PEDS in IFE
Presentation of Michael Childers (APEX)
Aug 12 Telcon Presentation

Slide 1 – Title Slide

PEDs in IFE

It has been proposed that a possible way to make closed captions available to passengers whose embedded system does not currently support closed captions is by the use of PEDs to support the captions.

Slide 2 – The range of options for the use of PEDs in IFE is broad. These are some key decision points:

Incremental to existing PEDs program
Independent of existing PEDs program

Networked
Local storage

Fixed server
Mobile streaming unit (MSU)

Passenger-owned
Airline-owned
Third party-owned

Airline-specific content set
Generic content set

Early window
Late window

On aircraft
Off aircraft

While there may be some reasonable options that cost considerably less than embedded systems, let me dispel the notion that PEDs options are simple, easy and cheap.

Slide 3 - Hardware Considerations: First let's look at the hardware considerations. The airline makes a capital investment in a supply of tablets.

If these tablets are part of a WiFi network, the aircraft must be DO-307-certified to determine that emission-mitigation procedures have been deployed. If the server or any part of the

network are attached to the aircraft, then it has to be DO-160-certified. These might well cost into the hundreds of thousands of dollars.

Because of potential breakage issues, many airlines that own their own PEDs choose to ruggedize them to reduce breakage, and those that don't may run high maintenance, repair and replacement costs.

Then there are the logistical issues. Getting them on and off the aircraft may require carts, and because the devices need to be charged when they aren't in use, the storage carts have to be designed for airflow for heat mitigation. Batteries have to be charged and batteries have to be replaced, and all of the PEDs, the chargers, the cables, and the storage carts have to be stored in a secured location behind airport security when not on the aircraft.

Someone has to meet the aircraft to move the carts on and off. The devices must be maintained and repaired.

Because they contain high value content they are subject to strict inventory control requirements.

And, of course, the content has to be loaded using some kind of Content Loading Stations and involving someone to perform this function.

Slide 4 - Content Considerations: The next consideration is content. Depending on how content is licensed for the other IFES onboard the same aircraft, there is a good chance that additional license fees may apply.

Then the content must be loaded to the devices. When, where, and by whom?

If you are using PEDs because you have an MPEG-1/2 system that doesn't support dynamic text, then these files must be re-encoded in MPEG-4, and then the files must be re-integrated into a content bundle, run through a QC process, and then be delivered to the aircraft. All of the content management costs that were incurred for the MPEG-1/2 system are now duplicated.

But if you are using pax-owned PEDs, then you've got to go a big step farther—the files have to be transcoded into multiple data rates optimized to a range of viewing devices.

Content security requirements are greater when the content is stored on a PED.

Some kinds of content – such as live TV – may not be able to be delivered to a PED. Some kinds of interactive content may not be supported on the PED. A requirement for "an identical content set" on the PED as on the other IFES may be impossible, but at the very least imposes a considerable amount of expense on the Content Set.

Slide 5 - Content Costs: The costs involved in content include:

- Content license fees
- Content Management costs, i.e., encoding/transcoding
- Content Integration, i.e., building content sets into digital deliverable files with content attribute and content system operational metadata.
- Digital Rights Management (DRM) license fees:
    - Display of the closed captions in a manner enabling user functionality is player-dependent. When PEDs are involved, we are speaking of Adaptive Streaming technology in order to optimize display across multiple device types. An example might Microsoft Silverlight. Within Silverlight is DRM software called Microsoft PlayReady. The service provider airline will pay royalties for the use of this DRM.
- Patent royalties
    - Usually apply on a decoder level and with COTS devices will likely have been paid by the PED manufacturer. But depending on hardware used, there may be a possibility of patent royalties in the codec.
- Collective management fees (public performance fees, synchronization fees, mechanical fees)
    - Cover performance royalties on the music.
    - A kind of "errors and omissions" coverage for gaps in synchronization coverage.
    - Probably doesn't involve mechanical fees as copies are ephemeral.

Slide 6 - Networked PEDs; WiFi IFE Systems: One potential option is the installation of networked PEDs, i.e., a Wireless IFE System—WiFi IFE. Certainly wireless IFE is significantly less expensive than embedded IFE, and it may be that installation of WiFi IFE is less expensive than retrofitting an aircraft. But things may not be as simple as they seem.

More and more airlines are installing WiFi today for connectivity. Having two separate systems onboard—one for connectivity and one for IFE—either means going to the same service provider for both, or finding a way to integrate two systems from two providers.

While less expensive than wired systems, WiFi IFE might reach costs into six figures for cap-ex, and ongoing monthly costs are not insignificant.

There are certification requirements both for the wireless systems and for the use of PEDs inflight. Certification costs may also reach into six figures, and may have to be duplicated for different fleets or aircraft types.

And when content is streamed, there are Digital Rights Management (DRM) royalty fees that apply to the content protection schemes that are not applicable in a local storage—on the device--situation.

Slide 7 - WiFi IFE Architecture: A typical wireless IFE system involves the installation of a fileserver, which is attached to the aircraft and involves DO-160 certification, as well as wireless access points for at least every 50 seats (perhaps more for some systems).

