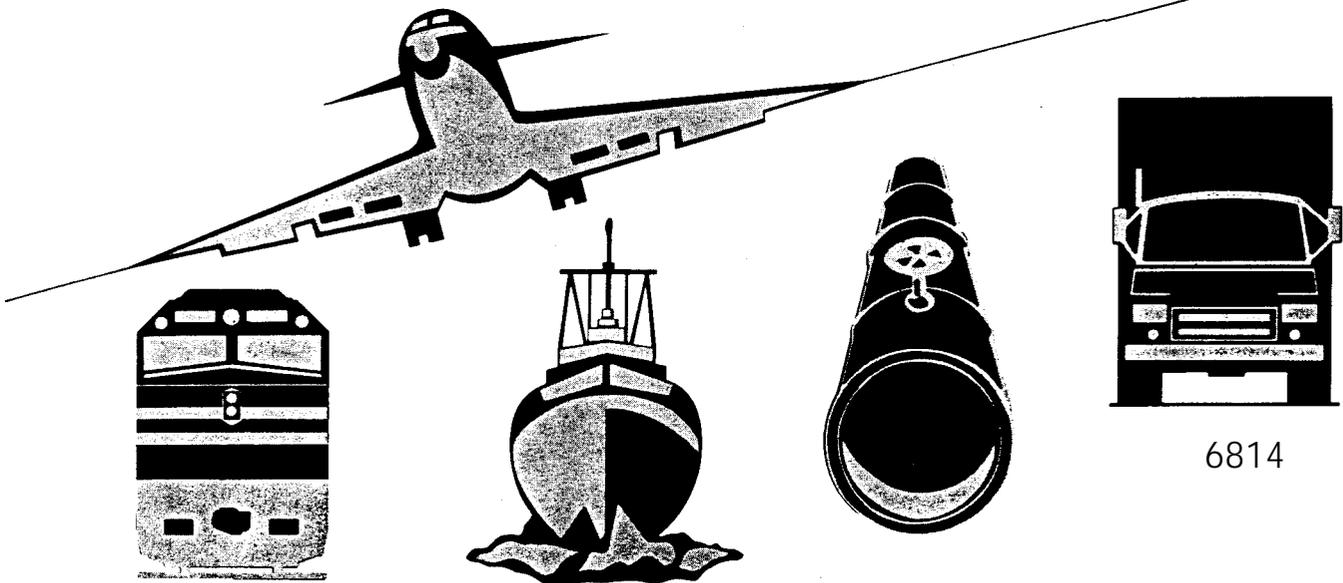


NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

IN-FLIGHT LOSS OF CONTROL AND
SUBSEQUENT COLLISION WITH TERRAIN
CESSNA 177B, N35207
CHEYENNE, WYOMING
APRIL 11, 1996



6814

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**Adopted: March 11, 1997
Notation 6814**

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CONTENTS

EXECUTIVE SUMMARY	v
1. FACTUAL INFORMATION	
1.1 History of Flight	1
1.2 Injuries to Persons	6
1.3 Damage to Airplane.....	6
1.4 Other Damage	6
1.5 Personnel Information	6
1.5.1 Pilot in Command	7
1.5.2 Pilot Trainee.....	8
1.5.3 Pilot Trainee’s Father	9
1.5.4 Airplane Occupants’ Sleep and Activity History Prior to the Accident	9
1.5.4.1 Pilot in Command’s Sleep and Activity History Prior to Starting Flight	9
1.5.4.2 Pilot Trainee’s Sleep and Activity History Prior to Starting Flight.....	10
1.5.4.3 Pilot Trainee Father’s Sleep and Activity History Prior to Starting Flight	10
1.5.4.4 All Occupants’ Sleep and Activity History After Starting Flight.....	10
1.6 Airplane Information	12
1.6.1 Airplane Fuel Information and Guidance.....	12
1.6.2 Weight and Balance.....	13
1.6.3 Stall Speeds.....	14
1.6.4 Wing Flap Settings	14
1.6.5 Climb Speeds and Climb Rates	14
1.7 Meteorological Information	15
1.7.1 General Weather Information.....	15
1.7.1.1 Weather Observations.....	16
1.7.1.2 Crosswinds.....	17
1.7.1.3 Density Altitude.....	19
1.7.1.4 Precipitation.....	19
1.7.1.5 Lightning Data.....	21
1.7.2 Witness Descriptions of Weather Conditions Near the Airport	21
1.7.2.1 Other Pilots	21
1.7.2.2 Air Traffic Control.....	22
1.7.2.3 Other Eyewitness Statements	23
1.8 Aids to Navigation.....	23
1.9 Communications	23
1.10 Airport Information	23

1.11	Flight Recorders	23
1.12	Wreckage and Impact Information	23
1.13	Medical and Pathological Information	25
1.14	Fire	25
1.15	Survival Aspects	26
1.16	Media Aspects	26
1.16.1	Itinerary Planning	28
1.17	Previous Record Attempt	30
1.18	Postaccident FAA Action and Legislative Changes	32
2.	ANALYSIS	
2.1	General	34
2.2	Analysis of the Accident Sequence	35
2.2.1	Operation of the Airplane’s Controls	35
2.2.2	The Accident Scenario	35
2.3	Human Performance Aspects	41
2.3.1	Fatigue	41
2.3.2	Fatigue Awareness and Education	42
2.3.3	Media Attention and Itinerary Pressure	44
2.3.4	Aeronautical Decision Making	46
2.4	Recent Legislative Changes	49
3.	CONCLUSIONS	
3.1	Findings	50
3.2	Probable Cause	53
4.	RECOMMENDATIONS	54
5.	APPENDIXES	
	Appendix A--Investigation and Hearing	55
	Appendix B--Transcript of AFSS Weather Briefing	56

EXECUTIVE SUMMARY

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, and rear seat passenger (the pilot trainee's father) were fatally injured. Instrument meteorological conditions existed at the time, and a visual flight rules flight plan had been filed. The flight, which was a continuation of a transcontinental flight "record" attempt by the youngest "pilot" to date (the pilot trainee), was operated under the provisions of 14 Code of Federal Regulations Part 91.

