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National Transportation Safety Board

Washington D.C. 20594

Safety Recommendation

Date: March 21, 1997

In reply refer to: A-97-20 and 21

Mr. Barry L. Valentine
Acting Administrator
Federal Aviation Administration
Washington, D. C. 20591

On April 11, 1996, about 0824 mountain daylight time, a privately owned Cessna 177B, registration N35207, collided with terrain after a loss of control following takeoff from runway 30 at the Cheyenne Airport, Cheyenne, Wyoming. The pilot in command, pilot trainee,[1] and rear seat passenger (the pilot trainee's father) were fatally injured. Instrument meteorological conditions existed at the time, and a visual flight rules (VFR) flight plan had been filed. The flight, which was a continuation of a transcontinental flight "record"[2] attempt by the youngest "pilot" to date (the pilot trainee), was operated under the provisions of 14 CFR Part 91.[3]

[1]The pilot trainee, a 7-year-old girl, did not hold a pilot certificate. To be eligible for a student pilot certificate a person must be at least 16 years old, and to be eligible for a private pilot certificate a person must be at least 17 years old. (14 Code of Federal Regulations (CFR) 61.103 and 61.83.)

[2]In July 1995, an 8-year-old boy flew back and forth across the United States, setting what was regarded as the "record" for the youngest "pilot," although these flights were not officially recognized as records. The boy's father reported to the Safety Board that he had contacted the Guinness Book of Records and learned that it kept no record for the youngest pilot.

[3]For more detailed information, read Aircraft Accident Report--"In-flight Loss of Control and Subsequent Collision with Terrain, Cessna 177B, N35207, Cheyenne, Wyoming," (NTSB/AAR-97/02)

The National Transportation Safety Board has determined that the probable cause of this accident was the pilot in command's improper decision to take off into deteriorating weather conditions (including turbulence, gusty winds, and an advancing thunderstorm and associated precipitation) when the airplane was overweight and when the density altitude was higher than he was accustomed to, resulting in a stall caused by failure to maintain airspeed. Contributing to the pilot in command's decision to take off was a desire to adhere to an overly ambitious itinerary, in part, because of media commitments.

Sleep/Fatigue-Related Issues

In the days before the accident, the sleep schedule of the pilot in command may have led to fatigue. He received 6 ½, 6 ¾, and 5 ½ hours of sleep, respectively, in the 3 days prior to the start of the trip on April 10, compared to the 8 ½ to 9 hours of sleep that he typically received per night on weekends.[4] On April 10, he awoke at 0330, earlier than his normal wake-up time. By mid-afternoon on April 10, during the fueling stop at Rock Springs, he told a witness of being tired. After arriving at Cheyenne, he telephoned his wife and said that he "was really tired."

There is evidence that people tend to underestimate their level of tiredness,[5] so that when the pilot reported being "really tired" it probably reflected a high level of fatigue. Accordingly, based on his early wake-up time (0330 Pacific daylight time), his long and demanding flight regime the first day of the transcontinental flight, his comments about being tired, and his potential sleep loss in the days before the trip, the Safety Board concludes that the pilot in command suffered from fatigue on the day before the accident.

The pilot in command had the opportunity to receive a full night's sleep the night before the accident between the time he checked into his hotel room at about 1900 and the time he checked out the next morning at 0622. However, the

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[4]Extra sleep on weekends is often a sign that the individual is building a sleep deficit during the week. The pilot in command routinely received less than 7 hours of sleep per night during the work week and compensated by sleeping longer on weekends. Before the accident, his sleep was less than usual during the work week, and he had no opportunity to compensate.

[5]See Aircraft Accident Report, "Uncontrolled Collision with Terrain, American International Airways Flight 808, Douglas DC-8-61, N814CK, U. S. Naval Air Station, Guantanamo Bay, Cuba, August 18, 1993" (NTSB/AAR-94/04)

quantity and quality of his sleep during that time is unknown. Immediately before the accident, the pilot in command committed several errors that are consistent with a lack of alertness.[6] The number and variety of these errors are consistent with a general degradation in performance of the sort produced by fatigue. Fatigue can degrade all aspects of performance, especially decision making, and could have resulted in the pilot in command being less than fully alert as he made the final determination to take off. However, there are other possible explanations for these errors, such as the effects of rushing, distraction from tasks, or the influence of habitual bad flying practices.[7] In addition, as noted above, the pilot in command had the opportunity to receive ample rest the night before. Therefore, there is insufficient evidence to conclude that fatigue was a factor in the accident.

Fatigue Awareness and Education

The Safety Board is concerned that the pilot in command continued flying the day before the accident even though he knew that he was fatigued. Recent literature[8] indicates that fatigue is a pervasive factor, often difficult for an individual to recognize, that can degrade decision making and most other aspects of human performance.

