Model Airline Safety Program

The author introduces a picture of what he considers an ideal airline flight safety program should be, including a definition of flight safety, the 21 safety functions which were recommended by the Technical Committee of IATA, several organizational considerations, and three safety inhibitors. The conclusion stresses the need for safety professionals to work together to determine a consensus of the future course of safety departments and programs.

by

Captain David A. Simmon, Jr.

(Presented at Flight Safety Foundation's 41st International Air Safety Seminar in Sydney, Australia, December 1988)

This discussion incorporates my thoughts about a model airline flight safety program and is not meant to reflect the safety program of my employer, United Airlines, or any particular airline's safety program. It is, rather, about what an airline's safety program should be; what it can be; a safety manager's Christmas list, if you will.

The purpose of this paper is to produce a document which contains the views and opinions of the world's professional safety managers. It is, in effect, a "Straw-Man" of the ideal safety organization. I would like to express my appreciation to the many professional safety managers of the world's airlines and, in particular, to the members of the Safety Advisory Committee of IATA, for their opinions and input into this paper.

This paper only covers **flight** safety programs and does not deal with either ground safety programs or maintenance quality assurance programs.

In early 1988, the IATA Technical Committee, which is the senior body addressing operational safety concerns on behalf of the membership of over 160 airlines, recommended that all airlines should establish a safety department, managed by a professional safety officer and accomplishing certain key flight safety functions.

Each of these functions will be covered in some detail, after which I will discuss organizational considerations and some safety inhibitors. But first, let us start with a definition of what Flight Safety should mean to a typical airline.

What Is Safety?

If you ask 10 different people what Flight Safety means to them, I expect you will get 10 different answers. One chief pilot I know feels that keeping the airline safe is the responsibility of the Flight Safety Department, leaving him free to manage his line operation without worrying about safety details. At the other end of the centralization-decentralization scale is the chief executive officer (CEO) of an airline who feels that safety is so important that it is a required part of every employee's job responsibility and that a dedicated Flight Safety Department is not necessary.

While each of these views contains an element of truth, they fail to capture an essential safety aspect which is red**undancy.** Safety **is** redundancy — that extra layer of protection to ensure important safety actions are accomplished and that nothing falls through the organizational cracks. Safety is much like an umbrella insurance policy which **supplements,** not replaces, the basic coverage.

Of course, the chief pilot is responsible for the safety of his operation. The safety department should also provide the necessary overview to bring deficiencies to his attention, and to assure that critical safety items are accomplished. The CEO is to be commended for his views about the importance of safety, but his views that a flight safety department is not necessary can only be supported in a perfect world where everything is done correctly. The fact is that it isn't and probably never will be. As long as humans (who make mistakes) are involved in aviation, we will need that extra layer of redundancy.

Redundancy is central to all areas of aviation safety. One pilot **flies** while another **monitors**. Cockpit Resource Management (CRM) programs stress teamwork to ensure that an individual failure does not result in a crew failure. A controlled flight into terrain accident will not occur unless there is a simultaneous failure of four independent safety systems: (1) the pilot flying, (2) the pilot not flying, (3) the ATC controller, and (4) the GPWS system. Redundancy in management is no different — important safety functions need to be backed up by a department whose **primary function is the safety of flight.**

Now let's look at some of the ways a flight safety department can provide that extra layer of protection to keep the operation safe:

Safety Functions Categorized

I have grouped the following 21 safety programs into four major categories which are:

- Accident Prevention Programs
- Collection/Analysis/Communication of Safety Information
- Technical and Training Liaison
- Emergency Response Procedures.

While all of the areas are important, special emphasis needs to be placed on the accident prevention programs since safety's goal is always to strive to be more **pro-active** and less **reactive**.

Accident Prevention Programs

1. Independent internal investigation of incidents and accidents with provisions for appropriate safety recommendations to management.

I feel that this is the single most important Flight Safety program for any airline. A good investigation program will typically yield two to three specific cor-rective recommendations for each investigation and, additionally, provide numerous accident prevention scenarios for communication to the pilot group. A wealth of statistical information will also be available for future analysis to aid in improving various train-ing programs.

2. Comprehensive safety training programs focused on specific safety objectives.

Training is the cornerstone of any accident prevention program. Sometimes, however, these training programs become fragmented and lack a central focus. This is especially true in large organizations where the responsibility must be delegated to a large number of people. This problem can be easily overcome, however, by assembling the safety and training people, periodically, to identify problem areas, determine specific safety objectives and develop coordinated, focused training programs. These programs should identify a measurement criteria which can be used to monitor the success of the program or indicate the need for revision and additional emphasis.

3. Flight data recorder exceedance program.

The area which holds most promise for the future of accident prevention is Digital Flight Data Recorder (DFDR) programs. Most of the improvements in this technology have been driven by accident investiga-tion requirements rather than accident prevention needs. Hopefully, this will change in the future as advances in computers and artificial intelligence will open new possibilities for accident prevention through human factor improvements. Many airlines, with the cooperation of their pilots, have very suc-cessful DFDR exceedance programs today.

Without question, the investigative need for more sophisticated parameters will increase in the future, es-pecially when one thinks about hypersonic, fly-by-wire aircraft constructed of composite materials and utilizing augmented stability. Our challenge will be to find a way to **prevent** accidents with DFDR equipment rather than just determine what happened.

4. Airfield inspection program.

Although airport managers and station managers do a good job of providing the flight crews with a safe environment in which to operate, there is a need to verify the airports condition on a periodic basis and from a pilot's point of view. These inspections are particularly important when new stations are added to the operation or whenever new people without much operational experience are assigned as station managers.

These inspections typically take most of a day and cover areas like a test of the Company Emergency Response Procedures, CFR capability, Airport Emergency Exercises, Signage, FOD program, Wildlife and Bird Control Programs, accuracy of airport charts, proposed new construction, and specific operational problems reported to the Flight Safety De-partment by the flight crews.

5. Management objectives to reverse undesirable safety trends.

The flight safety department can be of considerable help to senior management by developing, recommending and tracking management safety goals. These safety goals should apply to various levels of management and will serve to focus attention on specific problem areas. While the goal for fatal or hull loss accidents will always be zero, the goal for other less significant areas can be calculated as a reduced percentage of the last two to three years' experience.

6. Overview function utilizing appropriate safety assurance and quality assurance programs.

These programs are, simply, the process by which the Flight Safety Department encourages other depart-ments to look at themselves and to make appropriate safety improvements in the operations. For example, in 1987, we issued a letter of concern to our Flight Dispatch Department about long-range dispatching and fuel validation procedures. This letter generated a study within the Dispatch Department that resulted in improved procedures and documentation.

