BATTERY ENGINEERING

Custom lithium battery engineering for autonomous aerial systems

A high-current battery pack engineered for compact packaging, mechanical resilience, repeatable manufacture and application-specific testing.



Industry

Aviation and autonomous systems

Application

Custom lithium-ion battery power for an autonomous aerial system

43.2V
Nominal pack voltage

2.68kWh
Nominal battery energy

2kW
Continuous power

100A
High-current pulse capability

Prescribed Load Profile

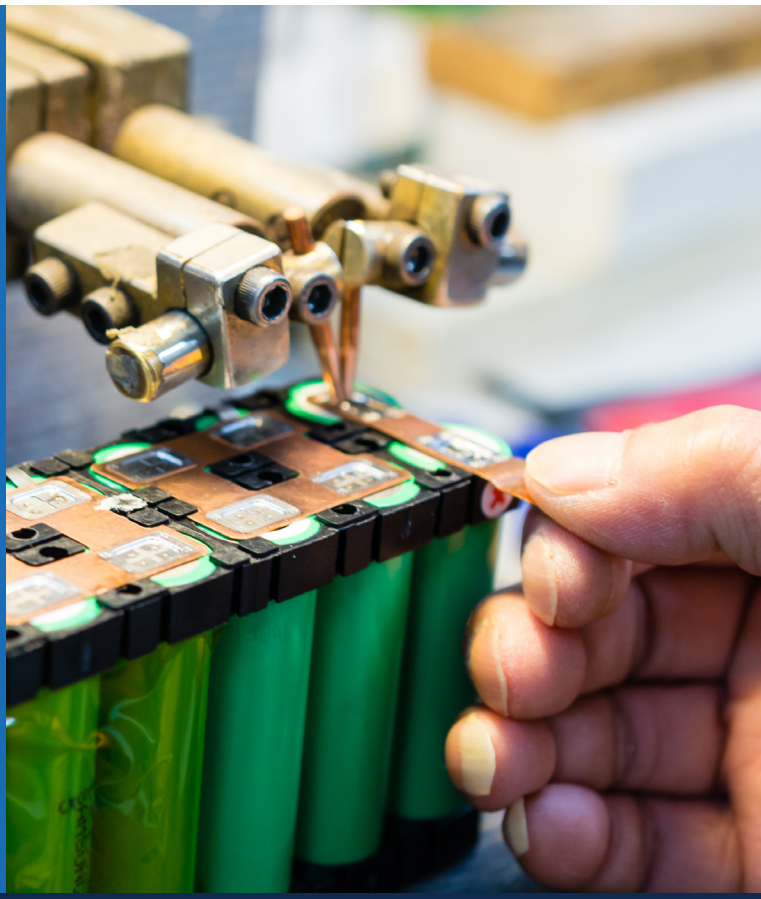
Operational scenarios in the field demand 40A continuous discharge with short duration pulses of 100A.
High current test equipment is programmed to emulate this typical load profile

The challenge

High power within a constrained footprint.

Autonomous aerial systems need a battery that can deliver high current without adding unnecessary weight or taking up valuable space. Connections and internal components must also withstand vibration and high G forces while limiting heat build-up.

For this mission-critical application, reliable power delivery was a core design requirement. The battery needed to maximise usable run time and maintain consistent power under changing loads, while supporting repeatable manufacture. A capacity rating alone would not show how the pack responded throughout discharge.



Developing a high-current or space-constrained battery?
Book a technicaldesign discussion with MI Battery Engineering about the load profile, packaging and testing requirements.
www.mibattery.com.au

13 Sheridan Close
Milperra NSW 2214 Sydney
P +6161 2 9519 1200
E sales@mibattery.com.au

41 Wisdom Terrace
Wangara WA 6065 Perth
P +61 8 9320 5444
E wasales@mibattery.com.au

Certified System Quality ISO 9001 SAI GLOBAL

BATTERY ENGINEERING



The solution

A custom pack, designed through to production.

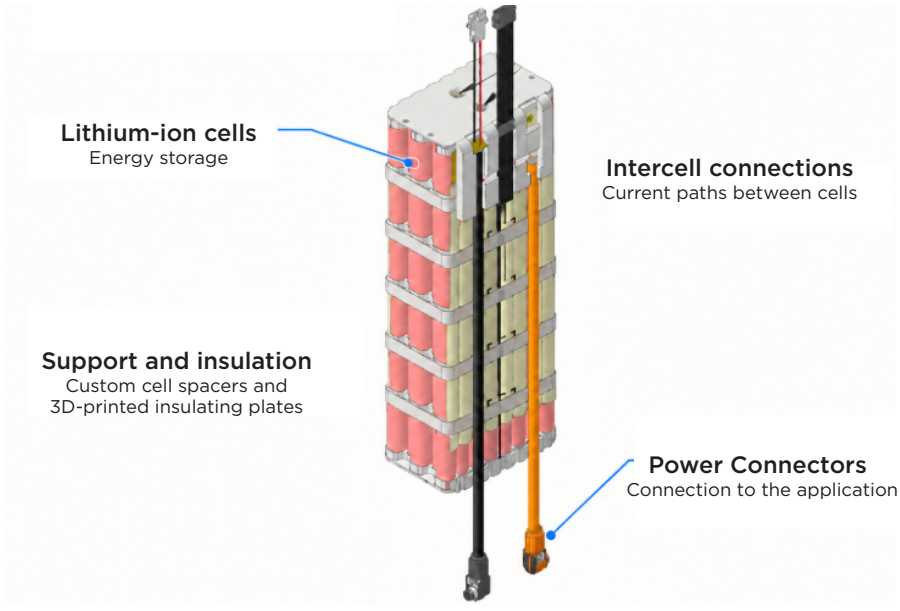
MI Battery Engineering designed a custom lithium-ion pack with purpose-made cell spacers, laser-cut intercell connections and high-reliability connectors. Insulating plates were designed and 3D printed to protect the assembly; 3D-printed components provided insulation and shock absorption.

