ETLs are electronic replacements for paper-based technical logs. They can send faster, more accurate data to back-office systems but there are few in operation. The experience of several airlines that operate ETLs, and the benefits they have enjoyed, are examined here.

ETLs in operation - airline case studies

An electronic technical log (ETL) replaces an airline's paper technical log with an electronic and paperless system.

Only a small number of airlines are currently operating ETL applications, but a growing number are now considering them due to benefits they offer, such as real-time fault reporting and improvements in defect recording accuracy.

The main functions and potential benefits of an ETL are examined here.

Airline case studies are included to establish which ETL solutions have been adopted and what benefits they have brought.

Paper technical log

The traditional tech log process involves entering data manually into a paper-based document.

A tech log entry is made at the end of each flight sector. It includes flight information and any technical issues that occurred during the flight.

"The technical log can serve two main functions," explains Dave Cooper, line maintenance manager at BA CityFlyer. "It acts as a journey log, detailing various operational aspects related to the previous flight sector, and also provides a maintenance log function. Some airlines choose to keep separate journey and maintenance logs, while others combine the two functions in a single tech log."

Journey record

"Typical journey log items include information such as: the flight number; arrival and departure airports; out, off, on and in (OOOI) times; flight duration; and the number of landings," explains Cooper.

The flightcrew that operated the previous sector will enter these operational data in a traditional paper tech log after landing.

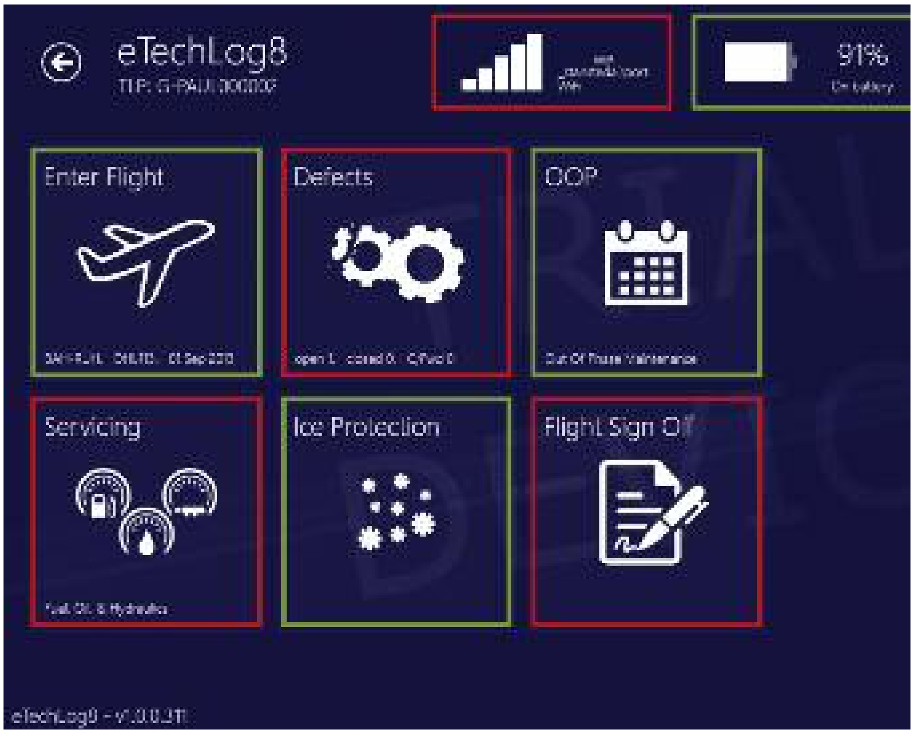
"Fuel, oil and hydraulic levels will also be recorded at the end of the flight," continues Cooper. "These data can be fed back to fleet planning and operations personnel, which can then use them to monitor how performance criteria, such as fuel burn, are meeting expectations. Figures for the fluid uplift required to operate the next sector are also recorded."

Maintenance record

The flightcrew will record any aircraft defects they observe during a flight sector in the technical log, as well as during pre-flight checks or inspections.

Line maintenance personnel check the defect log after every sector flown. The airline's maintenance control centre (MCC or MAINTROL) relies on the technical log for an overview of each aircraft's maintenance status. The MCC is responsible for coordinating the required action following identification of a defect.

Some aircraft are equipped with central maintenance computers (CMC) and built-in-test-equipment (BITE). BITE automatically detects certain defects, associated with systems and their components, and assigns fault codes to them. CMC codes are ultimately generated.



Conduce claims its eTechLog8 is intuitive, quick and instinctive to use. It features fat, finger-friendly buttons to move between the different sections of the ETL application.

NVable's Appixo ETL has been available since 2012. It has separate tabs for each section of the tech log. Each tab is colour-coded red or green to indicate when a particular section has been completed.

In some cases this information is stored and accessed by maintenance personnel when the aircraft has landed. In most cases these defect data and associated fault codes can be transmitted to the airline's maintenance and engineering (M&E) system while the aircraft is still in flight, usually via the aircraft's aircraft communications addressing and reporting system (ACARS).

