FLIGHT SAFETY FOUNDATION

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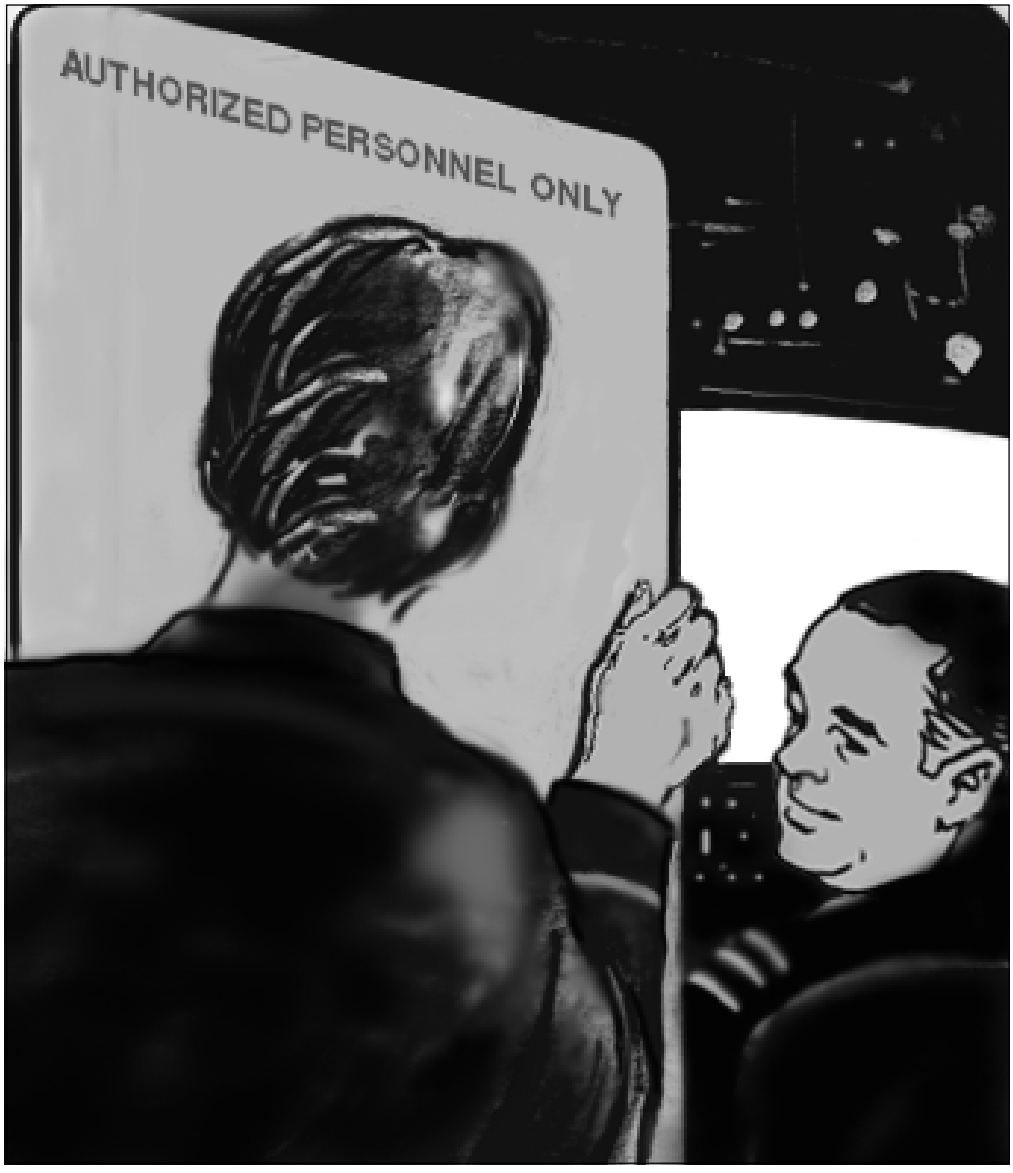
FLIGHT SAFETY
D I G E S T

Accident and Incident Reports Show Importance of 'Sterile Cockpit' Compliance



Flight Safety Digest

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In This Issue

Flight Safety Foundation is an international membership organization dedicated to improving aviation safety. Nonprofit and independent, the Foundation 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 a positive influence on aviation safety. Today, the Foundation provides leadership to nearly 600 member organizations in 75 countries.

Accident and Incident Reports Show Importance of 'Sterile Cockpit' Compliance

In 1981, additional U.S. Federal Aviation Administration Regulations were enacted to reduce accidents by prohibiting nonessential crew activities during critical phases of flight. A recent review of anonymous reports suggests that noncompliance remains a problem.

Robert L. Sumwalt III
President, Aviatrends

Six minutes before touchdown, Eastern Air Lines Flight 212, a McDonnell Douglas DC-9 with 78 passengers and four crew members on board, was descending toward Runway 36 at Charlotte, North Carolina, U.S. Because patchy dense fog hid the runway from view, a very high frequency omnidirectional radio range (VOR) distance measuring equipment (DME) nonprecision instrument approach was being flown. During the approach, the flight crew discussed politics, used cars and the nation's economic uncertainty.

Two minutes prior to touchdown, the conversation switched to trying to identify a local amusement park that the aircraft had just passed. Shortly after receiving landing clearance, the captain remarked to his first officer, "Yeah, we're all ready. All we got to do is find the airport." Three seconds later the aircraft impacted terrain 3.3 miles (5.3 kilometers) short of the runway. Seventy-two people were killed in the 1974 accident.[1]

Fourteen years later, in 1988, the flight crew of Delta Air Lines Flight 1141, a Boeing 727, spent 17 minutes chatting with a flight attendant in the cockpit while taxiing for departure at the Dallas-Fort Worth (Texas, U.S.) International Airport. During the two minutes between the flight attendant's departure from the cockpit and the initiation of takeoff roll, the flight crew started the number three engine and conducted the before-takeoff checklist. In their haste to prepare for departure, the crew apparently failed to set the flaps for takeoff, an omission that was not identified during the crew's checklist recital. Seven seconds after takeoff rotation, the aircraft's stall warning system activated. Seconds later the aircraft plunged to the ground. There were 15 fatalities and 26 serious injuries.[2]

The U.S. National Transportation Safety Board (NTSB) determined that poor cockpit discipline played a role in each of these accidents. In its investigation of the DC-9 accident

at Charlotte, the NTSB stated that the crew's nonpertinent conversations "were distractive and reflected a casual mood and lax cockpit atmosphere, which continued throughout the remainder of the approach and which contributed to the accident." In the Dallas-Fort Worth accident, the NTSB said that "had the captain exercised his responsibility and asked the flight attendant to leave the cockpit or, as a minimum, stopped the nonpertinent conversations, the 25-minute taxi time could have been used more constructively and the flap position discrepancy might have been discovered."

Numerous accidents and serious incidents have occurred when the flight crews diverted their attention from the tasks at hand and engaged in activities unrelated to flying.

The cockpit of an aircraft during taxi-out or approach is neither the time nor the place for nonflight-related conversation. Numerous accidents and serious incidents have occurred when flight crews diverted their attention from the tasks at hand and engaged in activities unrelated to flying.

In 1981, the U.S. Federal Aviation Administration (FAA) enacted Federal Aviation Regulations (FARs) Part 121.542 for air carriers and Part 135.100 for air taxi operators. "Flight Crewmember Duties," also known in the industry as the "sterile cockpit rule," are the subject of these two parts of the FARs. These regulations prohibit crewmembers from performing nonessential duties or activities while the aircraft is in a "critical phase of flight."

The FARs define "critical phase of flight" as all ground operations involving taxiing, takeoff and landing and all other flight operations conducted below 10,000 feet (3,050 meters) mean sea level (MSL), except cruise flight.

The *Federal Register* explains the FAA's rationale for the rule making: "Critical phases of flight … are the phases of a flight in which the flight crew is busiest, such as during takeoff and landing and instrument approaches. When many complex tasks are performed in a short time interval, distracting events could cause errors and significant reductions in the quality of work performed. The performance of a non-safety related duty or activity when flight crew workload is heavy could be the critical event which precludes a flight crewmember from performing an essential task such as extending the landing gear prior to touchdown."[3]

There are situations where 10,000 feet MSL might be an insufficient boundary for defining the critical phase of flight. At high-altitude airports, 10,000 feet above ground level (AGL) may be a more appropriate boundary. For flights with cruise altitudes below 10,000 feet MSL, crews can use a specific distance from the airport or the beginning of descent as a signal to begin sterile cockpit procedures.

The FARs never intended to prohibit functions that are necessary for flight safety. Items that must never be stifled include: accomplishment of checklists, crew callouts, procedural discussions, voicing safety concerns and crew interactions such as acknowledgments and commands. Conversely, because they are not related to the safe operation of aircraft the regulations specifically prohibit the following during critical phases of flight: "non-safety related [radio calls] as ordering galley supplies and confirming passenger connections, announcements made to passengers promoting the air carrier or pointing out sights of interest and filling out company payroll and related records, … eating meals, engaging in nonessential conversations within the cockpit and nonessential communications between the cabin and cockpit crews, and reading publications not related to the proper conduct of the flight… ."

Responsibility To Maintain Sterile Cockpit Shared by Crewmembers

The regulations are carefully worded to apportion the responsibility of keeping the cockpit "sterile": "Regarding crewmember involvement with nonessential activities: No flight crewmember may engage in, nor may any pilot in command permit … nor may any flight crewmember perform … ." Responsibility for maintaining the sterile cockpit is on each crew member. If any duties except those duties required are conducted during the critical phase of flight, the pilot in command must not permit them to continue.

