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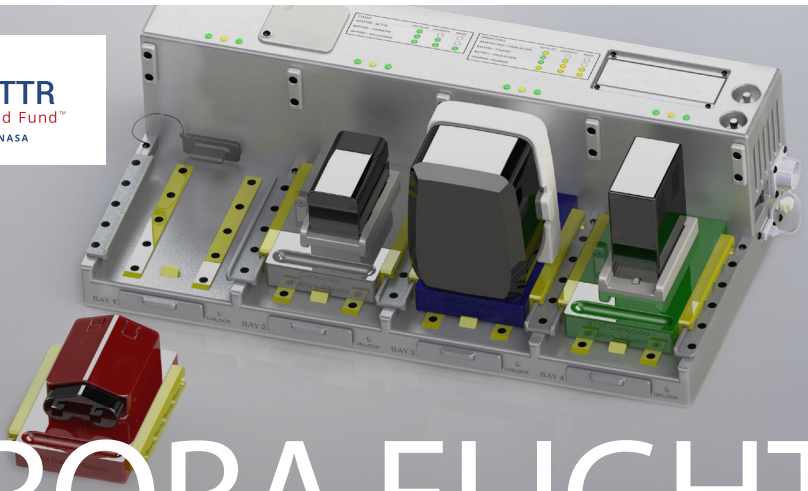

CAD image of the Universal Battery Charger showing four separate battery types

AURORA FLIGHT SCIENCESCORPORATION

From camcorders and digital cameras, to science experiments, to drills, the International Space Station is home to a handful of tech gadgets and power tools that constantly need to be charged. Just like on Earth, all of these things require their own dedicated chargers. While the obvious inconvenience of lugging dozens of various adapters to space might seem like reason enough to invest in a universal battery charger, the driving force is actually the cost. The estimated total to launch 1 kg (a little over 2 pounds) of equipment into orbit is over $10,000. Although the newer launch vehicles may drive that figure down, it will still cost thousands of dollars to send equipment into space – necessitating a simpler, cost-effective system for use on the ISS.

PROJECT
ISS Universal Battery Charger (UBC)

MISSION DIRECTORATE
Human Exploration and Operations

PHASE III SUCCESS
Recent Phase III follow-on contracts with NASA worth $200K to supply the UBC to the Internatwional Space Station; technology results in costs savings of $2 million per launch.

SNAPSHOT
Aurora Flight Sciences has utilized the NASA SBIR program to develop a Universal Battery Charger for use on the ISS capable of interfacing with the most commonly used batteries on board.

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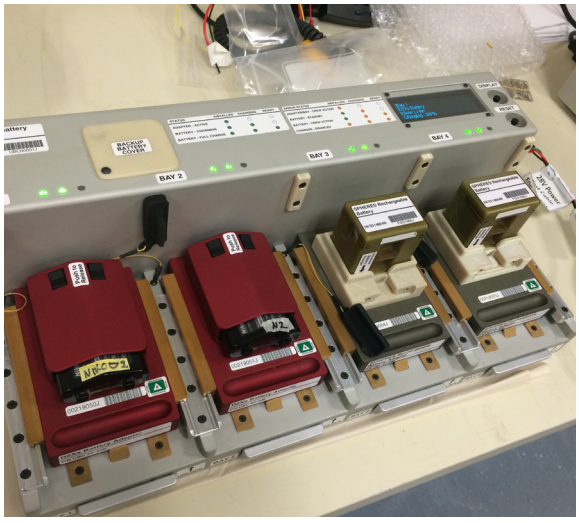
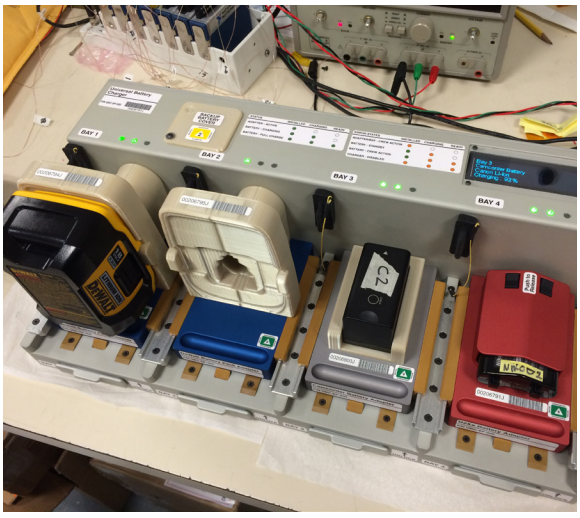
Aurora Flight Sciences had been developing payloads for use on the ISS spanning several decades. One of its ISS payloads, SPHERES, which is a collection of miniaturized satellites used for experiments, was burning through large amounts of non-rechargeable alkaline batteries. This equated to a few million dollars in launch costs. A 2010 NASA Small Business Innovation Research (SBIR) solicitation sought the development of a rechargeable battery for SPHERES. Familiar with NASA's needs, Aurora responded to the solicitation, but brought a whole other idea to the table.

