Use of Flight Data Recorders To Prevent Accidents in the U.S.S.R.

Analysis of flight recorder information has proven a valuable tool both for investigating accidents and improving the level of flight safety since 1965.

by
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Civil aviation flight safety in the U.S.S.R. is one of the most important challenges that confronts designers, manufacturers and operators of aviation equipment. Measures directed toward safety improvements include continuous improvement in the construction of aircraft and equipment, improvement of operational parameters of critical equipment components in case of emergencies, and improvement of professional training of flight crews.

The recording and analysis of objective information about the "airplane/flight crew/environment" system are important to the solution of these problems. At present, flight parameters and crew member conversations are recorded, along with the corresponding parameters of the air traffic control system.

The use of flight information is of special importance for qualitative improvement in the investigation of aircraft accidents, the reduction of the time spent in investigations and for the improvement of reliability in determining the accident cause.

The installation of a broad variety of devices for objective control of technical flight characteristics of the aircraft and the recording of acoustic information aboard civil aircraft in the U.S.S.R. began approximately 25 years ago. The first recording devices were primitive emergency data recorders with a limited amount of recorded information. At present, the U.S.S.R. uses modern modular systems for recording and storing information with unlimited possibilities for further expansion. They satisfy the airworthiness standards in this country as well as abroad.

Since 1965, 12-channel flight data recorders of the MSRP-12 type and their modifications have been installed in civil aircraft of the U.S.S.R for the storage of flight accident information. These recorders improved the quality of flight accident investigations significantly over the earlier, emergency information units. In accordance with the improved experience using these devices, the operational parameter requirements of these devices increased. These requirements were included later in airworthiness standards.

The current airworthiness standards recognize that recorded flight data permits analysis of aviation accidents and helps determine their causes. The status and operation of systems and components of an aircraft and the action of its cockpit crew can be monitored in detail. The recording of flight data information comprises both technical flight parameters and acoustic information. It is necessary that the technical flight data and acoustic information be synchronized.

The use of flight data recorders ensures the documention of the following groups of parameters:

- basic aircraft information (time, date, flight number, aircraft registration number)
- flight mode data (altitude, airspeed, acceleration, pitch angle, angle of attack, flight path angle)
- control position (rudder, stabilizer/elevator, aileron)
- powerplant data (rpm, throttle position, EGT, EPR)
- aircraft system data (hydraulic pressure, power supply system parameters).

It is necessary that the technical flight data and acoustic information be synchronized.

The protected data recorder must ensure the accumulation of information to accommodate a flight of at least 25 hours duration. The system must be protected from mechanical and thermal impacts.

The most prevalent flight data recorder units currently used in the U.S.S.R. are the MSRP-64, MSRP-256 and BUR-1-2. Their main characteristics are as follows:

MSRP-64: This unit records 48 analog parameters and 32 single commands (3 analog parameters at a registration frequency of 8 Hz: elevator deflection, vertical g, roll angle). The data carrier is a magnetic tape. The preserved recording time is 25 hours of previous operation. The system is installed in IL-62, YAK-42, TU-134 and TU-154 aircraft.

MSRP-256: This recorder records 228 analog parameters and 128 single commands (service set), and 114 analog parameters and 88 single commands (protected emergency set) at a registration frequency of 1 Hz. The data carrier is a magnetic tape. The protected emergency set ensures a preserved recording time of 12.5 hours of previous operation. The service set is a quick-access recorder; its preserved recording time is 25 hours of previous operation. This recorder is installed in IL-86 aircraft.

BUR-1-2: This recorder records 25 analog parameters and 48 single commands. The registration frequency varies from 1 Hz to 16 Hz. Its preserved recording time is 50 hours of previous operation. The data carrier is a bimetallic magnetic tape. This system is installed in L-410 airplanes and MI-6 helicopters.

The newer TU-204 and IL-96 aircraft are equipped with MSRP-A-2 recorders which record 30 analog parameters, 80 single commands and 32 serial codes. Their registration frequency varies from 0.5 Hz to 32 Hz. The protected emergency set has a preserved recording time of 17 hours of previous operation; the service set (with a quick-access feature) has 25 hours of preserved previous operation. The data carrier is a bimetallic magnetic tape.

The BUR and MSRP-A systems have a lower rate of recording errors, are smaller in size and weight and can record more parameters and single commands than the recording systems of the previous generation.

Such a broad variety of recorders available for use allows their application in large airplanes with wide fuselages as well as in light airplanes and helicopters. The "weight/parameter ratio" of the recorders (i.e., recorder weight/number of recorded parameters) is 0.24-0.27 kg (.53-.6 lb) and is satisfactory for these applications. These recorders also ensure a high level of preservation of recorded information during an accident and allow easy access to recorded information using double cassette recorders. The latter permits unlimited expansion of analysis of flight information for analysis of the cockpit crew's actions evaluation of the operational condition of the equipment on board, including values of the actual stress experienced; analysis of actual fuel flow rates; development of an optimal flight regime; and determination of the aircraft's total safe flight time.

U.S.S.R. aircraft have also been equipped with technical flight data recorders, and with acoustic recorders for the synchronous registration of crew member conversations. The installation of acoustic recorders in the aircraft is necessary because many accidents, characterized by the sudden occurrence of critical situations, are accompanied by an interruption of communication between the members of the flight crew and air traffic controllers. Investigations have shown that with adequate equipment a cockpit crew's conversation may be recorded well enough to be understandable during playback even at high noise levels. Acoustic recorders must provide reliable information about the actions of cockpit crew, including their observations, whereby they analyzed the situation and took measures to prevent an incident from proceeding to an accident. This information is also useful in investigating accidents. In addition to recording crew conversations, the general acoustic environment of the cockpit is recorded. Also important to accident investigations are the sounds from flap and landing gear extension and retraction, engine noise and other sounds of special importance in analyzing the sequence of events. Acoustic recorders register the following information:

... many accidents ... are accompanied by an interruption of communication between the ... flight crew and air traffic controllers.

- air-to-ground and air-to-air communications
- interphone conversations between crew members
- direct conversations between crew members
- speech or sound signals of navigation aids or approach control that are audible in the headphones of crew members
- crew members' announcements through the passenger cabin communication system.

At present, civil aircraft of the U.S.S.R. are equipped with type MS-61 and MARS-B acoustic recorders.

The MARS-B system underwent certification testing and has met the airworthiness standards requirements of the U.S.S.R. It has the following important characteristics:

- preserved recording time of 30 minutes of flight
- four independent channels of recorded information.

The recorded technical and acoustic flight data are decoded by special data processing systems (DUMS, NDU-8, MN-61 or MARS-N) on the ground.

These systems meet the requirements for flight data "express processing." They allow an evaluation of the efficiency and technical state of the recording systems. The necessity to improve flight data processing and to reduce the time of processing requires the use of computers. The LUCH-74 and LUCH-84 computer systems have been operating in U.S.S.R. civil aviation since 1974. They allow:

- automatic analysis of the flight information with output of results presented as a graph or a listing of physical data, completely eliminating manual data processing
- performance of an express-analysis of

flight data for quick determination and documentation of airborne system malfunctions and flight crew failures, thus reducing the analysis cost considerably

- a more thorough analysis of the flight data from accidents
- evaluation of the technical state of the aircraft's systems.

Objective control systems in cockpits have allowed improvements in professional training programs for crews, improvements in flight and technical operating procedures and, overall, have permitted a more purposeful management of measures for an effective flight safety improvement program.

Recorded flight information is utilized in the U.S.S.R. for two main purposes — for investigation of accidents and incidents and for the improvement of flight safety.

At present, the procedures for using recorded flight information for accident investigation are selectively applied. They have resulted in:

- detection of the connection between an aircraft accident and a technical system failure
- determination of the nature of failures in technical systems and their influence on the capability for a safe landing
- evaluation of the correctness and timeliness of a cockpit crew's operations to reduce the influence of a technical failure on the safe flight of the aircraft
- determination of the reasons for a technical failure.

The high level of information provided by onboard flight data recording and ground processing systems has offered new ways for the investigation into the dynamic aircraft/environment systems functioning under special flight conditions. In particular, it allows one, by means of calculations, to determine the influence of different kinds of disturbances (aircraft systems malfunctions or the external effects of weather, for example), as well as to evaluate the parameters associated with these disturbances in order to develop models of the various special situations encountered in abnormal flights. These models are then employed to determine the causes of accidents and to develop effective measures for their prevention.

Heretofore, solving these problems through manual methods was an immensely time-consuming task.

Gosavianadzor's organization incorporates a scientific research laboratory that develops procedures and equipment for investigating accidents, as well as operative procedures for processing of flight information. The laboratory is equipped with modern computer systems which are part of a local computer network. This network enables optimal processing of flight data plus analytical calculations relative to flight dynamics and cockpit crew actions.

The laboratory's computer center has a specialized computer that is part of a LUCH-84 system, plus different universal and personal computers, and a number of peripheral units. The computer library contains the technical characteristics of all types of civil aircraft in the U.S.S.R. The computer system can solve many different kinds of direct and indirect flight dynamics problems.

There is a wide variety of methods for preliminary estimation of flight dynamics problems. Stability and control of airplanes is evaluated by calculation of the balance parameters, flight path energy, etc. Computer algorithms permit investigation of stability and control under transient conditions and make a quantitative analysis of flight disturbances. Heretofore, solving these problems through manual methods was an immensely time-consuming task. A series of special software programs was developed for solving special tasks. Abundant kinematic data enabled investigators to use analytical methods to correct disturbances, improve reliability of results and in some cases, to determine where improvements of aerodynamic characteristics of aircraft could be made. Processes for evaluation of dynamics, independent of aircraft types, must:

- evaluate stability and control of the flying aircraft on all stages in the evolution of events leading to an accident

- identify and evaluate instabilities and determine their nature

- compare the range of the actual flight parameters with their tolerance values (angles of attack and sideslip, flight altitude, etc.)

- evaluate cockpit crew actions at all stages of the events leading up to the accident.

Basically, we have been successful in satisfying these requirements.

One problem that can be solved by this computer system is the filtering and correcting of flight and initial data into useful forms of information. At this stage of calculation, a special subsystem processing of flight and initial data is used. The operator takes part in filtering and correcting data, changing the numerical values in the time function in a logical manner. The subsystem approximates and filters discrete data, sorts and transfers the information in the form needed for modeling and plotting, and calculates derivatives of different orders of selective kinematic parameters.

A second problem that can be solved by this system is evaluation of flight dynamics. The aircraft model is based on a total system of differential equations and kinematic relations that describe the movement of aircraft in space. The model consists of a number of subsections, or units. The major units are aerodynamics, thrust, landing gear, etc. These units provide calculation of forces and moments which influence the plane's flight. Other units are the stabililization of the model, calculation of instabilities, correction of actual data using limiting conditions, calculation of atmospheric parameters, etc.

The data are displayed on a screen and a plotter. Analysis of these visual data is the basis for the control of modeling, for correction of actual information (e.g., by modeling of different flight configurations) and for correction of model parameters.

