You'd Better Sit Down: There's Been A Crash

No overall plan exists to deal with the psychological grief of survivors of U.S. air accidents, say the authors. They report on a program aimed at meeting the post-crisis needs of one group of U.S. airline employees and their families.

by

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and
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"What struck the Reverend … most forcibly as he moved among relatives of the Pan Am Flight 103 casualties was their furious denial of the event. They shook their heads, pounded tables, pushed their fists in their eyes. One woman fell to the floor in the raw grip of hysteria, screaming, 'My baby, my baby … .'" (*Newsweek*, January 2, 1989, p. 21).

According to U.S. National Transportation Safety Board statistics, there were 33 accidents involving U.S. scheduled airlines in 1987, 29 in 1988 and two, at the time of writing this article, in early1989. The grief of surviving family members has been chronicled for the public to observe in various forms of media presentations. It has been called, "the cruelest kind of grief," (*Newsweek*, January 2, 1989), since it occurs when relatives are anticipating a homecoming. Rather, they are faced with ruin.

The American Red Cross, airline managements, employee groups and various other groups have begun to intervene with the waiting relatives within hours after a disaster's occurrence. However, no overall disaster plan which deals with the psychological grief of survivors — of passengers *and relevant aviation personnel* — currently exists within the U.S. aviation community.

Although there is extensive research about human reactions to disasters (earthquakes, floods, bombings, etc.) and what types of services are needed to minimize the shock and aftereffects upon survivors, no data exist about how airline employees cope with an air crash within their own carrier or in the system at large. Few organized services at any of the major carriers are provided to assist employees though the post-crash period. Those known to exist within the U.S. are sporadic, and were developed in the aftermath of a specific crash.

After the Crash: What if Employees Don't Cope?

Companies, much like individuals, are equally vulnerable to sudden death and disaster that involves members of their group. Management and employee groups need to experience a healing process for ultimate adaptation.

If grief is resolved at the corporate level, companies could expect to experience higher incidences of stress-related symptoms within the employee groups. These symptoms include absenteeism, psychosomatic illnesses, actual increases of physical illnesses, drug and alcohol abuse, increased medical expenses, increased grievances, co-worker and worker-supervisor problems, employee attrition, and deterioration of morale for the entire work force. Such symptoms can occur from six months to two years following a tragedy, and in many cases are not linked in the minds of the employers or employees to the unfortunate event.

How to Intervene

This article will focus on part of a systemic approach that was utilized for intervention with airline pilot groups following two major air crashes involving U.S. carriers. Although targeted for a specific employee group, implications are relevant for management teams, ground crew and other flight crew personnel.

This system was implemented by PIERRS (Professional Information, Education, Resources, and Referral Services) specifically to meet the post-crisis needs of commercial airline pilots and their families. All services were oriented toward enhancing aviation safety.

For a 30-day period after each crash, pilots and family members had access to a 24-hour toll-free crisis counseling line. The line was staffed by trained counselors who were knowledgeable about current working conditions in the larger aviation community and within specific carriers. They were also professionally trained in coping with grief and loss. The telephone counseling was backed by a national referral network of licensed mental health professionals. These professionals were available to provide services for employees who wanted grief-related counseling in their local area.

Contact was made by counseling staff with the go-team pilots assigned to work with the various accident investigating teams throughout the aftermath of both disasters, and with eyewitness pilots. All other contacts were initiated by those who wished the services.

Staff also developed an educational document, "You'd Better Sit Down: There's Been a Crash," which was mailed to the homes of pilots. The document informed the pilots and their families of the available counseling resource. The primary purposes were to educate the employee group about typical responses to an unexpected tragedy, and to provide a mourning ritual through which pilots and their families could begin the healing process.

A Caveat to Consider

Grief is a universal phenomenon. Expressions of grief and rituals that are designed to heal the loss are, however, cultural specific. It is hoped that the educational approach outlined here could be reviewed within the aviation communities from other countries so that its application could be adjusted and made culturally relevant. The larger context would change. The ritual provided might need to be adjusted, but the goals remain the same: (1) to enable those who work within the aviation community to acknowledge the loss and their connectedness to it, (2) to provide a means by which they could honor the dead, (3) and to encourage individuals and working groups to find support from others and within themselves so that they could move beyond the loss and continue their personal and professional lives.

The Larger Work Environment: The Backdrop to a Crash

The crash event must be viewed from the larger context. The pilots from the airlines with which we intervened were like many pilots in the U.S. "Deregulation Era." Many had been employed by one or several airline companies which had undergone acquisition, merger, sale, or bankruptcy. They experienced the stress associated with job and career instability, financial insecurity and absorbing, or being absorbed, into another pilot group and corporate culture. The backdrop of their work environment included: a recent merger that was in an initial adjustment period, air traffic control problems, problems with scheduling, delays, consumer complaints, maintenance and safety issues, strained labor-management relationships, strained relations within labor groups and long commutes due to domicile closings. The identity of the specific airline carrier and the relevant crash are purposely omitted here as these facts are *secondary to the process of the intervention presented.*

The original version of "You'd Better Sit Down: There's Been a Crash" was written for a specific audience of pilots/families at a specific point in U.S. history. The characteristics of pilots and the descriptions of the larger working environment which are included should not be interpreted as suggesting that all pilots are like those described in the paper nor that all carriers have similar histories, issues and cultures. The pilots killed in this crash were males. The press immediately suggested that the cause of the crash was most likely due in part to pilot error. These specifics are reflected in the intervention. A similar intervention has been adapted for other groups of pilots who also experienced a crash. It could again be redesigned for relevance with management and other aviation employee groups who experienced a crash. The following material was mailed to the homes of pilots by the affected carrier:

"You'd Better Sit Down: There's Been a Crash"

We are responding to the tragedy of Flight … . You have lost fellow pilots, other flight crew members, and an estimated … (number of) fellow human beings in an accident. The nation at large feels the impact of your carrier's losses. The media has quickly attributed the cause of this tragedy, at least in part, to pilot error. The families of the pilots killed in the crash had no time to prepare for their loss, no time to say good-bye, no time to anticipate the grief that would befall them. The lives

of their loved ones were interrupted in their prime when the deceased had major responsibilities (emotional, financial) and vital roles (husband, father, pilot, friend). Victims who die suddenly in their prime leave the biggest holes in families. They cannot easily be replaced. Life is interrupted, tasks to meet and dreams to be fulfilled are instantly halted.

Family members are most likely in a stage of shock — an alarm has sounded to which they need to respond. Over the coming days, weeks and years they will experience an interruption in their lives, the magnitude of which could not be anticipated, and a series of emotional reactions to their loss that will be intense, prolonged and repetitive.

How People Respond to Loss

Adults experience a whole variety of thoughts, physical reactions and emotions after the death of a loved one or close friend including:

- Guilt associated with the last contact, with unfulfilled wishes and dreams, with conflict and anger, with being left alive.

- Remorse about topics left unsettled, unsaid, unresolved.

- Anger at being deserted.

- Aloneness, isolation.

- Idealization/bastardization. Strong conflicting feelings of love and hate felt for the victim(s) can vie for attention.

- Shame about living. The survivor might question how long he or she should feel bad. How can they cope with any joy, any enjoyment of life? How long do they need to remain in constant misery?

- Being overwhelmed by the nature and the magnitude of the loss. All else pales in its wake. The agendas and routines that are a part of normal day-to-day living (schedules, appointments, chores) now seem insignificant.

- Enmeshment. A part of the survivor's self died with the victim. It is difficult to establish the boundaries that separate the two.

- Physical symptoms may be frightening. It is typical for survivors to experience physical symptoms and to wonder at their seriousness. The possibility of one's own death takes on a new reality. Typical symptoms that may occur following a severe trauma include:

- Change in appetite.

