The Devil's Advocate — Some Social and Economic Safety Problems Facing Airline Managers

Our present high level of safety must be continued despite economic constraints if public confidence is to be retained, says the author in this discussion of management approaches to aviation safety.

by

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As you realize, this is a very sensitive subject. Aviation safety has been the object of pro and con discussion for many years. Because of deregulation, the following observations will be limited to the U.S. aviation industry.

Those of us who are powerfully motivated by safety for airline operations often become impatient, aggravated and aroused with the delayed or negative response by management to safety recommendations from knowledgeable sources. Before we criticize we should try to understand management's reluctance or skepticism towards our efforts to achieve safety objectives.

Consider the American Indian's pertinent philosophy: "Great Spirit, grant that I may not criticize my neighbor until I have walked a mile in his moccasins."

Let's take a brief look at management's position. Incidentally, my personal experience in reasoning about safety initiatives with top officials has usually been productive. In some cases the issues had not come to their attention or had been understated.

Neutral or negative attitudes towards safety measures are not consistent with the way major airlines have achieved their current remarkable safety record of better than one fatal accident per million flights. Few people realize that numerous safety developments and techniques have originated with and have been initially financed by the aviation industry. To mention a few: engineering, medical and safety departments; flight data recorders; two way radio voice communication; air traffic control; ground position warning systems; flashing navigation lights; airborne radar; deicing techniques; airplane performance criteria; minimum weather criteria; flight planning; and, of course, the incorporation of flight attendants as part of the flight crew. These and many other industry-developed safety practices have built a cushion of operational safety upon which the industry relies today.

At times one airline would take the lead on adopting a safety measure against the wishes of others. This happened with the adoption of airborne radar.

However, the free market competition induced by deregulation compelled the airlines to review their costs. It is essential to realize that economic survival of an organization with thousands of employees is a tough management problem in a lean and sometimes mean competitive, capitalistic business world. Managers who endanger economic stability or fail to show shareholders the promise of dividends put themselves in jeopardy of losing their positions and reputations. They are likely to be replaced by managers who **will** take steps to improve economic survival.

On the other hand, variations exist in management approaches to improve safety or to economize, especially where astute management, even under deregulation, has resulted in economic success. For instance, the president of one large air carrier is pleading for **more** safety regulation to compel his competitors to spend as much money on safety as he does.

Airline operations continue to surprise many safety specialists by continuing to be statistically safer since de-

regulation than before. Management may be led to assume that there is very little, if any, difference between airlines that have had safety organizations, medical departments, large engineering staffs and those that have not.

The costs of such units and other non-required safety measures cannot be ignored in a competitive world. Management sometimes feels it is necessary only to comply with the minimum regulations required by the FAA or other government agencies. They tend not to recognize the U.S. congressional act which requires the airlines to operate with the "highest possible degree of safety in the public interest," a fine ethical statement, though difficult to define and difficult to achieve, unless the competitive airlines act in concert to assure compliance with improved safety practices above the required minimums.

Just as on a battlefield, when a commander tries to discover the intentions of the opposing forces, an understanding of the economic, political, and social forces that motivate managements' decisions looms as a logical imperative if we wish to capture their interest in a safety measure. Both management and employees have a common enemy which is the relentless force of gravity, quick to take advantage of any weakness in our defences against it.

An actual case will serve to illustrate a negative management attitude. It occurred 70 years ago with the world's first permanent system of scheduled air transportation: the United States Air Mail Service (for which I served as aeronautical engineer). The U.S. Post Office, to assure continuing financial support for the service, had to prove to a very skeptical U.S. Congress that air mail operation was dependable. This was before the development of instrument flying, before inflight verbal radio communication, before aviation weather service, before anti-icing techniques were conceived, and before redundancy of critical equipment such as multiple powerplants became safety policy.

The work horse of this service was the World War I British-designed de Haviland DH-4 light bomber biplane, fitted with one 400-hp Liberty engine. It was equipped with two 250,000-candlepower landing lights for night operations. One of these was slanted downwards to help the pilots to follow the railways or roads at night.

The Post Office, striving to prove reliability, issued an order that "the mail must go through." Of the first 40 pilots hired by the Post Office, 31 were soon killed in the line of duty. Much of this carnage was due to the psychological pressure exerted by the Post Office to fly regardless of weather. The Post Office officials belittled pilots' protests about flying in unsuitable weather even when pilots could not see across the field because of fog. A pilot's refusal to fly was considered to be his resignation from the service. To make a long story short, the U.S. Air Mail pilots went on strike.

This first strike in aviation history was called off after a few days when the Post Office agreed that if a field manager insisted on flight against the pilot's judgement, the manager was to make a circuit of the field himself if he was a pilot, or sit in the airplane's mail compartment while the pilot made a circuit of the field to prove or disprove his contention about local fog conditions.

This was told to me by one of the pilots involved in the deliberations, E. Hamilton Lee, now 96, who lives in San Bernardino, Calif. The air mail service established the basics of airline operation and in 1927, having proved the value of airline service, it was transferred to the newly organized Boeing Air Transport, now United Airlines.

Until 1978, the U.S. airlines operated under strict government control on assigned routes and fares that provided a profit. Since deregulation in 1978 and sometimes before, airline managements have been accused by aviation safety proponents of cutting corners on safety policies presumably to lower their costs of operation and to meet schedules.

Examples of actions taken by management to cut costs under deregulation include: limiting fuel reserves to minimum requirements; ignoring items on minimum equipment lists to satisfy the urgency to meet schedules; and, reducing turnaround time on long flights. Engineering staffs, medical departments and safety organizations have been reduced or abolished. Economic restraints have been put on maintenance. Management felt that such steps were necessary to stay in business.

We must recognize that safety is one of many management problems. Management is beset by numerous distractions in trying to attain the essential objective of producing goods or services at a profit or promise of a profit that will satisfy the shareholders. In airline operations, the product is a service measured by passenger miles coupled with high load factors, with reliability, comfort, care, and safety — in short, satisfied passengers. In accomplishing this, the CEO and his management must consider numerous laws and regulations; competitive rates, schedules, and competitive tricks; internal and external politics; monitoring operations; correcting mistakes; public relations; lawsuits; sabotage; industrial relations; budgets; and, constant fiscal pressure to optimize dividends or reduce losses.

With all these and other irritating distractions plus the maintaining of a good safety record, social responsibil-

ity may recede into the background. So when an executive is asked to invest resources for a safety measure that usually adds to costs and may not visibly improve productivity, it is understandable why he may respond impulsively and negatively in an era in which airlines have established an admirable statistically safe record.

Conversely, management should try to understand and have a genuine sympathy for the safety motivations of its employees and of reputable safety organizations. The flight crews in particular are in a good position to make safety suggestions. They serve on the front line of the struggle against the law of gravity and, as you well know, are the "first to arrive at the scene of an accident." Unions have been effective in focusing attention on safety issues, but management associates union activity with possible increased costs of operations and, therefore, at times tends to have a conditioned negative response to union safety suggestions.

And there is the overriding reality of very little, if any, difference in safety records between airlines that have safety, medical, and engineering departments and those that do not have them. But airlines quickly learn from each other. The technical data exchange is commendable.

Aviation veterans are often critical of a current group of new airline executives (the MBAs, the bankers, the financial operators) for their ignorance of operating doctrines and traditions that underlie air transport safety. This is not a great impediment if they are anxious to learn. Three greats in airline history were W.A. Patterson of United, a **banker**; C.R. Smith of American , an **accountant**; C.E. Woolman of Delta, an **agricultural specialist.**

One of the buzz words in high technology today is "systems management." The pilot in an airline is a systems manager of powerplants, controls, communications, and navigation systems. The chief executive officer of an airline is also a systems manager. But the systems he deals with are composed of people, not hardware. One responsibility is symbolized by wiring and flow diagrams, the other by organizational charts. Of the two, which do you think is the more difficult and complex to deal with?

Prior to deregulation, the airlines were indirectly indemnified through air fares for the costs of safety development, beyond the FAA requirements, by a judicious Civil Aeronautics Board (CAB) which was disolved during U.S. deregulation.

