The Importance of Training In Aviation's Future

Stimulation of international exchange of information is needed to develop new methods of training to help improve safety.

by
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The development of aviation during the next 25 years and beyond has been rather definitely planned out. To the aircraft presently being operated will be added new designs now in production or planned. Implementation of electronic equipment and digital electronic computers will provide a significant improvement in the quality of flight operations, influencing the accuracy, economy and safety of flight. One of the principal problems that is necessary to solve now, however, is the achievement of optimal interrelationships between the potential improvements offered by technology and the human being with the priority being placed on the human to make sensible and unerring decisions.

This matter is studied and discussed widely in the world aviation literature. In connection with this matter, I will address the most important component of it — the training of flight crew members.

What constitutes training? How is it interpreted in our company? What is the connection between teaching and training? The term "teaching" means the cultivation of habits, practicing and exercises that develop the capabilities necessary to master the profession. The term "training" is somewhat broader in meaning and is considered to be a synonym for the concept of "change of behavior." The purpose of training is to cultivate definite behavior patterns in crew members before they are given the responsibility to fulfill their functions in everyday operations, and to change these patterns consistent with demands of particular conditions and with the information available for decision making. There is an acute need at present for the delicate, skilled selection of specialists to operate modern aircraft.

Throughout the more than 30-year history of international Aeroflot flights, we have been constantly searching for the best ways to select and train aviation specialists. At present, Aeroflot is selecting specialists on the basis of education, previous experience, health and conformity of personal characteristics with requirements for pilots of modern aircraft.

In the Soviet Union, great importance is given to educational preparation for flight crew training. In our country, there are presently 26 educational institutions that prepare personnel for Aeroflot. More and more funds are allocated for purchasing training books, simulators and laboratory equipment. Our authorities recognize the close connection between education, professional training and the general culture. As an example of this, greater emphasis is being placed on employing specialists with higher education for the airline.

In addition to the aforementioned work experience, the candidate's advancement in service experience is thoroughly evaluated in terms of a flight specialist position. For example, in preparation for duty as pilot-in-command of the IL-86 heavy transport aircraft, the candidate must pass through a series of stages in professional advancement. First, he must fly as copilot in light, piston-engine airplanes for 800 to 1,000 hours, followed by flight as pilot-in-command of the same type for an additional period of not less than 600 to 700 hours. Retraining then follows in short-range air carrier jet aircraft, where again the pilot must fly for 1,000 to 1,500 hours as copilot before advancing to pilot-in-command for another 1,000 hours before becoming eligible for consideration to fly heavy transport aircraft. If selected, the pilot again repeats the schedule of copilot to pilot-in-command with approximately the same number of hours in each position as in previous cycles. Upon completing the heavy transport training period, the pilot may transition into the IL-86 operation as copilot for 1,000 to 1500 hours before assuming the post of pilot-in-command.

This training schedule may have some deficiencies but, as a rule, it leads to highly professional specialists who fly heavy transport aircraft. This example of professional advancement illustrates the importance we attach to the aspect of practical training in the pilot's overall aviation specialist education.

A pilot may be employed in Aeroflot's international operations after his experience in domestic flying in particular types of aircraft as pilot-in-command. In this case, he begins a probation period as copilot of the same type of aircraft in which he is experienced for 450 flight hours. Successful completion of this probation will permit his appointment as pilot-in-command for international operations. This procedure has been adopted to provide a practical learning period for the understanding of the differences between Soviet national flight rules and international flight rules.

Theoretical training for the new trainee is extensive. Lessons take place in special training centers in the form of classroom lessons, using technical means of training and evaluation. These lessons cover:

- English language study
- International aviation law
- International rules of flight
- Use of aviation information documents.

English Language Study: This course comprises 450 teaching hours of the following sections:

- Radiocommunications in English and aeronautical phraseology, the goal being a fluent mutual understanding between flight crew and air traffic control personnel
- Contact with airport servicing personnel, the goal being a functional mutual understanding
- Proficient use of aeronautical materials
- Everyday functional topics, e.g., hotel and ground transportation requests and conversations, etc., the goal again being a functional mutual understanding.

Two methods are used in the lessons: the traditional lecture method, and a comparatively new one — psychological/semantic. Inasmuch as the trainees seeking to work in the airline are highly motivated, much of the training is self-dependent. Technical means of training and evaluation are employed including, at an appropriate stage, the use of simulators for training, with emergency situations simulated for principal airports.

International Aviation Law: This course comprises 80 teaching hours and includes the following topics:

- International aviation organizations
- Documentation and its legal ramifications
- Standards and recommendations

- Application of aviation law and spheres of its implementation

- Legal status of pilot-in-command

- Procedures for coordination with airport services in emergency situations.

International Rules of Flight: This course comprises 60 teaching hours, including further mastery of knowledge in the process of studying English and international air law. Lessons are conducted in the form of "business games" using technical means of training and evaluation. They are conducted, as a rule, by a flight specialist who has extended practical experience in international flights.

Use of Aviation Information Documents: This course comprises 30 teaching hours, and is aimed at providing a thorough educational preparation for international flight planning. The main materials used in this course are Jeppesen manuals, aeronautical information publications and supplements.

