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STTP on "Aircraft Systems Testing requirements and Certification procedures"

The Department of **Aeronautical and Aerospace Engineering** organised a **Short-Term Training Programme (STTP)** titled **Aircraft Systems Testing Requirements and Certification Procedures** on **23-09-2025** at **10:00 am to 4:00 PM**, and **24-09-2025** at **10:00 am to 1:00 PM** in **MVJCE**.

Objectives of the Event

The primary objectives of the event were:

- To understand Aircraft Systems Architecture.
- To explore Testing Methodologies.
- To familiarize with Certification Standards.
- To prepare students for Industry Roles (under Aircraft Manufacturing, Design, Flight Test, Certification).

Event Overview

Day 1 – 23/09-2025 (10:00 AM to 4:00 PM) : - The programme began at 10:00 am in the Auditorium with a welcome address by Prof Irfan Khan, followed by an introduction about the guest and session, addressed by Dr Vinu M Kuriakose, HOD Aeronautical and Aerospace Engineering.

Session 1 (10:30 AM to 12:30 PM) : - The session started by the expert Shri Ramesh Kumar, Former Head, Flight Control System department, HAL, Bangalore, with an active participation of 122 registered students. The presentation covered deep insights into Introduction to Aircraft Systems, Redundant System Architectures, Avionics Systems and Electrical Systems.

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Figure 1: Inauguration of the STTP

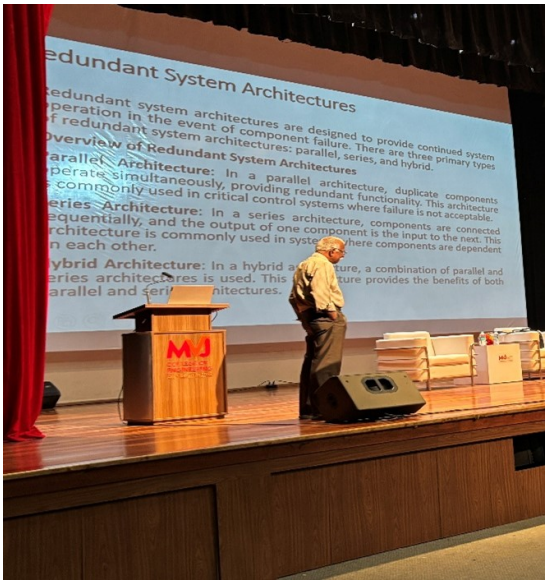

Figure 2: Sessions of STTP

Day	Time	Session Details
Tuesday, September 23 2025	10 am - 11 am 1 - 4 pm	Welcome Address Introduction to the Tool
Wednesday, September 24 2025	10 am - 1 pm	Presentation

Table 1: Schedule of the Event

Key Discussions of Session One:

The primary objectives of the event were:

- Aircraft systems, like communication or navigation, may have duplicates that are not active simultaneously but can be activated by the pilot when needed.
- For critical systems (e.g., flight attitude control), multiple systems may operate in parallel, constantly comparing their performance.
- Communication, Navigation, and Surveillance (CNS): Systems for communicating with ground stations, navigating using various signals, and monitoring air traffic.
- To prepare students for Industry Roles (under Aircraft Manufacturing, Design, Flight Test, Certification).
- Flight Control: Includes auto-stabilisation to maintain aircraft attitude and Fly-by-Wire (FBW) systems, where computers control flight surfaces.
- Processing Platform: Hosts the computer systems that run the avionics applications.
- Federated: Older, traditional architecture where each system is a separate unit (LRU - Line Replaceable Unit).
- Integrated and Distributed: Modern architecture that uses partitions to separate applications, enhancing fault containment and allowing multiple applications with different safety requirements on the same platform.
- Redundancy in Power: Backup systems, such as additional batteries and generators, are crucial to ensure that critical systems remain operational during emergencies or primary power source failures.

Session 2 (1:30 PM- 4:00 PM) : - The presentation of session 2 started at 1:30 PM and covered the topics of Hydraulic and Pneumatic Systems, Engine testing, Ground testing, and Landing Gear Testing, which explore different Testing Methodologies of an aircraft, which helps the students to prepare for Industry Roles.

Figure 3: Expert Presentation on Testing Procedures

Key Discussions of Session Two:

The primary objectives of the event were:

- Integrated Systems Testing (IST) to validate avionics, hydraulics, and electrical systems in sync. Iron bird platforms for full aircraft systems simulation before first flight.
- Environmental stress screening (ESS) for thermal cycling and vibration endurance. Digital twin modelling to predict system behaviour and optimise test cycles.