In addition to the small chance of suffering a fatal accident, airline management can rely on insurance for financial protection when a loss occurs. So it would seem that logic favors the cost-cutting operation and some degree of management complacency. There is also an economic limit to safety and how much the public is willing to pay for small increments of additional safety. For example, consider the cost of preventing a fire following a crash. If the anti-misting fuel technology to avoid crash fires had succeeded and had been adopted, it would have added an estimated $700 million a year to the cost of operating the U.S. jet fleet. A study has indicated that about 30 passengers per year might be saved from death.[1] This amounts to more than $20 million dollars per year to save one life if it worked in all crashes. For cost benefit studies, a value of up to $2 million may be placed on a life in the U.S.

Alternate, less expensive ways to meet a safety objective should be explored in the public interest but this does result in delays. Fortunately, a British development for the suppression of cabin fires using water mist promises a less expensive, if partial, solution. This justifies often-used pleas to delay a safety measure until further research is done an exercise in frustration.

The morality of placing a dollar value on life is questionable, but what is the alternative if a cost-benefit analysis is required to justify the expense of a new safety measure.

Cost-benefit safety studies are a self-defeating requirement because as safety improves and fewer people are killed or injured, it becomes increasingly difficult to show a dollar benefit for a safety installation. For example, in the case of anti-misting fuel, if the annual number of lives saved from crash fires were reduced from 30 to 15, the cost per life saved would rise to about $40 million per year instead of $20 million.

I have tried to illustrate how management may rationalize its tactics of procrastination on the adoption of safety measures: I suppose my list of management problems posed by time constraints, competitive pressures, fiscal pressures, politics, organizational pressures, that compete for attention with safety can be enlarged. But there are forces other than government oversight that, in varying degrees, will arouse management attention to safety. First I should like to observe that **cockpit** complacency has been blamed for many of the accidents and undesired events suffered by airlines, but one hears little or nothing about management complacency.

It might help safety if, when accident hearings are conducted by the U.S. National Transportation Safety Board (NTSB) or similar organizations in other countries, the first person to be called to testify should be the chief executive officer to describe his safety policies. Prof. Kenneth Andrews of the Harvard University Graduate School of Business Management has observed that "every accident, no matter how minor, results from a failure of organization."[2] (Of course, acts of God should

be excluded, e.g. clear air turbulence and bird strikes.) This pins responsibility on management. An accident is a reflection of management's ability to provide quality performance, of which safety is a derivative.

No executive wants to be accused of substandard-quality performance. But probably not many CEOs realize that safety is implicated in the "quality" of their operations. This could be stressed in safety discussions. And if a CEO thinks the cost of safety is too high, "wait until he has an accident," (in the words of Capt. Heino Caesar of Lufthansa). There is little doubt about the power of a fatal accident or even a serious near accident to overcome organizational complacency. But corrective measures taken after an accident occurs, known as "tombstone" safety, will not revive the fatally injured, reduce the suffering of injured survivors, fully reestablish public confidence, or repair a mutilated management reputation.

Legal and social forces, as well as high liability verdicts, are effective in persuading management to take a closer look at safety. Some years ago, the president of an airline was criminally indicted for allowing a case of hazardous chemicals to be loaded into one of his cargo airplanes. It resulted in a fatal accident that killed the crew. The packing case which had been transferred from another airline had not been properly labeled or packaged. It is difficult for me to fix responsibility for this misfortune on an executive sitting in an office far removed from the operation; nevertheless, it probably could be considered as an organizational failure for which the CEO can be held responsible.

The airline in question pleaded no contest and paid a large financial penalty. In another more recent case, societal pressure obliged the president of an airline to resign from his post following a fatal accident involving one of his Boeing-747s.

Manufacturers also are at risk. The project manager and safety engineer of a ship building company owned by an aerospace company were found guilty of criminal negligence in the death of 17 workers in 1971.

The magazine *Occupational Hazards* in the December 1984 issue reported on the criminal indictment of top officials of a film recovery plant who knowingly exposed an employee to fumes of sodium cyanide that resulted in his death. The officials were indicted and convicted. The article discusses several comparable cases in which corporate officials were held responsible for homicide or manslaughter. "Corporate officials," the article states, "are no longer totally immune from criminal charges."

Cost-saving measures brought on by airline deregulation, the threat of becoming embroiled in product liability, and the weakening of engineering departments have inhibited the progressive technical innovations that were so important to the development of aviation safety in the past. One large manufacturer of transport aircraft complains that it greatly misses the past input from airline engineering departments to improve the designs of its new transport aircraft.[3] To be fair to deregulation, the tightened economic pressures and practices were initiated in 1973, five years prior to deregulation, by the increased cost of fuel.

The current improvement in the financial condition of the major airlines may revive the important safety related departments that have been reduced or abandoned. It is worth noting that the airlines that did not have medical safety and engineering departments benefited from those that had them by the development of improved transport designs, medical information, and operational procedures.

I probably have understated the pressures, diversions, and logic that may give the impression of management procrastination in adopting safety measures. And we cannot ignore the very fine current rate of fatal accidents. There is another factor. The cost and weight of a single safety device may appear to be of little significance. But when multiplied by the number needed for a fleet of airplanes plus the cost of installation, cost of maintenance, cost of training, the sum may easily reach multimillions of dollars; if it malfunctions, the fleet may be temporarily grounded.

Of course, changes in procedures alone may be relatively inexpensive and should not be excused on a cost basis. An example would be the transfer of flight attendant training from the marketing division where the emphasis was on cabin performance with relaxed concern about safety, to the operations division of the airline for effective safety training.

The airline industry faces a great safety challenge in coming years. Remarkable technical innovations to improve the efficiency of operations are in the process of being adopted even though new techniques create uncertainty until the "bugs", if any, become visible and are corrected.

Among the new developments are the tilt-rotor aircraft, neutral stability coupled with fly-by-wire active controls, optical fibre replacing metal wiring, composite materials, multi-bladed propellers, ceramic powerplant parts, computerized systems for air traffic control (although with doubt about the reliability of software), sub-orbital supersonic operations (London to Hong Kong in less time than a Concord flight from London to New York), the replacement of operationally seasoned cockpit crews by relatively unseasoned crews, and satellites used for navigation, real-time weather information and communications.

The use of flight data recorders to detect departures from good practice before they result in accidents are among the important developments that should enhance safety and efficiency. Traffic is expected to double in the next ten years. The present record of less than one fatal accident per million flights for the major airlines is a superb, hard-won achievement. Nevertheless, the public perception of safety is based not on a good safety rate but on frequency of fatal accidents and numbers killed. With the doubling of air traffic and a **constant** safety rate, the number of fatal accidents could double; public confidence is then likely to deteriorate.

So, the great challenge facing the airlines is how to improve an already excellent safety record in an era of new technology and **doubling** of traffic. Cabin attendants will play a very important part in trying to attain one fatal accident in two million flights if public perception of safety is to be retained at the present level of less than one per million flights. Finally we should also include government induced accidents such as local curfew laws, noise abatement, and the psychological pressures on flight crews to meet schedule promises.

Cabin attendants are front line soldiers in the constant war against terrorism. They face the dual task of soothing passengers' latent anxieties which are constantly reinforced by terrorist acts, accidents, and the media. Cabin attendants must practice tranquil disciplined demeanor in the cabin in addition to performing the task of responding efficiently to emergencies.

The responses of cabin attendants in the past have amazed me with their calm heroism. I am pleased to see that this [cabin safety symposium] agenda includes aspects of terrorism. "It is a war we cannot win and dare not lose" according to Brigadier Mackenzie-Orr, the Australian expert on this vital problem.[4]

I mentioned before that the cushion of safety technology on which we now rely was developed by our industry above and beyond the regulatory demands of government. In a free society, safety should not depend completely on government regulations. This concept was impressively stated in 1912 by a famous British Jurist, Lord Maulton, in an essay on "Law and Manners." It follows:

"I ask you to follow me in examining the three great domains of human action. First comes the domain of positive law, where our actions are prescribed by laws . . . which must be obeyed. Next comes the domain of free choice, which includes all those actions to which we claim and enjoy complete freedom.

"But between these two there is a third large and important domain in which there rules neither positive law nor absolute freedom. In this domain there is no law which inexorably determines our course of action, and yet we feel that we are not free to choose as we would. This is the domain of obedience to the unenforceable, the obedience of a man to that which he cannot be forced to obey.

"And to my mind, the real greatness of a nation, its true civilization, is measured by the extent of this law of obedience to the unenforceable. It measures the extent to which the nation trusts its citizens; and its existence and area testify to the way they behave in response to that trust. . . The true measure of a nation's greatness is the extent to which the individuals composing the nation can be trusted to obey self-imposed law."

