

**Integrated Vehicle Health Management (IVHM) for Aerospace Applications:
An overview of the Program initiated at CSIR-NAL, Bangalore, India**

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Abstract: Aircraft industry is maintenance intensive and involves very high through life- cycle costs. IVHM is a system engineering concept, highly inter-disciplinary in nature and built on the sound maintenance philosophy of reduced maintenance time & cost and increased availability of aircraft for operations. IVHM is about conceptualizing the health management architectures, developing functional and fault models, brain-storming on cost-benefit analysis, utilizing robust diagnostic & prognostic algorithms for diagnosing the onset of faults in real-time and predicting the remaining useful life (RUL) of the mission. A program of such magnitude requires interaction / collaboration among R&D, Academia, Industry, Users, Maintenance experts and last but not the least, the Regulatory Authorities.

This talk gives a brief introduction and overview of IVHM for aerospace applications, approach of development and its critical requirement for the worldwide aircraft programs. A few case studies, which are part of the National IVHM Mission at **CSIR-NAL, India** are dealt with. Finally, roadmap in the context of Indian Aerospace IVHM programs is presented.

Bio: Dr. Vanam Upendranath is a Senior Principal Scientist at National Aerospace Laboratories, Bangalore since 2010. Earlier he worked as a Scientist at CEERI, Pilani, on embedded electronic systems, industrial automation and wireless sensor networks. Dr. Upendranath has initiated the IVHM activity at NAL during 2010. He is a member of the National IVHM Taskforce Committee setup by the Aeronautics Board, DRDO, Govt. of India. As the convener, Upendra organized the first NAL-NASA international Workshop on IVHM & Aviation Safety (www.nal.res.in/wias), sponsored by Indo-US Science and Technology Forum (IUSSTF), during January 2012. He has also participated in the SAE IVHM Standards Committee meetings at Cleveland, and facilitated the happening of HM-1 & E-32 Cte meetings in Bangalore under the aegis of SAE India.

Upendra did his Masters from NIT Warangal, India and Ph..D from University of Trento, Italy. During his Ph.D program tenure, he was also a visiting Researcher at EEE Dept, Johns Hopkins University. He was awarded Gold leaf Certificate for the work in top 10% of the research papers presented at IEEE & PRIME at EPFL, Switzerland on his PhD work, and received Best R&D project awards at CEERI.