Recurrent training is also conducted at special centers every three years for personnel who fly on international flights. This training covers the same topics as the basic course, but with fewer hours of training required. The principal method of training is the verbal sharing of accumulated experience at seminars. All flight specialists attend this type of recurrent training, irrespective of their positions and seniority levels.

Practical training of crew members is the second component of the whole system of training. It employs a multi-faceted approach and is mainly found in flight operating units. It is conducted generally by flight specialists, and includes:

- *Simulator training*. Mastery of crew interaction, the use of cabin accessories and their operation in emergencies and complicated situations. At least 3 hours per quarter is devoted to this, taught by simulator instructors.

- *Technical training*. This syllabus includes instruction about the technical operation of the aircraft, such as peculiarities of particular aircraft in regard to aerodynamics and flying qualities. Three to four hours are taught each quarter.

- *Professional training*. Legal questions, perfection of language and optimization of crew member interaction in different stages of flight. Safety of flight is taught in this unit. Leading flight specialists teach this training about eight hours each month.

- *Seasonal training*. This training is given twice a year, during spring-summer and autumn-winter periods, for three days. The most important aspects of aircraft operation and systems during particular seasons are taken into account.

- *Aircraft and systems*. Practical lessons in aircraft and their systems are conducted with the aim of improving knowledge about their systems and the overall operation.

- *Requalification*. Improvement and confirmation of qualification with annual renewal of licenses is conducted. This includes a complete evaluation of professional skill in the simulator, by simulator specialists, and in flight, by command personnel. Technical evaluations are conducted to check professional skills in aerodynamics, navigation, understanding of the aircraft technical systems and their documentation, meteorology and other subjects.

- *Flight training*. Command instructional personnel conduct continuous flight training of active crew members during regular operations. In our opinion, this is a most effective method for teaching, building on the extensive fundamental training already received by the pilots. Active exchanges of experience in aircraft operation occur, arising from particular conditions and situations.

Practically, in terms of aviation personnel training, all levels of flight specialists are covered: the pilot-in-command organizes the prepa-

ration of the crew before the planned flight and judges the current qualification of his crew for the flight; the commanding instructors of flight units address particular matters of aircraft operation on specific airways and in specific airports; and the department of flight operation and navigation is engaged in the development of the strategy and tactics of general training and evaluates the levels of readiness and skill of command-instructor personnel.

Self-critically evaluating the existing training system, we can honestly observe that the possibilities of further progress in operations are not exhausted. The possibilities of information exchange at the international level with the help of different professional international organizations, e.g., IATA, ICAO, Flight Safety Foundation, etc., are constantly explored in order to compare different approaches to training. Searching for new training methods that offer improvement will positively influence development of international civil aviation, making it safer. That is why information exchange is so necessary. ♦

Investigating Foreign Aircraft Accidents In the U.S.S.R.

Regulations and procedures for inquiries into accidents involving non-Soviet aircraft are designed with the primary goal of prevention.

by
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The investigation of every accident involving a foreign aircraft in Soviet territory is obligatory. However, the sole purpose of this process is accident prevention, not apportionment of blame or liability. Such investigations are conducted by the State Supervisory Commission for Flight Safety under the U.S.S.R. Council of Ministers (Gosavianadzor for short).

These regulations were worked out in compliance with the U.S.S.R. Air Code, Article 26 of the Chicago Convention, and its Annex 13. The regulations also take into account bilateral and multilateral agreements on air transportation between the U.S.S.R. and other states.

The procedure is as follows:

Air traffic control (ATC) personnel and airfield controllers, upon receiving the information that an accident has occurred involving a foreign aircraft, immediately notify the Accident Investigation and Prevention Department and the General Flight Safety Inspection section of the U.S.S.R. Ministry of Civil Aviation. They also notify the regional civil aviation department in the territory where the accident occurred.

The next step is to notify the diplomatic representatives of the state of registry of the aircraft involved and the representatives in the U.S.S.R. of the air carrier to which the aircraft belongs.

Within 24 hours after the accident, Gosavianadzor, together with the Department

of International Relations of the Ministry of Civil Aviation, prepares and sends the appropriate notification to the state of registry and the state of manufacture. This is accomplished through the U.S.S.R. Commission for the International Civil Aviation Organization (ICAO). The notification is sent in Russian and contains the following information, if available:

- The ICAO accident/incident data report (ADREP) abbreviation identifying the accident
- The model, nationality and registration marks of the aircraft
- Name of owner, operator and lessor, if any, of the aircraft
- Name of the captain
- Date and time (local time or universal time code, UTC) of the accident
- Last point of departure and point of intended landing
- Position of the aircraft with reference to some easily defined geographical point, and the latitude and longitude (if the accident occurred outside an aerodrome area)
- Number of crew and passengers aboard, those killed and seriously injured; number of others killed and seriously injured
- The extent of damage to the aircraft
- The circumstances of the accident in brief
- The name of the organization conducting the investigation
- Physical and geographical characteristics of the accident area
- The name of the organization responsible for preparation of the notification.

The previous data should be presented in plain language, although the order is optional. Also, the dispatch of the notification should not be delayed if some of the information is not immediately available.

