

Abstracts of Talks

Advancements in Future Propulsive Technologies and its Testing for Certification



Mr. Alok Nanda
CTO



GE Aerospace is at the forefront of inventing the future of flight for both commercial and defense customers. Our continued investment in innovation, driven by an annual R&D spend of over \$2 billion, enables us to deliver cutting-edge technologies in the aerospace industry.

Central to our vision of future propulsion is the RISE (Revolutionary Innovation for Sustainable Engines) program, which aims to achieve more than 20% better fuel efficiency and 20% lower carbon emissions compared to the most efficient commercial engines in service today. The RISE program is advancing a suite of pioneering technologies, including advanced engine architectures such as Open Fan, a compact core for next-generation compressor and combustor technologies, and hybrid electric systems.

In the defense sector, leveraging over six decades of experience in high Mach engine programs, GE Aerospace is well-positioned to be a key technology provider in hypersonic propulsion. Our advanced technologies can propel air-breathing missiles and aircraft seamlessly across a range of flight Mach numbers, enabling vehicles to fly in unpredictable, hard-to-track paths. Our breakthrough technologies also include the Adaptive Cycle Engine, which optimizes air diversion for either cruise efficiency or combat thrust, for greater range, more acceleration, and better thermal management than today's combat engines.

As we build the future of propulsion, we are putting safety first. GE Aerospace's commitment to innovation continues to differentiate us as a leader in the aerospace industry, shaping the future of flight.



Mr. Aniruddha Mukhopadhyay
Fellow, Lead Chief Technologist,



Global polarization of national security postures had been shifting at the pace of technology as well as threats. National security is now a multi-lateral challenge and needs agility at the speed of relevance and constant evolution of readiness against adversaries. Although technology is an exciting enabler, adoption at that speed of relevance with consistency, accuracy and partitioning (CAP) remains a big challenge. Traditional approaches, heavily reliant on late-stage testing and validation, hinder the provision of both operational coverage and development speed. Furthermore, two other key challenges are learning fast at a very large scale with overflowing data and constant demand for cascading technology upgrades. Again, traditional approaches for modernization do not meet today's demand. Additionally, shifting the processes requires confidence in CAP throughout the teams where cross-functional collaboration remains a challenge. Countries, agencies, and organizations around the world are trying new approaches and collaborating within friendly networks. In this talk, we will touch up on some of the key enablers like physics and test driven, live, virtual, constructive V&V approaches. To that extent, we will provide examples of continuous test, and verification for system development/upgrade with multiple sensors and technologies. Another topic will be synthetic data driven ML-based development and calibration of collaborative autonomous systems. We will also leave room to explore path forward in local context.



Dr. Antonio Monzon

CSEP, Senior Expert

Certification Coordinator & DAE – A400M DASS & M-MMS

AIRBUS

In recent years, civil regulatory bodies, notably the European Union Aviation Safety Agency (EASA), have made considerable efforts in developing a dedicated regulatory framework to certify Artificial Intelligence (AI) / Machine Learning (ML) technologies in aviation. In contrast, the military sector has seen relatively few initiatives, such as the NATO AI Strategy and the European Defence Agency's Trustworthiness for AI in Defence Working Group. The certification of AI/ML applications for military aviation presents distinct challenges and risks, necessitating tailored approaches and solutions to ensure both safety and operational effectiveness. This speech aims to identify and examine the specific considerations involved in certifying systems that incorporate AI/ML-based technology for military use. In particular, the discussion will focus on the relevance of tactical missions, adaptability and flexibility, resilience, data availability, and the ethical implications of military applications. Furthermore, a forward-looking perspective on the development of a military regulatory framework will be presented, outlining potential approaches for certifying AI/ML-based applications in military aviation in the future.

Navigating Airworthiness in Futuristic Aerospace: Collaboration Strategies for Military Aviation Certification



Dr. Chandrika Kaushik
Outstanding Scientist
Director General(PC & SI), DRDO



Rapid evolution of advanced aerospace technologies involving Artificial Intelligence, Hybrid-electric propulsion and additive manufacturing are redefining standards of military airworthiness. Traditional certification frameworks are often reliable for many deterministic systems but are undergoing many evolutionary changes to address and handle complexities of non-deterministic and adaptive technologies that are critical to modern military aviation.

Integration of evolving technologies in the present military aerospace systems mandates advancements in technical standards as well as evolution in stakeholder collaboration approaches and policies as complexity and adaptability of these innovations requires synchronized efforts across regulators, industry and researchers. Lack of evolution in stakeholders engagement policies and mechanisms will widen the gaps in understanding and misaligned priorities and can hinder the seamless adoption of these transformative technological advancements in the modern military Aero systems.

