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Bringing EV Battery Experience to Urban Air Mobility

By Randy Tan, Product Portfolio Director for EV at ENNOVI (formerly known as Interplex)

Electric vertical take-off and landing (eVTOL) aircraft promise access to short-range, low-emission, city-wide transportation and regional hops - both with regard to the movement of passengers and the shipping of deliveries too.

The core challenge when it comes to battery design for urban mobility projects of this kind is dealing with the 'power-energy paradox'. eVTOLs require massive power bursts when they are taking off or coming into land - which leads to a rapid build-up of heat. There are also strict weight constraints to consider, as every kg will have a notable impact on the range that can be covered before the next recharge is needed.

In addressing challenges of this kind, engineers are increasingly applying expertise that has been gained from companies within the field of electric vehicle (EV) battery design. System-level technologies, such as cell contacting systems, busbar architectures and high-reliability interconnects, are destined to play an essential role in minimising electrical losses, improving manufacturability and ensuring long-term performance under dynamic conditions.

Aviation Battery System Challenges

Electric and hybrid aircraft must balance energy capacity, power delivery, thermal management, and safety within far tighter weight constraints than road vehicles. Key parameters such as specific power (W/kg) are especially important during high-demand flight, meaning battery packs must support both high peak power and extended lifetime without degradation. Thermal stability requirements and mitigation to prevent thermal runaway events are more stringent. Finally, additional mechanical resilience is needed to withstand vibration, pressure, and temperature variations experienced during flight.

These requirements elevate the importance of advanced interconnect systems, not just for efficiency but for safety and certification compliance.

Advanced Cell Contacting Systems

A crucial component of the high-voltage battery pack is the cell contacting system. These systems provide secure electrical contact between individual cells and aggregate modules, while supporting integrated health monitoring and thermal management.

The latest CCS designs use laminated conductive layers and compact connectors to reduce resistance and energy loss, improving the usable power and safety of battery modules. Advanced systems also incorporate flexible die-cut conductor (FDC) technology and adhesive-free lamination, which enable thin, lightweight current paths that minimize weight and volume. These advanced technologies improve manufacturing throughput and cycle times. They also support rapid gas-release pathways to enhance thermal safety.

Figure 1: ENNOVI's Adhesive-Free Lamination Technology combines cost-efficiency, design flexibility, and enhanced performance to produce robust cell contacting systems (CCS)

In aviation battery modules, these attributes contribute to uniform current distribution, reduced hotspots, and enhanced pack longevity, all of which are critical when scaling to larger packs.

Compact High-Current Power Distribution

Busbars, which replace traditional bulky wiring harnesses, provide low-impedance conductive pathways that distribute electrical power from the battery cells to power electronics and propulsion systems. In EV designs, a range of busbar solutions has evolved, from flexible multilayer busbars to high-voltage rigid extruded configurations, that balance electrical performance with space and weight optimization. Compared to wiring harnesses, busbars also improve manufacturability and thermal performance.

Key characteristics of advanced busbar architecture include compact and vibration-resistant layouts, enabling efficient routing in confined spaces. Material selection, like copper or aluminum, can be tailored to optimize conductivity, thermal performance, and weight. There are also phase busbar designs with integrated sensing and sealing features for complex powertrain connections.

In aviation battery packs, these busbar systems improve current handling, module integration, and thermal management, which directly support the elevated safety and energy requirements.

Solid-Free Interconnects

In high-reliability applications, press-fit connector technology eliminates the need for solder and the associated common soldering issues such as cold joints, voids, and cracks. Benefits of press-fit connectors include gas-tight, high normal force connections, minimizing contact resistance, and enhancing stability under thermal cycling.

For aviation systems, these solder-free interconnects, which are validated to IEC 60352-5 and IPC-9797 standards, simplify assembly and maintenance. They also enhance resilience to high-vibration and temperature loads, critical factors for flight-rated battery packs and power electronics. ENNOVI supports a variety of configurations, including board-to-board, blade-to-board, and high-current interfaces for power modules.