The chief of the local civil aviation authority, in whose territory the accident occurred, is responsible for conducting the initial investigation. The period involved is from the time the accident occurred until the arrival of the investigation team, or commission. Upon reception of the notification and until the arrival of the commission, the chief of the local civil aviation authority shall:

- Organize search-and-rescue operations, if necessary, with the help of the appropriate organization.
- Arrive at the accident site in the shortest possible time.
- Ensure that witnesses of the accident and persons taking part in search and rescue operations are identified and listed.
- Collect information and dispatch it to the Accident Investigation and Prevention Department of the Gosavianadzor of the U.S.S.R.
- Ensure withdrawal and sealing of any records (tapes).
- Organize medical examination of the crew and the controllers, take explanatory statements from the crew and other officials responsible for support of flight operations.
- Take steps for saving and preserving documents and onboard data recorders found at the accident site. Organize, if necessary, a search for wreckage in the neighboring territory and ensure its preservation.
- Ensure immediate meteorological observations and prepare the corresponding statement.
- Register (by photographs, drawings or other means) ice or other deposits on

the aircraft surface as well as other evidence which may be lost before the commission arrives.

- Organize the drawing of preliminary sketches of the accident site.

If the aircraft, due to the accident, is located where it hinders other flights or railway, automobile or other traffic, then, on agreement with the Gosavianadzor of the U.S.S.R., the aircraft may be moved as necessary. In moving the aircraft, care should be taken to preserve the structure (or the wreckage) in the condition it was at the accident site.

Upon reception of the initial notification of an accident involving a foreign civil aircraft, Gosavianadzor of the U.S.S.R. decides who shall staff the investigation commission. It then informs the U.S.S.R. Ministry of Foreign Affairs and the U.S.S.R. Ministry of Civil Aviation.

Further coordination of the investigation activities is carried out by the Investigator-in-Charge (IIC). Coordination of actions with the state of registry and the state of manufacture at this state of the investigation is effected through the Department of International Relations of the U.S.S.R. Ministry of Civil Aviation.

The state of registry and the state of manufacture are authorized to designate an accredited representative for the purpose of participating in the investigation of the accident, including advisers to assist them. Any special arrangements associated with the arrival of the representatives of the state registry and the state of manufacture in the U.S.S.R. and at the accident site are handled by the U.S.S.R. Ministry of Civil Aviation in agreement with the Gosavianadzor of the U.S.S.R. and other interested ministries and organizations.

The representatives of the state of registry and the state of manufacture who participate in the investigation are permitted to:

- Visit the accident site and examine the aircraft or the wreckage.
- Participate in questioning witnesses.
- Examine documents and evidence relevant to the accident.

The IIC ensures the support of all the activities of the accredited representatives who participate in the investigation.

If a foreign state whose citizens were killed in the accident makes a request to participate in the investigation, this is submitted through the U.S.S.R. Ministry of Civil Aviation and the Ministry of Foreign Affairs to the Gosavianadzor of the U.S.S.R. After such a request is approved, the expert appointed by the foreign state is permitted to:

- Visit the accident site.
- Examine the pertinent factual information.
- Assist in supplying information to help identify victims.
- Obtain a copy of the final report.

If additional information, equipment or experts are needed, the U.S.S.R. Gosavianadzor, through the Ministry of Foreign Affairs, sends an inquiry to any state with a request to supply information, equipment or experts to support the investigation. The state supplying the information, equipment or appointing the experts may appoint representatives for participation in the accident investigation. However, the extent of participation in the accident investigation by accredited representatives or experts of a state other than the state of registry or state of manufacturer is limited to the aspects of the accident for which their help was requested. The exact extent and form of their participation is determined by the IIC in each case.

The aircraft accident investigation process includes the collection, recording and analysis of all available information, determination of the accident cause or causes, and completion of the final report that also contains safety recommendations.

The investigation commission includes the IIC, his deputies and members. The accredited representatives of other states, advisers and experts are not members of the commission. The IIC is responsible for coordination of the activities of the commission with the representatives of other states and for settling all questions the latter may ask in connection with the investigation procedure.

The IIC is the senior official in the investigation, responsible for its completeness and quality. The IIC and commission members have free access to the aircraft, the wreckage and any documents related to the accident. Any activities of the representatives of foreign states connected with the examination of the aircraft (or the wreckage), withdrawal of the evidence (including the tapes) and questioning of witnesses shall be undertaken only through arrangement with the IIC.

The collecting and recording of relevant information should not be delayed until the accredited representatives of the states arrive. However, if the state of registry requests that the aircraft, its contents and any other evidence remain untouched until its accredited representatives examine them, the IIC makes all necessary provisions to fulfill such a request as far as it is feasible, and does not interfere with the investigation process. The same applies to requests by the state of manufacture about preserving the aircraft (the wreckage) undisturbed.

For the purposes of the investigation, the commission is divided into subcommissions according to the main directions of the activities (flight, engineering, administrative, etc.). Procedural and engineering aspects of commission activities are regulated by the provisions in force in the U.S.S.R. and procedures recommendations (manuals).

Decisions on the primary procedural and organizational aspects of the investigation are made by the commission, and the IIC has the right to make the final decision. Any problems arising in connection with the participation of foreign state representatives in the investigation are settled by the IIC through the accredited representatives of the state.

