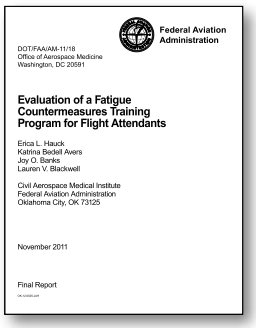
Measures of Countermeasures

Evaluation of a flight attendant fatigue-fighting program shows promise.

BY RICK DARBY



REPORTS

Cognitive, Affective, Behavioral

Evaluation of a Fatigue Countermeasures Training Program for Flight Attendants

Hauck, Erica L.; Avers, Katrina Bedell; Banks, Joy O.; Blackwell, Lauren V. U.S. Federal Aviation Administration (FAA) Civil Aerospace Medical Institute. DOT/FAA/AM-11/18. November 2011. 14 pp. Tables, figures, references. Available through the Internet at <www.faa.gov/library/reports/medical/oamtechreports/2010s/media/201118.pdf>.

Flight attendants work for the safety of passengers but face physiological challenges that leave them vulnerable to a mismatch between the body's circadian rhythms, or "internal clock," and the demands of the job. Their schedules vary, their duty periods can be longer than those of people who work in offices, they often cross time zones and work at night, and they can experience unscheduled duty when on call. Such factors call for fatigue mitigation.

This report describes research evaluating a comprehensive fatigue countermeasures training program for flight attendants. Researchers analyzed existing fatigue training programs for content, conducted a scientific literature study and consulted subject specialists to develop a training program to evaluate.

"A total of 50 domestically based flight attendants volunteered to attend a one-day training event," the report says. "Ten flight attendants participated in the first training event, 23 participated in the second and 17 participated in the third." Two flight attendants were dropped from the analysis because it was determined that they had extensive pre-existing knowledge of fatigue and fatigue countermeasures, which might have skewed the results.

"Flight attendants participated in the fatigue countermeasures training as a part of a one-day event hosted by the FAA," the report says. "Prior to arrival, flight attendants were asked to complete an online survey that included questions and the various … pre-test measures. The training lasted approximately three hours and was followed by administration of post-test measures. All participants were provided with a handout of the training materials and tools to aid fatigue prevention and management.

"Approximately six weeks after the initial training, participants were contacted via email and asked to complete a follow-up survey."

Criteria for evaluation of the results included cognitive, affective and behavioral outcomes:

"Cognitive outcomes included declarative and self-knowledge, while affective outcomes included motivation and attitude. The behavioral outcome measured involved skill acquisition or the individual's use of learned fatigue countermeasures."

Overall, the report says, the results demonstrate the effectiveness of a thoroughly developed, comprehensive training program.

"As a result of the training, participants improved their knowledge of basic fatigue information and strategy use; they acquired new information, were able to articulate awareness and exhibited greater recognition of effective fatigue countermeasure strategies," the report says. "Participants also showed improvements in their self-efficacy [belief in one's own ability] for addressing fatigue and the strength of their attitudes toward fatigue and the importance they place on fatigue management."

Information, awareness and attitude are important precursors to improvement, but did the training program result in *behavior* that would tend to counteract fatigue among the flight attendants? On the whole, pre-test and post-test results appeared to validate this outcome.

"Training participants demonstrated changes in the level of fatigue experienced and the number of fatigue countermeasure strategies they used," the report says. "For example, 41.2 percent of flight attendants utilized naps for fatigue management following training, as compared to only 27.8 percent prior to training. Flight attendants even received more nightly sleep as a result of training, increasing from 6.78 hours per night to 7.37 hours."

Training effectiveness was "clearly demonstrated" in cognitive outcomes and skill acquisition, the report says. But although flight attendant attitudes about the need to counter fatigue and belief in their ability to do so improved between the baseline and the post-test scores, the score for motivation was not statistically significant, with the mean actually declining from pre-test to post-test. Unusually among the cognitive and affective variables, the mean then increased at the time of the six-week follow-up survey.