- Tremors, clammy skin, sweating or chills, difficulty breathing, overwhelming tiredness, body aches, increased heart rate, breathing rate, and abnormal blood pressure levels.

- Decreased abilities to think clearly, to make decisions and to solve problems. It is as if all cognitive facilities have gone into slow motion. The survivor feels disoriented, confused, unable to get his or her bearing.

- A great desire to not feel — to not think — to escape all responsibilities and to avoid contact with others who have strong emotional ties. It is not uncommon (while it is potentially damaging) for parents to want to avoid their children during this time. Just as love has no bounds, grief also knows no bounds, and the strong feelings of attachment felt with those still living are difficult to separate from those felt for the recently dead.

- Memories.

- Longings.

- Inability to be comforted. Contact with others seems odd. There is emotional distancing from those who remain.

- Fear of the present and of the future.

- Shoulds. I should have … . He should have … .

- If onlys. If only I had … . If only he had … . If only they had … .

- A sense of unreality. Time is distorted.

- Frightening dreams occur. The survivor may begin to fear sleep. At later stages of grieving, the dead loved one often reappears in dreams in a comforting manner. Those who have reconciled their loss, can experience these contacts as support, as assurances that they are at some level still connected.

- Questioning of religious and spiritual beliefs. A quest for answers.

How Peers Respond to Loss

Those affected by an air tragedy extend beyond the immediate families of the victims to include fellow pilots at their carrier and throughout the aviation community. At some level, each pilot has acknowledged

the possibility that his or her life could end this way. Each pilot's family has imagined a similar scenario. Because grief has no time limits, when a disaster occurs, it can remind people of their own past losses, making the tragedy very personal.

Employees' responses to a tragedy that involves coworkers often depend upon other work stressors that they may be experiencing. Employees whose professional attitudes and behavior change in negative ways, as a result of work-related frustrations and job strain, usually choose to totally distance themselves from the losses of a work-related tragedy. They can pretend that it wasn't real people who lost their lives. The cynicism, anger, hopelessness and helplessness so typical of stressed employees can be reflected in a "so what" attitude. Off-colored jokes about the tragedy may be told, slurs against individuals may be made, and the victims themselves may be blamed for somehow "causing" the tragedy. The strong emotions one might feel are attributed to other causes and not to the grief that the individual, at some level, is experiencing.

Such employees are extremely vulnerable to experiencing strong post-traumatic reactions when a work-related tragedy occurs. As observed by experts from the U.S. National Institute of Mental Health (NIMH):

> "Since experiencing both types of stressors (work stress and catastrophe) lowers a worker's psychological defenses, it seems reasonable to expect that suffering from both sources of stress in the same disaster would be very damaging to the worker's health and well-being. The interaction of the two stress patterns, in other words, may enhance the effects of each, so that a worker already at risk from one is highly vulnerable if exposed to the other (Hartsough, D.M., & Myers, D.G., p. 34)."

Peers can also experience grief symptoms, which can be experienced at varying degrees of intensity and duration. Remember that grief is a positive, healing human response. *It occurs when a human being acknowledges the value of human relationships, the value of life and the loss that is created when attachments are severed.* Grief is highly correlated with caring for others. The absence of an immediate grief response (denial, anger, bargaining, depression and acceptance) says something about both the overwhelming nature of the tragedy just experienced and one's ability to tolerate additional emotional trauma and stress.

A pilot might think it desirable to find a way to not feel any emotional reaction to a crash — "to take a pill," to get back to work and push aside any feelings, so that the strong emotions following the tragedy are not experienced. Such a solution has far reaching ramifications for all other relationships in the pilot's life.

One characteristic of stressed employees is isolation. Isolation for pilots can easily become a way of life. Many pilots commute to their assigned trips and rarely fly with the same crew. After a crash, pilots may perceive demonstrations of caring and support offered by others as expressions of sympathy or pity. Outwardly, at least, they might suggest that they do not want to be pitied. After years of work stress, they have increasingly shielded themselves against being hurt by others, and they also have shielded themselves from being touched and comforted by others. Expressions of caring may be responded to with anger, denial and often cynicism. The person broods that "nobody cares," and that his feelings "don't matter" to others, yet overtures of caring are actively rejected. This perpetuates the feeling of isolation. Out of fear of receiving hostile responses, good-intentioned people learn not to reach out. They learn that any response they make may be taken as a wrong response. And, the stressed pilot remains alone.

The Impact of Human Error

How does the concept of human error or pilot error impact on pilot responses to the air crash? Following the crashes of several major air carriers, counselors talked with hundreds of pilots and reported a range of responses that included:

Disbelief

Anger

- at those who point to pilot error;
- at the evidence that supports human error as a contributing factor to the accident;
- at the press who declares a "cause" before all evidence is gathered;
- that fellow pilots could have, in some way, made an error that contributed to the disaster;
- at the charges that have been levied against pilots in general as "complacent and bored;" and,
- at the few people who have come to the defense of airline pilots as trained professionals dedicated to protecting the lives and safety of passengers and crew members.

Bargaining

- I can accept this if … . ;
- I can continue to fly if … . ; and,
- I can continue to feel good about myself and my profession if … .

Depression

- about the actual accident and the losses that follow;
- about the state of affairs for airline pilots as, "professionals;" and,
- about your own life, dreams and goals.

Research and observations of those who have survived a tremendous personal loss suggest that acceptance occurs when:

- the losses have been accepted as real;
- the varying emotions that accompanied the loss have been accepted as valid;
- help and comfort have been accepted from, and offered to, others;
- self-dignity remains intact; and,
- the person is reenergized to reinvest and take active control of his or her life.

Attributing an accident to human error is a very simplistic solution to a very complex process. As stated by a major air carrier's spokesperson, "Nobody is infallible. … What we try to do is have enough backup systems in place. *Hardly any accident occurs that there aren't a whole chain of events that occurred. If you can break that chain you have a safe operation."* [emphasis added]

If human error were to exist, it must be established which events outside the cockpit contributed to that error. If you believe, as many mental health experts do, that any behavior makes sense as *an attempt to problem-solve and to cope with all the factors that determine one's current situation,* then you must look to the larger environment to see what contributes to mistakes, poor judgment and lack of concentration. In everyday life, what events cause one to drive off with a car door open? It, or something similar, such as leaving a coffee cup on top of the car or locking keys in a car, has most likely happened to each of us at one time in our lives. When? When we were distracted, preoccupied, worried, or distressed. Mistakes are a human response when one can't concentrate, focus or screen out disturbing thoughts. All of these reactions are common coping mechanisms used to deal with *stress* when the demands of one's environment exceed one's coping skills.

Pilots, like all humans, experience stress. Without some amount of stress we couldn't exist. But when life events place demands on us that exceed our ability to adapt we experience *dis-stress.* Loss of a loved one, divorce, separation, change in work status, work expectations, corporate mergers and acquisitions all are *recognized* as life events that can, singly and in tandem, trigger stress-related symptoms (emotional/psychological, physical, behavioral). It is important to remember that *stress is cumulative.* It can be the result of intense, sudden events or ongoing, chronic conditions that wear down the individual until symptoms develop. It is equally important to keep in mind that *symptoms may develop up to two years after a single stressful event.*

Aircraft accidents can't be laid solely at the feet of individual pilots. The larger context has to be explored.

In 1986 and 1987, a team of psychologists, therapists and researchers at Virginia Polytechnic Institute and State University, Blacksburg, Va., U.S., investigated the reported stress levels of pilots from one carrier with long term, unstable working conditions and compared those responses to those of pilots from two stable carriers (June 1987 issue of *Air Line Pilot* Magazine, "Deregulation Aftermath"). The differences between the reported levels of stress and well-being between pilot groups were significant. For example, pilots from the two categories of carriers (stable and unstable) differed significantly in the degree of physical symptoms experienced, perceived mental health functioning, level of symptoms of depression, financial worries, levels of marriage and family conflict, self-esteem, optimism about career futures, and the degree to which they felt they could control work-related events. *The work environment can strengthen an individual's ability to cope with the rest of the demands of living, or the work environment can be so stressful that demands on the person at work spill over and impact all other areas of the person's functioning.*

What Are Valued Characteristics of Commercial Airline Pilots?