Readouts of flight data recorder data, examination of aircraft components and elements are carried out, as a rule, in appropriate Soviet institutions. If necessary, representatives of the state of registry and the state of manufacture participate. If there is no technical means available in the U.S.S.R. to carry out these tasks, they may be fulfilled in some other state in the presence of commission representatives. Such research work is performed in coordination with an authorized agency of the respective state.

Questions about making information concerning the aircraft accident available to the public with the purpose other than that directly related to the investigation are settled by the IIC in coordination with appropriate organizations. The opinions of accredited representatives of states participating in the investigation are taken into consideration.

Subcommissions and working groups compile their reports based on the investigation results. The reports are discussed at commission meetings and are used in subsequent activities. The reports are supplemented with the working materials that substantiate them.

The final report is the concluding document on the results of the investigation into an accident involving a foreign aircraft in the U.S.S.R. The draft final report is prepared by the commission and is signed by all of its members. The final report is written in Russian in the format recommended by ICAO Annex 13.

Gosavianadzor of the U.S.S.R. sends the draft final report through the U.S.S.R. Commission for ICAO to all states that participated in the investigation, and invites their comments. Comments received within 60 days of the date of the transmittal letter are considered by the Gosavianadzor of the U.S.S.R. and, if necessary, by other ministries and organizations. Specific comments that are considered inexpedient for inclusion in the final report should be appended to the draft final report.

After 60 days from the date of the transmittal letter, Gosavianadzor of the U.S.S.R. sends the final report through the U.S.S.R. Commission

for ICAO to:

- The State of Registry
- The state of Manufacture
- The State whose citizens were killed in the accident, if it participated in the investigation
- Any State which provided relevant information, facilities or experts.

All the expenses for the investigation of an accident involving a foreign civil aircraft, support of the work of the commission and the representatives of the foreign states, elimination of the accident consequences and help to persons who suffered in the accident and assistance to the victims relatives are borne by the U.S.S.R. Ministry of Civil Aviation. Subsequent demand is made for compensation of expenses on the part of the aircraft owner or the state of registry in that order, defined by agreement between the parties. ♦

Aviation Statistics

The Medical Risk of Airline Pilots Over Age 60

An Excerpt of the Report on Medical Risk Assessment and the Age 60 Rule Regarding Airline Pilots by the Office of Technology Assessment, U.S. Congress

by
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The Age 60 Rule

According to the so-called Age 60 Rule, the U.S. Federal Aviation Regulations (FARs) require Part 121 pilots to retire at age 60. This part covers commercial passenger and cargo air carriers that operate aircraft with more than 30 seats or 7,500 pounds payload capacity. There is no mandatory retirement age for pilots who operate aircraft under regulations other than Part 121. This includes operations of aircraft for commuter air carriers, on-demand air taxis, or aircraft used for corporate/executive, personal business and pleasure flying.

The age rule has been very controversial since it was initiated 30 years ago. One group opposed the rule calling it unfair and unsafe. Another group called the rule discriminatory. Some experts in both aviation and medicine have argued that during a flight emergency, experience and expertise is what counts. They cite how the older pilots have used their experience and expertise to save lives in flight emergencies and how younger pilots have been involved in air disasters. But the U.S. Federal Aviation Administration (FAA) contended that many study findings support the agency's position of retain-

Table 1 - Airline Transport Pilots, Employment
New ATP Certificates Issued

Calender Year 1980 - 1989

Description	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
ATP	65,506	70,311	73,471	75,938	79,192	82,740	87,186	91,281	96,968	102,087
Pilots Employed by Airline	29,808	30,230	28,144	28,108	29,963	32,960	37,108	41,963	43,795	43,671
New ATP Certificate Issued	7,116	4,763	5,037	7,959	5,643	5,081	6,498	7,678	7,461	7,829
ATPs over Age 60	4,433	4,999	5,315	5,704	6,063	6,094	6,031	6,014	6,340	6,707

Source: FAA Airmen Statistics and Air Transport Association

ing the age 60 rule unless there is strong evidence produced to abandon it.

Since airline deregulation was instituted in 1979, the demand for airline transport pilots has increased. As shown in Table 1, during the past decade, airline pilot employment increased from 29,808 pilots in 1980 to 43,671 in 1989. It is estimated that about 90 percent of the pilots employed by major airlines hold airline transport pilot (ATP) certificates. Table 1 also shows that over the years, the ATP population increased from 65,506 to 102,087 and the number of ATPs reaching age 60 increased annually.

Based upon the FAA assumption of aviation growth over the decade and the current ratio of airline pilot employment and airline traffic, it is estimated that U.S. airlines will need 2,000 new pilots annually to support the traffic growth. However, it should be pointed out that FAA Airmen statistics show that in 1989 there were about 12,000 ATPs aged between 50 and 59 years. Over next 10 years, therefore, an average of 1,000 ATPs will reach age 60 annually. In other words, beginning in 1990 the airlines will need a total of 3,000 new pilots each year to support normal operations. By the end of the century, the airlines will need a cumulative total of more than 30,000 new pilots.

Could it be a problem to train 30,000 ATPs to meet these airline needs? The FAA and the airline industry are faced with finding ways to fill the void. With increasing demand for airline (Part 121) pilots and the large increase in ATPs over the age of 60, there have been public debates on the merit of the age 60 rule.