Defects detected by a CMC or BITE would also be manually entered into a technical log by maintenance technicians on the ground, after the flight has landed.

There is another category of defects that does not result in, or produce, CMC fault codes, because these faults cannot be detected by BITE. Examples of these are cracked flightdeck windscreens, or sticky flight controls and unresponsive flight surfaces. These non-CMC faults are often referred to as flightdeck effects, and have to be manually written in the maintenance record by the flightcrew, who then hand the tech log to mechanics after the aircraft has landed.

Aircraft defects can generally be grouped into three categories: defects needing a simple fix that can be carried out during the allocated turnaround time; those that can be deferred; and those that cannot be deferred and will cause an aircraft-on-ground (AOG) situation.

Maintenance personnel will use a number of manuals to manually identify and troubleshoot the CMC and non-CMC defects that are written up in the technical log. These include a fault isolation manual (FIM), a minimum equipment list (MEL), a configuration deviation list (CDL), an aircraft maintenance manual (AMM) a structural repair manual (SRM) and an illustrated parts catalogue (IPC).

The FIM will be used to identify and assign fault codes to defects observed by the flightcrew. FIMs are provided by aircraft manufacturers for each aircraft type. Some older aircraft might have a similar document called a fault-reporting manual (FRM). The fault codes contained in FIMs or FRMs are generally derived from ATA chapter references.

Most FIM/FRM fault codes will relate to ATA chapters, but may have subsections specific to the individual aircraft type.

The MEL and CDL are used when deciding whether a defect can be deferred or not. "The MEL identifies if an aircraft can operate with a certain defect, or series of defects, and for how long," explains Cooper.

The AMM, SRM and IPC are used to identify approved defect rectification procedures.

Maintenance personnel will record in the paper tech log whether a fault has been rectified or deferred. It is also possible for the pilots to defer a defect, providing there are no maintenance actions required to dispatch the aircraft.

In addition to defect information, maintenance personnel will enter details of any part or component changes in the tech log. This will include the part number and serial number of the removed and installed components.

The paper tech log also generally includes a section for out-of-phase (OOP) tasks. The paper tech log therefore documents the aircraft's current maintenance status.

Cabin defects may also be recorded in the tech log. Flight attendants will record any cabin-related faults in a separate logbook that is handed to line-maintenance engineers upon landing.

The pilot in command will be notified if any cabin defects are serious enough to be considered an airworthiness issue, and will then record this defect in the tech log.

Once the line maintenance technician has completed the necessary defect entries and actions, component change details, and any OOP information, they sign the tech log to confirm that the aircraft is approved for service. The captain flying the next sector then has to check and sign the log to confirm they have accepted the aircraft for service.

Paper tech logs are normally produced on three-, or four-ply paper, since multiple copies are required. There is a legal requirement for a copy of the tech log, including the most recent signed and accepted entry, to remain on the aircraft. This has the most up-to-date record of the aircraft's maintenance status. A copy of the most recent entry confirming that the aircraft has been signed and accepted for service is required to stay on the ground.

The use of three or four-ply paper allows flightcrew and line maintenance technicians to complete the tech log entries before tearing off several copies for distribution.

Airlines will leave the main tech log on the aircraft, and leave copies of the most recent entry on the ground for the line station and MCC. Depending on the location, it may take several days for the tech log entry to reach the MCC. When it does, the data will be manually entered into the airline's M&E system.

Electronic technical log

An ETL is an interactive software application that is designed to completely replace an airline's paper tech log.

It is hosted on a hardware device that will fall under electronic flight bag (EFB) guidelines.

An EFB is the combination of software with a visual display hardware device that permits flightcrew or maintenance personnel to carry out operational tasks that previously relied on paper and manual processes.

ETLs are classified as Type B EFB software applications by the European Aviation Safety Agency (EASA) and the Federal Aviation Administration (FAA).

The hardware used is often consumer-off-the-shelf (COTS)-based personal electronic devices (PEDs), such as laptops or tablet computers.

When an ETL is installed on this hardware it becomes an EFB solution.

EFB or ETL?

The distinction between EFBs and ETLs can cause confusion.

Airlines might prefer to maintain the ETL as a standalone application on a separate hardware device from the rest of its EFB software. In these circumstances it may be referred to simply as an ETL, although it is still officially an EFB solution.

EFBs are more commonly associated with software applications that provide electronic replacements for the traditional contents of a pilot's flight bag, such as electronic aeronautical charts or document viewers to access various manuals and forms.

Tech logs are not part of the pilot's flight bag. Some operators may therefore be unaware that ETLs can be incorporated within EFB solutions alongside other operational software applications, and accessed from the same hardware.

ETL content

A typical ETL will have a user interface that displays separate screens covering each of the main sections of a paper tech log. These will generally include sections for flight details, defects, and fluid and fuel levels.

The user can navigate between the screens via tabs, buttons, or tiles to complete each section of the tech log as required.

In the defects section, an ETL could offer a menu of ATA chapter references or FIM fault codes to assign to a defect description. In some ETLs the defect entry screen may be linked to the aircraft's MEL.

