Elektro-Automatik

EA Elektro-Automatik Powers the Future of Sustainable Flight

Enabling Aviation's Transition to a Net-zero Future

The growth of electric vehicles that we see on our roadways is taking to the skies as well. The world's leading aviation and engine companies are moving rapidly to an electrified, zero-emission future.

Airlines have committed to aggressive renewable energy goals, with a drive by many to achieve net-zero greenhouse gas emissions by 2050. Some have even announced plans to move to hydrogen-powered flight on short haul trips during the next decade.

Every corner of the aviation ecosystem is being re-imagined for an electric, sustainable future. The traditional internal combustion and kerosene engines that have powered airplanes since the days of the Wright brothers are being re-designed to become DC electrified power plants fueled by liquid hydrogen. In fact work is under way to convert every system on the plane – and on the ground – to DC power.

For aerospace engineers charged with leading the initiatives to make this possible, the task in some ways can be far more complex than what is faced by their automotive electric vehicle counterparts – since an electric plane requires substantially more power, along with even greater safety and reliability performance.

Developing New Technologies for Sustainable Fuel

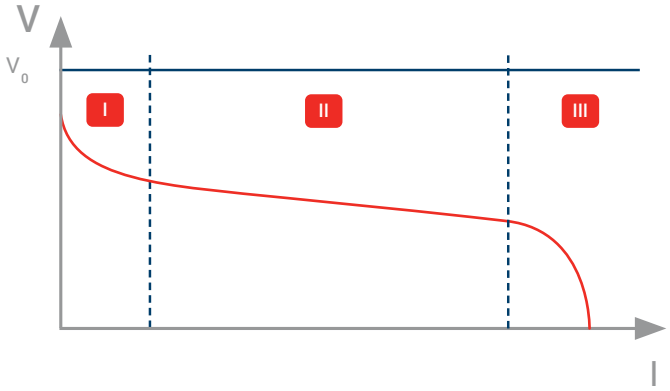
Sustainable fuel and power systems in tomorrow's airplanes will require an entirely new DC electrified charging and propulsion systems rather than today's mix of DC and AC power solutions. Engineers are hard at work tackling the many barriers that must be overcome for these new technologies to take flight:

- Energy supply and storage, encompassing liquid hydrogen fuel and fuel cell battery management technologies. These systems must be capable of providing clean, smooth power during peak take-off demands as well as more moderate in-flight power requirements
- Weight and size of engines and battery power systems
- Ability to withstand extreme/harsh conditions, ranging from vibration, temperature changes, humidity, and high acceleration/gravity conditions
- Hazardous materials, including lithium batteries and explosive hydrogen that needs to be loaded and containedin a liquid condition at -250 degrees Celsius or, alternatively, may be stored as gas under pressure up to 700 bar
- A range of power conversion and power distribution systems to convert main DC supply grid levels of 700-1000V into lower ranges for instrumentation (28 VDC), air conditioning (400 VDC), or critical landing gear/wing control/braking systems (±270 VDC)

Inventing New Power and Test Routines

EA Elektro-Automatik power supply and load technologies are relied upon by today's new aviation pioneers as they move rapidly to innovate every facet of aerospace power systems in their drive to switch from AC to DC power. Each new electronic system and device must be thoroughly tested for performance, reliability, EMI interference and safety. Every solution presents first-of-its-kind challenges that must be proven out initially in development labs on the ground, and ultimately in flight.

- High power DC electric propulsion motors (electric turbines) with megawatt-capable peak power levels
- Passenger-related heat/air conditioning, lighting, infotainment
- Heavy-duty landing flaps/braking/landing gear
- Avionics instrumentation
- Battery capacity and efficiency for long distance flights – fuel cells paired with non-flammable battery boosters



