# At Your Surface

**The FAA has implemented most of its planned runway and ramp safety improvements, but ASDE-X implementation is lagging.**

## REPORTS

### Aviation Runway and Ramp Safety: Sustained Efforts to Address Leadership, Technology, and Other Challenges Needed to Reduce Accidents and Incidents

U.S. Government Accountability Office (GAO). Report no. GAO-08-29. November 2007. Figures, tables, appendixes. Available via the Internet at <www.gao.gov/new.items/d0829.pdf> or from GAO.*

The U.S. Federal Aviation Administration (FAA) is implementing its Next Generation Air Transportation System (NextGen) to better manage air traffic, both in flight and on the ground. The GAO was asked by a U.S. congressional subcommittee to evaluate (1) the progress being made in addressing runway safety and what additional measures, if any, could be taken, and (2) the factors affecting progress in ramp safety and what is being done to address them.

"FAA and other aviation stakeholders have taken steps to address runway and ramp safety, but the lack of coordination and leadership, technology challenges, the lack of data and human factors–related issues impede further progress," the report says.

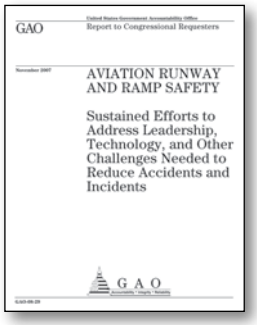
The GAO analysis determined that the FAA had completed or was implementing 34 of the 39 initiatives in its 2002 national runway safety plan. Four initiatives had been canceled, and one — meeting published milestones for Airport Surface Detection Equipment, Model X (ASDE-X) — had not been achieved.

"Most of the completed objectives involved (1) developing and distributing runway safety education and training materials to controllers, pilots and other airport users; (2) supporting and developing new technologies intended to reduce the potential for runway collisions; and (3) assessing and modifying procedures to enhance runway safety," says the report. "The results of our survey of experts indicated that the most effective actions that FAA was taking were lower-cost measures, such as enhancing airport markings, lighting and signage."

One system being tested by FAA is runway status lights, embedded in runways, which change color to warn pilots when a runway is not clear, and require no input from controllers. Also in the testing stage is a similar system of flashing lights visible to aircraft on approach, to alert pilots that a runway is occupied and unsafe for landing.

To operate automatically, runway status lights require data from surface surveillance systems such as ASDE-X or its earlier version, ASDE-3. The main value of the surveillance systems, however, is to give controllers a better understanding of what is going on throughout the network of runways and taxiways by integrating data from various sources, including radar and aircraft and vehicle transponders.

ASDE-X "has experienced cost increases and schedule delays from its original baselines and is encountering some operational difficulties," the report says. "At the same time, additional technology to prevent runway collisions is years away from deployment. … FAA has revised its cost and schedule plans twice since 2001 to deploy ASDE-X at 35 airports by 2011." As of August 2007, ASDE-X was commissioned at 11 airports.



"Although it took about four years for ASDE-X to be commissioned at those 11 airports, FAA plans to deploy the system at the remaining 24 additional airports in less than four years," the report says. "Furthermore, not all 11 ASDE-X commissioned airports have key safety features of the system. For example, as of August 2007, three of the ASDE-X commissioned airports did not have safety logic, which generates a visible and audible alert to an air traffic controller regarding a potential runway collision. Moreover, five airports, including the three lacking safety logic, do not have a system enhancement that allows ASDE-X to alert controllers of potential collisions on intersecting runways or runways intersecting taxiways during inclement weather."

In addition, "air traffic controller fatigue, which may result from regularly working overtime, continues to be a matter of concern," the report says. "We found that, as of May 2007, at least 20 percent of the controllers at 25 air traffic control facilities, including towers at several of the country's busiest airports, were regularly working six-day weeks."

Improvement of ramp safety is being hindered by a lack of a complete source of data on ramp accidents and lack of comprehensive standards, the report says.

"We found no federal or industrywide standards for ramp operations," the report says. "The federal government has generally taken an indirect role in overseeing ramp safety; airlines and airports typically control the ramp areas using their own policies and procedures. Meanwhile, some airlines and airports have initiated their own efforts to address ramp safety, and aviation organizations have begun collecting ramp accident data. We asked experts to provide their views on those industry efforts, and they indicated that the most effective ones were being taken mainly by airlines, for example, by setting safety targets and using ramp towers."