ETLs may permit users to search ATA chapters or fault codes using key words, and to enter a manual defect description.

Some ETLs may permit users to include photos of a defect or damage, alongside the written explanation.

An ETL might also allow cabin defects to be recorded. Some vendors provide separate cabin log software that links to their ETL product.

ETL access

Most ETLs are native applications. This means that they are installed on a hardware device so that they can function without internet connectivity.

Airlines may issue EFB hardware devices to a specific aircraft, or to individual flightcrew. In many EFB solutions, at least two hardware devices are issued to an aircraft, and the ETL may be installed on both devices. In others, a single EFB hardware device is used as the master ETL.

Some ETLs allow pilots, maintenance personnel and cabin crew to access the application using separate hardware devices.

ETL data

An ETL may be capable of connecting to aircraft avionics for the purposes of downloading, uploading or transmitting data to and from the ground.

Information such as flight management system (FMS) data could then be downloaded to populate certain sections of the ETL.

Connectivity to avionics could also be used for sending ETL data to back-office M&E systems via the aircraft's communication systems. This would allow ETL data to be sent during flight.

Operators might prefer to transfer all ETL data when on the ground, using WiFi or cellular networks, or other methods.

Data transmitted from an ETL will normally be sent from an aircraft to an airline's back-office systems via a cloud server provided by the software vendor. This will often be capable of integrating ETL data directly into the airline's M&E or operations systems. Two-way data exchange between aircraft and back-office systems is often possible.

Engineer & Captain's acceptance

Once flightcrew and maintenance personnel have completed the sections of the ETL relevant to them, the line mechanic and captain sign off the log to confirm the aircraft is fit for service.

ETLs include an electronic sign-off or signature feature to perform this function. This could require the user to sign on the screen, enter an authorisation code, enter a pin code or scan an ID card. The level of security required for the electronic signature will need to be agreed with an airline's local airworthiness authority.

A copy of the completed ETL page needs to be kept on the ground before the aircraft departs. There are a number of ways to achieve this using an ETL.

It may be possible to transfer the data directly to back-office systems via WiFi or cellular on-ground connectivity methods.

Alternatively operators may leave a copy of the tech log entry on a USB stick or even produce a hard copy using a flightdeck printer.

Advantages of an ETL

An ETL can deliver data to airline M&E and operations systems faster and more accurately than traditional paper-based tech logs.

A main problem with paper logs is mainly that the information from the flight and technical logs exist in several systems, and maintenance personnel do not have access to all of them. An ETL can bring all the information together.

Using a traditional paper process, the tech log data has to be manually entered into the required back-office systems. Data entry errors can occur, especially in relation to problems with deciphering or interpreting the handwriting of pilots or line maintenance mechanics.

If a defect description is inaccurately keyed in from the paper log record into the M&E system, the number of no-fault-found (NFF) incidents could increase. An ETL offers increased data accuracy that

Skypaq's eLog has been available since 2007 and features a full defect management section. The eLog is compatible with iOS and Windows operating systems.

could reduce an airline's NFF rate. It could do this by assigning a specific fault code to a defect, and by replacing the inconsistencies of handwritten text with a standardised and legible typeface for the defect description.

The ability to transfer data directly from an ETL to an M&E system cuts out the need for manual data entry and any associated errors. It also provides the airline's MCC with a near real-time overview of fleet maintenance status.

The traditional paper tech log process requires each completed tech log page to be faxed, e-mailed, or hand carried to an airline's base or line station. This means there is a delay of hours or days before any data is entered into the M&E system. By this time, some defects raised in the log may have already been rectified, giving an inaccurate view of the current fleet maintenance status.

An ETL may be able to send some defect data while in flight, depending on the level of connectivity available. Most will automatically synchronise and send the latest log entry following Captain's acceptance, while the aircraft is still on the ground, providing a near real-time status.

Having access to an aircraft's real-time maintenance status allows the MCC to plan line maintenance tasks more efficiently. It may allow them to prepare for a specific fault rectification before the aircraft lands, subsequently minimising any disruption during the turnaround process.

ETLs could also reduce turnaround times by cutting the time required for fault diagnosis at the gate. In the traditional paper process the mechanic would read the handwritten defect description, before consulting the appropriate maintenance manuals to identify the required action. The search menus on ETLs might assign an ATA chapter reference or fault code to the recorded defect. The mechanic will then know which manual and chapter reference it needs to refer to for the appropriate response. In some cases this may be accessible via a link in the ETL.

ETL connectivity considerations

There are two aspects of ETL connectivity to consider: whether the ETL is permitted to connect to aircraft avionics; and how it will transfer data to back office systems on the ground.

EFB classifications

The ability of an ETL to connect to aircraft avionics and the options available for sending data to back-office systems will be partly determined by the classification of the hardware device that hosts it.

EFB hardware has traditionally been classified under three categories: Class 1, Class 2 or Class 3.

Class 1 devices are not permitted to connect to aircraft systems. They are usually COTS-based PEDs and are not fixed to the aircraft. In some cases they may be approved for use in all phases of flight, provided it can be demonstrated that they are secured and viewable.

