

# Green juice



Growing passenger expectations regarding the availability of in-seat power have forced an increasing number of airlines to look around for efficient, reliable power solutions.

**Reducing onboard energy consumption slims down a carrier's costs. Henry Canaday examines some healthier options for providing in-seat power.**

**It's** tough to be an airline today. Passengers are demanding more power for entertainment and communication in seats. Environmentalists want less fuel burn, reduced material waste and fewer dangerous chemicals flying around, and to cut damage to land, air and water. There is a conflict there, between pushing power to passengers and limiting carbon and other footprints.

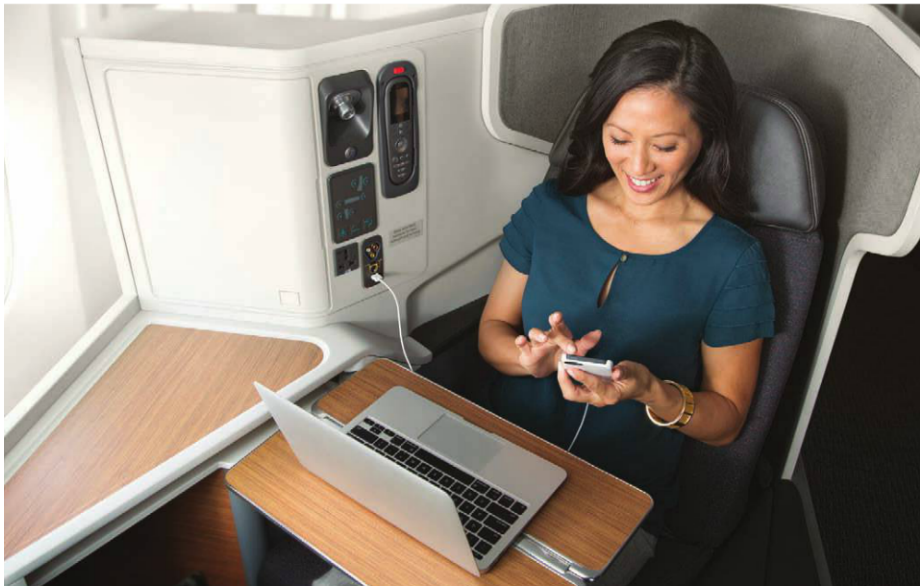
One path to meeting both objectives is to choose the greenest possible systems for in-seat power. Green here means several things. Efficient power distribution shrinks wasted energy, minimising cabin heat and power demands. Lighter systems reduce aircraft weight, cutting fuel use. Reliable, long-lived technology diminishes repairs and downtime, which are energy and material wasters.

And power delivery is just one part of the chain. Green distribution devices should be compatible with highly efficient generators and power-using equipment as well.

Paying attention to efficiency, weight, reliability and compatibility pays cash dividends to carriers, too, while they protect the environment. The benefits of other green features are less directly obvious.

Manufacturing power systems in an environmentally friendly manner may bring no immediate benefit to airlines. But green manufacturing can save money at recycling time, or when regulators enforce new rules on system providers and equipment must be replaced.

So smart choices are the order of the day. Fortunately, power distribution vendors are working hard to improve these choices. "The greenest form of power provision an airline can offer is no power," jokes Jens Brey, KID-Systeme's product manager cabin systems.



Price and weight are typically the key considerations for airlines looking to install in-seat power, but system efficiency and reliability affect carriers' bottom lines as well.

"But that means no comfort, no modern life and no social network." That is not KID's goal.

KID's Skypower is an advanced in-seat power and cabin power management system that gives passengers juice for their personal electronic devices, including laptops, smartphones and tablets. It is flexible enough to work with the latest cabin and consumer technologies, and can be accessed via USB and 110V AC.

The firm's Skyfi, meanwhile, is an onboard connectivity platform that offers a wide range of communication options, media applications and services. Skyfi can provide GSM telephony and data, or full telephony and internet services, plus the ability to stream content to personal devices via an airline app.

