Training the Entire Flight Department

The ever-increasing sophistication of machines and procedures requires an integrated approach to impress on all employees that safety of flight is the overriding concern of those who use air transportation.

by

Raoul Castro
President
Aerospace International Management Systems, Inc.

When we mention training, we think in terms of flight crew training without considering that every person in a flight department should be trained to perform his or her job competently. The objective of recurrent training is to keep all employees at a specified level of proficiency.

The old adage — a chain is as strong as its weakest link — is apropos to safety and training. The links of the training chain are: competent management, the transference of skill from classroom and simulator to the cockpit, flight planning accuracy, cabin passenger safety, correct procedures in the performance of maintenance tasks and many others.

Proficiency as it applies to training flight operations personnel is to:

- Impart general knowledge of how a task should be performed.
- Inculcate the ability to perform the specific task in a competent and skilled manner.

Recent accidents point to the fact that something is amiss in training or that classroom training is not being applied. Has training become so boring, or passe, that we put up with it as something we *have* to do to keep our job?

Consider the following situations: Boeing 737 over Hawaii, Boeing 747 over the Pacific, DC-10 at Sioux City, Iowa, MD-80 at Detroit, Michigan, Boeing 737 in the Potomac River, Boeing 737 in New York's East River. In the first three situations the crew performed with tremendous competence and skill. In the remaining three situations, the crew did not perform well. Accident investigators agree that "Accidents don't just happen, they manifest themselves from a sequence of minor incidents." How much did maintenance training and pilot training contribute to the above accidents?

Training to Develop And Maintain Skills

Skills have to be maintained. Therefore, training becomes the key factor in ensuring that an individual understands those things for which he is accountable and responsible. Accountability is the obligation to carry out the duties of a position. Responsibility is the obligation to perform work correctly and on time and to meet established schedules. Personnel in an aircraft operation must possess a high degree of discipline, reliability, and moral obligation for the passengers' well being and safety.

An Airline Transport Pilot (ATP) license or a degree in engineering does not necessarily make a manager. Management training is needed.

A mechanic with seniority and an airplane and powerplant (A&P) license, aspiring to a maintenance manager position, may find that without management skills his job becomes a disaster.

The significant factors of an aviation training program must include, pilot and mechanic proficiency, communication skills, leadership, decision making, work organization, delegation of responsibility, acceptance of responsibility, and assertiveness. The employee must have initiative and take advantage of company provided training.

Regardless of the number of airplanes that a company may be operating, a flight operations training program should be structured to the unique requirements of that particular operation.

Examples:

- An aviation department manager must be in regular training to keep up with the state-of-the-art of management. New management methods that can improve the operation should be explored. This can be accomplished by attending development programs and seminars in organization and management.

- A company operating overseas flights should have crew members trained in all aspects of overwater flight and emergency procedures.

- A company operating in and out of demanding airports, i.e., Aspen, Colorado, should train crews with emphasis on high-altitude airports, crosswind takeoffs and landings, and appropriate airport approach and departure procedures.

- Maintenance personnel should be trained on the correct equipment, and how to schedule maintenance in order to maximize utilization.

Basic Training Requirements

The basic training requirements for a flight operation are:

- Management training
- Pilot initial and recurrent training
- Maintenance personnel initial and recurrent training
- Survival training — for all personnel
- Safety, security, and emergency plans — for all personnel

Management Training

This addresses those concerned with the effective management and efficient operation of a flight department.

The 1980s will be marked as the period when aviation faced many of the constraints that other industries are facing.

The aviation management methods of the 1970s have become obsolete. Consequently, management training and education should be future oriented. *Development* is the concept to be used, a combination of productive training and positive experience.

In many magazine articles on management, the manager being interviewed talks about the programs he has instituted for his employees, but does not mention his own training. It leaves one to assume that he does not require training because he has all the answers. "When a manager is finished learning, he is finished."

Managers signal poor management practices when they do not respect and recognize the ability of their employees.

Pilot Initial and Recurrent Training

Programs should be built on training objectives based on a philosophy that can be described with the matrix in Figure 1.

Crew training must cover all the unique operational requirements of the flight operation. An emphasis must be placed on operational procedures. A proficiency level must be attained and means of maintaining that level must be prescribed. Frequency of training sessions is essential to the maintenance of the prescribed level of proficiency. Tolerable safe deviation from prescribed standard operating procedures must be defined.

To accomplish a viable interface between man and machine and optimum crew coordination, the main objective, which is the discipline and ability to transfer classroom and simulator training to the actual airplane cockpit, must be considered. It would be impossible to achieve crew coordination without the implementation of standard operating procedures that integrate individuals into the formation of a disciplined crew. These goals are accomplished by training that will maximize human performance, provide better application of present training knowledge and make optimum use of flight simulators.

Maintenance Personnel Initial And Recurrent Training

Personnel must receive initial training by type of airframe and powerplant. This training should be provided by the aircraft manufacturer's designated training agency. Training sessions should be provided once a year at the minimum.

Recurrent training should be based on aircraft type, or if qualified, on two aircraft types, with alternate training every six months but no less than every year.

An in-house program for "on-the-job-training" (OJT) should be in place for apprentice technicians and technicians that have not had initial training on a particular type of aircraft.

The maintenance chief should attend management seminars or courses to enhance his skills.