Class 2 devices are permitted to connect to aircraft systems for data transfer, via an approved aircraft interface device (AID). They can also be portable and based on COTS hardware. They can be used in all phases of flight, provided they are attached to an approved flightdeck mounting.

Class 3 devices are installed avionics equipment. They are part of the certified aircraft systems.

EASA has recently amended its classification of EFBs from Class 1, 2 and 3 to a distinction between portable and installed solutions. The FAA is expected to adopt the same classification in 2015.

This article will refer to EFB solutions under the original Class classifications since the FAA has yet to amend its definition.

Connecting to avionics

An ETL hosted on a Class 1 EFB would not be able to download data from the aircraft's avionics.

ETLs hosted on Class 2 or 3 EFB solutions would have the potential to connect to aircraft systems, such as the FMS. Those with the required functionality could then download information and automatically populate certain required tech log data fields.

Connecting to the back office

The options available for transferring data to back-office systems are airborne and ground-based solutions.

Radio and Satcom are the main aircraft communication systems for transmitting data while airborne.

ETL data could be sent via an ACARS message over radio or Satcom.

Some Satcom solutions also support the transfer of data via Internet Protocols (I.P.). This provides larger and faster transfer rates than ACARs messaging.

On the ground an ETL could send data to back office systems in I.P format via WiFi or cellular networks.

These methods normally provide larger data transfer capabilites than airborne systems.

Other options for ground-based data transfer might include Bluetooth, or the use of USB storage devices.

Some EFB devices have built-in wireless or cellular connectivity capability. Others can access the WiFi or cellular connectivity systems that are available in some modern aircraft.

Class 1 and 2 EFB devices will often have built-in communication capabilities. This might include the ability to connect to WiFi or cellular networks, or the presence of USB ports so that data could be transferred via USB storage devices.

ETLs accessed via Class 1 EFBs cannot use the aircraft's communication systems, since they are not permitted to connect to the avionics. They rely on their in-built capabilities and can only transfer data when on the ground.

ETLs operated on Class 2 EFBs could also use the device's in-built systems for data transfer when on the ground. They may have the added option of sending data via the aircraft's communication systems. Provided they are connected to an approved AID, they may be able to send ETL data via radio or Satcom while in flight. They could also send data when on the ground using an aircraft's WiFi or cellular connection.

"A single, engineering-controlled cellular or WiFi gateway on-board an

Thomas Cook is currently using Conduce's legacy ETL but is working towards implementing efbTechLog8. It is in the process of decoupling its ETL solution from other EFB software.

aircraft provides a more cost-effective and reliable connectivity solution that is easier to manage than hundreds of mobile cellular or wireless devices," claims Murray Skelton, director of business development at Teledyne Controls.

Modern aircraft, such as the 787 and A350, feature on-board network server units that allow them to connect to airport WiFi networks for uploading and downloading data.

Some aircraft have an avionics ground link device with cellular connectivity capability. One such unit is Groundlink Comm+ produced by Teledyne Controls.

A Class 2 EFB could connect to Groundlink Comm+ for cellular data transfer using Teledyne's Groundlink AID+. The connection to the AID could be made via a hardwired Ethernet connection.

Teledyne also offers its Groundlink WiFi product. This allows an EFB device with built-in wireless capability to access the Groundlink Comm+ unit via the AID without the need for an Ethernet connection.

Teledyne's Groundlink Comm+ unit can also act as a storage device for ETL data. "It is mandatory that a copy of the tech log should stay on the aircraft," explains Skelton. "An electronic copy of the tech log can be stored on the Groundlink Comm+. This means a copy of the tech log can remain on the aircraft at all times, even if the EFB solution involves portable hardware devices that are issued to individual crew members who remove them from the aircraft at the end of a flight."

As part of the certified avionics, Class 3 systems can use any available aircraft communication systems for transferring data, both on the ground and in the air.

Communication costs

In most cases it would be cheaper for airlines to transfer ETL data using ground-based, rather than airborne, communications systems. Airlines need to decide if the potential benefits of transmitting ETL data while in flight will outweigh the additional cost.

ETL case studies

A number of case studies have been included to identify which ETL solutions are in operation and what benefits they have brought their users.

Conduce: eTechLog8

Conduce's eTechLog8 is a development of a solution initially designed by Rolls-Royce (RR) subsidiary Optimised Systems and Solutions Ltd (OSyS). When RR decided to exit the ETL market, Conduce took over maintenance and support of this legacy ETL product.

Conduce re-designed the ETL to take advantage of new technologies following the arrival of Windows 8.1 and the Panasonic Toughpad. The new application is branded eTechLog8.

Conduce's eTechLog8 is a native application that is designed to fully function offline. It is a Windows solution, but device clients can be made available for iOS or Android.

"Most interest in 2014 is for Windows-based systems, and specifically the Panasonic FZ-G1 Toughpad," says Steve Russell, chief executive offer at Conduce Group. "eTechLog8 is an intuitive application that is quick and instinctive to use. This helps speed up system implementation, training and all-important turnaround times. eTechlog8 uses fat, finger-friendly tiles or buttons to move between the different screens of the application."