Study and Findings

Early in 1990, the subcommittee on investigation and oversight, Committee on Public Works and Transportation, U.S. House of Representatives, asked the Office of Technology Assessment (OTA), an agency of the Congress, to examine the medical aspects of the age 60 rule and to analyze the state of the art of medical risk assessment.

To respond to the subcommittee's request, OTA interviewed FAA officials and medical experts and reviewed aeromedical literature, pilot health and safety data, as well as medical technologies. In the report, statistics on pilot performance and age were reviewed, available medical screening technologies were evaluated and medical cost and many related economic issues were examined. The findings in the report are as follows:

- Pilots between 60 and 69 years old who are permitted to fly under the strictest FAA medical requirements (Class I and

II medical certificates) have an accident rate twice as high as similar pilots who are in their 50s (See Figure 1).

- Sudden physical impairment has not been a factor in airline accidents. In one survey of U.S. air carrier accidents, no accidents during the 10-year period of the survey were attributed to acute incapacitation or impairment of the pilot. Virtually all pilot-caused accidents stem from judgment, or decision-making deficiencies, rather than impairment or incapacitation caused by medical disease. The 1981 Institute of Medicine

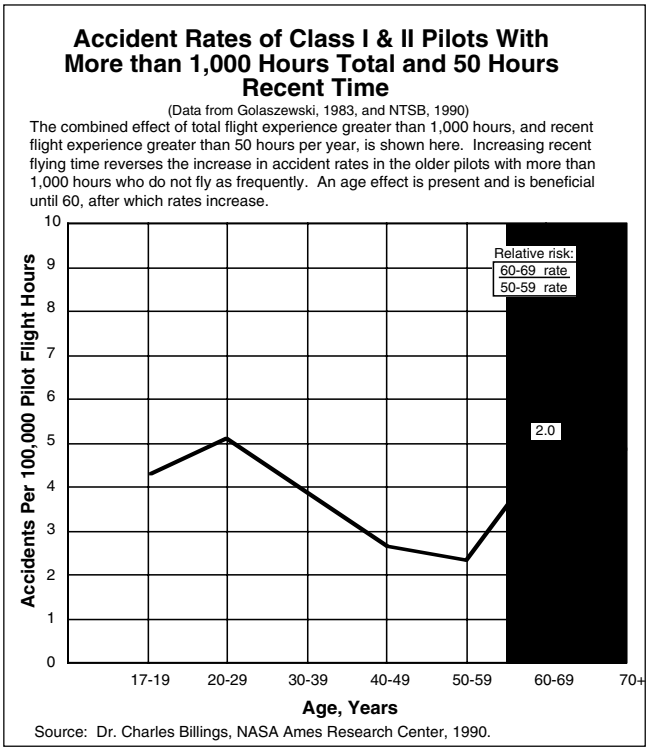


Figure 1

(IOM) Report notes that sudden incapacitations, when they occur, are not likely to cause accidents because the copilot or flight engineer can take over the controls.

- As pilots become older, the incidence of illness relevant to pilot performance rises. Data from the FAA's Civil Aeromedical Institute show that the rate at which airline pilots are denied medical certification increases with age. The average annual denial rate for airline pilots is 4.3 per 1,000 active airline pilots, increasing from 1.0 per 1,000 in the 25-29 age interval to 16.2 per 1,000 in the 55-59 age interval.

- No governments or industries currently have the ability to predict with certainty the development of medical conditions that could affect pilot performance. In 1981, the IOM specified a number of screening and detecting methods that could improve the evaluation of pilot health conditions, although none of these is now required for FAA medical certification. The OTA recently identified procedures and technologies for medical risk assessment that could enhance the protocol suggested by the IOM for examining older pilots. However, these procedures and technologies cannot ensure that current levels of pilot performance would be maintained if the age rule were abolished.

- Using all enhanced medical screening procedures and technologies for pilots between 60 and 65 would more than triple the average annual cost for Class I medical exams, increasing each one from about $300 to $1,000. On average, approximately $1,000 more in follow-up exams would be required for pilots whose exams produce abnormal screening results.

- Analysis indicates that the increase in accidents in the over-60 pilot group may be due to a subtle age-related deterioration in cognitive function (information processing and intellectual functioning) that is of sufficient severity to interfere with pilot performance and outweigh gains in experience in this group. Improved neuropsychological measures of cognitive performance would need to be developed and validated before FAA could reliably ground only the "high-risk" pilots who are over 60. This finding is the result of reviewing age-related diseases and current FAA medical certification examination requirements. But the report concluded that

the so-called high-risk pilots cannot be identified.

Related Economic Problems

In the report, it was pointed out that allowing airline pilots to fly beyond age 60 would raise a number of economic questions such as:

- *Legal action*. Pilots disqualified by new screening procedures may sue on the basis of discrimination, especially if the new tests have high error rates.

- *Labor contract*. Pilot union retirement (and other collective bargaining) agreements are based upon mandatory retirement of pilot service at age 60.

- *Salaries*. Senior pilots have substantially higher salaries than junior pilots.

