FLIGHT SAFETY FOUNDATION

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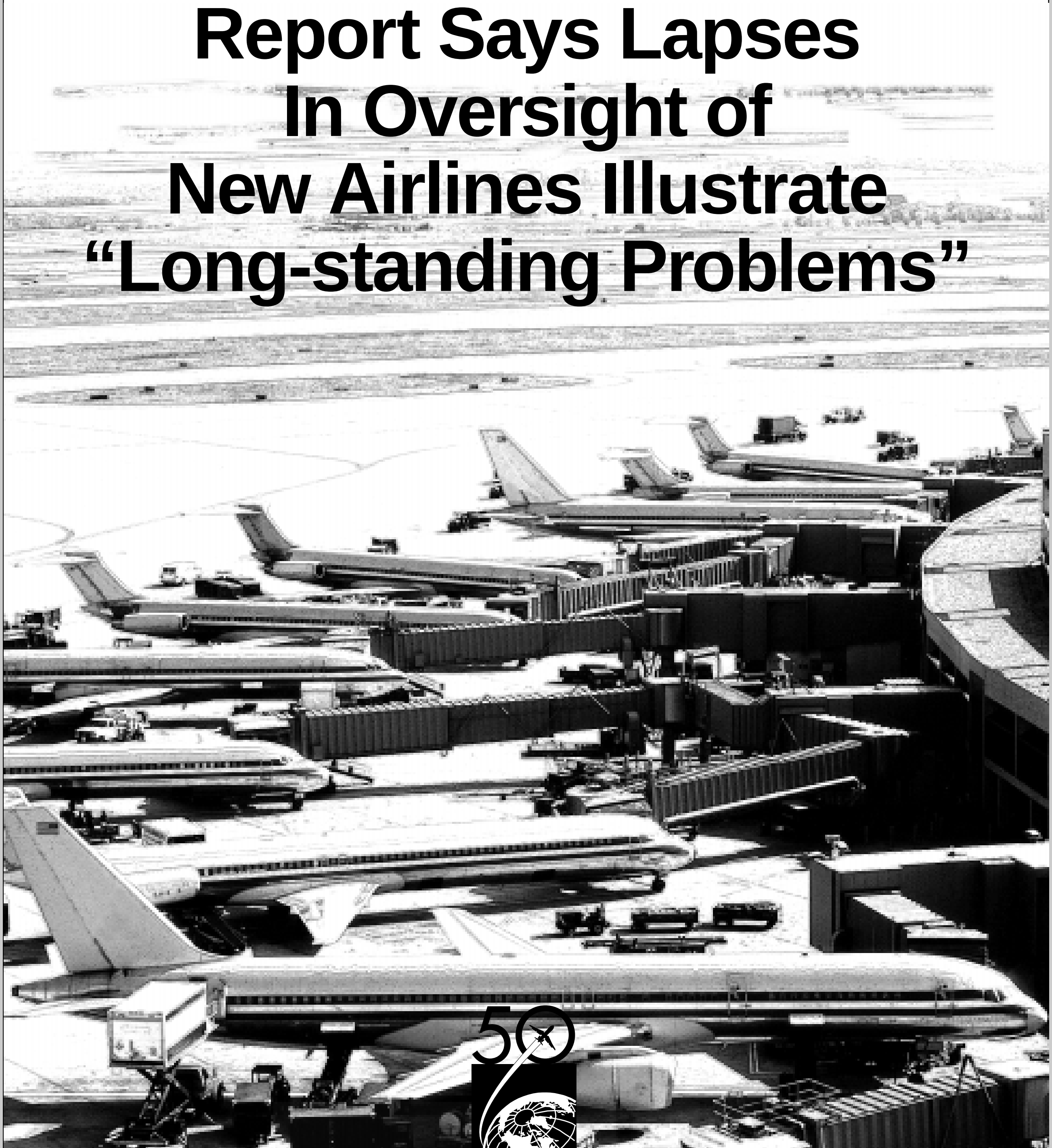
FLIGHT SAFETY

Report Says Lapses In Oversight of New Airlines Illustrate "Long-standing Problems"



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In This Issue

Flight Safety Foundation (FSF) is an international membership organization dedicated to the continuous improvement of flight safety. Nonprofit and independent, FSF was launched in 1945 in response to the aviation industry's need for a neutral clearinghouse to disseminate objective safety information, and for a credible and knowledgeable body that would identify threats to safety, analyze the problems and recommend practical solutions to them. Since its beginning, the Foundation has acted in the public interest to produce positive influence on aviation safety. Today, the Foundation provides leadership to more than 660 member organizations in 77 countries.

Report Says Lapses in Oversight Of New Airlines Illustrate "Long-standing Problems"

The U.S. General Accounting Office (GAO) report found that during the study period the U.S. Federal Aviation Administration (FAA) had no policy of increased surveillance for start-up airlines with above-average rates of accidents, incidents or enforcement actions. It also cited deficiencies in inspector training and FAA databases. But it acknowledged that recent FAA initiatives have the potential to bring about significant improvement.

Robert L. Koenig
and
FSF Editorial Staff

A study by the U.S. General Accounting Office (GAO) has found that during their first five years of operations, start-up U.S. airlines had, on average, higher rates of accidents, incidents and enforcement actions initiated by the U.S. Federal Aviation Administration (FAA) than did established airlines. Nevertheless, the study also determined that during the study period (1990 through 1994), the FAA had no systematic policy for undertaking proportionally greater surveillance of start-up airlines with the highest incident and enforcement-action rates.

The report on the study, *Aviation Safety: New Airlines Illustrate Long-Standing Problems in FAA's Inspection Program*, suggested that deficiencies in the FAA's oversight of new airlines was in part related to shortcomings in the agency's overall aviation safety inspection program that the GAO had called attention to in earlier reports — particularly insufficient training of FAA safety inspectors and unreliable databases.[1]

But the report also said, "To its credit, FAA has made some progress to correct its problems, and recent initiatives by DOT [the U.S. Department of Transportation, of which the FAA is a part] and FAA, if implemented, should go a long way toward strengthening the [inspection] program." And the report said that "the available data show that both new and established airlines experience accidents infrequently," and that more than half of the new airlines had no incidents during the study period, and 42 percent of the new airlines had no FAA enforcement actions taken against them.

During the nearly two decades since the 1978 deregulation of the U.S. commercial airline industry, dozens of new airlines have been formed. Seventy-nine U.S. airlines that had been operating for less than five years were offering scheduled flight service during the period of the GAO study, January 1990 through December 1994. Before new airlines start operating, they must be authorized by the DOT on two separate levels:

- The Office of the Secretary of Transportation Air Carrier Fitness Division, in making its recommendation on "economic" authority to operate, assesses whether new airline applicants have the financial resources, managerial competence and the necessary intention to comply with government regulations; and,

- The FAA Flight Standards Service, in granting safety authority to new air carriers, uses a comprehensive process to determine whether the applicants' aircraft, facilities, manuals, pilots and other personnel meet federal safety standards.

After the new airline begins operating, the FAA conducts safety inspections and takes other steps to monitor the carrier's operations. The FAA's inspections are in two categories: "routine inspections," which are generally spot checks performed by individual inspectors on a periodic basis; and "special inspections," which complement routine inspections with more comprehensive evaluations of airline operations.

The report said that the GAO study addressed "(1) the safety performance of new airlines (airlines having five or fewer years of operating experience) compared with that of established airlines (airlines with more than five years of experience) in terms of accidents, incidents and FAA-initiated enforcement actions and (2) the frequency with which FAA inspects new airlines compared with its inspections of established airlines. In addition to [its] analysis of new airlines, [the GAO] also assessed the status of FAA's efforts to correct long-standing problems that limit the effectiveness of its overall safety inspection program." In addition, the report raised the issue of publishing airline-specific safety data for use by the traveling public.

In analyzing the safety record of air carriers, the GAO examined three sets of data: data from the U.S. National Transportation Safety Board (NTSB) on accidents; the FAA's data on incidents; and the FAA's data on enforcement actions. All three sets of data, the report said, had certain limitations. For example, some of the NTSB files on accidents did not specify which airline was operating the aircraft, and the FAA's data on incidents may be subject to underreporting. " ... The data on the number of enforcement actions initiated, while complete, may reflect differences among FAA field offices in the emphasis they placed on initiating enforcement action," the report said. "We reviewed and made refinements to these data, where appropriate, to address these concerns."

"Rates based on relatively few departures are susceptible to large fluctuations and may not accurately predict longer-term performance."

A new airline was defined by the GAO researchers as one that provided scheduled domestic air service for five or fewer years at any time from the beginning of 1990 to the end of 1994, the most recent years for which complete data were available for incidents, accidents and enforcement actions in all the databases used. "For example, an airline that began service in 1994 would be considered a new airline, since its first year of operations was within the study period," the report said.

"Similarly, an airline that began operating in 1986 would also be considered a new airline in our analysis of 1990 data, because that airline's fifth year of operations occurred in 1990," the report said. "However, beginning with the analysis of 1991 data, that same airline's operations would then be included in the comparison group of established airlines — those that had provided scheduled domestic service for more than five years during the 1990–94 period."

For its analysis, the GAO separated airlines into two groups: "large airlines," which used aircraft with a seating capacity of more than 30 persons, or a maximum payload capacity of more than 3,402 kilograms (7,500 pounds); and "commuter airlines," which tended to operate smaller aircraft.

The study's statistical universe included 265 airlines. Of these, 29 were classified as new large airlines, 60 as large established airlines, 50 as new commuter airlines and 123 as established commuter airlines. During the review period, 20 new airlines reached their sixth year of operations and were then classified as established airlines.

The report said that "new airlines begin operations with fewer departures compared to established carriers … . As a result, as with accident data, caution must be exercised in the interpretation of incident and enforcement data. Rates based on relatively few departures are susceptible to large fluctuations and may not accurately predict longer-term performance."

The NTSB defines an accident as an event during which individuals are killed or seriously injured, or in which an aircraft is substantially damaged. Accidents can range from those that destroy the aircraft and fatally injure everyone on board, to situations in which the aircraft sustains damage, but no one on board is seriously injured.

The GAO found that U.S. aviation authorities reported 201 airline accidents (45 of which involved fatalities) during the 1990–1994 study period. Of those, 45 involved fatalities, and five of the 45 fatal accidents involved new airlines. "Although the available data show that both new and established airlines experience accidents infrequently, we found that, on average, new airlines had higher accident rates than established airlines during their early years of operations," the report said. After analyzing the data, the GAO found that new airlines had an accident rate of 0.60 per 100,000 departures during the study period, compared with the established airlines' accident rate of 0.36 accidents per 100,000 departures.

Incidents, under the FAA's definition, are occurrences other than accidents that affect, or could affect, the safety of aircraft operations. Common categories of incidents include engine malfunctions, landing gear collapse, system failures and the loss of directional control. Also considered incidents are minor collisions with airport structures such as fences or runway lights, and in-flight turbulence that results in minor damage to the aircraft or less-than-serious injuries to persons in the aircraft.

At the FAA's suggestion, the GAO researchers discarded certain types of incidents over which an airline has no control, such as bird strikes and lightning strikes. The GAO examined the remaining 2,879 incidents reported by U.S. aviation authorities during the study period, in which new airlines had an average of 8.1 incidents per 100,000 departures (Table 1). The GAO said that that rate was 52 percent higher than the established airlines' average of 5.4 incidents per 100,000 departures.

Thirty-eight (48.1 percent) of the new airlines had at least one incident during the study period, and the incident rate ranged from 2.8 per 100,000 departures to 666.7 per 100,000 departures, the highest figure being a statistical anomaly, representing an airline that had a single incident in a mere 150 departures. "Other airlines that had relatively high incident rates also had a relatively low number of departures," the report said. "Consequently, we aggregated the data for new large and commuter airlines into groups to deal with the statistical effects of this phenomenon."

Among the 203 established airlines, 162 (79.8 percent) had at least one incident during the study period. The higher percentage of airlines experiencing one or more incidents among established airlines compared with new airlines was presumably because established airlines had on average more departures than new airlines. Table 1 shows incidents and incident rates for new and established airlines.

"At certain times during their first five years of operations, new airlines that experienced incidents had rates that greatly exceeded the average rates for established airlines," the report said. "For new large airlines, these times were during their second, fourth and fifth years of operations (Figure 1). For example, the rate for new large airlines more than tripled between their first and second years of operations. Of the 18 new large airlines that had their second year of operations sometime during 1990 through 1994, seven (38.9 percent) had incidents. The other 11 second-year new airlines had no incidents."

