GE's innovative Connected FMS provides a powerful fleet management solution in every phase of flight.

Integrated future

Regarded as one of the most demanding 'office' environments in the world, the cockpit has never been more integrated with the inclusion of new technology. Emma Kelly examines the latest advantages that make the pilots' job just that bit easier.

The electronic flight bag (EFB) has come a long way since its introduction in what seems like a short space of time, with the device now a standard sight in the cockpit. The technology's opportunity to fulfil its true potential is ahead, however, with the next stage in the EFB evolution already underway. The development of new applications and integrated solutions, all designed to improve situational awareness, reduce pilot workload, and improve operational performance, is set to elevate the humble EFB to a new capability level.

NASA's Traffic Aware Strategic Aircrew Requests (TASAR), for example, is a recent addition to an EFB's arsenal, with the potential to provide airlines with efficiency, fuel, and time savings. Described as being like the Waze navigation app on the ground, TASAR algorithms identify real-time fuel and time-saving flight trajectories and provide recommendations to pilots via the EFB. Based on NASA TASAR test flights with Alaska Airlines, more efficient flight trajectories could yield estimated savings of US$14.97 million a year for the airline.

Seattle-based data analytics specialist APiJET – the first company to obtain a commercial licence to offer TASAR technology – has been working with Alaska Airlines to develop a production-ready system which it has dubbed 'Digital Winglets'.

Digital Winglets delivers a variety of benefits, according to TJ Horsager, APiJET's Vice-President of Sales and Business

Development. Economics benefits come in the form of fuel, emissions, and flight time savings, with the Alaska Airlines trials demonstrating savings of US$97 per flight. "Beyond these operational efficiencies, APiJET's Digital Winglets product can assist airlines with avoiding turbulence, providing additional operational efficiency situational awareness to pilots and fine-tuning actual aircraft performance," he says. "Finally, a tool exists…which supports real-time cockpit decision-making activities considering actual real-time data, including flight constraints and hazards. Digital Winglets-generated route recommendations provide pilots with operational efficiency situational awareness levels which do not exist in cockpits today and provides a platform to introduce new data sources," he adds.

Digital Winglets is used on portable EFBs and, depending on aircraft equipage, it uses aircraft interface devices (AID)/servers and in-flight connectivity. "Another APiJET core
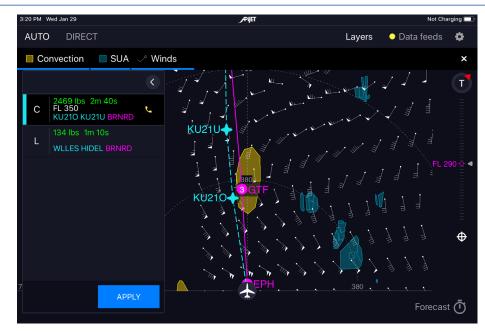
competency is connected aircraft related systems, and we work closely with our airline customers to align deployment with available connected aircraft equipage and resources," says Horsager. Digital Winglets fits perfectly within the company's Smart Aircraft System product line, which is focused on digital transformation for airlines through real-time analytics, machine learning and the fusion of aircraft- and ground-based data, he explains.

Alaska Airline's plans to ultimately equip its entire fleet have been impacted by the COVID-19 crisis, but Horsager says it is working with the airline to provide TASAR-related benefits during these turbulent times. It is also actively in discussions with other carriers, including interest from low-cost carriers.

SITUATION AWARE
Increasing EFB functionality through the addition of off-board communication, access to aircraft parameters and data management capability is at the heart of Teledyne Control's GroundLink AID+ system developments. The system connects WiFi-enabled EFBs and other crew devices through a cockpit wireless network, providing crew with instant and secure access to a broader range of in-flight information than previously available to improve navigation, aircraft performance and fuel consumption.

"When an EFB and its applications are interfaced with the Teledyne Controls GroundLink AID+ solution, the EFB is fed with a range of data from the aircraft. This data allows the EFB application to be 'situation aware', and this helps flight crew in many ways," explains Teledyne. "Plotting the aircraft position on charts or airport moving maps in real time gives an instant indication of the aircraft's location and this, in turn, ensures that related information, such as airport STAR and SID information is all available, without the need to search for the data. The A834 data can also be used for auto-population of electronic forms to avoid

Digital Winglets: APiJET has become the first organisation to obtain a commercial licence to offer Traffic Aware Strategic Aircrew Requests (TASAR) NASA technology.

typographic errors, all helping to reduce time, effort and workload," Teledyne adds.