The National Transportation Safety Board determines 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.

The safety issues discussed in the report include fatigue, the effects of media attention and itinerary pressure, and aeronautical decision making. A recommendation concerning the circumstances of this accident and the importance of aeronautical decision making was made to the Aircraft Owners and Pilots Association, the Experimental Aircraft Association, and the National Association of Flight Instructors. Recommendations concerning aeronautical decision making and the hazards of fatigue and were made to the Federal Aviation Administration.

**NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594**

AIRCRAFT ACCIDENT REPORT

**IN-FLIGHT LOSS OF CONTROL AND
SUBSEQUENT COLLISION WITH TERRAIN**

**CESSNA 177B, N35207
CHEYENNE, WYOMING
APRIL 11, 1996**

1. FACTUAL INFORMATION

1.1 History of Flight

On April 11, 1996, about 0824 mountain daylight time (MDT),¹ 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,² and rear seat passenger (the pilot trainee's father) were fatally injured. Instrument meteorological conditions existed at the time, and a VFR³ flight plan had been filed. The flight, which was a continuation of a transcontinental flight "record"⁴ attempt by the youngest "pilot" to date (the pilot trainee), was operated under the provisions of 14 Code of Federal Regulations (CFR) Part 91. (See section 1.17 for the intended route of flight.)

On the morning of April 11, the pilot in command, the pilot trainee, and the pilot trainee's father arrived at the Sky Harbor FBO⁵ at the Cheyenne Airport between 0715 and 0730. A copy of a privately recorded videotape made

¹Unless otherwise indicated, all times are MDT, based on a 24-hour clock.

²The 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 CFR 61.103 and 61.83.)

³Visual flight rules

⁴In 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.

⁵Fixed-base operator

by a bystander, displaying a time hack beginning at 0739 (video-recorder clock time), showed the airplane being loaded with personal effects. The ramp appeared to be dry, and the airplane's shadow could be clearly seen on the pavement. The video recording then showed the pilot in command and the pilot trainee conducting portions of a preflight briefing and a taped television interview. During the interview, rain could be seen streaming off the airplane's wings, and water was forming puddles on the ramp.

The program director for a local Cheyenne radio station conducted a telephone interview with the pilot trainee and her father at the airport about 0745. He invited her to stay in Cheyenne because of the weather, but the pilot trainee's father indicated that they wanted "to beat the storm" that was approaching. The pilot trainee spoke with her mother by cellular telephone as she ran to the airplane to depart. She ended the call when she boarded the airplane.

At 0801:21, the pilot in command contacted the Casper AFSS⁶ via telephone and requested a weather briefing for a VFR flight from Cheyenne to Lincoln, Nebraska, the first scheduled fuel stop of the day's intended flights. The weather briefer reported:

at this time we have an AIRMET [airman's meteorological information] for icing moderate below...twenty four thousand in Wyoming[; an] AIRMET for turbulence...along the route[,] possibly severe below eighteen [thousand] otherwise moderate[;] [IFR (instrument flight rules)] flight precautions are in effect likewise along that route of flight[; and] there's a cold front just to the north of your position[,] actually they depict it through there now.

The pilot in command replied, "yea its startin to rain here." The briefer continued:

with regards to the rain showers...virtually a line of it on a north south line just west of your position an [they're] movin from south to north at this time so we have thunderstorms icing and [IFR]...not looking for a lot of improvement[.] [C]heyenne[']s

⁶Automated Flight Service Station

currently twenty six hundred broken three thousand overcast ten miles with light rain[.]

The briefer then described current weather conditions at several points east of Cheyenne, and the pilot in command said, “yea probably looks good out there from here...lookin east looks like the suns shining as a matter of fact.”

The briefer also reported that the “forecast for [C]heyenne through [9:00 a.m. local time] calls for two thousand scattered to broken four thousand broken and light rain[;] thunderstorms [and] after [9:00 a.m. local time] lowering ceilings fifteen hundred feet along your route of flight,” and that rain, fog, and thunderstorms were forecast for several points along the intended route of flight. He stated, “so...if you can venture out of there and go get east it looks [...],” to which the pilot in command replied “yea it looks pretty good actually.” The briefer then made reference to the “adverse conditions” currently at Cheyenne, and the pilot in command said, “yea its raining here pretty good right now[, I] mean its you know steady but nothin[g]...bad[,] and to the east it looks real good.” The pilot in command then filed a VFR flight plan for the intended flight to Lincoln, Nebraska. The telephone conversation was terminated at 0807:44. (See Appendix B for a full transcript of the briefing.)

Following the recording of the taped television interview, there was a break in the private video recording. At 0813:06, the pilot in command contacted the Cheyenne ATCT⁷ requesting clearance to taxi, and, at 0813:24, the local controller responded “taxi to runway three zero, verify you have ATIS⁸ echo?” The pilot responded “negative, what’s the ATIS,” after which he was then given the ATIS frequency of 134.425 MHz and was requested to “advise when you have echo.” The pilot responded, verifying the frequency as 134.25, and this was corrected by the local controller.

The next private video footage did not have a time hack displayed. In that segment, the airplane’s engine was running, the airplane external lights were visible, and the nosewheel was still chocked. Rain was falling, and the ramp showed standing water. The recording stopped again, and when it resumed, the engine was no longer running, and the external lights were off. A lineman was observed removing the nosewheel chock, after which the airplane’s external lights

⁷Air Traffic Control Tower

⁸Automated Terminal Information Service

were turned back on and the engine was restarted. The airplane then taxied from its ramp location (see Figure 1) southeasterly along the parallel taxiway to the approach end of runway 30.

