Electronic Flight Bags: What Airlines Want

Airlines appear highly motivated to swap their bulky flight bags for a digital reference. Many recognize that the plethora of charts, maps and other paperwork can be a pain in the backside.

By Capt. Edward Hanson

Jeppesen Sanderson will tell you that it took 65 years for the chart-making company to produce and deliver its 1 billionth piece of paper, but it took only 24 months to go from 2 billion to 4 billion pieces of paper. Pilots with major airlines must manhandle a flight kit chock-full of charts, maps, departure/arrival procedures and reference books used to conduct normal flight. The flight kit weighs at least 25 pounds (11.3 kg). One airline reports that as many as 50 of its pilots are on medical leave due to back problems from carrying their paper-laden flight bags. Small wonder that there is such interest in making the cockpit paperless with electronic flight bags (EFBs).

The EFBs’ many potential applications have yet to be fully exploited. Most airlines considering EFBs await the release from the Federal Aviation Administration (FAA) of advisory circular (AC) 120-75, which was published in January but was subsequently pulled back.

The carriers have good reason to consider EFBs. Most commercial cockpits bear a lot of paper, including the following: maintenance log book, a copy of the minimum equipment list (MEL), the fault reporting manual (FRM), an operations data manual (ODM), the airports restriction manual (ARM), the engine reporting book, and charts, maps and approach plates.

Some airlines carry a copy of the pilots reference manual in their cockpits so that crewmen don’t have to carry it in their flight kits. Delta Air Lines includes a plastic shrink-wrapped "brick" of approach plates and procedures for offline airports and ones that may be used as alternate or emergency airfields. The brick was created to decrease flight kit weight and lower publications costs.

Each manual or book has currency requirements and must be appropriately updated for FAA compliance. The onboard manuals and publications cross-reference each other and are individually noninclusive. This means that any anomalous event may require referencing several of the manuals at once.
"What we are doing now in the paper-based data world is not unsafe," says David Young, Delta’s system manager for information processing and distribution. "But the development of an electronic flight bag can enhance the safety of our operation."

"FedEx pilots haul around Jepp bags like everyone else, so far," says a company source. "There are questions with the electronic flight bag in regard to backup systems—two laptops? two printers?—and the procedures," she says.

Nevertheless, FedEx is a pioneer in computerizing cockpit activities. Since 1991, its pilots have been using the Hewlett Packard Omnibook to make calculations—factoring runway length, weight, winds, temperature, etc.—in preparation for takeoffs. The cargo carrier began installing Spirent Systems’ "pilot access terminal" in its MD-11s about a year ago and, with supplemental type certificate (STC) now in hand, is in the process of fitting the system in its Airbus A310 and A300-600 aircraft.

But FedEx’s pilot access terminal, which includes an onboard receptical with power for recharging, is used only for fault reporting and to make the calculations formerly made with the Omnibook. It transmits the reports to an onboard server; then the reports are transmitted to FedEx ground facilities via the airborne communications addressing and reporting system (ACARS). The pilot access terminal has helped speed aircraft maintenance and turnaround, according to Emil Hurtak, FedEx’s manager-avionics and electrical engineering.

Southwest Airlines, too, has brought computerization to the pilots’ seats. "For more than three years, we’ve been carrying the Fujitsu laptop computer," says Ken Gile, Southwest’s director of flight operations. "We use them for number crunching."

Like FedEx pilots with their Omnibooks, Southwest crewmen use their laptops to make such calculations as decision speed and safety speed during takeoff. The computer database also includes the aircraft’s MEL. Each of Southwest’s 363 Boeing 737s (-200s, -300s and -500s) includes a laptop and accompanying "cradle" behind the pilot’s seat. The cradle includes a recharger. The computer is menu-driven, and pilots use a stylus to change displays.

Does Southwest plan to expand its onboard computing capabilities? "We look at all of the options, but right now, there are some FAA regulatory concerns," says Gile, in reference to AC120-75.

JetBlue Airways has been using electronic flight manuals since 1999. Pilots are issued Hewlett Packard laptops containing every company manual, such as flight operations, station operations, general maintenance and MELs, says Al Spain, vice president of flight operations. While laptops are bigger than the handheld units demonstrated at aviation conferences, "a true electronic flight bag means you have everything you need," he says. Because laptops are considered to be personal electronic devices (PEDs), it is easier to introduce new capabilities in them. JetBlue pilots, too, use the computers to calculate
takeoff factors. JetBlue operates 23 Airbus 320s, with firm orders for an additional 82 and options for another 49 A320s.