More than 20 airlines are already using or trialling the system, including LCCs, says Teledyne. The system works with "pretty much" all EFB hardware and software solutions, with some integration required from some software vendors, but "many of the leading applications work out of the box".

In addition, Teledyne's GroundLink Broadband interface connects an EFB to high-bandwidth IP connectivity in-flight, allowing the EFB to access real-time data from the ground, such as live weather, for more efficient routing and turbulence avoidance. At the same time, its ACARS over IT solution uses the same architecture to allow the EFB and aircraft systems to access ACARS via cellular or Ka-/Ku-band satcom.

For example, Teledyne has been working with in-flight broadband connectivity provider Viasat and Australian carrier Qantas on real-time black box data streaming, as well as connecting flight deck and EFB applications in real time. "By providing aircraft data in real time to the flight deck and the ground operations, insightful decisions can be made in relation to predictive aircraft maintenance and optimising flying for fuel efficiency," says Teledyne. The California-based company says it is also working with

several China-based customers who are looking at "other innovative solutions and how they will be able to maximise that real-time aircraft data".

EFB and ground systems data requirements are only going to increase in the future, predicts Teledyne. It is already looking at the next-generation requirements for EFB and the complete real-time monitoring of an airline's operation. "Having successfully already tested our real-time telemetry/data streaming solution, we see much more real-time data requirements becoming commonplace for airlines," it adds.

FMS DATA INTERFACE
GE Aviation is working with airlines, aircraft OEMs, the US FAA, and EFB and industry partners to bring its Connected FMS to market. "Connected FMS creates a new interface to the FMS [Flight Management System] that enables tablet applications and ground-based applications the ability to access FMS data and upload custom route/data requests to the FMS," explains Jeff Ellis, GE's Product Director, Navigation and Guidance Ecosystem.

The interface would enable an integrated solution for pilots, airline operation centres and controllers by integrating EFBs, flight planning and onboard FMS. With »»

Game changer: Teledyne Control's GroundLink AID+ system provides crew with instant and secure access to a broader range of in-flight information than previously available to improve navigation, aircraft performance and fuel consumption.

connectivity to other data sources, such as weather, traffic, and turbulence, and merged with the 4D trajectory of the aircraft from the FMS, crew would benefit from enhanced situational awareness and dynamic route optimisation. To make the system work, it needs an AID for connectivity; EFB and ground applications that can leverage the connectivity; and a Connected FMS-enabled FMS. Such a solution would provide many benefits, relating to reducing pilot workload, improving pilot situational awareness, and optimising the operation of the aircraft, says Ellis. He points, for example, to the ability to have the FMS's configuration set up on a tablet app before the flight, allowing the pilot to load the flight plan into the aircraft quickly and avoiding the need for manual entry.

Improved situational awareness would come from having a real-time flight plan integrated with other data sources, such as weather, traffic and turbulence, integrated views on the tablet EFB, the ability to visualise the 4D trajectory and the entire

descent path on an EFB and overlaying lateral paths on top of aeronautical charts. Safety benefits come from the ability to cross-check FMS data ensuring critical data, such as performance parameters, are correctly entered into the FMS.

Airline interest in the solution is strong, and GE continues to work with airlines to refine it, says Ellis, although he concedes the current economic environment is having an impact.

MAKING BETTER DECISIONS

Integration with EFB functionalities will be a significant component of Thales's next-generation FMS, PureFlyt which is currently under development. The whole basis for PureFlyt is to allow the efficient management of aircraft in a connected ecosystem, allowing crews to make better decisions using more sources of information and enabling the delivery of improved performance during complex phases of flight.

Both PureFlyt software and hardware prototypes are running in an integration laboratory environment, with results proving "very promising", says Thales, pointing to fast response times, decreasing crew workload and operational benefits.

Certification and entry-into-service plans are dependent upon discussions currently underway, with the manufacturer previously aiming for certification in 2024.