Use of this system for investigation of flight accidents allows one to reduce the investigation time … .

The operator takes part in the modeling; he can begin, interrupt or step back in the modeling process and can display the intermediate results on a screen, plotter or printer. Returning to a previous time frame is possible because the actual data are stored at each step of the processing.

The operator can correct the model's data and parameters by interrupting the modeling (e.g., to select initial conditions) as well as by changing data without interrupting the process.

Use of this system for investigation of flight accidents allows one to reduce investigation time but increase the reliability of results by expanding the range of solvable problems.

Using this computer system, a number of hard landings of aircraft that occurred in 1988-89 were investigated. The results allowed determination of the nature of incorrect actions by cockpit crews during the last stage of approach (destabilized approach), and to develop effective prevention procedures. These results were reported in the ISASI (International Society of Aviation Safety Investigators) seminar in Munich in 1989 and at the Soviet-American summit of flight accident investigators in Moscow in September 1989 (see also "Main Causes of Hard Landings," February 1991 FSF *Accident Prevention*).

Besides the Scientific Research Laboratory of

Gosavianadzor, which investigates most major and difficult-to-analyze accidents involving U.S.S.R. civil aircraft, there are more than 200 centers for flight information processing and analysis throughout the U.S.S.R. These centers systematically direct the actions of flight crews. This direction is one of the main measures for the prevention of accidents; it enables the determination of incorrect actions of crew members and any flight manual violations for the particular aircraft involved. Automated processing of flight information is the only way to evaluate these actions effectively. For quick detection and documentation of errors in aircraft handling, special equipment and methods of rapid analysis of flight data were developed.

This system ... has reduced the number of deviations and violations.

The number of flights in the U.S.S.R. whose crews' actions are modified as a result of flight information processing has increased from year to year. Currently, 100 percent of flights utilizing the IL-86 and YAK-42 aircraft are involved.

This system of controlling flight crew actions has reduced the number of deviations and violations in flying techniques considerably — the number of such cases declined from 17 percent to 3.3 percent during the past 10 years. In addition to these measures, procedures for evaluating the professional level of cockpit crews in major aircraft types under "minimum-conditions in ICAO categories" were developed. Computer software enables authorities to rapidly process flight data that were recorded during training, testing and scheduled flights as part of a program for qualification training of professional crews. At the same time, objectivity and the quality of control of the preflight preparations of flight crews are increasing.

The recorded and processed technical flight parameters are also of special importance for the development of a strategy of aircraft maintenance, depending on the state of aircraft equipment. Analysis of the technical state of the aircraft contains three major components: evaluation of efficiency, short-range forecast, and long-range forecast. First, the analysis must determine the malfunctions of aircraft systems having flight safety consequences. If some parameters or their functions exceeded tolerance limits, it is necessary to investigate the following:

- Did a malfunction really take place (integrity of the malfunction signal)?
- Which effects led to malfunctions (malfunctions of technical equipment, incorrect actions of flight crew or unforseen operating conditions)?
- Were the recorded malfunctions a result of intolerable stress in the aircraft's systems?

An efficient system is a system which permits a forecast, i.e., a prediction of the technical condition of aircraft systems during the period of interest. The short- and long-range forecasts must determine a probability of failure of the technical system during the next flight, and maximum time before failure. The latter can be provided by determining major tendencies of changes in the technical state of aircraft systems. One example of such an automated system is diagnostic equipment for the IL-86 aircraft, which utilizes recorded flight data. This system allows:

- an analysis of hydraulics and engine vibrations
- a diagnosis of engines during cruise flight
- an analysis of the engine control system during takeoff, climb and reverse thrust
- an evaluation of engine thrust
- a diagnosis of the airframe
- a diagnosis of power-supply systems

- an evaluation of the fuel rate

Analysis of the technical condition of the aircraft from flight data recording and processing is complicated by a large amount of statistical information. This requires adequate computer software.

One of the major measures that contributes to the prevention of aviation accidents by use of recorded flight data is the investigation of operating conditions of aircraft systems. Knowledge of actual operating conditions can lead to improvements in aircraft design, development of optimal flight conditions, determination of actual fuel rate and solution of many other problems. One of the important trends toward investigations of operating conditions of aircraft systems is the utilization of flight data for analysis of stresses that affect systems and components of aircraft. The safe total flying time of an airplane, and periodic maintenance required in relation to stress, are determined by the summation of the individual stresses and their recalculation into equivalent stress. Programs for testing of aircraft systems and components also take into consideration the actual stresses that act on the aircraft under real operating conditions.

The issue of flight safety and the use of systems for its objective management are of great importance … .

A high level of flight safety can be achieved if all requirements of the Airworthiness Standards of Civil Aircraft of the U.S.S.R. are met. First of all, aerodynamic stability and control characteristics must meet the standards. Investigations have shown that the state of surfaces, airframe, internal aerodynamics of engines and other systems change during an aircraft's lifetime. Control of these characteristics is possible only if all flight data recorded in all airplanes of a type are used.

A statistical analysis of flight parameters permits control of the level of flight safety and allows an evaluation of the technical condition of the aircraft. An analysis of takeoff and climb parameters is of special importance, because these characteristics strongly influence flight safety and are close-coupled with the technical condition of engines and airframe.

With that aim, the Scientific Research Laboratory of Gosavianadzor of the U.S.S.R. and other institutions are developing algorithms related to flight analysis characteristics for studying specific aircraft without requiring the scheduling of actual aircraft flights to collect the data. The analysis permits testing the flight integrity of each airplane and to make timely improvements.

The issue of flight safety and the use of systems for its objective management are of great importance for the country. Therefore, Gosavianadzor and industry departments of the U.S.S.R. developed a government program directed toward improvement in managing flight safety and an improvement in U.S.S.R. aircraft. The program includes projects for developing procedures for flight safety management and for continuing improvement of technical systems and computer software programs.

The program contains about 140 scientific and research projects that are to be completed in the time period between 1990 and 1992.

Cooperation between Soviet and U.S. safety experts in the analysis of statistical data regarding accidents in civil aircraft of the U.S.S.R. and the United States has shown that flight safety in the U.S.S.R. has improved in recent years, and that the level of flight safety in the U.S.S.R. is close to that in the United States.

The goal in the U.S.S.R. is a more effective use of flight information to prevent aircraft accidents and to achieve a level of flight safety that is comparable to worldwide safety standards. ♦

Aviation Statistics

U.S. Commuter Air Carrier and Air Taxi Accident Statistics and Trends Calendar Year 1990

by
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U.S. commuter air carriers (scheduled air taxi service operating under 14 CFR Part 135) in 1990 were involved in 14 accidents, according to the U.S. National Transportation Safety Board (NTSB). This is the lowest number of accidents recorded since 1981 when the NTSB first categorized air carrier accidents according to the federal aviation regulations (FARs) under which the accident flights were conducted. The groupings are:

- large airlines in both scheduled and non-scheduled service operating under FAR Part 121
- commuter air carriers in scheduled service under FAR Part 135
- on-demand air taxi in non-scheduled service under FAR Part 135
- general aviation-all other civil flying.

Until 1981, commuter air carriers and air taxis had been classified as part of general aviation.

Of the 14 accidents involving commuter air carriers in 1990, two were fatal accidents that resulted in four fatalities which were equal to the previous low of four fatalities recorded in 1986.

There were 104 accidents, including 26 fatal accidents and 40 fatalities, involving U.S. air taxi operators in 1990, compared to 113 accidents, including 26 fatal and 88 fatalities the year before, the NTSB reported. One of the fatal accidents was a midair collision with a general aviation aircraft.

The total accidents, fatal accident and fatalities of commuter air carriers and air taxis are shown in Tables 1 and 2; the briefs of the two fatal commuter air carrier accidents and the 26 fatal air taxi accidents are reported in Appendix 1.

The NTSB also reported that, according to U.S. Federal Aviation Administration (FAA) preliminary estimates, U.S. commuter air carriers flew a total of 2.229 million hours during 1990, which translated to 392 million aircraft miles, and performed 5.8 million takeoffs and landings. These figures show little change from the year earlier, but are approximately 30 percent higher than those recorded in calendar year 1986. The accident rate and fatal accident rate for 1990 in terms of aircraft hours flown, miles flown or aircraft departures represent a record low since record keeping began in 1975. Figure 1 is a graphic display of total accident rates and fatal accident rates of commuter air carriers for the past 16 years, showing a strong improvement of safety performance in commuter air carrier operation.

The commuter air carrier accident rate dropped

Table 1

Accidents, Fatalities and Rates
U.S. Air Carriers Operating Under 14 CFR 135
All Scheduled Service
(Commuter Air Carriers*)
1980-1990

	Accidents		Fatalities		Aircraft	Aircraft		Accident Rates +					
								Per Million Aircraft Miles		Per 100,000 Aircraft Hours		Per 100,000 Departures	
Year	Total	Fatal	Total	Aboard	Miles Flown#	Hours Flown#	Departures #	Total	Fatal	Total	Fatal	Total	Fatal
1980	38	8	37	37	192,200,000	1,175,588	1,776,999	0.198	0.042	3.232	0.681	2.138	0.450
1981	31	9	34	32	193,001,000	1,240,764	1,835,144	0.161	0.047	2.498	0.725	1.689	0.490
1982	26	5	14	14	222,355,000	1,299,748	2,026,691	0.117	0.022	2.000	0.385	1.283	0.247
1983	17	2	11	10	253,572,000	1,510,908	2,328,430	0.067	0.008	1.125	0.132	0.730	0.086
1984	22	7	48	46	291,460,000	1,745,762	2,676,590	0.075	0.024	1.260	0.401	0.822	0.262
1985	21	7	37	36	300,817,000	1,737,106	2,561,463	0.070	0.023	1.209	0.403	0.820	0.273
1986	15	2	4	4	308,147,340	1,723,034	2,727,777	0.049	0.006	0.871	0.116	0.550	0.073
1987	32	10	59	57	347,348,534	1,927,580	2,781,068	0.092	0.029	1.660	0.519	1.151	0.360
1988	19	2	21	21	378,802,234	2,085,285	2,899,439	0.050	0.005	0.911	0.096	0.655	0.069
1989	17	5	31	31	391,859,110	2,226,271	2,907,662	0.043	0.013	0.764	0.225	0.585	0.172
1990P	14	2	4	4	392,000,000	2,229,000	2,900,000	0.036	0.005	0.628	0.090	0.483	0.069

P Preliminary data.
\# Source of estimate: FAA.
\+ Rates are based on all accidents including some involving operators not reporting traffic data to Research and Special Programs Administration (RSPA).
* Prior to 1989 scheduled all-cargo operations are included. All-cargo air carriers no longer meet the RSPA definition for "Commuters". May also include accidents involving cariers whose FAA operating specifications permit scheduled revenue operations under 14 CFR 135, but who have not received a RSPA fitness determination.

