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EDITORIAL

AEROSPACE AND ALLIED TECHNOLOGIES

Indian aerospace sector has been witnessing a huge growth because of demand related to immense economic development and Government's initiatives on regional connectivity as well as Make in India policy. India is now competing with the biggest aviation markets, such as China and US, and is the country with the fastest-growing air passenger market in the world. India's domestic airline capacity has doubled over the past ten years, from 7.9 million in April 2014 to 15.5 million in April 2024, according to a recent research based on Official Airline Guide (OAG) data. With more increase expected over the next six years, by the end of 2030, the nation expects to have grown to 300 million passengers. The size of the Indian aviation market is projected to be 13.89 billion USD in 2024 and will rise to 26.08 billion USD by 2030, growing at a compound annual growth rate (CAGR) of 11.08% during this forecast period (2024-2030). In addition, India is a vital market for military aircraft since it has been enhancing its aerial capabilities by acquiring new aircraft and developing its own military aircraft to safeguard its borders. In view of this, there are several challenges to achieve this high growth in the aerospace sector. At present, there are various national aerospace programs such as SARAS, HANSA, LCA, AMCA, ALH, launch vehicle and missile, etc. The success of these programs mainly depends on R&D on aerospace materials and allied technologies that have been pursued by various academic, defence, national laboratories, and public sector institutions in the country. One of the focused areas in this sector is to reduce the dependence on import of these materials and technologies.

CSIR-National Aerospace Laboratories, a unit of Council of Scientific and Industrial Research (CSIR) was established in 1959. In last 65 years, CSIR-NAL is only Government institution in India which is doing R&D activities in aerospace sector, mainly civil aircraft programs. It is a premier organization aligned to high-technology with an emphasis on advanced aerospace disciplines and one of the pioneers in the areas of aerospace materials and technologies. It houses a number of cutting-edge testing facilities, several of which are recognized as national facilities that are not only the best in India but also on par with other facilities of a similar nature around the globe. It has contributed significantly to the national aerospace initiatives of the country. Additionally, it has created several vital technologies for the strategic sector that continue to assist the mission-mode programs of the nation. The mission of CSIR-NAL is to support all national aerospace initiatives, design and build small and medium-sized civil aircraft, and develop aerospace materials and technologies with a strong scientific component. Some of its major R&D disciplines are national trisonic aerodynamic facilities, flight mechanics and control, propulsion, composites, computational fluid dynamics, experimental aerodynamics, structural design and testing, structural dynamics and integrity, surface coatings, aerospace materials, aerospace electronics and instrumentation, civil aviation, electromagnetics, manufacturing technology, etc. It has several R&D projects funded by CSIR itself, DST, ARDB, MNRE, ADA, ISRO, DRDO, etc. It has around 380 scientists and 600 technical and support staff engaged with all the projects. Every year several B. Tech., M. Tech., and M. Sc. Students come to CSIR-NAL for the internship. Students mainly from engineering, materials science,

physics, and chemistry streams are getting enrolled for Ph. D. program under Academy of Scientific and Innovative Research (AcSIR).

This special issue on "Aerospace and allied technologies" has covered some key areas of development in aerospace materials and technologies such as antennas, radomes, aerospace grade carbon fiber, ceramic sensors, thermal barrier coatings, health monitoring of aerospace structures, testing of CFRP structures, computational fluid dynamics, computation for design of aerospace vehicles, Al-Mg-Sc alloy for aircraft structure, and radar-absorbing materials and coatings for stealth application. The readers may get a good grasp of R&D activities of CSIR-NAL with this special issue, wherein several young as well as experienced researchers are working towards advanced aerospace materials and technologies. ❒

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He has published 261 peer-reviewed papers in the internationally reputed journals, 33 papers in Conference Proceedings, 6 Book Chapters (including 2 in CRC Handbooks) and 8 comprehensive review articles. He has executed 45 sponsored/grant-in-aid projects and is the inventor of sixteen patents (including 11 international patents). He has contributed 120 papers in national and international conferences. Dr. Barshilia has delivered 150 invited lectures (including Plenary and Keynote) in India and abroad.

Dr. Barshilia was awarded Young Scientist Award in 2000 by CSIR, Dr. Ambasankaran Award in 2001 by Indian Vacuum Society, Outstanding Research Award in 2004 by CSIR-NAL, MRSI Medal by Materials Research Society of India in 2011. He is the elected fellow of The Indian National Academy of Engineering and The National Academy of Sciences, India.

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Dr. Parthasarathi Bera obtained his B. Sc and M. Sc. in Chemistry from Jadavpur University, Kolkata and earned his Ph. D. in autoexhaust catalysis from Indian Institute of Science, Bengaluru. He was a Post Doctoral Fellow at University of Washington, Seattle, USA and University of Pennsylvania, Philadelphia, USA. He worked as a Marie Curie Fellow at Instituto de Catálisis y Petroleoquímica, CSIC, Madrid, Spain. He joined CSIR-National Aerospace Laboratories, Bengaluru in January 2010. At present, he is a Senior Principal Scientist at CSIR-National Aerospace Laboratories. His main research interests include synthesis and characterization of functional ceramic nanomaterials and nanocomposite coatings, catalysts for green energy and environment. He has published 152 articles in peer-reviewed international journals. He is a coauthor of 29 technical documents, 3 book chapters, 29 conference papers, and 3 Indian patents. He has given 11 invited lectures in India.

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Dr. Abhay Anant Pashilkar, completed his B. Tech/(Hons) in Aerospace Engineering from Indian Institute of Technology Kharagpur (IIT Kharagpur) and M. E. in Aerospace Engineering from the Indian Institute of Science (IISc), Bengaluru during the year 1993. Post this he joined the Flight Mechanics & Control Division (FMCD), National Aerospace Laboratories.

Since 1993, he has worked on various National Projects like the LCA and SARAS. Further he completed his Ph. D. from the IISc, Bengaluru in 2002. Dr. Pashilkar was with the NTU, Singapore for his post-doctoral fellowship from 2003 till 2005.

Dr. Pashilkar was the Group Head, Flight Simulation in the FMCD division from 2008 till 2016 and its Deputy Head from 2014 till 2021. From 2018 he was heading the Systems Engineering Division of CSIR–NAL and was the appointed as Program Director for Civil Aircraft Programs at CSIR–NAL.

He is a recipient of the 1997 NAL Young Scientist Award, 2001 CSIR Young Scientist Award and the 2003 INAE Young Engineer Award. He is honoured with Distinguished Alumni Award 2023 of Indian Institute of Technology Kharagpur.

He resourcefully coordinated the “Mirage Upgrade Project for Final Operating Clearance” which received the CSIR Technology Shield during the year 2019 from the Hon’ble President of India. He has guided 7 Ph. D. students and has over 30 papers in National and International Journals.

His areas of research includes Flight Dynamics Modelling and Simulation, Parameter Estimation, Flight Control and Human Factors in Aviation.

Dr. Pashilkar, an Eminent Aerospace scientist took over as Director, CSIR–NAL in the month of September 2022 and continues to contribute towards India’s Civil Aviation programmes.

Note by the Editor-in-Chief, *Science and Culture*: *This issue has been sponsored by the CSIR-National Aerospace Laboratories, Bengaluru.*