Table 1
Incidents and Incident Rates for New And Established Airlines, 1990–1994

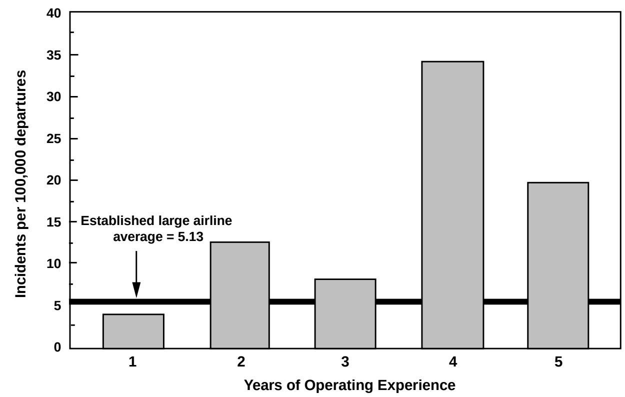
Category of Airline	Number of Incidents: New	Number of Incidents: Established	Incident Rate per 100,000 Departures: New	Incident Rate per 100,000 Departures: Established
Large	34	1,721	11.50	5.13
Commuter	142	982	7.61	5.80
Total	**176**	**2,703**	**8.14**	**5.35**

Source: U.S. General Accounting Office analysis of U.S. Federal Aviation Administration and U.S. Department of Transportation data

The average incident rate for new commuter airlines in the third year of operations was 11.6 incidents per 100,000 departures — twice the average incident rate of 5.8 per 100,000 departures for established commuter airlines (Figure 2).

FAA officials told GAO investigators that they did not know exactly why new airlines, as a group, tended to have higher incident rates. Nevertheless, the report said that FAA officials "theorized that new airlines may encounter more incidents because their fleets expanded faster than their organizational ability to absorb the growth, train their staff and maintain their fleets." Other possibly influential factors that the GAO said "may warrant closer scrutiny" included the difficult financial condition of some new airlines, and the extent to which the airlines "contracted out" major functions such as maintenance, which the report said "can lead to a loss of control or oversight."

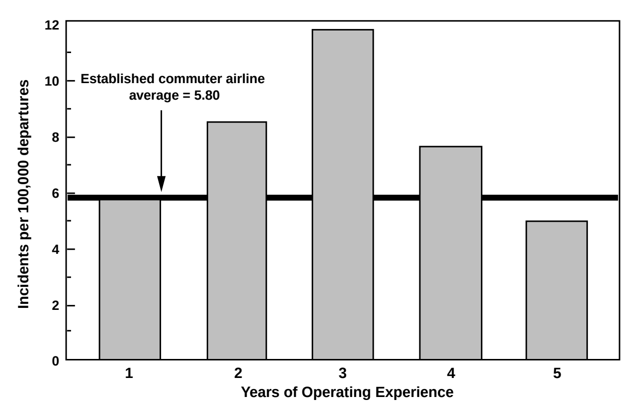
Average Incident Rates for New Large Airlines and Established Large Airlines, by Years of Operating Experience, 1990–1994



Source: U.S. General Accounting Office analysis of U.S. Federal Aviation Administration and U.S. Department of Transportation data

Figure 1

Average Incident Rates for New And Established Commuter Airlines, By Years of Operating Experience, 1990–1994



Source: U.S. General Accounting Office analysis of U.S. Federal Aviation Administration and U.S. Department of Transportation data

Figure 2

Enforcement actions are initiated by the FAA in response to apparent or alleged violations of U.S. Federal Aviation Regulations (FARs) or the U.S. Federal Aviation Act — for example, an airline's failure to perform proper aircraft maintenance or a pilot's failure to maintain the altitude directed by air traffic control. If enforcement actions are found to be warranted, the FAA has the option of taking administrative actions, such as issuing warning notices or letters of correction, or seeking legal enforcement remedies, such as revoking, suspending or changing an airline's operating authority. U.S. aviation authorities reported 3,982 FAA-initiated enforcement actions from 1990 through 1994.

The rates of FAA-initiated enforcement actions were higher, on average, for new airlines during the study period, the GAO found. The FAA initiated 14.8 enforcement actions per 100,000 departures for new airlines, compared with 7.3 enforcement actions per 100,000 departures for established airlines. As with incidents, new large and commuter airlines experienced the highest enforcement-action rates after several years of operations. New large airlines' average annual enforcement actions peaked in the fourth year of operations (Figure 3) and those for new commuter airlines were highest during the third year of operations (Figure 4).

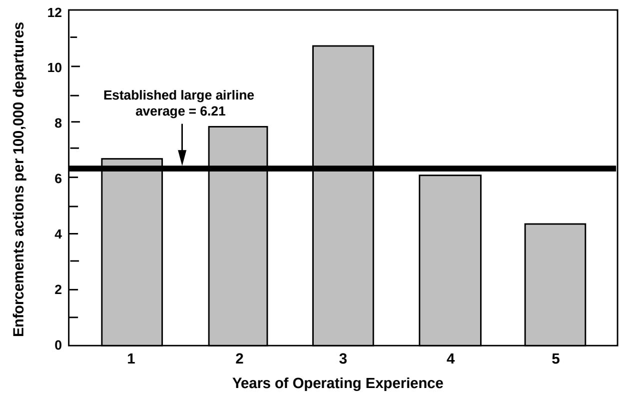
Nevertheless, the GAO report said, "Most of the enforcement actions initiated during the period were concentrated among a relatively small group of airlines, and over 40 percent of the new airlines had no enforcement actions initiated against them. ... Of the 190 total enforcement actions taken against new large airlines during the five-year period studied, the FAA initiated 141 actions (74.2 percent) against 10 airlines, and 49 actions against 11 other airlines."

Average Annual Enforcement Actions By FAA Against New Large Airlines During Their First Five Years of Operations, 1990–1994

Source: U.S. General Accounting Office analysis of U.S. Federal Aviation Administration and U.S. Department of Transportation data

Figure 3

Average Annual Enforcement Actions By FAA Against New Commuter Airlines During Their First Five Years of Operations, 1990–1994



Source: U.S. General Accounting Office analysis of U.S. Federal Aviation Administration and U.S. Department of Transportation data

Figure 4

The gap between rates of enforcement actions against new and established commuter airlines was relatively slim. The FAA initiated an average of 7.0 enforcement actions per 100,000 departures for new commuters, compared with 6.2 enforcement actions per 100,000 departures for established commuters. But the concentration of enforcement actions against new commuters in the third year of operations resulted in a third-year rate of 10.7 enforcement actions per 100,000 departures, more than 70 percent higher than the average rate for established commuters.

The report said, "Of the total 2,286 enforcement cases that had been initiated in 1993 for which data on final action are available, 1,538 (67.3 percent) concluded with an administrative action, 84 (3.7 percent) concluded with a civil penalty, 79 (3.5 percent) concluded with a certificate suspension and 18 (0.8 percent) concluded with a revocation. In another 567 cases (24.8 percent), FAA took no action."

Table 2 (page 5) gives a complete breakdown of accidents, incidents and enforcement actions for new and established airlines during the study period.

The FAA's inspection responsibilities are immense. According to figures given in the report, the agency employs about 2,500 inspectors to oversee about 7,300 scheduled commercial aircraft, more than 11,000 charter aircraft, about 184,400 active general aviation aircraft, about 4,900 repair stations, about 600 pilot-training schools, about 200 maintenance schools and more than 665,000 active pilots. As a result, the GAO has advocated targeting the FAA's safety inspections to airlines that data suggest may be more prone to safety problems than the industry average.[1]

Table 2
Departures, Accidents, Incidents and FAA-initiated Enforcement Actions For Large and Commuter New Airlines and Established Airlines, 1990–1994

						Rates per 100,000 Departures		
Category of Airline	**Years of Operating Experience**	**Departures**	**Accidents**	**Incidents**	**Enforcement Actions**	**Accidents**	**Incidents**	**Enforcement Actions**
New Large	1	27,030	0	1	23	0.00	3.70	85.09
	2	112,435	1	14	90	0.89	12.45	80.05
	3	115,325	0	9	42	0.00	7.80	36.42
	4	14,826	2	5	24	13.49	33.72	161.88
	5	26,021	1	5	11	3.84	19.22	42.27
	Subtotal	**295,637**	**4**	**34**	**190**	**1.35**	**11.50**	**64.27**
Established Large	**Subtotal**	**33,539,748**	**102**	**1,721**	**2,610**	**0.30**	**5.13**	**7.78**
New Commuter	1	196,631	1	11	13	0.51	5.59	6.61
	2	331,735	1	28	26	0.30	8.44	7.84
	3	421,158	4	49	45	0.95	11.63	10.68
	4	377,405	2	28	23	0.53	7.42	6.09
	5	539,073	1	26	23	0.19	4.82	4.27
	Subtotal	**1,866,002**	**9**	**142**	**130**	**0.48**	**7.61**	**6.97**
Established Commuter	**Subtotal**	**16,943,588**	**78**	**982**	**1,052**	**0.46**	**5.80**	**6.21**
All New Airlines	1	223,661	1	12	36	0.45	5.37	16.10
	2	444,170	2	42	116	0.45	9.46	26.12
	3	536,483	4	58	87	0.75	10.81	16.22
	4	392,231	4	33	47	1.02	8.41	11.98
	5	565.094	2	31	34	0.35	5.49	6.02
	Total	**2,161,639**	**13**	**176**	**320**	**0.60**	**8.14**	**14.80**
All Established	**Total**	**50,483,336**	**180**	**2,703**	**3,662**	**0.36**	**5.35**	**7.25**

Note: Includes departure, accident, incident and enforcement action data for deregulated all-cargo airlines and commercial operators of aircraft when those operations or events occured during operations under either U.S. Federal Aviation Regulations (FARs) Part 121 or FARs Part 135.

Source: U.S. General Accounting Office analysis of data from U.S. Department of Transportation, U.S. Federal Aviation Administration and U.S. National Transportation Safety Board

Even though the FAA's national inspection guidelines did not specifically require more frequent inspections of new airlines, the guidelines "grant latitude to FAA's regional and district offices to identify the areas they determine to be important in the interest of safety," the report said. "Over the years, the FAA has targeted specific airlines and areas of commercial airline operations for increased surveillance on the basis of a variety of factors.

"For example, FAA has used an increased frequency of noncompliance with [the FARs], an increased frequency of incidents by individual airlines, the deteriorating financial conditions of individual airlines and non-airline-specific attributes (such as aging aircraft) to target its surveillance activities. However, FAA has not compared the performance characteristics of new airlines, as a group, with those of established airlines to determine whether new airlines should be targeted for increased surveillance."

The GAO found that, from 1990 through 1994, FAA field offices inspected new large airlines, as a group, about three times as often (one inspection for every 20.3 new airline departures) on average as they inspected large established airlines (one inspection for every 65.5 departures). The report said that the FAA inspected new commuter airlines at a frequency (one inspection per 113.1 departures) only slightly greater than that for established commuter airlines (one inspection per 107.8 departures).

"However, no clear pattern in the inspection rates distinguished those airlines that had relatively high rates of incidents and enforcement actions from those that had few or no such problems," the report said. "Some airlines with high incident and enforcement rates were inspected less frequently than the average, while other airlines with no accidents, incidents or enforcement actions were inspected more frequently than the average."

For example, among the 17 new large airlines that were responsible for 85 percent of the incidents and enforcement actions from 1990 through 1994, "the frequency of inspections varied from one inspection for every two departures to one inspection for every 66 departures," the report said. One new large airline — ValuJet — had a 40 percent higher incident rate than the average, but was inspected only about one-third as frequently as all large new airlines through 1994. The report quoted FAA officials as saying that the low inspection rates for some new airlines with relatively high problem rates "may be due to the fact that some new airlines, particularly new commuters, may serve airports that are not closely located to the field office where their inspectors are assigned."

"The recent disclosures about safety problems at ValuJet Airlines and FAA's oversight of ValuJet illustrate the need to closely monitor new airlines," the report said. A detailed FAA inspection of ValuJet, which had expanded its fleet from two airplanes to 47 airplanes in two years, found 35 regulatory violations. Another inspection, in September 1995, found 58 violations, including the lack of a continued analysis and surveillance program, discrepancies between ValuJet's maintenance manual and the FARs, and unapproved maintenance procedures. An FAA "special emphasis program" for ValuJet resulted in a preliminary report on May 6, 1996, that "identified 130 findings on several aspects of ValuJet's operations, including flight operations training, crew qualifications, manuals and procedures, and maintenance," the report said. Following the May 11, 1996, in-flight fire and impact with terrain of a ValuJet DC-9-32 following takeoff from Miami (Florida, U.S.) International Airport, with a loss of all 110 on board, the FAA intensified its scrutiny of the airline.

[The NTSB found the probable causes of the accident to be "(1) the failure of SabreTech (an independent contractor) to properly prepare, package and identify unexpended chemical oxygen generators before presenting them to ValuJet for carriage; (2) the failure of ValuJet to properly oversee its contract maintenance program to ensure compliance with maintenance, maintenance training and hazardous-materials requirements and practices; and (3) the failure of the (FAA) to require smoke-detection and fire-suppression systems in class D cargo compartments.