- *Training*. Every pilot promotion or retirement has multiple effects on training within an airline. For example, if a pilot flying an airline's largest aircraft leaves, the airline must provide additional training to each pilot who moves up to a larger aircraft. The multiplying effect in this case is at least as large as the number of aircraft types in the airline's fleet.

Possible Development

The subcommittee released the report without comment. But it is certain that it will be of interest to all who may be concerned with the age rule. It is not known when the FAA will take steps to review the Age 60 Rule. However, it is reported that Senator Charles E. Grassley (R-Iowa) and Representative Jim Lightfoot (R-Iowa) have introduced bills in the Senate and House to raise the mandatory retirement age to 65. ♦

Reports Received at FSF Jerry Lederer Aviation Safety Library

Books

The Political Economy of International Air Safety: Design for Disaster? / Vicki L. Golich. — New York : St. Martin's Press, 175 Fifth Avenue, New York, New York 10010, U.S. 1989. 180p., ill. ISBN: 0-312-02825-3.

Key Words
1. Aeronautics — Accidents — Political Aspects.
2. Aeronautics — Safety Measures.

NOTES: Bibliography: p. 144-175.

Summary: Aviation safety issues are used to analyze international regime change — what triggers it, what form it takes, why and what effect(s) it may have on global relations at large. The analysis assumes the aviation regime was characterized by hegemonic stability and by management methods which weakened the dominant power's resource base by distributing benefits to other regime participants. Surplus capacity, associated with the operation of a market economy, intensified the effects of this process, adding to the forces impelling regime change. After the Second World War, a pattern of safety management emerged under the U.S.-dominated aviation safety regime; U.S. government elites, struggling to respond to conflicting domestic and international demands, relaxed safety in favor of efficiency. U.S. corporate elites, struggling to maintain market share, did the same. Catastrophes resulted, ultimately triggering the changes. Initially, the changes took place within the United States. In the 1990s, the changes may be more global. There is increasing evidence that Europeans or others may try to participate equally or replace the United States as aviation safety manager. [overleaf]

Pilot: Mental and Physical Performance / David C. Edwards. — Ames, Iowa : Iowa State University Press; 1990. xii, 219p. ISBN: 0-8138-0452-3. $26.95.

Key Words
1. Aeronautics — Psychology.
2. Airplanes — Piloting — Physiology
3. Air Pilots — Performance.

Contents: Seeing and Other Senses — Perception in Flight — Perceiving Cockpit Information — Psychology of Aircraft Controls — Learning and Memory Systems — Everyday Memory — Effective Flight Training — Making Decisions — Reasoning, Problem Solving, and Planning — Control of Attention — Work Load and Time-Sharing — Body Response to Flying Conditions — Sleep and Biological Rhythms — Boredom and Fatigue — Stress and Distress — Psychopathology — Judgment and Pilot Error — Index.

Summary: This book examines the human element in aviation. It addresses the mental and physical capabilities and limitations of pilots from a psychological viewpoint. The book also discusses some common myths about human performance that can lead to pilot errors in flying. The myths, misconceptions, and up-to-date concepts involving every aspect of a pilot's functioning are interspersed with situations and examples from actual flight records. The book is intended to give a thorough briefing to pilots of their abilities and limitations.

Reports

Report on the Accident to Boeing 737-400 G-OBME Near Kegworth, Leicestershire on 8 January 1989. — London : Department of Transport, Air Accidents Investigation Branch, [August] 1990. Aircraft Accident Report 4/90. xiii, 221 pages in various pagings, illust., graphs, color photos. ISBN: 0-11-550986-0.

Key Words
1. Aeronautics — Accidents — 1989.
2. Aeronautics — Accidents — Design.
3. Aeronautics — Accidents — Engine Failure.
4. Aeronautics — Accidents — Pilot Training.
5. Aircraft Cabins — Design and Construction.
6. Airplanes — Airworthiness.
7. Airplanes — Crashworthiness.
8. Airplanes — Seats — Crashworthiness.
9. British Midlands Airways — Accidents — 1989.

Summary: The plane left Heathrow Airport for Belfast at 1952 hours with 8 crew and 118 passengers (including 1 infant) on board. As a result of engine problems, the crew initiated a diversion to the East Midlands Airport. While on approach, the aircraft initially struck a field adjacent to the eastern embankment of the M1 motorway and then suffered a second severe impact on the sloping western embankment of the motorway. 47 passengers died; all crew members survived. Of the other 70 occupants, 74 suffered serious injury. The cause of the accident was that operating crew shut down the No 2 engine after a fan blade had fractured in the No 1 engine. This engine subsequently suffered a major thrust loss due to secondary fan damage after power had been increased during the final approach to land. The following factors contributed to the incorrect response of the flight crew: 1. The combination of heavy engine vibration, noise, shuddering and an associated smell of fire were outside their training and experience. 2. They reacted to the initial engine problem prematurely and in a way that was contrary to their training. 3. They did not assimilate the indications on the engine instrument display before they throttled back the No 2 engine. 4. As the No 2 engine was throttled back, the noise and shuddering associated with the surging of the No 1 engine ceased, persuading them that they had correctly identified the defective engine. 5. They were not informed of the flames which had emanated from the No 1 engine and which had been observed by many on board, including 3 cabin attendants in the aft cabin. Thirty one Safety Recommendations were made during this investigation relating to engines, pilot training on engine vibration, instrument displays, flight crew training for emergencies, flight crew training on simulators, certification requirement for gas turbine engines, flight data recorders, seat loading and design, cabin floors, child restraint systems and child seat design, and stowage bin design. [Synoposis]

Accidents/Incident Briefs

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

Lessons Learned From Hijacking

Boeing 737: Aircraft destroyed. Fatal injuries to 120 persons.

