Over the next two to three years, it is expected that USB-A will vanish as consumer electronics companies begin to make a change to USB-C. USB-C ports can be used to charge larger personal devices. Airlines can therefore use USB-C ports in seats to provide a service to passengers.

The introduction of USB-C and its potential to offer a better power solution

As passengers' use of personal electronic devices (PEDs) increases, so does the need to provide a power solution to charge PEDs on board the aircraft. The introduction of in-seat USB-C connectors allows passengers to power and charge a variety of electronic devices, giving them a cost-effective alternative to providing AC power.

The growing number of airline and airport apps means that passengers use PEDs for boarding cards, gate information, airport maps, and transfer/taxi services. Many passengers now view their PEDs as essential to modern day air travel as their passport.

PEDs are highly portable, and so make it possible for passengers to enjoy a variety of media, without the need for airlines to change cabin architecture.

With large memories and the ability to download and store TV programmes and movies at the touch of a button, passengers will naturally want to upload their favourite content to a PED prior to flights.

In addition to smartphones and tablets, passengers are increasingly travelling with larger notebook and laptop devices. These offer more content options, a larger screen and the chance to complete work projects and multi-task.

Passengers, therefore, expect to have the facilities to power and charge their devices so that they can stay entertained in the air, but also need enough power post-flight to manage connections, transfers and communications.

Universal Serial Bus (USB) Type A & C

Universal Serial Bus (USB) is an industry standard that is widely used to communicate with, connect and power electronic devices. The single letter suffix in USB-A, -B and -C refers to the type of connector. This is followed by a numeric data standard. In the case of USB-C, this has evolved from 2.0 to 3.0, handling a maximum of 5GB of data. USB-C 3.1 can transfer 10GB of data.

Today, the most common variant is USB-A, which is compatible with almost all modern laptops and notebooks. USB-C is smaller and more slender than USB-A, as well as being designed with a reversible tip that eliminates input orientation.

The USB-A female socket is commonly used in aircraft seatbacks to interface PEDs with the aircraft's IFE system. IFE vendors have historically supported the default USB power that supplies 5V DC at 0.5A or 0.9A delivering 2.5 watts (W) to 4.5W of energy.

An iPhone charger delivers 5W from 5V at 1000 mA. A Retina iPad mini charger delivers 10W from 5.1 volts at 2100 mA. Connecting a cellphone to a USB-A power output of 2.5W will allow continued operation or slowly charge an inoperative one. The current IFE and power systems provide USB-A output in the region of 10W.

USB-C can handle higher data transfer rates and higher current and voltage, giving it the ability to charge increasingly more power-hungry devices. Alternatively, it can charge smaller devices at a faster rate.

On an aircraft, passengers do not need anything higher than 2.0 that can handle a max line rate of 480mbps. In flight this transfer rate is more than enough to support any data and content stream available.

The USB-C 3.0 is more about moving high levels of data to a storage device very quickly.

According to IFPL vice president of business development, David Thomas, "USB-C is the next connector that electronics companies are looking to develop. It is now being put onto all the larger Apple devices and Chrome Books, and will be the standard charging port in the future."

Thomas adds, "USB-C can provide up to 100W on the consumer electronics side through the connecter, as opposed to the current 10W USB-A power available through the latest aircraft IFE systems."

Offering passengers 10 times more power will allow them to use larger, more demanding electronic devices that would previously have had to be plugged into an integrated 110V alternating current (AC) system.

Thomas says the Type-C option has the potential to offer more passengers a better ancillary power solution. Adding, instead of having to acquire and fit, AC plug architecture and wiring, USB-C is cheaper than an AC, yet more expensive than a USB-A system.

"But when compared to a traditional 110V AC system, it is much cheaper, and offers a lot more opportunity for commonality between system and components," explains Thomas.

However, not all USB-C types will have the capability to handle 100W output, as Thomas explains. "USB-C provides the default power option of 15W, which is enough to charge a phone or a small tablet device, but not really enough to charge a laptop.

"USB-C with Power Delivery (PD) is another standard, but you can only get PD with USB-C, and not with USB-A because it does not have enough ancillary lines. USB-C has 12 lines, compared to USB-A which traditionally has five."

