

New Technology Initiatives in NAL



Last year NAL decided to celebrate the CSIR Foundation Day (26 September) as "[Materials Science Day](#)". Everyone liked the idea of using this special day to highlight a significant facet of our R&D success. It was therefore no surprise when we chose to use this year's CSIR Foundation Day to again highlight the recent, and very promising, technology initiatives at NAL.

As one glanced at the morning's programme, featuring *six* speakers, one was a shade concerned. Were we in for too much of a good thing? Fortunately this apprehension proved to be unfounded: every speaker appeared to be in top form and enjoyed the opportunity to, as Dr R V Krishnan put it in his opening remarks, "share the excitement" inside his R&D lab with his colleagues.

Dr P R Viswanath, Experimental Aerodynamics Division, opened the session with a lucid introduction on the prospects of using the pressure sensitive paint (PSP) technique for wind tunnel testing. The idea is to "paint" the wind tunnel model with PSP, excite it by a light source, study the intensity of the luminescence and thereby obtain the pressure map over the entire surface. Dr Viswanath (he's such a marvellously confident speaker) also discussed how the technique promises to significantly cut down the cycle time in design. A key issue in PSP technology is the development of a chemical paint with all the 'desirable' properties: e.g., no flow distortion, the ability to obtain information on shocks and vortices, cost-effective formulation, high shelf life etc. These aspects were discussed in the second lecture by Dr Indira Rajagopal, Surface Engineering Unit (who, like Dr S R Rajagopalan, is destined to remain an evergreen R&D person).

In the third lecture Dr J J Isaac, Propulsion Division, described some fascinating investigations on ramjet and scramjet technology being undertaken in his lab ("one engine cannot span the whole Mach number range", he explained). Discussing the motivation for NAL's projects to develop high performance combustors Dr Isaac said that "hypersonic vehicles are set to dominate the skies; but the technology requires a long gestation period, so we decided to enter the business early". The lecture contained many highlights including awesome and colourful video clips of the combustion experiments, but the compelling image one will retain is of Dr Isaac: eloquent, sanguine and himself all fired up.

The fourth lecture, after a brief break, was delivered by Dr J R Raol, Flight Mechanics and Control Division. Dr Raol's lecture, which was a wonderful expository effort, explained the concept of data fusion where data from different information sources (sensors, databases, knowledgebases) is "fused" into one representational form. The complexity, Dr Raol pointed out, arose from the fact the fusion models are usually non-additive; "we are often required to obtain the fusion from a mesh of confusion", he said. One also admired the stylish design of Dr Raol's lecture material and enjoyed his off-the-cuff humorous asides.

The fifth lecture by Dr T S Kannan, Materials Science Division, opened with an illuminating introduction on ceramics: their evolution (also featuring the Chinese connection), properties, applications and even a hypothesis on the etymology of "ceramics" (with possibly an Indian connection). Explaining how ceramics are now everywhere ("even the earth is a huge ceramic ball"), Dr Kannan discussed some specific aerospace applications of ceramics: e.g. how metals are being replaced by ceramics inside aircraft engines "because today's engines are getting very hot inside", and how ceramics will usher in "much quieter aircraft with suitable layers on the exhaust side".

In the sixth, and last, lecture, Dr S V Narasimhan, Aerospace Electronics and Systems Division, dwelt on the theme of quiet aircraft, and, more generally, 'quiet engineering systems' at much greater length (with applications "from the kitchen to the cockpit"). Discussing active noise control (ANC), involving the "cancellation" of noise by "anti-noise" of equal magnitude in the acoustic

domain, Dr Narasimhan described the many successful experiments undertaken in his lab. The highlight of this remarkable presentation, which opened with a very interesting slide linking the "known" noises (e.g. sound of an aircraft taking off, or the chirping of birds) to their decibel level, was when Dr Narasimhan actually played the sound files in the 'before' and 'after' ANC intervention mode. The noise difference (of up to 21 dB in one example), which everyone could "hear" clearly, was the best evidence of the success of another remarkable NAL technology development initiative.

The function ended with the concluding observations by Dr T S Prahlad, Director. In 1997, when Dr Prahlad had presented NAL's Vision 2002 to its Research Council, he had indicated that he would like technology to be the "central bedrock" of NAL's future activity. The six lectures provided overwhelming evidence that this proposed re-orientation had already started taking place, and the NAL Director could hardly contain his joy at this development. "We should really be now calling NAL a RD&T (research, development and technology) establishment now", he said.

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