Our high level of safety has been achieved through self-imposed safety developments which in many cases became required by regulation. This must be continued despite economic constraints if public confidence is to be retained in a period of increasing air traffic and new technology soon to come. About 40 years ago General Harold Harris, vice president of Pan American World Airways, asserted "Anxiety never disappears in a human being in an airplane — it merely remains dormant when there is no cause to arouse it. **Our challenge is to keep it forever dormant."**

[1]J. Lederer, "Aviation Safety Perspectives," 19th Wings Club "Sight" Lecture, New York, 1982.

[2]Prof. Kenneth R. Andrews, "Morale and Safety in Aviation," Fifth Annual International Air Safety Seminar, Flight Safety Foundation, Bermuda 1952.

[3]Joseph F. Sutton (Boeing), "Changing Scene in the U.S. Air Transportation System," 23rd Wings Club "Sight" Lecture, New York 1986.

[4]Brigadier M.H. Mackenzie-ORR OBE, "Security in the Age of Terrorism," 41st Annual International Air Safety Seminar, Flight Safety Foundation, Sydney, Australia 1988.

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C.O. Miller, "Management Factor Investigation Following Civil Aviation Mishaps," ISASI, "FORUM," September 1988.

Gerard M. Bruggink, "Reflections On Air Carrier Safety," Flight Safety Foundation Digest, June 1988.

Positive Views Concerning Airline Safety

Removing the U.S. Federal Aviation Administration from the Department of Transportation and making it an independent authority would provide professional rather than political management, says the author. It also would provide a more positive emphasis on the ways and means of improved air safety instead of concerning itself with political responses to uninformed criticism.

by

R. Dixon Speas

[R. Dixon Speas, noted international aviation consultant and member of the FSF Board of Governors and Executive Committee, addressed the Society of Senior Aerospace Executives at last year's Aviation Policy Workshop with some new thoughts about presenting safety in a positive manner. FSF is pleased to share his remarks to that body with our members, in the interest of stimulating discussion on safety issues that Speas addresses in this presentation — Ed.]

There is a wealth of detailed information, intelligent conclusions and astute recommendations in the April 1988 report of President Reagan's Aviation Safety Commission.

As to the most fundamental recommendation of the commission, transferring the FAA from the DOT and establishing it as an independent authority, there is much to be said in full support of such a transfer. One of the most important aspects of such a change is movement in a direction away from the political arena. Such movement should be helpful in eliminating some of the generalized and unfounded criticism of aviation safety. This is not to say that further safety improvement is not needed, but rather that the professional activity of safety improvement benefit from a less politicized environment.

It is highly encouraging to hear the voices being raised from many elements of aviation in support of an independent FAA. As Clifton F. von Kann (a strong backer of independent status for FAA) puts it with respect to the enabling legislation: "Never have so many aviation organizations joined so wholeheartedly in a common cause."

Eliminate Undeserved Attacks

Moving the FAA away from an environment of heavy political pressures should be helpful in eliminating some of the generalized and unfounded criticism of aviation safety.

The false information which has been written on the subject recently is truly amazing — including such irresponsible statements as:

"Deregulation is shrinking the margin of safety that airplane passengers have long taken for granted."

"Those who raised the issue of safety in the pre-deregulation debate have been proved correct."

Unfounded statements such as these represent unwarranted slurs against the qualified, experienced and devoted aviation professionals who work hard to provide airline passengers with steadily increasing safety. Pilots, mechanics, engineers, dispatchers, controllers and all the other professionals, including their managers and executives, can and should be proud of their accomplishments and cheered on to further progress, instead of being thrust into a defensive mode by false criticism.

Statistics Tell the True Story

Official statistics of the Staff Background Papers from the President's Aviation Safety Commission's report put the post-deregulation safety comparison in proper perspective for an objective understanding. It is to be emphasized that the professionals in airline operations are striving for ever-improved safety, and these efforts must and will continue. It is important, however, to acknowledge the progress that is being made.

There are those who express concerns that whereas the record looks good, the margins of safety may be questionable. The fact, however, that there are tens of millions of departures for each of the periods which were measured (pre- and post-deregulation), provides

samples of such size as to give full confidence in the Commission's statistical results.

Nestled away in the Commission's Staff Background Paper are two tables of safety statistics which are profound in their implications as to why an independent posture for FAA is appropriate.

The statistics in these two tables can be read with a negative orientation — namely, how many accidents there are per million departures. However, if a person goes through the simple process of converting it to a positive orientation, some highly encouraging facts are revealed with respect to what can only be considered an amazing improvement in airline safety.

One of these tables (Figure 1) compares the rates of fatalities, injuries and accidents for trunk and local service carriers between 1970-1978 (pre-deregulation) and 1979-1985 (post-deregulation), and shows significant safety improvement in five categories:

• Passenger fatalities per million enplanements decreased from 0.42 (1970-1978) to 0.30 (1979-1985);

• Passenger serious injuries per million enplanements decreased from 0.25 to 0.03;

• Fatal accidents per million aircraft departures decreased from 0.48 to 0.22;

• Serious injury accidents per million aircraft departures decreased from 1.92 to 0.83; and,

• Minor accidents per million aircraft departures decreased from 2.90 to 1.37.

A comparison of the same periods according to contributing factor, from the other table (Figure 1), yields the following for the rate of accidents per million aircraft departures:

• Equipment failure rate decreased from 1.49 (1970-1978) to 0.43 (1979-1985);

• Seatbelts not fastened from 1.49 to 0.68;

• Weather from 0.82 to 0.33;

• Pilot error from 0.54 to 0.21;

• Air traffic control from 0.26 to 0.11;

• Ground crew error from 0.23 to 0.11;

• General aviation from 0.10 to 0.04; and

• The "other" category posted the only increase, from 0.39 to 0.50.

On another positive orientation, look at millions of departures per fatal airline accident (Figure 2) and compare the figure of 2,174,000 for the 1970-1978 period with 4,545,000 for the 1979-1987 period. The latter figure represents more of a safety margin than anyone need worry about in comparison to such things as snake bites and lightning strikes.

I do quite a lot of traveling in my consulting practice — 125 departures on 21 airlines thus far this year. Statistically speaking, I can expect to be involved in a fatal accident once in about 17,600 years. I really do not expect to live that long. Further reflection tells me that with living in Tucson, Ariz., the exposure to lightning strikes (Tucson is known as one of the lightning strike centers of the United States) and snake bites (I came within two feet of stepping on a rattlesnake a few months after arriving at Tucson) is really much greater than my exposure to accident dangers in airline travel.

With respect to serious injury accidents (Figure 3), and minor accidents (Figure 4), the fact of improvement is unmistakable. Before deregulation, there were 521,000 departures per serious injury during the period 1970-78. Afterwards (1979-1987), there were 1,205,000, 131 percent safety improvement in this area. In the area of minor accidents, there were 345,000 departures per occurrence during 1970-1978 and 730,000 in the 1979-1987 period, a 109 percent improvement.

Reflecting on Accident Causes

Turning to the causes of accidents, first look at those occurrences related to the effectiveness of airline maintenance policies and procedures as shown in Figure 5. With 671,000 departures per equipment failure accident during 1970-1978 and 2,326,000 during 1979-1987 there is a strong, 247 percent differential or, again, positive change. This most certainly and conclusively proves that the airlines are devoting the resources required for advancing maintenance reliability. Most important among these resources are the highly professional management and work forces, which with the assistance of qualified and devoted FAA monitors, are ever improving the maintenance reliability of airline operations.

With respect to flight crew performance, the safety improvement shown in Figure 6 is reassuring in that operations in the cockpit are advancing in the right direction. This is reflected by the increase from 1,852,000 departures per pilot error accident during 1970-1978 to 4,762,000 during 1979-1987, a strong 157 percent improvement.

