

AVL



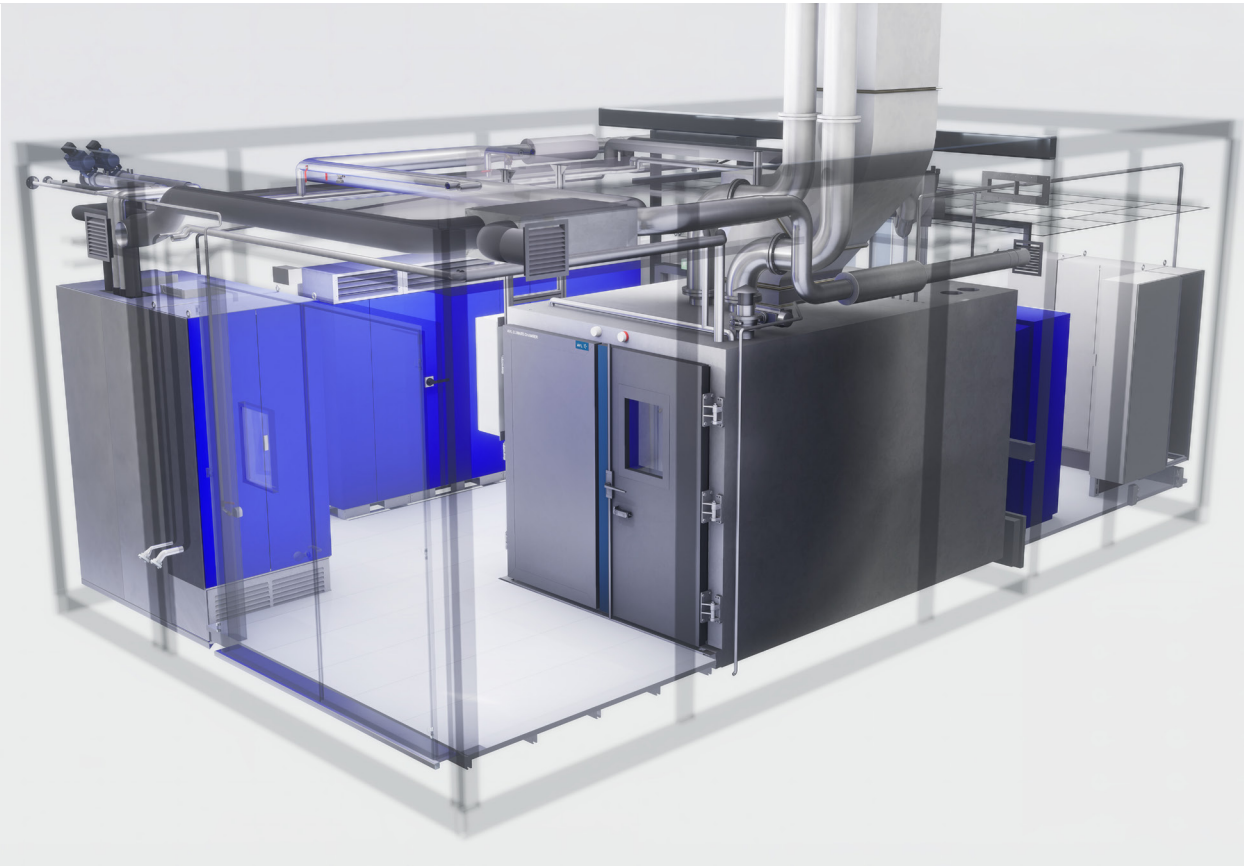
URBAN AVIATION TESTING

Battery Testing for Lilium eVTOL

Expertise and test equipment for success in battery development

SUCCESS STORY





CHALLENGE

Lilium is developing a full electric vertical take-off and landing aircraft (eVTOL) including the entire powertrain consisting of batteries, inverter, motor and control software. Especially for the battery, Lilium needs to deliver an innovative product that is new in mechanical, electrical and chemical design to meet specific technical requirements, the aviation certification demands to ensure best in class technology for the future of Urban Air Mobility.

As there is no established testing requirement for batteries in aviation yet, Lilium took the task to develop methods for product validation based on similar aviation projects while considering the established methods from other industries, like the automotive industry.

The necessity of developing a totally new battery to feed the energy demand for an eVTOL requires Lilium to have the best test environment available. In AVL, Lilium found the partner of choice. AVL with its deep and long expertise in battery test systems, has the right products and solutions to help Lilium develop their battery successfully.

AVL designed and proposed a test facility that is being implemented subsequently in several phases. Part of the test facility is the proper test equipment for cell-, pack- and system testing, as well as the infrastructure design from necessary media supply to test facility layout and planning, up to service and support in R&D and production.

RESULT

AVL worked out detailed concepts for the different battery test equipment needs, especially the Cell-, Pack- and System testbeds. Those are customized regarding the specific cell chemistry and aviation design boundaries, like redundancies and communication stack to allow an extensive test operation that goes beyond the borders of in-use operation.

AVL Battery Test Systems offer the possibility to validate battery cells, packs and systems in aviation applications. With the battery control regimes implemented into the testbed system, the aviation battery pack testing can be performed with all jet specific parameters under real environmental and technical conditions.

AVL offers maximum flexibility and value – from individual components to complete testing laboratories with planning and infrastructure solutions, such as:

- AVL E-STORAGE SIC™ battery emulator
- AVL PUMA 2™ Battery automation system
- AVL battery cell and pack system test chambers and the AVL safety system

BENEFITS

Provide ideal conditions for electrical performance tests and thermal or climatic environmental tests

Unique control technology for realistic charging and discharging profiles enables excellent control accuracy with parallel high current dynamics

High system versatility with automatic configuration changes reduces downtime

Easy to use thanks to user-friendly battery test automation software AVL PUMA 2™ Battery

Maximum safety thanks to AVL's functional safety design



A focus was set on the high current flow necessary during the eVTOL starting and landing procedure and the handling of complex redundancy methods of the battery pack units. The offered solution is designed to be implemented stepwise, while still allowing synergy effects for the projects and energy efficiency in the operation. This minimizes the total cost of ownership (TCO) while maximizing transparency of costs, and providing best operational usability of the equipment.

In addition, a test facility building was planned, including a bunker for battery abuse testing, technical building equipment and layout. The concepts and design boundaries are used for the final implementation of the test equipment on the Lilium Campus.

ADDED VALUE

This cooperation is valuable for both sides. AVL can share its engineering expertise and solution offerings into new mobility sectors and Lilium gains speed and trustworthy technology. Increased speed in development and verification for new battery packs. The collaboration allows Lilium to focus on the relevant eVTOL technology and rely on test equipment to have the best setup for development and a quicker time to market. It allows for independent testing having their own testbeds available at their facility.



„Outsourcing test and verification tasks of our newly developed battery pack to a third party was not an option, as we need to be as close as possible to the product to ensure fastest and smoothest development.“

Daniel Quinger,
Team Lead Energy Testing, Lilium

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