Commercial pilots are professionals:

- trained;
- checked regularly for competence and health;
- loyal and dedicated;
- perfectionistic;
- threatened when their competency, their profession or their security is attacked; and,
- tied to family responsibilities, financial responsibilities, a professional image with standards, status, and expectations.

Equally, pilots are imperfect humans in an imperfect system!

When threatened they experience stress:

- internally;
- interactionally;
- in job performance;
- in enthusiasm; and,
- in self-esteem.

When they anticipate or actually experience a loss they grieve and:

- deny their symptoms;
- become angry;
- blame others;
- are cynical;
- try to bargain;
- become depressed; and,
- through support (given and received), help (given and received) and understanding (given and received) they resolve their losses and move on.

Ceremonies and Rituals for the Death of an Airline Pilot

A death ceremony is a formal ritual where the recently deceased receives special remembrance and attention in a public and formalized way. In every culture and subculture throughout history some type of death ceremony takes place up to a year after a death to acknowledge the bond that exists between group members. These ceremonies serve many valuable functions. Historically, they have been found to be critically important to the ability of the society to recover from the loss, remain cohesive and go on.

Death ceremonies can:

- renew ties;
- reinforce ties;
- promote future reciprocity at the time of one's own death;
- express group solidarity;
- provide an opportunity for alliances to be established;
- remind group members of mutual obligations;
- enable people to test whom they can trust in the future and whom they cannot; and,
- demonstrate a group's unity and values.

How do airline pilots acknowledge the death of a fellow pilot? What ceremony is in place to remind them of their link with each other and with the deceased pilot?

Pilots are often uncomfortable talking about aircraft accidents, dying and death. They are tempted to think of themselves as somehow outside ordinary human experience, as being immune to the forces that ultimately shape all human life. Their technical orientation fosters an objectivity that can becomes a shield against recognizing personal vulnerability, the pilot's own mortality, or confronting the eternal human questions of life's meaning.

Airline pilots, unlike military pilots or police officers, have no established way to honor their dead. There are no guidelines, no norms and no common message to deliver. For the airline pilot who dies in a crash there are no taps, no formation flights over his grave, no medal, no flag, and no public acknowledgment by colleagues and professionals.

For pilots who commute long distances, live apart in different communities and fly with different crews, a sense of anonymity develops. It is easy for the pilot to lose ties with other individual pilots and with all pilots as a group. With no opportunity to develop a common identity, or an esprit de corps, there are few common traditions or common history to pull pilot groups together.

This lack of solidarity and lack of established ritual means that pilots at your carrier are unlikely to know what to do when a colleague dies. They may feel that their condolences might be inappropriate or that they may say or do something wrong or something offensive. The pilots' traditional discomfort with expressed emotion may cause them to prefer to keep grief private, and fear an emotional reaction would be inappropriate for a pilot. "Getting back to work," "not bothering others" and "being in control," is, after all, what is expected of pilots.

Airline pilots may not know what is proper, acceptable, normal, and tolerable behavior following an aircraft accident for the following reasons:

- personality constraints;
- a lack of common history with fellow pilots;
- few after-work socializing among pilots due to commuting constraints and possible merger tensions;
- lack of any established guidelines concerning how pilots should respond to a crash and the death of fellow pilots; and,
- being unsure of what responsibilities you have as members of the group.

Guidelines

The following suggestions are offered as a beginning:

1. Nothing is so devastating as BLAME. Following a crash, don't accuse either yourself or your fellow pilots.

Few human beings within the same system could handle accusations of blame for a tragedy of such magnitude while themselves grieving for a fellow pilot.

2. You can help. There are several simple things you can do that can be truly helpful.

Pilots at your company and other carriers may feel:

- unqualified to help;
- uncomfortable and awkward;
- at a loss for what to say or do; and,
- concerned about initiating contact or offering assistance.

Pilots at the affected carrier may feel:

- judged;
- a lack of support from fellow pilots;
- reluctant to discuss feelings, especially those that might reflect being weak or emotional; and,
- discussion of one's reaction to the crash may reflect on one's ability to fly or handle stress.

Please remember that simple communication is probably the most important and helpful thing you can do right now.

- Speak to each other in the crew lounge, the crew bus, wherever you meet. Even a casual comment on the weather is helpful. It is **not** too late to express your concern.

- Simply say, "I'm sorry," "Hi," or just smile.

- Be yourself. Trust your instincts. Use your own words.

- Accept silence. It is often part of the shock or depression of grief.

- Listen. Sometimes those who are grieving express anger. Be as understanding as you can.

3. For a limited time period set aside the differences between pilot groups, employee groups, labor management groups, and airlines. Say or do one thing for your fellow pilots at the affected carrier to acknowledge the enduring ties among all of you. Be generous. Acknowledge each other as the professionals you are.

4. The worst possible way for this type of human tragedy to end would be for the people to be forgotten. Following a crash at your carrier, we ask that you make a personal commitment to honor the pilots who were killed. In this way, when you look back on the tragic accident you can be proud of your performance. And recognize it as a time when you did your best.

How to Acknowledge Your Caring and Support for Those Impacted

Read over each of the attached biographies of the pilots. (Biographies were included as part of the mailing to pilot families, but are not included here). Then, please write a postcard to the family of each pilot. If you knew the victim personally, write a personal statement to the family. If the deceased pilots were not known to you, write a positive statement about being an airline pilot, or just sign your name.

Mail these cards to us as an expression of your personal sympathy to the families, and as an acknowledgement of your peer who has lost his life. We will collect them and forward them to the families of the pilots of Flight … .

The above information was about grief, about normal human responses to a tragic accident, and suggestions for ways to both honor the pilots involved in an air disaster and to bring about a solidarity and a mutuality between pilot groups.

What you experience with a crash is a sudden, shocking tragedy. In terms of human suffering, the most tragic aspects of a sudden death are:

- there is no time for good-byes;
- there is no time for finishing; and,
- there is no time to prepare for the shock or grief that you will experience.

Acknowledge your humanity, take time to honor your losses.

Please Use The Postcards
(end of mailing to pilot families)

The postcards were addressed to PIERRS which collected, counted and forwarded them to the families of the pilots involved in the accident.

Conclusions

We received and distributed more than 8,800 postcards from pilots, not only from the affected carrier, but from others throughout the industry who heard of the intervention. They expressed sympathy, loyalty, identification, and support for the pilots who had died and for their own profession. A few examples of postcard comments follow:

"… I know the kind of life and work that your husband experienced. Each pilot can almost write the diary of a fellow pilot. I share your loss, you have my personal sympathy."

"… We as airline people, had good times and bad times and we have stuck together. The great loss you have experienced from your husband's death is deeply felt by all of us who share a common bond. My prayers are with you and have been since the crash."

"… Pilots get to live a dream few others do. That helps to make their lives complete."

"… To a pilot one of the greatest experiences is to break out on top of a solid overcast into the brilliant sunshine. I like to think that this transition has been a similar one for … ."

In summary, the above intervention was designed for use with a specific employee group who had experienced an aviation disaster. It provides information about the normal grief response and provides a ritual through which individual employees who are members of a larger group may begin to cope with that loss and move on. Such interventions are not a standard procedure for U.S. aviation personnel following a crash. It is hoped that sharing this information may spur more consideration of providing a means for aviation personnel to acknowledge a tragedy and to deal with it not only on a technical level, but a personal level as well.

[Ed. note: For those interested in learning more about PIERRS and its work, Little and Gaffney may be contacted at 703-359-8311, or by writing to PIERRS, 9441 Silver King Court, Fairfax, VA 2203 U.S.]