The air traffic control system has become more heavily

FIGURE 1

SAFETY STATISTICS TABLES
The President's Safety Commission

COMBINED TRUNK AND LOCAL SERVICE CARRIERS, PASSENGER FATALITY AND AIRCRAFT ACCIDENT RATES, DOMESTIC SCHEDULED SERVICE

	1970-78	1979-85
Passenger fatalities per one million enplanements	0.42	0.30
Passenger serious injuries per one million enplanements	0.25	[1]0.03
Fatal accidents per one million aircraft departures	0.46	[1]0.22
Serious injury accidents per one million aircraft departure	1.92	[1]0.83
Minor accidents per one million aircraft departures	2.90	[1]1.37

[1] The 1979-1985 rate is lower than the 1970-1978 rate at the 95 percent confidence level.
Source: Derived from computer printout of Part 121 and 135 operation accident briefs provided by the National Transportation Safety Board; U.S. Civil Aeronautics Board, Forms 41 and 298; and Regional Airline Association, Annual Reports, various years.

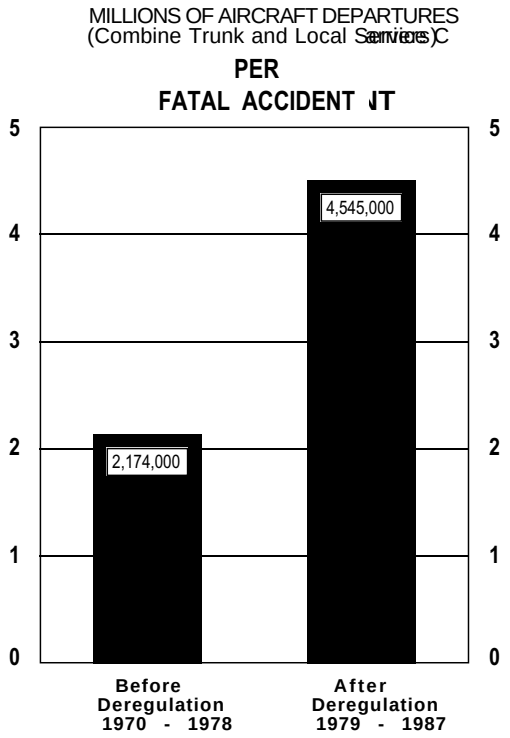
COMBINED TRUNK AND LOCAL SERVICE CARRIERS, TOTAL ACCIDENT RATE BY PRINCIPAL CONTRIBUTING FACTOR, DOMESTIC SCHEDULED SERVICE

Contributing factor	Accidents per one million aircraft departures 1970-78	1979-86
Equipment failure	1.49	[1]0.43
Seatbelt not fastened	1.49	[1]0.68
Weather	0.82	[1]0.33
Pilot error	0.54	[1]0.21
Air traffic control	0.26	[2]0.11
Ground crew error	0.23	0.11
General aviation	0.10	0.04
Other	0.39	0.50
Total	5.28	[1]2.42

[1] The 1979-1985 rate is lower than the 1970-1978 rate at the 95 percent confidence level.
[2] The 1979-1985 rate is lower than the 1970-1978 rate at the 90 percent confidence level.
Source: Derived from computer printout of Part 121 and 135 operation accident briefs provided by the National Transportation Safety Board; U.S. Civil Aeronautics Board, Forms 41 and 298; and Regional Airline Association, Annual Reports, various years.

Source: Staff Background Papers of The President's Safety Commission, April 1988

Figure 2



Data Source: Staff Background Papers of the President's Safety Commission, April 1988

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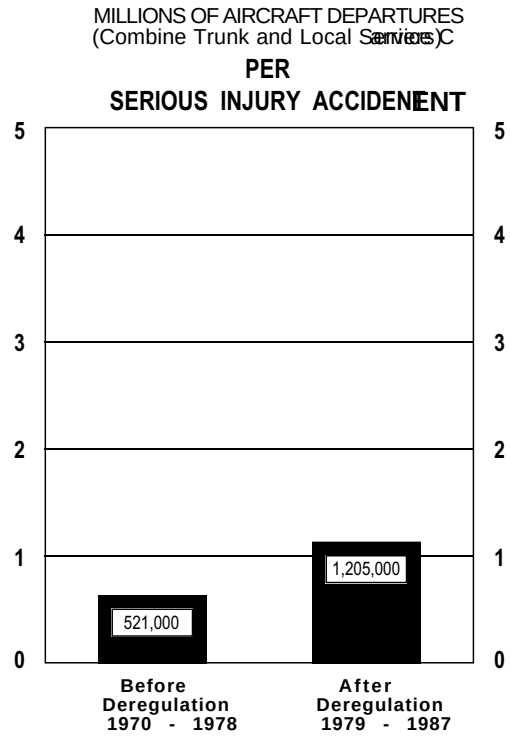
Figure 3



Data Source: Staff Background Papers of the President's Safety Commission, April 1988

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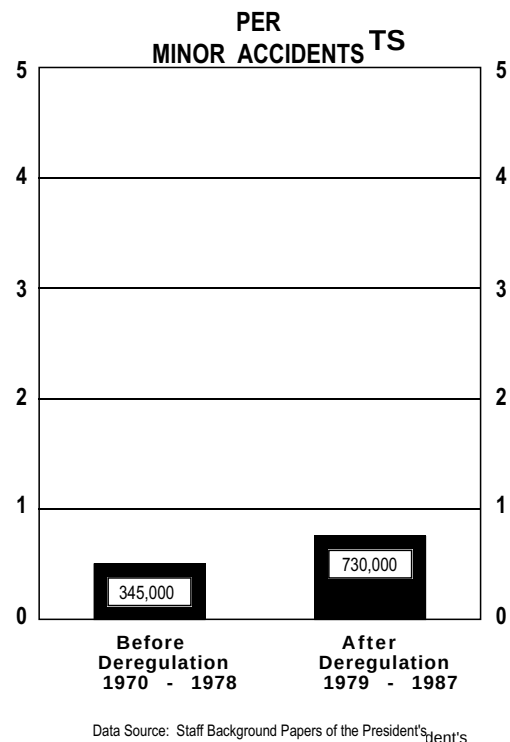
Figure 4



Data Source: Staff Background Papers of the President's Safety Commission, April 1988

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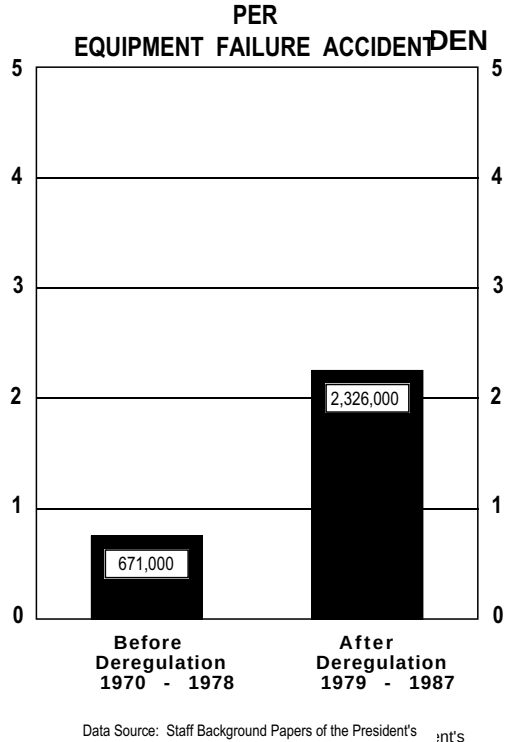
Figure 5



Data Source: Staff Background Papers of the President's Safety Commission, April 1988

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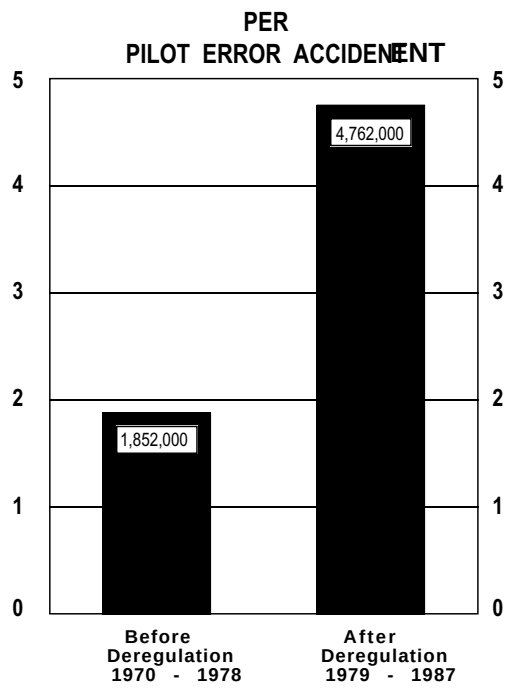
Figure 6



Data Source: Staff Background Papers of the President's Safety Commission, April 1988