The FAA also places the regulatory responsibility in the hands of companies: "No *certificate holder* shall require … any flight crewmember [to] perform any duties during a critical phase of flight except those duties required for the safe operation of the aircraft." [Italics added for emphasis.]

The following report was submitted to the U.S. National Aeronautics and Space Administration (NASA) Aviation Safety Reporting System (ASRS).[4] The report illustrates how poorly designed company procedures can contribute to unsafe conditions.

"Distracted by flight attendant with passenger count. [We] took off, and to this moment, I do not remember being cleared for takeoff. This had the potential for a 'Canary

Islands' takeoff accident. [In history's worst aviation accident, 583 persons were killed after the runway collision of a KLM Boeing 747 and a Pan American Airways 747. The 1977 collision was blamed on failure of the KLM pilot in command to follow approved procedures and directives and on his failure to abort the takeoff.] Company procedure for flight attendant cockpit visit while taxiing contributed …"

Aircraft operators would be prudent to survey their operational practices and eliminate those that could create cockpit distractions.

Noncompliance Leads to Accidents and Serious Incidents

Although the sterile cockpit has enhanced aviation safety, it is difficult to estimate the number of accidents and serious incidents that it has prevented. Where noncompliance has led to accidents and incidents, the unfortunate results are obvious. Delta Flight 1141 is one such example. Each year the ASRS receives scores of incident reports that illustrate deviations from the sterile cockpit. Typical are remarks such as, "If we [had] adhered to the sterile cockpit this situation probably would not have occurred."

ASRS Directline in 1993 published a review of 63 incident reports involving sterile cockpit deviations.[5] Researchers noted that the following problems were attributed to sterile cockpit violations:

- 48 percent were altitude deviations;
- 14 percent were course deviations;
- 14 percent were runway transgressions;
- 14 percent were general distractions with no specific adverse consequences;
- 8 percent involved takeoffs or landings without clearance; and,
- 2 percent involved near-midair collisions.

In analyzing each report, ASRS researchers tabulated reported violations of the sterile cockpit; multiple violations were noted in some reports. Below are the five most frequent violations:

- *Extraneous conversation*

  As in the cited accidents in Charlotte and Dallas-Fort Worth, the ASRS review noted that 35 of the 63 reports mentioned extraneous cockpit conversations when describing incidents. As explained in one report, "Both the FO [first officer] and I became distracted because of a conversation that was started before the level-off. At 4,300 feet [1,310 meters] our altitude alert system went off … . Our sterile cockpit procedures should haveeliminated this problem if properly followed."

- *Distractions by flight attendants*

  Fifteen of the 63 reports mentioned distractions created when flight attendants entered or called the cockpit during a critical phase of flight. One reporter said that a flight attendant entered the cockpit during taxi with coffee for the crew. "Crew attention momentarily diverted," said the reporter. Then the aircraft inadvertently encroached on an active runway, forcing another aircraft on final approach to go around.

- *Nonpertinent radio calls*

  Non-safety-related radio calls below 10,000 feet, such as ordering galley supplies and confirming passenger connections, were found in 12 of the 63 reports.

  Although it occurred prior to the 1981 FARs implementation, a September 1978 midair collision illustrated the potential safety implications of conducting non-safety-related radio calls during a critical phase of flight. In that accident, a Pacific Southwest Airlines (PSA) Boeing 727 collided with a Cessna 172 over San Diego, California, U.S.[6] The NTSB noted that while air traffic control (ATC) was providing traffic advisories to the PSA crew and issuing visual separation instructions, the 727's flight engineer was off the ATC frequency discussing catering needs on the company radio frequency. The NTSB did not find a causal link between the flight engineer's company radio conversation and the accident's occurrence, but did state that "it does point outthe dangers inherent in this type of cockpit environment during descent and approach tolanding."

- *Public address (PA) announcements*

  "Beautiful day making approach into familiar station, captain elects to make a PA announcement to passengers while flying the aircraft," reported one pilot."Resulting

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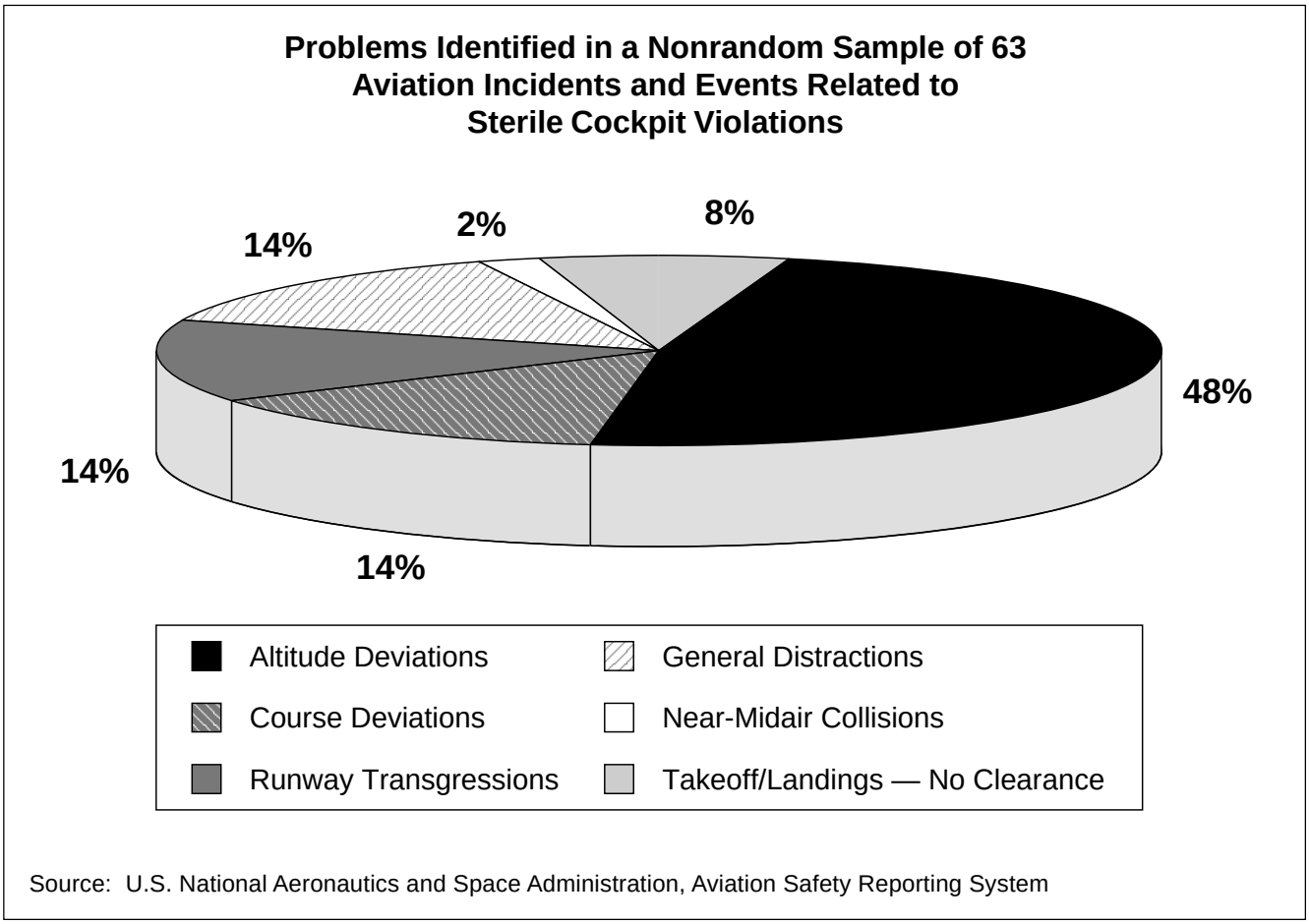

Figure 1

distraction of the passenger announcement [caused us to overshoot] altitude [by] 500 feet [152 meters]." An additional nine similar reports were among the 63 in the ASRS review.

- *Sightseeing*

"Nowhere does Webster's [Dictionary] define 'sightseeing' as an activity that is essential to the safe operation of aircraft," said the ASRS researchers who found three such reports in its review. "When sightseeing is conducted by flight crewmembers below 10,000 feet, not only is it potentially dangerous, but it is illegal."

The cockpit voice recorder (CVR) transcript of Flight 212 illustrated the danger of sightseeing (page 5).

"It is apparent that during this discussion a considerable degree of the flightcrew's attention was directed outside the cockpit," the NTSB said. "This particular distraction assumes significance because during this period the aircraft descended through … the altitude which should have been maintained until it crossed … the final approach fix (FAF)."

Flight Attendant Notification Policies Vary

Because the cockpit should remain sterile below 10,000 feet MSL, cabin crews need a method of determining whether the aircraft is above or below 10,000 feet. A 1988 U.S. Department of Transportation (DOT)report highlighted cabin crew difficulties determining precisely when sterile cockpit procedures were in effect.[7] DOT researchers surveyed pilots and flight attendants, and of the 35 flight attendants from 16 airlines who responded, 80 percent said that their companies had a signal or policy to indicate when sterile cockpit procedures were in effect. Nevertheless, some confusion was suggested by the respondents; some flight attendants stated that their airlines had such procedures, while others from the same airlines said no such procedures were in place.