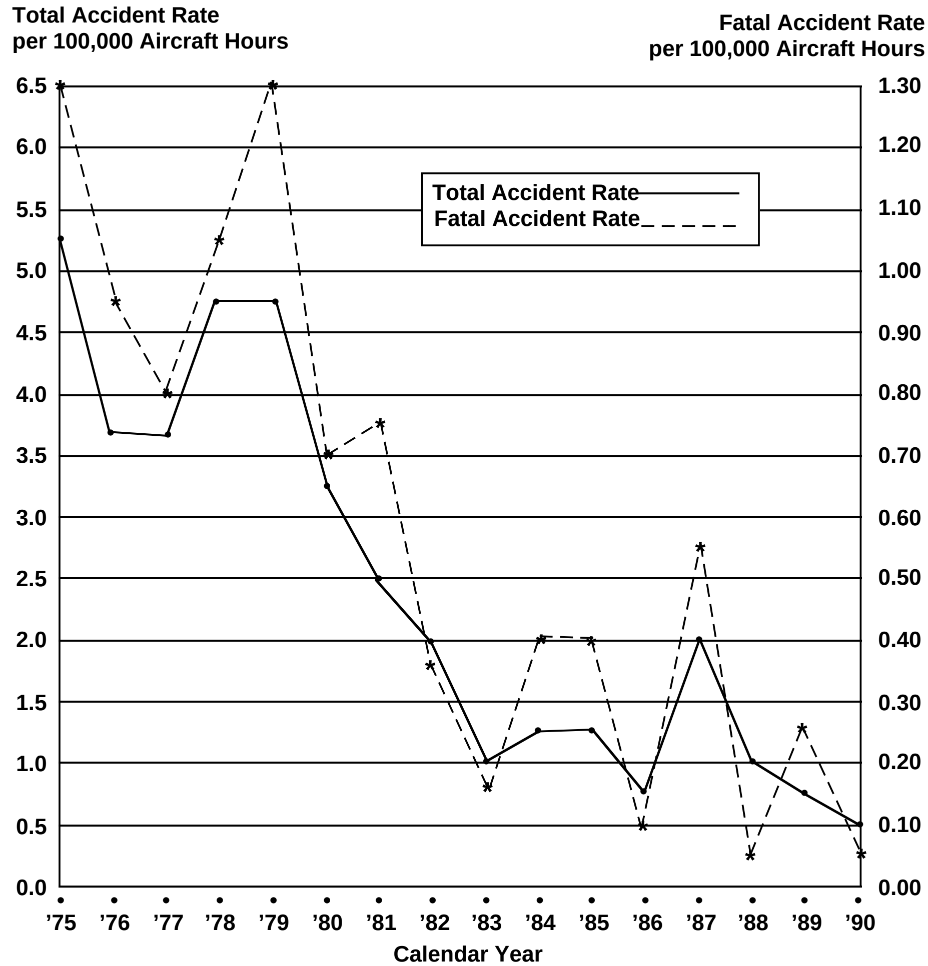
Table 2

Accidents, Fatalities and Rates
U.S. Air Carriers Operating Under 14 CFR 135
Non-scheduled Operations*
(On-demand Air Taxis)
1980-1990

	Accidents		Fatalities		Aircraft	Accident Rates Per 100,000 Aircraft Hour	
Year	Total	Fatal	Total	Aboard	Hours Flown#	Total	Fatal
1980	171	46	105	101	3,617,724	4.73	1.27
1981	157	40	94	92	2,895,827	5.42	1.38
1982	132	31	72	72	3,256,763	4.05	0.95
1983	141	27	62	57	2,574,883	5.48	1.05
1984	146	23	52	52	3,079,007	4.74	0.75
1985	152	35	76	75	2,782,696	5.46	1.26
1986	116	31	65	61	2,913,358	3.98	1.06
1987	97	30	65	63	2,877,002	3.37	1.04
1988	96	27	58	54	2,841,717	3.38	0.95
1989P	113	26	88	n/a	3,128,793	3.61	0.83
1990P	104	26	40	n/a	3,170,000	3.28	0.82

P Preliminary data.
\# Source of estimate: FAA.
* Accidents on foreign soil and in foreign waters are excluded.

Figure 1 — Total Accidents and Fatal Accident Trends
U.S. Commuter Air Carriers 1975-1990



from 5.13 accidents per 100,000 aircraft flight hours in 1975 to a rate of 0.63 in 1990, a decrease of 88 percent. Figure 2 shows a scatter diagram of annual total accidents and fatal accidents involving commuter air carriers against annual flight hours for the past decade. The graphic depiction clearly delineates that in commuter air carrier operation, aircraft accidents and aircraft hours flown were well correlated: the accident frequency distribution appears to be an inverse function of aircraft hours flown. In other words, the aircraft accident frequency decreased proportionately as the aircraft hours flown increased.

Over the period from 1975 to 1990, the operational and safety performance indicators for U.S. air taxis, unlike the commuter air carriers, varied up and down without a discernable pattern. The annual aircraft hours flown increased from 2.5 million in 1975 to 3.6 million in 1980 and dropped to 2.8 million in 1981, but fluctuated annually in the following years.

The frequency of total and fatal accidents appeared to follow a similar up-and-down pattern of aircraft hours flown. During the period between 1975-1985, the safety performance of air taxi operations in terms of accidents per 100,000 aircraft flown showed few changes. Again, unlike the commuter air carriers which recorded a significant improvement in safety over the period, the safety performance of air taxis was very unstable. The changes are shown in Figure 3. Although the accident and fatal accident rates decreased somewhat in the past three years, the scatter diagram of air taxi accidents and hours flown as shown in Figure 4

Figure 2 — Scatter Diagram of Total Accidents, Fatal Accidents and Hours Flown U.S. Commuter Air Carriers 1980-1990

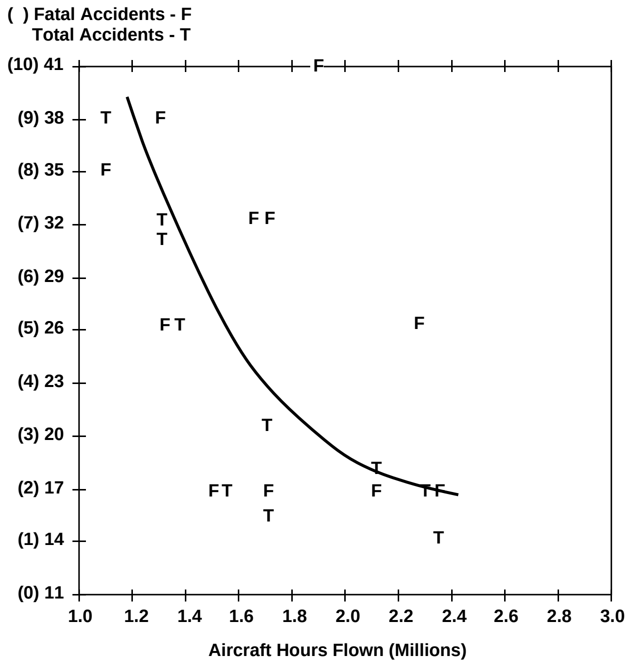


Figure 4 — Scatter Diagram of Total Accidents, Fatal Accidents and Hours Flown

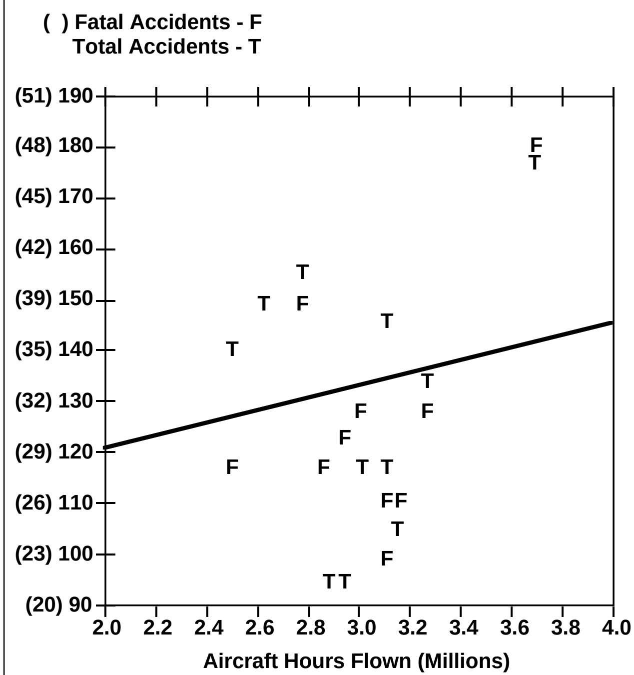
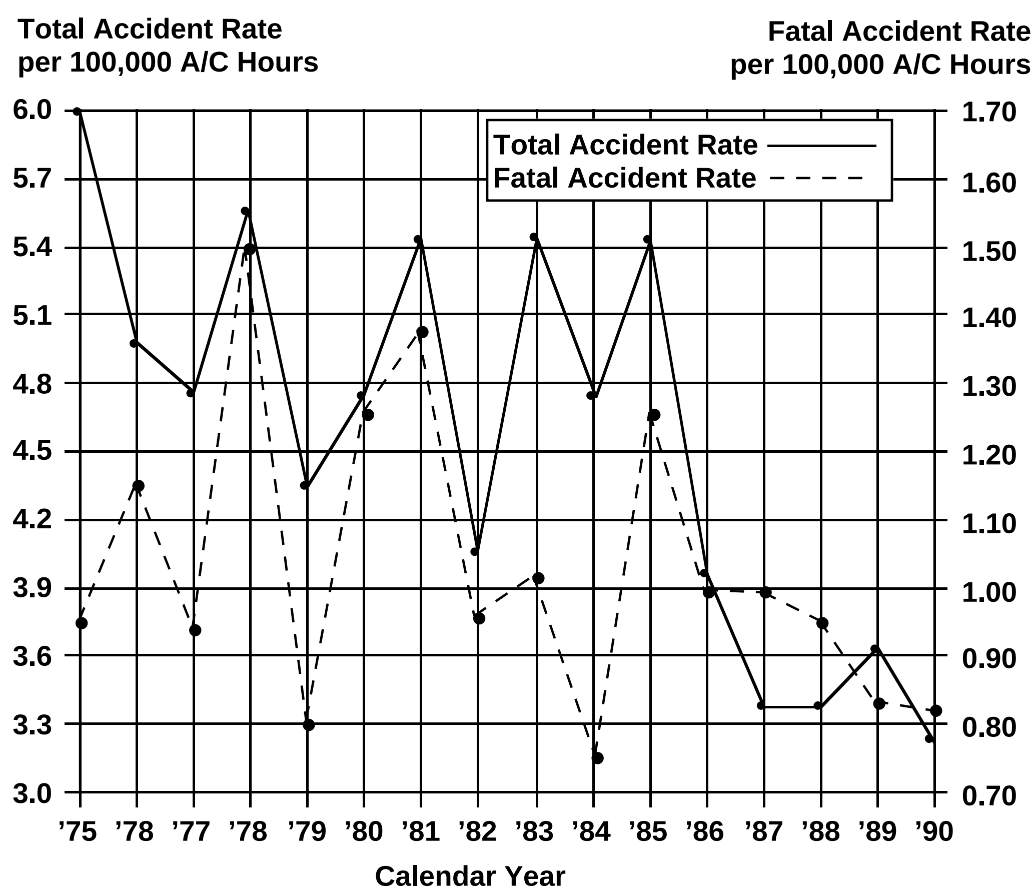


Figure 3 — Total Accidents and Fatal Accident Trends U.S. On-demand Air Taxi



did not reflect that the aircraft accidents and aircraft hours flown were correlated at all.