At 0815:39, the pilot in command stated, “I don’t get four two five on this radio.” At 0815:43, the local controller transmitted “cardinal two zero seven roger, runway three zero, wind two eight zero at two zero occasional gusts three zero altimeter two niner seven zero.” At 0816:00, after no response was received, the controller asked for an acknowledgment, and the pilot responded “OK, two zero seven, are we going the right way for three zero?” The controller responded “you are heading the right way for runway 30, did you get the numbers?” and the pilot acknowledged “we got em.”

At 0818:12, the local controller advised the pilot that a “twin Cessna just departed reported moderate low-level windshear plus or minus one five knots” and the pilot responded “we got that thank you.” At 0818:53, the local controller advised that “tower visibility [is] two and three quarters [of a mile], field is IFR⁹ and say request,” to which the pilot responded “OK two zero seven would like a special IFR um ah right downwind departure.” The controller responded “I’m not familiar with special IFR” and the pilot corrected with “I’m sorry, special VFR.”

The local controller then coordinated with the local radar controller and, at 0820:19, advised the pilot that he was “cleared out of [the immediate airport vicinity] to the east, maintain special VFR conditions,” which the pilot acknowledged.

At 0820:51, the local controller inquired “let me know when you are ready,” and the pilot responded, at 0820:56, “two zero seven’s ready.” Two seconds later, at 0820:58, the airplane was cleared for takeoff. The controller told investigators that the airplane was rolling at the time of this transmission.

The private videotape then showed the airplane beginning its takeoff roll on runway 30, lifting off, and then the view of the airplane becomes obstructed by a building.

⁹Instrument flight rules

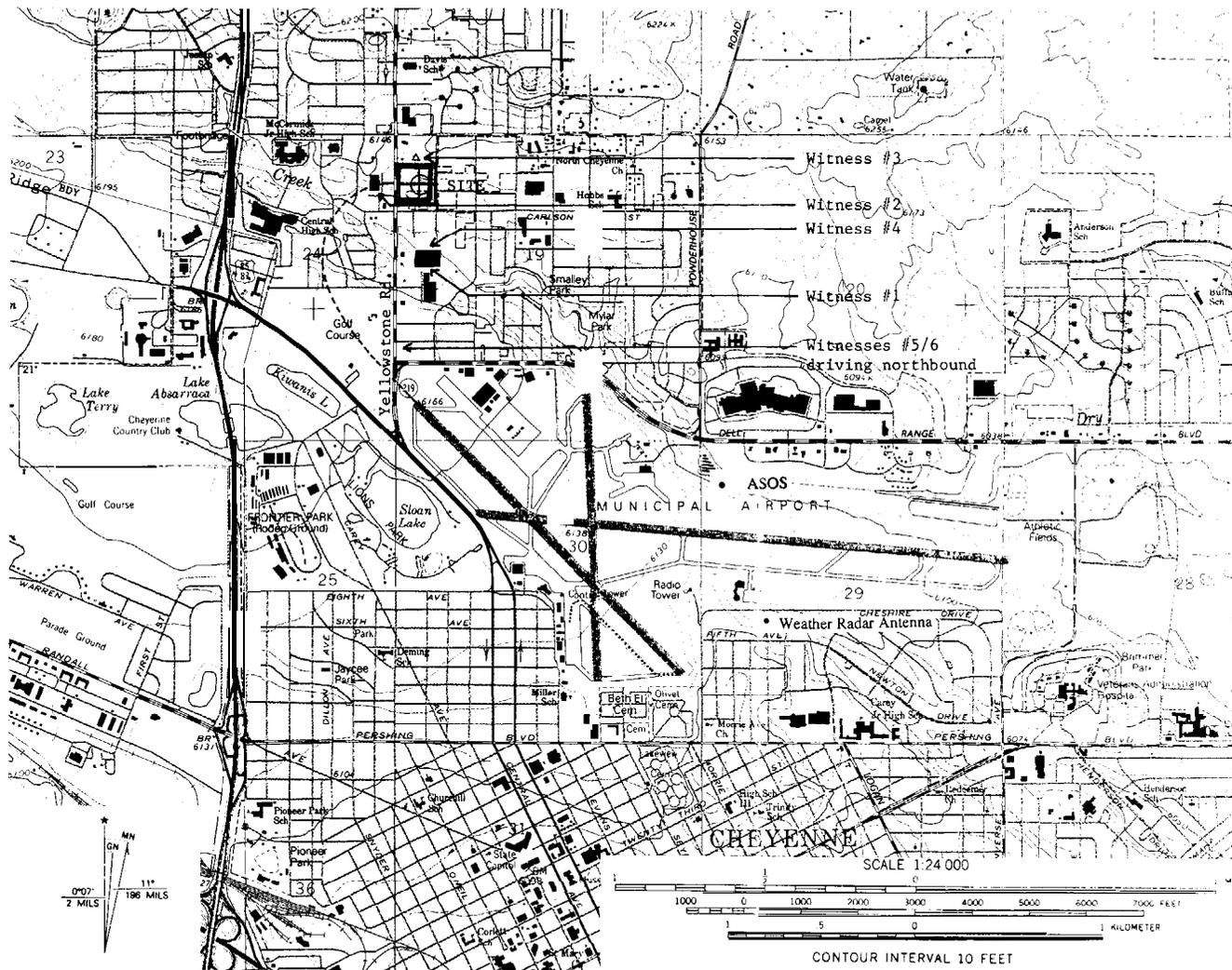


Figure 1.--Map depicting airplane ground track and airport.

Ground witnesses observed the airplane depart the upwind end of runway 30 heading in a northwesterly direction, and then execute a gradual right turn to an easterly heading. The witnesses generally described the airplane as having a low altitude, low airspeed, a high pitch attitude and wobbly wings. As it was rolling out of the right turn, at several hundred feet agl,¹⁰ the airplane was observed to rapidly descend to the ground in a near-vertical flightpath. The impact occurred approximately 4,000 feet north of the departure (upwind) end of runway 30 in a residential neighborhood.

1.2 Injuries to Persons

<u>Injuries</u>	<u>Flightcrew</u>	<u>Passengers¹¹</u>	<u>Other</u>	<u>Total</u>
Fatal	1	2	0	3
Serious	0	0	0	0
Minor	0	0	0	0
None	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	1	2	0	3

1.3 Damage to Airplane

The airplane was destroyed by impact. The value of the airplane was \$45,000.