Flight attendants reported several different procedures by flight crews for notifying the cabin crews when sterile cockpit procedures were required. "Some airlines have advocated the 10-minute rule, i.e., the sterile cockpit rule should

Partial Transcript of Eastern Flight 212's Cockpit Voice Recorder

Captain:	There's Carowinds [amusement park], I think that's what that is.
Captain:	Carowinds.
First officer:	Ah, that tower — would that tower be it or not?
Captain:	No I [unintelligible words] Carowinds, I don't think it is. We're too far — too far in, Carowinds is in back of us.
First officer:	I believe it is.
Captain:	By [nonpertinent word] that looks like it, you know, it's [unintelligible words] Carowinds. Yeah, that's the tower.
First officer:	Gear down please, before landing.
Captain:	That's what that is.
	(Sound similar to [landing] gear extension)
	(Sound of terrain warning)
Captain:	Carowinds. That's Carowinds there.
	(70 seconds later the aircraft became a controlled-flight-into-terrain accident.)

Source: U.S. National Transportation Safety Board

be in effect for 10 minutes after takeoff and 10 minutes before landing," said the DOT report. "However, there are problems associated with trying to estimate a time span *before* an event."

At least one flight attendant noted that company procedures required cabin crews to estimate when 10,000 feet has been reached. The DOT report concluded that this method was difficult under ideal conditions, and impossible under restricted visibility.

"A few airlines have attempted to deal with [sterile cockpit notification] by using the chime-call or another signal when the 10,000 foot mark has been crossed," said the DOT report. "This provides a good indication of sterile cockpit as long as the signal is heard and is not confused with another signal (e.g., passenger requesting assistance)."

Another procedure was illumination of the "No Smoking" light as a sterile cockpit cue; with nonsmoking flights increasingly widespread, this procedure may require reevaluation.

Association of Flight Attendants (AFA) Safety Representative Noreen Koan said that the ideal notification tool is a PA announcement from the flight deck as the aircraft climbs and descends through 10,000 feet. The DOT report acknowledged that this might be a good technique, but said, "The success of this method depends entirely on the reliability of the announcement. Even in cases where the announcement is company policy, it is not always made."

The ASRS review suggested another weakness with procedures such as PA announcements at 10,000 feet and calls to flight attendants on the interphone. "These procedures require one [cockpit] crewmember to be 'out of the [communications] loop.' And as evidenced by literally thousands of ASRS reports, the potential for problems (such as misunderstood clearances and altitude deviations) increases when a crewmember is out of the loop … . For those who develop company procedures, consideration should be given to developing something that doesn't create its own set of distractions. With the increased use of two-crewmember cockpits this consideration is increasingly important."

Although the sterile cockpit was implemented to increase safety … there is evidence to suggest that safety can be impairedby misunderstandings about the rule.

The DOT report said, "Perhaps the best signal as to when sterile cockpit

procedures are in effect is an indicator light above the cockpit door or on the annunciator panel." Unlike a discrete tone or a PA announcement, this method was less likely to be missed or confused with another signal, according to the report. For optimum performance, a light should be installed near the cockpit door and adjacent to the interphone on each flight attendant communications panel. The indicator light's major disadvantage is that it requires installation.

Misinterpretations of Sterile Cockpit Are Possible

Although the sterile cockpit was implemented to increase safety by minimizing distractionsduring critical flight phases, there is evidence to suggest that safety can be impaired by misunderstandings. An airline captain, for example, was observed reprimanding his first officer for accomplishing the after-takeoff checklist below 10,000 feet. The first officer's actions, however, were entirely appropriate because the checklist function was required for flight safety and was clearly stated as such in the company's operating procedures.

Misunderstandings can also prevent important safety-related information from reaching the flight deck.

"Flight attendants, many already intimidated by the authority and mystique of the flight deck, are expected to determine which situations are essential to the safe conduct of the flight," according to Rebecca Chute and Earl Wiener in a recently published crew communications study.[8] "Rather than take the chance of being wrong and thereby breaking the law or, at the very least, embarrassing themselves and perhaps subjecting themselves to a reprimand from the captain, they [may fail to] communicate valuable, safety-related information to the pilots."

In 1984, a United Air Lines Boeing 727 encountered a severe wind shear on takeoff from Stapleton International Airport, Denver, Colorado, U.S. The wind shear caused the takeoff roll to be excessively long, resulting in the 727's underside being dragged through the localizer antenna at the departure end of the runway. The antenna punctured the fuselage and remained lodged there. The cockpit crew was unaware that the aircraft had struck the antenna, but could not determine why the aircraft would not pressurize. The flight attendants, on the other hand, had heard and felt a loud thump and vibration shortly after takeoff, but did not notify the cockpit crew because of the senior flight attendant's desire to adhere to the sterile cockpit procedures. Capt. Ricky Davidson, chairman of the U.S. Air Line Pilots Association's (ALPA) Accident Survival Committee, said, "It is crucial [that flight attendants] understand that it is better to risk interruption and break the sterile cockpit rule than to fail to communicate."[9]

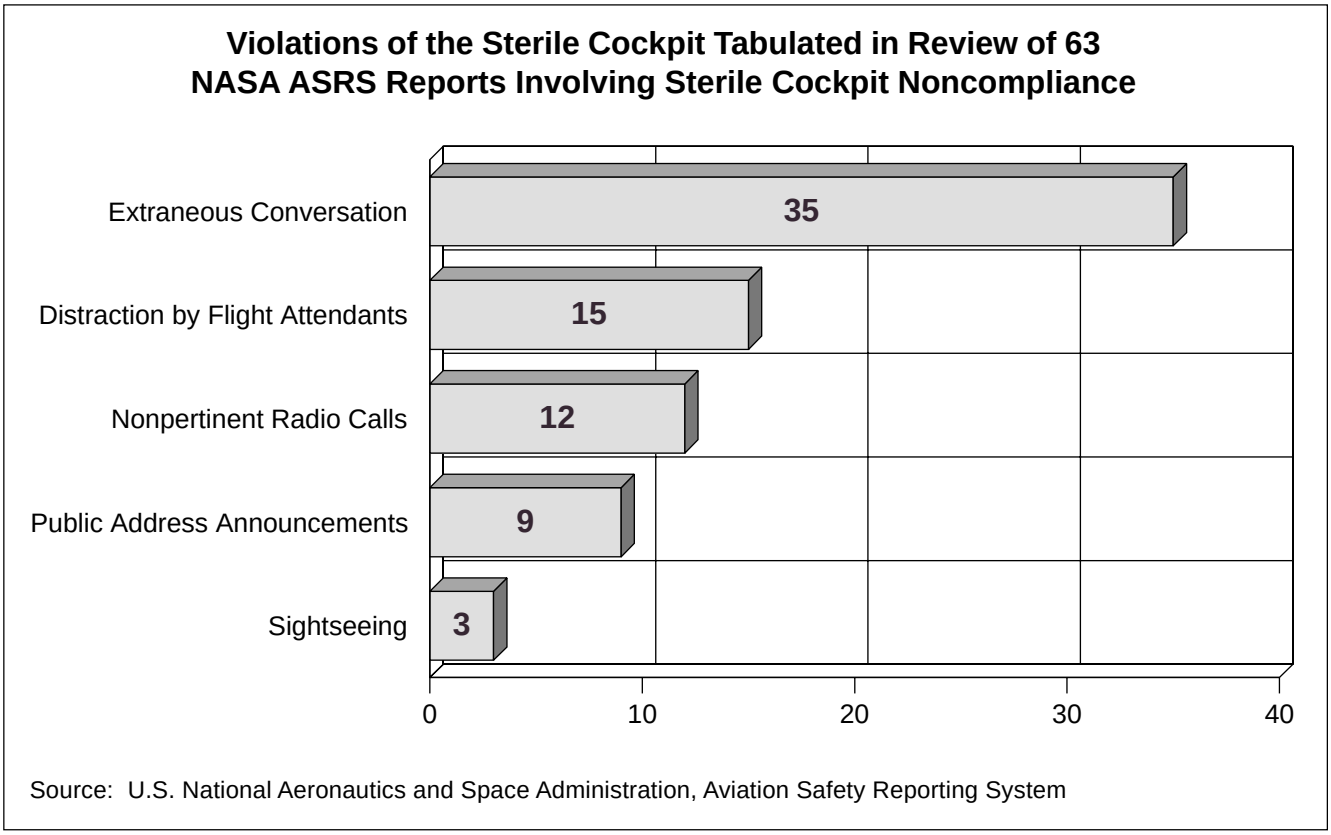

Figure 2

Of the 25 pilots surveyed in the 1988 DOT report, 72 percent indicated that they had experienced problems because of a lack of information about the sterile cockpit. Eighty percent of the pilots and 86 percent of the flight attendants surveyed indicated that cabin crews needed more specific guidance about when sterile cockpit interruptions were appropriate.

Training is the key to minimizing the potential for misunderstandings, officials said. "The quality of the decisions (as to whether or not to contact the cockpit) made by the flight attendants will be directly related to the information they received in training. The clearer the flight attendant's understanding of sterile cockpit procedures and flight operations, the better these decisions will be," said the DOT report.

To minimize ambiguity about the sterile cockpit rule, American Airlines provides a home study course for flight attendants.

"Sterile cockpit can be interrupted for an emergency or safety related item that could potentially be of danger to the passengers, crew or the aircraft," said American's training guide. "If you encounter something unusual, don't be afraid to report it so the cockpit [crew] can help determine first if it serious."[10]

The following guidelines, a combination of the American Airlines course and other industry sources, provide specific examples of when sterile cockpit interruptions may or may not be appropriate: [10,11]

Situations That Warrant Sterile Cockpit Interruptions

- Fire, burning odor or smoke in cabin;
- Medical emergency;
- Unusual noise or vibration;
- Auxiliary power unit (APU) torching;
- Fuel or other fluid leakages;
- Exit door ajar or unable to be armed/disarmed;
- Extreme temperature change;
- Evidence of deicing problems;
- Suspicious, unclaimed bag or package;
- Cart stowage problem; and,
- Any other condition that seems abnormal or that a flight attendant believes the flight crew should know about.