["Contributing to the accident was the failure of the FAA to adequately monitor ValuJet's heavy maintenance programs and responsibilities, including ValuJet's oversight of its contractors, and SabreTech's repair station certificate; the failure of the FAA to adequately respond to prior chemical oxygen generator fires with programs to address the potential hazards; and ValuJet's failure to ensure that both ValuJet and contract maintenance facility employees were aware of the carrier's 'no-carry' hazardous-materials policy and had received appropriate hazardous-materials training."[3]

[ValuJet agreed to suspend its operations in June 1996, resuming limited operations the following September. In July 1997, ValuJet Inc. announced its merger with Orlando, Florida, U.S.-based AirWays Corp., and ValuJet adopted the name AirTran Airlines.]

In June 1996, the FAA administrator initiated a review of "lessons learned" based on the FAA's history with ValuJet, known as the 90 Day Safety Review. That assessment found that the agency's surveillance system did not differentiate between new and established airlines. "The safety review recommended a heightened level of surveillance of newly certificated airlines for at least the first five years of the companies' operations," the GAO report said.

For the FAA to target its inspectors to the areas of greatest risk, the report said, it "needs to have performance-based criteria to gauge various aspects of aviation safety, and the criteria or measures of safety must be underpinned by reliable data."

The report said that the FAA's aviation-safety databases, although improved, were still not adequate. The FAA began in 1991 designing its "resource-targeting" system, the Safety Performance Analysis System (SPAS). But the report said that the system — which will help target inspections by analyzing information from 25 different FAA and other aviation-related databases — is not expected to be fully operational until 1999. The report said that the new system will be only as reliable as the databases, some of which "contain incomplete, inconsistent and inaccurate data." The FAA has promised to improve the quality of the data. "Until FAA implements its data quality improvement strategy, problems with data quality may limit SPAS' usefulness and prevent it from realizing its full potential to target resources to higher-risk activities," the report said.

The new system will be only as reliable as the databases, some of which "contain incomplete, inconsistent and inaccurate data."

"Even if FAA inspectors are targeted to the areas of greatest risk," the report said, "they must be adequately trained to effectively carry out their responsibilities. ... During the course of our work on new airlines, we interviewed 37 FAA inspectors who were involved with the initial certification or continuing surveillance of new airlines. Although the results of these interviews are not projectable to the universe of inspectors, they do indicate a continuing concern among FAA safety inspectors about the adequacy of the training they receive.

"Sixteen of the inspectors said they had gaps in training that affected their effectiveness in doing their jobs. For example, one inspector requested training on Airbus aircraft when the airline he inspected began using that aircraft, but he did not receive the training until two years after the airline went out of business."

Meanwhile, reductions in the FAA's overall budget in fiscal years 1993 through 1996 "significantly reduced the funding available for technical training," the report said. The FAA training budget decreased by 42 percent between fiscal years 1993 and 1996, even though the agency had received direction from the U.S. Congress to hire more than 230 additional safety inspectors in fiscal year 1996. The cost of training new inspectors combined with the budget reduction would probably further inhibit the additional training of current inspectors, the GAO said.

On two occasions — in December 1993 and December 1994 — the DOT inspector general classified the FAA's oversight and inspection program as a "high-risk" area. (The FAA administrator disagreed with the 1994 assessment, and the U.S. secretary of transportation's report to the U.S. president, although expressing concern about oversight and inspection standards, did not designate the program as "high-risk.") For 1995, the DOT inspector general "stated that past and ongoing work indicated that significant management weaknesses existed in many of the department's safety programs and recommended that safety oversight be reflected in the secretary's ... report as a 'problem area,'" the report said. "However, ... DOT and FAA have recently undertaken a number of initiatives that, taken together, have the potential to address these concerns."

In May 1996, the U.S. secretary of transportation announced initiatives designed to bolster the FAA inspection program. They included:

- Accelerating the hiring of additional aviation safety inspectors;
- Examining the FAA's computer systems and planning an upgrade of the agency's tracking and data systems; and,
- Conducting a comprehensive review of FAA inspection operations, including a review of inspector training and work assignment.

In May and June, the FAA Flight Standards Service conducted a self-assessment that resulted in recommendations for improving inspector training, including defining requirements for currency and recurrent training. The FAA planned to implement the recommendations within two years, the GAO report said.

On Sept. 16, 1996, following the FAA 90 Day Safety Review, the FAA deputy administrator issued a report that included 30 recommendations and proposed implementation strategies.[2] "For example," the GAO report said, "the [FAA] report noted that FAA could improve its resource targeting to address safety risks and that the only way to significantly improve aviation safety is through changing FAA's methods of assessing risk and using new analysis techniques on more complete data. The report said that using systems such as SPAS will allow FAA to more effectively use inspection, surveillance and enforcement resources where they are most likely to improve safety."

The FAA report recognized that its inspection function has historically been understaffed and that "FAA's training programs do not always provide the frequency of training or meet the specific needs identified by employees, manager and industry," the GAO report said. "It included recommendations to ensure that FAA's resources and training are adequate to meet safety requirements.

"As noted in the 90 Day Safety Review, an effective inspection program requires a stable source of financing. The ... Federal Aviation Reauthorization Act of 1996 creates a National Civil Aviation Review Commission [NCARC] that will analyze financial needs and safety trends and make specific recommendations for change. [On May 28, 1997, the commission held the first of two public hearings. Seventeen organizations testified at that hearing, which concerned FAA financing. On Sept. 10, 1997, Stuart Matthews, FSF chairman, president and CEO, made a presentation to the NCARC. On Oct. 8, 1997, the NCARC held its second and final hearing, which included testimony from the Air Transport Association of America; the Air Line Pilots Association, International; the Airline Dispatchers Federation; the Professional Aviation Maintenance Association; and others.] Recent experience with the lack of authority to collect aviation excise taxes underscores the need to develop a long-term financing solution for FAA that will ensure adequate funding of aviation inspectors and required training."

The FAA report recommended increased surveillance for airlines during their first five years of operations and periodic reviews of the management, financial and operational status of new airlines.

The GAO report also cited the establishment of the commission headed by U.S. Vice President Al Gore as a step among the other FAA initiatives that "have the potential to address several of FAA's long-standing problems."

[Since the FAA 90 Day Safety Review report and the GAO report were issued, the FAA has moved to implement the FAA report's recommendations to bolster its oversight of new airlines. In an August 1997 statement, the FAA reported that its regulatory approach to new airlines "has undergone a transformation" in response to last year's 90 Day Safety Review report. In addition to hiring more inspectors, the FAA's "best inspector resources are being focused on new carriers," the statement said. "A national certification team of safety experts has been established and the selection of the best and brightest inspectors has begun. A new airline will have to win the team's approval to [begin operations]. For the first time, new carriers will fly under increased supervision by FAA safety inspectors" for the airlines' first five years.

[As of June 1997, the FAA had 3,028 inspectors, compared to 2,776 inspectors the previous federal fiscal year and 2,324 in 1994. The FAA says that it plans to employ 3,297 inspectors in fiscal year 1998. At the same time, the FAA plans "to upgrade computer data collection and tracking," the agency statement said. "Both elements are key to the agency's ability to focus resources when violations or other safety concerns are identified."

[The FAA said that its new "national certification team" was already selecting the most experienced inspectors and starting to assign them to inspect new airlines. The agency had begun implementing the new requirement that it conduct follow-up inspections of new carriers during their first five years of operations. In addition, the FAA said that its "inspectors will receive enhanced training before entering the field." During a one-day "stand-down" last year, the FAA conducted a comprehensive review of all inspector work assignments and training requirements, and obtained direct responses from its inspectors.[4]]

The GAO report noted that the DOT regularly publishes certain types of consumer-related information on individual airlines, such as those concerning on-time records and lost luggage. But safety-related indicators such as accident rates, incident rates, near-midair collisions and pilot deviations are published by the FAA in aggregated format, rather than airline-specific.

"Because the airlines might react negatively to how such [airline-specific] data would be used, FAA officials have said that airlines might be hesitant to share such information, which would impair FAA's efforts to improve the system's overall safety," the report said. "We recognize FAA's desire to obtain such information from the airlines on a voluntary basis. However, FAA's mission to promote air safety argues that it should have access to whatever data ... can help it to better improve air safety. If the airlines do not choose to share such data voluntarily, FAA could pursue the appropriate regulatory or legislative remedies to gain such access.

"Before publishing airline-specific safety data, FAA would need to address a number of issues. First, FAA would need to develop a consensus among the affected and interested parties (airlines, passengers, aviation safety system analysts, etc.) on the most appropriate criteria for measuring airline safety performance. Second, FAA would need to gather and analyze the data and develop a monitoring system to verify the completeness and accuracy of the data. Third, FAA would need to take appropriate measures, including enforcement actions, where necessary to ensure that airlines comply with data requirements.

"While such an endeavor is a formidable task, the benefits could be substantial. It would not only allow FAA to publicly disclose airline-specific safety data to help the public in making transportation decisions but, just as importantly, better equip FAA to identify and pre-emptively act on emerging aviation safety trends."

[Flight Safety Foundation strongly supports the confidentiality and deidentification of all safety-related data gathered by airlines, whether from digital flight data recorders (DFDRs) or crew reports. The Foundation believes that flight operations quality assurance (FOQA) programs cannot succeed unless individuals and air carriers are absolutely confident that data about safety-related deviations or incidents will not result in negative consequences for the reporting party.

[Stuart Matthews, FSF chairman, president and CEO, said in a broadcast radio interview: "Publishing the so-called safety record of individual airlines is a bad idea. To begin with, it is questionable whether airlines, passenger associations and aviation safety specialists will ever arrive at a consensus about the 'most appropriate' criteria for measuring airline safety; the criteria selected will probably be arbitrary or a bureaucratic compromise.

["But even if everyone could agree on the appropriate measuring sticks, it is all too easy to draw wrong conclusions by comparing 'safety-related' statistics. In short-term measurements, random variation plays a huge role, making the comparison of airline A with airline B during one month, for instance, statistically meaningless. If you compare the airlines over, let's say, a five-year span the comparison might be statistically significant but it would not necessarily be practically significant. The airline industry and individual airlines change rapidly, so a rate that includes data from five years ago might well be irrelevant for someone trying to choose the 'safest' airline.

["But those considerations pale in comparison with the most important one, which is that it goes against human nature to ask an airline to report data that could cost it dearly in the marketplace if the public perceives, rightly or wrongly, that it is less 'safe' than a competitor or if the airline knows that such data might become an issue in future litigation."]

The GAO report added that one step in the process of obtaining and publishing airline-specific safety data "would involve NTSB's and FAA's ongoing effort to refine the definition of accident, but the completion date for this effort has not been established."

In the conclusion to its report, the GAO said: "We believe that the basic challenges of starting a new airline, and the overall results of our analysis, argue for closely monitoring the performance of new airlines during their first several years of operations and conducting increased or comprehensive inspections of those airlines with elevated rates of safety-related concerns." The GAO report said that the FAA's recent initiatives to tighten its inspection of new airlines "have the potential to significantly improve the FAA's inspection program, but only if they are effectively implemented."

The report recommended that the secretary of transportation instruct the FAA administrator to "(1) closely monitor the performance of new airlines, particularly during the early years of operations, and conduct increased and/or comprehensive inspections of those new airlines that experience elevated rates of safety-related problems; (2) evaluate the impact of recent budget reductions on FAA's critical safety-related functions, including — but not limited to — inspector training, and report the results to Congress through the appropriations process; and (3) study the feasibility of developing measurable criteria for what constitutes aviation safety, including those airline-specific safety-related performance measures that could be published for use by the traveling public."

To implement the recommendations included in the FAA's 90 Day Safety Review, the GAO report recommended that the secretary of transportation require the FAA administrator to establish "(1) clear goals and objectives addressing the safety review's identified problem areas; (2) measurable performance criteria to assess how the goals and objectives are being met; and (3) a monitoring, evaluation and reporting system so that FAA's implementation of the recommendations contained in FAA's 90 Day Safety Review can be reported to the Secretary and the Congress on a regular basis.

"We also recommend that the chairman of NTSB and the administrator of FAA jointly establish a date for completing the ongoing re-evaluation of the definition of accident."

In its three-page response to the GAO report,[5] the DOT said that it welcomed the analysis and recommendations, but questioned some aspects of the statistical analysis of new airlines' safety records. Although the DOT agreed with the report that inspection of new airlines should be bolstered, the DOT response said that the FAA, overall, has done an excellent job in helping make air travel in the United States extremely safe.

"The FAA aviation safety inspection program has provided effective safety oversight of the commercial airline industry, as evidenced by the 1.5 million passengers that arrive safely at their destinations every day," the DOT said. "We agree that oversight of new airlines can be further strengthened so that it continues to be effective as airlines evolve. The Department and FAA are moving to accomplish this objective." The DOT said that it was "pleased that GAO was able to take into account actions taken pursuant to the recommendations of the 90 Day [Safety] Review in reaching the conclusions of its study."