1.4 Other Damage

The airplane damaged a section of a paved, residential street.

1.5 Personnel Information

There were three occupants aboard the airplane. The pilot in command, occupying the front right seat; the pilot trainee, occupying the front left seat; and the father of the pilot trainee, occupying the left rear seat.

¹⁰Above ground level

¹¹The pilot trainee was considered a passenger because she held no pilot certificate.

1.5.1 Pilot in Command

The pilot in command was 52 years old and was a stockbroker by profession. He held a commercial pilot certificate with airplane single-engine land and instrument ratings, issued on December 11, 1990; and a flight instructor airman certificate with airplane single-engine land rating, issued in April 1992. His flight records for the last 2 years indicated that he gave flight instruction to eight students, in addition to the pilot trainee, during that time.¹² In March 1996, he completed a flight instructor refresher course.¹³ A search of FAA¹⁴ records showed no record of violations or enforcement actions against him. He instructed students through a flying club he helped to organize at the Half Moon Bay Airport, Half Moon Bay, California.

According to another flight instructor at the Half Moon Bay Airport, the pilot in command had once attempted to taxi out with the tow bar still attached to the airplane while providing flight instruction. He also indicated that the pilot in command had developed his own instrument approach into the Half Moon Bay Airport that went down to 500 feet. Another pilot based at the Half Moon Bay Airport stated that on several occasions, he had witnessed the pilot in command execute approaches to the airport when the weather was below minimums.

He possessed an FAA second class medical certificate issued on May 24, 1995, with the limitation that “holder shall wear lenses that correct for distant vision and possess glasses that correct for near vision.” The private video, recorded the morning of the accident, showed the pilot in command wearing what appeared to be corrective lenses before he boarded the airplane.

The pilot in command’s total pilot time, as reported in his latest flight log through April 8, 1996, was 1,484 hours. This log was opened on May 10, 1990, with 597 flight hours brought forward. He had logged no instrument time during the 6 months preceding the accident flight, and 4.1 hours of actual and 4.0 hours of simulated instrument time during the 12 months preceding the accident

¹²FAA records were obtained for seven of those students. They indicated that, as of July, 1996, none had been issued a private pilot certificate. The eighth student could not be uniquely identified in the FAA records.

¹³The curriculum, which was approved by the FAA, included a 1-hour section on weather and a 1-hour section on human factors in aeronautical decision making, as part of a 16-hour curriculum.

¹⁴Federal Aviation Administration

flight. The flight log showed that he had conducted eight flights out of airports at elevations exceeding 4,500 feet mean sea level (msl). In addition, although not entered in the flight log, he conducted two such takeoffs as pilot in command the day before the accident. The details of these high-altitude takeoffs are summarized as follows:

DATE:	AIRPLANE:	LOCATION:	ELEVATION:
07/18/91	C-177B	REXBURG, ID	4,858
07/20/91	C-177B	JACKSON, WY	6,445
07/21/91	C-177B	REXBURG, ID	4,858
08/02/93	C-177B	BATTLE MT., NV	4,532
08/02/93	C-177B	RAWLINS, WY	6,813
08/11/93	C-177B	JACKSON, WY	6,445
08/11/93	C-177B	ELKO, NV	5,135
08/06/95	C-177B	S. LAKE TAHOE, CA	6,264
04/10/96	C-177B	ELKO, NV	5,135
04/10/96	C-177B	ROCK SPRINGS, WY	6,760

According to the pilot in command's wife, he flew whenever he could, and he liked to take long weekend trips. She said he had flown twice to Oshkosh, Wisconsin, and once to Sedona, Arizona. He wanted everyone to learn how to fly, and he liked to provide flying opportunities to children. According to his wife, he took his young nephews and his sons (when they were children) flying, and he was active in the Young Eagles program that provided flying experiences to children.

1.5.2 Pilot Trainee

The pilot trainee, born on May 5, 1988, was 7 years old. She possessed neither an FAA medical certificate, nor any pilot certificate. Her total instructional time, as reported in her personal flight log through April 6, 1996, was 33.2 hours, of which 28.0 hours were conducted in a Cessna 172, 1.5 hours in a Cessna 152, and 3.7 hours in a Cessna 177B (the accident airplane). The logbook showed a total of 46 landings between November 3, 1995 and April 6, 1996. A total of 29 instructional flights were logged, all with the pilot in command of the accident flight as her instructor.

1.5.3 Pilot Trainee's Father

The pilot trainee's father was 57 years old and was a systems analyst. He possessed neither a pilot certificate nor an FAA medical certificate.

1.5.4 Airplane Occupants' Sleep and Activity History Prior to the Accident

1.5.4.1 Pilot in Command's Sleep and Activity History Prior to Starting Flight

On Sunday, April 7, the pilot in command awoke between 0630 and 0700 Pacific daylight time (PDT) after going to bed the night before between 2230 and 2300. He participated in a news conference at the airport, spent a routine day with his family, and went to bed about 2200. On Monday, April 8, the pilot in command awoke about 0430 PDT¹⁵ and arrived at the airport in Half Moon Bay, California, about 0500 PDT to participate in a live television interview on a national news program. He then worked at his job as a stockbroker until 1300 PDT, participated in another media interview in the afternoon, and went to bed about 2200 PDT. In addition, his flight log showed that on April 8, he piloted a 4-hour flight conducted from Half Moon Bay to San Carlos, California, and return.

On Tuesday, April 9, he awoke about 0445 PDT and worked from 0600 to 1300. He attended a local water board meeting from 1900 to 1930, and he went to bed about 2200 PDT.

On Wednesday, April 10, he awoke about 0330 PDT to arrive at the airport and participate in a television interview with the pilot trainee and her father at 0530 PDT on a national news program prior to the start of the transcontinental flight. At 0617 PDT, the pilot in command received a weather briefing, and, at 0700, the flight departed Half Moon Bay.