Today, this process is very subjective, but in the future it probably will be supplemented by formalized quality control and safety assurance programs. The concept of safety assurance which combines risk assessment and system safety in the human factors area is an important future development effort.

Collection/Analysis/Communication of Safety Information

7. Flight safety data bases.

Data bases are, of course, a key part of any safety department's activities. At United, the Flight Safety Department maintains two separate data bases: (1) a Captain's Report data base in which we process about 200 reports a month, and (2) a Flight Safety Investigation Data Base in which we categorize all of our significant investigations.

The problem with most data bases, by the way, is that they are too complex, manpower intensive, expensive and not user-friendly.

8. Internal analysis of safety trends and periodic reviews with senior management, including the CEO.

Of course, keeping millions of binary digits in a black box does not improve safety at all unless someone analyzes the data and presents it to someone else with the authority to make changes. At United, the Flight =Safety Department analyzes the data, produces a written quarterly report, and presents a briefing to senior management for action.

9. Periodic reviews with crew member unions.

Unions are a valuable source of safety information and it is important to earn the cooperation of the pilots and flight attendants in safety programs. Joint meetings with safety, training, and engineering departments should be held on a periodic basis.

10. Confidential crew member incident reporting system.

No matter how hard we try to separate safety from the disciplinary side of our airlines, there will always be a perception among some crew members that a safety report could be used against a crew member. Therefore, it is essential that a confidential incident reporting system be established to guarantee anonymity to the submitter. When these reports are received, they should be de-identified, researched, answered in writing, and distributed to both management and employees.

11. Participation in industry safety activities.

The mutual exchange of safety information among one's peers in the industry is a valuable resource and an essential safety activity. The list of worthwhile organizations is extensive and should include The Safety Advisory Committee (SAFAC) of the International Air Transport Association (IATA), various ATA committees like the Flight Systems Integration Committee (FSIC) and the Aviation Safety Committee, the International Society of Air Safety Investigators (ISASI), the U.S. National Aeronautics and-Space Administration (NASA), the International Civil Aviation Organization (ICAO), the U.S. Federal Aviation Administration (FAA), numerous accident investigation authorities, several excellent safety schools, and, of course, The Flight Safety Foundation.

I have not listed many organizations outside the United States because of lack of personal knowledge. They are, however, no less important.

12. Communication to crew members of the appropriate safety information.

An effective communication program is essential to any airline's safety program. There is not any one best communications vehicle. All media should be used, including safety bulletins, safety magazines, audio-visual presentations, posters, bulletin boards, incident summaries, informal briefings, accident analysis, and special publications.

Safety communications should not be limited to just the safety department since communication is truly a team effort. Technical publications from the engineering department, training safety bulletins, training and procedural bulletins from the fleet captain, and letters from the chief pilots, and the VP of flight operations are all part of an effective safety communications program.

Technical and Training Safety Coordination

13. Liaison between operations, maintenance and training departments on safety issues.

Maintaining an overview and effective coordination between Operations and Maintenance/Training is an important safety function. This should not be interpreted as a lack of trust of either maintenance or training, but rather an indication of openness and a willingness to always consider an independent operational safety viewpoint.

For example, the flight safety department at United has a person stationed at the maintenance base. He attends all maintenance briefings, tracks chronic aircraft write-ups, represents the operational viewpoint on a number of issues and provides maintenance personnel with another avenue to surface safety concerns.

14. Monitoring the contents of cabin safety information cards and video tapes.

While the production and distribution of safety information cards and video tapes may be accomplishedby various departments, it is important for the Flight Safety Department to control the content and approve the final product to insure that the safety message is not obscured by marketing considerations.

15. Supervision of evacuation and ditching demonstrations required by appropriate authorities.

This safety function requires a coordination of efforts between Maintenance, Flight Operations, Cabin Services, Emergency Procedures Training and the appropriate national authority.

16. Aircraft safety equipment user requirements.

The large amount of safety equipment installed on aircraft today requires a coordinated effort to be effective and to satisfy the needs of the users. By obtaining a consensus of representatives from Flight Safety, Cabin Services, Emergency Procedures Training, and Engineering, the best solution will be found.

17. Overview of all emergency training and procedures for flight and cabin crews.

The key to effective emergency procedures training is to assign the responsibility for both cabin and cockpit emergency procedures training to one department so that pilots and flight attendants will receive coordinated training. This is accomplished within the flight operations training departments of most airlines. Toensure that the training produces the desired results,flight safety should overview the process.

Corporate Emergency Response Procedures

18. Development and maintenance of a corporate emergency response procedures manual.

Since every accident is different, no one can really become an expert in managing an aircraft disaster. It is clear, however, that the response will be much better if the procedures and processes are thought out in advance and committed to writing in a Corporate Emergency Response Procedures Manual. This effort will require a significant corporate commitment involving a coordinated response from at least fifteen different departments. A typical manual will require at least six man-months to write.

19. Testing and validation of all corporate emergency response procedures.

A manual, of course, isn’t any good unless people are trained to use it. Flight Safety’s responsibility is to assess the degree of readiness of each department and to ensure that appropriate corrective actions are taken. This generally takes place in two levels of validation. A departmental procedural review is useful to identify problems and the need for remedial action. Finally a corporate-wide drill is needed to ensure that all departments’ actions are coordinated.

A corporate-wide exercise must go into considerable detail to be of value. If only the call list is exercised, you will only know that the telephones work. In a recent exercise at United, over 700 man-hours were spent in planning for the exercise which contained 31 separate sub-scenarios. This exercise, however, has produced numerous improvements to the plan.

20. Participation in airfield emergency exercises.

Participation in these exercises, which are required under ICAO Annex 14, provides a valuable opportunity to assess the state of preparedness of the various airfields, the local disaster plan and the coordination with local company management.

21. Liaison with accident investigation authorities.

Coordination with the accident investigation authority during an accident will be much smoother if a good working relationship is developed before the fact. Additionally, these organizations have excellent statistical data bases and can usually furnish real-time incident information to the airline.

Flight Safety Organization

Now, let us look at the organizational structure needed to accomplish the above functions. Although there are a number of variations which may be appropriate for individual airlines, certain basic principles apply.