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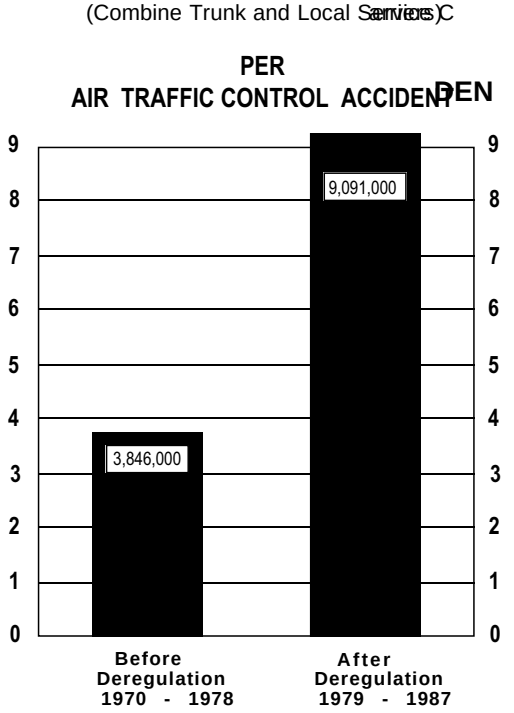
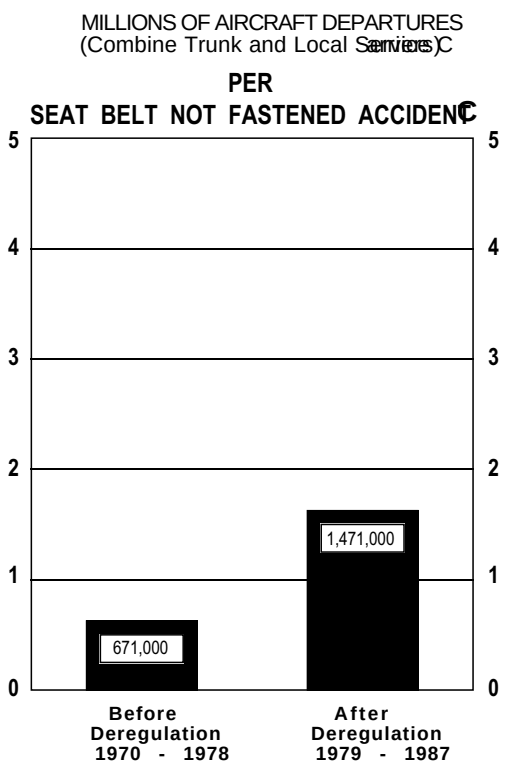
Figure 7



Data Source: Staff Background Papers of the President's Safety Commission, April 1988

Construction: PRC AVIATION - April 1988

Figure 8



Data Source: Staff Background Papers of the President's Safety Commission, April 1988

Construction: PRC AVIATION - April 1988

loaded in the post-deregulation period with 129 percent as many departures as in the pre-deregulation era. The safety improvement with respect to air traffic matters as shown by Figure 7, however, is reliable testimony to the safety consciousness of the thousands of FAA controllers, managers and equipment personnel who are responsible for maintenance and advancement of our nation's air traffic control system. Here, there were 3,846,000 departures per ATC accident during 1970-1978 and 9,091,000 in the 1979-1987 period, a 136 percent improvement.

Cabin Safety Practices

One area of consideration which touches all air travelers, and which can be individually witnessed, is the cabin attendant and flight crew attention to individual passenger security. The most appropriate measure utilized by the Commission's staff which concerns this area is seat belt fastening. Figure 8 shows an improvement, although less dramatic than that of the other measures reviewed. During 1970-1978, there were 671,000 departures per seat belt-not-fastened accident compared to 1,471,000 during 1979-1987, a 119 percent improvement.

There are many variations in degree of excellence with respect to cabin procedures, cabin attendant announcements and flight crew announcements concerning passenger security:

- At gate departure;
- En route; and,
- At gate arrival.

There are opportunities among a number of airlines for improvements with respect to:

- Announcements;
- Monitoring of precautionary measures; and,
- Consistency in following specified procedures.

With further attention to these areas as they relate to individual passenger security and safety, future measurements will show improved safety.

The Bottom Line

What does this positive orientation review have to do with the desirability of creating an independent FAA? Were the agency an independent one, there would be a more positive emphasis on the accomplishments of improved air safety with continued emphasis on ways and means for further improvement rather than the category of political response to uninformed criticisms which have been witnessed in recent years.

An independent FAA would more fully encourage and effectively acknowledge safety advancements than can be done by a department of the government under political rather than professional management.

Some may say, "How do you account for the fact that substantial safety improvements have taken place during the era of political control?" One response is that the professionals within the industry working with professionals in the FAA are responsible for the substantial improvements in air safety. With an independent FAA removed from the environment of political control, professional advancement of air safety will be accelerated.

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Reports Received at FSF Jerry Lederer Aviation Safety Library

Reports:

Air Safety. FAA's Traffic Alert and Collision Avoidance System. U.S. General Accounting Office. February 1988. Report No. GAO/RCED-88-66BR. 22p.

This report provides information regarding the safety benefits expected from TCAS; commercial prospects for TCAS and FAA's plans for TCAS III development.

Microwave Landing Systems. Additional Systems Should Not Be Procured Unless Benefits Proven. U.S. General Accounting Office. May 1988. Report No. GAO/RCED-88-118. 71p.

Reviews the FAA's National Airspace System plan. Addresses FAA's management of the development and acquisition of a precision approach and landing system, the microwave landing system.

FAA Staffing. Improvements Needed in Estimating Air Traffic Controller Requirements. U.S. General Accounting Office. June 1988. Report No. GAO/RCED-88-106. 66p.

The GAO evaluated the FAA's standards for staffing the nation's air traffic control system. Specifically, they examined whether the standards reasonably project staffing requirements and how the standards are used. Staffing standards are critical for FAA to determine how many controllers it needs. Current standards have not been validated and fall short of accurately reflecting FAA's controller staffing needs, particularly for peak traffic periods and assuring an adequate training pipeline. Moreover, FAA's current standards are generally not used outside of FAA headquarters. Field managers have developed their own methods for estimating staffing requirements because in some cases they are not aware that headquarters has developed new standards.

Aviation Safety. Airlines Should Check Pilot Applicants' Safety History. U.S. General Accounting Office. June 1988. Report No. GAO/RCED-88-154. 26p.

GAO evaluated FAA's regulations, policies and guidance pertaining to pilot hiring for commercial passenger airlines and the type and availability of FAA data on a pilot's safety background that could be used during the hiring process.

Findings include that FAA has few regulatory requirements for airline pilot hiring practices, allowing airlines to develop their own criteria; FAA maintains databases containing records of all pilots' safety history and the validity of pilots' certificates; airline practices regarding pilot safety background checks varied. FAA should inform airlines about how to access FAA's databases and should encourage airlines to verify pilot information.

Aviation Safety. Enhanced Requirements Can Improve Commuter Pilot Training. U.S. General Accounting Office. September 1988. Report No. GAO/RCED-88-218. 31p.

GAO evaluated the FAA commuter airline pilot training regulations. This included changes in the commuter airline industry; commuter and major airline pilot training regulatory requirements and commuter airline accident reports and statistics.

Airline Competition. Fare and Service Changes at St. Louis Since the TWA-Ozark Merger. U.S. General Accounting Office. September 1988. Report No. GAO/RCED-88-217BR.

Examines changes in TWA's share of the air travel market at Lambert-St. Louis International Airport, changes in the number of cities served and types of air service available to St. Louis air travelers, and changes in air fares for travel to and from St. Louis.

Air Traffic Control. FAA Should Define the Optimal Advanced Automation System Alternative. U.S. General Accounting Office. November 1988. Report No. GAO/IMTEC-89-5.

The objectives of this review were to evaluate (1) FAA actions to obtain more technical information and to modify test plans before awarding the contract to buy Advanced Automation System (AAS) in order to modernize air traffic control computer systems, and (2) a benefit/cost study FAA prepared.

FAA's actions to obtain additional technical information and modify test plans generally complied with Congressional direction. GAO found flaws in the methodology used to conduct the benefit/cost study, and also found that FAA has not successfully controlled AAS design costs but opposes suggestions that a design-to-cost goal be adopted to help control costs.