There are tiles for entering flight details, creating defects and subsequent defect actions. Other tiles include those for OOP tasks, fluid uplifts and usage, de-icing, and engineering sign-off and captain's acceptance.

eTechlog8 allows users to search for defects via ATA references or fault codes for specific aircraft types. A keyword search function can be incorporated when looking up these codes. It also allows manual defect descriptions and photos to be attached.

Conduce is currently developing an application called eDoc8 that will allow documents such as maintenance manuals or the MEL to be launched from within eTechLog8. "Since these documents are essentially offline stored manuals, a separate application is required to ensure they are tracked and revised appropriately," explains Russell.

Conduce is also developing a cabin defect application called eCabinLog8. This will integrate with eTechLog8, and is initially available as a Windows or iOS mobile device application. It allows users to photograph a cabin defect, annotate it accordingly and transmit it to eTechLog8, either directly from device to device or via the internet.

eTechLog8 provides more functionality than the legacy ETL, including the ability to integrate data with multiple M&E systems for two-way data exchange. This takes place via the eTechLog generic integration system (eGis). eGis allows for synchronised secure data exchange via web services and/or XML files.

eTechLog8 can connect to aircraft systems for downloading data or to transfer data via aircraft communications.

A flightdeck printer can be provided as part of the eTechLog8 solution if required.

Conduce expects several new airlines to go live with eTechLog8 in 2015. The legacy ETL is in service with Thomas Cook Airlines in the UK.

Thomas Cook and Conduce

Thomas Cook Airlines UK was the first UK-based airline to receive

BA CityFlyer has been operating the Appixo ETL since 2012. It credits the Appixo ETL with improving the airline's technical dispatch reliability.

operational approval for an ETL.

Its current fleet consists of 10 757-200s, two 757-300s, three 767-300ERs, 11 A321s and four A330-200s.

Thomas Cook first started operating the OSyS ETL in 2006 before Conduce took over the development.

The airline is using Conduce's legacy ETL solution across the whole fleet with Panasonic CF-19 Toughbooks and the Windows XP Pro operating system. Two Toughbooks are issued to each aircraft. The captain's Toughbook acts as the master ETL device, with the other unit used for back-up. Both units are also used for other EFB applications.

"The ETL has been part of a single EFB solution made up of a suite of applications," explains Paul Stephenson, operational performance manager at Thomas Cook Airlines.

"The airline has now decided to decouple the ETL from the other EFB applications. One set of devices will be used solely for flight operations and another for the ETL. This reduces the risk of delays caused by competing requirements for the same device from pilots and engineers," adds Stephenson."

The decoupling process is already under way as new aircraft are introduced to the fleet. While the ETL remains on the CF-19 Toughbooks the other EFB software is being transferred to separate hardware devices.

Thomas Cook is working towards a new EFB solution, and will also have Conduce's upgraded ETL called eTechLog8. For flight operations software there will be two hardware devices issued and fixed to the aircraft. Flight crew will also be issued with portable personal devices. One Panasonic Toughpad will be issued to each aircraft to function purely as an ETL.

Thomas Cook's current ETL does not have any integration with aircraft systems.

The Panasonic Toughbooks each have a SIM card, allowing data to be sent from the ETL when the aircraft is on the ground using 3G cellular connectivity.

These data are visible to the airline's MCC via a secure web portal. ETL data do not currently integrate with the airline's M&E system and have to be entered manually.

"We are working towards automatic transfer of the ETL data into the M&E system," says Stephenson.

Thomas Cook has seen benefits from operating an ETL.

"The ETL has helped the airline achieve improved on-time departures," claims Stephenson. "This is because it provides better quality data, improved data turnaround, and enhanced control for defects, OOP requirements and scheduled maintenance. Flightcrews are also able to identify operational issues more easily without having to review pages of data."

NVable: Appixo ETL

NVable is based in Glasgow, Scotland, and was formed in 2005.

Its Appixo ETL has been available since 2012. It is a native, touch application that can function offline.

The Appixo ETL is designed for Windows operating systems, but could also be developed for iOS and Android.

The Appixo ETL user interface includes a main summary page and then separate tabs for each section of the tech log. This includes a sector tab which includes general operational information. The other tabs are for defects, OOP tasks, oil & hydraulic fluid uplift, fuel uplift, de-icing information and sector sign-off.

"The user is guided through each stage of the ETL process," explains Cameron Hood, chief executive officer at NVable. "The Appixo ETL can prompt the user or request validation for certain actions before the log can be signed-off. Each tab is colour-coded red or green. When a section of the ETL is incomplete the tab is red. When that section is completed it turns green."

When entering a defect the user can select from a drop down menu of ATA chapter codes and a manual defect description can be entered.

The ETL can be configured to search ATA chapter references by keyword if required.

The defect tab records any component changes and cabin defects.

The sector sign-off tab includes an electronic signature function.