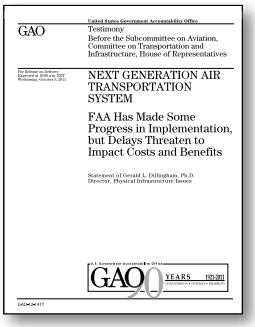
"The lack of significant improvement in motivation may suggest that the information presented during training was somehow overwhelming for participants," the report says. It seems understandable that after the participant took a test, underwent the training and took another test, the knowledge would be there, but the drive to put it into practice left temporarily on the shelf.

"Additional training outcomes regarding sleepiness, physical symptoms, work-family conflict and family-work conflict were not found to be significantly different following training," the report says. "It is possible that fatigue simply does not affect these outcomes; alternatively, the four- to six-week time frame may have been insufficient to observe significant changes. This may highlight the challenges of fatigue management faced in flight operations and warrants further attention."

Keeping the Pace . . . or Not

Next Generation Air Transportation System: FAA Has Made Some Progress in Implementation, But Delays Threaten to Impact Costs and Benefits

Dillingham, Gerald L. U.S. Government Accountability Office (GAO). GAO-12-141T. October 5, 2011. 10 pp. Available on the Internet at <www.gao.gov/products/GAO-12-141T>.


GAO

Testimony
Before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, House of Representatives

NEXT GENERATION AIR TRANSPORTATION SYSTEM

FAA Has Made Some Progress in Implementation, but Delays Threaten to Impact Costs and Benefits

Statement of Gerald L. Dillingham, Ph.D.
Director, Physical Infrastructure Issues

GAO 90 YEARS 1921-2011

Testifying before the U.S. House Subcommittee on Aviation, Dillingham — GAO director of civil aviation issues — commented on the state of play in the U.S. Federal Aviation Administration's (FAA's) Next Generation Air Transportation System (NextGen). NextGen represents a nearly complete revision of air traffic control procedures, using satellite-based surveillance instead of ground-based radar, performance-based navigation rather than step-by-step instructions by controllers and replacing most voice communications with data links.

"Over the years, concerns have been raised by Congress and other stakeholders that despite years of efforts and billions of dollars spent, FAA has not made sufficient progress in deploying systems and producing benefits,"

Dillingham said. His testimony discussed the results and improvements to NextGen to date and ongoing issues that will affect NextGen implementation.

On a positive note, Dillingham said that:

- "FAA has set performance goals for NextGen through 2018, including goals to improve the throughput of air traffic at key airports by 12 percent over 2009 levels, reduce delays by 27 percent from 2009 levels, and achieve a 5 percent reduction in average taxi time at key airports."

- "FAA has begun work to streamline its procedure approval processes — including its environmental reviews of new procedures — and has expanded its capacity to develop new performance-based navigation routes and procedures. In 2010, FAA produced over 200 performance-based navigation routes and procedures, exceeding its goal of 112. FAA reports thousands of gallons of fuel savings from the performance-based navigation routes in operation at Atlanta and the continuous descents being used into Los Angeles and San Francisco."

'Due to the integrated nature of NextGen, many of its component systems are mutually dependent on one or more other systems.'

However, Dillingham said, airlines have complained that the FAA's routes and procedures so far have not been optimal.

"To address these concerns, FAA has undertaken thorough reviews in a number of areas," Dillingham said.

"FAA has completed initial work to identify improvements needed in the airspace in Washington, D.C.; North Texas; Charlotte, North Carolina; Northern California; and Houston, Texas — focusing on routes and procedures that will produce benefits for operators," he said. "While the specific benefits from this work are not yet fully known, FAA expects to achieve measurable reductions in miles flown, fuel burn and emissions from these actions. In addition, airport surface management capabilities — such as shared surface surveillance data and new techniques to manage the movement of aircraft on the ground — installed in Boston and New York have saved thousands of gallons of fuel and thousands of hours of taxi-out time, according to FAA."