It is difficult to establish hard rules for staffing because of individual variances between airlines. For example, at United Airlines, our flight safety investigations are initially conducted at the Training Center and then reviewed, modified, and released by the Flight Safety Department. Part of the manpower, then, comes from the Training Center and the Flight Safety manpower would be understated if compared to an airline that accomplishes its investigations totally within the Flight Safety Department. Nevertheless, here are some recommendations for the staffing of a typical Flight Safety Department. As previously stated, these numbers do not include ground safety functions or quality control functions within the Engineering and Maintenance Departments. Note that most of the numbers are variable and are a function of the number of departures per year:

- 1 Manager
- 1 Secretary
- 1 Flight Safety Investigator for each 250,000 departures
- 1 Engineering Representative for each 500,000 departures
- 1 Data Coordinator for each 500,000 departures
- 1 Cabin Representative for each 500,000 departures
- 1 Clerk if more than 500,000 departures
- 1 DFDR Specialist for each 500,000 departures

A key person in the Flight Safety Department is the flight safety investigator. This individual should have a degree in science or engineering, be a graduate of an approved safety school, have two to five years of safety work experience, and be a pilot with at least 2,000 hours of heavy jet experience.

The engineering representative provides the interface with the engineering and maintenance department and must be a fully qualified staff engineer plus having enough piloting experience to be sensitive to the operational viewpoint of the flight crews.

The cabin representative should have line experience as a flight attendant and be thoroughly familiar with the responsibilities and procedures of flight attendants.

The data coordinator position also requires special qualifications. This person must have enough piloting experience to be able to read flight crew technical reports, summarize them in clear language, and input the data into the data base. Additionally, this individual must be able to write fourth generation query programs against the data base in order to produce the necessary management reports.

Since safety covers so many different areas, it is important to centralize the responsibilities within one or two departments. Care must be taken not to allow sub-safety departments to spring up throughout the organization. This leads to turf problems, inefficiencies, and a fragmented approach which prevents important functions from being accomplished. Two types of safety organizations seem to have evolved among the world's airlines, both of which appear to be working well. Some airlines have separate ground safety and flight safety departments while others combine the two into one safety department.

While rank, position, and status arguments are usually self-serving in nature, there is an important reason why they should be considered in safety. An airline sends an important message to all employees, the industry, the press and the public, with the title it places on safety department employees. The title, per se, is not as important as the relative position within the company. For example, if the head of the training department is a director, then the head of the safety department should be a director. Since cockpit human error is responsible for approximately 80 percent of worldwide hull losses, it is particularly important for the head of the safety department to be one notch higher than either the domicile chief pilots or the training fleet captains.

An airline can strongly influence the safety of the operation by establishing the correct reporting relationship of various departments. If the safety department is to provide an overview of all operations and maintenance, it naturally follows that it should report to the senior operations executive who is responsible for these functions. In small airlines this will usually be the CEO. In large airlines where the CEO may not have the time to be directly involved in the daily operations, it will usually be a senior or executive vice-president of operations.

The separation of checking and line operations is another very important organizational safety consideration. As previously mentioned, nearly 80 percent of the worldwide hull losses are due to cockpit crew error. This clearly drives the requirement that airlines must establish **objective** training and checking programs with a high degree of standardization. Unfortunately, some airlines still have a strongly decentralized flight operations organization under the control of the domicile chief pilot which tends to promote a "Good Old Boy" type of organization. If instructors or check airmen report to the chief pilot, the objectivity of the quality control process may be compromised. While strong-willed individuals may overcome this problem, the tendency always will be there. The following are three excerpts from a recent FAA inspection of a strongly decentralized airline in the United States:

> "The team found a lack of organization, coordination, standardization and discipline in the cockpit that can be attributed to minimal guidance in the flight manu-als and a lack of direction from those

> who develop, supervise and manage flight training and standardization programs."
>
> "A review of crew member records certified by line check airman indicates little or no deviations from normal procedures on line checks. In fact the majority of the annual line check certifications contained only remarks such as 'good flight.' Reports contained discrepancies of crew coordination, standardization and discipline on nearly every en route inspection, leading them to conclude line check airmen are not fulfilling their responsibility."
>
> "Proficiency check airmen are not recording failures when they occur, instead they are omitting grades on the check forms and recording the checks as incomplete."

I believe that this element of quality control is so important that training and checking functions should be separated from the line pilots by at least one additional management layer above the domicile chief pilot.

Safety Inhibitors

Along the road to ensuring a safe operation, some inhibitors may surface. These problems generally reflect a failure of senior management whose responsibility is to provide a safe, effective, and harmonious work environment. The safety manager must, nevertheless, become involved since the safety of the operation may be seriously compromised.

Excessive **internal politics** is the antithesis of safety because it distracts from the real task at hand. Indecision stemming from political concerns can paralyze an organization for months or even years. Over-concern about rank, who reports to whom, personal prestige, who is right instead of what is right for the organization, salary and benefits, appeasing others instead of doing what is right for the safety of the operation, and personal aggrandizement are all indicators of trouble ahead.

When these conditions exist, the safety manager must become involved and try to develop strategies to divert attention away from politics and back to the business of flying airplanes safely from departure to arrival station.

The corporate **accountant** is another safety inhibitor. Although money changers, accountants, and chief financial officers have been around for centuries, their influence in the airline industry has increased dramatically since the arrival of deregulation. Some accountants look at safety departments as another expense which must be reduced to the lowest possible cost.

Zero based budgeting, return on investment (ROI) requirements, challenges of every expense item, excessive paperwork, and across the board cuts are all part of their bag of tricks. They will find an airline with a one-man safety department and ask you why you can't do the same; disapprove a program they don't understand; or, decline an invitation to even learn about a new safety program.

The answer, of course, is to learn to play their game. The accountants are only doing their job. We, the safety managers of the world's airlines must become more aggressive. Learn how to justify everything! Don't go to your boss with your hat in hand and ask if you can have more people. Instead, find an airline that has a program you need, copy it, and put it in your budget with the necessary justification and manpower. Then, let them turn you down if they must. Don't let the accountants pull you down to the lowest common denominator; rather find the airline with the best safety program and use it to pull yourself up to the highest level of safety. This stair-step approach has been used effectively for decades by unions with great success. Let's use it for **safety.**

The last safety inhibitor is **reactive management.** In the final analysis, safety is little more than being pro-active instead of reactive. Unfortunately, it is easier and more natural to be reactive than pro-active. It is easier for a manager to just delegate a problem to a subordinate, then it is to think out possible solutions, discuss the assignment with the subordinate, review the work processes and finally reach the agreed-to best solution. It is easier to just talk about something than it is to commit it to writing, and then revise it again and again. It is easier to leave something to judgment than to think it out in advance and establish the appropriate policy, standards, procedures and guidelines. It is easier to react to a problem than it is to prevent it in the first place. It is easier, but it is not b**etter** or more **effective** or **safer** or the **right thing to do.**

The safety manager's final responsibility is, then, to urge, persuade, encourage, support and motivate everyone involved with the safety of flight to become more pro-active.