The correlation coefficient is too small to be considered significant.

Because aircraft hours flown has been used for years by governments as well as by private industry to measure aviation safety, the opposite findings of the correlation analysis over aircraft accidents and exposure involving commuter air carriers and air taxis as shown in Figures 2 and 4 could renew a debate of an old question: Are aircraft hours flown a valid measurement of flight safety? ♦

Appendix 1
U.S. On-demand Air Taxi Fatal Accidents (14 CFR 135 Operations)
Calendar 1990

Date	Location	A/C Type	Damage	NOF	Service	Phase	Remarks
1/16	Appleton, Wis.	CN C402B	Destd	1	Cargo	Apprch	Crashed into terrain during final approach
1/17	Leadville, Colo.	CN 208A	Destd	1	Cargo	Cruise	Hit Mount Massive, CO
1/29	Williston, Vt.	CN 208B	Destd	2	Cargo	Takeoff	Crashed in snow/fog and low visibility
1/29	Schuyler Falls, N.Y.		CN 208B	Destd	1	Cargo	Takeoff Crashed due to loss of control in snow
2/05	Baker, Ore.	CN 420B	Destd	1	Cargo	Cruise	Hit snow-covered high ground in snow shower
2/09	Rapid City, S.D.	MU-28-60	Subst	1	Pax	Takeoff	Lost control in climb, collided with terrain
2/27	Denver, Colo.	CN 208A	Destd	1	Cargo	Apprch	Crashed into backyard of house
3/08	Miami, Fla.	Aerosptle 350D	Destd	2	Pax/Cgo	Cruise	Forced landing due to loss of power
4/01	Boulder, Colo.	CN 421C	Destd	2	Pax	Apprch	Collided with garages and a house
4/20	Dallas, Texas	Beech-58	Destd	1	Cargo	Takeoff	Not available
5/04	Wilmington, N.C.	Nomad 24	Destd	1	Cargo		Not available
6/09	Bethel, Ark.	PA-32	Subst	1	Cargo	Climb	Emergency descent due to loss of power
6/15	Challis, Idaho	CN Tu206G	Destd	2	Cargo	Takeoff	Failed to maintain directional control
6/30	Glacier, Wash.	Aerosptle AS350	Subst	1	Pax	Ground	A pax walked into tail rotor blades
7/02	Ashford, Wash.	CN T210L	Subst	5	Pax	Cruise	Crashed into terrain on Mount Rainer
7/12	Pinon, Ariz.	CN T210N	Destd	3	Pax	Apprch	Collided with power lines after rejected landing on private field
7/23	Plymouth, Mich.	PA-60-600	Destd	1	Cargo	Climb	Midair collision with a general aviation aircraft PA-28-140 which was on a training flight. An instructor and a private pilot on board the PA-28 were fatally injured, the PA-28 was totally destroyed.
8/09	Greenwood, S.C.	BE-18	Destd	1	Cargo	Climb	Forced landing due to loss of power
8/12	Wrangell, Alaska	CN A185F	Destd	1	Pax	Takeoff	Lost control and crashed
8/27	Elkhorn, Wis.	BH206B	Destd	5	Pax	Climb	Crashed on takeoff on a sightseeing tour
9/12	Port O'Connor, Texas	Bell 206	Destd	1	Pax	Takeoff	Crashed in heavy rainstorm

Date	Location	A/C Type	Damage	NOF	Service	Phase	Remarks
9/21	Flagstaff, Ariz.	PA-31-350	Destd	1	Cargo	Descent	Descended into trees and hilly terrain in heavy rain shower
11/20	Albion, Idaho	PA-34-200T	Destd	1	Cargo	Cruise	Collided with terrain in adverse weather
12/18	Evanston, Wyo.	PA-31-350	Destd	1	Cargo	Apprch	Crashed on IFR approach, fire after impact
12/19	Unknown	CN 182H	Destd	1	Cargo	Cruise	Missing aircraft not yet recovered
12/21	False Pass, Alaska	CN C-200	Subst	1	Pax/Cgo	Cruise	Crashed into mountainside

Source: NTSB

1990 Accident Statistics for Worldwide Scheduled Air Carrier and Commuter Airline Fleet

Each year many aviation organizations and governmental authorities publish data relative to commercial aircraft that come under their purview. The Flight Safety Foundation has gathered data from the leading authorities in order to develop a combined report that details a global picture of the scheduled air carrier and commuter airline fleet accidents.

The listing that is displayed in this report is drawn from sources that reflect all aviation operations, from ramp accidents to accidents that occur in flight. The only criteria for inclusion is that the accident or incident met the reporting threshold of the originating authority. All incidents known to have resulted in a fatality or injury are included. The report applies to turbine-powered scheduled passenger and cargo aircraft.

Sources for this report include: Shung C. Huang, U.S. Federal Aviation Administration; Stan Smith, U.S. National Transportation Safety Board; Robert Woodhouse, International Air Transport Association; I.E. Mashkivsky, Commission for Flight Safety, Council of Ministers, U.S.S.R., and an article by David Learmount titled "Safety in Riches," *Flight International*, January 16-22, 1991.

Figure 1 is a summary that details the phase of operation during which the accidents or incidents took place, the number of occurrences in each and the fatalities or injuries that were recorded. For accidents that resulted in a fatality, only the number of fatalities are listed, not the number of associated injuries.

Figure 1

Phase of operation	Number of events	Fatalities	Injuries
Parked or being towed	11	2	
Sabotage,hijack shootdown,terrorism	6	214	
Ground operations fatal	2	16	
Ground operations nonfatal	17		16
Flight operations fatal	32	784	
Flight operations	96		223

Parked or Being Towed

Date	Operator	Aircraft	Location	Fatalities
Jan 25	Capital	SD-360	Bristol, U.K. Wind tipped aircraft onto wingtip.	
Jan 31	Federal Express	B-727	Indianapolis Indiana U.S. A ground service mechanic was fatally injured by a tug.	1
Feb 3	Royal Jordanian	B707	Unk. Tow truck driven into nose gear, causing its collapse.	
Mar 12	Continental	DC-9 & DC-10	Agana Guam Parked DC-9 hit by towed DC-10. Ambiguous taxi lines were a factor.	
Mar 15	Northwest	B747-200	Los Angeles California, U.S. Towbar failed, causing tug to jack-knife, collapsing left main gear.	
Apr 1	Brymon Airways	DHC-7	London U.K. Ground handler fell under main landing gear during pushback and was killed.	1
Jun 23	LAN Chili	B707-300	Unk. While aircraft was being towed, number 3 engine hit a parked tug and was torn away.	
Jun 27	British Airways	B737-200	Madrid Spain Tug ran into nose gear during hook-up. Nose gear collapsed. Four crew injured.	
Sept 22	Air Hongkong	B707	Sydney Australia Nose gear failed on pushback.	
Oct 10	Bouraq	BAe748	Tarake Indonesia Nose gear collapsed during parking.	
Nov 3	Aeroflot	Tu-154	Unk. Aircraft parked on ramp, awaiting tow, captain released brakes. Aircraft rolled back, damaging itself and another plane.	

Sabotage, Hijack, Shootdown, Terrorism

Date	Operator	Aircraft	Location	Phase	Fatalities	Total Onboard
Jan 5	TAAG Angola Airlines	L-100-20 Hercules	Angola Fire in No. 3 & 4 engines. Emergency landing overrun caused substantial damage. Suspect missile strike.	Landing		N/A

Date	Operator	Aircraft	Location	Phase	Fatalities	Total Onboard
Mar 27	TAAG Angola Airlines	C-212	Kuito Angola Believed to have been shot down.	Unk.	25	25
Jun 12	Aeroflot	IL-76	Unk. Shot down by surface-to-air missile.	Landing	10	10
Oct 2	Xiamen	B737-200	Guangzhou China Hijacker detonated bomb during final approach.	Landing	104	Unk.
Oct 2	CAAC	B757-200	Guangzhou China Aircraft awaiting takeoff when hit by Xiamen B737.	Taxi	75	Unk.
Oct 2	China Southern	B707	Guangzhou China Aircraft destroyed when hit by Xiamen B737.	Parked		N/A

Ground Operations — Fatal

Date	Operator	Aircraft	Location	Phase	Fatalities	Total Onboard
May 11	Philippine	B737	Manila Philipines Explosion in almost-empty center fuel tank during taxi. Ignition source believed to be overheated fuel boost pump. No evidence of bomb.	Taxi	8	119
Dec 3	Northwest	DC-9-14	Detroit Michigan, U.S. While taxiing in fog, the aircraft strayed onto an active runway and was hit by a B727 taking off.	Taxi	8	44

Ground Operations — Nonfatal

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
Mar 5	Tampa Florida	B-707-300	Miami Florida, U.S. Aircraft fell off jacks after weighing. Wings and fuselage were damaged.	Mainten.		N/A
Apr 8	Aeroflot	Tu-154	Unk. Aircraft struck a parked refueler due to crew and ground service error.	Taxi		168
May 27	Thai Airways International	A300	Manila Philippines Nosewheel sank in mud and collapsed when aircraft turned off runway.	Taxi		250

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
Jun 12	Aeroflot	Tu-154	Gdansk Poland Taxiing aircraft struck lamppost due to crew error and inadequate taxi markings.	Taxi		144
Jun 29	Aeroflot	An-12	Cargo aircraft struck another aircraft while taxiing due to crew and ground service personnel error.	Taxi		7
Jul 27	World Airways	DC-10	Bharu Malaysia Taxiing aircraft threw debris that injured people on the ground.	Taxi	4	N/A
Aug 9	Aeroflot	An-24	Unk. Taxiing aircraft struck a parked ground service vehicle due to crew and ground service personnel error.	Taxi		52
Aug 15	Aeroflot	Yak-42	Unk. Taxiing aircraft struck another plane due to ground control deficiencies.	Taxi		N/A
Sept 8	American Eagle	Jetstream 31	Miami Florida, U.S. Jack collapsed sideways during tire change and seriously injured two engineers.	Mainten.	2	N/A
Sept 28	Northwest Airlines	B-727-200	Detroit Michigan, U.S. Fire erupted in vicinity of auxiliary power unit (APU). Injuries occurred during emergency evacuation.	Taxi	4	120
Oct 1	Air Midwest	Jetstream 31	St.Louis Missouri, U.S. Ground handler fell backward into rotating prop. Engine had been shut down but handler was badly injured.	Servicing		N/A
Oct 5	Sterling	SE 210	Unk. Aircraft was about to take off when a main gear collapsed.	Taxi		N/A
Oct 14	Aeroflot	Tu-154	Unk. Aircraft struck another airplane while executing a 180 degree turn.	Taxi		N/A
Oct 14	Pegasus Airways	B737	Istanbul Turkey Refueling hose parted and fuel ignited. Fire quickly extinguished.	Servicing		58
Oct 29	USAir	DC-9-31	Columbus Ohio, U.S. DC-9 collided with Cessna 310.	Taxi		47
Oct 30	South African Airways	B747-200	Manchester U.K. Taxied into airbridge.	Taxi		N/A