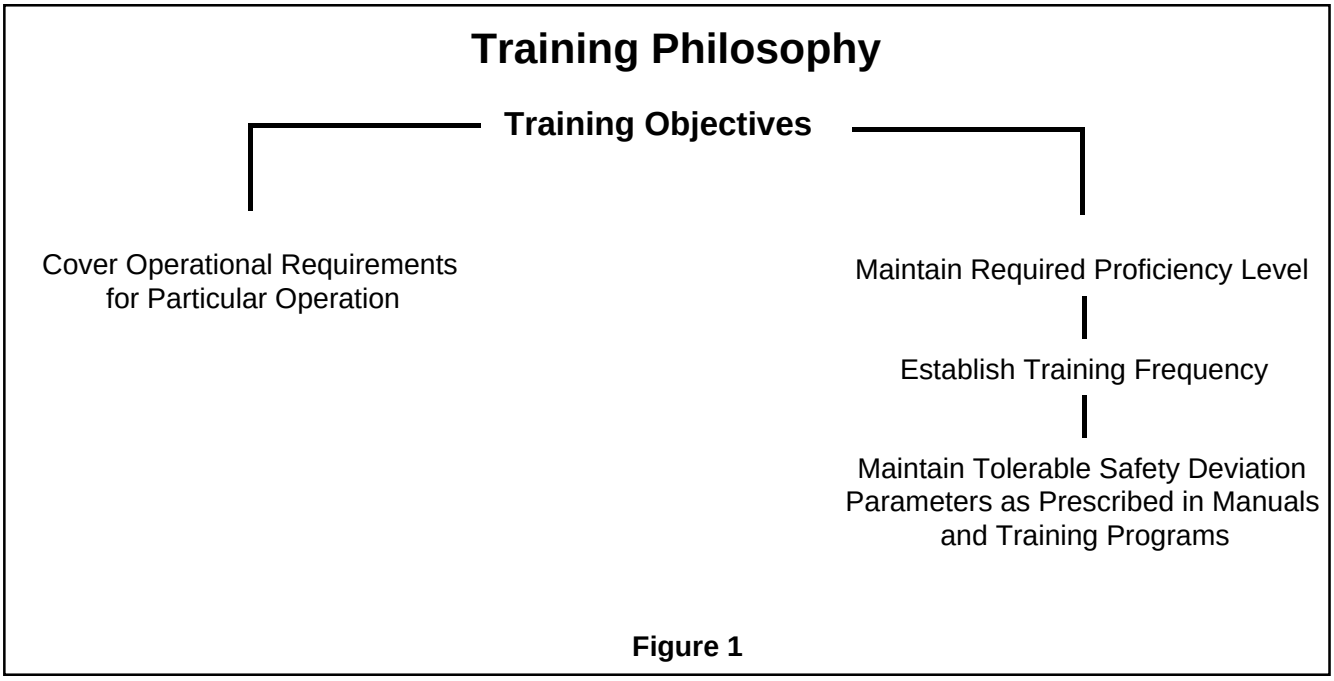


Figure 1

Survival and First Aid Training

Frequently, a minimal amount of training is provided in survival and first aid for inflight and ground emergencies. The lives of crew and passengers may depend on advance training and preparation. Survival training for crew members should be done regardless of the area of operation. There are many areas worldwide where ditching or landing in a wilderness area can be considered a possibility. Survival training can be obtained from several agencies that specialize in this type of training.

The value of first aid training has applications both on and off the aircraft not only to help others but to provide self first aid. First aid training can include cardiopulmonary resuscitation (CPR), the performance of the Heimlich maneuver, and training in the immediate and temporary care given a victim in case of accident or sudden illness.

Information on where to receive first aid training can be obtained from such organizations as the local Red Cross, heart association, fire department, and hospital.

Safety, Security and Emergency Plans

Organizing commences with the development of programs, and establishing the ground work for action and instruction to meet the necessary objectives.

Safety and security are the business of every employee in a flight operation, and they must be trained to be able to recognize threats to safety and security.

An emergency plan should be established as an outline for procedural actions to be taken in the event of an emergency. Flight operations personnel have to be familiar with the "action plan." They should review it regularly and keep it up to date.

The emergency plan has to meet the requirements of the particular flight operation. Instruction on procedures can be conducted on an in-house basis by company or outside personnel.

The Training Manual

The aviation department training manual is really the curriculum, or central theme, in which the training subjects are correlated. It should start with the flight operation training philosophy, defining the objectives of each training subject and areas of study to be emphasized, (i.e., ground, flight, maintenance, safety and security).

To minimize crew manpower loss and to maximize crew training effectiveness, a three-phase training program can be developed per the example in Figure 2.

Maintenance training can be programmed the same as pilot training. The training phases can be broken down into powerplant and airframe components to make sure that the technician is not overburdened with too much training in a particular subject at one time.

Regardless of whether the training is provided by in-

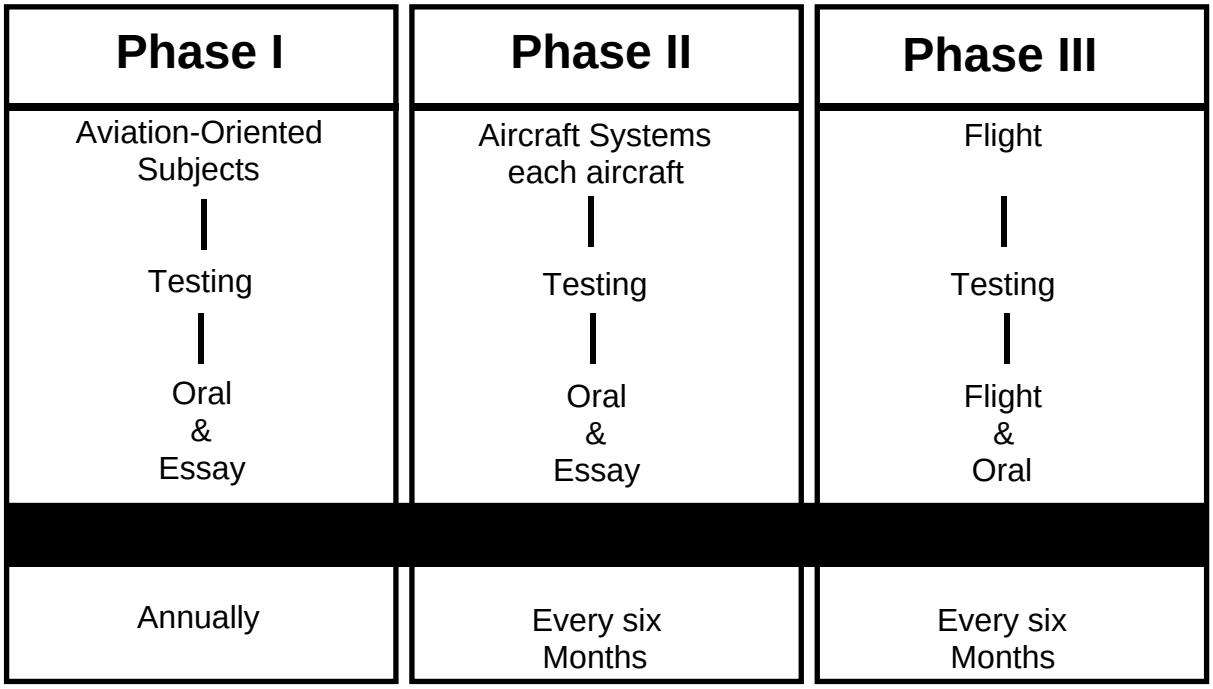


Figure 2

house personnel or by a contract training agency, the training manual is essential to the company flight operation training requirements. It is the responsibility of the manager or chief pilot to see that the training conforms with the requirements of flight operations.

The training manual need not be part of the operations manual but the operations manual should reference the training manual.

Contract Training Agency

When a contract training agency has been selected to conduct phase II and phase III training, the program should be designed to the company requirements. The training agency should be instructed to use the company training curriculum and company aircraft checklists.

Training has to maintain pace with the increasing sophistication of machines and procedures in order to prevent the possibility of human error accidents. Safety of flight is the overriding concern. Confidence is the mainstay of the system; projecting an image of incompetence may dissuade air travelers from using it.

[This article is excerpted from the author's material scheduled for publication by Southern Illinois University Press in "Corporate Aviation Management."— Ed.]

About the Author

Raoul Castro is president of Aerospace International Management Systems, Inc., Upland, California, U.S. AIMS provides evaluation services to the aviation industry with emphasis on management methods and safety programs. The organization also has developed management software for corporate flight operations.

Castro has taught courses at Southern Illinois University in corporate aviation management, fixed base operation management and aviation industry regulations. He also has participated in safety audits and seminars for the Flight Safety Foundation; has spoken extensively before industry trade association meetings; and has written more than 50 articles on corporate aviation management.