In addition, some NextGen and related programs are projected to be completed on time and on budget, he said. They include such critical programs as automatic dependent surveillance-broadcast (ADS-B), the satellite-based information broadcasting system; collaborative air traffic management and systems to manage airspace and flight information; system-wide information management, the "information management architecture" for the national airspace system; and time-based flow management, designed to integrate airport and air traffic control information.

One exception, Dillingham said, is en route automation modernization (ERAM): "Delays in implementing the ERAM program are projected to increase costs by $330 million, as well as an estimated $7 million to $10 million per month in additional costs to continue maintaining the system that ERAM was meant to replace. Moreover, due to the integrated nature of NextGen, many of its component systems are mutually dependent on one or more other systems. For example, ERAM is critical to the delivery of ADS-B, because ADS-B requires the use of some ERAM functions."

Additional challenges to NextGen include these, Dillingham said:

- "Delays to NextGen programs, and potential reductions in the budget for NextGen activities, could delay the schedule for harmonization with Europe's air traffic management modernization efforts and the realization of these benefits. FAA officials indicated that the need to address funding reductions takes precedence over previously agreed upon schedules, including those previously coordinated with Europe."

- "FAA and the National Aeronautics and Space Administration (NASA) — the primary agencies responsible for integrating human factors issues into NextGen —

must ensure that human factors issues are addressed so that controllers, pilots and others will operate NextGen components in a safe and efficient manner. Failure to do so could delay implementation of NextGen. We recently reported that FAA has not fully integrated human factors into the development of some aviation systems."

- "FAA has embarked on an initiative to restructure a number of organizations within the agency. We have previously reported on problems with FAA's management and oversight of NextGen acquisitions and implementation. … While elimination of duplicative committees and focus on accountability for NextGen implementation is a positive step, it remains to be seen whether this latest reorganization will produce the desired results."

Keeping pace with NextGen's rollout schedule is important to maintain credibility with the airline industry that will need to invest in the corresponding avionics, Dillingham said.

"As we have previously reported, a past FAA program's cancellation contributed to skepticism about FAA's commitment to follow through with its plans," he said. "That industry skepticism, which we have found lingers today, could delay the time when significant NextGen benefits — such as increased capacity and more direct, fuel-saving routes — are realized."

BOOKS

Staying Current

Commercial Aviation Safety

Rodrigues, Clarence C.; Cusick, Stephen K. McGraw-Hill, 2011. Fifth edition. 368 pp. Figures, tables, references, index.

This is the updated edition of a textbook that has been published for more than two decades. Regulatory issues discussed are largely confined to U.S. agencies and the International Civil Aviation Organization (ICAO), but otherwise the contents are applicable to commercial aviation wherever it is found.

The authors say, "This edition updates, revises and makes current the aviation safety and security information contained in previous editions; establishes new changes in the format and content of the chapters to make the flow of information progressive and logical; and broadens the field of study to include regulatory information on ICAO and safety management systems (SMS) that is essential to the practicing aviation professional."

The following are examples of the updated material in the new edition.

- Chapter 4, about reporting and recording safety data: "The ICAO five basic traits of an effective safety reporting system have been added. Information from previous editions has been revised and updated, and additional information about LOSA [line operations safety audit] and AQP [the FAA advanced qualification program for pilot and flight attendant training] has been added."

- Chapter 6, about accident causation models: "Information on Dr. James Reason's 'Swiss cheese' model of accident causation has been expanded and updated from the latest ICAO safety documentation. The SHELL model, another widely used conceptual tool, has been added."

- Chapter 9, on aircraft safety systems, "has been revised to include recent developments in jet engine design and new cockpit enhancements from Boeing and Airbus on their latest aircraft models."

- "Chapter 13 on aviation safety management systems is new. The chapter discusses the evolution of SMS principles and explains safety risk management and safety assurance as the heart of an effective SMS organization. The chapter concludes with a brief discussion of the future of the SMS process in commercial aviation safety."