This presentation explores strength, weakness and lesson learnt from various policies, mechanisms, frameworks, standards developed and adopted globally for enabling successful stakeholder collaboration in developing airworthiness standards and certification processes for addressing the challenges by these emerging technologies. For example, Success of EASA-FAA partnership on AI certification and NATO's UAS validation programs highlights effectiveness of harmonized standards and simulation-based testing and public-private partnerships. Lessons from failed initiatives including fragmented additive manufacturing efforts of European AM research consortium and proprietary restrictions in autonomous combat aircraft projects reveal pitfalls of inadequate coordination and inflexible frameworks.

This presentation summarizes actionable strategies to foster robust ecosystems, harmonize global standards and integrate adaptive frameworks like Overarching Properties to ensure compliance without stifling innovation. By aligning regulatory rigor with demands of emerging technologies, this presentation seeks to redefine the pathway to airworthiness in the context of futuristic aerospace for paving the way for safer and more efficient military operations.

Challenges in Net Centric Operations (NCO) using Software Defined Radio (SDR) and its Testing for Certification



Mr. Elior Shenhav
Project Manager
Rafael Advanced Defence Systems



RAFAEL, a proven Israeli worldwide industry leader in the defense market, with extensive successful performance in development, production and maintenance capability. Rafael has completed several high-end projects with the Indian Air Force. The upcoming presentation will feature a comprehensive talk on the integration of SDR NCO applications, focusing on the development, validation and enhancement of situational awareness capabilities for the IAF, and future advanced capabilities.

The presentation will delve into the technical intricacies, challenges and validation process of bringing to the end user a state-of-the-art capability, in-board systems, and various network members.

Attendees will gain insights into the operational and support functionalities enabled by this process, including the generation of a Situational Awareness (SA) picture, tactical updates, and the execution of offensive and defensive actions. The talk will also cover the structural elements of integration, the roles of network members, and the advanced communication protocols that ensure seamless data exchange and operational efficiency. This session promises to be an enlightening exploration of developing cutting-edge defense technology, validation methods, and its applications in modern aerial warfare.

Advancements in Position-Navigation-Time (PNT) Technologies for Future Advanced Aircraft and its Testing Philosophy



Mr. Frederic Xavier Mary
VP Sales
Safran Electronics and Defence



Mr. Cedric Gaschard
Sales & Marketing Manager
Safran Electronics and Defence



Every battlefield is a dynamic and chaotic environment. The speed of engagement in the battlespace and the complexity of the electromagnetic spectrum make situational awareness more challenging than in any other domain. Recent conflicts have highlighted more than ever how the ability to accurately determine one's position and that of the enemy in an absolute geographical frame of reference and on a well-synchronized time scale is both a key and a weak point of modern military forces. This is where Resilient Positioning, Navigation and Timing comes in.

The primary source of PNT information comes from GNSS satellites (Global Navigation Satellite System), such as GPS satellite positioning. In modern armies, hundreds of thousands of military systems rely on satellite navigation systems to operate, move, attack and communicate. However, with the proliferation of electronic warfare equipment and increasing technological efficiency, militaries around the world are facing increasing GPS jamming and spoofing attacks that impact operations and put forces at risk. As enemy capabilities to conduct electronic warfare become increasingly sophisticated, understanding the vulnerabilities of PNT information and increasing its resilience become key challenges. Accurate and reliable PNT data are at the core of situational awareness and military operations to ensure mission success.

Safran, a global leader in navigation and timing, invites you to view its latest solutions for PNT.

Techniques for Validating Aerospace Gas Turbines



Mr. Geraint Rhys Rees

Chief Engineer – Defence UK & International Future Programmes,



The talk will review methodologies and approaches that can be utilized to verify and validate aerospace gas turbine technologies, starting with requirement definition through design and development to successful service operation and monitoring. The presenter will additionally consider future opportunities that Artificial Intelligence and Machine Learning provide to further increase the fidelity of gas turbine engine service life validation.

Long duration Hypersonic Flight – Myth or Reality



Prof. Gopalan Jagadeesh

Professor, Dept. Of Aerospace Engineering



Long duration (Few 100 s to min.) hypersonic flight is considered as the final frontier of Aeronautics and Astronautics. Sustainable hypersonic flight for both military and civil applications are vigorously being pursued by many countries around the globe. Hypersonic flows encountered by rockets, re-entry capsules and air breathing scramjet missiles are riddled with numerous complex yet intriguing phenomena such as shock-shock interaction, shock boundary layer interaction, non-equilibrium flows, shock material interaction, chemical kinetics etc., If the design and survivability of such vehicles can be ensured, applications ranging from low cost high speed transport, strategic advantage for defense and reusable launch vehicles can be made possible. Several efforts across the globe have been reported in the past to delve deep and decipher the flow physics of hypersonic flows pertaining to Scramjet engines. Despite meticulous efforts there are several unsolved mysteries associated with such flows.