An ex-U.S. Air Force pilot, Castro's credentials include an Airline Transport Pilot certificate with eight type ratings and an Airframe and Powerplant certificate. He has extensive civil experience flying corporate aircraft and in organizing and managing corporate flight departments for major U.S. companies. ♦

Reports Received at FSF Jerry Lederer Aviation Safety Library

Reports:

Aircraft Evacuations: The Effect of Passenger Motivation and Cabin Configuration Adjacent to the Exit./ Helen Muir, Claire Marrison, Alyson Evans (Cranfield Institute of Technology) — *London: Civil Aviation Authority, November, 1989. CAA Paper 89019. ISBN 0860394069. V,* 42p.

Key Words
1. Survival (after airplane accidents, shipwrecks, etc.).
2. Airplanes — design and construction.
3. Aeronautics, commercial — passengers.
4. Evacuation of airplanes.
5. Aeronautics — safety measures.

The main objective of this experimental program was to investigate the influence of changes to the cabin configuration allowing access to the emergency exits, and the rate at which passengers could evacuate an aircraft. The evaluated configuration involved a range of widths for the passageway through a bulkhead leading to floor-level exits, and a range of seating configurations adjacent to the Type III overwing exit. The results suggested that the blockages known to occur in some emergency evacuations can be significantly reduced when the passageway through a bulkhead is greater than 30 inches. The minimum seating configurations specified by the CAA in Airworthiness Notice No. 79 in 1986 were shown to have significantly increased the rate at which passengers can be evacuated through a Type III overwing exit. The results suggest that the optimum distance between the seat rows on either side of the exit would involve a vertical seat projection of between 13" and 25". [Modified author abstract].

Statewide Aviation Weather Collection and Dissemination Study./ Glenn L. Miller, project manager. — Des Moines, Iowa: Iowa Department of Transportation Air and Transit Division; Potomac Associates Inc., in association with Pannell Associates. Available through Iowa DOT, State Capital, Des Moines, Iowa 50319 (no fee), September, 1989.

Key Words
1. Meteorology in aeronautics — Iowa — United States.
2. Meteorology — observation.
3. Weather forecasting — automation.
4. Aids to air navigation.
5. Automated weather observing system (AWOS).

This study details a plan for a comprehensive and coordinated statewide weather system to support aviation needs in Iowa. The plan calls for the establishment of 61 Automated Weather Observing System (AWOS) sites to supplement the 15 programmed federal AWOS and Automated Surface Observing System (ASOS) sites. The proposal would tie the 61 sites together via a statewide computer and telecommunication network. The plan will incorporate federal AWOS and ASOS sites into the state network and would allow for the input of the Iowa data into the federal dissemination system. Access will be provided to the Direct User Access Terminal Services through the Iowa system. The study was initiated by a state appropriation to evaluate gaps in the federal weather monitoring and dissemination system within the state and to assess the role of the state in complementing the federal system. The plan would enhance the automatic acquisition of weather data and the dissemination of this data using state-owned telecommunication facilities.

The Economic Impact of Civil Aviation on the U.S. Economy. — Washington, D.C.: Partnership for Improved Travel: Available through Partnership for Improved Air Travel, Melissa Deitch, 1850 M Street, NW, Suite 900, Washington, D.C. 20036-5890, $30, June 1989. Prepared by Wilbur Smith Associates. ISBN 0-9624127-0-8. 1 vol, *various pagings*.

Key Words
1. Aeronautics, commercial — economic aspects — United States.
2. Aeronautics, commercial — freight — economic aspects — United States.
3. Aircraft industry — economic aspects — United States.
4. Airports — economic aspects — United States.

This study examines the total aviation industry, and measures its economic importance to the U.S. economy in terms of dollar value and jobs created. The study measures and documents the value of the financial transactions that are attributable, or associated with, civil aviation in the U.S. (commercial aviation, general aviation, aircraft manufacturing and the firms throughout the U.S. that provide goods and services to the civil aviation industry.) The study also estimates the economic value of aviation to each state and to major metropolitan areas. The findings show that in 1987 aviation and related economic activity totaled $522 billion. This is greater than the gross national product of

all nations except the United States, the Soviet Union, Japan and West Germany. Aviation and associated businesses employed 8 million people — 7.3 percent of the U.S. civilian workforce — who earned $155 billion. Aviation contributed $254 billion, or 5.6 percent, to the U.S. gross national product. [modified overview].

Human Factors Issues in Aircraft Maintenance and Inspection: Final Report./ William T. Sheperd and James F. Parker (Civil Aeromedical Institute). — Washington, D.C.: U.S. Federal Aviation Administration, Office of Aviation Medicine: Available through NTIS*, October 1989. Report No. DOT/FAA/AM-89/9. *120p*.

Key Words
1. Airplanes — maintenance and repair.
2. Airplanes — inspection.
3. Aeronautics — accidents — human factors.
4. Airlines — employees.

The report contains 15 papers presented at a Federal Aviation Administration-sponsored workshop held in October 1988. The objective of the meeting was to identify human issues of importance, particularly as such issues might contribute to inspection or maintenance error. The desired outcome was to be an improved understanding of personnel performance in aviation maintenance, and recommendations, as appropriate, to the FAA concerning needed research efforts or possible new or revised regulatory actions. Several recommendations to FAA are listed in the areas of communication, training, management, regulatory review research and development. [Modified author abstract].

Evaluation of the Scott Aviation Portable Protective Breathing Device for Containment Leakage as Prescribed by FAA Action Notice A-8150.2. Phase I — Original Tests of the Portable Protective Breathing Device. Phase II — Tests of the Redesigned Portable Breathing Device; Final Report./E. Arnold Higgins, Garnet A. McLean, Peggy J. Lyne, et al (Civil Aeromedical Institute). — Washington, D.C.: U.S. Federal Aviation Administration, Office of Aviation Medicine: Springfield, VA: Available through NTIS*, November 1989. Report No. DOT/FAA/AM-89-11. *35p*.

Key Words
1. Airplanes — oxygen equipment.
2. Aircraft survival equipment.
3. Airplanes — protective breathing equipment.
4. Respirators.
5. Scott Aviation Portable Breathing Device.

Performance tests of the crew portable protective breathing device were conducted at ground level and 8,000 feet altitude. Tests measured contaminant leakage, oxygen and carbon dioxide levels, inhalation/exhalation pressures and internal/external dry-bulb temperatures. Test subjects included male and female, small and large. Changes in neck seal materials and opening sizes were made.

The Effects of Wearing Passenger Protective Breathing Equipment on Evacuation Times through Type III and Type IV Emergency Aircraft Exits in Clear Air and Smoke. Phase I — Evacuations in Clear Air. Phase II — Evacuations in Smoke; Final Report./ Garnet A. McLean, E. Arnold Higgins, Peggy J. Lyne, James H.B. Vant (Civil Aeromedical Institute, University of Oxford). — Washington, D.C.: U.S. Federal Aviation Administration, Office of Aviation Medicine: Available through NTIS*, November 1989. Report No. DOT/FAA/AM-89/12/ *33p*.

Key Words
1. Airplanes — oxygen equipment.
2. Aircraft survival equipment.
3. Airplanes — protective breathing equipment.
4. Respirators.
5. Evacuation of airplanes.