Whose Job Is It?

If your organization does not have a flight safety department, I hope you will start one. If your flight safety department does not accomplish all of the functions, I hope you will add to the list.

Finally, I hope you will agree that it is our responsibility, the safety professionals of the world, to determine the future course of safety programs and Safety Departments. It is unrealistic to expect CEOs, or even vice presidents of flight operations, to understand the problems, challenges, details or benefits of safety programs. Our job is to present senior management with the facts so they can make informed decisions. Individually, there is not much any one of us can do; together, there is not anything we cannot accomplish. ♦

Reports Received at FSF

New Books:

Annual Index/Abstracts of Society of Automotive Engineers Technical Papers. 1987. ISBN 0-89883-635-2.

Includes subject and author indexes to technical papers, transactions and special publications.

Jane's Aerospace Dictionary. 2nd edition. 1986. ISBN 0-7106-0365-7.

Entries cover aerospace disciplines such as data processing, materials science, electronics, meteorology, and medicine. Also has acronyms, telecommunication codes, equations, electronic equipment designations.

Jane's All the World's Aircraft. 1987-88. ISBN 0-7106-0850-0.

Current products of the world's aircraft manufacturers, civil and military.

Chapman, Robert P. Pilot Fatigue — a Deadly Cover-up. 1st ed. 1982. 244p. ISBN 0-6824-9900-5.

". . . pilot and crew fatigue as a major cause of air crashes. (Airlines must be) as concerned about flight crew working conditions as . . . about productivity."

Reports:

Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1982. Final Report. R.A. Delucia and J.T. Salvino, Naval Air Propulsion Center. July 1988. Report No. DOT/FAA/CT-88/23. 30p.

This report presents statistics relating to 161 gas turbine engine rotor failures which occurred during 1982 in U.S. commercial aviation service use. Rotor fragments were generated in 88 of the failures and, of these, 16 were uncontained. The predominant failure involved blade fragments. Seven disk failures occurred and all were uncontained. Seventy percent of the 161 failures occurred during the takeoff and climb stages of flight.

Statistics for the Engineer. 1963 (Reprinted May 1982). Society of Automotive Engineers, Inc. SAE/SP-63/250. 45p. ISBN 0-89883-128-8.

Table on Contents: How to Summarize Data, Significant Differences, Linear Regression Analysis (Two Variables), Analysis of Variance.

Properties of Aircraft Tire Materials. Richard N. dodge and Samuel K. Clark, University of Michigan. October, 1988. SAE 881358. 6p.

Design of Crew Rest Quarters. Werner Loffler, Lufthansa German Airlines. October, 1988. SAE 881366. 5p.

Obstacles to Performance. Robert O. Besco. Professional Performance Improvement, Inc. October, 1988. SAE 881369. 5p.

The Emergence of Satellite Communication for Commercial Aircraft. George A. Cobley, Rockwell International. October, 1988. SAW 881370. 7p.

Results of the AIA/ATA/FAA Dynamic Seat Testing Program. James L. Webster, Sr., Jean A. McGrew and William H. Shook, Douglas Aircraft Company. October, 1988. SAE 881375. 5p.

Measurement of Dynamic Reactions in Passenger Seat Legs. Van Gowdy and Richard F. Chandler, FAA Civil Aeromedical Institute. October, 1988. SAE 881376. 7p.

Discussion of Transport Passenger Seat Performance Characteristics. S.P. Desjardns, Mark R. Cannon and S. Joseph Shane, Simula Inc. October, 1988. SAE 881378. 9p.

Effects of Aircraft Size on Cabin Floor Dynamic Pulses. Caesar A. Caiafa and Lawrence M. Neri, Federal Aviation Administration. October, 1988. SAE 881379. 15p.

Assessment of Pilot Workload During Boeing 767 Normal and Abnormal Operating Conditions. A.H. Roscoe and B.S. Grieve, Britannia Airways. October, 1988. SAW 881382. 5p.

The Effects of High Information processing Loads on Human Performance. Diane Damos, Univ. of Southern California. October, 1988. SAE 881384. 4p.

Near Midair Collision Incidents and Midair Collision Accidents

A near midair collision (NMAC), is defined as an incident in which a collision hazard exists between two or more aircraft because the separation of all aircraft involved is less than 500 feet, or because one or more of the pilots report that a collision hazard existed. After a report is received, the U.S. Federal Aviation Administration (FAA) will initiate investigations and analyze all related events for the purpose of developing recommendations to reduce the number of occurrences. After NMAC incidents are investigated, the FAA classifies the incidents into the following categories by its severity:

Critical - A situation where collision avoidance was due to chance rather than an act on the part of pilot. Less than 100 feet separation would be considered critical.

Potential - An incident which probably would have resulted in a collision if no action had been taken by either pilot.

No hazard - When direction and altitude would have made a midair collision improbable, regardless of evasive action.

Unclassified -An incident in which no hazard was assigned.

Table 1 presents the distribution of near midair collision reports by severity of hazard since 1981.

Table 1 - Distribution of Near Midair Collisions by Severity of Hazard

	Critical	Potential	No Hazard	Unclassified	Total	Monthly Average
1981	84	233	76	0	375	31
1982	56	191	64	0	311	26
1983	97	284	85	9	476	40
1984	127	316	116	31	589	49
1985	170	395	136	76	777	65
1986	162	473	197	8	840	70
1987	181	582	259	37	1,059	88

In the beginning of the decade, only about 375 NMAC incidents were reported. The annual reports increased to 777 in 1985 and jumped to 1,059 in 1987. Annually, an average of 75 percent to 80 percent of the reports were classified in the ‘critical’ and ‘potential’ categories and about 20 percent to 25 percent in the ‘no hazard’ category. Although the NMAC reports in recent years increased substantially, it should be noted that at least a portion of the increase in NMAC reports can be attributed to improvements in the NMAC reporting procedures and a renewed emphasis on reporting of NMAC incidents.