The Laboratory for Hypersonics and Shock Wave Research (LHSR) and Centre of Excellence in Hypersonics (CEH) in Indian Institute of Science (IISc) Bangalore are in the forefront in furthering hypersonic research in India. High lifting wave-rider configurations, 3 D shock wave boundary layer interactions, laminar to turbulent transition, start/unstart of scramjet intakes, supersonic combustion dynamics, ultra-high temperature ceramics coatings, robust navigation and guidance algorithms, multidisciplinary design optimization technologies are the major thrust areas being pursued at LHSR and CEH in IISc Bangalore. Reliable ground testing, robust numerical studies complimented with innovative flight tests will be the way forward towards realization of practical hypersonic flying systems. A broad overview of enigmatic nature of foundational basic scientific, engineering and technology issues pertaining to hypersonic flight will be discussed in this lecture.

The lecture will also attempt to find answers to the ultimate question of whether long duration hypersonic flight is a myth or will become a reality in the near future.

Enhancing Combat Effectiveness with precision from sky: Trends in Air launched Capabilities



Mr. Raja Babu Ummalaneni
Distinguished Scientist & Director General
MSS Cluster, DRDO



Technology has played a significant role in shaping combat effectiveness throughout history. Technological superiority can provide a significant advantage on the battlefield. A few of the key trends in the field of air-launched capabilities which have emerged over time, reflecting advancements in technology and evolving military strategies are given below:

The increasing prevalence of Precision Guided Munitions (PGMs) has allowed air forces to strike targets with greater accuracy and reduced collateral damage. Modern air-launched weapons utilize advanced guidance systems, including GPS, inertial navigation, and laser guidance, to achieve pinpoint accuracy. Some are even equipped with artificial intelligence to autonomously select and engage targets.

Modern air-launched Long range / Standoff weapons are designed to engage targets at greater distances, reducing the risk to aircraft and crew. Air-launched weapons can strike targets deep within enemy territory, reducing the need for aircraft to penetrate heavily defended airspace. The development of Multi-role aircraft has allowed air forces to conduct various missions using a single platform, improving flexibility and reducing costs. Multi-role Aircrafts can carry a variety of weapons and sensors, allowing them to perform a wide range of missions.

The integration of Stealth technology into aircraft and munitions has become increasingly important for evading enemy air defenses. Stealth features enhance their survivability of Aircraft in contested airspaces. The integration of networked systems enables better communication, coordination, and improved situational awareness among aircraft and ground forces. Aircraft and drones equipped with advanced sensors provide real-time intelligence, allowing commanders to make informed decisions and adapt to changing battlefield conditions.

Although still in development, Hypersonic air-launched weapons promise to provide significant advantages due to their high speed and maneuverability. These weapons can potentially penetrate enemy air defenses and strike targets more quickly than traditional munitions. Unmanned aerial vehicles (UAVs) are playing an increasingly important role in air-launched capabilities, serving as both launch platforms for weapons and as weapons themselves (e.g., kamikaze drones).

The development of these advanced air-launched capabilities is likely to have a significant impact on the future of warfare.

Unlocking India's Cosmic Potential: Space Reforms and the Rise of Indian Space Companies in the Global Market



Mr. Rohan M Ganapathy
CEO & CTO,



India's space sector has undergone transformative reforms in recent years, positioning the country as a key player in the global space industry. This talk will explore the significant policy changes and initiatives that have paved the way for a more competitive and innovative Indian space ecosystem. With a focus on emerging private space companies, we will examine how these reforms have unlocked new opportunities for growth, collaboration, and technological advancement. The session will also highlight the potential of Indian space companies to capture a substantial share of the global market, from satellite services and space exploration to commercial space launches. By addressing both the challenges and the immense opportunities ahead, this talk will offer insights into how India is poised to become a global space powerhouse, contributing to advancements in science, technology, and economic growth worldwide.



Mr. Simon Taylor Page-Browne

Head of Programmes (UK), Airborne Systems Integration,



Digital Test and Evaluation: A Weapon/Platform Integration Perspective.

- Why the UK Defence community needs to increase the pace and capacity of weapons integration.
- How Modelling and Simulation (M&S) is used in current 4th generation air-launched weapon integration and clearance.
- The challenges of using Modelling and Simulation as a means of Qualification & Certification compliance.
- Examples of how MBDA is working towards answering these challenges.

The potential benefits to be realised for extant and future weapon integration programmes.