The GAO recommends that the FAA take measures that include "preparing a new national runway safety plan, improving data collection on runway overruns and ramp accidents, and addressing air traffic controller overtime and fatigue issues that may affect runway safety."

## Preliminary Results of an Experiment to Evaluate Transfer of Low-Cost, Simulator-Based Airplane Upset-Recovery Training

Rogers, Rodney O.; Boquet, Albert; Howell, Cass; DeJohn, Charles. U.S. Federal Aviation Administration (FAA) Office of Aerospace Medicine. DOT/FAA/AM-07/27. Final report. October 2007. 21 pp. Figures, tables, references. Available via the Internet at <www.faa.gov/library/reports/medical/oamtechreports/2000s/media/200727.pdf> or from the National Technical Information Service.**

Upset-recovery training is becoming widespread as a means of reducing the likelihood of loss of control in flight, which was second only to controlled flight into terrain as a cause of fatal accidents worldwide. Many training programs seek to teach recovery from unusual attitudes, such as extreme pitch and bank angles, using classroom instruction and low-cost training devices. The report says that the experiment it describes was an attempt to evaluate the effectiveness, which had previously been little researched, of such training.

The experiment was designed to test the hypothesis that a group of trained participants — the experimental group — will outperform a group of untrained participants — the control group — in an actual airplane in flight. The control and experimental groups, pilots studying at Embry-Riddle Aeronautical University, numbered 28 and 30 participants with 277.3 and 235.9 mean flight hours, respectively.

The experimental group received 10 hours of classroom and 10 hours of simulator-based aerobatics and upset recovery training. The simulations used Microsoft Flight Simulator 2002 software running on computers with high-fidelity graphics cards. Aerobatics and upset recovery procedures were practiced under simulated visual meteorological conditions and instrument meteorological conditions. The control group received no classroom or simulator training.

Flight testing was performed using a Beech Bonanza E33C equipped with a flight data recorder (FDR) and a cockpit-mounted video recorder (VR). The VR was focused on the participant's instrument panel and showed

airspeed, vertical speed, altitude, attitude, g force, manifold pressure and yoke movement. The FDR added measurements of yoke movement and rudder pedal displacement.

"During testing, each participant was subjected to four randomly ordered upsets," the report says. "For each upset, a participant was told to close his or her eyes while the safety pilot induced the upset. Then — when instructed to do so — the now open-eyed participant assumed control of the airplane and attempted to recover it to straight and level flight." The safety pilot intervened if needed. If a participant pilot returned the aircraft to straight and level flight with no verbal or physical assistance from the safety pilot, the recovery was considered successful; otherwise, unsuccessful.

The experiment encountered practical problems, such as recording-equipment failures, described in the report. The researchers "failed to obtain, or discarded, a significant amount of data," says the report.

Nevertheless, using what they had, the researchers analyzed the data and found statistically significant differences in some measures related to the four categories of upset — nose-high upright, nose-low upright, nose-high inverted and nose-low inverted.

"Experimental group performance exceeded control group performance 44.4 percent of the time," the report says. "This superiority appeared in all four [categories of] upsets and in six of the nine dependent measures [such as average g during pullout]. By contrast, in three dependent measures — altitude loss, seconds to first roll and rudder input — there was never a significant difference between experimental and control group performance."

### Time Series Analyses of Integrated Terminal Weather System Effects on System Airport Efficiency Ratings

Pfleiderer, Elaine M.; Goldman, Scott M.; Chidester, Thomas. U.S. Federal Aviation Administration (FAA) Office of Aerospace Medicine. DOT/FAA/AM-07/28. Final report. October 2007. 28 pp. Figures, tables, references. Available via the Internet at <www.faa.gov/library/reports/medical/oamtechreports/2000s/media//200728.pdf> or from the National Technical Information Service.**

The FAA has adopted the System Airport Efficiency Rate (SAER), a metric of air traffic control's ability to handle arrivals or departures by adjusting for weather, averaged over time. But, the report says, although the SAER has been widely accepted and used at U.S. airports, the question remains whether it is "sensitive enough to evaluate the efficacy of interventions aimed at improving performance during inclement weather."