The ratio of involvement of air carrier, military and general aviation aircraft in the NMAC reports differs annually. On the average, near midair collisions involving two air carrier aircraft accounts for about four percent, between two military aircraft accounts for about six percent; involving one air carrier and one military aircraft about five percent. The conflict involving two general aviation aircraft, or one general aviation and one airline aircraft, or one general aviation and one military aircraft accounts for about 85 percent.

Because of the possibility of a near midair collision turning to a real collision, the substantial increase of NMAC incidents stimulated the public concern over the possible increase of midair collision accidents. Annual frequency of midair collision accidents occurred before or after the 1981 air traffic controller strike, as shown in Table 2, were fluctuating between 12 and 35. It appears that there is no obvious upward or downward trends.

However, an analysis of the five-year rolling average of total midair collisions shows that midair collision accidents declined from 30 in the 1976-1980 period, to 23 in the 1983-1987 period. The fatal midair collision accidents declined from 19 to 13 in the corresponding periods. Apparently, the frequency of NMAC incidents and the midair collision accidents was not in positive proportion.

Note that midair collision accidents involving two general aviation aircraft accounted for 87 percent; the collisions in which general aviation aircraft were involved accounted for 98 percent. The last midair collision in the United States involving a large U.S. air carrier aircraft was over San Diego, CA, in 1978; the last midair collision in the United States involving a foreign airline was over Cerritos, CA, in 1986. In these two years, the fatalities involving midair collision accidents were exceptionally high.

Table 2 - Mid-Air Collision Accidents
U.S. Civil Aviation
1975 - 1987

	Accidents			No. of Accidents by Segments of Aviation Involved								
Year	Total	Fatal	Total Fatalities	121 and GA	S135 and S135	S135 and GA	N135 and N135	N135 and GA	GA and GA	GA and USMil	GA and Forgn	GA and Not Reg
1975	29	13	47			1		1	26	1		
1976	31	24	64			1		2	27	1		
1977	34	17	41					1	33			
1978	35	23	189	1					33	1		
1979	26	14	34		1			3	21	1		
1980	24	19	55				1	2	20	1		
1981	30	13	47			1	1	2	25	1		
1982	29	18	59			1	1	1	25	1		
1983	12	7	22					1	10	1		
1984	25	14	47			1			24			
1985	25	14	36				2		19	2	1	1
1986*	29	17	136						27	1	1	
1987*	23	11	35			3		2	17	1		
	352	204	511	1	1	8	5	15	307	10	4	1

121 - FAR Part 121 operators, including all national and regional airlines
S135 - FAR Part 135 operators, all scheduled service, including all commuters
N135 - FAR Part 135 operators, all non-scheduled service, including all on-demand air taxi
GA - general aviation
US Milt - U.S. military
FORGN - Foreign aircraft
Source: NTSB *Preliminary

To reduce the danger of midair collision, the FAA recently adopted a new rule requiring increased use of altitude-reporting (Mode C) transponders in the airspace around 138 of the nation's busiest airports. The Mode C transponder is an electronic device on an aircraft that transmits its position and altitude to the air traffic controller. Currently, the altitude-reporting transponder is required only on aircraft operating in 23 TCAs, which are blocks of restricted airspace over the 27 most heavily trafficked airports.

Effective July 1, 1989, the new regulation requires use of Mode C transponder:

• Above 10,000 feet mean sea level.

• Within a 30-mile radius of the 27 airports in 23 terminal control areas (TCAs), regardless of altitude and regardless of whether the aircraft is flying inside the TCA.

• In all airspace from the ceiling of a TCA up to 10,000 feet.

Effective December 30, 1990, Mode C equipment also will be required:

• Within and above all 109 Airport Radar Service Areas (ARSAs).

• Within a five-mile radius of certain other designated airports (only two at present) from the surface to 10,000 feet, and within a radius of five to 10 miles from 1,200 feet to 10,000 feet.

According to FAA estimates based on the most recent survey, there are about 35 percent or 95,000 of all general aviation aircraft, including air taxi and commuter air carrier aircraft, equipped with Mode C transponders. Balloons, gliders and airplanes without electrical systems which cannot support a Mode C transponder, will not be allowed to operate in a TCA or ARSA or in the airspace above those areas up to 10,000 feet mean sea level.

U.S. Civil Aviation Accident Trends

U.S. Air Carrier

In the first nine months of 1988, U.S. air carriers (exclusive commuter and air taxi) recorded 26 accidents, two of which were fatal, accounting for a total of 15 fatalities. These 26 accidents and two fatal accidents are very comparable with 25 accidents and three fatal accidents in 1987, but the 15 fatalities are significantly lower than 161 recorded in 1987. U.S. commuter air carrier and air taxi in the same period recorded 99 accidents, 26 fatal accidents and 61 fatalities as compared with 92 accidents, 28 fatal accidents and 67 fatalities in 1986. It appears that the safety performance for commuter and air taxi in the current year has no significant changes over its preceding year.

U.S. General Aviation

Also in the first nine months, U.S. general aviation recorded 1,803 accidents, 320 of them fatal, resulting in 579 fatalities. Table 1 shows that total accidents, fatal accidents and fatalities recording in the first nine months of 1988 decreased slightly over those occurring in the same period of 1987. The statistics further reveal that the improvement trends prevail almost in each operation category.

Table 1 — U.S. General Aviation accidents, fatal accidents and fatalities by kind of flying January thru September

	1987			1988		
Kind of Flying	Total	Fatal	Fatalities	Total	Fatal	Fatalities
Annual Total*	1,988	325	601	1,803	320	579
Personal	1,264	221	410	1,150	220	426
Business	137	34	65	125	39	65
Corporate/ Executive	14	4	10	3	0	0
Aerial Application	167	10	10	140	9	10
Instructional	271	26	58	250	22	37
Other	143	34	58	143	28	41

* Column may not add to the annual total because midair or ground collisions which could be counted more than one accident in each operation category if the aircraft involved were all general aviation aircraft.

A Decade of Improvement in General Aviation Flying

In the past decade, general aviation aircraft overall accident rates decreased from 12.9 (per 100,000 aircraft hours) to 8.25 or 36 percent; fatal accidents decreased from 2.09 to 1.45 or 30 percent. However, an analysis of general aviation safety performance by aircraft type reveals that the safety performance of one type aircraft improved more significantly than another type aircraft. The following Table 3 shows the safety performance of general aviation aircraft by type aircraft for calendar year 1977 and Table 4 shows that for calendar year 1986 (the accident data for 1987 are incomplete for such an analysis). Note that in terms of number of active aircraft in 1977, one in 44 general aviation aircraft was involved in accidents, and one in 267 was involved in fatal accidents. The number increased to 82 and 445, respectively in 1986. The improvement of safety performance for jet aircraft is the most significant. Its .87 accident rate and 0.18 fatal accidents rate (per 100,000 aircraft hours flown) in 1986 are more than three times better than those for turboprop. The rates for turboprop are almost two-times better than those for all piston-engine aircraft, which in turn, are far better than that for rotorcraft.