A Boeing 737, hijacked during a flight from Xiamen to Guangzhou, China, crashed into two parked planes when it made an emergency landing at Guangzhou's Baiyun Airport, causing heavy casualties. The following information is adapted from a report in *Beijing Review*, a Chinese news weekly.

After a week-long investigation, the Guangzhou Aviation Administrative Bureau and the Guangzhou Public Security Bureau reported that the Boeing 737 was hijacked after it took off from Xiamen in Fujian Province on its way to Guangzhou, capital of Guangdong Province.

According to surviving passengers and crew members, the male hijacker, who had been sitting in the 16th row, suddenly rushed towards the cockpit. Brushing aside a flight attendant who tried to stop him, the man forced his way into the cockpit and ordered all crew members except the pilot to leave by threatening to detonate an explosive. He then ordered the pilot to fly to Taiwan.

Communications with the ground were temporarily cut off, but finally the plane established contact with the flight control at Guangzhou's Baiyun Airport. To ensure the safety of the passengers and crew, the Guangzhou Aviation Administration informed the crew to land at any airport within or outside the borders of China's mainland, including Taiwan.

When the pilot replied that the aircraft had only enough fuel to reach Hong Kong, controllers agreed that he could proceed to Hong Kong and refuel there before flying on to Taiwan. Simultaneously, they contacted the Hong Kong Aviation Administration Department.

However, the hijacker was not happy about this arrangement and threatened to blow up the aircraft if it landed in Hong Kong. At 0904, with fuel running out, the pilot made an emergency landing at Baiyun Airport.

As the aircraft taxied from north to south along the runway, the hijacker attacked the pilot who lost control of the aircraft. The Boeing 737 swung to the right and collided with a parked China Southwest Airways aircraft, ripping open its cockpit.

Still moving, the 737 then collided with another aircraft, which was about to depart on a flight to Shangai, before exploding into a fireball.

After the fire was extinguished, two dead bodies were found in the cockpit of the hijacked aircraft. One was identified as Cen Longyu, the pilot. An identification card found in the coat of another body showed that the hijacker was Jiang Xiaofeng, born on August 11, 1969 in Linli County, Hunan Province. No trace of explosives was found.

According to the Public Security Department of Hunan Province, Jiang was a resident purchasing agent in Changsha, capital of Hunan Province, for the Development Corporation under the Goods and Materials Bureau of Linli County.

He had been taken into custody in September 1988 by Linli County police on a charge of robbery. On July 13 he had stolen 17,000 yuan (U.S. $3,600) from his company and was wanted by the local police.

A spokesman for the Civil Aviation Administration of China (CAAC) stated recently that major restructuring will be undertaken within the airport and airline involved in the hijacking incident. "This serious incident has revealed existing problems in the management of the airport and airline company," he pointed out. He reaffirmed the administration's commitment to rules and regulations that place safety of the passengers' lives and property above anything else.

The spokesman stated that, according to relevant international conventions designed to stop illegal interference in the safety of civil aviation, hijackers must be extradited and severely punished. "It is reported that the Taiwan authorities have recently made an explicit statement that they will no longer provide political asylum to hijackers and will send them back to their original departure point. We welcome this decision," he said.

Power Reduced, Aircraft Settled

Airbus A320: Aircraft destroyed. Fatal injuries to 91.

The air carrier was approaching its destination airport at Bangalore, India, in clear weather. The copilot was flying the aircraft, which was carrying 139 passengers and seven crew members.

As the aircraft descended through 500 feet on a visual final approach, the autothrottle was switched from speed mode to idle mode which reduced power prematurely. The aircraft subsequently undershot the approach and touched down on a golf course approximately 2,000 feet short of the runway threshold. After a short ground roll, it became airborne again only to settle to the ground some 300 feet further on among trees. The aircraft continued through the airport perimeter wall where the landing gear was torn off and it stopped short of the runway threshold.

The aircraft was destroyed by fire and 86 passengers and five crew members received fatal injuries.

Practiced too Hard?

Fokker F.27: Substantial damage. Serious injuries to two.

The twin turboprop commuter aircraft had departed the Cologne, West Germany, airport for a local flight. The crew was carrying out a series of practice stall recovery maneuvers as part of a check program.

After a series of maneuvers, both engines overheated and were substantially damaged. As a result, power was lost. The left engine caught fire and eventually fell off the aircraft. The crew was unable to maintain altitude with the reduced power of the remaining engine and carried out a forced landing on rough ground. The aircraft was damaged beyond repair and both crew members sustained serious injuries.

The Ice Man Took Control

Beechcraft 99 Airliner: Substantial damage. No injuries.

Although there had been heavy precipitation during the previous evening, the pilot failed to inspect the fuselage drains before departure into freezing flight temperatures. The aircraft took off on a non-scheduled cargo flight in the northwest U.S. at dawn late in December.