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Reports Received at FSF
Jerry Lederer Aviation Safety Library

Books:

Aviation Papers. National Research Council, (U.S.) Transportation Research Board. Transportation research record. 1158. Washington, DC. 46p. 1988. ISBN: 030904667X. LC Call No: TE7.H5 No. 1158.

Table of Contents: Identifying Potential Funding Sources for Airport Capital Improvements; An Idealized Model for Understanding Impacts of Key Network Parameters on Airline Routing; Dynamic Forecasting of Demand and Supply in Nonstop Air Routes; Weather Briefing Use and Fatal Weather Accidents; Defining the Philadelphia Regional Reliever Airport System; Estimation of Aircraft Operations at Nontowered Airports in the Delaware Valley Region.

The Anatomy of the Aeroplane. Darrol Stinton. Oxford: BSP Professional Books, xxiii, 322 p.: ill.; 25 cm. 1985. ISBN: 0632018763 (pbk.) LC Call No: TL671.2.S77 1985.

This textbook sets out to bridge the apparent gulf many feel exists between their understanding of aeronautical principles and the practical world of aeroplanes, by explaining how aircraft are shaped in terms of a technical response to natural, operational and design requirements. The shaping of an aeroplane is considered in terms of aerodynamics, propulsion, land and water operation and structural arrangement. The appendices include projects dealing with light aeroplanes, utility aeroplanes, subsonic transports, supersonic transports, and strike and reconnaissance aeroplanes.

Manual of Avionics; An Introduction to the Electronics of Civil Aviation. Brian Kendal. 2nd ed. Oxford: BSP Professional Books, 291 p.: ill.; 24 cm. 1987. ISBN: 0632018631 (pbk.) LC Call No: TL695.K46 1987.

This book comprehensively covers the principles and operation of the electronic systems and radio navigational aids used in civil aviation.

Wolf, Thomas. *The Nonprofit Organization — an Operating Manual.* Prentice-Hall, Englewood Cliffs, NJ. 184p. 1984. ISBN: 0136233155. LC Call No: HD 62.6 .W65 1984.

Based on the author's popular course at Radcliffe College, the book combines theory and practice on financial management and accounting, the "ten commandments" of fund raising, which planning process works best, assembling a board of trustees, what computers can do.

Major Loss Record. Aviation Information Services Limited. (Loose Leaf Binders).

The *Major Loss Record*, in two volumes, provides details of all known total losses of civil jet and turbo-prop airliners both passenger and cargo, Eastern and Western-built. It also lists all known executive jet total losses and gives details of 'Major Partial' losses of Western-built transports since 1st January 1968. Divided into three main sections: chronological, aircraft-type, and operator. Similar to the "Brown Book" CAA *World Airline Accident Summary.*

World Airline Accident Summary. (Great Britain) Civil Aviation Authority. Twenty first Consolidated Amendment (CA21). April 1989.

Covers Accidents up to the end of 1988 (together with amendments and additions to previous years).

International Flight Information Manual. April 1989. Volume 37. (U.S.) Federal Aviation Administration.

International Flight Information Manual. April 1989. Volume 37. Amendment No. 1, July 1989. (U.S.) Federal Aviation Administration.

Reports:

Aviation Safety. Serious Problems Continue to Trouble the Air Traffic Control Work Force. Report to Congressional Requesters. U.S. General Accounting Office. Report No. GAO/RCED-89-112. April 1989. 57p.

Presents the results of a survey of the air traffic work force — consisting of controllers, supervisors, and facility managers — to determine how those directly involved in air traffic control feel about their working conditions and other aspects of the air traffic control system. The results show that controllers and supervisors are troubled by working conditions and other aspects of today's air traffic control system that affect their ability to maintain the safety of the air traffic system. In contrast, facility managers viewed conditions more favorably. Overall, controller, supervisor, and facility manager views of working conditions did not differ significantly from the 1985 GAO survey results. Flight Safety Foundation evaluated the GAO questionnaire results and provided its views on safety.

Aviation Safety. Conditions Within the Air Traffic Control Work Force. Fact Sheet for Congressional Requesters. U.S. General Accounting Office. Report No. GAO/RCED-89-113FS. April 1989. 12p.

The fact sheet supplements the work summarized in the GAO report about problems concerning the air traffic control work force (see above). The fact sheet compares the complete 1988 questionnaire responses of air traffic controllers, supervisors, and facility managers (the air traffic work force) with those of the 1985 survey. The perceptions of the air traffic work force have changed little since the 1985 survey. Controllers, in general, believe that they are required to handle too much traffic; believe that more overtime is needed to cover training, leave, and other duties; and perceive a shortage of both developmental and full performance level controllers. A majority of controllers also believe that the quality of several essential areas of training provided to developmental controllers is inadequate, view their own morale as low, and believe that certain factors hinder FAA's ability to maintain system safety. Supervisors report, to a lesser extent, similar concerns. Facility managers, in contrast, view most of these areas more positively, much as they did in 1985.

Prediction of Success in FAA Air Traffic Control Field Training as a Function of Selection and Screening Test Performance. Carol A. Manning, Pamela S. Della Rocco, and Kevin D. Bryant. FAA Civil Aeromedical Institute. (U.S.) Federal Aviation Administration. Report No. DOT/FAA/AM-89/6. May 1989. 32p. Available: NTIS.*

This study compared correlations between Office of Personnel Management (OPM) selection test scores for Air Traffic Control Specialists (ATCs) and scores from the FAA Academy's second-stage screening program with measures of field training performance. While the OPM rating and the Academy course grade predict some measures of developmental training performance equally well, the Academy performance measures, particularly the laboratory performance scores, are better predictors of supervisor/OJT instructor ratings and training status than are OPM scores. It was concluded that it is not only appropriate, but also essential, that any analyses of training performance be conducted separately for developmentals in each option (en route centers, VFR towers, terminal radar facilities) because of disparate relationships between predictors and criteria.

Relationships of Anxiety Scores to Academy and Field Training Performance of Air Traffic Control Specialists. William E. Collins, David J. Schroeder, and Lendell G. Nye. FAA Civil Aeromedical Institute. (U.S.) Federal Aviation Administration. Report No. DOT/FAA/AM-89/7. May 1989. 9p. Available: NTIS.*

State-trait anxiety scores were used prior to the 1981 strike of air traffic control specialists (ATCSs) to estimate perceived levels of job stress in field studies of this occupational group. The present study assessed the relationship between anxiety, as measured by the State-Trait Personality Inventory (STPI), and post-strike ATCS trainee success at the FAA Academy and during field training. Academy test scores were obtained for 1,790 students in the enroute option. Criterion data included the field training status of the Academy graduates as of July 1988. Statistical analyses determined the relationships between ATCS student scores on the STPI measures and (a) normative data and (b) Academy and field performance. Results support the operation of some personality-related self-selection among ATCS applicants regarding anxiety, and the importance of this characteristic for ATCS job success.

"Operational Workload" — A Study of Passenger Energy Expenditure During An Emergency Evacuation. E.A. Higgins and James H.B. Vant. FAA Civil Aeromedical Institute. (U.S.) Federal Aviation Administration. Report No. DOT/FAA/AM-89/5. March 1989. 36p. Available: NTIS.*

In a continuation of a previous study which determined workloads for an emergency evacuation in an orderly manner, this study required passengers to avoid the aircraft aisles and to traverse over seat backs to the exit in order to simulate a maximum effort which might be anticipated in an emergency. This information is necessary to formulate qualification requirement for passenger protective breathing equipment. Recommended values proposed in the first study should be modified since the tests in this study represent maximum workload more realistically.

Canadian Aviation Safety Board Annual Report. 1988. (31 March 1989) ISBN 0-662-56612-2. 58 pages (English).