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
Dec 5	Northwest Airlines	B727	Detroit Michigan, U.S. Crew started APU while taxiing after landing. Residual fuel in the APU caught fire and fire spread to wing before it was extinguished by ground crew.	Landing	6	69

Flight Operations — Fatal

Date	Operator	Aircraft	Location	Phase	Fatalities	Total Onboard
Jan 2	Pelita Air Service	C-212	Jawa Sea Sumatra Ditched following mechanical problems. Sank after 10 minutes.	Cruise	9	16
Jan 13	Aeroflot	Tu-134	Sverdlovosk U.S.S.R. Crew made emergency landing after short in electrical circuit started fire in cargo compartment.	Cruise	27	71
Jan 15	Servicios Aereos Nacionales	C-212	Pico Blanco Costa Rica Crashed in mountains.	Cruise	23	23
Jan 18	Eastern	B727-231	Atlanta Georgia, U.S. On landing, aircraft collided with a King Air 100, killing King Air pilot.	Landing	1	158
Jan 25	Airfast Indonesia	BAe 748	Lombok Indonesia Crashed into high ground during diversion forced by bad weather.	Divert	19	19
Jan 25	Avianca	B707	Cove Neck New York, U.S. Fuel exhaustion without declaring emergency, following ATC delay and go-around on final approach in bad weather.	Approach	73	73
Feb 5	Helicol	Gulf-stream 1	El Saldo Columbia Crashed into high ground in poor visibiity.	Cruise	15	15
Feb 14	Indian Airlines	A320	Bangalore India Aircraft descended steeply with idle power, pilots unaware of speed decay until too late. Touched ground short of runway, became airborne again, hit trees and an earthen bank.	Approach	90	146
Mar 1	MIAT	An-26	Mongolia Crash circumstances unknown.	Unk.	30	30
Mar 13	Alaska Airlines	B-727-227	Phoenix Arizona, U.S. During takeoff, aircraft hit and killed a pedestrian.	Takeoff	1	48

Date	Operator	Aircraft	Location	Phase	Fatalities	Total Onboard
Mar 21	Tan-Sahsa	L.188	Tegucigalpa Honduras Hit high ground at 4,500 ft on the normal NDB approach track where the minimum safe altitude was 7,000 ft.	Approach	3	3
Mar 23	Unk.	An-26	Santiago de Cuba Cuba Crashed following rejected takeoff.	Takeoff	20	Unk.
Mar 27	Aeroflot	IL-76	Kabul Afganistan Aircraft stalled during final approach.	Approach	9	9
Apr 12	Wideroe	DHC-6	Vaeroy Norway After takeoff in high winds, aircraft crashed into sea.	Takeoff	5	5
Apr 18	AeroPerlas	DHC-6	Contadora Island Panama Birdstrike on right engine. Crashed into sea.	Takeoff	20	22
May 4	Unk.	L-1049	San Juan Puerto Rico Ditched in sea due to engine fire	Cruise	1	Unk.
May 10	Aviacsa	FH-227	Tuxtia Gutierrez Mexico Right engine failed on approach and aircraft crashed short of airport.	Approach	21	Unk.
May 18	Aerolift	Beech 1900	Manila Philippines Right engine failure during initial climb. Crashed into house. Four people on ground killed.	Climbout	21	21
Jun 6	TABA	FH-227	Altamira Brazil Crashed short of airport.	Approach	23	41
Jun 6	Ptarmigan Lake Airways	DHC-6	Thistle Lake Canada Aircraft failed to climb, during takeoff hit parked aircraft and cartwheeled.	Takeoff	2	2
Aug 1	Aeroflot	Yak 40	Stepanakert U.S.S.R. Crew modified their approach and struck a hill on descent.	Approach	46	46
Sept 11	Faucett	B727-200	Newfoundland Canada Declared fuel emergency and ditched.	Cruise	15	15
Sept 13	Aeroflot	Yak 42	Sverdlovsk U.S.S.R. Crew coordination breakdown resulted in premature descent and aircraft struck tree line short of the runway.	Approach	4	129

Date	Operator	Aircraft	Location	Phase	Fatalities	Total Onboard
Sept 20	Omega Air	B707-321B	Marana Arizona, U.S. Crashed and burned on takeoff at Davis-Monthan Air Force Base.	Takeoff	1	3
Oct 3	Eastern	DC9-31	Atlantic Ocean Passenger killed due to injuries sustained from turbulence.	Cruise	1	97
Oct 10	Aeroflot	An-8	Novosibirsk U.S.S.R. Crashed short of runway.	Landing	9	Unk.
Oct 21	Aeroflot	IL-62	Siberia U.S.S.R. Crashed in a ravine a few miles short of airport runway.	Approach	176	
Oct 24	Cubana	Yak 40	Santiago de Cuba Cuba Aircraft crashed in wooded area during an approach in poor weather.	Approach	10	31
Nov 14	Alitalia	DC9	Zürich Switzerland Aircraft hit hillside five miles short of Kloten Airport in rain and fog.	Approach	46	46
Nov 21	Bangkok Airways	DHC-8	Koh Samui Island, Thailand Crashed in heavy rain and wind during approach.	Approach	38	38
Nov 18	SATENA	C-212	Medellin Columbia Crashed in mountains.	Approach	15	15
Dec 4	Sudania	B707	Nairobi Kenya Aircraft crashed short of runway during second approach in fog.	Approach	10	10

Flight Operations — Nonfatal

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
Jan 2	American Airlines	DC-10	Baltimore Maryland, U.S. Injuries resulted from emergency evacuation due to smoke in the cockpit.	Landing	10	257
Jan 4	Northwest	B727	Madison Florida, U.S. Crew shut down No. 3 engine after compressor stall at 30,000 ft. Engine separated from aircraft. Possible toilet ice ingestion.	Cruise	0	145

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
Jan 5	Aerolineas Argentinas	F28	Villa Gesell Argentina Overran runway on second landing attempt. Aircraft destroyed by fire.	Landing	0	90
Jan 15	Skywest	Metro 3	Elko Nevada, U.S. During VOR let down in snowstorm, aircraft descended too early and hit mountainside.	Approach	13	16
Jan ?	Aeroflot	IL-86	Moscow U.S.S.R. Gear collapsed on landing.	Landing	0	347
Jan 16	United	B757	New York New York, U.S. Tailstrike due to over-rotation.	Takeoff	0	Unk.
Jan 20	TurEuro	B727	Istanbul Turkey Right landing gear collapsed on landing.	Landing	0	69
Jan 20	American Airlines	DC-10	San Juan Puerto Rico In-flight turbulence caused injury to crew and passengers.	Cruise	47	155
Jan 24	Nashville Eagle	Swearingen 226TC	Morrisville North Carolina, U.S. Intentional gear up landing when right gear would not extend.	Landing	0	11
Jan 29	Birmingham Executive	Gulfstream 1	Birmingham U.K. Nose gear failed following porpoising on landing.	Landing	0	10
Jan 29	Iberia	A300B4	London U.K. Right engine fire on landing.	Landing	0	197
Jan 29	KLM	B747	Amsterdam The Netherlands Aircraft hit a heron, cracking glass on a side window.	Takeoff	0	97
Jan 30	Transafrik	Hercules	Luanda Angola Mid-air collision with An-26 causing damage to Hercules. No data on other aircraft.	Cruise	Unk.	Unk.
Feb 3	Aeroflot	IL-86	Unk. Structural failure caused left main gear to fail during rollout.	Landing	0	359
Feb 4	Finnair	MD-87	Helsinki Finland At touchdown hit car on runway centerline. Two persons had been servicing centerline lights.	Landing	0	88

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
Feb 6	Aeroflot	TU-134	Unk. Engine failed en route. Crew made emergency landing.	Cruise	0	70
Feb 12	Taxi Aereo Marila	F27	Bauru Airport Brazil Landed too far down the runway, took off again and hit houses, then fell on a car, killing the occupants.	Landing	5	40
Feb 14	Northwest	B747	Tokyo Japan No. 2 engine low oil pressure forced diversion to Narita. Same problem resulted in aircraft being forced to return to Narita the next day.	Cruise	0	168
Feb 18	Okada Air	BAe One-Eleven	Lagos Nigeria Stick-shaker came on at rotation. Captain abandoned takeoff and aircraft overran runway.	Takeoff	Unk.	Unk.
Feb 24	FTG Air Service	F27	Bergisch Germany Dual engine fire during aircrew stall training. Fire could not be extinguished. Forced landing made.	Cruise	2	2
Feb 26	Channel Express	Herald	Guernsey U.K. Upper half of left passenger door failed at 600 ft.	Climb	0	3
Feb 28	Aeroflot	YAK-42	Unk. Pilot made inadvertant gear-up landing.	Landing	0	123
Mar 1	Katale Air Transport	B707-329C	Goma Zaire Undershot runway, right gear collapsed.	Landing	0	6
Mar 16	America West	B737-300	Santa Ana California, U.S. Tail strike on takeoff.	Takeoff	0	110
Mar 22	CAAC	Trident 2	Guilin China Overran runway onto soft ground. Gear and wings broken.	Landing	0	Unk.
Mar 23	Cubana	An-26	Santiago de Cuba Cuba Aborted takeoff, hit ditch and caught fire.	Takeoff	20	41
Mar 24	Cathay Pacific	L-1011-1	Tokyo Japan Hard landing in crosswind caused wing spar damage and fuel leak. Some passengers sustained minor injuries during evacuation because wind moved escape chutes.	Landing	27	300

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
Mar 29	ERA Aviation	DHC-6	Chevak Alaska, U.S. Very hard landing caused failure of right and nose gear, right wing and engine.	Landing	0	15
Apr 1	Skywest	Metro 3	Panoche California, U.S. Pilot fell asleep. Overstressed wing upon awakening.	Cruise	0	1
Apr 1	Safe Air	Argosy	Woodbourne New Zealand Left main gear failed to lock down and gear collapsed on landing.	Landing	Unk.	Unk.
Apr 3	Merpati Nusantara	Twin Otter	Lebuhanraio Indonesia Engine problems resulted in crash landing.	Cruise	0	17
Apr 4	Islena de Inversiones	Twin Otter	Utila Honduras Undershot runway.	Landing	0	20
Apr 5	Lineas Aereas Paraguayas	DC-8-61	Ezeiza Airport Buenos Aires Overran runway in bad weather. Nose gear collapsed.	Landing	0	164
Apr 9	Federal Express Anchorage	B747	Tokyo Japan No. 2 engine fire resulted in diversion to Tokyo Narita.	Cruise	Unk.	Unk.
Apr 19	Channel Express	Herald	Guernsey U.K. Failure of right main landing gear.	Landing	0	3
Apr 19	Aeroflot	Tu-154	Unk. Pilot accidently selected reverse thrust on two engines during final approach.	Approach	0	157
May 5	Ladeco	B707-320C	Asuncion Paraguay Gear collapsed on landing.	Landing	0	3
May 7	Air India	B747-200	Delhi India No. 1 engine and pylon detached from wing on application of reverse thrust, contacting ground in tilted position and causing serious fire damage to engine and wing.	Landing	0	235
May 13	Continental	B747	Manila Philippines Engine trouble shortly after takeoff caused aircraft to return to Manila.	Climb	0	400
May 18	Philippine	B737-300	Iloilo Philippines Undershot runway in heavy rain, hit approach lights and fences.	Approach	0	72