Table 2 — U.S. General Aviation Accidents and Rates
By Aircraft Type
Calendar Year 1977

Aircraft Type	Accidents Total	Accidents Fatal	Active A/C 3/	Hours Flown (000) 4/	Ratio 1/ Total	Ratio 1/ Fatal	Rate 2/ Total	Rate 2/ Fatal
Single-engine piston	3,383	587	147,300	24,328	44	250	13.9	2.41
Multi-Engine piston	417	30	18,136	4,297	44	604	9.7	0.70
Turboprop	27	7	2,890	1,326	107	412	2.0	0.53
Turbojet	12	3	2,277	911	189	759	1.3	0.33
Rotorcraft	250	33	4,726	1,703	19	143	14.6	1.94
Glider, Etc.	75	5	3,616	270	48	723	27.7	1.85
Overall	4,164	665	177,541	32,077	43	267	13.0	2.07

1/ The ratio of one aircraft involved in accidents per number of aircraft.
2/ Number of accidents per 100,000 aircraft hours.
3/ Active aircraft are estimated by the FAA, based on the annual General Aviation Activity and Avionics Survey. The term of "active aircraft" is referred to those aircraft which flew at least one year in a calendar year.
4/ Hours flown were estimated by the FAA based on the annual survey.

Table 3 — U.S. General Aviation Accidents and Rates
By Aircraft Type
Calendar Year 1986

Aircraft Type	Accidents Total	Accidents Fatal	Active A/C 3/	Hours Flown (000) 4/	Ratio 1/ Total	Ratio 1/ Fatal	Rate 2/ Total	Rate 2/ Fatal
Single-engine piston	2,062	356	169,175	21,263	82	475	9.8	1.71
Multi-Engine piston	191	54	20,503	3,493	107	379	5.5	1.54
Turboprop	35	12	4,637	1,345	132	386	2.6	0.89
Turbojet	14	3	3,967	1,654	284	1,322	0.87	0.18
Rotorcraft	191	39	5,465	1,689	28	140	11.3	2.31
Glider, Etc.	92	10	7,010	394	76	701	8.7	1.61
Overall	2,585	474	210,757	29,511	82	445	8.7	1.61

1/, 2/, 3/ & 4/ see Table 2

However, it should be pointed out that the above comparison of safety performance between fixed-wing aircraft and rotorcraft in terms of aircraft exposure may not be relevant because fixed-wing aircraft and rotorcraft are two entirely different type of aircraft; their operational procedures and flight environments, as well as functions are also different; rotorcraft perform more takeoffs and landings in per average hours than the fixed-wing aircraft. If the safety performance for rotorcraft is measured by another safety yardstick, such as takeoff/landing, the findings are entirely different. Following Table 4 shows a comparison of accident rates of general aviation fixed-wing aircraft and rotorcraft by operations (takeoff and landings). Note that both accident rate and fatal accident rate for rotorcraft in terms of operations is superior than that for fixed-wing aircraft.

Table 4 — Total Accidents and Fatal Accidents Fixed-Wing Aircraft vs. Rotorcraft

	Accidents	Fatal	Operations@	Rate Total*	Rate Fatal*
Fixed-wing aircraft	2,394	435	82,116,000	2.95	0.529
Rotorcraft	191	39	7,911,000	2.41	0.492

* Rate per 100,000 operations
@ The number of operations is derived from the FAA General Aviation Activity and Avionics Survey, Annual Summary Report 1986 Data.

Accident/Incident Briefs

Air Carrier

False Alarm

Pakistan - August

Boeing 747: No damage. Minor injuries to four of 442 passengers.

Landing at Karachi in rain after a flight from Islamabad, the Boeing 747 pilot had difficulty applying the brakes effectively. Consequently, the aircraft stopped within 20 feet of the runway threshold.

In the meantime, the control tower twice reported that there was a fire in one of the engines, so the airplane was evacuated when it came to a stop. One passenger broke an arm and three others sustained minor injuries during the emergency.

After the airplane was evacuated, an examination revealed that there had not been a fire in any of the engines. The airport was closed for three hours and several other flights had to be cancelled.

Engine Failure After Takeoff

Ethiopia - September

Boeing 737: Aircraft destroyed. Fatal injuries to 31, various injuries to 71, two missing.

The aircraft carrying 104 passengers and 10 crew members was on a scheduled flight from Addis Ababa to Assab and had made a stop at Bahir Dar. Two or three minutes after takeoff from Bahir Dar, one engine failed apparently from bird ingestion, according to sources.

The pilot attempted to return to the airport but was unable to reach the runway so he put the airplane down on open land two miles short. The airplane hit the ground and burst into flames.

Approach During Thunderstorm

Thailand - September

Tu-134: Aircraft destroyed. Fatal injuries to 76; various injuries to six.

The air carrier was approaching to land at Bangkok's Don

Data reported in the accident/incident briefs on this and the following pages are based upon preliminary information obtained from agencies and organizations participating in the FSF Accident Prevention Program, as well as the news media. They are subject to future revision.

Muang International Airport during a thunderstorm. It was at 2,000 feet agl in line with the runway, and the pilot had requested permission to land, when it disappeared from the approach control radar display.

The Tu-134 crashed into a rice field approximately five miles short of the runway. Thai aviation authorities dismissed an initial report by the pilot, the only survivor not in critical condition, that the accident was caused by a lightning strike. Officials initially considered that turbulence associated with the thunderstorm may have caused the aircraft to lose altitude on final approach, along with a last-minute decision by the pilot to go around and avoid the thunderstorm and strong winds.

Baggage Cart Attack

United Kingdom - March

BAC 1-11: Extensive damage to wing. No injuries.

The airliner was being readied for push-back from the satellite terminal at Gatwick Airport prior to a scheduled departure. Weather was heavy rain and a strong, gusting wind at 25 to 35 knots.

Propelled by the winds, a nearby baggage cart rolled into the leading edge of the right wing, causing extensive damage. The cart's brakes were later tested and found to require adjustment; the brakes of the carrier's entire fleet of baggage carts were subsequently checked and adjusted.