Air Traffic Control. Continued Improvements Needed in FAA's Management of the NAS Plan. U.S. General Accounting Office. November 1988. Report No. GAO/RCED-89-7.

GAO evaluated the status of the FAA's National Airspace Systems Plan. This report presents the current cost and schedule estimates for the plan's most significant projects, along with findings, conclusions and recommendations regarding the agency's management of the air traffic control modernization effort.

National Plan of Integrated Airport Systems (NPIAS) 1986-1995. Report of the Secretary of Transportation to Congress Pursuant to P-O-97-248. November 1987.

Sets forth the estimated costs for airport development projects over the 1986-1995 period. Begins an effort to explore in greater depth the relationship among demand, system performance and investment needs.

Regulations:

Federal Aviation Regulations. FAR, Part 25 — Air Taxi Operators and Commercial Operators. Change 28, Eff September 22, 1988. Change 29, Eff September 22, 1988. U.S. Federal Aviation Administration.

Federal Aviation Regulations. FAR, Part 135 — Air Taxi Operators and Commercial Operators. Change 28, Eff September 22, 1988. Change 29, Eff September 22, 1988. U.S. Federal Aviation Administration.

International Flight Information Manual. Volume 36, April 1988. Amendment No. 3, January 1989. U.S. Federal Aviation Administration.

Aviation Statistics

Drug Testing Program and Public Transportation Safety

After a lengthy investigation of the train collision accident in the Northeast Corridor near Chase, Maryland, January 4, 1987, the U.S. National Transportation Safety Board (NTSB) determined that "the probable cause of this accident was the failure, as a result of impairment from Marijuana, of the (train) engineer to stop his train. . ." Again, in the report of the aircraft accident January 1988 near Durango, Colorado, the NTSB cited that the captain's use of cocaine before the accident was a contributing factor to the crash. The use of drugs by transportation personnel has been a major concern in public transportation safety.

Long before these happenings, the U.S. Department of Transportation (DOT) recognized the potentially disastrous consequences from even a single mistake because of drug use and had set forth regulations to combat illegal drug abuse and trafficking, and expressed the belief that a drug-free transportation workplace is essential to transportation safety. The Department directed its operating administrations (the Federal Aviation Administration, Federal Highway Administration, Federal Railroad Administration, United States Coast Guard, Urban Mass Transportation Administration, and Research and Special Programs Administration) in late 1988 and early 1989 to issue a series of anti-drug programs in the aviation, motor carrier, railroad, maritime, mass transit and pipeline industries, respectively. the rules are intended to ensure a drug-free transportation workforce and to eliminate drug use and abuse in public transportation.

Under these rules, drug testing of transportation employees who have safety or security related responsibilities will be conducted by an employer prior to employment, periodically, randomly, after an accident, based on reasonable cause, and after an employee returns to duty to perform sensitive safety or security related functions for an employer. The final rules generally require the testing for the presence of marijuana, cocaine, opiates, amphetamines and phencyclidine (PCP).

To ensure that testing is conducted in a fair, accurate manner and to protect the privacy and dignity of individuals, procedures under the rules must follow DOT standards for specimen collection and laboratory analysis and qualifications. All these are based on Department of Health and Human Services Guidelines. The "Mandatory Guidelines for Federal Workplace Drug Testing Program," known as "HHS Guidelines," were published in the Federal Register on April 11, 1988 (53 FR 11970).

The HHS Guidelines include procedures for collecting urine samples for drug testing. They also include procedures for transmitting the samples to testing laboratories, testing procedures, procedures for evaluating, test results quality control measures applicable to laboratories, recordkeeping and reporting requirements.

Transportation employees who test positive will be removed from their duties. An employee can be reinstated only with the approval of a medical officer, after completing rehabilitation. The rules encourage but do not require companies to offer employees an opportunity for rehabilitation. However, all

companies covered by the rules are required to have employee assistance programs that provide information and training for affected workers and supervisors on the effect of drug use on health and safety.

Under the final drug testing rules, approximately four million transportation employees will be subject to random or other types of drug testing. These include about three million interstate truck and bus drivers, 538,000 aviation industry employees, 195,000 mass transit employees, 120,000 seamen serving on commercial vessels, 116,500 employees of companies that operate pipelines and 90,000 railroad employees, who are already subject to limited alcohol and drug testing required by the existing regulations. Large companies generally will be required to implement drug testing by December 1989. Small companies will have a longer period of up to two years from the effective date of the rules to begin testing.

The following is a summary of transportation employees nationwide who will be affected by the new drug testing program:

Transportation Mode	Covered Employees
Highways	Under the Federal Highway Administration rule, interstate motor carriers are required to develop drug testing programs for drivers of trucks weighing more than 26,000 pounds or trucks of any size carrying hazardous materials that require a placard to be carried on the vehicle, and buses carrying more than 15 passengers. Truck owner-operators also will be subject to testing, either by a motor carrier with whom they have a contract or under their own arrangements, such as through a consortium of owner-operators. Drivers of interstate commercial trucks and buses are already prohibited from using drugs, such as amphetamines, narcotics, or other habit-forming drugs.
Railroads	Railroad employees covered by the new Federal Railroad Administration rule include those directly involved with movement of trains, such as train crews, railroad yard crews, dispatchers, conductors and persons responsible for installing and maintaining signal systems. The new rule strengthened an existing rule by mandating random drug testing and prohibited the use of controlled substance by workers on or off duty. Since 1985, railroad employees have been subject to a program that includes pre-employment, post-accident and reasonable-cause testing.
Mass Transit	Under the Urban Mass Transportation Administration rule, transit systems are required to have drug programs covering transit vehicle operators, vehicle controllers and vehicle maintenance workers. Any transit system that fails to implement a drug program will be ineligible for federal funds.
Merchant Marine	The U.S. Coast Guard rule covers merchant seamen aboard vessels who perform duties directly affecting the safety of vessel operation. Any licensed or documented seamen, whether or not a member of the crew, is subject to the rule. Also any one engaged to work in a sensitive position aboard a vessel that is required to be operated by a licensed or documented individual is subject to the rule. This would include state-employed pilots, certain industrial personnel and undocumented crew members. Also, the rule will cover self-employed vessel operators but does not apply to employees such as waiters, waitresses, bartenders and musicians serving on board a vessel.
Pipelines	The Research and Special program Administration rule covers employees performing certain operation, maintenance and emergency response functions on pipeline and liquefied natural gas (LNG) facilities. Also, employees of companies operating pipelines used to transport natural gas andhazardous liquids, and operators producing and storing LNG are subject to the rule.
Civil Aviation	Under the FAA final rule, pilots, flight attendants, mechanics, airport security screening personnel, flight engineers, aircraft dispatchers of domestic and supplemental air carriers, commercial air taxi operators and commuter operators will

be subject to drug testing. Contractors performing safety-related functions and air traffic facilities not operated by the FAA or military will also have to have drug-testing programs. However, the aviation drug rule does not apply to private pilots. The FAA "Anti-Drug Program for Personnel Engaged in Specified Aviation" was published in Federal Register on November 11, 1988 (49 CFR Part 40 and 14 CFR Part 61 et al). A copy of this final rule may be obtained by submitting a request to the FAA, Office of Public Affairs, ATTN: Public Inquiry Center (APA-230), 800 Independence Avenue, S.W., Washington, D.C. 20591 U.S., or by calling 202-267-3484.

In this connection, it should be noted that the DOT's commitment to a drug-free workplace also applies to its own employees. DOT began random drug testing of its employees in safety and security-sensitive functions in September 1987.

Pursuant to the Department's program, a DOT employee will be removed from federal service under several circumstances: refusal to enter or to successfully complete a drug rehabilitation or abatement program; repeat usage of drugs; refusal to provide a urine specimen for drug testing; on-duty use of illegal drugs; or, a determination that a DOT employee has engaged in illegal drug trafficking.

The drug test program for FAA employees began in February 1987. As of the end of January 1989, as reported by FAA, some 42,000 FAA employees had been tested for illegal drug use during their periodic medical examinations, resulting in 49 positives. Among 8,451 applicants for FAA jobs who were tested, 55 were found positive. The random drug testing program for FAA employees is now in progress.

Accident/Incident Briefs

Unstabilized Approach in Snow

Newfoundland - March 1987
(Final Report)

Ilyushin IL 86: Damage to engine cowling. No injuries reported.