One such intervention is the Integrated Terminal Weather System (ITWS), a suite of weather information products for improving air terminal planning, capacity and safety. ITWS integrates sensors and information systems from the FAA and National Weather Service into displays of current and predicted weather conditions for controllers and facility managers to use in decision making.

To assess SAER's ability to measure the effectiveness of ITWS, researchers used time series analysis, in which "data are statistically modeled to remove the lingering effects of previous scores, general trends and the lingering effects of preceding random errors," the report says. "Once outside sources of systematic variation have been removed, interventions may be tested to determine whether they have an effect."

Two time series analyses were conducted for each of 13 major U.S. airports. "Though some statistically significant effects were found (both positive and negative), the patterns of these effects were not consistent enough to draw any definite conclusions about the efficacy of the ITWS implementation," the report says. "Though the SAER is clearly doing what it was intended to do on a daily basis, it may 'control out' the variance needed to detect the consequences of interventions."

## WEB SITES

### U.S. Federal Aviation Administration (FAA), <www.faa.gov>

The FAA Web site is so large and diverse that users may not be aware of all the resources it contains.

To help, *ASW* sifted through the FAA Web site for free educational materials and learning tools. Following is a partial list of direct links. Videos listed are in color with sound. Several are also available with captions. All are viewable online with standard Internet video players. Manuals, booklets and brochures can be read online, downloaded or printed.

- "Physiology of Flight" is a video collection of numerous health topics such as fatigue, oxygen equipment, physics of the atmosphere and self-imposed stress: <www.faa.gov/safety/programs_initiatives/health/physiologyvideos>.
- "Aircrew Survival" videos cover hot and cold land survival; survival kits, life rafts and accessories; and surviving on open water: <www.faa.gov/safety/programs_initiatives/health/aircrewsurvivalvideos>.
- Pilot Safety Brochures are written for commercial and general aviation pilots. The FAA says, "Brochures acquaint pilots with the physiological challenges of the aviation environment." Subjects are varied and include alcohol and flying, hearing and noise, spatial disorientation, fatigue, vision and medications. Most are five to six pages with color illustrations. Instructions for obtaining hard copy versions are included in brochures: <www.faa.gov/pilots/safety/pilotsafetybrochures>.
- *Reducing the Number of Vehicle/Pedestrian Deviations at Your Airport* is a brochure written for airport operators discussing requirements for vehicle operators and vehicles: <www.faa.gov/runwaysafety/pdf/vpdrev.pdf>.
- The video package, "Driving on the Airport Operations Area," was produced in English and Spanish versions and has a facilitator's guide and booklet: <www.faa.gov/runwaysafety/aoa.cfm>.
- "Test Your Knowledge" is five online self-assessment exercises for pilots about airport taxiway markings, taxi and air traffic control instructions, runway incursions and situational awareness: <www.faa.gov/runwaysafety/knowledge.cfm>.
- *Runway Safety: It's Everybody's Business* is a 119-page, illustrated handbook about runway incursions. Written for pilots and controllers, the subtitle explains its focus — *What Pilots Can Do to Improve the Safety of Surface Operations*: <www.faa.gov/runwaysafety/pdf/handbook.pdf>.
- "ILS, PRM & SOIA Approaches: Information for Air Carrier Pilots" lists training videos on the instrument landing system, parallel runway monitor system and simultaneous offset instrument approaches. There is also a question and answer review for pilots: <www.tc.faa.gov/acb300/330_video_PRMSOIA.asp>.
- "Controlled Flight Into Terrain (CFIT) Education and Training Aid" includes two volumes and a video. The introduction says, "Preventing CFIT accidents is the major goal of this training aid." Some sections of the training aid are aimed at upper level management, industry regulators and operators. Other sections contain information about training programs, selected readings and "CFIT causal factors, traps and solutions": <www.faa.gov/education_research/training/media/cfit/volume1/titlepg.pdf>. The video does not appear online. The training package with video is available from Flight Safety Foundation, which played a key role in its development.
- "Wake Turbulence Training Aid" was developed to reduce the number of accidents and incidents through pilot and air traffic controller education. The complete document is online: <http://www.faa.gov/education_research/training/media/wake/03SEC1.PDF>.●

**Sources**

* U.S. Government Accountability Office
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