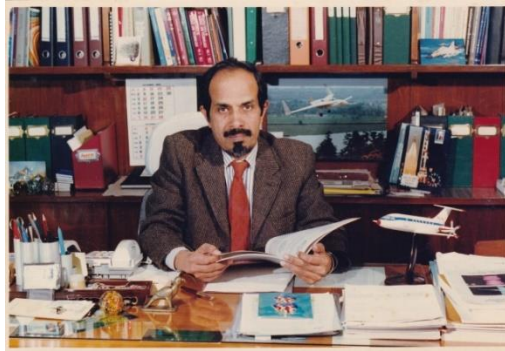


REMEMBERING PROF. RODDAM NARASIMHA



Prof. R. Narasimha, Director, NAL [1984-1993]

Prof. Roddam Narasimha passed away on 14 December 2020 in Bengaluru following a brief period of illness. In the passing away of RN (as he is usually referred to by his students), the world has lost an outstanding and gifted scientist, the nation has lost a great patriot and his students have lost one who has been at various times a teacher, research supervisor, colleague, mentor and a friend. Numerous national and international honours and awards have been bestowed on him for his outstanding research contributions and scientific leadership. He was a role model and we have been greatly influenced in multiple ways over the years of association.

Our association with RN has been a long and sweet 53 years (1967-2020), initially as graduate students in the Aero. Dept. of IISc and later as professional colleagues at the National Aerospace Laboratories (NAL). It will be almost impossible to narrate all our experiences, association and his professional contributions in this article, but we shall highlight some examples as students of RN and later as professional colleagues at NAL for nearly 9 years.

RN was a great teacher, had his own inimitable style, would come punctually and meticulously prepared for the class, would generously use the black board filling it in his beautiful hand writing. He would very often during the class draw our attention to some of the recent advances in the subject area. He taught us Fluid Mechanics, Gas Dynamics and a course in Turbulence. It was really a joy to attend his classes. To his research students, he gave a lot of freedom, he would suggest more than one research problem (often related), watch the progress for a while and then focus on what may appear interesting based on the initial results. (He would often say "I want you to look at one or two problems in parallel".) He was very open to working on a problem suggested by the student after a good and thorough discussion; in fact he would encourage his students to come out with their own research problems. We did experimental research in the supersonic wind tunnels; it took quite some effort and time to generate good data with the kind of instrumentation generally available. He was always available for technical discussions (amidst his busy schedule even those days), his guidance and insights were extraordinary. All his research students and some junior faculty would look forward to the afternoon tea with him in the high speed lab, a daily enjoyable meet that often ended in very fruitful technical discussions. We learnt tremendously on a variety of topics during these years, not just on fluid mechanics, but also on what makes a good research professional and perhaps most interestingly on how to communicate and write good research reports!!.

We always kept in constant touch with RN even after we graduated with a PhD degree. We both joined NAL as scientists and had the greatest opportunity and privilege to work with him when he became the Director of NAL. (Speculation was rife on whether RN would join NAL or not!) Our career at NAL during his leadership was most rewarding, exciting and enjoyable.

Prof Narasimha's initiatives and contributions at NAL are much too many even to mention here: some notable ones include, the civil aviation initiatives, advanced composites technology, flosolver parallel computer, enhancement of aerodynamic testing capabilities, restructuring of some of the scientific divisions at NAL for increased focus and productivity and many other LCA related technologies. He steered the Lab with a strong commitment to contribute significantly to the aerospace projects in the country being undertaken by DRDO [ADA, DRDL] and ISRO. These were the years when several important programs like the LCA, other space and missile programs were in progress in parallel. RN transformed the Laboratory to meet some of the growing technical and technological challenges posed by the various aerospace programs in the country. We were an inseparable part of the Golden Years of NAL. Here we highlight some examples of Narasimha's thoughts, initiatives and vision where we had direct knowledge and our own association.

Aerodynamic Testing [National Trisonic Aerodynamic Facilities, NTAF]

Much effort and contributions of the Aerodynamics Division during the early years of NAL were primarily in the aerodynamic testing in the 1.2m wind tunnel for the national aerospace programs and development of various test techniques. During the 1980's, with the progress in major national programs like the LCA, missile projects of DRDO and the launch vehicle projects of ISRO, there was heavy demand for testing in the 1.2 m wind tunnel with stringent time lines. RN strongly supported the proposal of operating the tunnel in two shifts as this was the fastest method of increasing its productivity. Once this was reached, RN addressed the augmentation of the instrumentation system to significantly improve both the quantity and quality of data acquired. In parallel, several new vendors for fabrication of complex, high strength steel wind tunnel models needed for testing [augmenting NAL's model shop facilities] were developed. Subsequently the first seeds were sown for the enhancement of the pumping and storage capacities of compressed air to further increase the productivity of the tunnel. These proposals were also strongly supported by the user organizations viz. DRDO, ISRO, HAL and CSIR-NAL. The demand for testing was so heavy (along with several tests requiring development of special test rigs), RN converted NTAF which was a part of the Aerodynamics Division into a full fledged Division with its own management structure. In response to demands for a larger continuous tunnel, RN argued that the way ahead was to use an innovative combination of CFD and wind tunnel testing in tunnels of modest size and further take advantage of the improvements in the data acquisition & instrumentation systems to obviate the need for a continuous tunnel. RN's vision for NTAF was to operate like a private enterprise (eg. CALSPAN, USA) in the future.