Content can be streamed to passenger-owned devices, airline-owed devices, or both. Keep in mind that passengers carry different kinds of devices from smartphones to tablets to laptops, and expect to connect them all. Content must be encoded—a process involving the compression of digital files from very large to relatively small. For an embedded system one encode can be used for the system since all the SDUs are the same. But for systems streaming to multiple device types, digital files must be encoded—or transcoded—to perhaps four different data rates.
So if you are layering a wireless system on top of an embedded system, you cannot use the same digital files to serve both. Instead you have to duplicate the substantial ongoing content management fees for the second system. But that's not all; on the second system you have to have four different files for each unit of content in order to serve the range of multiple devices that must be supported.

So when someone says that a PEDs system has to have exactly the same content set as the embedded system, it isn't the same. It is transcoded and integrated separately, and requires perhaps four times the storage.

Slide 8 - Options to WiFi IFE Architecture: There are options to this typical WiFi IFE system. For example, you can use a fileserver whose form factor is more like that of a tablet, and that can be combined in a very small unit with a WAP or two, or can add a couple of more WAPs in a separate container.

These are called Mobile Streaming Units (MSUs). The first advantage is that they do not have to attach to the aircraft, hence they are classified as "loose equipment." They can be stored in the galley or overhead bin during flight. This alleviates the cost of DO-160 certification. DO-307, to mitigate PED emissions, is still required.

This system is effectively a portable *system* not just portable devices. But the portability factor requires security protocols and inventory controls. So logistics are involved.

An integrated LTE allows for the loading of certain kinds of daily content.

Slide 9 - Non-networked PEDs; Local Storage Considerations: There are other options to a networked PED system, including tablets with local storage using SD cards.

This eliminates the need for a WiFi network, and does not require DO-160 certification.
It does not require the payment of DRM royalties.

But it does require logistics—carts for transporting the tablets, people to take the carts on and off the aircraft, people to disburse and collect the tablets on the aircraft, storage inside airport security, a place and a system for content loading, and an inventory control system.

Slide 10 - Extension of existing PEDs programs: The least expensive portables solution would most likely be for airlines that already have portables onboard that supplement, or perhaps in place of, a seatback system, or may be used for "service recovery."

In such a case, adding several more identical units to the existing program would not involve re-encoding and re-integrating the content set, and all additional expenses would be incremental. If this kind of tablet was offered only in premium cabins, and was then made available to persons in coach whose seatback system did not support closed captions, such portables might not include everything on the seatback system.

Slide 11 – Off-aircraft PEDS programs

One idea that I heard proposed was that an airline could maintain a supply of non-networked PEDs with locally-stored content, i.e., on the device itself such as on an SD card, that could be ordered by a self-identified passenger with a disability via the airline's website 48 hours before a flight and shipped via FedEx.

This would require a distribution infrastructure with security requirements (perhaps even MPAA site-surveyed), and since this would be off-airport, this solution would not qualify for Early Window content.

Another possibility would be an inter-airline, non-networked, stored content PED solution administered by a third-party.

A supply of devices would be maintained at most major airports with a generic content set, ordered in advance by the self-identified disabled pax, and distributed to the aircraft by catering or similar company just like a special meal. Since the storage and distribution would be behind airport security it would likely qualify for Early Window content, although there could be an MPAA requirement for site surveys.

Slide 12 - Issues relating to providing an airline-by-airline content set which is a mirror image of the embedded system content set:

In short, the request from the advocacy community that any PEDs system which is used as an alternative delivery method for closed captions be a mirror image of the content set on the embedded system of each airline is extremely limiting, and precludes some of the potential solutions. In addition, such a requirement imposes upon any such solution the most expensive components.

Not all content is easily transferred to PEDs: Some kinds of content and/or interactive functionality may not transfer easily from the embedded system to non-networked tablets or pax-owned devices. An example of an IFE component that would be difficult to integrate would be a live TV component.

A requirement for an airline-specific mirror-image content set precludes an inter-airline third-party service.

The use of pax-owned devices precludes the provision of Early Window content. And the size of the Content Set on the PED—considering that it may have to be four times the size of the embedded content set—may exceed the storage capacity of the PED.

Such a requirement is likely to preclude many airlines from using a PEDs-based solution.
So all of these are variables that impact potential programs that might utilize PEDs as an alternative means of providing closed captioned content.

Slide 14 – Applicable principles: Let's look at some guiding principles. When you look at all of the limitations involved on the various PEDs solutions, it seems that a requirement for a mirror-image transfer of the embedded system content into PEDs is not possible for most—or even all—of the impacted airlines.

Generic Content Set: So let's look at what a generic content set would look like.
While airlines like to differentiate themselves from their competitors, in reality the same 5 or 6 movies each month are licensed by 90% of airlines. It would not be difficult to identify the half dozen or so "most licensed" movies to be included in a generic content set.

The same approach could be taken with the ten or twenty most popular TV series.
I think that we could create a generic content set that could be, perhaps, a 75% to 80% match to the core content in the airline-specific content sets of the U.S. airlines.

Allowing for this relatively small variation would make an enormous difference in the cost structure.

Slide 15 - Applicable Principles (Part 2)

Let's look at some more guiding principles.

A generic content set is more likely to be implementable than an airline-specific, mirror-image of the embedded system content set.

Extension of existing PEDs programs are more likely to be implementable than unique PEDs programs.

Local storage PEDs programs are more likely to be implementable than networked PEDs.

A centralized, third-party PEDs program may be easier for some airlines to implement than an airline-managed program.

The same conditions may not apply equally to all airlines.