"We originally thought we would build this rechargeable system for our payload under this SBIR," recalls John Merk, Space Systems Group Lead for Aurora Flight Sciences. "But we felt that satisfying our own needs wasn't enough. We ended up pitching a universal battery charging system for the ISS that could accommodate much more than SPHERES. It would be capable of charging most of the commonly used batteries on board the ISS."

Aurora won a Phase I SBIR award from NASA and began to work on the conceptual design for what would soon be called the Universal Battery Charger (UBC). The company began looking at every type of rechargeable battery currently in use on the station. Since different batteries require different voltages and charging schemes, solutions were brainstormed to account for these differences. The ISS is also limited when it comes to power sources, similar to how there are never enough wall outlets in a bedroom. When Aurora won a subsequent Phase II award to begin building a more detailed design, the company was well on its way to turning their idea into a tangible system.





TOP LEFT Universal Battery Charger base system, charging (2) Nikon li-ion batteries and (2) custom SPHERES li-ion batteries

TOP RIGHT Universal BatteryChargerundergoing testing at Aurora's R&D Center, charging several different battery types (colored indicators and screen show status of batteries being charged)

BOTTOM Aurora Flight Sciences, along with MIT and Pratt & Whitney, are developing the next generation of electric aircraft. Pictured here is the D8 "Double Bubble" design concept

"We were able to say we have this great idea, and we want to turn it into a flight program," says Merk. "NASA really wanted to see it happen. We were engaged with the ISS vehicle office, and they agreed to be a Phase III sponsor – the SBIR helped us turn this into a real program."

"As a small R&D firm, you have to go after these higher risk, cutting edge technologies that are only funded under SBIR."

AURORA FLIGHT SCIENCES
SPACE SYSTEMS GROUP LEAD
JOHN MERK

The resulting design utilizes a four-channel base unit and sliding, removable battery adapters for a more savvy and space-saving design. Each adapter is specific to one battery type and contains all the information required to safely charge the batteries. Since every charger that makes its way onto the ISS has to pass stringent safety tests, creating a one-size-fits-all charger reduces the manpower and hours needed to perform multiple tests on different units.

Follow-on contracts with NASA soon followed worth $200K to supply UBC units to the ISS, which are set to make a debut with the launch of Space X 8 in 2016. Aurora has a rich history with the NASA SBIR program, dating back to 1986. Current projects that supplement the UBC include the development of a new-age spacesuit for NASA astronauts, building hybrid nanocomposites for future aircraft, and developing electric drive for vertical lifts. Aurora is also concurrently serving as the prime contractor on one of NASA's most anticipated projects – the D8 "Double Bubble" future aircraft series. In tandem with MIT and Pratt & Whitney, this project involves the revolutionary design of future aircraft through physics-based modeling across multiple engineering disciplines. The D8 has the potential of achieving a 71% reduction in fuel burn, a 60 EPNdB reduction in noise, and an 87% reduction in emissions.

For the Department of Defense, Aurora is currently in discussions regarding an internal rechargable battery on one of the agency's small satellites that would be launched from the ISS. Additional applications are being developed that involve a custom battery for an Extravehicular Activity application.

"For us, the NASA SBIR program has been invaluable," says Merk. "As a small R&D center, you have to go after these higher risk, cutting edge technologies that are only funded under SBIR. But you develop them and grow them into actual products. And many of our SBIRs have been integrated somehow into Aurora's larger portfolio."