The DOT also recognized the GAO's acknowledgment of the uncertainties resulting from the relatively sparse data for new airlines. " ... The data samples for accidents and incidents experienced by new entrant airlines contain a small number of events — sometimes only one — and the number of recorded departures in a year may be far fewer than the 100,000 used as a basis for normalizing. The limited data produce analytical results of inadequate validity to be considered as representative of all new entrant airlines. "As a result, a single new entrant incident could produce a substantial negative bias in comparing these less certain rates for new entrants with those of established airlines where there are more accidents, incidents and millions of departures over the five-year period studied by GAO."

The DOT added that "many new entrant airlines had exemplary safety records" from 1990 through 1994. More than half of the new airlines — 41 out of 79 — "had unblemished records," with no incidents or accidents during that period. An additional 17 new airlines (21 percent of the total) experienced only one incident during the period studied.

"These statistics clearly portray the exceptional influence that the small group of carriers, 27 percent (21 of 79) that experienced more than one incident had on GAO's analytical results," the DOT said. "In addition, we also appreciate the emphasis by the GAO report that the indication from the aggregated new entrant airline statistics must *not* be construed as meaning that *all* new entrants have safety deficiencies. By so doing, the GAO avoids inappropriately biasing the safety expectations of the traveling public against new carriers."♦

Editorial note: This article is based on *Aviation Safety: New Airlines Illustrate Long-Standing Problems in FAA's Inspection Program*, a report to Congressional requesters by the U.S. General Accounting Office. Report no. GAO/RCED-97-2 (October 1996). The 48-page report includes tables, figures and appendices.

References

1. An appendix to the report lists numerous earlier GAO reports along similar lines. They include the following, among others: *Aviation Safety: Targeting and Training of FAA's Safety Inspector Workforce* (GAO/T-RCED-96-26, April 30, 1996); *Aviation Safety: FAA Can Be More Proactive in Promoting Aviation Safety* (GAO/T-RCED-95-81, Jan. 12, 1995); *Aviation Safety: Commuter Airline Safety Would Be Enhanced with Better FAA Oversight* (GAO/T-RCED-92-40, March 17, 1992); and *Aviation Safety: FAA Needs to More Aggressively Manage Its Inspection Program* (GAO/T-RCED-92-25, Feb. 6, 1992).

2. U.S. Federal Aviation Administration (FAA). *FAA 90 Day Safety Review*. Unnumbered. Sept. 16, 1996. See also *90-Day Aviation Safety Review Implementation Plan: Milestone Status Report as of June 30, 1997*, which gives the status of the numerous specific recommendations in the 90 Day Safety Review. FAA, July 15, 1997.

3. U.S. National Transportation Safety Board. *Aircraft Accident Report: In-flight Fire and Impact with Terrain, ValuJet Airlines Flight 592, DC-9-32, N904VJ, Everglades, Near Miami, Florida, May 11, 1996.* Report no. NTSB/AAR-97-06. August 1997.

4. *FAA News*, APA 110-97, Aug. 14, 1997.

5. U.S. Department of Transportation document no. RCED-96-175; reproduced in the GAO report.

About the Author

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Aircraft Accidents Reported to the Transportation Safety Board of Canada (TSB) for 1996 Fell to an Estimated 10-year Low

The lowest accident rate was for large commercial airlines, which reported only one accident; the highest rate was for private airplanes, which reported 153 accidents per 100,000 hours flown.

FSF Editorial Staff

For the 13th consecutive year, large Canadian commercial airlines had no fatal accidents in 1996, according to statistics released by the Transportation Safety Board of Canada (TSB). The overall accident rate for Canadian-registered aircraft fell to 8.9 accidents per 100,000 flight hours, compared with 10.3 accidents per 100,000 flight hours in 1995.

Aircraft operated by Canadian Level I carriers (large commercial airlines) had one accident in the year. Aircraft operated by Level II carriers (regional operators) experienced five accidents, two of which resulted in a total of five fatalities.

Data current through February 1997 indicated that there were 390 aircraft accidents reported to the TSB last year. Canadian aircraft other than ultralights accounted for 339 of that number (13 percent fewer accidents than in 1995). Of these, 272 involved airplanes, 119 of which were commercially operated, and 55 involved helicopters. The remainder involved balloons, gliders and gyrocopters.

Based on indications that there was a small increase in flight activity during 1996, the overall Canadian accident rate is estimated to have fallen to a decade-low 8.9 accidents per 100,000 hours flown.

Aircraft flown by commercial airlines and regional operators accounted for a combined six accidents and five fatalities. (All data for fatalities include fatalities on the ground.) Aircraft flown by small local air carriers and specialty operators accounted for 113 accidents, 12 of which resulted in fatalities.

After decreasing sharply in 1992, helicopter accidents have returned to historical levels. Of the 55 helicopter accidents reported in 1996, six accidents produced a total of six fatalities. About 40 percent of the helicopter accidents involved charter operations.

Twenty-eight ultralight aircraft and 23 non-Canadian-registered aircraft in Canada were involved in accidents in 1996, resulting in 18 fatalities.

Canadian aircraft (other than ultralights) had 43 fatal accidents in 1996, representing a 17 percent decrease compared with 1995.

Table 1 (page 11) shows summary accident data for each year from 1987 through 1996.

In the table, commercial operators are defined as those who are paid to transport people or goods or to perform special tasks such as aerial photography, flight training or crop spraying; they are assigned Levels I through VI based on the nature of their operations. State operators include both federal and provincial government. Private operators are those who fly for pleasure or private companies flying for business reasons, including flights on which it is not possible to transport people or goods on a “for hire” basis.

Table 1
Canadian Aviation Accidents and Incidents
1987–1996

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Canadian-registered Aircraft Accidents[1]	**472**	**497**	**482**	**498**	**453**	**435**	**422**	**380**	**390**	**339**
Airplanes Involved[2]	399	427	408	415	378	385	366	302	315	272
Carrier Level I	1	2	0	0	1	3	4	1	1	1
Carrier Level II	0	5	12	8	12	8	6	6	10	5
Carrier Levels III–IV	151	167	171	157	142	134	133	120	149	113
Private/State	247	253	225	250	223	240	223	175	155	153
Helicopters Involved	55	58	59	70	64	34	52	63	68	55
Other Aircraft Involved[3]	20	15	19	14	14	17	8	21	12	12
Hours Flown (Thousands)[4]	3,347	3,623	3,737	3,411	3,301	3,308	3,490	3,776	3,790	3,800
Accident Rate (per 100,000 Hours)	14.1	13.7	12.9	14.6	13.7	13.1	12.1	10.1	10.3	8.9
Fatal Accidents	**55**	**50**	**60**	**47**	**64**	**47**	**48**	**33**	**52**	**43**
Airplanes Involved	43	41	51	36	56	39	45	30	44	34
Carrier Level I	0	0	0	0	0	0	0	0	0	0
Carrier Level II	0	2	3	1	1	0	1	0	2	2
Carrier Levels III–IV	16	15	13	14	20	10	18	15	22	12
Private/State	27	24	35	21	35	29	26	15	20	20
Helicopters Involved	9	8	8	8	7	3	3	3	11	6
Other Aircraft Involved	3	1	1	3	2	4	0	0	0	3
Fatalities	**103**	**95**	**155**	**91**	**373**	**80**	**102**	**80**	**107**	**70**
Serious Injuries	**72**	**52**	**86**	**60**	**54**	**64**	**61**	**35**	**53**	**38**
Ultralight Aircraft Accidents	**42**	**29**	**37**	**36**	**39**	**41**	**50**	**36**	**44**	**28**
Fatal Accidents	3	6	4	6	7	5	3	8	8	4
Fatalities	4	8	4	8	8	8	4	11	10	5
Serious Injuries	15	6	11	12	12	13	7	5	12	6
Non-Canadian-registered Aircraft Accidents	**41**	**26**	**26**	**25**	**30**	**25**	**16**	**21**	**18**	**23**
Fatal Accidents	7	4	4	2	5	8	1	4	3	4
Fatalities	10	4	4	3	12	19	2	9	5	13
Serious Injuries	6	7	11	7	3	6	3	1	2	2
All Aircraft: Reportable Incidents	**508**	**644**	**688**	**693**	**685**	**664**	**597**	**578**	**618**	**714**
Collision/Risk of Collision/Loss of Separation	160	189	215	211	159	156	145	152	143	194
Declared Emergency	90	101	169	160	220	200	190	138	190	200
Engine Failure	163	201	186	190	173	176	150	172	166	176
Smoke/Fire	57	61	57	58	69	71	55	62	53	78
Other	38	92	61	74	64	61	57	54	66	66

Carrier Level I
Canadian Level I carriers are air carriers that, in each of the two years immediately preceding the reporting year, carried one million or more revenue passengers, two hundred thousand or more tons of revenue goods or both.

Carrier Level II
Canadian Level II air carriers are those not assigned to Level I or licensed solely to serve the transportation requirements of a lodge operation, that, in each of the two years immediately preceding the reporting year, carried fifty thousand or more revenue passengers, ten thousand or more tons of revenue goods or both.

Carrier Level III to V
Canadian Level III to V air carriers are those not assigned to Level I or II and not licensed solely to serve the transportation requirements of a lodge operation.

Carrier Level VI
Canadian Level VI air carriers are, regardless of revenue earned, those that, throughout the reporting year, operated a licensed air service solely to serve the transportation requirements of a lodge operation.

[1] Ultralight aircraft excluded.
[2] As some accidents may involve multiple aircraft, the number of aircraft involved may not sum to the number of accidents.
[3] Includes gliders, balloons and gyrocopters.
[4] Source: *Statistics Canada*.
(1996 figures are preliminary as of Jan. 7, 1997, and subject to change.)

Source: Transportation Safety Board of Canada

Aviation Statistics: II

Specifications for Commercially Available Explosives-detection Devices Published by GAO

The U.S. Federal Aviation Administration intends to install advanced explosives-detection devices at selected U.S. airports. The U.S. General Accounting Office has presented a survey of available explosives-detection units.

FSF Editorial Staff

In September 1996, the White House Commission on Aviation Safety and Security recommended that the U.S. Federal Aviation Administration (FAA) purchase and install advanced explosives-detection devices at selected U.S. airports, partly in response to concerns arising from the explosion of TWA Flight 800. [While climbing through 4,180 meters (13,700 feet) after takeoff from John F. Kennedy International Airport, New York, New York, U.S., on July 17, 1996, the Boeing 747-100 exploded and separated into segments that fell into the ocean. None of the 18 crew members and 212 passengers survived. The cause of the explosion is still under investigation, but sabotage has been ruled out.] More than US$100 million worth of explosives-detection units are planned to be installed by February 1998 at major airports in the United States.

A U.S. Senate subcommittee requested that the U.S. General Accounting Office (GAO) supply the latest information concerning commercially available, advanced explosives-detection devices that can be used to screen checked baggage, carry-on items and electronic equipment such as laptop computers, passengers, cargo and mail. Gerald Dillingham, GAO associate director, transportation issues, responded in a report (no. B-276675) dated April 24, 1997.

For the report, an advanced explosives-detection device was defined as "one that, in most cases, has an automatic alarm that signals the operator if potential explosives are detected. If the device does not have an automatic alarm, then it has some other advanced capabilities to provide more information to the operator, such as highlighting or color coding a potential explosive."

The report said that the available devices "can increase the probability of detecting concealed explosives." But it cautioned that "some devices can detect only certain explosives, while others have slow baggage-processing rates; others rely almost entirely on the skills of the operators rather than on automatic alarms."

[For a detailed discussion of baggage and passenger screening for explosives, see *Airport Operations*, July–August 1996.]

The technologies for detecting hidden explosives vary. They include:

- **X-ray devices**. By X-raying a passenger or item, possible explosives can be identified by their "density, average atomic number and appearance," the report said. "The detection capabilities of these devices vary in terms of how the X-ray systems function — for example, by providing cross-sectional images or by using 'reflected' energies known as backscatter;

- **Chemical trace-detection devices**. Explosives emit vapors or leave residues that can be analyzed by detectors. "Samples are obtained through techniques such as using a wipe or a vacuum, examining a document or some other item that has been handled by the passenger, or sampling air gathered at walk-through portals," the report said; and,

- **Electromagnetic devices**. " ... Radio-frequency pulses [can] probe baggage or other items to elicit responses that would be associated with explosive materials," the report said.

In May 1997, the FAA announced that it planned to spend US$12.2 million on trace-detection systems, with deliveries beginning in within 60 days of the announcement. More than 500 trace-detection systems will ultimately be installed in the busiest U.S. airports.