¹⁵According to the pilot's wife, during the work week he normally went to sleep at 2200 and got up at 0445.

1.5.4.2 Pilot Trainee's Sleep and Activity History Prior to Starting Flight

According to her mother, the pilot trainee's normal sleeping pattern was irregular. She said that in the days before the start of the trip, the pilot trainee had received less sleep than normal. On Wednesday, April 10, she awoke at 0300 PDT and, at 0530, participated in a television interview with her father and the pilot in command. No further information has been made available concerning her sleep or activities just prior to the trip.

1.5.4.3 Pilot Trainee Father's Sleep and Activity History Prior to Starting Flight

The Safety Board was unable to obtain any information regarding the pilot trainee father's sleep and activity history prior to the flight.¹⁶

1.5.4.4 All Occupants' Sleep and Activity History After Starting Flight

On Wednesday April 10, the airplane departed Half Moon Bay at 0700 PDT, and landed at Elko, Nevada, approximately 1020 PDT and was refueled. At Elko, the pilot in command closed the flight plan from Half Moon Bay, filed a new one to Rock Springs, Wyoming, and received a weather briefing for the Rock Springs flight.

The airplane then departed Elko approximately 1115 PDT, arriving in Rock Springs, approximately 3 hours later. The pilot in command commented that he looked forward to resting at the hotel in Cheyenne. The airport manager said that the pilot was "noticeably exhausted." The pilot in command then telephoned the Casper AFSS and closed the flight plan from Elko, filed a new one to Cheyenne, and received a weather briefing for the Cheyenne flight. The pilot trainee spoke with the airport manager and several other airport staff members. The airplane then departed Rock Springs approximately 1540.

The airplane landed at Cheyenne Airport at 1726. The pilot in command telephoned his wife from the airport and said that he was elated at the

¹⁶His current wife did not respond to the Safety Board's requests for information.

receptions they had received. According to his wife, he sounded tired, and he stated that he was very tired.

The program director for a local Cheyenne radio station provided transportation for all three occupants from the airport to the hotel. During the ride, according to the program director, they discussed a storm front that was predicted to arrive in Cheyenne the next morning. According to the program director, the pilot in command was “very adamant” that the flight should depart by 0615, and the pilot trainee’s father agreed. He stated that all three occupants looked tired, and discussed being very tired. Upon arrival at the hotel at approximately 1900, the pilot trainee and her father checked into one room and the pilot in command checked into a separate room.

According to the hotel clerk, they all seemed happy and the pilot trainee’s father spoke of the need for an early departure. They dined in the hotel restaurant.¹⁷ Hotel records indicate that four long distance telephone calls were made from the father’s room the evening of April 10, the last one beginning at 2114. The pilot trainee’s mother received a telephone call during this period. According to the mother, the pilot trainee’s father related to her that the pilot trainee had gone to sleep with her head resting against the window on one of the flight segments, and that she had received assistance from the pilot in command on one of the landings because of winds.

On Thursday, April 11, the pilot in command checked out of his hotel room at 0622. The desk clerk said that he looked fairly rested and seemed happy. The pilot trainee’s father called the hotel front desk about 0625 to cancel a scheduled 0630 wake-up call. The pilot trainee’s father later indicated that the pilot trainee had been awake and ready to leave before 0600, but he asked her to sleep longer because he felt that it was important for her to receive 9 hours of sleep to make up for the lost sleep before the trip. He and the pilot trainee checked out of their hotel room at 0714 and, with the pilot in command, returned to the Cheyenne Airport by hotel shuttle.

¹⁷The morning of the accident, the pilot trainee’s father indicated to the radio station program director that “they” had dined at the hotel restaurant the night before. It is unknown whether “they” referred to all three of the flight participants (himself, the pilot in command, and the pilot trainee) or to only two of those participants.

1.6 Airplane Information

The airplane, a four-place Cessna 177B, serial No. 17702266, was manufactured in 1975 and was registered to the pilot in command on May 27, 1987. The airplane was equipped with a Lycoming O-360-A1F6D engine, serial No. L-20022-36A. Prior to the accident flight, both the airframe and engine had accumulated 3,582.3 flight hours. The airplane received an annual inspection on July 8, 1995, at 3,508.4 flight hours.

The airplane was equipped with dual 3-inch aluminum rudder pedal extensions on the left seat rudder pedal assembly, which were installed a few weeks before the record-attempting flight. Cushions on the front left seat (to raise up and extend the occupant forward) were visible on the video recording made immediately prior to the airplane's departure from Cheyenne.

1.6.1 Airplane Fuel Information and Guidance

The airplane was equipped with two integral 25-gallon fuel tanks providing a total of 49 gallons of usable fuel. The airplane was topped off with 26.3 gallons of 100 low lead aviation fuel by Sky Harbor Air Service, Inc., shortly after its arrival in Cheyenne on April 10.

The 1975 Cessna 177B Owner's Manual states in Section II that, "[p]rior to take-off from short fields above 3,000 feet elevation, the mixture should be leaned to give maximum power." According to FAA Advisory Circular (AC) 61-23B, Pilot's Handbook of Aeronautical Knowledge:

Carburetors are normally calibrated at sea level pressure to meter the correct amount of fuel with the mixture control in the "FULL RICH" position. As altitude increases, air density decreases....If the fuel/air mixture is too rich, i.e., too much fuel in terms of the weight of the air [high density altitude], excessive fuel consumption, rough engine operation, and appreciable loss of power will occur.