The extra lines in-built within the USB-C system allow it to transfer the additional power. The Type-C can be configured to 100W, 60W, 45W, 27W and 15W output increments.

Today's passengers expect an onboard power solution. This is because they are becoming more reliant on their PEDs for in-flight entertainment, as well as airport information.

How much power?

The varying degrees of power outputs available through a USB-C power delivery system, mean that airlines need to decide on the best solution. Ideally this should consider the aircraft's existing architecture, as well as future-proofing for advancements in PED technology.

If airlines are providing 150 passengers with 15W power in a narrowbody aircraft, and if all passengers are drawing 15W each at the same time, the system will need to cope with 2.25KW total power, plus a little loss.

Increasing the power output to 60W makes for a more complex system that needs a larger number of power supply units. This results in the need to add other smart technology, such as intelligent power management features which add to the expense.

Getting the most cost-effective system risks not being able to give all passengers power simultaneously. Yet it is an unlikely scenario that everybody on the aircraft will be plugged in, drawing 60W worth of power each at the same time. So according to Thomas, "it is really trying to work out what the best balance will be."

IFPL's vice president goes further saying, "Most aviation companies are looking at being able to support 60W. This is because it gives each passenger enough to power a laptop without being excessive.

"If you go to 100W you have to consider the efficiency of systems. When you are converting power at 90% efficiency, then 10% will be turned into heat. That means 10W of heat has got to be dissipated somewhere in the cabin. 60W will produce 6W of heat, which is an easier amount of heat to dissipate in the cabin."

Using the lowest possible power needed makes it easier to get rid of the heat. Therefore, the system design must also overcome the regulatory issues that relate to heat dissipation.

Reducing the USB-C power output to 27W will keep larger devices powered, but it is unlikely the unit will charge if switched on.

"It is a trade-off. You need to think hard about what you can get away with," explains Thomas. "This is especially true if you want to provide laptop-charging capability to a lot of passengers at any one time.

"In business class, it makes sense to add USB-C with power delivery. The system will fit well within the passenger demographic, because passengers will be able to work from their computers for many hours. In addition, the bulky AC system can be removed to save weight, creating more space."

According to Thomas, a 110V system will still have its uses in first- and premium- class cabins, as occupants may want to use high wattage devices which is unlikely to be unsupported by USB-C.

But in an economy-class cabin, Thomas says it is necessary to work out what the airline expects the passenger experience to be. Then, the amount of meaningful work a passenger could complete on a laptop in the space provided needs to be assessed.

IFPL USB-A&C combination outlet

As USB Type-C is being introduced to the consumer electronics market, a high percentage of passengers still own and will want to use devices with USB Type-A ports and connectors.

As a result of this transitional phase, IFPL has developed a Combination Outlet that has the capability to service USB-A and C adaptors simultaneously.

"USB-C is being talked about and everybody knows it is coming," says Thomas. "With existing USB-A power systems, IFPL has developed outlets that provide a simple upgrade to provide USB-C that will support 10-15W. It has additionally developed options to 60W with power delivery if requested."

It will be the aircraft's existing power supply system, however, that determines if power delivery is an option and its performance.

"This is not because IFPL outlets will not do this, but because of the aircraft's existing architecture. By retrofitting the existing USB-A with IFPL's USB-C outlets, it is likely that 10W or 15W output can be achieved."

Since USB-C looks similar to an iPhone's 'lightning connector', but with a small 0.6mm central tongue, it is expected that the Type-C connector will be mistaken for an Apple connector. Customer Induced Damage (CID) is, therefore, a concern, as trying to plug Apple's lead into a USB-C socket is likely to break the 0.6 millimetre tongue in the middle.

To address this, IFPL has developed and has a patent pending on its Rapid Fit cassette design, which is being introduced on its combination USB-A & C outlet. This allows the broken Type-C connector to be swapped without the need to remove or replace the entire unit, significantly reducing the airline's ongoing support costs.

A warning light on the outlet that remains illuminated in the event of damage or short-circuit makes it easier identify unserviceable items.

The Type-C outlet has been tested on over 10,000 insertions/extractions. It can support power up to 3A, 20V DC.