The report's documentation of available commercial explosives-detection equipment designed for airports is summarized by application category in the following tables: Table 1 (page 13), checked baggage; Table 2 (page 14), carry-on items and electronics; Table 3 (page 15), passengers; and Table 4 (page 15), cargo and mail.

Table 1
Commercially Available Advanced Explosives Detection Devices
Application: Checked Baggage

Technology	Manufacturer	Available devices	US$ Unit Price[a]	Characteristics, capabilities and other related information
X-ra				
Computerized axial tomography (CAT scan)	InVision Technologies Foster City, California, U.S.	CTX-5000SP	850,000 to 1 million	This is the only device certified by the FAA. The system is based on computer technology from the medical field that obtains a number of cross-sectional images of a bag that are displayed on a monitor. The device automatically alarms when potential explosives are detected. It is relatively slow in processing bags. As result, a certified system requires two devices to meet FAA standard for processing a specific number of bags per hour. Using a portion of the $144.2 million appropriated in September 1996 for explosives-detection devices, the FAA recently purchased 54 of these units, which will be deployed at selected U.S. airports.
Advanced X-ray	Vivid Technologies Waltham, Massachusetts, U.S.	H-1 VIS VIS-M VDS	250,000 to 375,000	Two different X-ray energies are used to determine the densities and average atomic numbers of the target material. These devices automatically alarm when potential explosives are detected. As part of the $144.2 million appropriated in September 1996, the FAA plans to purchase 20 units from among these manufacturers, which will be deployed at selected U.S. airports to test their on-line performance capabilities.
	EHG&G Astrophysics Long Beach, California, U.S.	Z-Scan-7 Z-Scan-12	350,000	
	Heimann Systems Wiesbaden, Germany	Hi-Scan 10050EDS	300,000	
X-ray backscatter	AS&E Billerica, Massachusetts, U.S.	Z-Backscatter 101Z 1001ZZ Q-scan 1000	75,000 to 100,000	Backscatter detects reflected X-rays, which provides an image on a monitor that highlights organic materials, such as explosives. These devices do not automatically alarm and therefore require operators to interpret the images for every screened object.
Electromagnetic				
Quadrupole resonance	Quantum Magnetics San Diego, California, U.S.		340,000	The unit uses radio-frequency pulses that probe bags to elicit unique responses from explosives. It is a nonimaging technology that provides chemical-specific detection and automatically alarms when explosives are detected. Using a portion of the September 1996 appropriated funds, the FAA plans to purchase five of these devices, which will be tested at selected U.S. airports.

FAA = U.S. Federal Aviation Administration

[a] Prices indicated are a range of costs or an approximate cost to purchase a unit. The price range on some units can be wide because of options that can be added. For example, some devices can be outfitted to detect both explosives and drugs.

Source: U.S. General Accounting Office

Table 2
Commercially Available Advanced Explosives Detection Devices
Application: Carry-on Items/Electronics

Technology	Manufacturer	Available devices	US$ Unit Pricea	Characteristics, capabilities and other related information
Trace				
Ion Mobility Spectroscopy (IMS)[b]	Barringer Instruments New Providence, New Jersey, U.S.	Ionscan 400	45,000 to $50,000	IMS devices measure the mobility of various molecules through a gas in an electrical field. Trace samples are gathered using a wipe or a vacuum and then analyzed by the device, which takes approximately five seconds for analysis. These devices provide chemical-specific detection and automatically alarm when explosives are detected; they are portable, with low false-alarm rates.
	Ion Track Instruments Wilmington, Massachusetts, U.S.	Itemizer	$55,000	
	Graseby Security Hertfordshire, England	Plastec	45,000	
	CPAD Technologies Ottawa, Ontario, Canada	Sirius Orion	70,000 90,000	
Combination Technologies[b]	Thermedics Detection Clemsford, Massachusetts, U.S.	Egis Rampart	30,000 to 170,000	These devices use a chemical separation and identification technique known as chromotography and chemiluminescence. The devices are highly sensitive and have chemical-specific capabilities. They automatically alarm when explosives are detected. The devices are portable, with low false-alarm rates.
Electromagnetic				
Quadrupole resonance	Quantum Magnetics San Diego, California, U.S.		65,000	These devices emit radio-frequency pulses that probe bags to elicit unique responses from explosives. The devices provide chemical-specific detection and automatically alarm when they detect explosives.

[a] Prices indicated are a range of costs or an approximate cost to purchase a unit. The price range on some units can be wide because of options that can. For example, some devices can be outfitted to detect both explosives and drugs.

[b] Using a portion of the $144.2 million appropriated in September 1996, the FAA recently purchased a mix of 30 devices that use IMS or combination technologies. The FAA plans to purchase another 459 devices among these two types of technologies from various manufacturers.

Source: U.S. General Accounting Office

Table 3
Commercially Available Advanced Explosives Detection Devices; Application: Passenger Screening

Technology	Manufacturer	Available devices	US$ Unit Price[a]	Characteristics, capabilities and other related information
X-ray X-ray backscatter	AS&E Billerica, Massachusetts, U.S.	Body Search	US$150,000	This device uses a low-level X-ray, producing a backscatter image capable of detecting organic and nonorganic materials. The device is nonintrusive, which allows the passenger to remain fully clothed while being scanned. The device has been approved by the U.S. Food and Drug Administration and the U.S. Department of Health and Human Services in connection with safety issues and X-ray levels. It is currently in use at several non-U.S. locations, but has not been deployed in the U.S. The device does not automatically alarm but relies on an operator's interpretation of image.
Trace Ion Mobility Spectroscopy (IMS)	Barringer Instruments New Providence, New Jersey, U.S	Token System Document Scanner	55,000 to 59,000	Using a document or token handled by a passenger, the device analyzes the item for the presence of residual explosives left by a person's hand. Both devices can automatically detect the presence of explosives.
	CPAD Technologies	NOVA	250,000 to 350,000	NOVA is a walk-through portal that samples air using gas chromotography and IMS. The device captures an image of the person being screened while passing through the portal. The device has been deployed in non-U.S. countries but not in the United States. It automatically alarms when explosives are detected.

[a]Prices indicated are a range of costs or an approximate cost to purchase a unit. The price range on some units may be wide because of options that may be added to a device. For example, some devices can be outfitted to detect both explosives and drugs.

Source: U.S. General Accounting Office

Table 4
Commercially Available Advanced Explosives Detection Devices; Application: Cargo and Mail

Technology	Manufacturer	Available devices	US$ Unit Price[a]	Characteristics, capabilities and other related information
X-ray High energy fixed-site system with backscatter	AS&E Billerica, Massachusetts, U.S.	Pallet Search	900,000 to 950,000	This device relies on an operator's interpretation of X-ray images. It does not have an automatic alarm but can be equipped with an auto alarm as an option. The device can be used to screen bulk mail and containerized cargo. It has not been deployed at any U.S. airports to date.
Trace Quadrupole resonance	CPAD Technologies Ottawa, Ontario, Canada	Mail Scanner	75,000	This device automatically alarms when explosives are detected. It operates under the same principle as the manufacturer's Orion trace detection device, which is used for screening carry-on items. It can be used to scan mail bags in bulk or individual mail pieces.

[a]Prices indicated are a range of costs or an approximate cost to purchase a unit. The price range on some units may be wide because of options that may be added to a device. For example, some devices can be outfitted to detect both explosives and drugs.

Source: U.S. General Accounting Office

Publications Received at FSF Jerry Lederer Aviation Safety Library

Study Reports Status of U.S. Air Traffic Control Automation-upgrade Project

Book offers reference guide to "practical" aviation law.

FSF Editorial Staff

Advisory Circulars (ACs)

Use of CD-ROM Systems. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 120-69. Aug. 14, 1997. 7 pp. Available through GPO.*

U.S. Federal Aviation Regulations (FARs) allow for the preparation, use and retention of the maintenance portion of the certificate holder's manual in electronic format provided that an electronic format is acceptable to the Administrator. An acceptable CD-ROM (compact disk read-only memory) system must be able to deliver to the user the same level of accuracy and integrity as a comparable paper- or microfilm-based format. Guidance is provided by this AC on the use of CD-ROM systems for the preservation and retention of the maintenance portion of the certificate holder's manual. Also provided in this AC is guidance on the use of CD-ROM systems for retrieving technical data from the certificate holder's manual. [Adapted from AC.]

Floor Proximity Emergency Escape Path Marking Systems Incorporating Photoluminescent Elements. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 25.812-2. July 24, 1997. 12 pp. Available through GPO.*

Floor-proximity emergency escape–path marking systems (FREEPMS) are designed to provide visual guidance for emergency evacuation of passenger cabins when all sources of cabin lighting more than 1.22 meters (four feet) above the aisle floor are completely obscured by smoke. This AC contains guidance material useful in demonstrating compliance with provisions of Part 25 of the U.S. Federal Aviation Regulations (FARs) about FREEPMS using photoluminescent elements. Systems using photoluminescent elements do not require electrical power, which was necessary for previous FREEPMS. Instead, these systems are charged by lighting sources such as normal passenger-cabin lighting or sunlight entering the cabin during the day when the shades are open. As the cabin darkens, the photoluminescent elements of the FREEPM discharge the stored energy as a luminescent glow. [Adapted from AC.]

Announcement of Availability: AC 65-13R, FAA Inspection Authorization Directory. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 65-13R. July 17, 1997. 1 p. Available through GPO.*

This AC announces the availability of AC 65-13R, *FAA Inspection Authorization Directory*, which contains yearly updated listings of the certificated mechanics who hold inspection authorizations within the state, U.S. possession or territory in which they are located. Also included is information about obtaining printed copies of AC 65-13R. [Adapted from AC.]

Airplane Flight Manual. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 25.1581-1. July 14, 1997. 21 pp. Available through GPO.*

The transport category Airplane Flight Manual (AFM) approved by the FAA is an authoritative source of information considered necessary for safely operating the airplane under normal, abnormal and emergency conditions. The AFM contains the operating limitations, operating procedures and performance information for the airplane. The information that must be provided in the AFM under the airworthiness regulations is outlined in this AC, along with guidance about the form and content of the FAA-approved portion of an AFM. Appendix 1 of this AC contains guidance for FAA approval of computerized AFM information that would replace or supplement parts of the paper AFM. [Adapted from AC.]

Guide for Developing and Evaluating an SFAR 36 Engineering Procedures Manual. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 140-8. May 22, 1997. 1 p. Available through GPO.*

This AC presents an acceptable means, but not the only acceptable means, for the development and evaluation of a Title 14 U.S. Code of Federal Regulations (CFR) Special Federal Aviation Regulation (SFAR) 36 engineering procedures manual. The SFAR 36 engineering procedures manual must accurately describe the engineering operations used to develop major repairs, and be within the limitations of the certificate holder's rating(s) and engineering staff capabilities, so that the technical data for major repairs under SFAR 36 can be developed. Appendix 1 contains examples from a sample engineering manual to illustrate requirements specified by the SFAR. The sample manual also includes information necessary to administer the regulation, such as the requirement for a list of effective pages, company SFAR 36 organizational chart and the recommended frequency of reporting requirements. [Adapted from AC.]

Qualification and Approval of Personal Computer-Based Aviation Training Devices. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 61-126. May 12, 1997. 7 pp. Available through GPO.*

Information and guidance is provided by this AC concerning one acceptable means by which personal computer–based aviation training devices (PCATD) may be qualified and approved for flight training toward satisfying the instrument rating training in accordance with U.S. Federal Aviation Regulations (FARs) Part 61 and Part 141. These guidelines are not mandatory, but are based on extensive industry and FAA experience in determining compliance with the relevant parts of the FARs. A distinction is made between PCATDs and flight training devices (FTD) qualified under AC 120-45, *Airplane Flight Training Device Qualification*, and flight simulators qualified under AC 120-40, *Airplane Simulator Qualification.* Acceptable criteria are also outlined under which the airplane or FTD flight-hour training time required for an instrument rating may be reduced by using PCATDs meeting acceptable FAA standards. [Adapted from AC.]

Pilot Records Improvement Act of 1996. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 120-68. May 8, 1997. 6 pp. Available through GPO.*

The Pilot Records Improvement Act of 1996 (PRIA) requires that air carriers request and receive certain records before hiring an individual as a pilot. Among the records from the FAA are those concerning pilot certificates, associated ratings, medical certificates and summaries of legal enforcement actions. If the individual was employed by other air carriers or other persons within the past five years, certain records concerning training, competency, disciplinary actions and terminations or other causes for separation are required. Relevant records are required from the National Driver Register concerning the motor vehicle driving record of the pilot being considered.

The new statutory requirement only applies to operators that have or are required to have an air carrier certificate. Air carriers conducting intrastate operations under U.S. Federal Aviation Regulations (FARs) Part 121 or Part 135 are also required to comply with the new requirements. This AC contains information and suitable standard forms, although not the only forms, that may be used to comply with the provisions of the PRIA. [Adapted from AC.]