During the landing after an uneventful flight, the pilot was unable to operate the elevator control to flare the aircraft. The aircraft landed hard and sustained substantial damage.

Upon inspection, the elevator cables and pulleys were found locked in a solid block of ice that had formed where pooled water at the low point of the fuselage had become frozen. Causal factors included inadequate preflight preparation and low temperatures.

Fatal Combination Comes Together

Cessna 421: Aircraft destroyed. Fatal injuries to five.

The aircraft was departing with a pilot and four passengers for a midday flight. Weather was not a factor on the fall day.

The pilot had a considerable amount of flight time, but had not flown this model aircraft except for a checkout that morning that lasted 35 minutes. Shortly after takeoff, the aircraft crashed into a home and burned. The aircraft was destroyed and all occupants sustained fatal injuries.

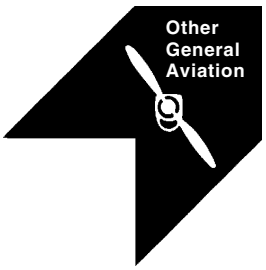
Investigation revealed that the aircraft was 134 pounds over gross weight, that proper airspeed had not been maintained and that the aircraft had stalled. An autopsy revealed that the pilot's left main coronary artery was blocked.

Remember the NOTAM

Beechcraft Model 60 Duke: Substantial damage. No injuries.

A Notice to Airmen (NOTAM) had been published warning pilots that an overrun area at the Bermuda Dunes, California, U.S., airport was under construction.

The pilot of the twin-engine business aircraft had departed another California airport and was landing at the Bermuda Dunes airport in mid-afternoon. The pilot undershot the runway during level-off and the right main gear struck a nine-inch lip at the threshold of the runway where overrun construction was underway. The main gear leg sheared off and the aircraft slid to the side of the runway. The aircraft was damaged substantially but the pilot exited without injury. The pilot had been aware of the NOTAM.



Whoa, Nellie! Go, Nellie! Oops!

Cessna 120: Moderate damage. No injuries.

The tailwheel two-seater was being landed at a grass strip during the noon hour of a mid-December day. During the rollout after an otherwise normal landing on the wet grass, the pilot applied brakes and found that braking was negligible and that the aircraft began to skid. He released the brakes but, as he did so, the 43-year-old aircraft began a turn to the left. The pilot tried to correct the turn with engine power and right rudder. The aircraft then turned to the right.

The pilot recognized that he would be unable to stop the aircraft in the runway distance remaining, so be applied full power to go around. The aircraft became airborne but the left stabilizer struck a fence post at the end of the runway. The stabilizer was partially detached and folded backwards, jamming the elevator and rudder and causing the aircraft to pitch nose-up to what the pilot estimated was a 70-degree nose-high attitude.

The pilot used engine power as a means of controlling pitch attitude, closing the throttle and opening it again to lower the nose and raise it again to re-establish a climb attitude. When the aircraft reached an indicated airspeed of 70 mph it began to vibrate severely. However, when the pilot reduced the airspeed to 65 mph, the vibration stopped and he was able to establish level flight at a height of 200 feet.

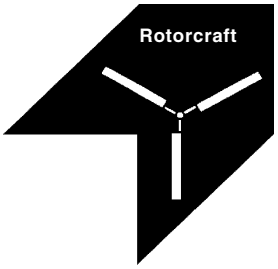
Having only engine power for altitude control and only ailerons for directional control, the pilot faced the inevitability of a forced landing. At this point, fortune smiled on the 600-hour private pilot. An airport with a 6,000-foot, hard-surface runway was directly ahead, so he transmitted a distress message on the control tower frequency and landed without further incident.

Why Checklists Were Invented

Cessna 310: Substantial damage. No injuries.

The pilot of the light twin-engine aircraft took off on a test flight to determine the reason for a suspected fuel problem. When he determined that the fuel gauges read too high, he returned to the airport.

A no-flap approach was set up and the pilot kept the power higher than 10 inches of manifold pressure, a configuration that does not allow the gear-up warning system to operate. During the landing flareout, the pilot reduced the power and heard a warning horn. He thought it was the stall warning. It was the gear-up warning — the airplane landed gear up. The aircraft was damaged substantially but the pilot, the only occupant, exited with no injuries.



Unattended Helo Has Mind of Own

Robinson R-22: Substantial damage. Minor injuries to one.

The pilot was preparing for a flight with a passenger. After the passenger boarded the two-place rotorcraft and the engine was started, the pilot decided to remove the aircraft's doors. He exited the aircraft to detach the doors and while he was doing so, the helicopter lifted off the ground approximately five feet. It then nosed up, causing the main rotor to strike the tail and rolled over.

The aircraft sustained substantial damage and the passenger, the sole occupant, received minor injuries. The pilot was not injured.

Better of Two Evils

Enstrom 280A: Substantial damage. No injuries.

The aircraft was in flight with a pilot and one passenger aboard. When the pilot saw power lines ahead, he made a 180-degree turn to avoid them and landed downwind. During the final phase of the landing, the helicopter hit a tree and then landed hard, incurring damage to the tail rotor, tail boom and main rotor drive shaft. The two occupants, however, exited the aircraft uninjured. ♦