CASE STUDY

Pioneering Urban Air Mobility: Ensuring eVTOL Safety and Maintainability with ReliaSoft MPC Plus

Our customer is a leader in the emerging Urban Air Mobility (UAM) market, designing and developing electric vertical take-off and landing (eVTOL) aircraft. Their mission is to advance the benefits of sustainable air mobility by replacing car commutes with much shorter electric air taxi flights that are safe, sustainable, low-noise, and cost-competitive.

Challenge

Our Aerospace customer needed to develop a completely new, FAA-compliant scheduled maintenance program for its novel eVTOL aircraft, adapting traditional aviation safety standards (MSG-3) to a revolutionary and unproven aircraft architecture.

Solution

By leveraging HBK's ReliaSoft MPC Plus software, engineers systematically performed MSG-3 analysis, managed complex system hierarchies, and efficiently generated the evidence-based maintenance tasks required for certification.

Result

This streamlined the creation of an optimized and data-driven maintenance program, significantly accelerating the path to FAA type certification, ensuring passenger safety, and establishing a scalable, cost-effective operational framework.

The Challenge

The single greatest hurdle for any new aircraft, especially a revolutionary one like an eVTOL, is achieving FAA Type Certification. A critical component of this is the development of a robust, safe, and efficient scheduled maintenance program. The industry-standard process for this is MSG-3 (Maintenance Steering Group, 3rd Task Force).

However, our customer faced a unique and complex challenge:

1. **Novel Architecture**: The MSG-3 process was created for traditional fixed-wing aircraft. Applying its logic-driven, top-down analysis to an eVTOL with distributed electric propulsion, redundant fly-by-wire flight controls, and unique battery systems is a pioneering effort.
2. **No Historical Data**: Unlike a new model of a conventional airplane, there is no legacy data to draw from. Every maintenance task and interval must be justified from engineering principles and analysis.
3. **Regulatory Scrutiny**: As a first-of-its-kind aircraft, every aspect of our customer's maintenance program would be under intense scrutiny from the FAA. The process needed to be impeccably documented, traceable, and defensible.
4. **Scalability**: The maintenance program needed to be not just safe, but also commercially viable for a future fleet of hundreds or thousands of aircraft.

The Solution

To navigate this complex landscape, we worked with our customer's reliability and maintenance engineering teams to implement HBK's ReliaSoft MPC Plus, a software tool purpose-built to facilitate the rigorous MSG-3 process.

Our software provides a structured framework to execute the highly detailed systems and powerplant analysis required. Using MPC Plus, our customer has begun to:

1. **Define the System Hierarchy**: The software allows engineers to break down the entire aircraft into a logical hierarchy, from major systems (e.g. propulsion, flight controls) down to individual components.
2. **Conduct Systematic Analysis**: For each item in the hierarchy, MPC Plus guides the team through the rigorous MSG-3 logic. This includes identifying functions, functional failures, failure effects, and failure causes. This systematic approach ensures no critical aspect is overlooked.
3. **Automate Logic and Decision-Making**: The software automates the MSG-3 decision logic to determine if a scheduled maintenance task is required and, if so, which type (e.g. Lubrication, Servicing, Inspection, Restoration). This removes ambiguity and ensures consistent application of the methodology.
4. **Generate Compliance Documentation**: MPC Plus acts as a central repository for all analysis, decisions, and justifications. It automatically generates the Maintenance Review Board Report (MRBR), the primary deliverable for the FAA, ensuring all data is traceable, consistent, and ready for regulatory review.

Results & Impact

By integrating ReliaSoft MPC Plus into their certification workflow, our eVTOL customer realized profound benefits that are critical to their success.

- **Accelerated Path to Certification**: The software streamlines an incredibly complex and labor-intensive analysis, reducing the man-hours required and minimizing errors. This directly shortens the timeline for submitting a complete and compliant maintenance program to the FAA.
- **Enhanced Safety and Reliability**: The rigorous, systematic nature of the MSG-3 process, as facilitated by MPC Plus, ensures a thorough interrogation of the aircraft's design for potential failures. This resulted in a more robust maintenance program and, ultimately, a safer aircraft for passengers.
- **Optimized Operational Costs**: The MSG-3 philosophy focuses on identifying only necessary maintenance tasks, avoiding costly and unnecessary over-maintenance (9% reduction of PMs). By creating an optimized program from day one, our customer ensured a lower total cost of ownership and a more competitive operational model.
- **A "Single Source of Truth"**: The software created a definitive, living record of the aircraft's maintenance basis. This becomes the foundational database for all future maintenance planning, logistics, and continuous improvement efforts as the aircraft enters service and accumulates real-world operational data.

Conclusion

For eVTOL companies to succeed in their missions, they must not only design a revolutionary aircraft but also prove it can be maintained to the highest safety standards in a commercially viable way. Tools like HBK's ReliaSoft MPC Plus provide the structured framework needed to manage this data, apply proven aviation methodologies like MSG-3 to novel technology, and build the foundation of trust with regulators and the flying public, paving the way for the future of urban air mobility.