Announcement of Availability: Commercial Pilot Practical Test Standards: FAA-S-8081 and FAA-S-8081-12A. . U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 61-125. April 30, 1997. 2 pp. Available through GPO.*

Both the Commercial Pilot Practical Test Standards for Lighter-Than-Air and the Commercial Pilot Practical Test Standards for Airplane have been published by the FAA to establish the standards for commercial pilot certification practical tests. Practical tests conducted by FAA inspectors and designated examiners must comply with these standards, which should also prove helpful to instructors and applicants alike during training and in preparation for the practical test. This AC announces the availability of FAA-S-8081-18, Commercial Pilot Practical Test Standards for Lighter-Than-Air, and FAA-S-8081-12A, Commercial Pilot Practical Test Standards for Airplane, in addition to information about obtaining paper copies or electronic access to the documents. [Adapted from AC.]

Criteria for Operational Approval of Auto Flight Guidance Systems. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 120-67. March 18, 1997. 4 pp. Available through GPO.*

Advances in technology present new opportunities and capabilities. This AC is intended to take advantage of improved operational capabilities of autopilot systems, particularly at lower altitudes. The AC presents one acceptable means, but not the only means, for gaining operational approval of the initial engagement or use of an Auto Flight Guidance System (AFGS) for takeoff and initial climb phases of flight under the following sections of Federal Aviation Regulations (FARs): Part 121.579(d); Part 125.329(e); and Part 135, section 135.93(e). This AC also complements a rule change allowing the use of an FAA operationally approved and certificated autopilot at altitudes of less than 153 meters (500 feet) above ground level in the vertical plane and in accordance with Parts 121.189 and 135.367 in the lateral plane. [Adapted from AC.]

Reports

A New Approach to Aeronautical Decision-Making: The Expertise Method. Kochan, Janeen A.; Jensen, Richard S.; Chubb, Gerald P.; Hunter, David R. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report No. DOT/FAA/AM-97/6. March 1997. 43 pp. Appendices, tables, figures, references. Available through NTIS.**

This report contains the results of four studies whose objective was to develop new models of aeronautical decision-making (ADM) in general aviation. New intervention strategies will be developed, tested and validated from these new models in the interest of safer general aviation operations among midaltitude general aviation pilots. These studies also identified three subgoals: (1) Determine the distinguishing qualities of expert aviators; (2) assess the processes by which they have acquired their skills; and (3) create a system of training and evaluation to raise the merely competent pilot closer to the level of the expert.

Through semistructured interviews, structured interviews, cognitive task analysis and verbal protocol analysis of a simulation experiment, these studies generated new insights into and modifications of the model of the expert pilot decision-maker. The studies suggest that expertise in general aviation has very little to do with flight time after a certain number of hours (as few as 2,000). Judgment is the characteristic that distinguished the expert from the merely competent pilot. In a previous study, Jensen outlined several characteristics that contributed to pilot expertise and that support the findings of the present studies. These characteristics are aviation experiences, risk management, dynamic problem solving and attention control. The previous study provided a framework for the present series of studies, which the authors believe will produce new training interventions and safer general aviation pilots.

Contains three appendices: (A) Initial Semi-Structured Interview Questionnaire; (B) Aviator Structured Interview; and (C) Experimental Protocol. [Adapted from Introduction and Summary and Conclusions.]

Keywords:
1. Pilots
2. Linear Modeling
3. Aircraft Pilots
4. Policy Capturing
5. Decision Making
6. Aviation Safety

Effects of Simulated General Aviation Altitude Hypoxia on Smokers and Nonsmokers. Nesthus, Thomas E.; Garner, Robert P.; Mills, Scott H. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report No. DOT/FAA/AM-97/7. March 1997. 63 pp. Appendices, tables, figures, references. Available through NTIS.**

In accordance with U.S. Federal Aviation Regulations (FARs) Part 91.211(a), general aviation (GA) pilots are permitted to fly continuously without supplemental oxygen up to 3,813 meters (12,500 feet). Hypoxia is a condition of reduced oxygen pressure in the body, which can cause impairment of function. The higher the altitude, the higher the degree of hypoxia. Symptoms and behavioral manifestations have a greater probability at higher altitudes.

Although the general effects of hypoxia are known, a person's lifestyle, physical conditioning and overall health and well being can interact with hypoxia and exacerbate its potential to decrease performance. This study is concerned with performance on the multiattribute task battery (MATB) test during limited exposures to hypoxia during simulated altitude conditions under 3,813 meters. Smokers and nonsmokers were compared to study the interactive effects of cigarette smoking with simulated altitude conditions.

The smokers group performed some tasks less accurately and required more time for response than the nonsmokers. The authors believe that the results reflect an additive outcome of combining the effects of smoking and hypoxia, because the nonsmoker group showed little change in performance when compared with the smoker group. There is sufficient evidence to suggest continuation of research into these factors to better understand the altitudes at which it should be recommended that smokers use supplemental oxygen for effective hypoxia protection.

Contains five appendices: (A) Descriptions of Subjective Measures; (B) NASA TLX Workload Scale; (C) Environmental Symptoms Questionnaire; (D) Mood II Scale; and (E) Stanford Sleepiness Scale. [Adapted from Introduction and Discussion.]

Keywords:
1. Smoking
2. Hypoxia
3. Simulated Altitude
4. Supplemental Oxygen
5. Requirement for Aviation
6. Multiple Complex Task Performance

Where the Safety Rubber Meets the Shop Floor: A Confirmatory Model of Management Influence on Workplace Safety. Thompson, Richard C.; Hilton, Thomas F. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine.

Report No. DOT/FAA/AM-97/8. March 1997. 12 pp. Table, figures, references. Available through NTIS.**

There is little doubt that management's actions affect employee perceptions of their organization and its safety priorities. Management can communicate through an organizational climate what is important in very concrete ways by stating goals, rewarding job behaviors and establishing policies and procedures. Because climate research rarely focuses on safety, a dynamic model relating climate to safety is lacking. This report represents an effort to model the relationship among climate, management support for safety and workplace safety.

Data were gathered through organizational climate surveys administered at the FAA Logistics Center in 1992 and 1995. Based on discussions with shop floor employees, inconsistencies between management policy and actions often led employees to question management priorities and whether safety was likely to be rewarded. Earlier research identified three factors strongly influencing safety: (1) confusion over organizational goals; (2) the perception that bringing safety issues to management would be politically risky; and (3) the perception that safety concerns would not be given a fair hearing. Results included two conclusions: (1) Managers promote safety by affecting the degree of politics in their organization's climate; and (2) supervisors promote safety by supporting fairness in the organization's climate. The first conclusion affects perceived safety conditions, and the second, compliance with safety rules. [Adapted from Introduction and Discussion.]

Keywords:
1. Organizational Climate
2. Safety Climate
3. Safety Perceptions

Air Traffic Control: Status of FAA's Standard Terminal Automation Replacement System Project. U.S. General Accounting Office (GAO). Report to the Chairman, Subcommittee on Transportation and Related Agencies, Committee on Appropriations, House of Representatives, March 1997. Report No. GAO/RCED-97-51. 16 pp. Tables, figures. Available through GAO.***

The Standard Terminal Automation Replacement System (STARS) project is a segment of the U.S. Federal Aviation Administration (FAA) Advanced Automation System air traffic control modernization program. This project is expected to replace 15-year-old to 25-year-old computers and related equipment used in FAA facilities to track aircraft in the airspace surrounding airports. Because of the significance of this project and the FAA's past problems with delays and cost overruns, this report examines two particular areas: first, whether the schedule for STARS is attainable; and second, whether cost estimates to make STARS operational are reliable. Between December 1998 and February 2005, STARS is scheduled to be implemented at 171 air traffic control facilities. To reach this goal, the FAA must manage several risk factors: (1) Key stakeholders need to be committed to the STARS schedule; (2) schedule conflicts between STARS and other modernization efforts need to be resolved; and (3) difficulties in developing system software that could delay the implementation of STARS must be resolved. Because of higher- than-expected costs for operating and maintaining STARS, total cost estimates could rise from US$2.23 billion to as much as $2.76 billion. FAA officials continue to revise the STARS cost estimate and believe that projected increases may be significantly lower. The report concludes that it is too early to tell how effective FAA's efforts to address these issues will be.

Aviation Safety and Security: Challenges to Implementing the Recommendations of the White House Commission on Aviation Safety and Security. Statement of Gerald L. Dillingham, Associate Director, Transportation Issues, Resources, Community, and Economic Development Division, before the Subcommittee on Aviation, Committee on Commerce, Science and Transportation, U.S. General Accounting Office (GAO). U.S. Senate, March 5, 1997. Report No. GAO/T-RCED-97-90. 9 pp. Available through GAO.***

The White House Commission on Aviation Safety and Security released a report with 57 recommendations that broadly covered safety, security, air traffic control and disaster response. The testimony in this report is centered on implementation issues relating to three areas covered by the Commission: aviation safety, air traffic control modernization and aviation security. Notable among the aviation safety recommendations made by the Commission was the establishment of a national goal to reduce the fatal accident rate by 80 percent within 10 years. Another was expanding the U.S. Federal Aviation Administration (FAA) inspection program to cover not only aging aircraft structural integrity, but also electrical wiring, fuel lines and pumps.

The Commission recommended that the deployment of new technology to modernize the air traffic control system be accelerated. Technology such as satellite-based navigation and new computers in ATC facilities and aircraft cockpits was also advocated. In aviation security, the Commission urged the FAA to deploy commercially available explosives-detection systems for checked baggage at U.S. airports while continuing to develop such equipment. The report concludes that as the FAA tries to fundamentally reinvent itself in light of the Commission's recommendations, it faces three obstacles: (1) the FAA's organizational culture and resource management; (2) the FAA's partnerships with the airline industry; and (3) determining the costs of implementing the recommendations and how they will be paid. [Adapted from Introduction.]

The Use of Weather Information in Aeronautical Decision-Making. Driskill, Walter E.; Weissmuller, Johnny J.; Quebe, John; Hand, Darryl K.; Dittmar, Martin J. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report No. DOT/FAA/AM-97/3. February 1997. 56 pp. Appendices, tables, references. Available through NTIS.**

Inadvertent entry into instrument meteorological conditions (IMC) and pilot error are often cited as causes in general aviation accidents. In response, the FAA sponsors pilot decision-making training interventions that focus on cognitive and motivational components of pilot decision-making. These components differentiate among processes pilots use when evaluating available information and the decisions they make about actions to take. This study had three major objectives: (1) Identify the individual weights or values that pilots attribute to ceiling, visibility, precipitation and terrain flight data elements based on three representative cross-country flights in a small aircraft; (2) assess interaction effects on the weights or values assigned that may affect the worth of the data elements; and (3) assess whether pilots place weight or value on these data elements according to such factors as the pilots' age, flying hours and source of certification.

The report concludes that although the use of weather data is consistent, the expressed degree of comfort among pilots varies when flying over different terrain under differing weather conditions. This may be because of differences in the level of understanding of the risks associated with flying under varying conditions, and differences in pilots' self-assessments and perceptions of their own abilities and skills. Pilot training or other interventions addressing risk assessment and self-perception is one recommendation of the study. Another is training to improve understanding of the effects of terrain type on interaction of meteorological conditions. Last, the study suggests that additional emphasis be placed on risk assessment and self-perception exercises in initial training and in subsequent seminars.

Contains six appendices: (A) Data Collection Package; (B) Pilot Information Form Data; (C) Expert Pilot Safety Ratings Package; (D) Plots of Expert Pilot Safety Ratings; (E) Selected Pair Comparisons among Policy Groups for Each Scenario; and (F) Comprehensive Occupational Data Analysis Program. [Adapted from Introduction and Discussion and Conclusions.]

Keywords:
1. Pilots
2. Aircraft
3. Decision-Making
4. Aviation Safety
5. Aircraft Pilots
6. Policy Capturing
7. Mathematical Modeling

The Effects of Video Game Experience on Computer-Based Air Traffic Controller Specialist, Air Traffic Scenario Test Scores. Young, Willie, C.; Broach, Dana; Farmer, William L. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report No. DOT/FAA/AM-97/4. February 1997. 13 pp. Appendix, tables, figure, references. Available through NTIS.**

The FAA uses the air traffic scenario test (ATST) in its selection and training of applicants for air traffic control specialist (ATCS) positions. In 1990, a major review of this program took place with three major selection policy goals: (1) Reduce the cost of the ATCS selection process; (2) see that the validity of the ATST selection process is maintained; and (3) support goals of diversity in the agency.