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
Jun 2	Markair	B737	Unalakleet Alaska Hit hillside in fog on approach.	Descent	4	4
Jun 2	Aeroflot	An-24	Unk. Crew made hard landing and aircraft destroyed by fire.	Landing	0	33
Jun 5	Aerolineas Argentinas	F28	Villa Gesell Argentina Overran runway. Gear torn off, fire damaged aircraft.	Landing	0	90
Jun 10	British Airways	BAe One-Eleven	Reading U.K. Left windscreen blew out at 17,000 ft and captain was blown half out. Steward held captain by ankles while aircraft diverted to emergency landing. Wrong windscreen retainer bolts used.	Cruise	2	14
Jun 15	TWA	TriStar	London U.K. Takeoff abandoned when cabin pressure surge was accompanied by overheat warning and smoke in rear cabin.	Takeoff	0	237
Jun 21	USAir	B727	Charleston South Carolina, U.S. Injuries sustained during emergency evacuation following landing due to No. 2 engine fire warning light.	Landing	4	120
Jun 30	Aeroflot	IL-62	Unk. Aircraft departed runway following landing.	Landing	0	102
Jul 2	Qantas	B747	Thailand Severe turbulence caused injuries.	Cruise	30	Unk.
Jul 7	Challenge Air	Cargo DC-8	Maimi Florida, U.S. Cowlings for Nos 1,3 and 4 engines fell off.	Takeoff	0	Unk.
Jul 14	TPI Int’l Airlines	L-188	Caribbean No. 3 engine gear box failed, No. 3 and 4 propeller lost.	Climb	0	3
Jul 14	Trans Arabian Air Transport	B707	Khartoum Sudan Nose gear collapsed.	Landing	0	Unk.
Jul 14	British Airways	B747-100	Miami Florida, U.S. Flight attendant suffered broken arm in sudden turbulence.	Cruise	11	384
Jul 19	AirUK	F27	Amsterdam The Netherlands Right main gear failed to lock down and collapsed on landing.	Landing	0	21
Jul 22	USAir	B737	Kingston North Carolina, U.S. Left engine malfunction during takeoff. Nose gear failure	Takeoff	2	25

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
			during abort.			
Jul 25	Ethiopian	B707-379F	Addis Ababa Ethiopia Aborted due to birdstrike.	Takeoff	0	Unk.
Jul 27	Mesa Airlines	C-208	Ruidoso New Mexico, U.S. Off airport emergency landing due to engine failure during descent.	Approach	0	5
Aug 1	LIAT	BAe748	Roseau Dominica Skidded sideways off wet runway trying to avoid overrun. Nose gear collapsed.	Landing	0	24
Aug 2	Pan American	A-310	Paris France No. 2 engine reverse warning light prompted rejected takeoff and emergency evacuation.	Takeoff	4	162
Aug 3	United Airlines	DC-10	Coeur D'Alene Idaho, U.S. Hot liquid spilled during flight, burning passenger.	Cruise	1	283
Aug 7	Nationair	B747	London U.K. Engine surge on roll out following application of reverse thrust. Tailpipe fires in three engines.	Landing	0	Unk.
Aug 8	Nigeria Airways	B737-200	Lagos Nigeria Overran wet runway.	Landing	0	Unk.
Aug 10	Aeroflot	An-24	Unk. Aircraft landed gear up.	Landing	0	43
Aug 12	Southern Air Transport	L100-30 Hercules	Juba Sudan Engine failure on takeoff. Aircraft returned to land and overran runway.	Landing	0	Unk.
Aug 21	United Airlines	B737-300	Los Angeles California, U.S. Right main gear failed to extend.	Landing	0	107
Aug 26	Dragonair	B737	Hainan Island Japan Engine failure after takeoff. Aircraft returned to Haikou.	Takeoff	0	128
Aug 27	United Airlines	B747SP	Los Angeles California, U.S. Landing gear failed to extend.	Descent	2	342
Sept 3	Far East Air Transport	B737	Taipei Taiwan Nose gear collapsed after hard landing in poor weather.	Landing	0	121

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
Sept 3	Air India	B747	Delhi India An engine failed shortly after takeoff forcing aircraft to return to airport.	Takeoff	0	313
Sept 4	Varig	Electra	Rio de Janeiro Brazil Nose gear failed to lock down.	Landing	0	95
Sept 5	Pan American	B747	London U.K. Fiberglass leading edge wing panel fell off.	Cruise	0	400
Sept 9	Aeroflot	Yak-40	Unk. Aircraft struck another aircraft during rollout.	Landing	0	22
Sept 10	British Airways	BAe ATP	Glasgow Scotland Main wheel came off.	Landing	0	30
Sept 21	SAS	DC-9	Malmo Sweden Smoke in flight deck air conditioning system caused flight to be aborted.	Cruise	0	45
Sept 29	Dan-Air	BAe One-Eleven	Inverness Scotland Left wing hit runway during landing roll.	Landing	0	82
Oct 3	Libyan Arab Airlines	F27-600	Tripoli Libya Nose gear collapsed.	Landing	0	Unk.
Oct 10	Angola Airlines	B707	Unk. Severe turbulence. Damage to upper surface panels on wings and stabilizers.	Cruise	0	Unk.
Oct 10	British Airways	B747-100	Bangkok Thailand Brake fire on landing.	Landing	0	255
Oct 14	Air India	B747	Delhi India Takeoff aborted when engine caught fire.	Takeoff	0	248
Oct 17	Virgin Airways	B747-200	New York New York, U.S. Damage following hard landing.	Landing	0	Unk.
Oct 20	Aeroflot	Tu-154	Unk. Center of gravity displacement resulted in rejected takeoff and overrun.	Takeoff	0	170

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
Oct 30	British Airways	B747-400	Bangkok Thailand A section of wing leading edge inboard of No. 2 engine found missing on arrival.	Cruise	0	Unk.
Nov 1	United Airlines	B747SP	Over Pacific Severe turbulence at 38,000ft.	Cruise	11	Unk.
Nov 2	American Airlines	DC-10	London U.K. Tire burst on takeoff, caused flap damage.	Takeoff	0	242
Nov 5	Egyptair	A300B4	Cairo Egypt Nose gear collapsed.	Landing		Unk.
Nov 15	Pakistan International	B707-320C	Peshawar Pakistan Right rear main wheel axle broke and fell off.	Takeoff	0	108
Nov 16	Air Jamaica	B727	Curacao Left main gear collapsed.	Landing	0	Unk.
Nov 16	Pan American	B747	Rio de Janeiro Brazil Nine tires burst on landing.	Landing	0	377
Nov 17	Aeroflot	Tu-154	Near Velichovky U.S.S.R. Forced landing with fire in cargo.	Landing	6	6
Nov 21	Aeroflot	IL-62	Yakutsk U.S.S.R. Diverted because of fog and overran the runway.	Landing	20	184
Dec 3	Northwest	B727-200	Detroit Michigan, U.S. Taking off in low visibility, hit a Northwest DC-9 that had strayed onto runway. There were 8 deaths on the DC-9.	Takeoff	0	156
Dec 5	Air Inter	A320	Lille France Collided with light aircraft on runway in light fog. Nose gear collapsed rearward.	Landing	0	142
Dec 11	Air Canada	L-1011	Over U.K. Explosive decompression following rear pressure bulkhead failure.	Cruise	0	110
Dec 12	Aeroflot	Tu-154	Unk. Landing gear failed to lower.	Approach	0	160

Date	Operator	Aircraft	Location	Phase	Injuries	Total Onboard
Dec 14	Aeroflot	An-24	Unk. Aircraft landed short due to premature descent.	Landing	2	43
Dec 23	Manx Airlines	BAe ATP	Isle of Man U.K. Nosewheel collapse.	Landing	0	Unk.
Dec 31	Horizon Air	Swearingen SA-227	Kalispell Montana, U.S.	Landing	0	15

Reports Received at FSF Jerry Lederer Aviation Library

Books

The Instrument Flight Manual: The Instrument Rating / William K. Kershner. — 4th edition. — Ames, Iowa, U.S. : Iowa State University Press, 1990. vi, 377p., ill. ISBN: 0-8136-0838-3.

Key Words
1. Airplanes — Piloting — General Aviation.
2. Instrument Flying.

Contents: Airplane Performance and Basic Instrument Flying — The Instrument Rating — Flight and Engine Instruments — Review of Airplane Performance, Stability, and Control — Basic Instrument Flying — Navigation and Communications — Navigational Aids and Instruments — Communications and Control of Air Traffic — Planning the Instrument Flight — Weather Systems and Planning — Charts and Other Printed Aids — Planning the Navigation — The Instrument Flight — Before the Takeoff — Takeoff and Departure — En Route — Instrument Approach and Landing — Instrument Rating Written Test — Instrument Rating Practical Test — Appendixes — Bibliography — Index.

Summary: Presents the basics of instrument flying. Discusses center and terminal area radar computer systems, terms, Air Traffic Control (ATC) procedures, aircraft communications and navigation equipment, and weather services.

The Student Pilot's Flight Manual: Including Night Flying and Emergency Flying by Reference to Instruments / William Kershner. — 6th edition. — Ames, Iowa, U.S. : Iowa State University Press, 1990. viii, 337 p. ill. ISBN: 0-8138-1611-4.

Key Words
1. Airplanes — Piloting — Handbooks, Manuals, etc.
2. Airplanes — Piloting — General Aviation.

Contents: Before the Flight — Presolo — Postsolo Maneuvers — Cross-Country and Night Flying — The Written and Practical (Flight) Tests — Appendixes — Bibliography — Federal Aviation Regulations — National Transportation Safety Board Part 830 — Index.

Summary: A step-by-step ground and flight reference for the person starting to fly and working toward the private certificate, but it also serves as a reference for the recreational pilot and the private pilot studying for the annual or biennial flight review. The sixth edition provides updated information covering the latest facts about aviation, especially FARs and airspace requirements, including the new recreational pilot certificate. It also contains information about ARSAs (airport radar service areas), TCAs (terminal control areas), weather information and services, night flying and emergency flying by reference to instruments. (Brochure).

Reports

Annual Report 1989-1990. Canberra : Civil Aviation Authority Australia, 1990. 96p.