- Brake fade and thermal soak testing under repeated high-speed stops. Retraction cycle endurance testing for fatigue life estimation. Steering system testing with feedback control loops and hydraulic servo valves.
- Full Authority Digital Engine Control (FADEC) testing for software-hardware integration and fail-safe logic. Altitude test chambers to simulate high-altitude engine performance and cold starts.
- Transient response testing for throttle changes, surge margin, and spool-up time. Emission and noise compliance testing for ICAO and EPA standards.

Figure 4: Q A session of day one, expert clarifying doubts.

The guest's thoughtful responses to technical questions added significant value, by actively engaging with participants and resolving doubts in real time, the speaker fostered an interactive and intellectually stimulating environment.

Day 2 – 24/09-2025 (10:00 AM to 1:00 PM) : - The programme of second day began at 10:00 am in the Seminar Hall 5 with a welcome address by Dr Vijayakumar R. The session was initiated by the expert Shri Ramesh Kumar by providing deep insights into Aircraft Environmental systems and certification of aircraft which provided detail information about Aircraft Certification, Regulatory Authorities and Frameworks, Type Certification Process, Airworthiness Standards, Environmental Certification and Flight Testing and Validation.

Figure 5: Expert Presentation on Testing Procedures

Key Discussions of Session Two:

The primary objectives of the event were:

- Major authorities include the FAA (USA), EASA (Europe), and DGCA (India), each enforcing region-specific rules aligned with ICAO global standards.
- DGCA India has updated its frameworks to recognise Type Certificates from other contracting states and to support amateur-built aircraft and advanced air mobility vehicles.
- For VTOL-capable aircraft, DGCA mandates Design Organisation Approval (DOA) and Production Organisation Approval (POA) under CAR-21 regulations.
- Certification Review Items (CRIs) are used to address project-specific deviations or special conditions during the process.
- DGCA's latest guidance includes performance-based airworthiness criteria for VTOL aircraft, motors, and propellers, with compliance paths including consensus standards.

- Modern flight testing incorporates digital twins, automated telemetry, and AI-assisted diagnostics. Validation now includes cybersecurity resilience, autonomous system behaviour, and fail-operational capability for critical systems.


Figure 6: Q A session of day two, expert clarifying doubts.

Experts' willingness to pause and clarify intricate points ensured that no participant was left behind, contributing to a well-rounded and inclusive discussion.
Throughout the STTP, the speaker's approach to doubt resolution was both patient and insightful, encouraging further dialogue and curiosity among attendees.

Finally, the STTP concluded with a vote of thanks to the speaker by Dr R.K. Mishra. He thanked MVJCE management and Principal for providing the opportunity to conduct STTP he thanked HOD, faculties and students for enthusiastic engagement throughout the program.

Outcomes of the STTP

The primary outcomes of the event were:

- Enhanced Understanding of Aircraft Systems Architecture: Participants gained a comprehensive overview of integrated aircraft systems, including propulsion,

Figure 7: Vote of Thanks by Dr R.K. Mishra

avionics, hydraulics, and flight control, with emphasis on their interdependencies and design considerations.

- Exposure to Real-World Testing Methodologies: The program introduced students to advanced testing techniques such as ground testing, engine performance evaluation, hydraulic and pneumatic system validation, and landing gear endurance testing.
- Familiarity with Global Certification Standards: Attendees were introduced to regulatory frameworks, including FAA, EASA, and DGCA, and learned about key certification processes such as Type Certification, Airworthiness Directives, and Environmental Compliance.
- Industry-Oriented Skill Development: The sessions bridged academic knowledge with industry practices, preparing students for roles in aircraft manufacturing, system design, flight testing, and certification engineering.
- Improved Awareness of Emerging Technologies: Discussions included current trends such as electric propulsion, fly-by-wire systems, and digital twin-based testing, equipping students with forward-looking perspectives.
- Interactive Learning Through Case Studies and Expert Sessions: Real-world case studies and expert-led discussions provided practical insights into certification challenges and testing workflows in commercial and defence aviation

sectors.

Conclusions

The Short-Term Training Programme on "Aircraft Systems Testing Requirements and Certification Procedures" successfully bridged the gap between academic learning and industry practices. Through expert-led sessions, participants gained valuable insights into aircraft systems architecture, advanced testing methodologies, and global certification standards. The interactive format fostered curiosity and engagement, while real-world case studies and discussions equipped attendees with practical knowledge essential for careers in aerospace engineering. This initiative has significantly enhanced the technical acumen of students and faculty alike, aligning them with the evolving demands of the aviation industry.

Report by: Dr Vijaya Kumar and Prof. Kalyan Yadav

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