Following a flight from Cuba with 190 passengers and a crew of 12, the aircraft was approaching Gander for a planned en route stop. Weather was an indefinite ceiling 200 feet obscured, 1/4 mile visibility variable 1/8 to 1/2 mile in light rain showers and fog.

The copilot was manually flying the ILS approach. At 328 feet above the ground, the rate of descent increased. The aircraft descended below the glideslope and deviated to the left of the localizer. The captain took control at the 200-foot decision height and completed the landing by visual reference. The airplane was still low and to the left, and the captain was correcting to the right as they crossed the threshold. During the landing flare, visibility was reduced by fog and the captain used the radio altimeter for altitude reference.

The airplane touched down with the left wing low, 36 feet to the right of the centerline while the pilot was correcting back to the left; the airplane continued to move toward the left side of the runway and tracked along its left edge for slightly more than 1,000 feet before returning to the centerline. The landing gear broke four runway and four taxiway lights; and, a cowling was torn off the left engine pod when it hit a snowbank located 42 feet to the left of the runway edge. The airplane taxied to the terminal with no further incident, and the crew was unaware of the damage until debris was found on the runway and they inspected the airplane.

The Canadian Aviation Safety Board, in its accident report, determined that the pilot brought the aircraft below the altitude where a missed approach is prescribed by the USSR Civil Aviation Ministry. The pilot was unable to keep the airplane on the centerline because of the impairment to visibility when dense fog was encountered during the flare. Contact with a snow-

Accident/incident briefs are based upon preliminary information from government agencies, aviation organizations, press information and other sources. The information may not be accurate.

bank that was higher than guidelines specified it to be contributed to the aircraft damage.

Bulldozing Airplane

India - January

Boeing 737: Significant damage to airplane. No reported injuries.

The jet air carrier was taking off from Gauhati Airport in Assam for a flight to Calcutta, when two bulls strayed onto the runway. The pilot aborted the takeoff but the airplane struck the animals.

The aircraft was badly damaged but there were no reported injuries to the 98 persons aboard. The fate of the interlopers was not reported.

Warning Light on Takeoff

Thailand - January

Airbus A300: Damage to tires and brakes. Minor injuries to 15.

The air carrier was departing Bankok International Airport for Tokyo with 239 passengers aboard. The pilot noticed a fire warning indicator and elected to abort the takeoff. Four main tires blew out in the process.

As the airplane came to a stop, a smoke warning indicator came on and the captain ordered that the airplane be evacuated.

Fifteen passengers were injured as they left the airplane using the inflatable escape slides; after hospital treatment they all were released. Cause of the aborted takeoff was attributed to overheated main landing gear.

Airframe Ice Strikes Again

United Kingdom - January 1987
(Final Report)

Fokker F-27 Friendship: Aircraft extensively damaged. Serious injuries to three.

The air carrier aircraft was being used for a training mission and crashed during the final stages of a simulated engine-out instrument approach to East Midlands Airport.

At the time, an almost stationary warm front was spread across the United Kingdom, and the area surrounding the flight locality was affected by a cold, continental airflow. The weather was cloudy and hazy, visibility was 2 1/2 miles. There was 7/8 stratus cloud with a base of 1,000 feet. Stratus layers went up to 3,500 feet. The freezing level was on the surface and the icing index was moderate to severe.

After a number of engine-out maneuvers, the airplane was inbound on an NDB approach with a simulated left engine failure. The pilot undergoing training for conversion to captain status was in the left seat with an instrument screen fitted before him.

Various reports by eye witnesses who saw the airplane on final approach noted that it: appeared lower than normal; appeared to be trying to climb with high power; was "behaving erratically"; and, was "wobbling" and that the wings were "dropping from side to side."

The aircraft struck the ground in a nose-low attitude, banked to the left with considerable left sideslip. The airplane was extensively damaged and the three crew members — a training captain in the right seat, the first officer in the left seat and another captain in the jump seat who was aboard for refresher training — were all seriously injured.

Later, an accumulation of mixed rime and glaze ice was found on the leading edges of the wings and tail surfaces, forming rough-surfaced horns an inch high above and below the airflow stagnation point; none was found on the flaps or landing gear. The pilot in the jump seat later reported being aware that both pilots in the front seats were regularly checking the wings for ice build-up but that he was not able to see the wings from his position.

The report of the U.K. Air Accidents Branch concluded that the probable cause of the accident was that the aircraft became uncontrollable at an airspeed well above both its stalling speed and minimum control speed because its flying and handling characteristics were degraded by an accumulation of ice. A decision by the training captain to not operate the airframe de-icing system was considered an underlying cause, but the report noted that he could not have been expected to foresee this at the time. A contributory factor was that the operating crew allowed the airspeed to fall below the normal approach speed during the latter stages of the approach.

Shoved by Tailwinds

Philippines - December

Fokker F.27: Aircraft extensively damaged. Some minor injuries.

The aircraft carrying 16 passengers ran into heavy weather over the island of Samar, and the pilot elected to land at Catarman Airport there. In spite of tail winds, the pilot was forced to approach the runway from seaward.

A fire reportedly broke out as the pilot applied full braking on the slippery runway that was undergoing repairs, and the airplane hit a pile of earth.

The right wing of the F.27 was badly damaged by the collision, and the pilot suffered facial injuries when he hit the instrument panel during the impact. Some of the passengers had unfastened their seat belts and received minor bruises when thrown forward.

Double Trouble

United Kingdom - January

Pilatus Britten-Norman BN-2T Turbine Islander: No reported damage. No injuries.

There was only a two-man crew aboard the twin-engine aircraft on a late afternoon flight from Bembridge to Nice.

The airplane was in cruise flight at 5,000 feet when both engines failed. The pilots were unable to restart either of the powerplants and accomplished a forced landing in a field at Cap d'Antifer. The two occupants escaped without injury and no aircraft damage was reported.

Airplane in a Cornfield

United States - January

Convair 580: Extensive damage. Some occupant injuries.

The twin-engine Convair, with 26 passengers and a crew of three aboard, encountered engine problems in flight.

The pilots were unable to reach an airport, so they made a forced landing on a dirt road near Buena Vista, Colo. The airplane overran the road and stopped in a cornfield. The airplane received extensive damage to the fuselage and gear, and some of the passengers were injured. There was no fire.

Low Visibility

Denmark - January

Piper PA-23 Aztec: Aircraft destroyed. Fatal injuries to four.

The air taxi aircraft was on a trip from Beldringe to Sindal in the northern section of the Jutland peninsula.

The pilot had reported that he planned to land at Sindal airstrip just before noon and circled the airport once. According to later police reports, low clouds could have interfered with the pilot's ability to keep the runway in sight. After the airplane circled and was apparently preparing to make an approach to land, it crashed less than three miles from the airport.

The two crew members and the two passengers were all killed in the accident. The airplane was destroyed.

Crash After Takeoff

Venezuela - January

Beechcraft Super King Air 200: Aircraft destroyed. Fatal injuries to two.

The aircraft had just taken off from the metropolitan airport in Charallave, approximately 10 miles south of Caracas when it crashed into a residential/country club neighborhood of the city.

Although no one on the ground was injured during the accident, a nearby home received damage from flying debris. The only occupants of the airplane were the pilot and copilot, both of whom died in the crash.

Disappeared at Sea

Solomon Islands - January

Piper PA-34-200T Seneca II: Aircraft and occupant missing.

The owner/pilot was the only occupant aboard the light, twin-engine aircraft that left Henderson Airport at Honiara, Guadalcanal shortly after midnight. The pilot was on a trip from Tarawa and Honiara to Brisbane, Australia.

There were no further communications from the airplane after the takeoff and a search was commenced later that afternoon by a helicopter, five vessels and five airplanes from the Solomon Islands and Australia. The search was called off after four days with no trace found of airplane or pilot.

Unsuccessful Go-Around

United Kingdom - April 1987
(Final Report)

Cessna 441 Conquest: Aircraft destroyed. Fatal injuries to one.

The pilot was the only occupant during a flight from Leeds Bradford Airport to Blackbushe Airport to pick up passengers. On arrival at the destination airport, the pilot told the tower he was unfamiliar with the airport and requested an overhead entry to the traffic pattern.