Trends in Canadian aviation safety show that the accident rate remains stable. There were 497 accidents involving Canadian-registered aircraft in 1988, 25 more than in 1987. Six of these occurred outside Canada. There were 25 accidents involving foreign-registered aircraft in Canada, the lowest number since 1983. Thus, there were 516 accidents in Canada, an increase in five over 1987. Fatal accidents and the resulting fatalities decreased in 1988.

Age, Alcohol, and Simulated Altitude: Effects on Performance and Breathalyzer Scores. William E. Collins and Henry W. Mertens. FAA Civil Aeromedical Institute, Oklahoma City, OK. Report No. DOT/FAA/AM-88/2. January 1988. 18p. Available: NTIS.*

Trained men in two age groups, 30-39 and 60-69, each performed at the Multiple Task Performance Battery (MTPB) in four separate full-day sessions with and

without alcohol at ground level and at a simulated altitude of 12,500 ft. Subjects breathed appropriate gas mixtures through oxygen masks at both ground level and altitude. Mean breathalyzer readings peaked near 88 milligrams percent and did not differ between age groups or altitude conditions. Younger subjects performed better than older subjects; performance of both age groups was significantly impaired by alcohol, but these adverse effects were greater for the older subjects. No significant effects on performance were obtained due to altitude or to the interaction of altitude with alcohol. These results and those from several effects of alcohol and altitude on blood alcohol levels and on performance need to be redefined.

Computer Procurement. FAA's $1.5-Billion Computer Resources Nucleus Project. (Fact sheet for the Chairman, Subcommittee on Transportation and Related Agencies, Committee of Appropriations, House of Representatives.) (U.S.) General Accounting Office. Report No. GAO/IMTEC-89-44FS. March 1989. 16p.

Reviews the preliminary results of the GAO ongoing audit of the Federal Aviation Administration's Computer Resources Nucleus (CORN) project. Includes information on the project's objectives, cost estimates, and implementation approach. The basic objective of the CORN project is for FAA to divest itself of its current Common Systems facilities and not to procure additional computer hardware. Under the CORN approach, the agency's Common System data-processing needs for the next 10 years are to be met through a single fee-for-service contract, from computer facilities provided and operated by a contractor. In addition, the contract is to include options for accommodating data-processing needs of other elements of the Department of Transportation. FAA issued the project's request for proposals on February 27, 1989, and anticipates that the contract will be awarded in late September 1989.

Outlook for Commercial Supersonic and Hypersonic Transport Aircraft. National Research Council (U.S.) Transportation Research Board. Transportation Research Circular Number 333, July 1988. 91p.

This collection of papers documents eight presentations during an all-day session at the TRB annual meeting on January 13, 1987. The areas include: (1) the particular market segment and size that might be served, (2) the profound implications of cruise Mach number, (3) the criticality and complexity of the technical, financial, and institutional issues involved, (4) the present climate for dealing with these issues, (5) the direction and magnitude of future research and development efforts likely to be required, (6) projected performance characteristics, and (7) the schedule for initial introduction and the succession of later configurations with increasingly higher performance.

Report on the Accident to Boeing Vertol 234 LR, G-BWFC 2.5 miles east of Sumburgh, Shetland Isles on 6 November 1986. Including the Review before Sheriff P G B McNeill QC (Chairman) and Professor P. Hancock and Mr. K.V. Kellaway (Assessors). U.K. Air Accidents Investigation Branch. Aircraft Accident Report 2/88. 1989. ISBN: 0115508988. 117p.

Regulations, Advisories :

AC 21-25. *Approval of Modified Seats and Berths Initially Approved Under a Technical Standard Order.* (U.S.) Federal Aviation Administration. 4/24/89. 4p.

AC 21-24. *Extending a Production Certificate to a Facility Located in a Bilateral Airworthiness Agreement Country.* (U.S.) Federal Aviation Administration. 4/14/89. 14p.

This advisory circular (AC) contains information and guidance concerning: (1) Federal Aviation Administration (FAA) production certificate (PC) holders located in the United States that plan to extend their PC to include a facility located in another country; (2) and the issuance of a PC to an applicant located in the United States when the applicant is engaged in a multinational coproduction program whereby major manufacturing facilities will be located in other countries. This AC further provides for extending a technical standard order authorization (TSOA) to include the production of auxiliary power units at the facility located in another country, in accordance with the criteria contained in the AC.

AC 150/5050-3B. *Announcement of Availability — Planning the State Aviation System.* (U.S.) Federal Aviation Administration. 4/11/89. 1p. Cancels AC 150/5050-3A dated June 1972.

This advisory circular announces the availability of the circular, which must be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC.

AC 150/5100-15A. *Civil Rights Requirements for the Airport Improvement Program (AIP).* (U.S.) Federal Aviation Administration. 3/31/89. 46p. Cancels AC 150/5100-15 dated September 24, 1984.

The Advisory Circular (AC) encompasses the basic civil rights requirements for the Airport Improvement Program (AIP). It is intended for sponsors using program assistance and for contractors and subcontractors working on projects under the program. This AC is updated to reflect the Disadvantaged Business Enterprises Program requirement mandated by the Airport and Airway Safety and Capacity Expansion Act of 1987, and also to include the general civil rights provision for airport

employment which sponsors are to include in all leases and contracts.

AIP (Aeronautical Information Publication) Canada. Amendment No. 3/89. Effective June 1, 1989. Transport Canada.

AC 150/5210-16. *Announcement of Availability — Standardized Basic Aircraft Rescue and Firefighting Curriculum (A Basic ARFF Training Course).* (U.S.) Federal Aviation Administration. 2/21/89. 1p.

Announces the availability of the curriculum and how to purchase it. The curriculum materials include instructor's guide, course transparencies, final test and instructor's key, 35 mm color slides, student manual, and aircraft diagrams — student's copy.

AC 121-31. *Training on Protective Breathing Equipment.* (U.S.) Federal Aviation Administration. 3/14/89. 3p.

This AC provides information regarding crewmember training on protective breathing equipment (PBE). Pertinent FAR require that each crewmember accomplish at least one firefighting drill using at least one type of installed hand fire extinguisher, appropriate to the type of fire to be fought, while using the type of PBE installed on that certificate holder's fleet. The purpose of the drill is to train crewmembers on the use of the protective breathing and firefighting equipment available on the airplanes in which they will serve.

(U.S.) *Federal Aviation Regulations.* Part 135 — Air Taxi Operators and Commercial Operators. Change 31. Amendment 135-30 and 135-31. U.S. Federal Aviation Administration.

This change incorporates two amendments in FAR Part 135: Amendment 135-30, Traffic Alert and Collision Avoidance System, effective February 9, 1989; and Amendment 135-31, Fire Protection Requirements for Cargo or Baggage Compartments, effective march 20, 1989.

(U.S.) *Federal Aviation Regulations.* Part 135 — Air Taxi Operators and Commercial Operators. Change 32. (U.S.) Federal Aviation Administration. Effective April 6, 1989.

This change incorporates Special Federal Aviation Regulation 50-2, Special Flight rules in vicinity of the Grand Canyon National Park in FAR Part 135.

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

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Aviation Statistics

A Summary of Daily Utilization and Propulsion Reliability Reports Of Selected Make and Model of New Efficiency Jet Transport Aircraft

July 1987 through February 1989

All public transport-type aircraft daily utilization and propulsion reliability data, furnished by U.S. operators, are compiled and published monthly by the National Safety Data Branch of the Aviation Standards National Field Office, U.S. Federal Aviation Administration. The report, entitled "Aircraft Utilization and Propulsion Reliability Report," contains the names of the operators, aircraft make and model (including fixed-wing and rotorcraft), engine make and model (including piston, turboprop and turbojet), number of aircraft in service, aircraft daily utilization, frequency of engine shutdowns and engine removals, as well as engine shutdown and removal rates. A review of the data could shed light on the reliability of engines of different engines.

