A 'Charter' Member of the Safety Club

Beginning with handwritten notes, Elrey Jeppesen created charts for safer navigation and approaches.

BOOKS

Jeppesen: A Biography by His Son

Jeppesen, Richard. Xlibris, 2008. 582 pp. Photographs, appendixes. Order from the author.*

Every professional pilot is familiar with Jeppesen approach charts, so essential in modern aviation that it might seem amazing that anyone ever flew without them. Yet in aviation's early days they did, and many suffered the ultimate cost in collision with terrain or obstacles. Elrey B. Jeppesen, who was barnstorming long before the government got around to licensing pilots, might have been among the victims. Instead, he devised the Jeppesen Airway Manual of detailed maps showing terrain and safe approach profiles, among the most important safety developments in navigation.

Written by his son, himself a former airline pilot, this book offers a personal insight into Jeppesen's life and personality. Jeppesen, born in 1907 to Danish immigrants, not only created the Airway Manual, but was among the first to design en route, descent, approach and missed-approach procedures. Those tasks occupied him almost from the time he was hired to fly the mail for Boeing Air Transport in 1932.

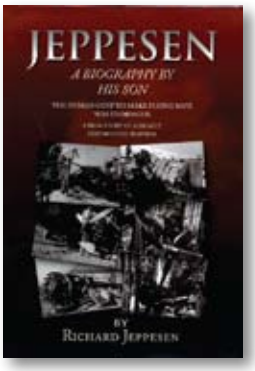
Elrey Jeppesen's story offers a grim reminder of the primitive conditions faced by the first generations of pilots. As the author says, "In the beginning, there were no universities of flight, no schools that taught flying, no books, no manuals, no flight rules, no minimum standards, no maintenance standards, no aircraft standards, no navigation facilities, and in the beginning no airports either." Other than all that, flying was a piece of cake.

Carrying mail was the main source of airline revenue in the United States in the days before passenger transportation became a mainstay of the business. But with the contract for carrying the mail came pressure for on-time delivery, regardless of flying conditions.

"When the mail sack came in, no matter what the weather, it was expected that the pilot would load up and take off," the author says. "If he refused, the station manager would fire him on the spot and get another one to do it. The mountainous route between Cheyenne [Wyoming] and San Francisco was covered with airplane wrecks. Dad told me, after awhile, you knew where the wrecks were, because you had been up on the mountain putting the body of a fellow pilot in a black body bag. You could navigate from one wreck site to another, you knew the tragedy of them all." One winter, the fatality rate among the mail pilots was almost 30 percent, the author says.

Even in merciful weather, night operations brought their own perils and some imaginative responses by pilots: "Dad said he would land during a day flight and taxi up to a farmer's house on one side of a canyon. He would ask the farmer if he would be willing to light a small stack of hay if Jepp [Elrey] called him up some night so he could navigate through the canyon." Some pilots, including Jeppesen, navigated by using road maps and following railroad tracks.

He began to systematize the procedures that helped him avoid crashes like those that took the lives of so many of his fellow airmen. At first, he kept handwritten notes about the relatively safe approaches he developed, illustrated with his own drawings.



"In those days, there were contour maps available, so Dad would draw the approach lines over the contour maps, which also helped verify terrain clearance," the author says. "He would list radio frequencies, phone numbers and other information about the route and the airport. He would list the alternate, emergency landing fields along the way."

The original notebooks lacked any standard symbology, but when Jeppesen eventually got into the business of making charts, he knew that consistency would be essential. "As the chart business grew, Dad hired draftsmen to draw the charts," the author says. "He had to create a 'database' (we call it today), so any draftsman could lay out a new chart and his use of symbols would be exactly the same as the guy that was drawing another chart across the drafting room."