Key Words
1. Aeronautics — Statistics — Australia.
2. Australia — Civil Aviation Authority.

Contents: Chairman's Review — Alan Woods, AC — Board Members — Highlights of 1989-90 — Honors — Australian Aviation Advisory Committee — Corporate Structure — Business Operations — Management Support Services — Appendices — Accounts and Financial Statements.

Human Factors Issues in Aircraft Maintenance and Inspection: Information Exchange and Communications," Report of a Meeting 13-14 December 1989, Alexandria, Virginia, U.S. Final Report / James F. Parker, Jr. (BioTechnology, Inc.) and William T. Shepherd (FAA Office of Aviation Medicine), co-editors. — Washington, D.C. : U.S. Federal Aviation Administration Office of Aviation Medicine; Springfield, Virginia, U.S. : Available from NTIS*, November 1990. Report DOT/FAA/AM-90/14. 139p.

Key Words
1. Airplanes — Inspection — United States.
2. Airplanes — Maintenance and Repair — United States.

Contents: FAA Overview of Maintenance-Related Information Exchange / Dennis Piotrowski — Major Air Carrier Perspective / Clyde R. Kizer — Mid-Level Air Carrier Perspective / Thomas F. Derieg — Commuter Airline-Vendor Communications / A. Fred Giles — Human Factors Issues in Manufacturers' Maintenance-Related Communication / Anthony Majoros — Facilitation of Information Exchange Among Organizational Units Within Industry / James Taylor — Information Needs of Aircraft Inspectors / Michael T. Mulzoff — Better Utilization of Aircraft Maintenance Manuals / Richard G. Higgins — The Information Environment in Inspection / Colin G. Drury — Data Base Support for Maintenance Requirements of the Nuclear Power Industry / Thomas G. Ryan — CD-ROM and Hypermedia for Maintenance Information / Robert J. Glushko — An Integrated Maintenance Information System (IMIS): An Update / Robert C. Johnson — Communication and Transfer of Non-Destructive Inspection Information / Stephen M. Bobo — Converting Technical Publications into Maintenance Performance Aids / Kay Inaba — Growth of Job Performance Aid Utilization / Daniel J. Berninger.

Summary: Proceedings of the FAA-sponsored 2-day meeting to address issues of human factors and personnel performance in aviation maintenance and inspection. This meeting focused on issues of "information exchange and communications." The primary goal was to consider means of ensuring that the exchange of information within the industry responsible for the maintenance of the U.S. air carrier fleet is accurate, efficient, and responsive to the particular needs of this industry. Eight recommendations were made to the FAA regarding effective communications methodology among the various members of the maintenance industry.

Civil Aviation Statistics of the World, 1989. Fifteenth Edition-1990. — Montreal, Canada : International Civil Aviation Organization, 1990. Report Doc 9180/15. ii, 168p. in various pagings.

Key Words
1. Aeronautics, Commercial — Statistics Periodicals.
2. Airlines — Statistics — Periodicals.
3. Aircraft — Statistics — Periodicals.
4. Air Pilots — Statistics — Periodicals.
5. Airports — Statistics — Periodicals.
6. Aeronautics — Accidents — Statistics — Periodicals.
7. Private Flying.

Contents: ICAO World Statistics: Aircraft, Pilots, Safety, Fleets, Traffic, Finance — Statistics by Region and State — Statistics for Commercial Air Carriers by State — Airports — Appendices.

Summary: Mostly tables, this yearly compilation includes summaries of statistical information reported to ICAO.

Aerospace Facts and Figures, 1990-91. Aerospace Industries Association of America, 1250 Eye Street, N.W., Washington, D.C. 20005, U.S., 1990. 176p., tables. ISBN: 0898-4425.

Key Words
1. Aeronautics — Yearbooks.
2. Astronautics — Yearbooks.

Contents: Forward — Aerospace Summary — Aircraft Production — Missile Programs — Space Programs — Air Transportation — Research and Development — Foreign Trade — Employment — Finance — Glossary — Index.

Summary: Contains tables, graphs and text describing aerospace activity through 1989 and includes some estimates for 1990 and 1991. Historical data on aircraft production, missiles and space programs, air transportation, research and development, foreign trade, employment, and finance are also included.

Annual Review of Aircraft Accident Data. U.S. Air Carrier Operations, Calendar Year 1987. — Washington, D.C. : U.S. National Transportation Safety Board, November 29, 1990. Report NTSB/ARC-90/01, NTIS Order Number: PB91-119693. 78p., charts, graphs.

Key Words
1. Aeronautics — Accidents — 1987.
2. Aeronautics — Accidents — Statistics — 1987.
3. Aeronautics — Accidents — United States — 1987.
4. Aeronautics, Commercial — Accidents — United States.

Contents: Introduction — 14 CFR 121, 125, 127 Operations — Scheduled 14 CFR 135 Operations — Nonscheduled 14 CFR 135 Operations — Midair Collision Accidents — Explanatory Notes — Cause/Factor Table - 14 CFR 121, 125 127 — Cause/Factors Table - Scheduled 14 CFR 135 — Cause/Factor Table - Nonscheduled 14 CFR 135 — NTSB Form 6120.4.

Summary: Presents the record of aviation accidents involving revenue operations of U.S. Air Carriers including Commuter Air Carriers and On-demand Taxis for calendar year 1987. [author abstract]

Aircraft Accident Report: Grand Canyon Airlines, Flight Canyon 5, De Havilland Twin Otter, DHC-6-300, N75GC, Grand Canyon National Park Airport, Tusayan, Arizona, U.S., September 27, 1989. — Washington, D.C. : U.S. National Transportation Safety Board; Springfield, Virginia, U.S.: Available from NTIS*, January 8, 1991. Report NTSB/AAR-91/01; PB91-910401. 34p.

Key Words
1. Aeronautics — Accidents — 1989.
2. Aeronautics — Accidents — Pilot Training.
3. Aeronautics — Accidents — Takeoff/Landing.
4. Grand Canyon Airlines — Accidents — 1989.

Summary: The flight was operating as a sightseeing flight under 14 CFR 135 from Grand Canyon National Park Airport. The airplane crashed during its initial landing attempt and was destroyed. The two pilots and eight passengers received fatal injuries, nine passengers received serious injuries, and two passengers received minor injuries. Witnesses described the airplane's approach as normal; however, the airplane travelled about 1,000 feet down the runway at an altitude of about 5 feet prior to touchdown. The airplane reportedly dropped to the runway, bounced back into the air, continued another 1,000 feet and dropped back onto the runway. Witnesses then saw the airplane veer off to right of the runway. When it neared the runway edge, observers saw it begin to climb in a nose-high attitude. The airplane continued to climb as it passed the control tower and reached an altitude of 150 to 200 feet above the runway. At this point, the aircraft rolled toward the left and crashed into trees on a hill. The controllers reported that all communications with the aircraft had been normal. There were no reports of winds or gusts at the time of the accident.

The Board determines that the probable cause of the accident was improper pilot technique and crew coordination during the landing attempt, bounce, and attempted go-around. As a result of the investigation of this accident, recommendations A-90-1 through A-90-6, A-90-37 through A-90-39, and A-91-11 through A-91-12 were issued. The safety issues discussed in the report are airline procedures for go-around maneuvers; crew training; airport certification; oversight of airport safety inspectors; emergency response; and passenger seat inspections. [Executive Summary]

UK Airmisses Involving Commercial Air Transport, January-April 1990. — London : Civil Aviation Authority, Greville House, 37 Gratton Road, Cheltenham, England, December, 1990. 32p. ISSN: 0951-6301.

Key Words
1. Aeronautics, Commercial — Great Britain — 1990.
2. Airplanes — Near Midair — Great Britain.

3. Airplanes — Collision Avoidance — Great Britain.

Contents: Introduction — Statistics — Commercial Air Transport Airmiss Reports (January-April 1990) — Appendices.

Summary: An "airmiss" is said to have occurred when a pilot considers that his aircraft may have been endangered by the proximity of another aircraft. Only the pilot of the aircraft can file an airmiss report. If the air traffic controller considers that flight safety has been hazarded, he will file an Aircraft Proximity Hazard report which will be investigated similar to but separate from the airmiss system.

Aircraft Maintenance: Potential Shortage in National Aircraft Repair Capacity. Report to Congressional Requesters. — Washington, D.C. : U.S. General Accounting Office, October, 1990. Report GAO/RCED-91-14**. 37p.: ill.

Key Words
1. Airplanes — Maintenance and Repair — United States.
2. Jet Transports — Maintenance and Repair — United States.
3. Aeronautics, Commercial — Safety Measures — United States.
4. Aviation Mechanics (Persons) — United States.

Summary: This is an interim report "that contains information based on discussions with selected airline-owned and independent repair stations. This report discusses reasons for recent increases in demand for maintenance; the extent to which the industry's capacity is being used; and the factors affecting future demand for and supply of airline and independent repair station services. ... FAA's recent regulatory changes to ensure the safety of aging aircraft will require substantial structural modifications and significantly increase short-term demand for repair services... The industry's two percent excess capacity in 1990 may fall short of meeting the increase in demand. ... The immediate obstacles to expanding the supply of repair capacity are the shortage of skilled aircraft mechanics in some markets and the long time required to bring new facilities on line." (pp.1-3)

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Accident/Incident Briefs

This information is intended to provide an awareness of problem areas through which such occurrences may be prevented in the future. Accident/incident briefs are based upon preliminary information from government agencies, aviation organizations, press information and other sources. This information may not be accurate.

Air Carrier

When Things Go Wrong, Other Things Go Wrong

McDonnell Douglas DC-9: Minor damage. Minor injuries to one person.

While the aircraft was in cruise flight shortly after midnight at FL 350, the low oil pressure warning light for the number two generator constant speed drive (CSD) illuminated. The crew inadvertently disconnected the number one generator CSD. Subsequently, the number two generator failed and, since CSDs cannot be reconnected in flight, all electrical power from the generators was lost leaving the battery as the only source of electrical power for the aircraft. Two attempts were made to windmill start the auxiliary power unit (APU) but, since they were made above the APU's start envelope of 30,000 feet, it failed due to hot starts. APU start envelope limitations were not indicated in this aircraft's flight operations manual.

A descent was made on emergency electrical power and a landing was made at an airport that was inadequate for the airplane. (The airport had a single 6,000-foot runway 60 feet wide and was selected because the pilot could see the rotating beacon; another airport with an 8,500-foot runway 100 feet wide was available nearby). The crew decided to make a no-flap approach and to lower the landing gear by emergency methods because the indicators were inoperable, although the systems were operable by normal means.

The landing speed was faster than normal, as required without flaps, and the aircraft ran off the end of the runway, damaging the landing gear doors and the number one engine nacelle. There was no fire and the captain, with minor injuries, was the only casualty among the three crew members and 99 passengers aboard the aircraft.