Situations That Do Not Warrant Sterile Cockpit Interruptions

- Non-safety-related logbook items;
- Meal preferences;
- Gate information;
- Misconnected baggage;
- Catering problems;
- Passenger accommodations such as wheelchairs;and,
- Rude passengers.

This list, along with appropriate regulatory requirements, provides a starting point for guidelines, which can be modified to suit the needs of each operator.

In addition to operators' training and specific guidelines, the captain of each flight can play an important role in encouraging flight attendants to voice safety concerns to the cockpit crew. Capt. Alan Price, Delta Air Lines' coordinator of human factors, has recommended that captains mention handling of the sterile cockpit during the preflight briefing.

A sample briefing, according to Price, might be: "Let's start with the sterile cockpit policy. Don't you worry about it! Let me do that. If *anything* happens that concerns you and you think we should know about it, pick up the phone and give us a call, or come see us. I'll let you know if it's a poor time to talk. We need and want to hear from you."[12]

The safety benefits of using sterile cockpit procedures are not limited to U.S. commercial air carriers. Operators not governed by the FARs (such as corporate and non-U.S. operators) are also encouraged to voluntarily adopt sterile cockpit procedures. The FAA noted: "Extraneous conversation in the cockpit during critical phases of flight causes crew distraction in small as well as large aircraft."[3] The accident and incident records send a clear message: aviation safety can be enhanced by using sterile cockpit procedures. ♦

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About the Author

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U.S. International Passenger And Freight Traffic Posted Gains In the First Half of 1993

U.S. Department of Transportation statistics indicate that non-U.S. carriers' total passenger traffic increased 2 percent during the first half of 1993.

U.S. Department of Transportation,
Office of International Aviation

The U.S. Department of Transportation's (DOT) Office of International Aviation reported that total U.S. international air travel rose by nearly 1.9 million passengers, more than 4 percent, during the first half of 1993 compared with the first half of 1992. U.S. carriers' total number of international passengers increased nearly 7 percent, raising the U.S.-flag share from 54 percent to 55 percent.

U.S. international freight traffic during the first six months of 1993 increased more than 124,000 tons (6 percent) compared with the similar period of 1992. Although the U.S.-flag carriers posted an increase in total international freight traffic (3 percent), the U.S.-flag share of freight declined from 40 percent to 39 percent.

Scheduled passenger traffic increased more than 5 percent and the number of charter passengers declined nearly 2 percent during the first half of 1993. U.S. carriers' scheduled passenger traffic rose nearly 7 percent and charter travelers, increased almost 10 percent. Non-U.S. carriers experienced an increase in total passenger traffic of 2 percent, with the figure for scheduled passengers increasing more than 3 percent and that of charter passengers dropping 8 percent.

New York was the largest U.S. international passenger gateway, with more than seven million passengers. Miami was second with 5.8 million passengers, and Los Angeles ranked third with 5.3 million passengers. Chicago ranked fourth with 2.8 million passengers, and Honolulu dropped to fifth with nearly 2.8 million passengers (a decline of more than 9 percent or 283,000 passengers compared with the first half of 1992). Among the top 20 U.S. international passenger airports, Miami posted the largest absolute gain (824,000 passengers), an increase of nearly 17 percent. Philadelphia recorded the largest relative increase of 28 percent. Fort Lauderdale experienced the largest relative decline, nearly 16 percent.

Scheduled freight tonnage increased 9 percent during the first half of 1993 compared with the similar period of 1992. Charter freight traffic dropped more than 13 percent. Total U.S.-flag freight traffic increased more than 3 percent as scheduled freight tons rose more than 5 percent and charter freight declined more than 5 percent. Non-U.S. airlines experienced an increase of more than 8 percent in total U.S. international freight tons, with scheduled freight traffic increasing 11 percent and charter freight traffic dropping 28 percent.

Miami was the largest U.S. international freight gateway during the first half of 1993, with more than 519,000 tons, an increase of more than 7 percent over the same period of 1992. U.S. carriers transported 45 percent of the freight traffic at Miami. New York and Anchorage ranked second and third, and experienced freight traffic declines of 2 percent and 3 percent, respectively. Washington, D.C., posted the largest relative increase, with 34 percent.

Eight of the nine regions cited in the report posted increases in passenger traffic during the first half of 1993. The Caribbean, with 5.2 million passengers, had the largest absolute passenger traffic gain (647,000 passengers or 14 percent). Europe, the largest region, with 13.7 million passengers, had the second largest absolute increase (455,000 passengers or 3 percent). The Far East, the second largest region, with 7.5 million passengers, was the only region to suffer a loss (62,000 passengers or nearly 1 percent).

Eight of the nine regions also recorded gains in freight traffic for the first six months of 1993. South America with nearly 331,000 freight tons, posted the largest absolute gain, approximately 50,600 tons (18 percent). The Far East, the second largest region, with more than 621,000 tons, also recorded a large absolute gain, more than 48,200 tons (8 percent). Europe, the largest region, with nearly 821,000 tons, had an absolute gain of 35,000 tons (more than 4 percent). Central America/Mexico was the only region to experience a decline in freight traffic during the first half of 1993, almost 36,800 tons (nearly 22 percent).

During the first half of 1993 compared with the same period of 1992, the top five country markets were Canada, Mexico, the United Kingdom, Japan and Germany. Mexico had a large absolute gain (262,000 passengers or 5 percent), causing Mexico to move to second place in total passenger volume. The United Kingdom experienced the largest absolute gain (306,000 passengers or 6 percent) and also moved up to third place. Haiti (58 percent), El Salvador (35 percent), Singapore (33 percent) and Aruba (30 percent) had large relative increases. Japan experienced the largest absolute passenger traffic loss (289,000 passengers or 6 percent) and dropped from second to fourth place. Sweden (24 percent), Portugal (17 percent) and Spain (13 percent) had large relative declines in passenger traffic during the first half of 1993. Overall, 37 of the top 50 passenger markets experienced traffic increases, 10 passenger markets recorded declines, and figures for three markets were not disclosed.

The largest five charter passenger markets during the first half of 1993 were Canada, Mexico, the United Kingdom, the Bahama Islands and Jamaica.

For the first six months of 1993, the top five freight country markets were Japan, the United Kingdom, Germany, Colombia and Korea. Colombia experienced the largest absolute gain (more than 43,400 tons or 41 percent) as it moved up to fourth place. Singapore (56 percent), Hong Kong (51 percent) and Brazil posted large relative increases. Mexico experienced the largest absolute loss (more than 28,600 tons or 40 percent). Costa Rica (29 percent), Belgium (27 percent), Ireland (13 percent) and Venezuela (10 percent) also recorded large relative declines in freight traffic during this period. Of the top 25 country markets for freight, 19 reported gains in freight traffic and six country markets experienced declines.

The top five charter freight markets for the first half of 1993 were Colombia, the Dominican Republic, Hong Kong, Guatemala and Canada. ♦

Table 1
Passenger Travel Between U.S. and the World
Arrivals and Departures

	Total Passenger Traffic			Scheduled Service					Charter Service			
				U.S. Flag		Other Flag			U.S. Flag		Other Flag	
Period	Traffic (000)	Total % Change	U.S. Flag %	Passenger (000)	Share (%)	Passenger (000)	Share (%)	Charter As % of Total	Passenger (000)	Share (%)	Passenger (000)	Share (%)
June 93	7,992	3.9	54	4,124	(55)	3,339	(45)	7	218	(41)	311	(59)
June 92	7,690		54	4,011	(56)	3,196	(44)	6	168	(35)	315	(65)
May 93	7,492	5.7	55	3,900	(56)	3,081	(44)	7	187	(37)	324	(63)
May 92	7,087		54	3,635	(55)	2,937	(45)	7	175	(34)	340	(66)
April 93	7,136	3.9	55	3,651	(56)	2,860	(44)	9	265	(42)	360	(58)
April 92	6,870		53	3,392	(55)	2,798	(45)	10	257	(38)	423	(62)
March 93	7,369	4.0	56	3,773	(58)	2,779	(42)	11	368	(45)	449	(55)
March 92	7,088		55	3,554	(56)	2,737	(44)	11	309	(39)	488	(61)
February 93	6,173	0.5	56	3,205	(58)	2,343	(42)	10	252	(40)	373	(60)
February 92	6,141		54	3,060	(56)	2,382	(44)	11	267	(38)	432	(62)
January 93	7,266	8.7	54	3,655	(56)	2,929	(44)	9	258	(38)	424	(62)
January 92	6,683		52	3,268	(54)	2,741	(46)	10	240	(36)	434	(64)
December 92	6,881	4.4	54	3,544	(55)	2,886	(45)	7	147	(33)	304	(67)
December 91	6,589		52	3,255	(53)	2,838	(47)	8	169	(34)	327	(66)
November 92	6,426	7.6	54	3,325	(56)	2,611	(44)	8	133	(27)	357	(73)
November 91	5,972		53	3,067	(55)	2,501	(45)	7	110	(27)	294	(73)
October 92	7,232	7.9	54	3,792	(56)	2,970	(44)	6	113	(24)	357	(76)
October 91	6,701		54	3,516	(56)	2,771	(44)	6	105	(25)	309	(75)
September 92	7,316	3.7	54	3,788	(55)	3,053	(45)	6	149	(31)	326	(69)
September 91	7,058		55	3,644	(56)	2,872	(44)	8	225	(42)	317	(58)
August 92	9,170	3.7	55	4,700	(56)	3,765	(44)	8	308	(44)	397	(56)
August 91	8,842		56	4,703	(57)	3,531	(43)	7	208	(34)	400	(66)
July 92	8,699	6.3	54	4 423	(55)	3,585	(45)	8	277	(40)	414	(60)
July 91	8,186		55	4 285	(56)	3,332	(44)	7	212	(37)	357	(63)
June 92	7,690	5.5	54	4,011	(56)	3,196	(44)	6	168	(35)	315	(65)
June 91	7,287		55	3,854	(56)	2,976	(44)	6	154	(34)	303	(66)