De-ice, Delay, Disaster

United States - November

McDonnell
Douglas DC-9: Aircraft destroyed. Fatal injuriesto 25 passengers and three crew. Serious injuries to 27 passengers and crew member. Minor or no injuries to 25 passengers and 1 crew member.

In its final report on last winter's fatal takeoff crash of a DC-9 at Denver, the National Transportation Safety Board determined that the probable cause was "the captain's failure to have the airplane de-iced a second time after a delay before takeoff that led to upper wing surface contamination and a loss of control during rapid takeoff rotation by the first officer."

Contributing factors were listed as the absence of regulatory or management controls governing operations by newly qualified flight crew members and confusion that existed between the flight crew and air traffic controllers that led to the delay in departure.

The DC-9 was operating as a regularly scheduled flight between Denver and Boise, Idaho. It was cleared to take off following a delay of about 27 minutes after de-icing. Weather was moderate wet snow and fog, temperature 28 degrees F, dew point 27.

The takeoff roll was uneventful, but after a rapid rotation, the airplane crashed to the right side of the runway. The DC-9 was destroyed and 52 of the 82 persons aboard received fatal injuries.

The Safety Board report concluded that, since the aircraft was exposed to subfreezing conditions in a moderate snowstorm for about 27 minutes after it had been de-iced, portions of the airframe became "contaminated" with a thin, rough layer of ice. The NTSB noted that enough wet snow fell to dilute the de-icing fluid sufficiently for ice to again form. It also theorized that the re-icing could have been delayed if the airplane had been anti-iced with a full strength glycol application following the de-icing that had been done with a 38 percent solution.

Gear Tale

United Kingdom - January

Piper PA-31 Navajo: Left wing, propellor and nose area damaged. No injuries.

After takeoff from East Midlands bound for Belfast on a regular mail flight, the pilot was unable to raise the landing gear successfully. Despite several recycling attempts, the red in-transit light stayed on. The pilot then attempted to lower the gear using the emergency hand pump but was unsuccessful, so he diverted to Manchester where his company was based.

Circling Manchester at 6,000 feet, the pilot was able to obtain a green gear-down light for the right main gear and declared an emergency in anticipation of an accident during landing. At 2 a.m., an hour 20 minutes after takeoff, he did a fly-by and control tower personnel confirmed that the right main gear was down, the left one appeared to be up and the nose gear was difficult to see.

During a discussion with personnel from the airplane's operating company, the pilot agreed to a suggestion to fly lower in warmer air in case ice was a factor. After another hour and 20 minutes of flying in warmer air and maneuvering to force the gear down, the pilot made another fly-by but the gear situation had not changed.

With fuel running low, the pilot elected to land. He feathered the right engine crossing the runway threshold, turned off the master switch and made a gentle touchdown on the right main gear about a third of the way along the 10,000-foot runway. During the last 230 feet of its runout, the airplane's left wing was in contact with the runway surface. There was no fire and there were no injuries to the lone occupant. Aircraft damage was confined to the underside of the outer left wing, left side propeller tips, nose gear doors, pitot tubes and the boarding step.

After the airplane was placed on jacks in the maintenance hangar, examination revealed that when the airplane landed, the left gear was locked in the up position, the right main gear was locked down and the nose gear was unlocked. It was found that a major discharge of hydraulic fluid had occurred inside the right landing gear well area and that the hydraulic power pack reservoir was empty. The reservoir was refilled and fluid gushed from the right gear well, the source traced to a rupture in the flexible hydraulic hose leading to the gear-down actuator. The hole in the hose was located next to the raised edge of a doubler plate on the rear spar of the wing and there was no clearance in either the down or up positions of the gear. There also was considerable corrosion of the steel braid in the hose. When the hose was replaced and the hydraulic fluid refilled, the gear operated normally.

Examination of similar aircraft in the same fleet revealed other hoses with braiding corrosion and fraying from the spar doubler plate.

Continued Flight Into ...

United Kingdom - April

Cessna 172: Aircraft destroyed. Fatal injuries to three in aircraft and to two on yacht.

In a final accident report, the U.K. Civil Aviation Authority stated, "The accident was probably the result of the pilot continuing VFR flight into adverse weather conditions for which he was neither trained nor qualified."

The airplane had been on a flight from Antwerp to Exeter with three aboard. Although ATC communications with the pilot were satisfactory during the flight, it was noticed that the pilot had trouble handling non-routine messages.

The aircraft was flown at altitudes between 1,000 feet and 4,500 feet to avoid clouds that included layered stratocumulus up to 8,000 feet, with locally imbedded cumulus. As the airplane approached the Solent area, ATC requested that the pilot descend from 3,500 feet to 3,000 feet and to accommodate a rerouting, which the pilot accepted. Then, the pilot was asked to make a 110-degree turn to the right which he also accepted.

Shortly after that, the Cessna was observed diving out of low clouds, apparently fast and under power. It struck a yacht, and both airplane and boat disintegrated and sank. The three aboard the airplane and the two aboard the yacht were killed. Little wreckage was recovered.

Pointing to the pilot as the cause of the accident, the CAA noted that the maneuvers he carried out in cloud would have been conducive to spatial disorientation, with subsequent loss of control of the aircraft. The pilot had a Belgian private pilot license for VFR only and his total flying time was 469 hours, of which 65 hours were in type. He had flown 50 hours during the 90 days preceding the accident.

One safety recommendation as a result of the accident was that the CAA review existing publications which remind pilots that they are responsible for the safe conduct of their flight and that, other than when under positive radar control, ATC service is "purely advisory." The CAA agreed to this recommendation and also is considering the addition to written and oral tests of questions relating to the acceptance of ATC requests.

A recommendation that pilots tell ATC controllers when they want to remain VFR was not agreed to by the CAA because the increase in radio traffic and the need for controllers to monitor weather before giving heading and altitude instructions would be counter-productive. The CAA noted that pilots without instrument qualifications are aware of their limits regarding clouds and visibility; however, the agency agreed to emphasize in publications and safety promotion activities the need for pilots to operate within their license provisions and limitations.

That Critical Time

United Kingdom - October

Cessna 421B: Aircraft destroyed. Fatal injuries to six.

The aircraft departed from Stansted Airport bound for Tatenhill Aerodrome with six occupants including the pilot. Shortly after takeoff, the pilot reported a problem and stated his intention to return to the airport. He was cleared for a left-hand pattern and return. As the airplane turned left to enter the downwind leg, observers saw the bank increase suddenly and the airplane turn on its back before descending vertically into a wooded area adjacent to the airport.