The Appixo ETL has not been connected to aircraft avionics before, but this would be possible if required.

NVable provides a ground server which facilitates two-way data transfer between the ETL and an airline's back-office systems. It can integrate ETL data into an M&E system.

NVable also provides access to the ETL via a secure web portal.

If line mechanics or other personnel need to access the ETL remotely, they can use the web portal, or have the software installed on their hardware devices.

NVable provides a printer as part of its ETL solution in order to allow a paper copy to be printed in situations where wireless or cellular connectivity may be unavailable.

"NVable can provide technical support for hardware devices that host the ETL," explains Hood. "We charge a single fee per aircraft which covers the use of the ETL, access to the Appixo portal and technical support for the EFB hardware."

NVable has added extra functionality to its ETL since it entered service,

Finnair claims that Skypaq's eLog has reduced the airline's average defect closing times by 48%. It has been operating the eLog on its mainline fleet since 2010.

including: fan blade balancing; damage reports; and line maintenance work packs. These will be specifically accessed by mechanics.

The damage reports section permits mechanics to include detailed schematics or photos of the damaged area.

The Appixo ETL is currently used by BA CityFlyer.

BA CityFlyer & the Appixo ETL

BA CityFlyer is a regional subsidiary of British Airways. It operates a fleet of six E-170s and 11 E-190s.

BA CityFlyer has been using the Appixo ETL since 2012. The ETL is hosted on a Class 1 solution, consisting of Panasonic FZ-G1 Toughpads running the Windows 8 operating system. One Toughpad is dedicated to each aircraft.

"We decided to keep the ETL as a separate standalone application," explains Cooper. "This prevents conflicting requirements from several people for a single hardware device during turnarounds. All other EFB software functions are hosted on iPads."

The Panasonic Toughpads and associated ETL software are issued to each aircraft and remain on board. In contrast, the iPad EFBs are issued to individual flightcrew and are taken off the aircraft.

The ETL does not connect to aircraft avionics since it is a Class 1 solution. It does, however, transmit data to the airline's M&E system.

"We use SIM cards in the FZ-G1s to transmit data via 3G cellular networks when on the ground," explains Cooper. "When there is a connection available, data are transmitted to NVable's server each time an ETL record is approved. It is then sent directly into the M&E system.

"Where we cannot connect to a cellular network we have a printer that connects to the FZ-G1 via a USB cable," continues Cooper. "Manually printing an ETL record ensures that we can leave a copy on the ground. When the printed copy reaches the dispatcher's office it is faxed back to the MCC."

BA CityFlyer aircraft also carry a hard copy tech log as back-up in case of a major hardware failure.

The airline attributes a number of benefits to the Appixo ETL.

"The Appixo ETL provides real time visibility of fleet status," claims Cooper. "The MCC can view events virtually as they happen via the web-based server. With the paper tech log it would sometimes be up to 48 hours or more until the information reached the MCC. The ETL has also improved accuracy and reduced errors in defect reporting. Since it automatically calculates when a maintenance interval will expire, there is no need to rely on maintenance personnel going through and checking dates.

"Errors in data input can happen when a hard copy of the tech log is manually entered into the M&E system, especially if the staff responsible lack the necessary technical experience," adds Cooper. "These errors are eliminated by direct transfer of the ETL data into the M&E system. Overall, the improvement in data accuracy has allowed us to develop a proactive approach to our operational engineering requirements, and delivered improved technical dispatch reliability."

Skypaq eLog ETL

Skypaq's eLog ETL has been available since 2007. It is a native application that can function offline.

The eLog ETL is compatible with Windows or iOS operating systems. An Android-compatible version could be provided if required.

The ETL functions as a touch application on devices or display screens that support this capability.

"The eLog ETL contains multiple sections to allow all elements of technical log data to be entered," explains Richard McKenna, chief executive officer at Skypaq.

Some of the sections include pre- and post-flight pages to enter sector details, including fluid usage and uplift. There is also a full defect management section for line maintenance technicians, and an electronic signature facility.

It is possible to search for defects by aircraft-specific ATA chapter or fault codes. The eLog ETL can be configured to allow a search of these codes by keywords. It is also possible to enter manual defect descriptions and photos.

Skypaq can integrate MELs within the eLog. This is linked to an electronic version of the MEL and synchronises with it for updates. Other maintenance manuals can also be linked to the ETL.

Skypaq has added extra functionality to its ETL since it first entered service. This includes the ability for maintenance technicians to provide remote defect management by accessing the ETL through their own hardware devices.

Once ETL data is received at its ground server Skypaq can make the information available to remote maintenance devices via a secure online portal. The application can also be downloaded to a maintenance device.

Data sent from the ETL is processed via a Skypaq ground server before being sent on to the airline. The eLog ETL allows for two-way communication.

"A key element of our application is the ability to send data from back-office systems to the ETL in a controlled manner," says McKenna. "We have also added a cabin log for cabin monitoring. The eCabinLog is a separate application, but can send data to the eLog ETL.

It is possible for the eLog ETL to connect to aircraft systems and prefill certain sections from the avionics data.