Mr. Suhas Gopinath
CEO,



As artificial intelligence reshapes aerial warfare, unmanned systems face sophisticated cyber threats that can compromise missions through command hijacking, sensor manipulation, and autonomous system exploitation. This talk examines how adversaries deploy AI-enabled attacks to bypass traditional UAS defences. We'll explore breakthrough defensive capabilities, including AI-powered anomaly detection and hardened security architectures, that enable resilient operations in contested airspace. The presentation offers a practical framework for implementing cyber defence in autonomous systems while maintaining tactical flexibility.

The System Engineering approach to Airworthiness & Certification: DER's (FAA) Perspective



Mr. Varun K. Malik
DER (FAA), CTO,



This seminar provides a detailed exploration of the airworthiness and certification process in the aerospace industry, focusing on the integral role of Designee's (Designated Engineering Representative (DERs), Organization Design Approval (ODA), Design Approval Organization (DOA)) authorized by the Certification Authorities (FAA, TC, EASA) to approve design data on per their delegation.

Tailored for Aviation Leaders, aerospace engineers, certification specialists, and aviation professionals, this session delves into the regulatory framework, process and engineering standards that ensure aircraft safety and compliance. Attendees will gain an overview of FAA's regulatory structure, including the Code of Federal Regulations (CFR), which defines the requirements for obtaining Type Certificates (TC), Supplemental Type Certificates (STC), and adherence to Technical Standard Orders (TSO). These certifications are vital for ensuring that aircraft and their systems meet rigorous safety and performance standards. Key industry standards such as ARP4754 and ARP4761 will be discussed, guiding systems engineering and safety assessment in the development of complex aircraft systems.

Additionally, attendees will get insight on DO-178 and DO-254 standards, which govern software and hardware assurance in avionics. Through the DER's perspective, participants will gain practical insights into how engineering principles and standards are applied to ensure systems meet stringent regulatory requirements and uphold the highest standards of safety and compliance. DER as an independent or part of design approval organization acts as a certification liaison between the applicant and certification authority ensuring clear communication, outlining means of compliance via plans and evaluating compliance throughout the system life cycle process.

The seminar will emphasize the numerous benefits of involving DER in the certification process to enhance Development and Process Assurance throughout all the critical phases of the project. DERs bring specialized expertise in specific engineering disciplines, providing valuable insights that enhance safety and compliance. They facilitate an efficient certification process ensuring alignment with regulatory requirements by mentoring and conducting detailed timely reviews and approvals of design data. DERs proactively support the design team to identify potential safety issues early in the development process, reducing the risk of costly redesigns and delays. By the conclusion of the seminar, participants will understand how leveraging DERs can enhance safety, streamline certification processes, and foster a culture of proactive risk management. This knowledge is essential for professionals navigating the complexities of aircraft certification, striving to maintain safety and compliance in the ever-evolving aerospace industry.

Latest Advancements to Crew Escape System Approach to Certification and Plan for Continued Support



Mr. Venugopal C

Head of Operations-India



In the era of make in India and Atmanirbhar Bharat initiative taken by GoI, it becomes imperative for the Global Suppliers to initiate establishing the facilities within the country by making use of the eco-system evolved over a period of time resulting in development of Technology & distribution of the resources within the country.

India, currently being 2nd biggest market for Martin-Baker, having 9 Indian platforms fitted with Martin-Baker Ejection seat and each one of the many upcoming aircraft programmes is a potential business for Martin-Baker. The life cycle support spanning for 35 to 40 years, Martin-Baker cannot ignore the potential that Indian market can offer in coming years. In this backdrop, Martin-Baker is considering establish manufacturing and MRO facility in India.

Further, Martin-Baker is conscious of the fact that in the last 10 years, there had been significant improvement in the defence eco-system in the country. Many prominent global defence suppliers have established/establishing facility within the country, exploiting the GoI initiative benefits, cost effective labour and enhancing indigenous content.

Looking at the Indian Market potential, Martin-Baker envisioned

- a) Establishing world class manufacturing, assembly and MRO facility within the vicinity of the Indian end users to offer seamless support for the projects spanning over 35 to 40 years.
- b) Significantly enhance the indigenous content over a period of time by making use of the ever evolving eco-system and the DRDO facilities.
- c) Foray into Rotary wing platforms for crash worthy seats.
- d) And over a period of time, enhance the facility that can become Ejection Seat hub for the whole of south-east Asia.

In order to realize this vision, Martin-baker is consider establishing facility in Bangalore, with HAL as the JV partner. This serves the dual purpose of being close to the end users like HAL & ADA to provide seamless support and to be in the close proximity of the certification agencies like CEMILAC, DGAQA and IAM for quick development turn-around activities.

The presentation titled “Martin Baker-India Initiatives and Challenges Ahead” enumerates the Martin-Baker vision for Martin-Baker India.