Educating operators in all modes of transportation on fatigue has been of special concern to the Safety Board. In 1989, the Safety Board recommended that the Department of Transportation (DOT) encourage education as part of an

[6]Specifically, he started the airplane engine while the nosewheel was still chocked; requested a taxi clearance without having obtained the automatic terminal information service [ATIS]; read back a radio frequency incorrectly; accepted a radio frequency that he could not dial on his radio; failed to acknowledge, as requested, the weather information provided by the controller; asked "are we going the right way"; failed to stop at the end of the runway; and used incorrect phraseology when he requested a "special IFR" [instrument flight rules] clearance.

[7]It was reported by pilots at Half Moon Bay that the pilot in command had executed unpublished approaches when the weather was below VFR minimums. It is also known that the pilot in command once attempted to taxi with a tow bar still attached to the airplane, and that a week before the accident flight, he forgot to do a runup and close the airplane door before making a flight with several reporters.

[8]See Fatigue Symposium Proceedings, November 1-2, 1995, National Transportation Safety Board and NASA Ames Research Center. Washington, D.C.: National Transportation Safety Board.

aggressive Federal program to address the problems of fatigue and sleep issues in transportation safety:

> I-89-3
> Develop and disseminate educational material for transportation industry personnel and management regarding shift work; work and rest schedules; and proper regimens of health, diet, and rest.

On April 20, 1996, the DOT provided the Safety Board with copies of a publication, two video films, and brochures developed for DOT use in fatigue education. One video and brochure, entitled "Fatigue Busters - How to Survive Fatigue in the 90's," was prepared by the Federal Aviation Administration (FAA) and has been sent to its regional safety offices. The Safety Board was impressed at the level of detail in this material and encouraged the DOT to continue to develop and disseminate similar materials as research progressed and to develop similar information in modes other than aviation and highway. As a result of these actions, on July 19, 1996, the Safety Board classified Safety Recommendation I-89-3 "Open--Acceptable Response."

In 1994, following a study of major air carrier accidents in which flightcrew performance was a factor,[9] the Safety Board recommended that the FAA:

> A-94-005
> Require U.S. air carriers operating under 14 CFR Part 121 to include, as part of pilot training, a program to educate pilots about the detrimental effects of fatigue, and strategies for avoiding fatigue and countering its effects.

In 1994, as a result of its investigation of an accident involving a Continental Express Embraer-120 RT on April 29, 1993, at Pine Bluff, Arkansas,[10] the Safety Board recommended that the FAA:

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[9]See Safety Study, "A Review of Flightcrew-Involved, Major Accidents of U.S. Air Carriers, 1978 Through 1990" (NTSB/SS-94/01)

[10]See Aircraft Accident/Incident Summary Report, "In-flight Loss of Control, Leading to Forced Landing and Runway Overrun, Continental Express, Inc., N24706, Embraer EMB-120 RT, Pine Bluff, Arkansas, April 29, 1993" (NTSB/AAR-94/02/SUM)

A-93-073
Require that 14 CFR Part 135 air carriers provide aircrews, as part of their initial and recurrent training, information on fatigue countermeasures relevant to the duty/rest schedules being flown by the company.

On September 8, 1995, the FAA issued Change 1 to Advisory Circular (AC) 120-51B, Crew Resource Management (CRM) Training. Appendix 3, Paragraph 2H, of the revised AC recommends CRM training on a number of topics, including factual information about the detrimental effects of fatigue and strategies for avoiding and countering its effects. As a result of this action, on January 16, 1996, the Safety Board classified Safety Recommendations A-94-005 and A-93-073 "Closed--Acceptable Action."

The Safety Board is encouraged by these actions and continues to encourage the transportation community to expand understanding and education on fatigue and countermeasures to it. However, the pilot in command's decision to continue flying the day before the accident when he knew that he was fatigued indicates that he did not adequately appreciate the potentially hazardous effects of fatigue on flight safety. The Safety Board concludes that information on fatigue and its effects, and methods to counteract it, might have assisted the pilot in command to recognize his own fatigue on the first day of the flight, and possibly enhanced the safety of the trip. Therefore, the Safety Board believes that the FAA should expand the development and increase the dissemination of educational materials on the hazards of fatigue to the general aviation piloting community.

Aeronautical Decision Making

Since 1988, the Safety Board has made three recommendations urging the FAA to enhance pilot training in decision making for commercial operations. Following its special study of emergency medical service helicopter operations,[11] the Board recommended that the FAA:

[11]See Safety Study, "Commercial Emergency Medical Service Helicopter Operations" (NTSB/SS-88/01)

A-88-002
Require that the material being developed for the Emergency Medical Service (EMS) pilot supplement to the aeronautical decision making manual for helicopter pilots be incorporated into EMS pilot initial and recurrent training.

On October 20, 1988, the FAA issued AC 135-14, "Emergency Medical Services/Helicopter." This AC provided information on overall training requirements that should be satisfied by Part 135 operators for FAA program approval, including guidance regarding aeronautical decision making for EMS helicopter pilots. On January 25, 1989, the Safety Board classified Safety Recommendation A-88-002 "Closed--Acceptable Alternate Action."