The eLog ETL can be integrated with back-office systems, including airline M&E systems. Skypaq has a commercial and technological partnership with Swiss Aviation Software (AMOS), and has also worked with other flight operations and M&E systems.

"At present there is an element of information overload, with a large amount of data being produced by an aircraft for each flight," claims McKenna. "Skypaq works with the airline to filter out and send only the most relevant data. We can transport other data alongside our ETL transmissions if required, including flight data monitoring (FDM) information.

Skypaq can provide a printer with its eLog ETL, depending on the requirements of an airline's local aviation regulator. Two airlines using Skypaq's eLog ETL are Finnair and FlyBe Nordic.

Finnair, Flybe Finland and the eLog

Finnair is the national flag carrier of Finland. Its mainline fleet consists of nine A319s, 10 A320s, 11 A321s, eight A330-300s and seven A340-300s.

Flybe Nordic is a joint venture between Flybe and Finnair. It launched Flybe Finland after acquiring Finnish Commuter Airlines in 2011.

Flybe Finland operates a fleet of two E-170s, 12 E-190s and 12 ATR72s. The E-Jets were previously part of Finnair's fleet. They operate for Finnair and in Finnair livery.

Finnair and Flybe Finland operate Skypaq's eLog as part of portable (Class 2) EFB solutions. In both cases the eLog is hosted alongside other EFB software.

Finnair's EFB solution uses Panasonic FZ-G1 Toughpads with the Windows 8.1 Pro operating system across its entire Airbus fleet.

Flybe Finland's solution uses HP EliteBooks with Windows XP on its Embraer E-Jets. The ATR72s do not currently have ETLs.

Finnair first used the eLog on the Embraer fleet in 2008, before introducing it to the narrowbody and widebody Airbus fleets in 2010.

Finnair also uses Skypaq's separate eCabinLog application, but Flybe Finland does not.

"EFB hardware devices are issued to a specific aircraft and kept on that aircraft," explains Ville Santaniemi, development manager, aircraft maintenance applications at Finnair.

In the Finnair fleet, four Toughpad devices are issued to each widebody aircraft: three on the flightdeck and one in the cabin. Each narrowbody is issued with three devices: two on the flightdeck and one in the cabin.

Flybe Finland issues two HP EliteBooks to each of it Embraer E-Jets for flightdeck use.

The eLog runs on a single master device in both fleets. The eCabinLog is a web application that can run on any device.

"Finnair and Flybe Finland line maintenance mechanics have remote web access to the ETL to manage defects, but in most cases they will use the ETL application on the EFB on the flightdeck to enter the necessary defect rectification information," explains Santaniemi.

The version of the eLog used by Finnair and Flybe Finland cannot connect to aircraft avionics, since it is part of a portable (Class 2) EFB with no avionics interface.

The Panasonic Toughpads and HP EliteBooks contain SIM cards, allowing data to be sent from the eLog to Skypaq's ground server using 3G cellular connectivity when the aircraft is on the ground.

"There are multiple integrations from the ETL server to back office systems," says Santaniemi.

This includes integration with the airline's AMOS M&E system, crew management system (CMS), flight performance system (FLIP), and emissions trading scheme (ETS) archive.

Finnair and Flybe Finland have seen

Cathay Pacific is in the operational approval stage with Ultramain's efbTechLogs. It is using three 777-300ERs for the approval process and has already experienced improved data integrity.

several benefits from introducing the ETL.

"Less manual data input is required, leading to fewer errors," claims Santaniemi. "The fleet technical status is always up-to-date, since the information is received more quickly. We have seen a 48% reduction in average defect closing times. As a result we have fewer open defects to worry about."

Ultramain: efbTechLogs

Ultramain Systems provides its efbTechLogs ETL software for iOS, Windows and Linux operating systems. An Android version could be provided on request.

efbTechLogs first entered service in 2008 with KLM. It is a native application that can operate without connectivity, and is the ETL software used by Boeing as part of its EFB solution for the 787.

efbTechLogs is a touch screen application that provides the user with a dashboard overview of the aircraft's current status.

"The dashboard shows open and deferred defects and selecting them takes the user directly to the details for that item," explains Larry Lenamon, manager of operational experience at Ultramain. "The dashboard provides all the relevant logbook status information to the user, as well as buttons or links to other sections of the logbook."

There is a menu function that allows the user to select between different sections of the ETL. When recording a defect the user can enter a manual description, search fault codes by keywords, or search for codes using what Ultramain describes as a 'fault tree'.

"The fault reporting tree is created from the operator's FRM for the specific fleet type, and can be tailored to a specific configuration down to the individual aircraft level," explains Lenamon. "Reported fault codes are driven directly by the fault selected by the user.

"The fault tree selection screen displays the top level nodes with selectable branches to drill down to the bottom level nodes of each fault group," continues Lenamon. "For example, they may start with the ATA chapter reference for wheels and brakes before filtering down to a specific problem with a brake wear indicator. The accuracy and reliability associated with assigning specific faults codes is one of the main justifications for an ETL solution."