1.6.2 Weight and Balance

The airplane's maximum gross takeoff weight was 2,500 pounds. The takeoff weight of the airplane on the morning of the accident was calculated by Safety Board investigators to be 2,596 pounds, using the following data derived from available weight and balance records, known fuel load, occupant weight provided by the Wyoming State Crime Laboratory, and weighed miscellaneous items:

ITEM:	WEIGHT:	ARM:	MOMENT:
	(pounds)	(inches)	(pound-inches)
Empty weight ¹⁸	1,589	103.95	165,177
Engine oil	17	47	799
Fuel (49 gallons)	294	112	32,928
Left-front pax ¹⁹	60	90	5,400
Right-front pilot ²⁰	170	93	15,810
Left-rear pax ²¹	205	134	27,470
Equipment/baggage ²²	154	162	24,948
Food, film, miscellaneous ²³	83	140	11,620
Lost fluids ²⁴	14	100	1,400
Lost food ²⁵	10	100	1,000
Estimated total at takeoff:	2,596	110.4	286,552
less 2 gallons fuel burned	-12	112	-1,344
Estimated total at site:	2,584	110.4	285,208

Center of gravity limits for the Cessna 177B at the maximum 2,500 pound gross weight limit are: 105.7 inches (forward) and 114.5 inches (aft).

¹⁸Includes 1 gallon unusable fuel

¹⁹Includes clothing worn

²⁰Includes clothing worn

²¹Includes clothing worn

²²Includes packed suitcases, video camera, tapes, and cell phone

²³Includes food and intact fluids on board and promotional hats

²⁴Includes bottles of drinkables and airplane oil

²⁵Includes packaged and nonpackaged food

1.6.3 Stall Speeds

The power off, aft center of gravity stall speeds, in miles per hour calibrated airspeed (CAS), published in the airplane owner's manual as a function of flap setting and angle of bank (AoB) for 2,500 pounds gross weight, were:

STALL SPEEDS - MPH CAS

	0° AoB	20° AoB	40° AoB	60° AoB
FLAPS UP	63	65	72	89
FLAPS 15°	58	60	67	83
FLAPS 30°	53	55	60	75

1.6.4 Wing Flap Settings

The 1975 Cessna 177-B Owner's Manual states that:

Take-offs are accomplished with the wing flaps set in the 0° to 15° position. The preferred flap setting for normal take-off is 10°. This flap setting (in comparison to flaps up) produces a shorter ground run, easier lift-off, shorter total distance over the obstacle, and increased visibility over the nose in the initial climb-out.

Examination of the airplane wreckage indicated a 10° flap extension at the time of impact. (See section 1.12)

1.6.5 Climb Speeds and Climb Rates

Interpolation of flight test data provided by Cessna for the weight, flap configuration, and approximate density altitude of the accident flight (6,670 feet) showed the following climb speeds and climb rates:

	<i>Climb Speed, CAS, mph</i>	<i>Climb Rate fpm</i>
Best rate of climb speed, V_y	81	387
Best Angle of climb speed, V_x	71	359
Slow Speed climb	61	232

For comparison purposes, the following climb rates are for the accident aircraft's weight and flap configuration at sea level:

	<i>Climb Speed, CAS, mph</i>	<i>Climb Rate fpm</i>
Best rate of climb speed, V_y	87	685
Best Angle of climb speed, V_x	72	634

1.7 Meteorological Information

1.7.1 General Weather Information

The NWS²⁶ 0900 surface analysis chart showed a weak, quasi-stationary front extending from western Montana southeastward through southeastern Wyoming becoming a moderate cold front over extreme northeastern Colorado. The chart indicated that the cold front curved northeastward through central Nebraska to a low pressure center located near Sioux Falls, South Dakota, and continued northeastward through northern Michigan.

The NWS 0600 850 millibar (about 5,000 feet) analysis chart indicated a center of low pressure over the Nebraska panhandle. The chart indicated southwesterly winds of 25 knots and 45 knots over Nebraska east of the low.

²⁶National Weather Service

The NWS 0600 700 millibar (about 10,000 feet) analysis chart showed a center of low pressure over western South Dakota. Also, the chart showed a trough of low pressure extending south of the low over eastern Wyoming and Colorado. The chart indicated southwesterly winds of 25 knots and 30 knots over Nebraska east of the trough.

1.7.1.1 Weather Observations²⁷

Weather observations at Cheyenne were accomplished by an ASOS²⁸ located approximately 3,300 feet north/northeast of the arrival (threshold) end of runway 30. Pertinent official weather observations for Cheyenne, in part, follow:

Cheyenne Airport, Wyoming

Field elevation 6,156 feet msl, ASOS-augmented

Time—0656; type—record; sky condition—measured ceiling 6,500 feet overcast; visibility—10+ miles; temperature—49 degrees F; dew point—32 degrees F; wind—320 degrees at 9 knots; altimeter setting—29.65 inches Hg.

Time—0739; type—special; sky condition—measured ceiling 2,800 feet broken 4,200 feet overcast; visibility—10+ miles; weather—light rain; temperature—44 degrees F; dew point—31 degrees F; wind—300 degrees at 11 knots; altimeter setting—29.67 inches Hg; remarks—rain began 0736 precipitation, trace precipitation fell since previous record observation.

Time—0756; type—record; sky condition—measured ceiling 2,600 feet broken 3,100 feet overcast; visibility—10+ miles; weather—light rain; temperature—44 degrees F; dew point—31 degrees F; wind—310 degrees at 15 knots; altimeter setting—29.67 inches Hg; remarks—rain began 0736 precipitation, trace precipitation fell since previous record observation.

²⁷Heights in surface weather observations are above ground level. All directions are true north unless noted. All distances are statute miles unless noted.

²⁸Automated Surface Observation System

Time—0815; type—special; sky condition—2,400 feet scattered measured ceiling 3,100 feet overcast; visibility—5 miles; weather—moderate rain; temperature—43 degrees F; dew point—32 degrees F; wind—260 degrees at 15 knots; altimeter setting—29.69 inches Hg; remarks—0.03 inch rain fell since previous record observation, wind shift began 0800.

Time—0823; type—special; sky condition—1,600 feet scattered measured ceiling 2,400 feet broken 3,100 feet overcast; visibility—5 miles; weather—thunderstorm light rain; temperature—40 degrees F; dew point—32 degrees F; wind—250 degrees at 20 knots gusting 28 knots; altimeter setting—29.71 inches Hg; remarks—broken variable scattered, thunderstorm began 0823, 0.04 inch rain fell since previous record observation, wind shift began 0800, peak wind 260 degrees at 28 knots/0817.