A fierce fire occurred immediately upon impact and all six occupants were instantly killed.

The CAA accident report noted that the aircraft was near the maximum takeoff loading of 7,450 pounds, at which weight the maximum single-engine climb rate of 350 fpm can only be achieved with gear up, flaps up, failed engine propeller feathered and a five-degree bank towards the live engine. If the gear is down and the dead engine propeller is not feathered, a positive rate of climb is not possible.

Investigators noted that the landing gear of the accident aircraft remained down from takeoff to impact and, at the moment of impact, the failed engine was not producing power and its propeller was not feathered.

The pilot was believed to have had 500 hours total time, with 200 hours in type.

Other General Aviation

Accident Review - United States

Recently, the National Transportation Safety Board published the Annual Review of Aircraft Accident Data for U.S. general aviation during calendar year 1986, covering accidents involving U.S.-registered aircraft not conducting revenue air carrier operations. Here are the highlights:

In 1986, a total of 2,614 aircraft were involved in 2,581 accidents (there were 29 midair collisions and four on the ground.) The total number of accidents represented a 5.8 percent decrease from the preceding year and the number of fatal accidents was down by 5.4 percent; however, there was a 1.2 percent increase in fatalities. Although the total accident rate decreased 1.7 percent from the previous year, the fatal accident rate remained essentially unchanged.

The lowest fatal and non-fatal accidents among aircraft types were recorded for turbojets. The highest total accident rate was for reciprocating engine-powered rotorcraft at 14.96 accidents per 100,000 hours flown; this group also had the highest fatal accident rate (2.66 fatal accidents per 100,000 hours). Despite the high rate for reciprocating engine-powered rotorcraft among the various types, these statistics represent a 30 percent reduction from the previous year, to the lowest level on record.
The total accident rate is a 48.6 percent reduction from the average rate for the past 10 years.

For categories under kind of flying, the highest total and fatal rates appeared in the personal/business combination. During the reporting year, 70.9 percent of the aircraft involved in general aviation accidents and 81.5 percent of aircraft involved in fatal accidents were in this category.

Midair Over Bay

Australia - August

Two Piper Cherokees: Fatal injuries to four, serious injuries to two.

Two single-engine Piper Cherokee PA-28-180 aircraft collided outside of controlled airspace over Moreton Bay.

One of the aircraft crashed into the sea and the three occupants were all killed. The other aircraft was able to crash-land nearby; no injuries were reported to the two persons aboard.

Over Ocean Without Paddle

Scotland - August

Cessna: Aircraft presumably sunk. No reported injuries to two.

Two persons departed in a Cessna from Greenland bound for Iceland and lost their way en route. Then, they ran low on fuel. The airplane was spotted by an Icelandic search-and-rescue aircraft, and a Royal Air Force Nimrod guided the lost pilot to the nearest vessel. The Cessna was successfully ditched near the vessel, and its two occupants were picked up safely by the crew of the research vessel.

Deer Bags Airplane

South Africa - August

Rockwell Commander: Extensive damage. No injuries.

The aircraft was taking off at Malelane, eastern Transvaal, when it collided with a buck. The aircraft reportedly crashed and was damaged extensively but there were no injuries to the occupants. The fate of the buck was not reported.

Fog + Mountain = Trouble

Italy - September

Cessna 210: Aircraft destroyed. Fatal injuries to three.

The airplane with three tourists aboard had arrived the afternoon before from Bari, and took off from Turin's Caselle Airport in northern Italy shortly before noon. Four minutes after it took off for Luton Airport, controllers lost contact with the Cessna 210, but rescue operations were not launched until the airplane failed to arrive at its destination in the afternoon.

The area north of Turin Airport was searched by helicopters until rain and fog forced them to abandon operations. The next morning, a farmer sighted the wreckage some 30 miles north of the airport and notified the authorities. The dead pilot was found seated in the airplane and the bodies of the other two occupants were lying in the airplane's debris several yards away.

The heavy rain and fog that hampered recovery operations were considered causal factors in the crash.

Fly the Airplane

United Kingdom - October

Homebuilt: Aircraft extensively damaged. No injuries.

Shortly after the pilot took off from Shoreham, the side-opening canopy of the homebuilt airplane became unlatched.

While the pilot was absorbed in a struggle to hold the canopy closed, the airplane entered a descending right turn. Before he realized what was happening the homebuilt hit the ground and was extensively damaged. The pilot was uninjured.

The Civil Aviation Authority comment added to the accident report reminded all pilots "of the golden rule when an emergency occurs in flight — Fly the Aircraft. Then, when the aircraft is under control, the old adage says: Aviate, Navigate, Communicate — in that order."

Murphy Loves Hand-Proppers

United Kingdom - July

SV4 Stampe: Propeller destroyed. No injuries.

The owner-pilot had fueled his airplane and started the engine by hand-swinging the propeller. The engine started properly, he boarded and was strapping himself in for a flight when the engine began to run rough. When the pilot advanced the throttle to "catch" the engine, it stopped and he noticed that the fuel selector was in the off position.

The pilot turned the fuel selector to the on position and climbed out to again start the engine by hand-propping. The engine caught in spectacular manner since he had forgotten to reduce the throttle setting after trying to catch the faltering engine. With the burst of power, the airplane's tail lifted and the propeller hit the ground and was destroyed.

Hand-propping alone and without proper precautions is an invitation to trouble. The CAA comment stated that, if it is not possible to have someone else in the aircraft during hand-propping, the airplane must be properly chocked, the control column secured in the aft position and the throttle setting checked.

Rotorcraft

Crash Into Water

India - August

Unidentified: Aircraft presumably sunk. Ten passengers and crew presumed drowned.

The Indian Oil and Natural Gas Commission helicopter crashed into the Bay of Bengal near Pondicherry and one body later washed ashore. The rotorcraft was carrying 10 passengers plus crew, including five nationals from other countries.

'Foot' Got Caught

New Zealand - March

Hughes 269B: Aircraft destroyed. No injuries.

The helicopter pilot landed in a clearing covered with long grass to wait while a hunter gutted a recently shot deer. When the hunter was ready, the pilot planned to air taxi the rotorcraft over and attach the carcass to the hook for transport.

As the pilot lifted the helicopter off, the right skid got caught beneath a partially buried log that was not visible through the long grass. The Hughes rolled over on its right side and was destroyed. The pilot escaped unhurt.