Source: U.S. Department of Transportation, Office of International Aviation

Table 2
Passenger Travel Between U.S. and Other Countries *
Top 50 Countries Ranked by Total Number of Passengers for January Through June, 1992 and 1993

			Total Passenger Traffic			Scheduled Service					Charter Service			
						U.S. Flag		Other Flag			U.S. Flag		Other Flag	
Country	For Jan–June Of:	Rank	Total Traffic (000)	92/93 % Change	U.S. Flag %	Passenger (000)	Share (%)	Passenger (000)	Share (%)	Charter As % of Total	Passenger (000)	Share (%)	Passenger (000)	Share (%)
Total — Disclosed Countries	93		41,422	4.2	56	21,645	(57)	16,097	(43)	9	1,467	(40)	2,213	(60)
	92		39,755		55	20,328	(56)	15,674	(44)	9	1,340	(36)	2,413	(64)
Canada	93	1	6,282	1.4	57	3,493	(69)	1,592	(31)	19	87	(7)	1,110	(93)
	92	1	6,197		55	3,316	(67)	1,640	(33)	20	90	(7)	1,151	(93)
Mexico	93	2	5,287	5.2	58	2,464	(58)	1,813	(42)	19	606	(60)	404	(40)
	92	3	5,025		55	2,272	(55)	1,831	(45)	18	512	(56)	410	(44)
United Kingdom	93	3	5,104	6.4	45	2,270	(48)	2,417	(52)	8	12	(3)	405	(97)
	92	4	4,798		45	2,132	(50)	2,174	(50)	10	28	(6)	464	(94)
Japan	93	4	4,883	-5.6	64	3,135	(65)	1,717	(35)	1	5	(16)	26	(84)
	92	2	5,172		61	3,170	(62)	1,977	(38)	0	9	(36)	16	(64)
Germany	93	5	2,577	6.6	60	1,523	(61)	980	(39)	3	31	(42)	43	(58)
	92	5	2,418		57	1,362	(58)	991	(42)	3	18	(28)	47	(72)
France	93	6	1,538	-5.5	69	1,053	(69)	477	(31)	1	3	(38)	5	(63)
	92	6	1,628		71	1,145	(71)	476	(29)	0	3	(43)	4	(57)
Jamaica	93	7	988	9.5	56	389	(47)	430	(53)	17	161	(95)	8	(5)
	92	7	902		54	349	(47)	400	(53)	17	139	(91)	14	(9)
Netherlands	93	8	957	17.7	21	205	(24)	656	(76)	10	0	(0)	96	(100)
	92	9	813		20	163	(23)	549	(77)	12	0	(0)	101	(100)
Dominican Republic	93	9	922	14.1	84	751	(84)	145	(16)	3	24	(92)	2	(8)
	92	10	808		81	643	(81)	151	(19)	2	11	(79)	3	(21)
Korea (South)	93	10	878	7.3	29	251	(29)	621	(71)	1	0	(0)	6	(100)
	92	8	818		43	353	(44)	445	(56)	2	0	(0)	20	(100)
Bahamas	93	11	832	18.5	71	332	(58)	237	(42)	32	255	(97)	8	(3)
	92	12	702		94	399	(100)	0	(0)	43	264	(87)	39	(13)
Italy	93	12	744	-1.6	50	367	(50)	369	(50)	1	8	(100)	0	(0)
	92	11	756		48	358	(48)	390	(52)	1	8	(100)	0	(0)
Brazil	93	13	642	14.8	44	270	(43)	355	(57)	3	13	(76)	4	(24)
	92	14	559		34	165	(33)	332	(67)	11	24	(39)	38	(61)
Switzerland	93	14	555	5.3	24	133	(25)	404	(75)	3	0	(0)	18	(100)
	92	15	527		27	137	(27)	362	(73)	5	5	(18)	23	(82)
Taiwan	93	15	545	9.0	32	177	(32)	368	(68)	0	0	(0)	0	(0)
	92	16	500		45	221	(44)	277	(56)	0	2	(100)	0	(0)
Australia	93	16	537	9.1	60	320	(60)	217	(40)	0	0	(0)	0	(0)
	92	17	492		69	340	(69)	152	(31)	0	0	(0)	0	(0)
Venezuela	93	17	504	18.0	51	237	(49)	249	(51)	4	18	(100)	0	(0)
	92	18	427		48	192	(46)	221	(54)	3	13	(93)	1	(7)

Source: U.S. Department of Transportation, Office of International Aviation

* For disclosure of country's data, at least three carriers must report data.

Table 3
Passenger Travel Between U.S. and Other Countries *
Top 50 Countries Ranked by Total Number of Passengers for January Through June, 1992 and 1993

			Total Passenger Traffic			Scheduled Service					Charter Service			
						U.S.Flag		Other Flag			U.S.Flag		Other Flag	
Country	For Jan-June Of:	Rank	Total Traffic (000)	92/93 % Change	U.S. Flag %	Passenger (000)	Share (%)	Passenger (000)	Share (%)	Charter As % of Total	Passenger (000)	Share (%)	Passenger (000)	Share (%)
Spain	93	18	502	-12.7	60	301	(62)	186	(38)	3	2	(13)	13	(87)
	92	13	575		58	326	(59)	222	(41)	5	9	(33)	18	(67)
Hong Kong-UK	93	19	422	12.2	59	246	(59)	174	(41)	0	2	(100)	0	(0)
	92	19	376		58	217	(58)	159	(42)	0	0	(0)	0	(0)
Aruba	93	20	410	29.7	75	196	(70)	85	(30)	31	111	(86)	18	(14)
	92	23	316		69	149	(60)	98	(40)	22	69	(100)	0	(0)
Bermuda-UK	93	21	384	7.6	99	374	(100)	0	(0)	3	5	(50)	5	(50)
	92	20	357		99	343	(99)	5	(1)	3	9	(100)	0	(0)
Netherlands Antilles	93	22	380	15.2	84	302	(85)	54	(15)	6	18	(75)	6	(25)
	92	22	330		82	254	(81)	59	(19)	5	17	(100)	0	(0)
Costa Rica	93	23	375	18.7	65	245	(65)	130	(35)	0	0	(0)	0	(0)
	92	24	316		64	201	(64)	115	(36)	0	0	(0)	0	(0)
Philippines	93	24	369	10.1	37	138	(37)	231	(63)	0	0	(0)	0	(0)
	92	21	335		37	123	(37)	212	(63)	0	0	(0)	0	(0)
Israel	93	25	343	17.1	47	160	(47)	183	(53)	0	0	(0)	0	(0)
	92	27	293		41	120	(41)	173	(59)	0	0	(0)	0	(0)
Colombia	93	26	315	2.9	47	148	(47)	167	(53)	0	0	(0)	0	(0)
	92	25	306		43	133	(43)	173	(57)	0	0	(0)	0	(0)
Argentina	93	27	299	-1.0	79	228	(78)	63	(22)	3	8	(100)	0	(0)
	92	26	302		51	138	(48)	147	(52)	6	17	(100)	0	(0)
Belgium	93	28	283	11.9	60	170	(60)	111	(40)	1	0	(0)	2	(100)
	92	32	253		56	142	(58)	104	(42)	3	0	(0)	7	(100)
Guatemala	93	29	280	10.2	63	173	(63)	103	(37)	1	4	(100)	0	(0)
	92	30	254		57	145	(57)	109	(43)	0	0	(0)	0	(0)
New Zealand	93	30	276	3.0	48	133	(48)	143	(52)	0	0	(0)	0	(0)
	92	28	268		48	128	(48)	140	(52)	0	0	(0)	0	(0)
Cayman Islands	93	31	242	-8.3	75	152	(72)	60	(28)	12	30	(100)	0	(0)
	92	29	264		48	102	(43)	137	(57)	9	25	(100)	0	(0)
Denmark	93	32	232	-8.7	10	24	(11)	198	(89)	4	0	(0)	10	(100)
	92	31	254		25	63	(26)	179	(74)	5	0	(0)	12	(100)
Ireland	93	33	223	-0.4	22	35	(17)	173	(83)	7	13	(87)	2	(13)
	92	33	224		19	34	(16)	181	(84)	4	9	(100)	0	(0)
Panama Republic	93	34	208	18.9	81	160	(80)	39	(20)	4	9	(100)	0	(0)
	92	37	175		77	134	(77)	40	(23)	1	1	(100)	0	(0)
Peru	93	35	201	9.2	46	92	(46)	109	(54)	0	0	(0)	0	(0)
	92	35	184		55	102	(55)	82	(45)	0	0	(0)	0	(0)

Source: U.S. Department of Transportation, Office of International Aviation

* For disclosure of country's data, at least three carriers must report data.