The airplane was seen to make a very wide traffic pattern but all calls were normal and the pilot reported three green lights on base leg. An observer about 2,200 feet from the Runway 26 threshold and 600 feet north of the centerline was watching the airplane. He reported seeing the main gear lower to apparently the three-quarter down position and then immediately retract while the airplane continued along the final approach path. Most witnesses considered that the airplane was flying at a normal speed; one said it was slow.

At a height of about 100 feet the pilot reported he had a problem and that he would go-around. One observer said the airplane yawed momentarily to the left when the go-around was begun and others also reported that, as soon as the airplane's nose was raised, a bank angle of 60 degrees to the left began to develop and the airplane began a turn in that direction. The bank increased and the turn tightened, and the airplane, with engines "revving" loudly, continued its turn to about 135 degrees when it crashed into trees semi-inverted. The airplane was destroyed and the pilot killed upon impact.

The reason for the initiation of the go-around, according to the U.K. Air Accidents Investigations Branch, was an unsafe main landing gear indication caused by a defective microswitch. There was no evidence of pilot incapacitation. Examination of the airplane's wreckage showed no engine or propeller control, or flap or flying control malfunction. The curved flight path followed by the airplane during the go-around attempt and the tightening of the turn suggested that a large thrust asymmetry occurred, but due to the absence of flight recorders, this could not be substantiated.

The probable cause was given as loss of control at low altitude. The investigators noted that the reason for the loss of control could not be determined, but they considered that the asymmetric thrust hypothesis was most probable.

Midair Survived

United Kingdom - January

Cessna 182: Aircraft destroyed. Serious injuries to two.

Cessna 152: Aircraft destroyed. Serious injuries to two.

Both aircraft were on training flights in the local area; one was doing touch and go's in the traffic pattern and the other was approaching to land.

The two airplanes collided on final approach and crashed to the ground. The wreckage was scattered on the runway. The aircraft both were declared total losses, but all four persons involved, two in each airplane, survived although they were seriously injured.

Cable Strike

United Kingdom - December

Cessna 182: Minor damage. No injuries.

The pilot was taking off from a grass farm airstrip slightly less than 1,600 feet long. The weather was good, with a slight crosswind from the right at six knots. The runway was reported as soft with grass up to five inches high.

According to the pilot, the airplane lifted off after a ground run of slightly more than 300 feet and he held it close to the surface in ground effect to pick up climb airspeed. However, the pilot had not taken into account

the fact that a line of power cables crossed the takeoff path, 25 feet high and some 650 feet past the end of the runway.

The airplane struck the powerlines but the pilot was able to retain control and he continued on to his destination of Staverton. He made a Mayday call and another pilot relayed his request for an emergency landing. After landing safely, the airplane was examined for damage and it was found that there were mainly scratches on the windshield and on the left wing leading edge, and a damaged pitot head.

Wires? What Wires?

United Kingdom - November

Piper PA-20: Minor damage. No injuries.

The airplane had just been bought by a group of pilots and was given an annual inspection before being flown to its base.

The pilot who brought the airplane to the home airport was the most experienced of the group, and he invited another member for a check ride around the traffic pattern, since the latter pilot had not previously flown a PA-20. After a short flight locally, the pilots returned to the airport at dusk. Because of the prevailing wind, the pilot in the left seat suggested that the approach be flown from an easterly direction rather than the normal northeast direction. This approach brought them over power cables close to a hangar and club house near the threshold of the runway.

The pilot in the right seat went around at about 100 feet on final because he was not satisfied with the approach, and followed the same approach path for a second attempt. The approach was flown at 65 knots and full flaps. When he closed the throttle on short final, the pilot heard a bang that he thought was an engine problem.

After an uneventful landing, the pilots found damage to the propeller spinner, the propeller and to the left wing strut. The electric wires, about 300 feet from the touchdown point and approximately 19 feet above the ground, were later discovered to have been severed.

No Way Back

United Kingdom - December

Piper PA-28: Aircraft destroyed. No injuries.

During a flight from Blackpool to Mona, the airplane, with a pilot and three passengers, was being flown beneath a cloud base which varied between 1,000 and 2,000 feet above the ground. There was a wind of more than 30 knots from the northwest.

After flying to the south along the Conway estuary for a time, the pilot turned right to a westerly heading and then turned further to a northwest direction. He then found himself at an altitude of 1,400 feet heading toward ground that rose to between 1,400 and 3,000 feet, and that the airplane was losing speed and was descending rapidly. The pilot later stated that there was not enough visibility to the rear to allow a turn back towards the water, and that he had no alternative to a forced landing because he feared a stall if he did a 180-degree turn.

The subsequent forced landing was successful in that the occupants, who were wearing shoulder belts, evacuated the airplane with no reported injuries. However, the landing gear was broken and enough other damage was incurred that the owner considered the airplane totalled.

The pilot later noted that he had no idea that standing wave downdrafts could be so severe.

Perils of Distraction

United Kingdom - January

Piper PA-32R-300: Extensive damage. No injuries.

After a local flight, the pilot was returning to Leicester airfield and was making a straight-in approach. He was informed that he would follow another airplane that was already in the traffic pattern for landing.

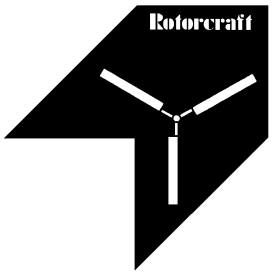
When he made visual contact with the runway, the pilot realized that he might be getting too close behind the airplane ahead of him; and when he reported on final was asked to perform a circle to the right for spacing. He elected, instead, to do a missed approach — and subsequently landed without lowering the gear.

There was extensive damage to the belly of the airplane and to the propeller. However, there was no fire and the pilot was not injured. The pilot cited his failure to extend the gear to the request that he circle and that the automatic gear-lowering system had been removed from the airplane according to a service bulletin.

Crash into Sea

Finland - January

Agusta-Bell 206B Jetranger II: Aircraft destroyed. Fa-



tal injuries to three.

Shortly after taking off from the deck of a ship to airlift a radio mast to a nearby island, the helicopter crashed into the sea. The aircraft was reported to have hit the water at high speed.

According to witnesses, the helicopter's lights disappeared just minutes after it left the vessel in the early evening, and mechanical malfunction was suspected as the cause of the crash. Although small pieces of wreckage were found the next day, the main parts of the helicopter were not discovered until the following day, along with the bodies of the pilot, a Finnish shipyard engineer and a representative of the British manufacturer of the radio mast.

Fog Over Water

Switzerland/West Germany - January

Private helicopter, unidentified make. Aircraft destroyed. Fatal injuries to two.

The helicopter was on a flight from Zurich, Switzerland, to Friedrichshafen, West Germany, on the northern shore of Lake Constance that lies across the Swiss-West German border. The direct route crosses the lake.

The weather included fog in the area.

The helicopter crashed into the lake and the wreckage was found near the Swiss border on the south shore. The search for the two occupants had to be called off later because of fog.

Cable in the Way

United Kingdom - January

Bell 206B: Aircraft damaged beyond repair. Minor injuries to one.

The aircraft was carrying out a gas pipeline survey with a pilot and one passenger aboard in mid-morning. During the mission, the pilot decided to land near the edge of a field. There was a 10-knot wind but the weather and visibility were good beneath a cloud base of 1,500 feet.

During the later stage of the landing approach, the pilot noticed an electric power cable directly ahead.

Although the pilot immediately began a turn and added power to avoid the cable, the helicopter's tail rotor hit it. First the tail rotor separated and the aircraft entered a rapid, rotating descent. Then the main rotor separated and the helicopter hit the ground. The pilot immediately closed the throttle and turned the master switch and fuel selector off. The helicopter rolled on its right side and the pilot and the passenger escaped through the left-hand front door. There was no fire, and the occupants received only minor injuries.

Quick Student

United Kingdom - January

Robinson R22: Substantial damage to helicopter. No injuries.

During a dual instruction flight, the instructor was demonstrating hovering flight. The student had a total of about six hours of rotorcraft flying time.

After about a half hour of flight in the designated practice area, the instructor gave control of the R22 to the student while they were in a hover at about five feet above the ground. The helicopter began to move to the right and the student quickly lowered the collective control. Before the instructor could counteract the student's control input, the right skid of the rotorcraft contacted the ground and the R22 rolled on to its right side.

The instructor stopped the engine and turned off the master switch, and he and the student evacuated through the left windshield. The two occupants had been wearing shoulder harnesses and were not injured, but the helicopter sustained enough damage to be considered beyond economical repair.