

The requirement for in-seat power has increased in recent years; with an expectation among passengers in all cabin classes for at least some access to power. This is alongside the general requirement for wireless internet and in-flight entertainment.

In-seat power hardware & systems

In-seat power includes power outlets and plug configurations available to airline passengers at their seats while travelling. The availability of these options vary from operator to operator, and will differ further between their fleet types. An operator, for example, may roll out a new in-seat power configuration gradually, installing new power outlets across its long-haul fleet ahead of progressing to the rest of its aircraft.

The main requirement of passengers today is the ability to power personal electronic devices (PEDs). PEDs include mobile phones, smartphones, tablets, laptops and e-readers. The need for in-seat power resources will be greatest on long-haul routes, where overall entertainment for passengers is most prevalent, so they are most commonly seen on medium to widebodied aircraft.

There are three main types of power supply available on aircraft today:

AC power

A seat equipped with alternating current (AC) power supply means that customers only require the standard wall power supply provided by the PED's manufacturer. AC power is 110V AC, which is a worldwide standard. AC power units fit almost all mainstream plugs, including the US, European and UK common configurations (meaning the two and three pin settings).

Passengers usually do not need an adapter, since the plug socket configuration on the aircraft will

incorporate each configuration. As a general rule, a maximum of 125 Watts can be provided by AC power outlets.

DC Power and Empower

EmPower is a connector type found on many commercial airlines. It typically provides about 15V DC power, equating to up to 75 watts per seat. As the per-seat power is limited, however, Empower DC power may not be compatible with all devices. An adapter is often required.

While these may be available from cabin crew in some airline classes, the availability is not universal, so passengers will often need to have their own adapters. The loss in efficiency experienced through using the adaptor also means that a PED may not be sufficiently powered to operate or charge.

In the event of Empower availability on an aircraft, there are two varieties of socket. An EU/UK/USA socket will accept European, UK and USA plugs without the requirement for an adapter, while an EU/USA socket will require a travel adapter for UK-configured plugs.

Universal Serial Bus (USB)

Developed in the mid-1990s, the standard USB interface is the universal format that is compatible with almost all laptop devices. USB ports are designed to supply the electric current needed to charge any standard or high-power device, including mobile phones and tablets, with a USB interface.

In-seat power also varies between cabin classes. Virgin Atlantic offers in-seat power across its Upper Class and



The increase in mainstream in-seat power availability has given passengers more options to use electronic devices in flight.

Premium Economy classes, and a select number of Economy cabins among its Boeing and Airbus aircraft. Virgin's aircraft typically have AC power and USB connections as standard in its Upper Class and Premium Economy cabins, whereas its A330 fleet has AC power, and its A340-600 fleet offers AC Power and USB capabilities in these cabins. In Economy class, USB only is offered across its 747-400 and A330 aircraft, while USB and AC Power is seen both in its Upper Class, Premium Economy and in its 787 standard cabins.

The cost of retrofitting in-seat power will affect an operator's decision to install it on older fleets, so it is more likely to be found on new aircraft types.

British Airways (BA) only provides in-seat power across its mid- to long-haul fleets. BA's Club World and World Traveller Plus cabins have a variety of Empower, USB, EU/USA and EU/UK/USA sockets across its 747, 767, 777 and 787 fleets. Availability in its World Traveller cabins is mixed, with some (not all) 777s providing 110V AC EU/UK/USA sockets and USB connections. This is also the same for its 787 fleet.

In-seat power access, combined with modern in-flight entertainment (IFE) systems, allows passengers to engage in a wide range of activities. IFE and in-seat power is subsequently often interfaced to some extent in modern aircraft cabins. A

survey outlining IFE manufacturers was carried out by *Aircraft Commerce* in 2015 (see *IFE and cabin connectivity providers survey*, *Aircraft Commerce*, August/September 2015, page 20).

IFE systems are generally separated into several categories of hardware: external connectivity hardware; internal connectivity hardware; on-board servers and roll-on/roll-off portable servers; seatback screens and associated hardware and wiring connections; remote control systems; drop-down screens; tablet devices and portable recharging carts; and in-seat plugs and accessories, such as frames for passengers' own PEDs.

There are now three main categories of IFE system: traditional embedded systems, standalone systems with content supplied on tablet devices, and wireless systems. These all depend on either hardware or wireless internal connectivity.

KID-Systeme

KID-Systeme's in-seat power offering is known as 'SKYpower'. It has a separate portfolio covering its IFE capabilities. This is termed 'SKYfi'.