The effects of passenger protective breathing equipment (PPBE) on the time required for simulated emergency evacuation through overwing aircraft exits were studied in two experiments, one in clear air and another in smoke. The results supported the conclusion that exit hatch opening size was the most important factor in determining the time required to evacuate through these exits, followed next by the effects of smoke and finally by the wearing of PPBE. [Modified author abstract]

Aircraft Accident/Incident Summary Report — Kenai, Alaska, December 23, 1987. — Washington, D.C.: National Transportation Safety Board: Available through NTIS*, Order Number PB89-910407, September 30, 1989. Report No. NTSB/AAR-89/03/SUM. *11p*.

Key Words:
1. Aeronautics — accidents — 1987.
2. Aeronautics — accidents — engine failure.
3. Aeronautics — accidents — weight and balance.
4. Aeronautics — accidents — takeoff/landing.
5. South Central Airways — accidents — 1987.

South Central Airways, Flight 2001, (commuter flight, 14 CFR Part 135), crashed on December 23, 1987, shortly after departing Kenai Municipal Airport, Kenai, Alaska. The pilot reported that the plane had lost power in one engine and that he was circling for landing. The aircraft crashed into a house near the airport. The aircraft and house were destroyed by impact forces and the post crash fire. The two occupants of the house escaped with minor injuries. The pilot and five passengers were killed. The two surviving passengers were able to get out of the airplane and out of the house

before the aircraft exploded and burned. NTSB believes the probable cause of this accident was the failure of the No. 3 cylinder of the right engine during a critical phase of flight and the pilot's mishandling of the emergency during which he allowed the airplane to descend and impact the terrain. NTSB made several recommendations regarding prescribed checklist, actual passenger weight, and weight and balance data.

** U.S. Department of Commerce, National Technical Information Service (NTIS), Springfield, VA 22161 U.S. Telephone: 703-487-4780*

Aviation Statistics

Worldwide Airline Safety Records Calendar Year 1989

During 1989, worldwide airlines suffered 47 accidents and other occurrences that resulted in fatalities to passengers or crew during revenue jet or turboprop operations, and another four fatality related accidents during crew training and positioning operations. These events cost at least 1,609 passenger and crew lives plus more fatalities to persons on the ground. (Fatalities not the result of an airplane crash or an incident that resulted in significant damage, are not included in these totals.)

A preliminary study indicates that at least 25 percent of the fatal accidents (excluding fatal occurrences involving sabotage, hijacking or aircraft being shot down) may have involved controlled flight into terrain. This fact is a compelling reminder of the importance of constant pilot vigilance and the need to properly use Ground Proximity Warning Systems (GPWS) and related technologies. Several major accidents are believed to be related to failures of aircraft structures or engines, although the probable causes of the accidents have not been finally determined. To ensure flight safety, aviation authorities have taken measures to strengthen routine maintenance and inspection for fatigue and cracks as well as reviewing basic aircraft designs. Concern increased about the problems of aircraft aging, aircraft design and aircraft engines due to the following accidents:

- On January 8, 1989, the fan blade failed in the No. 1 engine of a Boeing 737 during takeoff/climbout. The crew accidentally shut down the wrong engine and 47 passengers were killed during the emergency landing. Thus, an engine failure, which might have ended in a safe landing, was compounded by human error.

- On February 24, 1989, a Boeing 747 jetliner lost a forward starboard underfloor cargo door and a large section of the fuselage above the door during high-altitude cruise. Nine passengers were blown out of the hole. Fortunately, the aircraft was landed safely. All 19 crew members and the remaining 327 passengers survived the mishap.

- On July 19, 1989, the number two engine of a DC-10 suffered an uncontained fan disc failure, and then encountered flight control difficulties as a result of hydraulic system failure. The aircraft crashed and burned during an emergency landing. One hundred and eleven persons were fatally injured and 85 persons survived.

Terrorist activities in 1989 appeared relatively quiet in Western Europe and North America. This might be attributed to the introduction of more effective weapon and explosive detection equipment that may have deterred terrorists. Unfortunately, such has not been the case elsewhere. On September 19, a French DC-10 crashed in the Tenere Desert of Nigeria while en route to Paris; all 171 persons perished in the crash. Sabotage by terrorists is suspected. On November 27, a Colombian Boeing 727 exploded on takeoff at Bogota Airport killing all 107 people on board. The accident is widely believed to be connected with drug wars in Colombia.

Ground safety continues to be a significant problem; during the past year many airport workers were injured and many aircraft were damaged during taxi, pushback and other operations close to the ramp area. Many nonfatal occurrences probably go unreported. Although, in general, the damage to aircraft and injury to ramp workers were minor, they cost the airlines significant revenue in lost aircraft service time. In 1989, worldwide airlines recorded at least two fatal accidents during pushback or taxi. In each accident one ground service person was killed.

The following is a list of worldwide fatal accidents and jet transport aircraft hull losses for calendar year 1989, compiled by Flight Safety Foundation. It is preliminary information and subject to further verification.

1989
Worldwide Fatal Accidents in Commercial Jet and Turboprop Operations

Flight Safety Foundation, January 1990

Source: Flight Safety Foundation, based on information from Aviation Information Services Ltd. (AISL) Major Loss Record, U.K. Civil Aviation Authority (CAA) World Airline Accident Summary, Boeing Commercial Airplane Company, and other sources.

Scheduled Commercial Passenger Jet Flights

Date	Aircraft Type	Operator	Location	Flight Phase	Fatalities Pass/Crew	Total Occupants Pass/Crew
Jan 8	B-737-400	British Midland Airways	Near E. Midlands airport Leicestershire, England	Cruise	47 / 0	118 / 8
Left-side engine failed while approaching cruise altitude. Crew shut down right-side engine and could not restart. Aircraft crashed across a motorway about 1/2 mile from runway threshold.						
Feb 24	B-747-122	United Airlines	Honolulu, Hawaii, U.S.	Climb	9 / 0	336 / 18
Portion of fuselage skin separated during climb, creating hole through which nine passengers were sucked out. Aircraft returned safely to Honolulu.						
Mar 10	F-28 Mk.1000	Air Ontario	Dryden, Ontario, Canada	Takeoff	21 / 3	65 / 4
Aircraft crashed and burned following takeoff in a snowstorm.						
Jun 7	DC-8-62	Surinam Airways	Near Zanderij Int'l Airport, Paramaribo, Surinam	Final Approach	166 / 9	177 / 9
Aircraft crashed when it undershot runway during approach in darkness and fog.						
Jun 17	IL-62M	Interflug	Schonefeld Airport Berlin, East Germany	Takeoff	20 / 0	103 / 10
Takeoff was aborted and aircraft overran across a road into fields. Aircraft wing struck a water tank and fire broke out, spread and destroyed the aircraft.						
Jul 19	DC-10-10	United Airlines	Sioux City, Municipal Airport Sioux City, Iowa, U.S.	Cruise & Landing	110 / 1	285 / 11
Number two engine suffered uncontained fan disc failure, fragments of which severed hydraulic lines, resulting in loss of flying controls. During emergency landing, a wing contacted the runway and the aircraft cartwheeled, broke up and caught fire.						
Jul 27	DC-10-30	Korean Air	Tripoli Int'l Airport, Tripoli, Libya	Landing	68 / 4	182 / 18
Undershot on landing in thick fog and collided with two houses and several cars. Six people on the ground were also killed.						
Sep 3	B-737	Varig	Near Sao Jose do Xingu, Brazil	Cruise	12 / 0	48 / 6
Aircraft became lost because of an apparent navigational error and ran low on fuel. Aircraft made a successful emergency belly landing but sustained substantial damage.						
Sep 20	B-737-401	USAir	La Guardia Airport, New York, U.S.	Takeoff	2 / 0	55 / 6
Aircraft overran runway following an aborted takeoff, hitting a pier and finally coming to rest in the river.						
Oct 21	B-727-224	TAN/SAHSA	Near Tegucigalpa, Honduras	Approach	129 / 3	139 / 7
Aircraft flew into a mountain while positioning for an approach during daylight with precipitation, low clouds and strong gusting winds.						
Oct 26	B-737-209	China Airlines	Near Hua-lien, Taiwan	Climb	47 / 7	47 / 7
Aircraft flew into the side of a hill after making an incorrect turn during the initial climb. The accident occurred during rain and darkness.						