Pureflyt will be able to connect with 'open world' EFB solutions and not just Thales products, says the manufacturer. Thales has its own AvioBook EFB solution which is a secure, connected, and integrated application comprising up to 14 modules with data sharing between the modules, says Thales. AvioBook is currently used by 65 customers on 2,500 aircraft worldwide.

"The real advantage of the AvioBook EFB is that it offers a completely integrated and intelligent environment for operators to work within. The huge amount of information that pilots and others must handle can be a challenge to prepare and carry out a flight safely and efficiently. In giving users access to the information as and when it is needed, without prohibiting access to the full data set required under law, AvioBook represents a genuine step forward for the EFB market," says Thales.

Thales says it has also developed hardware, combining a wireless access point, AID and quick access recorder, designed to bridge the gap between existing onboard systems, portable devices used for EFBs and ground staff workstations, ensuring the right information goes to the right person in a secure way. This provides the pilot with key weather and turbulence information and alerts from the ground in real time, ensuring they can be reactive to developing situations.

"Connected planes, and the AvioBook Connect app, mean that future communication between all actors on a flight, including dispatchers, pilots, crew, mechanics, will be streamlined and more efficient," says Thales.

EFB software suppliers also foresee a greater and more integrated role for EFBs in the future. "We expect the EFB to become a central and necessary part of any flight operation, not only replacing paper but serving as the information pivot for the whole airline. As technology and

infrastructure evolve, more use cases can now be tackled," says Fabien Grisaud, Senior Product Owner for Pilot Solutions at Lufthansa Systems.

A MARRIAGE IN THE COCKPIT

Lufthansa Systems has been working with GE on the Connected FMS, demonstrating the in-flight synchronisation of the flight plan from GE's FMS to Lufthansa Systems' pilot applications at last year's EFB Users Forum. "We believe the communication between our pilot solutions and the FMS is an essential part of the future EFB," says Grisaud. "Indeed, the EFB is becoming one of the central interfaces in the cockpit as it concentrates all data necessary to conduct the flight… A connection between EFB and FMS drastically increases situational awareness and strategic decision-making," Grisaud adds.

With the increased amount of data available to the pilot, how to extract the relevant data will be crucial. "We believe the EFB should not only be centralising all the relevant information but also process it and feed the pilot with the information he or she needs at the right time. The EFB must be deeply connected in order to fetch all relevant data and incorporate the intelligence needed to extract the relevant excerpt for its user. Therefore, I see EFBs evolving as pilot assistants, capable of stressing the most important information based on the current experience situation," says Grisaud.

Lufthansa Systems is currently looking at how it can provide all the necessary information a pilot needs to conduct the mission, without the need to interact with the device being used. "This way pilots are spending less time trying to get the information they need, and more time looking outside and performing cockpit duties," he explains.

Lufthansa Systems currently has around 140 airlines using its EFB solutions, which benefit from being part of an ecosystem, including its flight planning Lido Flight 4D

solutions and Lido FMS. "We're, for instance, currently working on providing in-flight weather for our customers, using the same source and depiction standards as our colleagues from flight planning. This consistency facilitates collaborative decision-making and helps to establish a common situational awareness," he says.

DextraData, the developer of the Logipad.aero EFB, agrees that EFBs will become more critical and that flexibility in system design is vital to allow them to fulfil their future role. "EFBs are not only just a document reader. Instead, they will be a centralised point to interchange data with different kinds of software and systems," says the Essen-based company. "To meet these requirements, EFB system architecture needs to be well designed, easy to deploy and maintain. The heart of an EFB system is not only the application on users' end-devices… it is the overall

architecture to seamlessly fit or integrate into the existing environment in an easy and useful way," DextraData adds.

Flexibility is at the heart of its solution, which is being used by airlines including AeroLogic, Air Astana, Ethiopian and Virgin Atlantic onboard a fleet into the hundreds. "One of Logipad's greatest technical achievements is probably its high flexibility and the bundling of numerous types of information in one interface with a very simple synchronisation and comprehensive search function," it says.

The German company works closely with its customers to understand their requirements and adapt the product as required. "One of the advantages of our solution is that the Logipad can be customised very quickly and easily," it adds.

So, all hail the EFB. Its evolution appears unstoppable, with airlines and pilots set to reap the benefits. ■

A connected ecosystem: Pureflyt will be able to connect with 'open world' EFB solutions and not just Thales products.