SpeedBat - AM based smart battery pack for space and future mobility applications

Abstract:

SpeedBat develops a TRL7 ultra-lightweight, scalable battery pack for space and unmanned electric flying vehicles (UEFV), starting from TRL4 and validated on the S30 Speeder (TRL5). It leverages metal additive manufacturing to embed electrical functions, interconnections, and heating elements directly into the structure, reducing integration time. The design addresses demisability, recyclability, and scalability via parametric design. The architecture enables easy replacement of defective cells, avoiding full system replacement. Commercialization by Almatech is expected within two years. The consortium includes SMEs ALM and SPEEDER, AMRC, and CSEM.



Countries involved

Application sectors
Aerospace, Space, maritime drones

Research and innovation domains
Advanced manufacturing processes, Sustainable manufacturing

Total cost in M€ (millions)
2.39 M€

Starting date
01/06/2026

Duration (in months)
26 months

Project leader
Emmanuel Onillon
emmanuel.onillon@csem.ch
Centre Suisse d'Electronique et de Microtechnique SA

Project participans
Almatech SA
Speeder Systems LTD
AMRC

RATIONALE OF THE PROJECT

SpeedBat addresses the need for lightweight, cost-efficient, and scalable battery systems for space and Unmanned Electric Flying Vehicles (UEFVs). Current solutions rely on conventional manufacturing with multiple assembly steps, complex wiring, limited scalability, and high costs. These constraints increase integration time, risk of failure (e.g. misconnection), and limit design optimisation in terms of weight, thermal performance, and functionality.
The space and UEFV markets demand batteries with reduced mass, improved reliability, and lower production costs. Existing battery packaging is bulky, poorly optimized, and difficult to adapt to different missions, while electrical integration remains complex and expensive. In parallel, UEFVs face strong limitations in range and payload due to battery weight and inefficient volume usage.

The project tackles these challenges by leveraging additive manufacturing to integrate electrical functionalities (wiring, connectors, heaters) directly into the battery structure, reducing assembly steps and improving reliability. However, key challenges remain in scaling the manufacturing process, ensuring material properties, enabling efficient post-processing (e.g. powder removal in complex channels), and achieving certification for demanding aerospace environments. SpeedBat therefore aims to overcome technological, manufacturing, and integration barriers to enable next-generation structural and multifunctional battery systems.

TECHNOLOGICAL INNOVATION, ACHIEVEMENTS AND RESULTS

SpeedBat introduces a breakthrough battery pack architecture embedding electrical functionalities (conductors, connectors, heaters) directly into additively manufactured structures, eliminating complex wiring and reducing integration steps by up to a factor of three versus state-of-the-art harness-based solutions. The project advances laser powder bed fusion (L-PBF) through multi-laser process development using Aheadd® CP1 alloy, enabling higher productivity, improved surface quality, and supportless manufacturing of complex geometries. In parallel, innovative post-processing solutions, including Hirtisation, address key challenges such as powder removal and internal channel finishing. Key achievements include a scalable, parametric battery architecture enabling modular capacity extension, integration of structural battery concepts for UEFVs, and design approaches accounting for manufacturing, cleaning, and insulation constraints. These innovations target ~20% mass reduction and significant cost reduction.

MARKET POTENTIAL

SpeedBat targets growing markets in space batteries and UEFVs, driven by demand for lightweight, low-cost, and scalable energy systems. The space battery market benefits from increasing satellite constellations (~1000 satellites/year), leading to potential demand of ~2000 batteries annually. Current battery costs (~500 k€) are expected to decrease significantly (~70 k€), enabling large-scale deployment. In parallel, the global drone market is projected to grow from $30B (2022) to >$55B by 2030, with the UAV battery market reaching ~$8B by 2028. Structural battery solutions offer strong competitive advantage by improving payload, range, and efficiency. SpeedBat enables cost reduction, mass reduction (>20%), scalability, and integration, positioning it to capture a share of high-value space and emerging UEFV markets.

IMPACT POTENTIAL

SpeedBat delivers strong industrial and economic impact by enabling lightweight, cost-efficient, and scalable battery systems for space and UEFVs. A ~20% mass reduction and simplified integration lower launch costs, increase payload, and improve reliability. Structural batteries enhance UEFV range, payload, and efficiency, boosting competitiveness in fast-growing drone markets. The project strengthens the European additive manufacturing value chain, supports SMEs, and accelerates industrial adoption, opening new commercial opportunities in space and future mobility sectors.