Scheduled Commercial Passenger Turboprop Flights

Feb 3	Fokker F-27 Mk 600	Burma Airways	Near Mingaladon Airport Rangoon, Burma	Takeoff	23 / 3	25 / 4
Aircraft took off and entered fog. It veered left and collided with a tree. A fire broke out on impact, destroying the aircraft.						
Mar 8	Shorts 330	Olympic Aviation (Olympic Airways)	Mt. Kerkis, Samos, Greece	Approach	31 / 3	31 / 3
Aircraft flew into a hillside while preparing to land in daylight, with thick fog.						
Apr 10	Fairchild FH227B	Uni-Air	Near Valence, France	Approach	19 / 3	19 / 3
Aircraft flew into the side of a mountain during darkness with rain and light mist.						
May 8	Beech 99	Holmstroem Air	Virkvarns Airport, Oskarshamn, Sweden	Final Approach	14 / 2	14 / 2
Aircraft reportedly stalled, entered a steep bank and crashed.						

Date	Aircraft Type	Operator	Location	Flight Phase	Fatalities Pass/Crew	Total Occupants Pass/Crew
Jun 11	Twin Otter 300	Aerotaca	Caribabare, Columbia	Approach	6 / 0	18 / 2
Aircraft flew into a hillside in poor weather, following a previous landing attempt.						
Jun 28	BAe 748 B Super 2B	Cameroon Airlines	Yaounde, Cameroon	Landing	1 / 2	43 / ?
Aircraft crashed at runway end during attempted go-around in bad weather.						
Jul 21	Twin Otter 300	Talair	Near Porgera, Papua, New Guinea	Climb	1 / 2	20 / 2
On departure, the aircraft made a steep climbing right turn, veered left and crashed into trees.						
Aug 15	AN-24	CAAC	Hongqiao Airport, Shanghai, P.R. China	Takeoff	28 / 6	34? / 6?
Aircraft overran runway into river.						
Aug 25	Fokker F-27 Mk. 200	Pakistan Int'l Airlines	Missing between Gilgit & Islamabad, Pakistan	Cruise	49 / 5	49 / 5
Aircraft disappeared en route.						
Sep 15	Twin Otter 300 PK-NUE	Merpati Nusantara Airlines	Missing between Manokwari & Bentuni Irian Jaya, Indonesia	Approach?	19 / 3	19 / 3
Aircraft failed to arrive at Bentuni on completion of a flight from Manokwari. The last contact with the flight, ten minutes before it was due to land, was routine.						
Sep 23	Dornier 228-201	Vayudoot	Near Pandharpur, India	Cruise	8 / 3	8 / 3
Aircraft crashed into a reservoir behind a dam, reportedly at a steep dive angle.						
Sep 26	Metro III	Skylink Airlines	Terrace-Kitimat Airport, Terrace, British Columbia, Canada	Approach	5 / 2	5 / 2
Pilot may have broken off an approach to begin a go-around. Aircraft struck tree tops, went out of control, and crashed. Accident occurred in daylight, but with fog and smoke present.						
Sep 27	Twin Otter 300	Grand Canyon Airlines	Near Grand Canyon National Park, Ariz., U.S.	Landing	8 / 2	19 / 2
Aircraft landed in normal touchdown zone, bounced, and pilot attempted a go-around. Aircraft struck wires and trees and crashed.						
Oct 28	Twin Otter 300	Aloha Islandair	Halawa Valley, Molokai, Hawaii, U.S.	Cruise	18 / 2	18 / 2
Aircraft flew into high ground in darkness.						
Dec 26	Jetstream 31	NPA	Pasco, Washington, U.S.	Approach /Landing	4 / 2	4 / 2
Aircraft went down in a field just short of the runway and burst into flames.						

Non-Scheduled Commercial Passenger Jet Flights

Feb 8	B-707-331B	Independent Air	Mt.Pico Alto, Santa Maria, Azores	Approach	137 / 7	137 / 7
Aircraft flew into a mountain while positioning for visual approach in daylight.						
Sep 3	IL-62M	Cubana	Havana, Cuba	Climb	115 / 11	115 / 11
Aircraft crashed into a residential area shortly after takeoff at night with heavy rain strong gusting winds. Fourteen people on the ground died.						

Non-Scheduled Commercial Passenger Turboprop Flights

Sep 8	Convair 580	Partnair	Off Hirtshals, Denmark	Cruise	50 / 5	50 / 5
Aircraft crashed into the sea.						
Nov 21	An-24	Aeroflot	Near Tyumen, USSR	Approach or Landing	28 / 6	36 / 6
Reportedly crashed in poor visibility.						
Dec 21	C-130 Hercules	Bolivian Air Force	Near Guayavamerin, Bolivia	Takeoff or Climb	16 / 8	18 / 10
No further details.						

Occurrences Involving Sabotage, Hijacking or Aircraft Being Shot Down: Commercial Passenger Flights

Jun 18	An-26	Ariana Afghan Airlines	Near Zabol, Iran	Cruise /Landing	6 / 0	35 / 5
During attempted hijack, copilot was shot in the shoulder and a rear door was opened, making control difficult. A forced landing was made on an unsuitable strip and the aircraft overturned.						

Date	Aircraft Type	Operator	Location	Flight Phase	Fatalities Pass/Crew	Total Occupants Pass/Crew
Jun 28	Fokker F-27 Mk 600RF	Somali Airlines	Near Hargeisa, Somalia	Climb	24 / 6	24 / 6
Terrorists claimed to have brought down the aircraft with a missile; this has not yet been confirmed.						
Sep 19	DC-10-30	UTA	Massif de Termit region, Niger	Cruise	155 / 15	155 / 15
In-flight explosion.						
Nov 27	B-727-21	Avianca	Near Bogata, Columbia	Climb	10 / 6	10 / 6
In-flight explosion.						