The ATCS job requires that controllers manage multiple information sources, assess and integrate the data and prioritize their actions. The pretraining screen (PTS) test battery was developed by Aerospace Sciences Inc. (ASI) to assess these cognitive and sensory skills. The ATST is a personal computer (PC)-based application that strongly resembles a video game. Because of this, there was concern that some applicants with prior video game experience would have an advantage. A previous ASI study from 1991 suggested that the composite score earned on the PTS was equally valid for applicants with or without prior video game experience even though ASI did not directly study the relationship to final scores earned on the ATST. The present study's purpose was to refine the analysis of the earlier ASI study by evaluating the incremental validity of prior video game experience over general aptitude as a predictor of work sample test scores.

Contains one appendix: (A) Computer Usage Survey. [Adapted from Introduction.]

Keywords:
1. Video Games
2. Selection
3. Computer
4. Screen
5. Hierarchical Regression
6. Air Traffic Scenario Test

A Laboratory Model of Readiness-to-Perform Testing. I: Learning Rates and Reliability Analyses for Candidate Testing Measures. Gilliland, Kirby; Schlegel, Robert E. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report No. DOT/FAA/AM-97/5. February 1997. 70 pp. Appendices, tables, figures, references. Available through NTIS.**

Readiness-to-perform (RTP) is defined as the state in which a person is prepared and capable of performing a job for which the person is willingly disposed and is free of any transient risk factors, such as drugs, alcohol, fatigue or illness. Typically, readiness-to-perform testing takes place prior to initiating work activities. It is assumed that when performance does not measure up to some established standard or baseline, some risk factor or combination of risk factors is responsible.

Because of the lack of studies investigating the reliability and validity of RTP tests, the FAA sponsored a large-scale, highly controlled laboratory investigation of selected RTP tests to develop a laboratory model of RTP testing. Each worker establishes a baseline performance on the RTP test by extensive practice on the test. Subsequent performance is compared with the established performance baseline. Increases or decreases in performance are assumed to result from some risk factor such as drugs or fatigue.

The RTP test does not identify the particular risk factor, but instead assesses a worker's performance at a given time, thus acting as a simple screening device. The results of this study provide the foundation for the concept of RTP testing for preventative screening for the behavioral variations often accompanying risk-factor exposure. The data also support the proposition of the laboratory model approach.

Contains two appendices: (A) Performance Measures; and (B) Reliability and Differential Stability Coefficients. [Adapted from Introduction and Discussion.]

Keywords:
1. Performance-based Testing
2. Readiness-to-perform
3. Reliability Analyses
4. Fitness-for-duty
5. Learning Rates
6. Validity Testing

Airport and Airway Trust Fund: Issues Related to Determining How Best to Finance FAA. Statement of John H. Anderson Jr., Director, Transportation Issues, Resources, Community, and Economic Development Division, U.S. General Accounting Office (GAO). Subcommittee on Aviation, Committee on Transportation and Infrastructure, U.S. House of Representatives, Feb. 5, 1997. Report No. GAO/T-RCED-97-59. 16 pp. Figures, appendices. Available through GAO.***

Identical testimony to GAO/T-RCED-97-56.

FAA Financing: Issues and Options in Deciding to Reinstate or Replace the Airline Ticket Tax. Statement of John H. Anderson Jr., Director, Transportation Issues, Resources, Community, and Economic Development Division, before the Committee on Finance, U.S. General Accounting Office (GAO). U.S. Senate, Feb. 4, 1997. Report No. GAO/T-RCED-97-56. 16 pp. Figures, appendices. Available through GAO.***

The testimony in this report discusses four items concerning the Airport and Airway Trust Fund (see previous item) and its possible replacement: (1) Airport and Airway Trust Fund status; (2) issues raised by a coalition of seven of the largest airlines to replace the ticket tax; (3) potential effects of the coalition's proposal on domestic airline competition; and (4) potential effects on competition that alternative options for financing the U.S. Federal Aviation Administration (FAA) will have. The report concludes that if the U.S. Congress decides to replace the ticket tax with an alternative form of financing, there are numerous options, such as a tax on usage indicators including departures, passenger enplanements, passenger-miles flown or fuel consumed. Whatever is chosen, it must guarantee that: (1) there is a secure funding source for FAA; (2) the nation's airports and airways are used as efficiently as possible; (3) commercial users pay sufficiently for their use of the system; and (4) the airline industry remains strong and competitive.

Contains three appendices: (I) Change in the Amount Paid by Grouping under the Coalition's Proposal Compared with the Ticket Tax, 1995; (II) Change in the Amount Paid by Grouping under a $10 Tax Per Enplanement Compared with the Ticket Tax, 1995; (III) Change in the Amount Paid by Grouping under a $0.42 Tax Per Gallon Compared with the Ticket Tax, 1995. [Adapted from Introduction.]

Airport and Airway Trust Fund: Issues Raised by Proposal to Replace the Airline Ticket Tax. U.S. General Accounting Office (GAO). Report to Congressional Requesters, December 1996. Report No. GAO/RCED-97-23. 16 pp. Tables, figures, appendices. Available through GAO.***

The Airport and Airway Revenue Act of 1970 established the Airport and Airway Trust Fund to finance U.S. Federal Aviation Administration (FAA) investments in the airport and airway system, including construction and safety improvements at airports and the upgrading of air traffic control technology. About 87 percent of the tax revenue traditionally has come from a tax (which was 10 percent before lapsing at the end of 1996) on domestic airline tickets, with the remainder coming from a US$6 per passenger charge on flights originating in the U.S. for international destinations, along with other sources.

Nevertheless, because of recent efforts to control federal spending, charging users directly for government services becomes a more likely option. Because the present ticket tax is based on fares, and not on the actual costs to the FAA, it may not fairly distribute the system's costs. A coalition of seven of the largest airlines has proposed replacing the ticket tax with user fees. Their proposal, however, only takes into consideration factors that would reduce their own cost while increasing the cost for competing small and low-fare airlines, which would have serious implications for competition among domestic airlines. This report favors a more precise fee system that would account for the costs to the FAA of managing the airport and airway system, which vary greatly among the airlines. Neither the 10 percent ticket tax nor the largest airlines' proposal takes these factors sufficiently into account. The report concludes that broader study is needed to decide how best to finance the FAA.

Contains two appendices: (I) Status of the Airport and Airway Trust Fund and the Potential Effect on FAA's Budget of the Trust Fund's Taxes Lapsing; and (II) Major Contributors to This Report. [Adapted from Results in Brief.]

Books

Practical Aviation Law, 2nd ed. Hamilton, J. Scott. Ames, Iowa, United States: Iowa State University Press, 1996. 216 pp.

This book is intended for the undergraduate studying aviation law, or as a quick reference guide for aviation managers, professional and private pilots, flight crews and other aviation professionals or enthusiasts. Limited to aviation law in the United States, the book is concerned with basic legal knowledge and perspective on understanding how to "navigate" the legal system as it relates to aviation. It aims to help the user to determine when it is, and is not, necessary to consult with an aviation lawyer. The book is divided into five sections: Administrative Law, Aircraft Accidents, Aircraft Transactions, Airports and Airspace and Airline Labor Law. It also contains a listing of key aviation organizations, a bibliography and an index. [Adapted from Preface.]

Commercial Air Transport Books. Sterling, Christopher H. McLean, Virginia, United States: Paladwr Press, 1996. 303 pp.

This book contains an annotated English-language listing of more than 2,700 books, monographs, reports and periodicals primarily about commercial air transport, with emphasis on passenger air transport. Entries cover more than a century (1894 through 1995) of citations on airlines, airliners and their regulating agencies. The book is arranged in nine parts: (I) History, (II) Airliners, (III) Airlines, (IV) Airline Operations, (V) Regulation, (VI) Air Mail, (VII) Airports, (VIII) Periodicals and (IX) Bibliographies.

To keep the work within manageable size, several types of publications are largely excluded, including Congressional hearings, highly technical works, children's books and works of fiction, among others. Entries are rated based on a "star" system, indicated by asterisks, to rate an entry's relative importance (within the context of air transport), with one star indicating "above average in usefulness" to three stars indicating "outstandingly important." The author includes a unique section called "Desert Island Dozens" containing lists of the dozen airline and airliner books selected by several airline authorities that they would want to have if stranded on a desert island. Index. [Adapted from Introduction.]♦

Sources

* Superintendent of Documents
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Updated U.S. Federal Aviation Administration (FAA) Regulations and Reference Materials

Advisory Circulars (ACs)

AC No.	Date	Title
150/5300-13	02/14/97	*Change 5 to Airport Design.*
00-46D	02/26/97	*Aviation Safety Reporting Program.* (Cancels AC00-46C, dated 02/04/85.)
121-22A	03/07/97	*Maintenance Review Board Procedures.* (Cancels AC121-22, *Maintenance Review Board*, dated 01/12/77.)
21-15K	03/13/97	*Announcement of Availability — Aircraft, Aircraft Engines, and Propeller Type Certificate Data Sheets and Specifications.* (Cancels AC21-15J, dated 01/20/95.)
00-44II	May 1997	*Status of Federal Aviation Regulations.* (Cancels AC00-44HH, dated August 1996.)
140-7I	03/06/97	*FAA Certificated Maintenance Agencies Directory.* (Cancels AC140-7H, *FAA Certificated Maintenance Agencies Directory*, dated July 24, 1995.)
20-128A	03/25/97	*Design Considerations for Minimizing Hazards Caused by Uncontained Turbine Engine and Auxiliary Power Unit Rotor Failure.* (Cancels AC 20-128, *Design Considerations for Minimizing Hazards Caused by Uncontained Turbine Engine and Auxiliary Power Unit Rotor and Fan Blade Failures*, dated March 9, 1988.)
150/5320-12C	03/18/97	*Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces.* (Cancels AC 150/5320-12B, *Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces*, dated Nov. 12, 1991.)
00-46D	02/26/97	*Aviation Safety Reporting Program.* (Cancels AC00-46C, *Aviation Safety Reporting Program*, dated Feb. 4, 1985.)
150/5000-3T	09/12/97	*Address List for Regional Airports Divisions and Airports District/Field Offices.* (Cancels AC 150/5000-3S, dated Nov. 7, 1996.)
00-30B	09/09/97	*Atmospheric Turbulence Avoidance.* (Cancels AC 00-30A, *Rules of Thumb for Avoiding or Minimizing Encounters With Clear Air Turbulence*, dated Nov. 21, 1988.)
36-1G	08/27/97	*Noise Levels for U.S. Certificated and Foreign Aircraft.* (Cancels AC 36-1F, *Noise Levels for U.S. Certificated and Foreign Aircraft*, dated June 5, 1992.)
20-126F	08/12/97	*Aircraft Certification Service Field Office Listing.* (Cancels AC 20-126E, *Aircraft Certification Service Field Office Listing*, dated Jan. 17, 1995.)
27-1A	07/30/97	*Certification of Normal Category Rotorcraft.* (Cancels AC 27-1, *Certification of Normal Category Rotorcraft*, dated Aug. 29, 1985.)
60-25A	07/29/97	*Reference Materials and Subject Matter Knowledge Codes for Airman Knowledge Testing.* (Cancels AC 60-25, *Reference Materials and Subject Matter Knowledge Codes for Airman Knowledge Testing*, dated March 28, 1996.)
150/5345-1V	07/23/97	*Approved Airport Equipment.* (Cancels AC 150/5345-1U, *Approved Airport Equipment*, dated Feb. 20, 1989.)
21-25A	07/21/97	*Approval of Modified Seating Systems Initially Approved Under a Technical Standard Order.* (Cancels AC 21-25, *Approval of Modified Seats and Berths Initially Approved Under a Technical Standard Order*, dated April 24, 1989.)
61-122A	06/02/97	*Announcement of Availability: FAA-S-8081-5B, Airline Transport Pilot and/or Type Rating (Airplane-Helicopter) Practical Test Standards (Changes 1 and 2).* (Cancels AC 61-122, *Announcement of Availability: FAA-S-8081-5B, Airline Transport Pilot and/or Type Rating (Airplane-Helicopter) Practical Test Standards*, dated Nov. 12, 1995.)

Updated U.S. Federal Aviation Administration (FAA) Regulations and Reference Materials (continued)

Advisory Circulars (ACs) continued

AC No.	Date	Title
150/5100-17	05/01/97	*Land Acquisition and Relocation Assistance for Airport Improvement Program Assisted Projects.* This update (change 2) replaces Appendix 2 with a corrected and updated Appendix 2 describing replacement housing payment options for mobile home displacement, and modifies paragraph 8-3, Owner Retention, to advise that owner retention may be offered to an owner occupant where the airport owner determines that retention and removal of an acquired dwelling by the displaced owner is practical and feasible.
183-35G	05/01/97	*Airworthiness Designee Function Codes and Consolidated Directory for DMIR/DAR/ODAR/DAS/DOA and SFAR No. 36.* (Cancels AC 183-35F, *FAA DAR, DAS, DOA, and SFAR No. 36 Directory*, dated March 28, 1996, and AC 183-33A, *Designated Airworthiness Representatives*, dated Oct. 1, 1985.)
140-2Z	04/18/97	*List of Certificated Pilot Schools.* (Cancels AC 140-2Y, *List of Certificated Pilot Schools*, dated March 27, 1996.)
135-13E	04/18/97	*List of Air Carriers Certificated by Title 14 of the Code of Federal Regulations (14 CFR) Part 135.* (Cancels AC 135-13D, *List of Air Carriers Certificated by Title 14, CFR part 135*, dated March 6, 1996.)
147-2DD	03/26/97	*Directory of FAA Certificated Aviation Maintenance Technician Schools.* (Cancels AC 147-2CC, *Directory of FAA Certificated Aviation Maintenance Technician Schools*, dated Nov. 30, 1995.)