The accompanying table summarizes the daily utilization of selected makes and models of new efficiency jet transport aircraft, and the frequency of engine shutdowns and removals for a 20-month period from July 1987 through February 1989. New efficiency jet transport aircraft refers to those fuel economy jet transports built since the early 1980s. It includes all models of the Boeing 757, Boeing 767, Airbus 310, and MD-80.

New Efficiency Jet Transport Aircraft

Daily Utilization, Engine Shutdowns, Removals and Rates July 1987 through February 1989 1/

Engine Make/Model	Aircraft Make/Model		Number A/C 7/87	Number A/C 2/89	Utilization2/ 87	Utilization2/ 89	Number of AVG	Number of SDN	Number of RML	Shutdown Rate (Per 100,000 Hours)	Removal Rate (Per 100,000 Hours)
RR211535 E4-437	A	3/	6	6	12	10	11	1	3	1.09	3.28
RR211535 E4-437	B	4/	25	25	10	9	10	10	37	3.48	12.85
CF6-80A	C	5/	22	30	9	10	9	3	49	1.03	16.86
CF6-80A	D	6/	25	30	10	9	10	3	56	0.87	16.18
CF6-80C282	E	7/	2	6	11	11	10	1	2	2.04	4.09
PW2037	F	8/	28	28	8	11	9	17	101	5.78	34.25
PW2037	G	9/	28	44	9	9	9	38	121	10.71	35.71
JT9D-7R4D	H	10/	19	19	11	11	11	13	49	5.12	19.31
JT9D-7R4D	I		7	7	10	8	9	8	10	10.09	13.85
JT9D-7R4D	J	11/	11	11	11	11	11	9	22	6.31	15.63
JT8D-217A	K		102	157	8	8	8	21	190	1.64	14.79
JT8D-219	L		20	20	9	9	9	9	35	2.27	15.87
JT8D-219	M	12/	19	31	7	8	7	1	22	1.00	22.52

A : B-757-200
B : B-757
C : B-767-232
D : B-767-223
E : B-767-200
F : B-757-251
G : B-757-232
H : B-767-222
I : A-310-200
J : B-767
K : DC-9-82
L : DC-9-83
M : MD-88

1/ Some Aircraft M/M had reports that covered fewer than 20 months.
2/ Utilization — Average daily utilization of aircraft is rounded up to nearest hour.

87 — The first quarter average in 1987.
89 — The most recent three-month average in 1989.
AVG — A daily average over the 20-month period.

3/ In service since 10/87
4/ In service since 7/83
5/ In service since 11/82
6/ In service since 12/82
7/ In service since 5/87
8/ In service since 11/84
9/ In service since 3/85
10/ In service since 9/82
11/ In service since 12/82
12/ In service since 5/88

Since some of the operators of the new efficiency jet transport aircraft did not furnish aircraft utilization and propulsion data to the FAA on a continuing monthly basis, the data for a few aircraft were incomplete. To minimize the bias in data analysis, the statistics shown in the table include only data for seven different engines, installed in 13 aircraft models, which had five or more aircraft in service during the reporting period.

The statistics show that the new efficiency jet transports were used, on average, between 7 and 12 hours a day. In this connection, it should be noted that the engine shutdown and removal rates are presented in terms of shutdowns or removals per 100,000 engine hours. The aircraft average daily utilization in number of hours is obtained by dividing the number of aircraft and number of days of the reporting month into the

aircraft fleet time. Engine time is a product of total fleet time and the number of engines of each aircraft. Since aircraft are required to have regular service and maintenance, the actual daily utilization of aircraft can be higher on many days than the average daily utilization. This factor may vary between different aircraft because, for example, a brand-new aircraft may not need as much time as an aging aircraft for maintenance and routine service.

A comparison of the statistics for engine makes and models installed in different airframes reveals that the propulsion reliability differs not only from one engine model to another, but also among engines of the same model installed in different aircraft models. For example, while the removal rates of PW2037 engines in aircraft models (F) and (G) were almost identical, model (G) had a higher shutdown rate than model (F).

There is no obvious relationship between engine shutdown and removal rates. In many cases, one engine/aircraft combination recorded a lower shutdown rate but a higher removal rate than another engine/aircraft combination. For example, the JT9D engine equipped in aircraft model (H) recorded a lower shutdown rate but a higher removal rate compared with the same engine in aircraft model (I).

The overall engine removal rate* is approximately one per 7,500 hours, while the shutdown rate is about one per 46,000 hours. Caution should be used in comparing removal and shutdown rates between different engine and aircraft models because data may not be complete in some cases, and because the number of shutdowns and removals may not be large enough to draw statistically valid conclusions in some cases.

For a copy of the report or other information, interested readers may direct correspondence to:

> DOT/Federal Aviation Administration
> Aviation Standards National Field Office
> National Safety Data Branch, AVN-120
> Oklahoma City, Oklahoma 73125 U.S.

*"Overall" rates are computed by dividing the total number of events for all engines by the total number of hours for all engines. ♦

Accidents/Incident Briefs

The following information on accidents and incidents is intended to provide an awareness of problem areas through which such occurances may be prevented in the future.

Feathers in the Fan

South Africa - April

Boeing 747: Damage to engine and tires. No injuries.

The widebody jet was departing at approximately 2000 hours from the Windhoek airport. During its takeoff run a bird was ingested by an engine and the captain decided to abort the takeoff.

During the emergency stop, the brakes overheated and a number of tires overheated and were blown out. However, there was no fire and no personnel injuries were reported. Initial inspection revealed that the ingested bird had caused enough damage to warrant the rejected takeoff, according to an airline spokesperson.

Because the city's lodging facilities were full, most of the aircraft's 360 occupants were forced to spend the night at the airport terminal until a replacement aircraft was available early the next morning.

Engine Fire in Flight

United States - April

Boeing 747: Damage to one engine. No injuries.

The four-engine aircraft had taken off from Miami International Airport bound for Paris. Shortly after takeoff, one of the port engines caught fire and the pilot shut it down. No further fire was reported.

Since the aircraft was already over the Atlantic Ocean, the pilot dumped fuel to lower the landing weight within limits and returned to the airport for an emergency landing.

The aircraft landed without further incident. A number of persons were anxious but there were no injuries and the passengers were put on another flight.

Compressor Stall

United States - April

Boeing 747: Damage to one engine. No injuries.

The widebody jet was departing Los Angeles International Airport, headed for London with 332 passengers aboard. During the takeoff, one of the engines was seen to be trailing smoke and flames. Alert control tower operators radioed the pilot with a report on the occurrence.

The pilot dumped fuel over the Pacific Ocean and returned to the airport where fire and rescue equipment was standing by. However, there was no further evidence of fire and the aircraft landed without incident. The passengers were transferred to another aircraft to continue their journey.

A spokesperson later reported that the engine in question had experienced a compressor stall.

Engine Trouble

Colombia - April

Sud-Aviation SE 210 Caravelle: Aircraft destroyed. Fatal injuries to five in aircraft and two on the ground; unspecified injuries to 11 persons on the ground.

The twin-engine cargo jet was departing from Barranquilla with 12 tons of meat, mail and mixed freight. The aircraft's intended destination was Bogota.

Shortly after takeoff, the aircraft apparently suffered an engine problem. Within two minutes after departure, the aircraft crashed into a fishing village, wrecking five huts and injuring numerous inhabitants. The aircraft's crew of three and two passengers were killed in the crash. The nature of the engine trouble that was said to have caused the accident was not specified.

The Final Cause

India - October 1988 (Final report)

Boeing 737-200: Aircraft destroyed. Fatal injuries to 132.

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

A court of inquiry has blamed the pilot for the crash last fall of a twin-engine jet airliner in which all but one of the 133 persons aboard were killed (*Flight Safety Digest*, January 1989, page 13). The report also charged as unsatisfactory, the actions of the National Airport Authority (NAA) which manages the airport at which the accident occurred.