Scheduled Commercial Freight Jet Flights

Feb 19	B-747-249F	Flying Tigers	Puchong, near Kuala, Lumpur, Malaysia	Final Approach	0 / 4	0 / 4
Aircraft crashed into steep terrain.						
Mar 18	DC-9-33RC	Evergreen International Airlines	Near Saginaw, Texas, U.S.	Takeoff/ Approach	0 / 2	0 / 2
Crew declared an emergency shortly after taking off and advised air traffic control that a cargo door was open and that they were returning. Aircraft crashed into open ground while turning onto final approach.						

Non-Scheduled Commercial Freight Jet Flights

Mar 21	B-707-349C	Trans-brasil	Near Guarulhos Int'l Airport, Sao Paulo, Brazil	Final Approach	0 / 3	0 / 3
Aircraft undershot the runway in daylight and good weather. Eighteen people on the ground were killed.						
Apr 26	Caravelle 11R	Aerosucre Colombia	Near Barranquilla, Colombia	Initial Climb	2 / 3	2 / 3
Aircraft lost altitude and crashed into houses shortly after takeoff. Two people on the ground were also killed.						
Oct 20	Il-76	Aeroflot	Near Leninakan, Armenia, USSR	Approach	7 / 10	7 / 10
Aircraft crashed into a mountain.						

Commercial Freight Turboprop Flights

Jan 12	BAe (HS) 748 Srs.2A	Bradley Air Services	Near James M. Cox Int'l Airport, Dayton, Ohio, U.S.	Climb	0 / 2	0 / 2
Aircraft climbed to 1300 feet, then turned right and descended into the ground.						
Feb 6	Merchantman 952F	Intercargo Service	Provence Airport, Marseille, France	Initial Climb	0 / 3	0 / 3
Aircraft climbed to about 50 feet before veering to the right and crashing.						
Jul 31	Convair 580	Air Freight NZ Corp/Fieldair Freight Ltd.	Auckland Int'l Airport, Auckland, New Zealand	Takeoff	0 / 3	0 / 3
Aircraft hit ground beyond the departure end of the runway. Accident occurred at night.						
Prior to Oct 4	An-32	Aeroflot	Cherigovskaya, Oblast (region), Ukraine, USSR	Unk	9 total	9 total
No further details.						
Oct 24	Mitsubishi MU-2B-60	Besit	Near Sardinia, Italy	Cruise	0 / 2?	0 / 2
Aircraft crashed into the sea.						
Nov 5	H.P. Herald 401	Aerosucre Columbia	Near Chaparral, Tolima, Columbia	Cruise	3 / 3	3 / 3
Aircraft flew into a mountain in darkness and heavy rain.						
Nov 27	L-382E Hercules	Tepper Aviation?	Near Jamba, Angola	Approach or Landing	? / 5	? / 5
No further details.						

Other Selected Major Jet and Turboprop Accidents Involving Commercial Operators

Feb 9	TU-154B2	Tarom	Otopeni Airport, Bucharest, Romania	Takeoff or Climb	0 / 5	0 / 5
Crew training flight. No further details.						

Date	Aircraft Type	Operator	Location	Flight Phase	Fatalities Pass/Crew	Total Occupants Pass/Crew
Mar 15	YS-11A-300F	Mid-Pacific Air	Near Purdue University Airport, Lafayette, Indiana, U.S.	Final Approach	0 / 2	0 / 2
Positioning Flight. On final approach, aircraft crashed short of runway.						
May 6	Embraer 110P1 Bandeirante	Southern Express	Mount Pleasant, Tennessee, U.S.	Approach	0 / 1	0 / 2
Positioning Flight. Crashed on approach in fog.						
Jul 21	BAC-111	Philippine Air Lines	Manila International Airport, Manila, Philippines	Landing	0 / 0	91/ 7?
Scheduled passenger flight. Aircraft overran across a road, struck cars and killed eight of the cars' occupants.						
Dec 28	An-24	Tarom	Near Bucharest, Romania	Cruise	1 / 6	1 / 6
Positioning flight. No further details.						

Accident/Incident Briefs

Ice in the Intake Causes Close Call

de Havilland DHC-8: No damage. No injuries.

The aircraft had arrived at the Newfoundland airport in the late evening and remained on the ramp overnight awaiting a scheduled flight the next morning. The flight crew installed plugs in the engine air intakes. Weather during the night included snow, freezing rain and rain accompanied by high winds. Temperature varied near the freezing point.

The aircraft departed shortly after 1000 hours the next morning on a scheduled IFR flight. One minute 19 seconds after takeoff in visual conditions, as the aircraft was passing through 1,800 feet, the twin-engine STOL aircraft suffered a flameout of the right turboprop engine. The crew secured the engine and prepared to return to the airport.

Two minutes 50 seconds after the right engine failed, the left engine also flamed out. The captain selected a frozen lake surface as a forced landing site because the aircraft was still beyond gliding distance to the airport. However, five seconds after it had failed, the left engine came back to life and, within the next 17 seconds, had returned to full power. The pilot completed a successful approach and landing at the airport. The aircraft was towed to the ramp.

Later analysis suggested to investigators that the engine flameouts were caused by ice in the inside bottoms of the intakes that had formed when the high winds blew away the intake covers and allowed precipitation to enter. About three hours after the flight crew had installed the intake covers the night before, ground personnel had found the covers and reinserted them along with rubber material to secure them from the wind. The flight crew was not notified that the covers had been off during the night, and when they arrived for the mid-morning departure there was no visible ice or snow anywhere on the aircraft. The crew did not question the reason for the rubber material that helped secure the plugs. In addition to the normal preflight inspection, the captain did an engine runup to check for ice buildup on the propeller spinners and experienced no telltale vibration. The engine air intakes were observed to be clear, but the bottoms of the intake chambers were not visible—this was where the precipitation had settled and frozen into a sheet of ice about an inch and a-half thick.

After the takeoff, when airspeed increased during climbout,

the suction of the passing air dislodged some of the ice in the intakes. The front half of the ice in the right-hand intake broke away and disrupted the airflow enough to cause the engine to flame out. Since the ignition switch was in the normal position there was no possibility of an automatic engine relight.

Fortunately, while the crew was securing the right engine, part of the procedure included selecting manual ignition for the left-hand engine. When ice in that intake gave way, the left-hand engine also flamed out, but it relit automatically because the ignitors were on. Had the right engine flamed out below 1,000 feet, according to the aircraft operating procedures then in effect, the ignition on the left engine would not have been turned on and it would not have relit.

As a result of the investigation's findings into this incident, the carrier and others instituted procedures for the ignition on Dash 8 aircraft to be left in the manual position during takeoffs and landings. This was also recommended by the Canadian Aviation Safety Board which stated that the incident might have been prevented had the ignition switches been in the manual position before the ice broke free.

This incident had the multiple factors that so often lead to accidents: weather, mechanical factor (intake plugs), communications failure, assumption (flight crew did not question "modified" intake plugs, overlooked ice (that would have required a ladder to see) and automatic ignition was off.

Confusion over Flame Causes Consternation

Boeing 727: No damage. No injuries.

The air carrier aircraft had just landed and was beginning to taxi to the gate. In accordance with standard procedures, the second officer attempted to start the auxiliary power unit.