#### INTELLIGENT DESIGN

KID powers more than 300,000 seats on airlines today. According to Brey, its power products consume low energy and have a green system and production lifecycle. "Our engineers design high-efficiency processes to minimise weight per watt and standby power consumption per passenger," he stresses.

The manufacturer has also established a continuing method of cutting the use of power, water and harmful substances, and reducing waste, at its production facilities. It works with local sub-suppliers to reduce fuel used for long transportation links. And Brey argues that the high reliability of KID's products minimises replacement and repair, thereby also reducing the amount of fuel used for transportation.

He says today's airlines are chiefly interested in low price and low weight. "I believe this will change in the near future, because of fuel prices

and global discussion of carbon footprints and their social and cultural effects," he affirms. "We stand for a green future."

Astronics is another long-established provider of aircraft power distribution products. Its EmPower in-seat power systems are in service with more than 150 airlines.

Astronics also provides advanced aircraft electrical systems for business jets, and pioneered the first solid-state power distribution for such aircraft. Solid-state systems replace extensive wiring and electromechanical components with modular electronics and software. This reduces wire weight by up to 30% and power waste by up to 60%, compared with traditional systems. Both improvements reduce fuel burn.

The company's CorePower line offers distribution, brushless starter generators, plus custom-designed distribution and power management units. It features solid-state circuit switching, and Astronics says it offers "high reliability, intelligent power management, thorough integration, distributed architecture and low weight". The company also customises electronics for many business and commercial jets, so operators do not buy or carry more weight than their needs dictate.

The firm builds a wide variety of power management units, with over 345,000 already installed. The Power Distribution Unit is Astronics' workhorse, which unsurprisingly supplies power to distribution units around the aircraft. The PDU also integrates power management functions into its in-seat systems.

Given a set level of power demand by passengers, efficiency of distribution is one key to minimising power required from engines,

explains Christine Ellis, Astronics' director of business development. The company's solution, which provides AC or USB power for personal devices, has efficiency upwards of 90%, even though no airline has mandated an efficiency requirement.

Airlines have not required green manufacturing processes either. But inflight entertainment OEMs have begun to mandate these processes, for example by eliminating lead and other substances. Astronics is complying with these IFE mandates.

Further, the Dodd-Frank Wall Street Reform and Consumer Protection Act in the US requires disclosure of whether conflict minerals – minerals extracted in a conflict zone and sold to perpetuate fighting – are in a company's supply chain. Ellis reports that Astronics is evaluating its supply chain for any such materials.

The manufacturer says it will continue to innovate through listening to its customers. Ellis elucidates, "By producing smaller and lighter-weight systems, we enable airlines to offer passengers amenities they expect, while reducing cost and carrying less fuel."

#### CURRENT MODELS

TDI's products include the Model ACS1275 Airborne In-seat Power Supply, which weighs less than two pounds for a three-seat configuration, and supplies both AC and DC outputs. Used as part of the OEM's Airborne Power Management System, these devices supply power on demand to all passengers without ancillary equipment such as master control units. TDI has 20,000 power supplies flying on over 600 Airbus, Boeing and Embraer types.

The company also makes LED lighting power supplies to replace ballast in fluorescent lamps, eliminating redundant enclosures and saving weight.

Ron DeLuca, TDI's vice-president of engineering, explains, "We build everything to RoHS standards." RoHS stands for Restriction of Hazardous Substances, the European directive controlling the use of certain hazardous constituents. "And we build high-efficiency products that are 90% or more efficient, depending on the application."





Pascall, like other manufacturers of aircraft power products, designs its offerings with longevity, efficiency, weight and size in mind.

Greater efficiency cuts the demand on engines. In addition, DeLuca points out that there is a reduction in the generation of heat from wasted electricity. Less heat in the cabin equates to less cooling power needed, thus less bulk and less fuel burned. And less waste can allow for other power needs, further reducing cost.

TDI designs its in-seat power systems for WF, or wild frequency. New generators that are smaller and lighter than traditional models are also less fixed in the frequencies they put out. By designing for these WF generators, TDI is adding to its raft of energy savings on board.