The carrier’s charts, maps and approach plates are still in paper format, as FAA has not yet approved the electronic display of this information. But JetBlue hopes to be able to display charts on pilot laptops by the first quarter of 2003, to further reduce the paper load. Unlike airplane cathode ray tube (CRT) displays, laptop screens can present detailed chart data clearly, Spain says. Pilots would use the laptop displays to verify the information presented on the airplane’s multipurpose control display unit (MCDU) and navigation screens. The actual approach would be flown using standard cockpit displays and systems.

Other airlines contemplating EFBs raise interesting issues. "The advent of digital jets means that we can change functions within the aircraft faster than we can change the supporting documents," Delta’s Young says. "The lead-in time to change our reference and operations manuals is too long.

"We need an information retrieval system that not only can keep up with the digital changes in the aircraft—such as flight management system [FMS] software upgrades, digital flight guidance system procedural changes, EFIS [electronic flight instrument system] modifications, EGPWS [enhanced ground proximity warning system] and TCAS [traffic alert collision avoidance system] implementations—but also use hyperlinks to all of the appropriate manuals during both normal and non-normal events," Young adds. "The answer is to join the digital world and make the books living documents that can be electronically updated and distributed."

United also seeks more functions and easier information access from the EFBs. "There are a lot of processes that can be accomplished if not encumbered by paper," says Rocky Stone, United’s manager of flight systems technology. "We’re working hard on a fully electronic aircraft maintenance logbook."

Planning to convert all logbook content into digital form and to add greater functionality, United is working on an EFB that "will allow the crew or mechanic to quickly review the full history of any maintenance discrepancy," Stone adds. "It will add simplicity and reliability to the process…and create an information flow for fleet trend analysis."

An interactive system will assist pilots in making critical "go/no go" maintenance decisions. The EFB, Stone believes, will feed directly to the airline bottom line by reducing both taxi gate returns and unnecessary air turnbacks.

Airlines, such as Delta, also believe that EFBs will deliver greater situational awareness. "We see an eventual electronic flight kit that delivers electronic ‘Jepps’ that are capable of providing positional orientation," says Young. "This would be an ‘expert’ system that shows the pilot where he is on an approach or departure procedure plate."
"Any instrument procedure should be auto-selected via the FMS and would present added value...for things like expected taxi routes and approach/tower, runway-specific frequencies," Young adds.

Critical to EFB efficiency is the checklist format. "At the present time, we’re required to stop a checklist when we reach an item that has not yet been accomplished. This has the potential to delay a flight," Young explains. "An electronic, ‘memory minder’ checklist could allow us to continue...[the checklist] and then return to the delayed items, as appropriate. This will increase our quality assurance that no item will be inadvertently dropped [and]...promote more timely operations."

Young listed further features that Delta seeks in EFBs. "We also want to use the data management functions to mask conditional items on checklists," he continues. "If the decision process leads to an ‘either/or’ or ‘yes/no’ scenario, no reason exists to present non-pertinent checklist items. The information manager should be expert enough to provide the pilot with exactly what he needs to see.

"The checklist also should provide a selectable level of detail," says Young. "It may be that a pilot wants to review a complete system before he denies himself a portion of it. Selectable detail will allow him to see the big picture and the individual items.

"This is a level of information retrieval ease that paper will never be able to provide," says Young, about the "selectable detail" feature. "We also want the electronic checklist to keep track of what has been accomplished and what has not, when multiple emergencies occur."

The EFB is designed to benefit maintenance personnel, as well as flight crews, but the advantages sought by the two factions are distinct. "There are three things that technical operations must know, and they all have to do with tracking," says Ray Valekia, senior vice president of Delta technical services. "We have to know the aircraft’s current condition; what and where all of the rotables, blades—all the parts—are; and where the parts are in their lifetime lines. All of this information can be efficiently coded into the electronic media."

The maintenance codes can be generated by pilot actions and FRM or by direct text entries. The EFB, potentially, can be accessed via data link in flight so that maintenance coordination, inventory queries, and parts retrieval can be initiated prior to an aircraft’s arrival at its destination. This would decrease downtime, ensuring that the right part is at the right aircraft at the right time.

Editors: In next month’s issue, Avionics Magazine will explore EFB operational issues and some solutions being offered.