Federal Aviation Regulations (FARs)

Part	Effective Date	Change	Subject
Part 129	04/21/97	Change 2	*Operations: Foreign Air Carriers and Foreign Operators of U.S.-Registered Aircraft Engaged in Common Carriage.* (Incorporates Amendment 129-25, "Revision of Authority Citations," adopted Dec. 20, 1995, and Amendment 129-26, "Sensitive Security Information," adopted March 13, 1997.)
Part 61	03/21/97	Change 9	*Certification: Pilots and Flight Instructors.* (Incorporates Amendment 61-101, "Aircraft Flight Simulator Use in Pilot Training, Testing, and Checking and at Training Centers," adopted March 18, 1997.)
Part 1	08/04/97	Change 6	*Definitions and Abbreviations.* (Incorporates Amendment 1-47, "Pilot, Flight Instructor, Ground Instructor, and Pilot School Certification Rules," adopted March 19, 1997.)
Part 25	08/28/97	Change 11	*Airworthiness Standards: Transport Category Airplanes.* (Incorporates Amendment 25-91, "Revised Structural Loads Requirements for Transport Category Airplanes," adopted July 14, 1997.)
Part 129	08/18/97	Change 3	*Operations: Foreign Air Carriers and Foreign Operators of U.S.-Registered Aircraft Engaged in Common Carriage.* (Incorporates Amendment 129-27, "Revisions to Digital Flight Data Recorder Rules," adopted July 9, 1997.)
Part 61	08/04/97	Change 1	*Certification: Pilots, Flight Instructors, and Ground Instructors.* (Incorporates Amendment 61-103, "Pilot, Flight Instructor, Ground Instructor, and Pilot School Certification Rules; Correction," adopted July 11, 1997.)

Updated U.S. Federal Aviation Administration (FAA) Regulations and Reference Materials (continued)

Federal Aviation Regulations (FARs) continued

Part	Effective Date	Change	Subject
Part 125	06/20/97	Change 11	*Certification and Operations: Airplanes Having a Seating Capacity of 20 or More Passengers or a Maximum Payload Capacity of 6,000 Pounds or Greater.* (Incorporates Amendment 125-29, "Revision to Minimum Altitudes for the Use of an Autopilot," adopted May 9, 1997.)
Part 25	03/12/97	Change 10	*Airworthiness Standards: Transport Category Airplanes.* (Incorporates Amendment 25-90, "Operating Requirements: Domestic, Flag, Supplemental, Commuter, and On-Demand Operations: Corrections and Editorial Changes," adopted March 12, 1997.)
Part 21	03/12/97	Change 2	*Certification Procedures for Products and Parts.* (Incorporates Amendment 21-74, "Operating Requirements: Domestic, Flag, Supplemental, Commuter, and On-Demand Operations: Corrections and Editorial Changes, adopted March 12, 1997.)
Part 125	02/12/97	Change 10	*Certification and Operations: Airplanes Having a Seating Capacity of 20 or More Passengers or a Maximum Payload Capacity of 6,000 Pounds or Greater.* (Incorporates Amendment 125-28, "Operating Requirements: Domestic, Flag, Supplemental, Commuter and On-Demand Operations: Corrections and Editorial Changes," adopted March 12, 1997.)
Part 91	02/07/97	Change 20	*General Operating and Flight Rules.* (Incorporates Amendment 91-253, "Operating Requirements: Domestic, Flag, Supplemental, Commuter, and On-Demand Operations: Corrections and Editorial and Other Changes," adopted March 12, 1997; Amendment 91-254, "Reduced Vertical Separation Minimum Operations," adopted March 27, 1997.)

Federal Aviation Administration Orders

Order No.	Date	Change	Subject
7110.10L	05/02/97	Change 3	*Flight Services.* (Transmits revised pages to Order 7110.10L, *Flight Services,* and includes the *Briefing Guide.*)

Accident/Incident Briefs

F-27 Engine Fire Results in Off-airport Accident with 27 Fatalities

Improper use of nosewheel steering during takeoff run results in premature rotation of De Havilland DHC-6 and left wing contact with the ground.

FSF Editorial Staff

The following information provides an awareness of problems through which such occurrences may be prevented in the future. Accident/incident briefs are based on preliminary information from government agencies, aviation organizations, press information and other sources. This information may not be entirely accurate.

Air Carrier

Airborne Engine Fire Leads to Fatal Accident

Fokker F-27. Aircraft destroyed. Twenty-seven fatal injuries.

The Fokker F-27 struck terrain shortly after a midday takeoff from an Asian airport. The aircraft crashed near a housing complex, but did not hit any homes; there were no injuries on the ground. Of the 45 passengers and five crew aboard the airplane, 27 are known dead, and many of the survivors suffered burns.

A survivor said that he saw the left engine on fire minutes before the accident. The pilot had initially indicated that he wanted to return to the airport, but decided instead to attempt an emergency landing at an air force base that is about one kilometer (0.6 mile) from the accident site. Reasons why the aircraft did not reach the runway at the air force base are still under investigation.

B-747 Diverted by Possible Bird Strike

Boeing 747. Minor damage. No injuries.

A Boeing 747 developed an engine fire immediately after taking off in daylight. The pilot secured the engine and diverted the flight to another airport without further incident. Passengers were transferred to another airplane, and the damaged engine was repaired.

Evidence indicated that the engine fire was the result of a bird strike while the airplane was operating at low altitude.

Air Taxi Commuter

Ground Power Unit Grounds Aircraft

NAMC YS-11 Turboprop. Minor damage. Minor injuries.

As the pilot was maneuvering the aircraft on the tarmac in daylight, the left propeller of the twin-turboprop Nihon Aeroplane Manufacturing Co. (NAMC) YS-11 struck a ground power unit.

The engine burst into flames; the aircraft was stopped immediately, and the passengers were evacuated. The fire was quickly extinguished. The only injuries were minor cuts suffered by several of the passengers as they pressed toward the evacuation chutes at the rear of the airplane.

Engine Fails Second Time

CASA C-212a. Aircraft destroyed. Three fatal injuries.

While attempting to land, the twin-turboprop Construcciones Aeronauticas SA (CASA) C-212a transport aircraft crashed about 270 meters (885 feet) short of the runway. Aboard were only the three crew members, who were killed in the accident.

The aircraft lost power in one engine (later determined to be the left engine) about 25 minutes before the accident. Other witnesses said that the plane was flying normally about 200 meters (655 feet) above the ground when it suddenly fell to earth. Weather was not cited as a factor in the accident.

The aircraft was reportedly returning after being stranded for seven days on an island, where the left engine had been repaired. The cause of the sudden impact with terrain has not been determined.

Cocked Nosewheel Causes Loss of Directional Control During Takeoff

De Havilland DHC-6 Twin Otter. Minor damage. No injuries.

The De Havilland DHC-6 was readying for the final sortie of a daylight training flight in clear weather with light winds. The pilot-in-training (PIT) was flying. The nosewheel was centered prior to the start of the takeoff roll. As the aircraft gathered speed, it drifted to the left. The PIT over-corrected for the drift, and the airplane veered to the right.

After giving the PIT an opportunity to recover, the captain took over the controls. He applied left rudder and increased power on the right engine in an unsuccessful attempt to steer the aircraft. Finally, fearing that the aircraft would veer off the right side of the runway into a large drainage ditch, the captain rotated the aircraft prematurely. The aircraft lifted into the air, but when the captain made a shallow left turn to regain runway alignment, the aircraft lost altitude and contacted the ground.

The captain assumed that the left main landing gear had touched down and continued the flight. While climbing into the landing pattern, the captain noticed that the nosewheel steering handle was deflected to the right. When questioned about it, the PIT said that he used the nosewheel steering to correct for the initial leftward drift on takeoff, a violation of standard procedure and of the instructions the PIT had received.

After an uneventful circuit and landing, inspection revealed damage to the left outboard aileron/flap attachment bracket and distortion of the aileron and fore-flap.

Failed Takeoff Ends in Ditching at Sea

Cessna 550 Citation II. Aircraft destroyed. No injuries.

A Cessna 550 failed to become airborne on its attempted takeoff from the airport and fell into the sea about 50 meters (165 feet) from the end of the runway. All five passengers and crew of the aircraft were rescued uninjured.

Rescue workers are trying to recover the aircraft so that the cause of the failed takeoff may be determined.

Corporate Executive

Hard Landing Damages Main Landing Gear

Cessna Citation 525. Minor damage. No injuries.

Following a flight the Cessna Citation made a hard landing and bounced. The main landing gear and tail were damaged in the accident. There were no personal injuries cited in the report.

Prop Blast Damages Cessna 210

Beechcraft King Air 200. Minor damage. No injuries.

A King Air 200 was parked in front of the large hangar, both doors of which were open. In preparation for a flight, the King Air pilot started the two engines and began to taxi the aircraft toward the runway.

As the aircraft turned right, a strong propeller blast entered the open hangar doors. A tool cart started to roll, and a banner suspended loosely on angle irons fell on a Cessna 210 parked below it, denting the top of the fuselage and causing damage to the right flap and the fairing between the flap and the fuselage.

Other General Aviation

Photo Flight Ends in Town Square

Single-engine aircraft. Aircraft destroyed. Eight fatal injuries.

A small plane crashed into a crowded town square in South America, killing at least eight people and injuring dozens more. The single-engine plane hit a truck and a car, and then plowed into a group of 700 people who had gathered for an outdoor bingo game.

Three of those injured received critical injuries. The plane's two occupants, who survived the accident, were photographing the crowd.

Vapor Lock at Low Altitude Suspected

Cessna CE-206. No damage. No injuries.

During a flight check in the CE-206, the pilot performed a simulated engine-fire maneuver. After the pilot had gone through the prescribed emergency procedures, the instructor pilot turned the fuel selector back to the "on" position and advanced the mixture control to start the engine running again.

Shortly thereafter, at an altitude of about 100 meters (350 feet), the engine stopped. Correctly suspecting a vapor lock in the fuel line, the crew took quick action to restart the engine, and a safe landing was made.

Sheep Cause Aircraft Accident

Kitfox II. Substantial damage. No injuries.

The Kitfox II, a single-engine, two-seat, dual-control homebuilt aircraft, banked immediately after taking off to avoid sheep. The aircraft lost flying speed and impacted the ground. There were no injuries to the two persons aboard, but damage to the aircraft was substantial.

Cherokee Has Nowhere to Turn

Piper PA-28 Cherokee. Aircraft destroyed. Four fatal injuries.

The PA-28 Cherokee was flying at low altitude through a narrow tree-filled valley when it struck the upslope at the end of the valley, killing all four persons aboard the airplane. The aircraft attitude at impact was 30-degree right bank and a steep upward pitch of 25 degrees.

The accident occurred in sharply rising terrain at the 1,616-meter (5,300-foot) level. The valley at that point is only 1.8 kilometers (one nautical mile) wide. This allowed little space for lateral movement to avoid terrain, which at the impact site rises at a gradient of 40 degrees, or at a rate some 20 times the maximum rate of climb of the accident aircraft as it was configured.

There was no indication of any mechanical or system malfunction that could have contributed to the accident, and weather was not reported as a factor.

Rotorcraft

Fire Engine Averts Further Disaster

Bell 206 JetRanger. Aircraft destroyed. One fatal injury.

A charity-organized pleasure flight in the JetRanger ended abruptly as the helicopter struck terrain. One person died in the accident and four others received minor injuries. The helicopter was destroyed.

The pilot made an apparently unscheduled landing about three minutes after takeoff, and the accident occurred when taking off again.

The helicopter fell on its side and skidded about 137 meters (450 feet) through fencing before coming to a stop and bursting into flames. Witnesses said that a fire engine was on standby at the charity event and extinguished the fire.

Hard Landing Damages Tailboom

Eurocopter France AS 355F1 (Twin Squirrel). Minor damage. No injuries.

The AS 355F1 helicopter was on a daylight flight. The aircraft made a hard landing, causing the tailboom to wrinkle. There was no other damage to aircraft or heliport, and there were no injuries to the four persons aboard the aircraft.♦

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INSIDE
BACK
COVER

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