Pascall Electronics makes a variety of devices for supplying cabin power in civilian aircraft. These are typically AC/DC converters, which convert alternating current from the aircraft power bus to direct current. Pascall also offers DC/DC converters, which step up or down voltage levels according to equipment requirements.

The company's devices alter power characteristics to support many cabin requirements, including high-power USB, satellite communications, direct-broadcast satellite (DBS) TV, seat displays, media servers, cellular communications and lighting.

#### UP TO SPEC

Equipment must first comply with customer specifications and airworthiness regulations, notes Phil Brace of Pascall's IFEC and Airborne Power Solutions division. These rules incorporate tests for electric and environmental conditions, including electromagnetic compatibility. Pascall does power factor correction and protects against short outages. The RTCA specification DO-160 sets nominal requirements, which airframe OEMs enhance with further demands.

Pascall optimises power solutions for longevity, efficiency, mass, materials, size, temperature and airflow. Brace says, "One of the most environmentally responsible things you can do is ensure your equipment has a long lifetime and is very reliable. Having units shipped around the world for repair and return is not environmentally friendly, nor is replacing them completely." Pascall designs for long

service life and has equipment integrated into some major IFE systems that have been flying for seven to ten years. These same units can also be refurbished, rather than replaced, as part of a customer-planned long-term maintenance programme.

Pascall aims for power conversion efficiency in the mid to high 80s, Brace says. The firm manages equipment size and weight through design optimisation and the use of surface-mount components. Thermal management is achieved through either passive convection cooling by heat sinks in equipment housings, or fans that activate at pre-set temperatures. The choice depends on both unit power and size and customer preferences.

The company is committed to protecting the environment and to continual improvement of its environmental performance in all operations. Pascall has operated an environmental management system accredited to an internationally recognised standard since 2008. The standard requires the company to reduce energy usage and waste in production, increase recycling, purchase in an ecologically friendly way, plus train its employees in how to impose environmental controls in their areas of responsibility.

Pascall continually monitors its system to assess its effectiveness and ensure compliance with policy, as well as to drive further improvements. Brace says that the company's physical location also leads it to impose a high level of green responsibility. He explains, "We are located on the Isle of Wight, which has many areas of outstanding natural beauty and designated sites of special scientific interest."

Research demonstrates that an outlet to power a personal device in flight is the fastest-rising need of airline passengers, says Ben Fuller, director of sales and marketing for digEcor. To meet that need, his firm recently

launched its Glide in-seat USB power device, which offers 5V USB power at the lowest cost on the market.

Glide has three elements. Firstly, there are one or more 300W power supplies per seat column, connecting redundantly for fault tolerance. Then there is one USB seat box, powering up to five outlets, for each seat group. Finally, Glide has one remote USB outlet per passenger. It is LED lit for ease of location and glows red to indicate faults. The whole package weighs less than one pound per passenger and fits within existing seat audio provisions.

"It's light and easy to install," Fuller insists. Optional cabin crew outlet controls make it possible to select the seats supplied with power, meaning carriers can sell power for ancillary revenue. So Glide's low weight saves fuel, while its cost and cash-generation potential offer economic benefits.

Bob Hess, senior cabin systems engineer for Commercial Aircraft Solutions at BAE Systems, points out that converting aircraft power to a form that's usable by passengers requires complex electronics. He says, "Traditional in-seat power solutions put the power conversion equipment under every seat."

In contrast, BAE's IntelliCabin uses a new architecture that reduces the total amount of power needed.

IntelliCabin shares power across the entire cabin, allowing a higher quality of service without the need for more power conversion. "This results in a lower weight overall for the system, which directly reduces fuel burn," Hess explains.

BAE is now integrating in-seat power control with other cabin control panels, which should reduce the need for more electronics on the aircraft. Hess adds that this enhancement will further augment weight and fuel savings.

It's tough to be an airline today. Going green costs money initially. However, the right approach to empowering the people will pay dividends in the future, and the fittest will survive and thrive. ■



The proliferation of personal electronic devices amongst today's flying public has resulted in USB outlets becoming standard on new in-seat power installations.