Following its investigation of a midair collision involving a Piper Aerostar PA-60 airplane and a Bell 412 helicopter that occurred on April 4, 1991,[12] the Safety Board further expressed its concern about aeronautical decision making. The Safety Board issued the following recommendation to the FAA on October 11, 1991:

A-91-93
Disseminate more aggressively available information and materials pertaining to Aeronautical Decision Making training and actively promote its implementation among all categories of pilots in the civil aviation community.

On December 1, 1989, the FAA published AC 120-51, "Cockpit Resource Management Training (CRM)," and on December 13, 1991, the FAA published AC 60-22, "Aeronautical Decision Making." Both publications addressed the importance of including decision making in pilot training programs. Based on the latter action, the Safety Board classified A-91-93 "Closed--Acceptable Action."

[12]See Aircraft Accident/Incident Summary Report, "Midair Collision Involving Lycoming Air Services Piper Aerostar PA-60 and Sun Company Aviation Department Bell 412, Merion, Pennsylvania, April 4, 1991" (NTSB/AAR-91/01/SUM)

In 1993, following its investigation of an accident involving a Scenic Air Tours Beech Model E18S near Maui, Hawaii, on April 22, 1992,[13] the Safety Board again expressed its concern about the adequacy of aeronautical decision making training and issued the following recommendation to the FAA:

> A-93-013
> Issue an air carrier operations bulletin instructing all principal operations inspectors to aggressively encourage all commercial operators to incorporate comprehensive aeronautical decision making (ADM) training in their pilot training programs.

On February 22, 1994, the Safety Board classified Safety Recommendation A-93-013 "Closed--Acceptable Action," based on the FAA's proposal to issue Change 1 to AC-120-51B to emphasize to field office inspectors the importance of encouraging operators to incorporate decision making in their company training programs. The change was subsequently issued on September 8, 1995.

Although these actions with regard to AC-120-51 (CRM) have improved and enhanced decision making training for commercial pilots, general aviation pilots are not exposed to this training. AC 60-22 (Aeronautical Decision Making), issued by the FAA in 1991, was aimed at general aviation pilots and flight instructors. This AC provides a basis for explaining decision making to pilots and a framework for teaching judgment issues to pilots. The AC describes common dangerous tendencies, dangerous attitudes, fitness for duty, and decision making models.

Recent developments in the area of aeronautical decision making[14] have focused on decision making involving real life situations, in which decisions must often be made rapidly in response to changing and ambiguous

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[13]See Aircraft Accident Report, "Tomy International, Inc. d/b/a Scenic Air Tours, Flight 22, Beech Model E18S, N342E, In-Flight Collision with Terrain, Mount Kaleakala, Maui, Hawaii, April 22, 1992" (NTSB/AAR-93-01)

[14]See Judith Orasanu and Terry Connolly, "The Reinvention of Decision Making" in Gary A. Klein, Judith Orasanu, Roberta Calderwood, and Caroline E. Zsambok (Eds.), *Decision Making in Action: Models and Methods.* Norwood, N. J.: Ablex Publishing Corporation.

circumstances. This work has emphasized the importance of experience for rapidly assessing situations and choosing workable alternatives.

The Safety Board is aware of several recent initiatives to upgrade the teaching of decision making to general aviation pilots. For example, the Air Safety Foundation of the Aircraft Owners and Pilots Association has recently developed a pilot training seminar entitled "Never Again" that is being presented to pilot groups and that focuses on actual weather-related incidents. By using videotape reconstruction and regular audience discussion, the seminar presents decision making issues in a manner that is compelling and closely related to actual pilot experiences. The Safety Board is also aware that the National Association of Flight Instructors is developing a new program in decision making skills aimed at flight instructor recertification training. It will emphasize judgment in concrete situations facing pilots. The Safety Board commends these efforts.

The Safety Board recognizes that the FAA's letter of April 24, 1996, to certified flight instructors (CFI) generally addressed CFI responsibilities and the importance of making appropriate decisions. However, it did not specifically refer to the circumstances of this accident. Therefore, the Safety Board believes that the FAA should incorporate the lessons learned from this accident into educational materials on aeronautical decision making.

In October 1996, Congress passed the Child Pilot Safety Act, which limits "record"-attempting flights and has ordered the FAA to conduct a study of the impacts of children flying aircraft. As shown in this accident, the record-setting aspect and associated media and itinerary pressure of such flights can distort a pilot's decision making and lead to an unsafe situation.

Therefore, as a result of the investigation of this accident, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Expand the development and increase the dissemination of educational materials on the hazards of fatigue to the general aviation piloting community. (A-97-20)

Incorporate the lessons learned from this accident into educational materials on aeronautical decision making. (A-97-21)

Also, the Safety Board issued Safety Recommendations A-97-19 to the Aircraft Owners and Pilots Association, the Experimental Aircraft Association, and the National Association of Flight Instructors.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By: Jim Hall
Chairman