Several prototypes refined current delivery, weight and the internal arrangement. Laser-cut links and new automated welding equipment supported tight manufacturing tolerances and repeatable assembly. In-process tests and work instructions made the pack ready for higher-volume production, with procedures refined as the design matured.

The work prompted the purchase of a precision bidirectional electronic load to reproduce the application-specific load profile before delivery. Temporary smart monitoring logged cell group voltages for capacity and balance checks. Packs were supplied with cells balanced and capacity verified through this process. The work also involved evaluation of high-performance 3D-printing materials.

Custom battery pack construction

Simplified engineering illustration





Custom intercell connections and cell spacers during battery-pack assembly.



Battery pack connected for bench testing, with temporary voltage monitoring leads.

Developing a high-current or space-constrained battery?
Book a technicaldesign discussion with MI Battery Engineering about the load profile, packaging and testing requirements.
www.mibattery.com.au

13 Sheridan Close
Milperra NSW 2214 Sydney
P +6161 2 9519 1200
E sales@mibattery.com.au

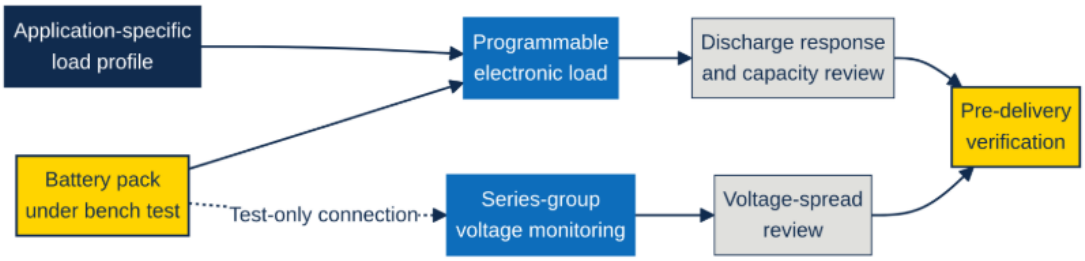
41 Wisdom Terrace
Wangara WA 6065 Perth
P +61 8 9320 5444
E wasales@mibattery.com.au

Certified System Quality ISO 9001 SAI GLOBAL

Technical configuration

BATTERY ENGINEERING

Subsystem	Equipment	Configuration
Energy storage	Custom lithium-ion battery pack	**43.2 V nominal · 2.68 kWh nominal**
Cell arrangement	**High-rate lithium-ion NMC cells · 216 X 18650**	**12S18P · 12 series groups, 18 parallel cells per group**
DC output	Custom pack power connections	**4 kW continuous · peaks up to 5kW**
Welding and interconnects	Laser-cut links · new automated welding equipment	High-current paths · high-G-load requirements · tight tolerances and repeatable weld positioning
Internal support	Custom cell spacers	Pack-specific cell positionin
3D printing	Purpose-designed insulating plates	Insulation and shock absorption
Bench load testing	Precision bidirectional electronic load **programmed to specific load profile**	40A stages · 2 × 100 A pulses of 1 minute · 89 minutes minimum
Test monitoring	**Logging through smart BMS**	Series-group voltage logging · bench use only, not installed in the application



Application-specific battery validation. This is a high-level process graphic, not an electrical schematic.

Key design consideration

A custom pack, designed through to production.

Pack-level readings do not show the full picture. Differences between series connected cell groups can become more apparent as the battery discharges or the load rises.

Testing monitored cell-group voltages throughout discharge to highlight any under-performing cell-groups and confirm they all met the required tight voltage-spread tolerance. Observing real time discharge response and voltage balance under load provided a more useful view of battery behaviour than nominal capacity test alone, and provided firm evidence of performance compliance before delivery.