As word got around about the Jeppesen charts, pilots sent him information about airfields he had never been to. But before he published a chart, he insisted on being sure that the data were accurate: "It turned out, meetings had to be scheduled for the purpose of standardization and verification. Dad would assemble pilot groups and discuss, for example, the minimum en route altitude between Elko [Nevada] and Reno. Some guys felt one altitude was okay, and others felt if you were just a little off course, you would marry a pine tree on some nearby ridge. He told me it was not unusual for tempers to flare, egos would flex and a lot of the old guys did not like this new instrument flying anyway. They figured if you couldn't see, don't fly. Maybe that is why they were older."

After a disastrous period when the mail was carried by the Army Air Corps, which "was not remotely qualified," the author says, and during which the safety record became even worse than before, the airlines once again took on the job.

"The Airway Manual was up and running," the younger Jeppesen says. "He had secured a [US]$450 bank loan and printed 50 manuals. He sold out immediately. Along with this came the recognition that someone was finally doing something about all these problems. … Dad became the center of it all, and it was overwhelming."

The Jeppesen business clearly met a need, but he faced many more problems. Distribution was a major headache, but possibly the greatest challenge was keeping charts up to date. In the years preceding World War II, new construction at and near airports made updates imperative. Furthermore, there was no such thing as a standard approach in commercial aviation's early days — each airline had its own.

"So which approach did Jepp choose to publish?" the author asks. "It became a difficult matter of judging the merits of each approach and compiling the best and safest ideas. Jepp did just that. What an unbelievable task that must have been."

No doubt it was. But Elrey Jeppesen persisted and was ultimately so successful that his name became part of the language of aviation. Long before he died in 1996, he could take immense satisfaction in knowing that his work had saved countless pilots from a fate that he had seen, close up, far too many times.

REPORTS

En Route Operational Errors: Transfer of Position Responsibility as a Function of Time on Position

Bailey, Larry; Pounds, Julia; Scarborough, Alfretia. U.S. Federal Aviation Administration (FAA) Office of Aerospace Medicine. DOT/FAA/AM-08/16. Final report. July 2008. 52 pp. Figures, tables, references, appendixes. Available via the Internet at <www.faa.gov/library/reports/medical/oamtechreports/2000s/media/0416.pdf> or from the National Technical Information Service.**

A researcher review of studies on human factors associated with air traffic control (ATC) operational errors (OEs) suggests that a disproportionate number of OEs occur during controllers' first 10 minutes on position. "Unfortunately, we do not know whether further improvements need to be made to the position relief process or whether factors unrelated to the transfer of position are responsible," the report says.

To help clarify the issue, the researchers conducted a retrospective study of the FAA OE database. The study, part of a larger time-vulnerability research effort, examined OEs based on time of day, time since start of shift and time on position.

If the trend was related to position relief, it was not evident whether the position relief

briefing (PRB) was inadequate or the controller entered the position during a busy traffic period. Each air traffic facility is required to develop a position relief checklist that covers steps such as a pre-transfer review of the situation by the incoming controller, a recorded verbal briefing by the outgoing controller and a post-transfer review by the outgoing controller.

"We have learned that there are two kinds of position transfers: those associated with replacement and those associated with providing assistance," the report says. The researchers found in their data review that position transfers for replacement did not generally occur during high-workload periods, so there was usually no need to rush. But transfers for assistance, such as when traffic was about to exceed the capacity of the controller on position and sectors had to be split between controllers, often did occur under time pressure and the process might have been hurried.

"The results [of examining the OE database] suggest that the position relief briefing process should address the unique human factors circumstances/vulnerabilities surrounding both types of position transfers, especially when the transfer process is rushed," the report says. "If, for whatever reason, there is only a short window of opportunity for the position transfer to occur, then the controllers involved have to depart from the ideal and address the reality that they face. Do the human factors vulnerabilities differ between a rushed replacement transfer, as compared to a rushed assistance transfer? For example, do controllers operate from a different mindset when they are being replaced versus when they are offloading only a portion of their position [control]?