The early morning flight had been inbound to the Ahmedabad airport in conditions of restricted visibility when it hit the ground approximately two miles short of the runway. The report was quoted as saying that the pilot misjudged the fog-shrouded runway and that the copilot did not have enough experience to effectively assist him.

The NAA was blamed in the report for not providing adequate navigational aids and weather information at the airport. Although an Instrument Landing System reportedly had been installed some time previously, it had not been placed in operation by the NAA. The agency also was faulted for not maintaining adequate firefighting facilities there.

Vulture Grounds Airbus

India - May

Airbus Industrie A300: Damage to front of aircraft. No injuries.

The widebody airliner was passing over New Delhi at an altitude of 4,000 feet when it struck a vulture. The pilot made an emergency landing with no further incident.

Upon inspection after landing, it was found that the encounter with the large bird had caused extensive damage to the aircraft. There was damage to the nose, pressure bulkhead and the radar antenna. The fate of the vulture was not reported.

Wind Gust Throws Trailer

New Zealand - May

Boeing 767-200: Engine cowling damaged. No injuries.

The aircraft was being loaded with passengers for a flight from Wellington International Airport to Sydney, Australia. Approximately 120 passengers had boarded by 1800 hours.

An empty luggage trailer was being towed past the aircraft when a sudden gust from a southerly gale blew the luggage trailer into the aircraft. The vehicle smashed into a starboard engine, puncturing the cowling. No one was injured but the aircraft was grounded until repair personnel could be flown in from Auckland. The passengers had to be accommodated for the night and rebooked on other flights the next day.

Big Bump in the Night

Australia - June

Boeing 747: No damage. Numerous minor injuries.

The aircraft was flying on autopilot at 32,000 feet over northern Australia. On board were 305 passengers on an overnight flight from Sydney to Singapore.

About 450 nautical miles southeast of Derby, Western Australia, the aircraft suddenly pitched up into a steep climb. After a gain of about 1,500 feet of altitude, the pilot disengaged the autopilot after which the aircraft descended steeply before he regained control. During the negative G descent, many unbuckled occupants were thrown about the cabin and some were seen to "float" out of their seats.

The aircraft landed at Darwin where 46 injured passengers were treated for cuts, whiplash and bruises; one also sustained fractured ribs. After a thorough inspection, the aircraft continued on to Singapore and to Frankfurt, West Germany, its final destination.

Post in the Way

France - June

Boeing 747: Slight damage. No injuries.

The widebody jet was departing Orly Airport, outside of Paris, bound for the island of Guadeloupe in the West Indies. It was carrying 455 people.

During the takeoff, the aircraft did not quite clear a 10-foot-high signal post. One tire was slashed and part of the fuselage was damaged. The pilot was unaware of the incident until controllers radioed him after the aircraft was out over the Atlantic Ocean on the way to its scheduled destination. The pilot decided to continue the flight toward Pointe a Pitre where the aircraft made a normal landing.

The damaged tire was replaced and minor repairs were made to a flap door and the aircraft was put back into service for its return flight to Paris.

Mountain in the Night

France - April

Fairchild FH-227B: Aircraft destroyed. Fatal injuries to 22.

The commuter flight had departed Paris and was making its approach to Valence, in the Rhone Valley north of Marseilles. Shortly after 2100 hours, 10 minutes prior to to its scheduled arrival time, the aircraft disappeared from air traffic control radar screens.

The widely scattered wreckage was found spread over a 1,000-foot area in the rugged Vercors Mountains about 12 miles from the airport. There were no survivors among the 19 passengers and three crew members, all of whom were assumed to have died when the aircraft hit a cliff at a height of approximately 3,300 feet. The aircraft was assumed to have exploded upon impacting the mountain and was completely demolished. Rescue service workers evacuated the bodies of the victims to a small village at the base of the mountain.

Forced Landing in Forest

Mexico - May

Pilatus Britten-Norman Trislander: Aircraft destroyed. Fatal injuries to six; 13 hospitalized with various injuries.

The chartered aircraft was carrying 17 passengers plus a pilot and a tourist guide from Chichen Itza, the archeological site in the Yucatan, to the Caribbean coastal resort of Cozumel. En route, the pilot reported to the Cancun control tower just before 1500 hours that he was having trouble with one of the aircraft's three engines. At the time the aircraft was within 10 minutes' flying time from the nearest airport at Playa del Carmen. he pilot was unable to reach the airport and made a forced landing in the forest. Rescue efforts were initiated at 1700 hours and the wreckage of the Trislander was discovered by a Mexican navy helicopter about 20 miles inland from Cancun in a densely wooded area. Six passengers had died in the crash and the survivors, which included the pilot, had sustained various degrees of injury, mostly fractures. The terrain was so inaccessible that the helicopter which found the accident site lowered food to the survivors by rope until rescuers could get there the next day.

Out of Balance

Sweden - May

Beech 99 Airliner: Aircraft destroyed. Fatal injuries to 16.

The twin-engine commuter had left Stockholm's Arlanda Airport on a regular flight to Virkvarns Airport at Oskarshamn. On board were a crew of two and 14 passengers, including a number of political leaders, students, civil servants, and union leaders.

When the aircraft was approximately 75 feet above the ground on final approach to the Oskarshamn airport, witnesses reported that it banked steeply and dove into the runway, immediately bursting into flames. No one survived and the aircraft was almost entirely consumed by the fire. There had been no emergency calls from the pilot.

Preliminary reports blamed the accident on excessive aft loading of the aircraft. As the airspeed, and consequently flight control effectiveness, was reduced on low final approach, control was lost and the aircraft stalled at too low an altitude to recover. Investigators reported that there had been too many heavy passengers seated in the rear of the aircraft, resulting in the center of gravity being placed too far to the rear. The average weight of passengers in the rear of the aircraft was stated to be well in excess of the 165-pound average used during weight and balance computations. A tape of radio communications revealed that the pilot had noticed during the flight that the aircraft was balanced improperly.

Power Failure

Philippines - May

Douglas DC-3: Extensive damage to aircraft. No report of injuries.

The cargo aircraft was bound from Manila to Roxas City to pick up a load of freight. The aircraft later was found to be carrying 16 unmanifested passengers, although it was licensed to carry only cargo.

During the takeoff run, the aircraft suffered a power loss and crashed on the right side of the runway. Initial damage assessment included both wings separated from the fuselage, landing gear collapsed, both propellers sheared off and one engine separated from its mountings. The aircraft was considered a total loss. There was no report of injuries sustained by the passengers.

Hill in the Way

Scotland - June

Cessna P206D Super Skylane: Aircraft destroyed. Fatal injuries to one.

The aircraft had taken off from Benbecula bound for Glasgow with a load of seafood. The pilot was the only occupant on the early morning flight.

The aircraft crashed less than 10 minutes later into a hill on the Ardnamurchan peninsula. The accident was discovered when a tourist telephoned the police with a report. A Royal Air Force helicopter was dispatched to search for the downed aircraft but low cloud prevented an air search. The wreckage was discovered later by a ground searcher; the aircraft had been destroyed and the pilot had been killed on impact.

Gear Collapse

United Kingdom - May

Cessna 401: Damage to right main landing gear, wing tip, aircraft belly, and propeller. No injuries.

The landing after the business flight was normal, until the aircraft had rolled some 1,500 feet. At that point, the right main landing gear gradually collapsed.

The aircraft rolled further along and departed the runway to the right, coming to rest cocked on the right wingtip about 30 feet into the grass and facing away from it. There were no injuries to the crew of two and the one passenger.

Later examination revealed that a metal failure had occurred in the bellcrank of the main gear retraction linkage that also forms part of the downlock. The break was reported to be caused by a bending overload, with the direction of the pressure the same that occurs during the final stages of gear extension. That same direction of loading would occur if the gear leg retracted while supporting the aircraft with the downlocks not positioned properly.