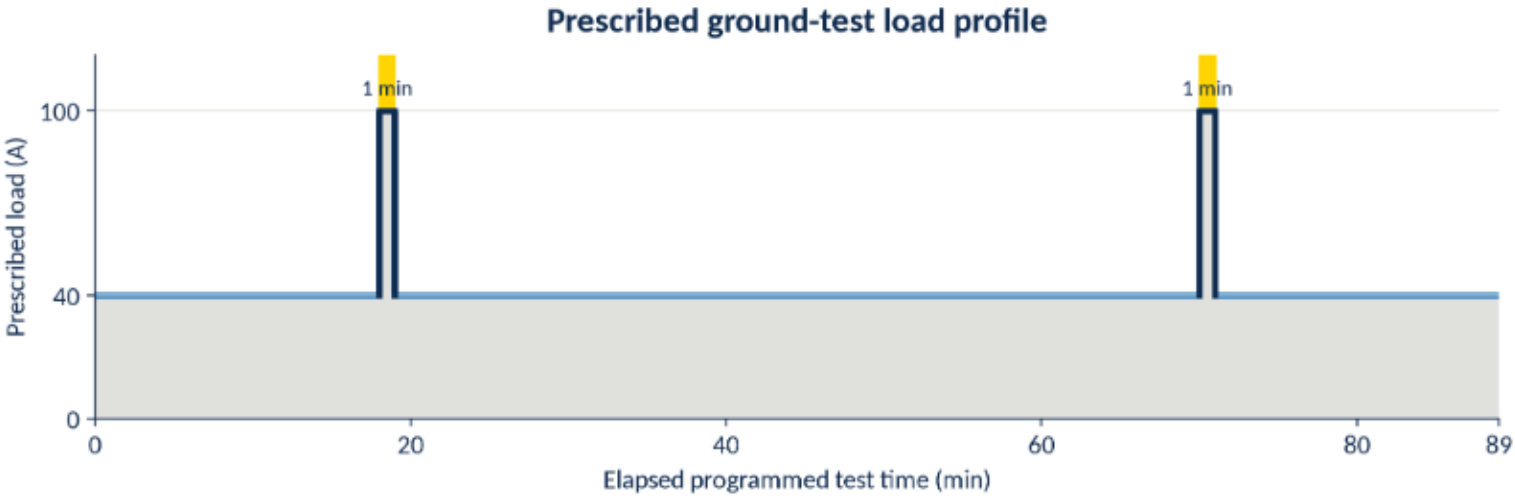


Developing a high-current or space-constrained battery?
Book a technicaldesign discussion with MI Battery Engineering about the load profile, packaging and testing requirements.
www.mibattery.com.au

13 Sheridan Close
Milperra NSW 2214 Sydney
P +6161 2 9519 1200
E sales@mibattery.com.au

41 Wisdom Terrace
Wangara WA 6065 Perth
P +61 8 9320 5444
E wasales@mibattery.com.au

Certified System Quality ISO 9001 SAI GLOBAL



Specified ground-test program: 40 A stages with two one-minute 100 A pulses over 89 minutes.
The graph shows the prescribed load profile, not measured discharge results or flight endurance.

The benefits

High-current performance

Prototype development improved current delivery, with capability reported at over 100 A

Pre-delivery load testing checked capacity and voltage behaviour against the specified profile, rather than relying on the nominal rating alone.

Mechanical performance and weight

Prototyping improved shock and vibration resistance and reduced pack weight

3D-printed components provided insulation and shock absorption within the custom assembly.

Production readiness and assembly efficiency

The pack was made ready for higher-volume production through documented work instructions and in-process tests, refined as the design matured to improve assembly accuracy and repeatability.

Assembly efficiencies also reduced production cost

Investment in testing and materials

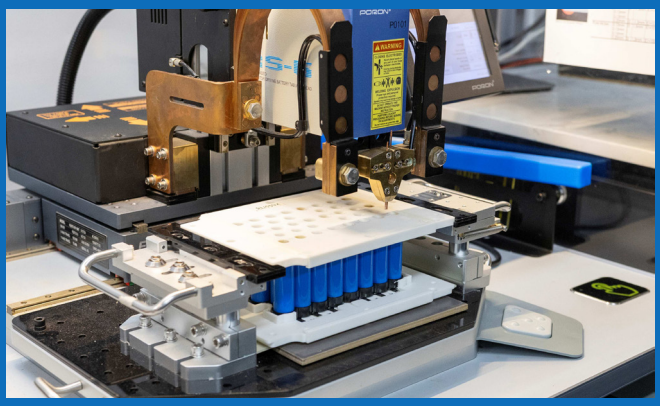
The project led to new test equipment being purchased and evaluation of high-performance 3D-printing materials, strengthening the focus on assembly repeatability and accuracy.

Sovereign engineering capability

Keeping battery design, assembly and testing capability in Australia supported security requirements, local troubleshooting and supply reliability. Local design changes helped manage risk and lead times as project requirements evolved.

Mechanical performance and weight

The design was revised in collaboration with the client as specifications changed and field testing identified improvements. Local engineering capability supported rapid changes to meet new requirements and project milestones.



MI BATTERY ENGINEERING

Developing a high-current or space-constrained battery?
Book a technicaldesign discussion with MI Battery Engineering about the load profile, packaging and testing requirements.
www.mibattery.com.au

13 Sheridan Close
Milperra NSW 2214 Sydney
P +6161 2 9519 1200
E sales@mibattery.com.au

41 Wisdom Terrace
Wangara WA 6065 Perth
P +61 8 9320 5444
E wasales@mibattery.com.au

Certified System Quality ISO 9001 SAI GLOBAL