Table 4
Passenger Travel Between U.S. and Other Countries *
Top 50 Countries Ranked by Total Number of Passengers for January Through June, 1992 and 1993

			Total Passenger Traffic			Scheduled Service					Charter Service			
						U.S.Flag		OtherFlag			U.S.Flag		OtherFlag	
Country	For Jan-June of:	Rank	Total Traffic (000)	92/93 % Change	U.S. Flag %	Passenger (000)	Share (%)	Passenger (000)	Share (%)	Charter As % of Total	Passenger (000)	Share (%)	Passenger (000)	Share (%)
Ecuador	93	36	199	4.2	48	95	(48)	104	(52)	0	0	(0)	0	(0)
	92	34	191		42	80	(42)	111	(58)	0	0	(0)	0	(0)
Singapore	93	37	179	32.6	16	29	(16)	150	(84)	0	0	(0)	0	(0)
	92	42	135		16	21	(16)	114	(84)	0	0	(0)	0	(0)
Haiti	93	38	177	58.0	80	141	(80)	35	(20)	1	1	(100)	0	(0)
	92	45	112		38	29	(30)	69	(70)	13	14	(100)	0	(0)
Barbados	93	39	175	8.7	83	137	(82)	30	(18)	5	8	(100)	0	(0)
	92	38	161		72	110	(71)	45	(29)	4	6	(100)	0	(0)
Trinidad/Tobago	93	40	164	9.3	48	76	(47)	86	(53)	1	2	(100)	0	(0)
	92	39	150		33	46	(31)	101	(69)	2	3	(100)	0	(0)
Honduras	93	41	154	6.2	56	84	(55)	68	(45)	1	2	(100)	0	(0)
	92	41	145		50	71	(49)	73	(51)	1	1	(100)	0	(0)
Chile	93	42	143	17.2	50	71	(50)	71	(50)	1	1	(100)	0	(0)
	92	43	122		41	49	(40)	72	(60)	1	1	(100)	0	(0)
Sweden	93	43	136	-24.0	51	69	(59)	48	(41)	14	0	(0)	19	(100)
	92	36	179		58	104	(69)	46	(31)	16	0	(0)	29	(100)
Antigua/Barbuda	93	44	135	17.4	80	99	(79)	27	(21)	7	9	(100)	0	(0)
	92	44	115		77	84	(76)	27	(24)	3	4	(100)	0	(0)
Portugal	93	45	121	-17.1	32	36	(31)	79	(69)	5	3	(50)	3	(50)
	92	40	146		45	55	(40)	81	(60)	7	10	(100)	0	(0)
Greece	93	46	116	13.7	35	35	(32)	75	(68)	5	6	(100)	0	(0)
	92	47	102		36	30	(32)	65	(68)	7	7	(100)	0	(0)
El Salvador	93	47	108	35.0	94	102	(94)	6	(6)	0	0	(0)	0	(0)
	92	52	80		79	63	(79)	17	(21)	0	0	(0)	0	(0)
Finland	93	48	*Data cannot be disclosed for this period.*											
	92	46	111		23	13	(15)	71	(85)	24	12	(44)	15	(56)
Russian Federation	93	49	96	0.0	35	24	(28)	62	(72)	10	10	(100)	0	(0)
	92	106	*Data cannot be disclosed for this period.*											
Poland	93	50	*Data cannot be disclosed for this period.*											
	92	51	82		2	2	(2)	79	(98)	1	0	(0)	1	(100)
Total — All Countries	93		43,446	4.5	55	22,305	(56)	17,343	(44)	9	1,555	(41)	2,243	(59)
	92		41,575		54	20,919	(55)	16,798	(45)	9	1,419	(37)	2,439	(63)

* For disclosure of country's data, at least three carriers must report data.

Source: U.S. Department of Transportation, Office of International Aviation

Table 5
Top 20 U.S. International Passenger Gateways
Scheduled and Nonscheduled Operations, January Through June, 1992 and 1993

Gateway City	For Jan-June of:	Rank	Total Passengers (000)	92/93 % Change	U.S. Flag Passengers (000)	U.S. Flag Passengers (%)	Other Flag Passengers (000)	Other Flag Passengers (%)
Total — Disclosed Gateways	93		39,339	5.1	20,848	53	18,491	47
	92		37,413		19,364	52	18,049	48
New York, New York	93	1	7,014	-0.5	3,169	45	3,845	55
	92	1	7,046		3,175	45	3,871	55
Miami, Florida	93	2	5,778	16.6	3,069	53	2,709	47
	92	2	4,954		2,217	45	2,737	55
Los Angeles, California	93	3	5,305	10.4	1,628	31	3,677	69
	92	3	4,806		1,444	30	3,362	70
Chicago, Illinois	93	4	2,801	15.6	1,768	63	1,033	37
	92	5	2,422		1,544	64	878	36
Honolulu, Hawaii	93	5	2,776	-9.3	1,169	42	1,607	58
	92	4	3,059		1,339	44	1,720	56
San Francisco, California	93	6	1,995	6.7	1,154	58	841	42
	92	6	1,869		1,031	55	838	45
Boston, Massachusetts	93	7	1,468	4.7	853	58	615	42
	92	8	1,402		798	57	604	43
Newark, New Jersey	93	8	1,458	0.3	736	50	722	50
	92	7	1,453		772	53	681	47
Dallas/Fort Worth, Texas	93	9	1,414	3.1	1,269	90	145	10
	92	9	1,372		1,209	88	163	12
Houston, Texas	93	10	1,203	4.9	834	69	369	31
	92	10	1,147		761	66	386	34
Atlanta, Georgia	93	11	1,118	4.7	791	71	327	29
	92	12	1,068		784	73	284	27
San Juan, Puerto Rico	93	12	1,116	4.4	965	86	151	14
	92	11	1,069		885	83	184	17
Orlando, Florida	93	13	1,025	11.3	202	20	823	80
	92	13	921		224	24	697	76

Source: U.S. Department of Transportation, Office of International Aviation

Table 5 (continued)
Top 20 U.S. International Passenger Gateways
Scheduled And Nonscheduled Operations, January Through June, 1992 and 1993

Gateway City	For Jan-June of:	Rank	Total Passenger (000)	92/93 Percent Change	U.S. Flag Passenger (000)	(%)	Other Flag Passenger (000)	(%)
Washington, D.C.	93	14	937	14.5	608	65	329	35
	92	16	818		509	62	309	38
Detroit, Michigan	93	15	927	5.7	810	87	117	13
	92	14	877		804	92	73	8
Guam, Mariana Islands	93	16	772	-9.6	555	72	217	28
	92	15	854		600	70	254	30
Seattle, Washington	93	17	606	-13.4	460	76	146	24
	92	17	700		467	67	233	33
Ft. Lauderdale, Florida	93	18	563	-15.6	104	18	459	82
	92	18	667		193	29	474	71
Saipan, Mariana Islands	93	19	540	7.8	322	60	218	40
	92	19	501		307	61	194	39
Philadelphia, Pennsylvania	93	20	523	28.2	382	73	141	27
	92	21	408		301	74	107	26
Total — All Gateways	93		44,197	4.4	23,957	54	20,240	46
	92		42,326		22,399	53	19,927	47

Source: U.S. Department of Transportation, Office of International Aviation

Publications Received at FSF Jerry Lederer Aviation Safety Library

Report Examines Turbine Engine Reliability

Inflight shutdowns and unscheduled removal rates were trended for a 36-month period. Controls and accessories created the most problems.

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Editorial Staff

Reports

Aircraft Turbine Engine Reliability and Inspection Investigations. Richter, Bruce A.; Ridenour-Bender, Margaret; Tsao, Mike. Report No. DOT/FAA/CT-92-29. October 1993. 58 p.; ill., tables, appendices. Available through the U.S. National Technical Information Service (NTIS)*.

Keywords

1. Actuarial Analysis
2. Inflight Shutdowns
3. Unscheduled Engine Removals
4. Service Difficulty Report (SDR)
5. Engine Case
6. Data Base
7. Ultrasonic
8. Inspection

Summary: This study of JT9D, CF6 and PT6 aircraft engine reliability represents a follow-on effort to the JT8D engine study that was published in the U.S. Federal Aviation Administration (FAA) Technical Center Final Report DOT/FAA/CT-91/10. As with the JT8D engine study, this study trended inflight shutdowns and unscheduled removal rates of JT9D, DF6 and PT6 turbine aircraft engines for a 36-month period covering February 1988 through January 1991.

The methodology was to review which air carriers consistently exceeded the standard deviation norm for inflight shutdowns and unscheduled engine removals on a monthly basis, then examine the engine component failures reported by those carriers. Engine component failures were grouped as follows: bearings, airfoils, cases, controls and accessories, fuel/oil systems and others (not trended).

Controls and accessories typically produced the largest number of inflight flameouts, compressor stalls and engine shutdowns. In addition to the actuarial analysis and component failure mode, trending performed on the JT9D, DF6 and PT6 engines, application of an inspection procedure developed for the JT8D engine was made on the JT9D and CF6 engine cases. [from abstract]

Index of FAA Office of Aviation Medicine Reports: 1961–1993. Collins, William E.; Wayda, Michael E. Report No. DOT/FAA/AM-94/1. January 1994. 73p. Available through the U.S. National Technical Information Service*.

Keywords

1. United States — Office of Aviation Medicine — Bibliography — Catalogs
2. Aviation Medicine — United States — Indexes
3. Civil Aeromedical Institute

Summary: This is an index to U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine reports (1964–1993) and Civil Aeromedical Institute reports. The index lists all FAA aviation medicine reports published from 1961 through 1993: chronologically, alphabetically by author, and alphabetically by subject.

Automation and Cognition in Air Traffic Control: An Empirical Investigation. Vortac, O.U.; Edwards, Mark B.; Fuller, Dana K. Report No. DOT/FAA/AM-94-3. February 1994. 17 p.; ill., tables. Includes bibliographical references. Available through the U.S. National Technical Information Service (NTIS)*.