Aerodynamics Research

In parallel to providing a boost and impetus to the aerodynamic testing effort at NAL, Prof Narasimha, in his own style, encouraged and suggested formation of an Experimental Aerodynamics Division with a strong focus on aerodynamics research that will have relevance to the aerospace projects in the country utilising the NAL wind tunnel facilities [including the 1.2m trisonic tunnel]. Significant scientific contributions were made in the broad areas of Flow Structure &

Management [to include vortex dominated flows on bodies & wings, separated flows, flow control and drag reduction methodologies] and development and application of advanced flow diagnostics to complex flows. The strength and expertise gained over the years enabled NAL bag a research contract from the Boeing Commercial Airplanes [USA] on “Relaminarisation on Swept Wings” and Prof. Narasimha was very kind and excited to help and guide us through this challenging scientific project [even after retirement from NAL]. NAL’s scientific contributions were very much valued at Boeing and this was possibly the first time NAL was placed on the International Aerospace Map.

Civil Aviation Initiatives

RN had not yet moved to NAL as Director when he delivered the Vikram Sarabhai Lecture on the future of civil aviation in India where he argued that civil aviation sector is a high growth sector of the economy and that the centre of gravity of the growth was moving eastwards as the western markets saturated. He further forcefully brought home the point that, with the right policies in place, civil aviation (works and services) would be a net generator of wealth and not a consumer as was generally perceived.

After taking over as Director, NAL, he carried forward these ideas by getting a series of studies made on the state of civil aviation in India and neighbouring countries, and in particular focussing on the requirement in India of different types of aircraft and sizes to meet the burgeoning growth. The report concluded further that, apart from aircraft to cater to the long, medium and regional routes, there would also be need for (commuter) aircraft with a capacity of about 10 to 20 seats to meet the traffic from and to tier 3 and 4 cities expected as the economy opens out into the hinterland.

The Chairman and members of the Research Council of NAL recommended that, from among the different aircraft types required, a Trainer Aircraft and a Light Transport Aircraft could be taken up by NAL preferably as a joint effort with a domestic or international development partner. After considerable discussion and debate, RN decided to take up two major projects: design & development of a two seater all composite trainer aircraft and design & development of a 14 seater Light Transport Aircraft, named subsequently as Hansa and Saras respectively. With the work in civil aviation gradually picking up, RN created the Centre for Civil Aircraft Design and Development (C-CADD) at NAL to give the major civil aviation initiatives more focus and visibility.

NAL witnessed the first successful flight of the Light Canard Research Aircraft [LCRA] in February 1987 : this all composite aircraft was built at NAL from kits [Rutan Long-EZ aircraft model, USA] and provided the first experience and tremendous confidence for NAL to build and fly an aircraft (LCRA logged over 300 flying hours). This was followed by the first successful flight of the Hansa, all composite two-seater ab initio trainer aircraft during November 1993, later certified by DGCA in 1998.

Although RN had retired from NAL even before the Saras project was approved by the Government, he had laid the foundation for managing major development projects in a R&D Lab like NAL with innovative mechanisms. It is clear that the visionary in him had thought through the entire project in his mind before embarking on such a complex initiative.

RN was our teacher, guru, mentor and a true and close friend, we have known his family for long. During the IISc years, it was very common to go with him for an evening tea at the cafeteria or his

residence.. We greatly cherish all those evenings we would meet, often with other colleagues, and discuss pretty much anything from science to history to politics to economics and from engineering to humanities. While he was at NAL, we had the privilege to travel with him on certain business and conference visits - these were great moments and great experiences that we cherish so much.

With great reverence and affection, we salute Prof Roddam Narasimha , a dedicated teacher, an outstanding scientist, an innovative engineer, an able administrator, an institution builder, a quintessential gentleman and above all, an extra ordinary human being. We miss him dearly and pray Almighty to shower his family with courage and strength to face this irreplaceable loss. May his soul rest in eternal peace.

P R Viswanath & K. Yegnanarayan

13 February 2021