Passengers access SKYpower via USB and 110 volts AC connections. Launched in 1999, it now services more than 300,000 seats worldwide. There are two packages offered to airline customers. The 'SKYpower classic' provides an

interface suitable for every 110-volt power plug design, so that PEDs, such as laptops or tablets, can be recharged during flight. The 'SKYpower USB' interfaces with any plug with a USB connection.

In terms of internal connectivity hardware, KID-Systeme offers several options to support its infrastructure. "The On-Board Control Equipment (OBCE) is a box that actively controls the accessibility of all devices in the cabin," says Johannes Ferstl, product manager connectivity systems at KID-Systeme. "The base transceiver station (BTS) acts as an access point for passengers' mobile devices. There is a universal hardware platform that hosts software applications called the head end server unit (HESU), and an airline control panel (ACP) that operates and maintains the entire system. Cabin WiFi is provided by various access points, supplied by an nWLAN unit called nWLU 2."

In-seat plugs and accessories are also provided by KID-Systeme. "We offer several in-seat power box options, including the ISPC plus, which can feed up to three KID AC Outlet Units, each 150W, and up to two USB Outlet Units," continues Ferstl. "This system offers space and weight efficiency for the airline and comfort to the passenger. 225 watts continuous power is supplied to the AC Outlet Units."

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The second option is the APC-MK2. This can feed up to four KID AC Outlet Units, each 150W, and up to four USB Outlet Units at 2.1 amps. 250 watts continuous power is supplied to the AC Outlet Units, while 28VDC 75W continuous power is supplied to the USB units. The third in the SKYpower range is the ISPS DC. It is the smallest box on the market today. In terms of power supply, it is identical to the APC-MK2, and can power PEDs such as smartphones, MP3 audio players, tablets, Wi-Fi enabled e-readers and portable gaming devices.

The final power box on offer is the ISPM, which feeds up to three AC Outlet Units and up to four USB Outlet Units 2.1 Ampere or three USB Double Outlet Units. It can also power up to three Combined AC & USB Outlet Units.

KID Systeme also supplies outlet units as standard with its SKYpower package. "The AC Outlet Unit (ACOU) is the interface for the passenger to obtain PED power provided by the SKYpower in-seat power system," says Ferstl. "KID-Systeme's ACOU-4 is compatible with all plug types. We also provide USB units as per the SKYpower USB package."

Its combined AC/USB Outlet Unit meets the requirements of both these outlet types. "The combined unit offers the benefits of a USB loading port and of a powerful AC outlet unit for laptops," explains Ferstl. "It is the smallest combined power solution on the market

and provides power to any plug in the world and to a variety of PED devices."

While the SKYpower and SKYfi equipment is installed wired, usage of the IFE system is wireless. The SKYfi system can store more than a terabyte, and standard content for the IFE system is loaded via an external device for all cabin classes. Weekly updates to the IFE can be uploaded via satellite connection. KID-Systeme typically sees greater demand for its SKYpower and SKYfi systems in the narrowbody sector.

IFPL

IFPL is a UK-based manufacturer. It specialises in entertainment hardware for aircraft. IFPL has recently developed a reversible USB power and data module (the Reversible USB-A 1337) that provides in-seat PED power for users. This allows passengers to charge PEDs and transfer data without an operator modifying and subsequently re-certifying its existing seat configurations, which is a significant cost for airlines.

"More than 90% of passengers take PEDs onboard, and this reversible USB module combines USB charging and data transfer capability in one industry standard module," explains David Thomas, head of business development at IFPL. "This means that the module can easily be incorporated into line-fit aircraft or as a retrofit onto existing fleets."

"The module is a simple and quick fit, removing the inconvenience of flat batteries for passengers, and allowing further integrations with on-board IFE."

The module is reversible, which minimises the possibility of customer-induced damage (CID). During its testing phase, the reversible USB module was trialled over 60,000 insertions. The USB-A 1337 supports devices up to 2.1 amps, or 5 volts of DC power. This allows charging of mainstream PEDs including, but not limited to, Apple, all Android, and Windows devices. Because it is an external module, the USB-A 1337 can be easily swapped and replaced in the event of malfunction.

IFPL provides internal connectivity hardware, and in-seat plugs and accessories for aircraft, in the form of USB, Ethernet, 110VAC, Arinc standard audio jacks, and magnetic audio jacks. All systems are connected on board through hardwired installation, rather than WiFi.

The demand for in-seat power is increasing, and cabin amenities, such as WiFi and modernised IFE, are a general expectation across cabins. New aircraft coming into operation, such as the A380, A350 and Boeing 787, are raising the bar for standard cabin configurations. **AC**

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