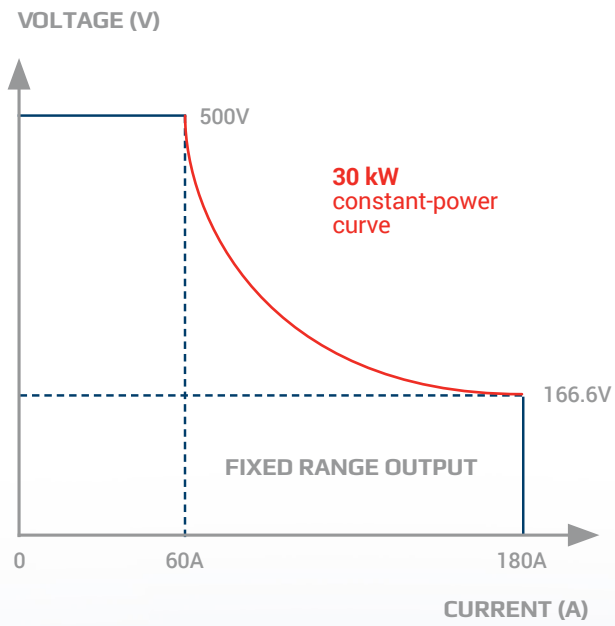
With the XY Table mode, the EA supply can simulate a fuel cell's output as shown here. Using the fuel cell output characteristic, testing the load circuit ensures that the circuit can operate under the varying output characteristic of the fuel cell.

The industry is focused on re-defining the entire "green" aviation ecosystem and hydrogen supply chain, beyond what is taking place to prepare the plane itself for flight. This includes hydrogen fuel produced by electrolysers, powered by solar power installations, as well as transporting the hydrogen fuel to the airport in emerging electric-powered trucks.

Testing the Future of Flight

EA Elektro-Automatik offers a range of power conversion products to properly test all these electrical and electronic devices and networks, with power ranges of 320W up to 3.84MW, and voltage ranges from of 0-60 VDC to up to 0-2000 VDC and current ranges up to 64,000A. EA products are particularly well-suited for these demanding test routines.

- **True Autoranging Capability.** This allows engineers to test a greater range of devices by delivering full power output over a wide range of voltages and currents. An EA supply can provide full power output down to 1/3 of its maximum voltage and current. As a result, EA can often provide a lower power DC supply for a given load requirement, save test rack space, and save on cooling requirements, all of which enables substantial cost savings and test system simplification.
- **Bidirectional Regenerative Power Supplies.** EA Elektro-Automatik's bidirectional power supplies are regenerative in sink mode, so that during testing (specifically long-term testing), the energy extracted from the device under test is recovered and sent back into the grid with 96% efficiency, paying for itself in just a few years.
- **Built-in Function Generator.** Unlike conventional power supplies, an external signal generator is not needed to connect with a power supply to modulate the power supply output.
- **Electronic Loads with Energy Recovery.** EA electronic loads with the same autoranging, function generator, and regenerative energy recovery features can test the fuel cell power source. The electronic load can simulate a wide range of states of the load, including failure states to ensure the fuel cell can output the necessary power and safely respond to any operating mode of the load.



True Autoranging: Output characteristic of EA Elektro-Automatik power supplies compared with a fixed range output power supply

A Long History of Aviation Test Performance

EA Elektro-Automatik is far from a newcomer to solving the difficult challenges of aviation/aerospace engineering. Whether it is airplane, drone or unmanned aerial vehicles, EA brings a deep track record of expertise in designing and testing to the world's most rigorous test routines and commercial/military standards:

- Reliability Test
- Functional Test
- Aging Test
- Auxiliary Equipment (Power and load) in EMC test
  - EN 61000-6-3:2011-09 (EMC) - Part 6-3 Class B Quality
- Regulation and Response Performance Test
- MIL-STD-1275, DEF-STAN 59-411, 61-5pt 6 issue 5 or 6
- MIL-STD-704 B-F, RTCA/DO-160 version F/G, GJB181-86/A-2003/B-2012
  - DC 28V Power Group
  - DC 270V Power Group (replaces 115V~ 400Hz)

Learn more at elektroautomatik.com

Elektro-Automatik

The Ideal Partner to the Sustainable Aviation Industry

EA Elektro-Automatik is a proven partner to the commercial and military aerospace industry, bringing nearly 50 years of demanding power and test innovation inconventional and electric aviation, passenger and commercial vehicle and locomotive technology development. Building on our position as Europe's leading manufacturer of programmable power supplies, EA Elektro-Automatik is positioned alongside the world's most talented engineers to help solve the industry's demanding power and test challenges.