"Questions such as these suggest that, although we have prescribed procedures that govern the position relief process, we know little about the varying states of mind and corresponding mental processes that are activated during a position transfer."

The researchers were inclined to conclude that past efforts to reduce OEs were of limited effectiveness because they looked for systemic problems that could offer generalized solutions. "This is a statistical approach in which individual differences are ignored and system-wide interventions are implemented," the report says. "However, for the individual involved in a given OE, the cause is not a statistical trend. Instead, the cause of the OE is associated with the specific mental processes (e.g., perception and vigilance, memory, and planning and decision making) and contextual conditions (e.g., static and dynamic sector characteristics) that affect the controller's performance.

"Thus, if we are to address the training needs of a given individual, we will have to switch from implementing a generalized training plan to a training plan that is customized to address specific needs based on the specific circumstances encountered. For example, an incoming controller who does not spend sufficient time mentally preparing to assume position control may not be aware of it."

The researchers concluded that present understanding of the cognitive processes involved cannot explain why OEs tend to occur early when a controller goes on position. "The current OE investigation process is insufficient for determining what the controller was thinking at the time of a position transfer," the report says. "This lack of information undermines the effectiveness of interventions designed to reduce OEs that occur early on position."

WEB SITES

Association of European Airlines, <www.aea.be>

The Association of European Airlines (AEA) has represented the major airlines of Europe for more than 50 years. AEA's Web site says its "primary objectives in the area of safety and operations include monitoring and influencing European and international rule-making on technical and operational

issues and the development of technical and operational requirements."

The Web site has, in addition to information on AEA policies, industry economics and related issues, two timely aviation safety documents about deicing/anti-icing of aircraft on the ground. Both may be viewed online, printed or downloaded at no cost.

- "Recommendations for De-Icing/Anti-Icing of Aircraft on the Ground," 23rd edition, Sept. 2008, 43 pages: Chapters include deicing/anti-icing methods for commercial transport airplanes using fluids, infrared technology and forced air technology; quality assurance programs; off-gate deicing/anti-icing procedures; and local frost prevention in cold-soaked wing areas. The document contains guidelines, tables, sample checklists and references to relevant SAE International and ISO (International Organization for Standardization) publications.

- "Training Recommendations and Background Information for De-Icing/Anti-Icing of Aircraft on the Ground," 5th edition, September 2008, 192 pages: The manual says it is "intended to provide a common basis for deicing/anti-icing training and qualification for deicing providers and airlines." The manual is divided into two sections: training and qualification recommendations and an overview of deicing/anti-icing procedures. It covers various topics including recommendations for qualifying staff, basic aerodynamics and meteorology relevant to deicing/anti-icing operations, and personnel safety and health issues.

Annex A lists aircraft types with detailed surface area measurements and dimensions and diagrams of spray/no-spray areas. Annex C contains an extensive bibliography of related readings. Annex D is a guide for developing lesson plans about theoretical and practical elements of deicing/anti-icing.

Icing Awareness: Pre-Flight Considerations Training, <www.batraining.com/blog/index.php/2008/02/20/icing-awareness-pre-flight-considerations-training/>

Bombardier Customer Services maintains a customer training Weblog that is open to the public. An icing awareness training program, applicable to commercial, business and other operations, is free online. The training program consists of audio-video presentations with graphics that address the following topics in general terms and are not limited to Bombardier airplanes:

- Low-speed aerodynamics;
- Effects of contamination;
- Contaminant formation;
- Contamination removal and protection; and,
- Deicing and anti-icing fluid application.

The reference materials section contains ground icing definitions, guidelines for deicing/anti-icing fluids, fluid holdover guidelines in table format, interactive holdover questions and answers, and more.

Instructions to obtain complimentary copies of the video on compact disc are provided. Information about other training materials specific to Bombardier airplane types is also available on the blog.

Sources

* <rfjeppesenbooks.com>

** National Technical Information Service, <www.ntis.gov>

— Rick Darby and Patricia Setze