Time—0830; type—special; sky condition—1,400 feet scattered measured ceiling 2,000 feet broken 3,100 feet overcast; visibility—2 ½ miles; weather—thunderstorm light rain; temperature—38 degrees F; dew point—32 degrees F; wind—260 degrees at 25 knots gusting 30 knots; altimeter setting—29.71 inches Hg; remarks—surface visibility 5 miles, thunderstorm began 0823, 0.06 inch rain fell since previous record observation, wind shift began 0800, peak wind 260 degrees at 30 knots/0830, pressure rising rapidly.

Part B of the Cheyenne Surface Weather Observation form showed that light rain began at 0740 and moderate rain occurred from 0815 to 0820. Also, the form showed light rain from 0820 to 0835.

1.7.1.2 Crosswinds

The nearest Doppler Weather Surveillance Radar-1988 (WSR-88D) was located at the Cheyenne NWS office on the Southern boundary of the airport. Velocity data derived from the Doppler radar indicated that the wind direction in the airport area around the time of the accident was from about 260 degrees true near the surface and did not shift substantially through approximately 350 feet agl. The winds were 15 to 30 knots.

The Cheyenne ASOS calculated the 2-minute average wind and the maximum 5-second wind once each minute. The following are along track and cross track wind components along the runway heading (304 degrees magnetic) calculated from the two sets of wind data from 0815 to 0824, inclusive:

2-Minute Average Wind

Time MDT	Wind Dir Magnetic	Wind Spd Knots	Along Trk Knots	Cross Trk Knots
0815	251	15	9	12
0816	247	18	10	15
0817	245	22	11	19
0818	243	23	11	20
0819	240	23	10	21
0820	238	23	9	21
0821	240	22	10	20
0822	241	20	9	18
0823	238	20	8	18
0824	237	20	8	18

Maximum 5-Second Average Wind

Time MDT	Wind Dir Magnetic	Wind Spd Knots	Along Trk Knots	Cross Trk Knots
0815	251	17	10	14
0816	242	24	11	21
0817	247	28	15	23
0818	240	25	11	22
0819	256	26	17	19
0820	234	25	9	23
0821	241	24	11	21
0822	241	23	10	20
0823	235	22	8	21
0824	250	23	14	19

Investigators asked the tower controller why runway 30 was in use at the time. He reported that at his console the wind readings, which did not come from the ASOS anemometer,²⁹ indicated that the wind direction was variable but did not seem to favor either runway (30 or 26). He also said that the accident airplane was parked near runway 30 and that the airplane would be able to depart faster using that runway.

1.7.1.3 Density Altitude

At the time of the accident, the Cheyenne Airport density altitude determined from the ASOS was approximately 6,670 feet.

1.7.1.4 Precipitation

The accident site was located approximately 1.5 nautical miles northwest of the radar antenna. (See Figure 1.) Data recorded at around 0820 indicated reflectivity of about 35 dBZ³⁰ (indicating moderate precipitation) at the departure end of runway 30 to about 45 dBZ (indicating very heavy precipitation) in the area where the airplane began its right turn. Based on these data, the rate of precipitation at the time of the right turn (assuming it was all liquid precipitation)³¹ was calculated to be a maximum of 3.146 inches per hour. Test data for high lift configuration airfoils from the National Aeronautics and Space Administration (NASA) Langley Research Center, Aircraft Landing Dynamics Facility (ALDF), show a maximum loss in lift of 2 to 3 percent for this rate of rainfall.

The PPI³² composite radar image from 0823 indicated reflectivities in the vicinity of Cheyenne from around 40 dBZ (indicating strong precipitation) to 50 dBZ (indicating intense precipitation). (See Figure 2.)

²⁹The controller's wind readings came from the original (pre-ASOS) NWS anemometer, which was located midfield, about 1,300 feet southwest of the ASOS, near the threshold of runway 30. No record of the direction of winds recorded by that anemometer is kept.

³⁰The measure of strength of weather echoes.

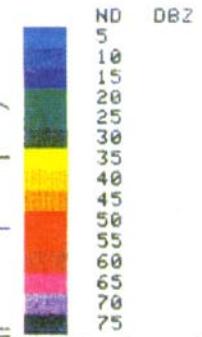
³¹The melting of snow and ice as it falls through the freezing level just above the surface results in an increased reflectivity. Therefore, to the extent that the precipitation was frozen, the precipitation rate would be less.

³²plan-position indicator

STM ID	AZ	RAN	TUS	MESO	HAIL	DBZM	HGT	ULOW	STM TOP	FCST	MUMT	MM	UOL
M	279	11	NO	NO	NEG	55	0.6	63	7.23	250	18	630	

04/12/96 14:53
 CMP REF 37 CR
 124 NM 54 NM RES
 04/11/96 14:23
 RDA: KCYS 41/09/07N
 6192 FT 104/48/21W

MODE A / 21
 CNTR 27DEG 1NM
 MAX= 65 DBZ



MAG=2X FL= 1 COM=1
 OUL:ST M AT
 OUL U/A:HI TU

A/R (RDA) 203 DEG
 66 NM
 Q15 R 1447 R
 PROD RCU: STP RPS
 KCYS 1453
 12/1451 *TIME OUT*
 CAN'T EDIT RCM
 HARDCOPY
**HARDCOPY REQUEST
 ACCEPTED**