A malfunction occurred during attempts to start the APU, which caused the unit's exhaust to torch twice. The resulting flames were visible to passengers seated on the right-hand side of the aircraft, several of whom shouted "Fire!" Two aft flight attendants initiated an emergency evacuation. However, the aircraft was in motion with the engines running.

The captain received the first hint of what was happening when the chimes sounded, and the aft airstair and two door-open lights illuminated. He immediately stopped the aircraft and shut down the engines. When they determined that the fire alarm was false, the cockpit crew, flight attendants and ground personnel used voice commands to stop the evacuation.

Resultant actions included a review of proper identification of APU torching with emphasis on communications with the flight deck prior to initiating an emergency evacuation when an unknown condition exists.

Where Did the Runway Go?

Boeing 727: No damage. No injuries.

The air carrier was on an ILS approach to the Nova Scotia airport during the December evening. The weather was slightly above the limits required for the front-course approach. When the aircraft reached decision height, the captain had visual contact with the full length of the approach lights and the green threshold lights.

During the landing flare, however, the pilot encountered an unexpected reduction in visibility and had difficulty tracking the runway centerline. He made a heading correction for what he perceived to be the needed crab angle. During the landing roll, the aircraft's left outside tire struck three runway edge markers on the left side of the runway. The markers were situated between 2,200 and 2,600 feet from the runway threshold.

Later investigation revealed that the night approach was normal until the aircraft crossed the runway threshold and began its flare. While the pilot was correcting for the crosswind, the aircraft entered an area of reduced visibility and he lost his visual alignment cues. A weather observation 16 minutes after the aircraft touched down indicated that the visibility had deteriorated rapidly at the airport, which is subject to variable Atlantic coastal weather conditions. The conditions include rolling, wind-blown fog banks that cause differing visibilities across the airport. In this case, the edge of reduced visibility was so sharply defined that the transmissometer for the active runway was not affected.

The pilot received no warning of the reduced visibility, since the official reported weather and the RVR reading indicated more than a half-mile visibility. The Runway 24A RVR reading decreased from 2,400 to 1,700 feet within the four minutes before the aircraft touched down. Had the pilot been aware of this information, he might have been alerted to the presence of a local fog bank.

Takeoff Emergency

In Wilderness

Piper PA-23: Aircraft destroyed. Fatal injuries to six.

The six-seat light twin was taking off from a remote airport in northern Quebec, Canada. The purpose of the flight was to carry five construction workers home from a project.

Approximately 30 seconds after liftoff, the aircraft was observed to suddenly turn back toward the airport and crash into a wooded area just off the runway. The aircraft was demolished, and the five construction workers and the pilot were killed. Weather was reported as not being a factor.

Mountain Encounter In Heavy Weather

Handley Page H.P.R. 7 Herald: Aircraft destroyed. Fatal injuries to six.

On a stormy Sunday night, the aircraft was carrying a cargo of Monday newspapers over mountainous terrain in Colombia. Weather included heavy rains and floods.

At approximately midnight, the twin-engine aircraft crashed into a mountain. The aircraft was destroyed and the three crew members and three passengers all received fatal injuries. Efforts to retrieve the bodies of the victims and the wreckage of the aircraft were hampered by the stormy weather.

Problems During Foggy Approach

Piper PA-32 Lance: Aircraft destroyed. Minor injuries to one.

The aircraft was carrying cancelled checks and commercial paper. There was only the pilot on board the pre-dawn November flight that was approaching an airport in North Carolina, U.S.

Fog was thickening as the pilot reported difficulty on final approach. Air traffic control lost radar contact with the aircraft. One of the airport's two runways was closed and a search begun, but the aircraft was not immediately found. The thick fog had reduced visibility to the point that no arrivals or departures were permitted during the hour that the runway was closed.

The aircraft was found in a densely wooded area two and a-half miles short of the runway. The wings had been torn off as the aircraft went through the trees, but the fuselage went between them and the pilot was able to evacuate with minor injuries. The aircraft caught fire and it and the cargo were destroyed.

.

Did I or Didn't I?

Piper PA-34: Moderate damage. No injuries.

The pilot had made a go-around after the first landing approach, retracting the landing gear in the process. He prepared for another landing attempt.

The aircraft landed with the landing gear retracted. There was no fire and no personnel injuries. The pilot exited the aircraft without trouble, but the aircraft sustained damage to both propellers, the underneath of the engine cowlings, fuselage and flaps.

During a review of the mishap, the pilot insisted that he had selected the gear down position of the landing gear control prior to the second landing attempt. However, an examination of the gear mechanism failed to reveal any fault with the system.

But I Saw the Three Green Lights

Piper PA-34: Moderate damage. No injuries.

The pilot of the business twin was receiving currency training. During a simulated engine-out situation in the traffic pattern, the pilot receiving training had lowered the first stage of flaps. On base leg, according to the instructor, he selected gear down. The instructor later

noted that he felt the gear go down and saw the three green lights.

The pilot turned to final approach, lowered the second stage of flaps and made a normal call, including a mention of three "greens" which the instructor confirmed. The aircraft configuration seemed ideal to the instructor. The pilot rounded out at a height of approximately 10 feet, yawed the aircraft to align it with the runway and reduced power.

The aircraft landed gear up. The crew reported later that the landing gear apparently folded and the aircraft settled onto its belly. There was no fire and the two occupants were able to evacuate the aircraft without injury. The aircraft sustained damage to the underside of the fuselage, the left flap, the propellers and the nose gear doors.

Examination of the aircraft revealed that it had first contacted the runway with the landing gear fully retracted and with one stage of flaps extended. After the aircraft was raised on jacks, power was applied and the gear extended normally. No malfunction of the system was found after numerous extension-retraction cycles.

Distraction Bugaboo Strikes Again

Cessna 152: Moderate damage. No injuries.

The solo student pilot was completing the second leg of a qualifying cross-country navigation practice flight. During the landing, the touchdown was normal; however, after rolling approximately 150 feet, the aircraft bounced back into the air.

There were two more bounces after which the aircraft touched down hard. The nose wheel collapsed and the aircraft came to rest on its nose. The pilot exited the aircraft without injury. There was no fire, but the aircraft suffered damage to the nose gear and the propeller.

Later discussion determined that the pilot had selected the incorrect frequency and was in intermittent contact with approach control. The resulting confusion on the part of the student pilot was considered by him and his flight instructor a distraction that may have been a factor in the landing incident.

Go-Around Ends in Overshoot

Piper PA-38 Tomahawk: Major damage. No injuries.

A student pilot was receiving dual instruction and was at the controls during a landing approach to a grass runway. The approach and touchdown were without incident. However, during the roll-out, the aircraft drifted to the left.

The instructor added full power to begin a go-around and the student raised the flaps. Almost immediately, the pilots felt a jolt and the aircraft became airborne. The stall warning sounded briefly and the instructor took over the controls. He held the aircraft in level flight while he checked that full power was set and flaps were up. However, the aircraft could not be prevented from sinking into bushes in the overrun area. The aircraft came to rest damaged beyond economical repair. There was no fire, and the engine, fuel and electrical switches were shut off. After an initial delay during which they had difficulty opening the door, the instructor and student evacuated the aircraft without injury.