Because of the fracture, the lower end of the bellcrank, and the lock link attached there, could move with spring pressure to a position where the downlock microswitch would operate — giving a down and locked indication almost regardless of the position of the gear leg. Investigators noted that a number of pivot bearings involved with retraction and extension of the gear leg had not received proper lubrication.

Foggy Approach

West Germany - April

Cessna 421 Golden Eagle: Aircraft destroyed. Fatal injuries to seven.

The twin-engine aircraft had departed Ajaccio, Corsica, with a crew of two and two couples, including a 1-year-old child. It was headed for Heubach Airport, approximately 18 miles from Stuttgart.

The aircraft was approaching its destination at about 1900 hours, in weather that was described as rain and fog. Shortly before its expected arrival time, the aircraft crashed into a hillside on Bargauer Horn Mountain, some 2 miles from the airport. A forester found the wreckage the next day; there were no survivors.

In Trouble Over the Mountains

Peru - May

Cessna 208 Caravan: Aircraft destroyed. Fatal injuries to nine.

The single-engine turboprop utility aircraft owned by the U.S. State Department was on a drug reconnaissance flight over the coca leaf-producing region of Alto Huallaga. It was participating in a cooperative drug enforcement program between the U.S. Drug Enforcement Administration and the governments of Peru and Bolivia to find and destroy cocaine laboratories in the two countries. Aboard were six American and three Peruvian narcotics agents. It had taken off from the Amazonian town of Tingo Maria and was headed for Lima.

The next day, the wreckage of the aircraft was found by helicopter crews in a rugged region on the side of 15,000-foot Huacranacro Mountain along the western Andes near the village of Villaycocha, approximately 70 miles northeast of Lima. No survivors were found. Rescue

operations were postponed until the next day because of the rugged terrain and the onset of nightfall.

No Gold in Them Thar Hills

Brazil - May

Beechcraft (model not identified): Aircraft destroyed. Fatal injuries to five.

The aircraft was departing from Boa Vista Airport, in the state of Roraima. It was to carry gold prospectors and their equipment to a clandestine gold mine. Pilot witnesses at the airport later reported that the aircraft appeared to have been overloaded and was having engine problems.

According to witnesses, the Beechcraft failed to gain altitude after takeoff and it appeared that the pilot was attempting to return to the runway. The aircraft crashed fewer than 1,000 feet beyond the runway and exploded. Both pilots and the three passengers in the aircraft were dead when fire personnel arrived less than five minutes later.

Aircraft vs. Tractor

United Kingdom - April

Piper PA-28-140: Extensive damage to left wing. No injuries.

The pilot had made an approach to land at an unlicensed airfield that had no radio facilities. Because the airport was frequently used and was fenced on both sides for most of its length, it was not considered necessary to make a low pass prior to landing.

The pilot overflew the field, then made a normal pattern and touchdown. As the aircraft was nearing an intersection with an unused runway, a farm tractor entered the runway from the left. Although the pilot applied full brakes and right rudder, a collision occurred.

The aircraft sustained major damage to the left wing but there was no fire and no one was injured. The tractor was a new, high-speed model and had been two fields away when the pilot had flown over the runway prior to entering the landing pattern.

Low on Climbout

U.K. - April

Piper PA-32-260 Cherokee Six: Damage to left wing and fuel tank.

The single-engine aircraft was departing Glenforsa on a flight to Edinburgh. On board were the pilot and six passengers.

After takeoff, the aircraft struck a fence along the airport boundary, but the pilot continued the flight. After an uneventful landing at the destination, inspection revealed that the left wing had been damaged. Also, a piece of barbed wire had punctured a fuel tank and had dangled from it during the flight.

Slippery Landing

United Kingdom - April

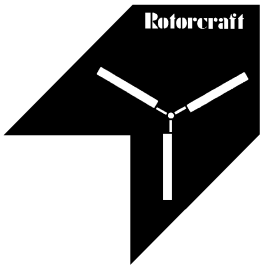
Gulfstream AA-5B: Nose gear detached. No injuries to four.

The aircraft was landing at an uncontrolled grass strip. The pilot had checked the surface wind conditions in the surrounding area and made two go-arounds to check the local wind and runway surface conditions. He chose the southeast runway with an available length of about 2,000 feet.

The pilot touched the aircraft down about 500 feet beyond the runway threshold and, as the aircraft appeared to decelerate normally, he expected no problems with the rest of the rollout. When the aircraft had slowed to about 30 knots and he applied brakes, he felt no increased deceleration. The aircraft continued along the grass strip without the benefit of braking and he shut down the engine before it ran into a bank along the boundary of the airstrip.

The aircraft received damage to a propeller blade, the nose gear separated, and there was minor damage to the bottom of the engine cowling. The occupants all were wearing shoulder harnesses and exited the aircraft with no injuries.

Further examination showed the pilot that the runway he had landed on had a slight downslope — and the moderately long grass surface was wet.



Cliff Strike

Australia - May

Hughes 500: Aircraft destroyed. Fatal injuries to two.

The rotorcraft, with a pilot and one passenger aboard, had taken off shortly after 1400 hours from Warrnambool on a flight to San Remo. The weather conditions in Western Australia were reported as good for the early afternoon trip.

At about 1500 hours, the helicopter crashed in the Port Campbell National Park, 155 miles west of Melbourne. Initial speculation was that the tail rotor struck a cliff near a rock archway known as London Bridge. The tail rotor then snapped off and the helicopter fell into knee-deep water, killing both occupants.

Hot Start

United Kingdom - June

Aerospatiale AS 332L Super Puma: Slight damage to paint. No injuries.

A fire began in the engine area just after startup. Some of the aircraft's paint was scorched before the blaze was extinguished but no further damage occurred.

A wet start or a fuel leak were suspected as the possible cause of the engine-start fire.

Grim Encounter

People's Republic of China - April

Aerospatiale AS 332L Super Puma: Aircraft destroyed. Fatal injuries to three.

The aircraft was flying in low visibility. Aboard were three crew members and no passengers.

At approximately 0300 hours, the helicopter was reported to have flown into a hillside. None of the occupants survived the crash and the rotorcraft was totally destroyed. ♦

Clarification

Gerard M. Bruggink, the author of "The First Two Minutes," published in the May 1989 *Flight Safety Digest*, has suggested a clarification of an editorial change in that paper.

On page 2 of the article, under "Explanatory Notes To Table and Graph," footnote #2 reads as follows:

2. Excluded are seven single-fatality mishaps; 1971 (1), 1973 (1), 1974 (1), 1978 (1), 1981 (3).

The following statement was deleted from the author's original footnote:

These would have been classified as ground or industrial accidents if the current aircraft accident definition were modified to reflect more closely the true risks of flying and the public's safety concerns.

The author has since provided further clarification of his footnote comments. The seven accidents represent almost 10 percent of the reviewed data, and the author has asked for an opportunity for readers to be made aware of the details behind his rationale for excluding the following seven accidents:

October 9, 1971: Supply van struck parked DC-9. Driver killed.

October 8, 1973: Ground crewman run over (DC-8).

February 2, 1974: Infant strangled by seat belt. (B-747, en route).

June 11, 1978: Ground crewman fatally injured (L-1011).

February 6, 1981: Line mechanic fatally injured while servicing nose gear doors (A-300).

May 20, 1981: Ground crewman run over (DC-10).

September 7, 1981: Passenger fell from truck-mounted loading stairs while taking photographs during an unscheduled stop.

These seven accidents are officially classified as fatal air carrier accidents. The author believes that these accidents—tragic as they were for the individuals involved—have no bearing on the true risks of flying. He prefers to treat them as ground or industrial accidents. Further, he suggests that failure to change the accepted definition of an aircraft accident may produce inaccurate air safety statistics. [Ed.] ♦