Manufacturing and Integration Considerations

Scaling battery technology for aviation involves more than just component design. Achieving high quality, repeatability, and certification readiness requires advanced manufacturing capabilities, such as precision stamping, machining, and molding, to produce tightly controlled conductor geometries.

ENNOVI's busbar sealing technology, for example, enhances reliability at coolant and high-voltage interfaces. For press-fit connectors, the company's advanced Indicoat plating and whisker mitigation techniques improve connector longevity.

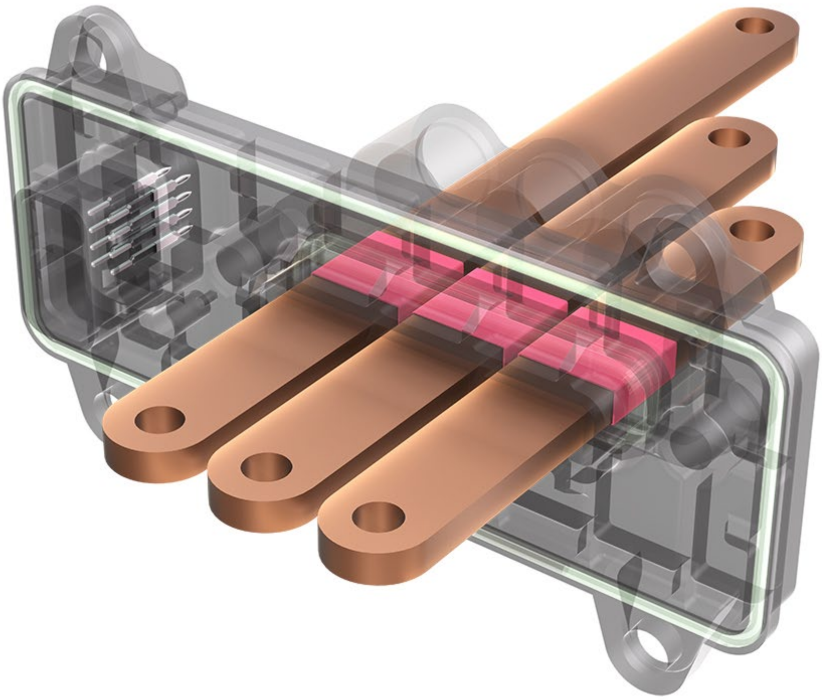

Figure 2: ENNOVI-SealTech provides a shrinking method for sealing busbars, preventing the leakage of oil or water coolants

These capabilities reduce production risk and enable end-to-end integration of interconnect and power distribution systems.

Translating EV Expertise into Aviation Battery Systems
Urban mobility battery systems require not only innovative interconnect hardware but also precision manufacturing and rapid design-to-production capability. EV engineering hubs have pioneered capabilities such as high-precision stamping, molding, plating, welding, diffusion bonding, and automated assembly, all of which improve quality and reduce cycle times for complex electrical components.

Companies with deep EV experience also bring modular design principles and quality systems that enable easier inspection, replacement, and recycling of battery modules. Modular CCS, for instance, allows individual cells or subpacks to be serviced or replaced without disassembling the entire battery, reducing lifecycle costs, and improving sustainability.
Specific EV-inspired technologies demonstrate how modular, manufacturable, and mechanically robust designs can improve performance while meeting rigorous safety and certification standards. This cross-industry adaptation accelerates development by leveraging proven engineering solutions originally developed for high-performance automotive applications.

These technologies, combined with ENNOVI’s precision manufacturing and integration expertise, build a foundation for safer, lighter, and more reliable aviation battery systems. They move beyond incremental improvements in cell chemistry to deliver holistic, certifiable solutions ready for flight.

About the Author

Randy Tan is the Product Portfolio Director for EV at ENNOVI (formerly known as Interplex), a provider of interconnect solutions. He has over a decade of experience in the electrical and electronic manufacturing industry. He has a product management degree from University College of Dublin.
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