Keywords

1. Automation
2. Air Traffic Control
3. Flight Progress Data
4. Cognitive Psychology
5. Memory
6. Applied Psychology

Summary: The investigators were concerned that the imminent automation of air traffic control may have negative consequences on cognitive functioning and ultimately on performance. This report investigated these possibilities by comparing normal, conventional air traffic control with an experimental condition designed to resemble an extreme version of automation.

Overall, measures of performance were comparable between conditions. Most of the cognitive measures (attentional demands, visual search, recall of flights, recall of flight data) were not impaired by the automation analog. Instead, two prospective measures (prospective memory, planning) showed improved performance. The prospective memory advantage is particularly surprising given that the automation-analog group was unable to manipulate external memory aids. Possible reasons for the prospective memory advantage include a reduced workload which allows the controller to get the necessary information in other ways, and a change in the nature of the task resulting from the "automation" of the strip management module. [from abstract]

National Aging Aircraft Research Program Plan. U.S. Federal Aviation Administration. October 1993. 69 p.; ill., tables. Includes bibliography.

Keywords

1. United States — Federal Aviation Administration
2. Airplanes — United States — Airworthiness
3. Airplanes — United States — Fatigue
4. Airplanes — United States — Maintenance and Repair
5. Airplanes — United States — Inspection

Summary: This document describes the U.S. National Aging Aircraft Research Program (NAARP) and how the NAARP will resolve technical issues related to the aging of aircraft. The basic questions addressed are: (1) How long can aircraft structural life be extended?; (2) Are the current techniques, methodologies and analyses used in design, manufacture, maintenance and inspection adequate?; and (3) What are the best methods for dealing with safety-critical information?

The research described in this plan supports maintenance, transport, commuter and engine programs conducted by the U.S. Federal Aviation Administration (FAA) Aircraft Certification and Flight Standards Services. This document supersedes the National Aging Aircraft Research Program Plan (DOT/FAA/CT-88/32-1), dated September 1991. The research projects identified in this plan fulfill specific mission needs identified by sponsoring organizations with the FAA. The overall research and development (R&D) program described in this plan is mandated by the Aviation Safety Research Act of 1988 (Public Law 100-591). Initiatives identified in this plan were coordinated with domestic and international aviation communities. Individual elements of this plan are being coordinated with other government agencies, the aviation industry, and academic institutions to avoid duplication of effort while maximizing the return on the research investment. [from report]

Maintaining Vigilance on a Simulated ATC Monitoring Task Across Repeated Sessions. Schroeder, D.J.; Touchstone, R.M.; Stern, J.A.; Stoliarov, N.; Thackray, R.I. Report No. DOT/FAA/AM-94/6. March 1994. 11p.; tables, graphs. Includes bibliographical references. Available through the U.S. National Technical Information Service (NTIS)*.

Keywords

1. Vigilance
2. Monitoring Performance Attention
3. Air Traffic Control

Summary: This study was undertaken to assess changes in vigilance/attention across three separate days as subjects performed on an air traffic control (ATC) simulation task. The monitoring task included the detection of: (a) altitude malfunctions; (b) aircraft conflict/no conflicts where two aircraft were at the same altitude on an airway simultaneously; and (c) triangular targets representing VFR aircraft that appeared either centrally or peripherally on the screen during the course of each session.

Outcomes were generally consistent with previous findings with this task and consistent with other literature with respect to the presence of performance decrements associated with time-on-task. The results were consistent with a view that the decrements are associated with lapses in attention or "blocks," rather than a generalized fatigue effect or a general modification in overall scanning behavior. Furthermore, the results suggest that there were aspects of monitoring performance that remain relatively immune to time-on-task effects, even during the course of the three two-hour sessions. [from abstract]

International Aviation: New Competitive Conditions Require Changes in DOT Strategy. Mead, Kenneth M. Testimony before the Subcommittee on Aviation, Committee on Public Works and Transportation, U.S. House of Representatives. May 1994. 17 p. Includes appendices.**

Kenneth Mead, director, Transportation Issues, Resources, Community and Economic Development Division of the U.S. General Accounting Office (GAO), testified about the U.S. Department of Transportation's (DOT) international aviation policy making. At the time of the testimony, the GAO was studying the impact of operating and marketing obstacles faced by U.S. airlines at airports in Europe and Asia and the impact of marketing alliances between U.S. and non-U.S. airlines.

Mead said that during the last 10 years, the characteristics of U.S. airlines have changed and their desire to compete internationally has increased. Mead said that the airlines' limited success in gaining greater access to international routes is because of heavy international regulation. He said that the regulation issue is complicated by other nations' concerns that U.S. airlines will overtake the other nations' markets if allowed to compete freely and by the often competing interests of the U.S. airlines that currently serve international markets. Mead also said that non-U.S. governments have sought to gain greater access to U.S. markets — many while restricting U.S. airlines' access to their markets.

Mead told the subcommittee that DOT's policy goal to achieve a deregulated environment ("open skies"), in which airlines can fly between countries when and where they want and set their fares accordingly, has, for the most part, not been achieved and probably will not be achieved in the near future.

Aviation Security: Additional Actions Needed to Meet Domestic and International Challenges. U.S. General Accounting Office (GAO). Report to Congressional Committees. January 1994. 53p. Available through GAO**.

Keywords

1. United States — Federal Aviation Administration
2. Airports — United States — Security Measures
3. International Airports — Security Measures

Summary: In December 1988, a terrorist bomb destroyed Pan Am Flight 103, killing all 259 passengers and crew. In response, the U.S. Congress passed the Aviation Security Improvement Act of 1990, which directed the U.S. Federal Aviation Administration (FAA) to improve aviation security. This U.S. General Accounting Office (GAO) report examines the FAA's response to the 1990 law.

The GAO found that the FAA has taken important steps to respond to the law, such as placing additional staff at Category X domestic airports (airports that have a high volume of traffic and complex security programs). Although the assessments of 18 of the 19 Category X airports examined a wide range of problems affecting aviation security and confirmed the need for many of the FAA's initiatives, the assessments did not match the capabilities, methods, or intent of known terrorist groups in the United States with vulnerabilities at individual airports. The FAA's matching of known terrorists' capabilities, methods and intent with airports' vulnerabilities is important to help determine the

appropriate level of security at domestic airports and develop effective contingency plans, the report said.

Important differences in security requirements exist between U.S. and foreign carriers for flights departing from some foreign airports. U.S. carriers are required to take more stringent security measures than their foreign counterparts. Nevertheless, on the basis of a review of foreign carriers' security programs, the FAA officials believe that a similar level of protection exists for U.S. passengers flying via most foreign carriers. GAO believes this conclusion is premature because the FAA has not completed its analyses of countermeasures that individual foreign carriers will be asked to adopt at specific airports and has not developed guidance defining such similarity or how it will be enforced.

The FAA recently issued requirements to improve cargo security. The FAA is taking actions to identify freight forwarders — entities that consolidate cargo and buy space on aircraft — and heighten security awareness in the cargo industry. However, the FAA has not developed an inspection strategy to ensure that freight forwarders comply with the new requirements. In addition, the FAA and the U.S. Postal Service (USPS) have negotiated an agreement in which the USPS is taking certain measures to improve the security of mail flown via passenger carriers. However, a prior agreement between the FAA and the USPS for securing mail was not successfully implemented.

The safety of the traveling public rests on how well the FAA can adapt to changing conditions. The GAO identified several actions that the FAA could take to improve its security program and help shape the future of aviation security. These actions include (1) pilot-testing new procedures before implementing them, (2) paying greater attention to such human factors issues as security screeners' performance and passenger profiling (interviewing), (3) making better use of the security information that the FAA collects on air carrier and airport inspections, and (4) providing airport security coordinators at Category X airports with security clearances. [from report]

Books

The Pilot's Burden: Flight Safety and the Roots of Pilot Error. Buck, Robert N. Ames, Iowa, U.S.: Iowa State University Press, 1994. 237 p.; ill. Includes bibliographical references.

Keywords

1. Aeronautics — Safety Measures
2. Airplanes — Piloting — Safety Measures
3. Aircraft Accidents — Human Factors

Summary: Most airplane accidents are attributed to pilot error, but why does the pilot err? The author argues that the airline pilot's workload has become so high-tech and air traffic control–dominated that mistakes are inevitable.

This book traces the evolution of the required skills and responsibilies of pilots from the early days of the open cockpit biplanes flying in uncontrolled skies to the latest computerized aircraft flying in the controlled skies of today. The author recounts aviation history to show how advancing technology has affected pilots. He covers the effects of aircraft development and design, the growth of U.S. Federal Aviation Administration (FAA) rules, the complexity of the air traffic control system, and computers in airplanes. In response to the growing demands these factors place on pilots, psychologists and cockpit resource management concepts have begun to teach pilots how to work as a team and how to better cope with their complex tasks and pressures. [from text]

Aviation has an excellent safety record, but little has been done to reduce the cockpit pressures on pilots. To avert, or at least lessen, the potential for catastrophe, a serious effort must be made to simplify and reduce the pilot's burden, according to the author.

Accident Facts: 1993 Edition. Hoskin, Alan F.; et al. Itasca, Ill.: U.S. National Safety Council, 1993. 111 p.; graphs, tables, glossary, appendix. Includes bibliographical references.

Keywords

1. Accidents — United States — Statistics
2. Death — Causes — United States — Statistics

This book is the U.S. National Safety Council's annual statistical report on accidental death, injury, work injury, illness incidence, and fleet accident rates and costs.