The probably cause, as determined by the U.S. National Transportation Safety Board (NTSB), was the poor inflight planning and decisions made by the flight crew following the failure of the number 2 generator constant speed drive unit. Contributing factors were the failure of the number 2 generator constant speed drive unit and the crew's inadvertent shutdown of the wrong generator which resulted in a complete loss of electrical power.

As a result of this accident, the NTSB published recommendations that the U.S. Federal Aviation Administration (FAA) require the aircraft manufacturer to redesign the flap and landing gear position indication systems of the DC-9 to ensure operation when the battery is the only source of electrical power; ensure that the flight operations manuals of all DC-9 operators contain an APU start envelope chart; and ensure that inconsistent statements regarding restarts of the APU be clarified.

A Close Encounter Of the Wrong Kind

Boeing 747-100: Minor damage. No injuries.

The widebody jet airliner was taxiing past a Boeing 757 that was holding short of the runway. As the Boeing 747 was passing the stationary aircraft, its left wingtip struck the right elevator of the 757.

There were no injuries to the 374 occupants of the 747 or the 119 persons in the 757, but both aircraft sustained minor structural damage, the 747 requiring repairs to the outer four feet of its left wing.

Factors involved included inattention to aircraft separation during taxiing and inadequate taxiing technique.

Air Taxi Commuter

Sleeping at the Controls Can Lead to a Rude Awakening

Fairchild SA-227 III Metro: Substantial damage to aircraft. No injuries.

The twin-engine turboprop commuter aircraft was being ferried on a positioning flight in daylight on an early April morning. It was cruising at 17,500 feet msl and the pilot was having trouble staying awake.

The pilot dozed off a couple of times. He was awakened from one of the sleep episodes by the sound of screaming wind noise. He saw that the indicated airspeed was in excess of 300 knots in a dive. During the recovery from the uncontrolled steep descent, the aircraft's wings were overstressed.

After the aircraft was landed safely, maintenance inspectors found that the upper skin panels of both wings were wrinkled over 60 percent of their chord.

Too High and Fast Became Too Low and Slow

Fokker F27 Friendship: Aircraft destroyed. Fatal injuries to two persons on the ground, various injuries to 15 in the aircraft.

The commuter airliner was higher and faster than normal during the final approach for landing. As a result, it touched down almost 2,500 feet past the runway threshold.

After approximately 1,300 feet of rollout after touchdown, the pilot aborted the landing and initiated a go-around. The aircraft lifted off at a steep nose-high attitude but lost height and the landing gear struck some houses and an automobile on a city road before coming to rest about 2,000 feet beyond the airport boundary.

The aircraft caught fire and was destroyed. Two occupants of the automobile were killed. Aboard the aircraft, two crew members and one passenger were injured seriously; one crew member and 26 passengers sustained minor injuries; and 26 passengers were unhurt.

Inflight Stall Training Taught a Hard Lesson

Fokker F27 Friendship: Aircraft destroyed. Serious injuries to two.

The aircraft was being used for a training check flight. There were two occupants aboard the aircraft in the early afternoon during visual conditions.

During the recovery from an approach to a stall with the aircraft in a landing configuration, both of the engines suddenly quit. A forced landing was accomplished. The F27 caught fire and was destroyed. The two crew members escaped with serious injuries. The cause of the engines stoppage was not determined.

Empty Aircraft Left On Runway

Piper PA-60: Minor damage. No injuries.

It was dark when the aircraft was approaching to land. The pilot failed to lower the gear and the aircraft slid to a stop on its belly. The aircraft was slightly damaged but there was no fire, and the pilot deplaned with no difficulty. He turned off the switches — including the lights — but did not notify the control tower that his aircraft was obstructing the runway.

The control tower operator and the pilot of another aircraft awaiting takeoff clearance had seen the accident aircraft veer to the left and assumed that it had made a normal turn off the active runway after landing. Consequently, the tower cleared the other aircraft, with an instructor and student pilot aboard, for takeoff. When the aircraft was approaching the liftoff point, the disabled Piper appeared in the beam of its landing light. The instructor took control and lifted the aircraft off, overflying the stationary aircraft by 20 feet.

Factors involved in the near-accident included the first pilot's failure to extend the landing gear and his failure to report the position of his disabled aircraft, plus inattention by the control tower operator.

Corporate Executive

The Windshear Gremlin Gives No Second Chances

Beechcraft King Air 90: Substantial damage. No injuries.

There was cumulonimbus activity and windshear present in the vicinity of the airport while the twin-engine turboprop aircraft was approaching to land. However, the approach speeds were not adjusted for the weather conditions.

During final approach, a high sink rate developed. The pilot applied full power but the aircraft touched down hard short of the runway and the oleo strut of the right main landing gear separated and the gear collapsed. The aircraft was substantially damaged, but the two crew members aboard the cargo flight were not injured.

Factors involved in the accident included inadequate landing judgment and wind compensation with windshear conditions present. In addition, the damaged area of the landing gear revealed signs of pre-existing fatigue cracking in the area that failed during the stresses imposed during the hard landing.

Aircraft Went Astray In Dark of the Night

Beechcraft King Air 90: Substantial damage. No injuries.

The twin turboprop had made a missed approach to land on the snow-covered runway during the darkness shortly before midnight. There were a pilot and two passengers aboard.

After touching down during the second approach, the pilot was unable to maintain directional control and the aircraft ran off to the right of the runway. The nose gear collapsed after the aircraft left the paved surface. There was substantial damage, but there were no injuries to the three persons aboard.

Causal factors included the slippery runway surface as a result of the snow and the loss of directional control.

Misjudging Height Leads to Early Touchdown

Cessna 402: Substantial damage. No injuries.

The pilot was flying a normal approach into a 10- to 15-knot headwind. There were windshear conditions in the vicinity of the airport.

The aircraft touched down heavily on the right main wheel 26 feet past the airport boundary fence and 315 feet prior to the runway threshold. It then bounced and touched down again, this time on the paved runway some 700 feet beyond the initial touchdown spot. At this point, the pilot heard the gear unsafe warning horn and noticed that the gear down light for the right gear was not illuminated. Following this, the right main gear leg slowly collapsed and the aircraft turned 180 degrees as it came to rest supported by the right wingtip. There was no fire, and the pilot and eight passengers deplaned without injury.

Windshear and overestimation of height were considered causes for the accident. The bellcrank lugs of the right main gear were found to have failed because of the overload caused by the hard landing.

Other General Aviation

Turbocharged Engines Like to Stay Warm

Cessna 404 Titan: Substantial damage. No injuries.

The turbocharged piston twin-engine aircraft was being used for aerial observation. As a result, the engines were operated at low power settings for an extended period. It was a winter midday in Canada with low ambient temperatures.

Both engines lost oil pressure and failed. The pilot declared an emergency and accomplished a forced landing during which the aircraft was damaged substantially. However, the crew of two sustained no injuries and was located three and a-half hours later by rescue services.

Cause for the double engine failure was attributed to the low outside air temperatures and the low power settings on the engines, which led to congealing of the oil in the turbocharger scavenge drain line in each engine. This blocked the oil flow and caused the bearing section to pressurize, forcing the oil past the turbocharger turbine shaft seal to flow into the exhaust and be lost. Both engines then failed due to lack of lubrication.

Pre-takeoff Control Checks Can Prevent Catastrophe

Piper PA-31: Aircraft destroyed. Serious injuries to two persons.

The aircraft had just undergone maintenance work. The pilot and one passenger were departing for a test flight.

After rotating at the normal point on the runway, the aircraft climbed rapidly. It pitched to a steep 30 to 40 degrees and rolled left, then right. Pitch and roll both increased and the aircraft crashed. The aircraft was destroyed by fire but the occupants were able to evacuate it with serious injuries.

It was found that the aileron control cables were connected in reverse.

Off You Go, But Keep It Short

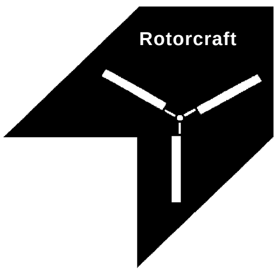
Cessna 152: Substantial damage. No injuries.

The aircraft had flown for three hours and 15 minutes since its last refuelling, after which the instructor and a student added another one hour and 15 minutes during a dual instruction flight. Satisfied with the student's performance, the instructor sent him off on his second solo flight in the pattern.

The student made one touch and go landing, but after takeoff when the aircraft had attained a height of approximately 75 feet, the engine began to run rough. When the pilot lowered the nose, the power returned but when he raised the nose again the engine failed entirely and he selected a forced landing field. However, the aircraft was not high enough to glide safely to the forced landing site and it went through the hedges at the boundary of the airport, crossed a road and stopped on its nose in a ditch.

The pilot had been wearing an aerobatic safety harness and was uninjured, and left the aircraft with no injuries. The aircraft did not fare as well, and sustained a bent propeller, collapsed nose wheel, distorted fuselage skin and broken attachment point for one of the main landing gear.

There was no fire, and no traces of fuel were found at the accident site. Later examination of the aircraft revealed that a total of slightly more than one gallon of fuel was in the tanks — the unusable fuel for the aircraft was listed as 1.25 gallon.



Mystery Break-up At Low Level

Hughes 269C: Aircraft destroyed. Fatal injuries to pilot.

The aircraft was being flown on a training flight with only the student pilot aboard. He had a total of approximately 30 helicopter hours which included 10 hours solo. The cross-country flight was planned with an altitude of 2,500 feet.

Witnesses reported seeing the rotorcraft flying at a height about 200 feet above tree-top level when it suffered an inflight breakup and simply came apart. The aircraft was destroyed and the pilot fatally injured.

The main section of the wreckage came to rest in a residential area and the three main rotor blades were scattered approximately 300 feet away. The tailcone with the tail rotor intact was located about 450 feet from the main section of the wreckage. Parts of the structure of the cockpit and contents of the interior of the cockpit were found almost a half mile away. Examination revealed contact with the cockpit and tailcone by the main rotor blades, although the cause or the sequence of the breakup was not determined.

Whiteout, Blackout — Same Result During Landing

Bell 205A: Substantial damage. No injuries.

The helicopter was about to land in a snow-covered clearing during a winter midday in Canada. There were a pilot and a passenger aboard.

As the aircraft was about to touch down, whiteout conditions were encountered caused by the rotor downwash. The pilot lost visual reference with the ground and the helicopter drifted to the right of the intended touchdown spot. The right landing skid collided with a snowbank and the helicopter rolled over.

The aircraft was damaged substantially but there was no fire. The two occupants were able to evacuate without injury.

Low Visibility Deceives Pilot

Bell 214: Aircraft destroyed. Fatal injuries to two, injuries to two others.

The helicopter was flying between two temporary heliports during the mid-afternoon. There were a pilot and three passengers aboard.

Visibility was poor as the aircraft approached the destination along a shore. During a shallow descent in mist and drizzle, the helicopter collided with the water approximately two thirds of a mile from shore. The helicopter was destroyed and the pilot and one passenger sustained fatal injuries. One of the other two passengers suffered serious injuries and the other minor injuries.

The causal factor was pilot's misjudging of the aircraft's altitude in the conditions of restricted visibility. ♦