Pictures of damage can be uploaded into the defect section if required. MELs can be integrated within efbTechLogs to help in the deferral decision-making process.

"Key components of an operator's MEL are incorporated as a resource within the application," says Lenamon. "Any deferrals utilise the approved values for deferral repair intervals specific to a particular MEL item. In addition, the ETL can link to the operator's actual MEL document."

efbTechLogs also includes an electronic signature capability.

A history function allows operators to search flight sector history for evidence of recurring defects on a particular aircraft. "Most customers keep up to 60 flight sectors of an aircraft's history," claims Lenamon.

The efbTechLogs software can auto-populate with avionics data, and use on-board communication systems to transmit information to ground servers, if it is part of an EFB solution with an approved connection to aircraft systems.

ETL data from efbTechLogs can be integrated with airline back-office systems. Data is sent from the aircraft to Ultramain's efbGroundSystem. This then integrates with the required back-office applications, including M&E systems. Data can also be sent from back-office systems to the ETL.

Maintenance personnel can access the efbTechLog software from remote devices if required.

"Maintenance personnel typically use a remote device with a native application when working directly on board the aircraft," says Lenamon. "They can also access the ETL data in the efbGroundSystem from any device with a web browser and connectivity."

In addition to its ETL, Ultramain also offers its eCabin solution for reporting cabin defects or issues. Data from eCabin can be incorporated within efbTechLogs. There is an option to require flightcrew approval for: all cabin defects; safety-of-flight cabin items only; or no cabin defect items.

efbTechLogs are in service or at some stage of operational approval with British Airways, Cathay Pacific, KLM, Singapore Airlines and Virgin Atlantic.

Cathay Pacific and efbTechLogs

Cathay Pacific is the flag carrier of Hong Kong. Its passenger fleet includes 747-400s, 777-200s, 777-300s, 777-300ERs, A330-300s and A340-300s. It also has 26 747 freighters split between 747-400Fs, -400ERFs and 747-8Fs.

Cathay Pacific is in the operational approval stage for implementing Ultramain's efbTechLogs and eCabin software applications.

"We are operating the software on three 777-300ERs for the approval process, but it will eventually be used across the whole passenger and freighter fleet," explains Rob Saunders, head of engineering cost management & business improvement at Cathay Pacific.

Each aircraft is using four installed Class 3 DAC hardware devices to host the ETL. "Three of the display units (DUs) are kept on the flightdeck and one in the cabin (for the ECL)," says Saunders. The EFBs are accessible by mobile devices in the cabin as part of a secure operational cabin WiFi network for use by crew and ground staff.

The DAC hardware runs a Windows operating system and hosts other EFB software alongside the ETL, including Navtech's electronic aeronautical charts.

Cathay Pacific's EFB solution allows the ETL to connect to aircraft systems and download data including city-pair information, OOOI time stamps, and aircraft location. The airline will only use Type A and B EFB software.

The connection to aircraft systems also allows ETL data to be sent during flight via an AID into the aircraft's Iridium Satcom or over the VHF transmission systems. Cathay Pacific will use WiFi connectivity to send ETL data when aircraft are on the ground at Hong Kong.

Data are sent in real-time over Aerosync from the aircraft via Ultramain's efbGroundSystem into the airline's M&E system which is also provided by Ultramain.

"The ETL is still being implemented, but the parallel run is already showing improved data integrity, which reduces the number of error corrections," claims Saunders. "Fewer data-entry clerks will be required and we will also remove the need for shipping and storing paper records as aircraft are migrated across to the ETL."

"Real-time, error-free data have many financial benefits in downstream processes, within both the flight operations and engineering departments, and through to customer-facing activities."

Other ETL Developments

Dublin-based Arconics is working on an ETL solution that will fit within its existing Aerodocs suite of EFB software.

AeroDocs software is already in service with several airlines, including Ryanair, Aer Lingus and Thomson Airways.

The AeroDocs ETL has been developed based on feedback from a wide range of operators. It will be compatible with Windows and iOS-based devices. It could run on Android devices, but Arconics is not yet seeing a strong market demand for that operating system.

The AeroDocs ETL will feature drop-down menus and manual options for information entry. This is designed to lower the user workload. It will also permit users to search defects by fault code or keywords.

The AeroDocs ETL will be capable of exchanging data with aircraft systems.

Data transmitted from the ETL will be integrated with back office systems via an Arconics' server, enabling information delivery to and from the aircraft appropriate to the activity that is under way.

Maintenance personnel will be able to access the ETL from remote devices by logging onto a secure local network. If required, a web portal can be used to access the resultant aircraft record.

Aircore Systems offers the AS-Techlog 3.0 ETL application as part of its AS-FlightBag 3.0 suite of EFB software.

AS-TechLog 3.0 is compatible with iOS and Windows 7 and 8 operating systems. Android and Linux versions are also in work.

AS-TechLog 3.0 features access to aircraft maintenance status, the MEL, a discrepancy log and e-signature functionality.

The e-signature facility conforms to EU-eSignature requirements for European Union (EU)-wide operations. AC

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