Jets: Airliners of the Golden Age. Ott, James; photography by Aram Gesar. Osceola, Wisconsin, U.S.: Motorbooks International, 1993. 158p.; ill. Includes bibliographical references, index. ISBN 0-87938-806-4.

Keywords

1. Aeronautics, Commercial — History
2. Jet Planes — History

Summary: Beginning with the Comet and ending with the Airbus Industrie A340, *Jets* covers the world's commercial jet aircraft and tells the stories of the test pilots,

cockpit crews, technicians and airline managers who have been involved with them. The book has more than 200 color photographs plus line drawings and technical performance data for each type of aircraft.

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Updated U.S. Federal Aviation Administration Reference Materials

Advisory Circulars (ACs)

AC Number	Date	Subject
150/5390-2A	01/20/94	*Heliport Design* (cancels AC 150/5390-2, dated Jan. 4, 1988).
39-6Q	02/15/94	*Announcement of Availability — Summary of Airworthiness Directives* (cancels AC 39-6P, dated Feb. 2, 1992).
150/5100-14C	02/16/94	*Architectural, Engineering, and Planning Consultant Services for Airport Grant Projects* (cancels AC 150/5100-14B, dated Nov. 21, 1988).
150/5210-17	03/09/94	*Programs for Training of Aircraft Rescue and Firefighting Personnel* (cancels AC 139.49-1, dated Nov. 12, 1974; AC 150/5200-15D, dated Jan. 21, 1988; AC 150/5200-21A, dated Feb. 24, 1981; AC 150/5200-27B, dated Sept. 1, 1987; AC 150/5210-16, dated Feb. 21, 1989).
150/5210-18	04/13/94	*Systems for Interactive Training of Airport Personnel*

Airbus Makes Off-airport Landing In Rice Paddy

Flight crew was forced to choose emergency landing site after determining that the aircraft had insufficient fuel to reach an alternate airport.

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.

Rice Paddy Cushions Landing, Aircraft Destroyed

Airbus A300. Aircraft destroyed. Two minor injuries.

The aircraft attempted an instrument landing system (ILS) arrival but was forced to execute a go-around after visibility declined below landing minimums because of fog. The flight was forced to divert to an alternate airport located about one flying hour away.

After the go-around, the flaps and slats did not retract, which reduced flying speed and doubled the amount of fuel required to reach the alternate. When it was determined that not enough fuel remained to reach the alternate airport, the flight crew searched for a suitable emergency landing field.

The flight crew chose a rice paddy that had been recently prepared for planting. The soft soil acted as a cushion when the aircraft touched down. There were only two minor injuries among the 247 passengers and 12 crew members. The aircraft was evacuated in less than 90 seconds without incident.

Safety Issues Raised After Fatal Crash

Piper PA-31. Aircraft destroyed. Eight fatalities. One serious injury.

After a night landing, the Piper with eight passengers on board struck a blast fence during roll-out. The aircraft, operating as Action Airlines, was destroyed by an immediate ground fire and the pilot and seven passengers were killed. A surviving passenger was severely burned.

The U.S. National Transportation Safety Board (NTSB), which is investigating the April 27, 1994, accident, said that "serious deficiencies related to the accident airplane have been noted that could affect the airworthiness or postcrash survivability of occupants of other airplanes." The NTSB said that based on preliminary evidence, the U.S. Federal Aviation Administration (FAA) "should take immediate action to address these deficiencies."

Initial examination of the wreckage revealed evidence that "no occupant of the airplane was using a safety belt at the time of the accident. It also became apparent that the safety belts had been improperly installed on several of the passenger seats."

The NTSB added: "Incorrectly sized attachment bolts had been used on the seat frames during reassembly, and some attachment bolts had been found with no associated bushings to allow the belts to swivel on the bolts.

"An examination of seats in other Piper PA-31 airplanes operated by Action Airlines revealed numerous safety belt and seat frame attachment anomalies on almost every seat. Safety belts were attached to nonapproved locations, which resulted in the belts being at an incorrect angle when fastened. Some belts were installed so that their webbing originated beneath the seat pans. Both conditions were not in accordance with Piper-approved engineering drawings. Other anomalies included nonstandard parts and missing, but required, parts associated with the safety belts and seat frames."

The NTSB said that the interior of the accident airplane, and others operated by Action Airlines, had been refurbished by Harrington Industries of Aiken, South Carolina, U.S., which it said was not an FAA-approved repair station. "However, FAA-certified airframe and powerplant (A&P) mechanics who work for the company routinely sign off repair documents and are surveilled by FAA inspectors. The president and two mechanics hold A&P certificates."

The repair facility was visited by an NTSB investigative team following the Action Airlines accident. The NTSB said that "employees acknowledged using the abovementioned parts and techniques during the refurbishment of airplane interiors. Nonstandard parts were found in their parts bins."

The NTSB added: "The person who is responsible for the complete disassembly and reassembly of newly upholstered seats, including the installation of safety belts, is not an A&P mechanic, but rather was previously employed as an automobile mechanic. This individual acknowledged that he had received no training on the disassembly and reassembly of airplane seats.

"Further, he was unaware of maintenance manual instructions and the need to use aviation quality hardware. The A&P mechanics who signed off the work orders acknowledged that they had not examined the work performed on the safety belt attachments, the reassembly of seats and their installation in the airplane. Piper service bulletins and maintenance manuals for other airplanes that had been refurbished or repainted were found to be out of date by as much as 23 years. Lastly, company personnel acknowledged that they had not properly rebalanced control surfaces, as required, after they were repainted."

Harrington Industries, the NTSB said, has been in business for about 20 years. The NTSB said that records and interviews for the past five years indicate that the company "refurbished or repainted 12 to 15 airplanes per month."

Based on its preliminary findings, the NTSB asked the FAA to evaluate maintenance conducted at Harrington Industries and to ensure that all work is conducted in compliance with approved practices and to "identify airplanes that have been repaired, refurbished or repainted by Harrington Industries."

The NTSB urged inspection of seat and safety belts and control surfaces to "ensure that balance is within tolerance limitations."

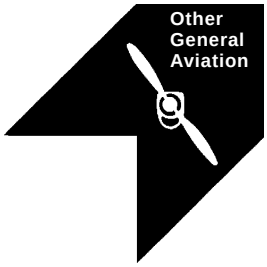
Fuel Exhaustion Downs Twin

Cessna 310. Aircraft destroyed. Three fatalities. Two serious injuries.

The aircraft was turning base for landing when an engine stopped. A few moments later, the second engine stopped. An off-airport landing was attempted on a street.

After touchdown, the aircraft struck an automobile and utility poles and was destroyed by a postimpact fire. It was determined that both engines stopped because of

fuel exhaustion. Three passengers were killed. The pilot and another passenger were seriously injured in the daylight crash.



Mechanical Problem Forces Landing Without Nose Gear

Beechcraft Duchess 76. Substantial damage. No injuries.

The twin-engine Duchess was being positioned for landing when pre-landing checks determined that only two green lights were on indicating main gear extension. An inspection in the mirror confirmed that the nose wheel had not extended.

The manual gear-extension procedure failed to lower the gear, as did maneuvering efforts. The pilot elected to execute an emergency landing with power off and propellers feathered.

As the aircraft approached the runway, engine controls were pulled back. The pilot attempted to hold the aircraft off as long as possible, using rudder to maintain a straight heading. The aircraft's nose and both engines and propellers were substantially damaged after touchdown. The pilot was not injured.

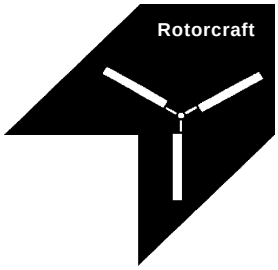
A postcrash investigation determined that a three-inch (eight-centimeter) section of the right-hand nose-gear door hinge had seized and had prevented the fork from achieving its correct position.

Turbulent Final Ends in Water

Piper PA-28. Substantial damage. No injuries.

The pilot reported that the approach to Runway 25 was smooth until just before the threshold, when the aircraft descended abruptly with the left wing low. Surface winds at the time were reported as 240 degrees at 25 knots.

Power was applied to arrest the sink rate but the left wing struck a small tree, yawed to the left and touched down. The pilot closed the throttle, but was not able to prevent the aircraft from entering a duck pond located just short of the runway threshold. The pilot and two passengers escaped without injuries. The aircraft's nose wheel was broken and the propeller, cowling, flaps and the left-wing leading edge were damaged.



Log Load Sends Helicopter Plunging

Kaman HH-43F. Aircraft destroyed. One fatality.

The helicopter was lifting a load of logs on a 150-foot (46-meter) line when the main rotor pylons separated from the aircraft. The aircraft descended, inverted, and the main rotor blades were found about one-quarter mile (0.4 kilometers) from the main fuselage.

The pilot was killed in the crash and the aircraft was destroyed. Weather was reported as visual meteorological conditions with clear skies, visibility 30 miles (48 kilometers) and winds at eight knots.

Downdraft Cuts Short Sightseeing Flight Short

Bell 47G. Substantial damage. Three minor injuries.

The helicopter took off on a daylight sightseeing flight with a quartering tailwind. At about 50 feet (15 meters) above ground level, the aircraft encountered a downdraft.

The pilot said that main rotor rpm decayed and the aircraft lost altitude. The helicopter narrowly cleared a fence and rolled over on its side after a skid struck a pine tree. The pilot and two passengers suffered minor injuries. Weather was reported as visual meteorological conditions, 7,000 feet (2,134 meters) scattered, visibility 10 miles (16 kilometers) and winds at seven knots.

The Management Challenge — Balancing Technology and Resources For Improved Aviation Safety

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FLIGHT SAFETY DIGEST

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