Easy on the Brakes

Piper PA-20: Minor damage. No injuries.

The pilot was approaching a grass runway with a crosswind of about five mph from the left. He added power to clear a slight hill near the approach end of the runway, and subsequently arrived at the touchdown phase further along the runway and with more airspeed than was normal.

The pilot applied what he later described as "heavy braking" to avoid overrunning the landing area. Approximately 50 feet from the end of the runway, when the aircraft was at a speed of about 10 knots, the right brake failed. Since the pilot was still applying heavy braking, the aircraft veered sharply to the left, ran off the runway and came to rest in a ditch. There was no fire but the aircraft sustained damage to the propeller and the left wing. The pilot evacuated the aircraft without injury. He later attributed the brake failure to

fading because of overheating from the heavy braking action during the rollout.

Roller Coaster Thrills Pilot

Cessna 182: Damage to internal structure. No injuries.

The pilot made a normal approach and touchdown on the grass runway. However, during the rollout, after the speed had dissipated to about 40 knots, the aircraft encountered undulations on the runway surface. These caused the aircraft to porpoise and it became airborne again for a short distance. The aircraft touched down nosewheel first before the pilot could bring it under control.

Examination of the aircraft revealed that it had sustained severe damage to the front bulkhead, the nosewheel fitting had separated from the bulkhead and the aircraft's lower structure and skin had buckled. There also had been minor ground contact by the propeller.

Other pilots who operated regularly at the airport were aware of a hump approximately 75 feet beyond the normal touchdown area. The airport operator reportedly agreed to level the runway surface to eliminate the hump.

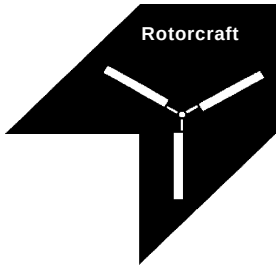
Third Bounce No Charm

Morane Saulnier Rallye 150: Substantial damage. No injuries.

While the pilot was on final approach, he allowed himself to become distracted by an aircraft that took off in front of him. As a result, he arrived at the point of roundout with his airspeed slightly slow, and experienced a sink rate that he was unable to correct before the wheels contacted the runway surface. The aircraft bounced to a height of five feet, landed on all three wheels simultaneously and bounced again. When the aircraft had slowed to between 15 and 20 knots after the third touchdown, the nose gear collapsed.

Heavy Helo Has Departure Problem

Enstrom 280C: Extensive damage. No injuries to three.



The helicopter had landed at the private landing area earlier in the fall day and was preparing to depart in mid-afternoon. The aircraft was close to its maximum gross weight and the wind from the north was described as light.

According to the pilot, the aircraft was brought to a hover into the wind and checked that all instrument indications were within proper limits. Turning to an easterly heading, the pilot moved the aircraft about 30 feet and turned to a southerly heading for departure. He noticed that the rotor rpm was low during acceleration so he added full power. This failed to restore the rpm and, since the terrain beneath the helicopter was unsuitable for landing, the pilot tried to increase the rpm by forward movement. However, the landing skids passed through the top of a hedge and the helicopter descended heavily onto plowed ground. Concerned that the aircraft might tip forward, the pilot raised the collective pitch lever in an attempt to fly to firmer terrain. Within approximately 30 feet, the aircraft impacted sloping ground and rolled onto its side.

The pilot and two passengers were able to evacuate the helicopter through the passenger door without injury. The aircraft sustained extensive damage to the main rotor blades, the engine and gearbox and received minor damage to the tail rotor and side panels.

Pilot's Pocket Snags Collective

Robinson R22: Extensive damage. No injuries.

The pilot, the helicopter's only occupant, was making a landing. He was turning the helicopter to the right, into the wind, in order to hover at a height of about 10 feet after having made a slightly crosswind approach.

When applying collective pitch to enter the hover, the pilot felt some resistance to movement of that control. While checking the instruments to see how much power he had, the rear section of the helicopter's right-hand landing skid caught on the ground and the rotorcraft

rolled over.

There was no fire and the pilot safely departed the aircraft through the left cockpit window after shutting everything down. The aircraft sustained substantial damage. The likely cause of the earlier resistance to the collective control movement was attributed to interference by the pilot's clothing.

Sudden Entry Into Fog Bank

Robinson R22: Aircraft damaged beyond repair. No injuries to two.

The pilot and one passenger were flying at 500 feet when they encountered a sudden deterioration in visibility. The pilot was not qualified or experienced in flying in instrument meteorological conditions, so he decided to land as soon as possible.

After selecting a suitable precautionary landing site, the pilot began an approach. At a height of about 50 feet, fog patches further reduced the visibility and the pilot lost contact with the ground. The helicopter landed on the inclined roof of a barn next to the intended landing spot. The pilot tried in vain to control the helicopter, but it rolled over and fell to the ground. There was no fire and the two occupants were able to evacuate the aircraft without injury.

Student Did Not Relinquish Controls

Robinson R22: Substantial damage. Minor injuries to one of two.

During a pre-solo lesson, the instructor was demonstrating an engine failure to the student. Beginning at a height of 300 feet at the edge of the airfield, the instructor applied full carburetor heat and lowered the collective pitch lever. The aircraft entered autorotation and descended normally.

The helicopter was flared at a height of approximately 50 feet when the instructor realized that the student had raised the collective lever. The instructor stated that he had control of the aircraft, but he experienced difficulty in overcoming control inputs being made by the student. As a result, the helicopter made ground contact, yawed to the right and rolled onto its left side. There was no fire.

The instructor, who had received a minor head wound from hitting the left door assembly, shut down the engine and electrical switches before he was helped from the aircraft by the student. The helicopter sustained extensive damage to the landing skids, fuselage, tail boom and the main rotor.

Extra Hand on Controls Foils Demonstration

Robinson R22: Extensive damage. No injuries to two.

The lesson for the mid-morning flight was quick stops, which the instructor pilot was demonstrating to the student. After hover practice, the lesson maneuver was demonstrated into a wind of about 12 knots. When he accomplished the maneuver, the student exhibited a tendency to allow the aircraft to gain height. While at a height of approximately 35 feet, he turned downwind in preparation for another quick stop. After the student did this a second time, the instructor wanted to demonstrate the hazard of turning downwind at too low an airspeed.

The instructor demonstrated the effects of low rotor rpm and the ensuing overpitching from a low hover into the wind. Then he showed a downwind transition from a hover of approximately six feet, and emphasized the sink that resulted and the extra power that was required to counteract it. During this demonstration, the rotor rpm began to drop and overpitching resulted. The instructor attempted to recover by lowering the collective pitch lever, but he experienced a conflict with the student who was trying to arrest the rate of descent by attempting to raise the same control lever.

Before the instructor could gain control of the collective, the lever was raised even further and the rotorcraft struck the ground and bounced. The left skid collapsed and the aircraft rolled onto its side, damaging the side of the fuselage and destroying the main rotor. There was no fire. The two occupants were able to exit without injury. ♦