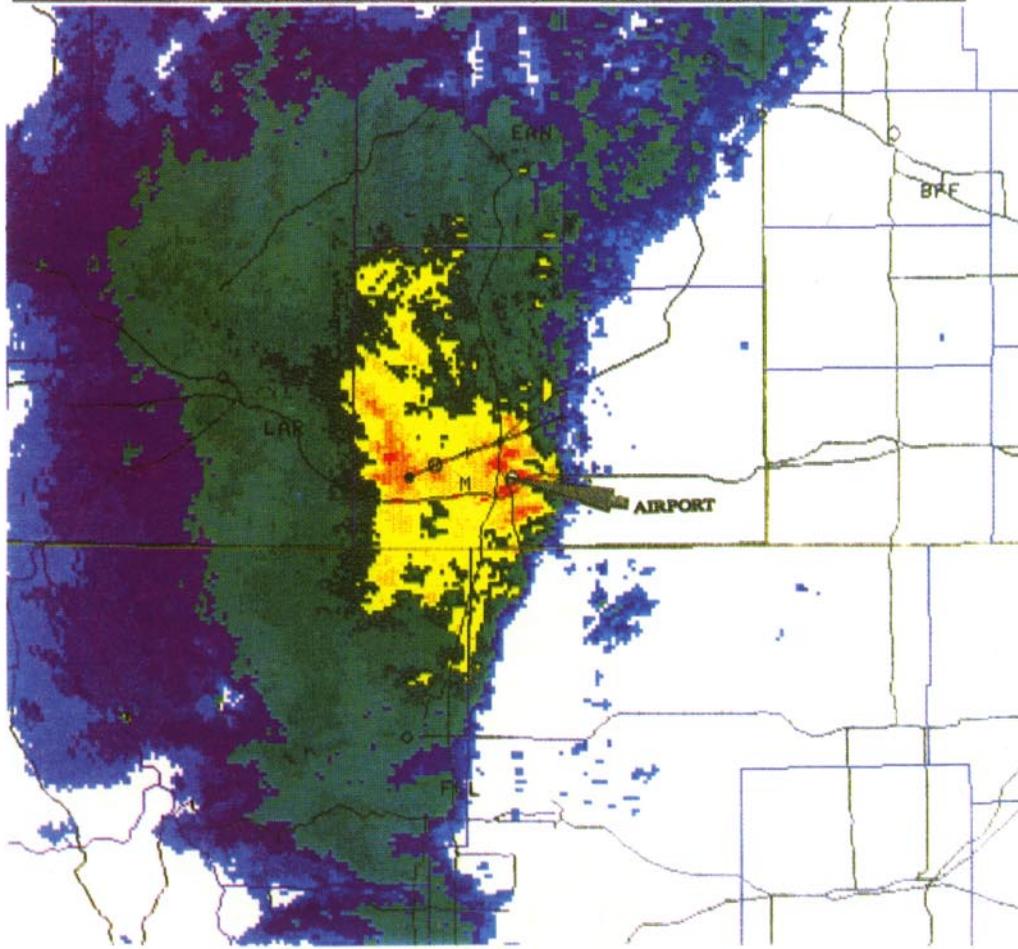


Figure 2.--Composite radar image.

1.7.1.5 Lightning Data

Cloud-to-ground lightning strike information from the National Lightning Detection Network for the 20-mile radius centered on Cheyenne was obtained from Global Atmospheric, Inc., for the period from 0805 to 0830, inclusive. According to a company representative, the median accuracy of the data was ½ mile.

The data indicate that prior to the accident airplane's takeoff, there were lightning strikes at 08:15:53, and at 08:18:38, and two strikes at 08:20:02. The strikes ranged from 0.5 mile to 1.2 miles to the west of the airport. The strikes at 0820 were about 1 to 2 miles south of the accident site.

1.7.2 Witness Descriptions of Weather Conditions Near the Airport

1.7.2.1 Other Pilots

A pilot with the State of Wyoming, who holds an airline transport pilot rating with more than 13,800 flight hours and has been based in Cheyenne since January 1987, departed from runway 30 in a Cessna 414 at 0816.

He recalled that once on the runway, the tower gave him westerly winds of 25 knots gusting to 30 knots. He tilted his weather radar up to avoid ground clutter and set it to the lowest scale of 10 miles. He remembered his radar painting a steep gradient of green/yellow/red echoes beginning about 4 to 5 miles from his position on the runway. He requested a 60-degree turn to the right (heading of 360 degrees) immediately after takeoff. While on the runway he observed cloud to ground lightning to the west (2 or 3 strokes spaced 10 to 15 seconds apart). The strongest part of the storm appeared to him to be 230 to 240 degrees off the departure end of runway 26, but echoes extended to about 330 degrees. The pilot recalled strong crosswinds during his takeoff, requiring significant aileron input. He said that he experienced control difficulties all the way down the runway, more so than he would normally expect under those wind conditions. After rotation the airplane did not initially accelerate very rapidly. He said that he experienced moderate turbulence, and his airspeed fluctuated +/- 15 knots. He said that the airplane began to climb adequately after leaving the airport boundary. At 200 to 300 feet above the ground, the turbulence and airspeed fluctuations subsided. He said he started his turn to the north about ½ mile after takeoff because of the approaching leading edge of the heavier rain.

He further stated he was aware that a Cessna 177 (the accident airplane) was planning on taking off soon after his departure because he had heard the accident airplane's pilot on the tower frequency. He said that he was concerned and immediately gave a pilot report to the tower, hoping that the Cessna 177 would hear it. He remembered reporting light-to-moderate turbulence, low level windshear, and airspeed fluctuations of +/- 15 knots. He said that he never talked to anyone in the accident airplane.

The pilot in command of United Express Flight 7502 (a Beech 1900) that landed at the Cheyenne Airport about 0820, just prior to the departure of the accident airplane, reported that as the airplane taxied to the gate, the rain showers became heavier. He remembered hearing on the radio the pilot of the Cessna 414 who had just departed reporting to air traffic control a 30-knot windshear. Upon hearing the report, the captain said that he decided to delay his planned takeoff until the weather improved. He said that he observed lightning within 1 or 2 miles of the airport as his airplane arrived at the gate.

He stated that the rain changed to what he believed to be small hail. The flight departed Cheyenne at 1020.

1.7.2.2 Air Traffic Control

The Cheyenne ATCT local controller, who was on duty at the time of the accident, reported that the weather began deteriorating after he took his position shortly before the accident. He recalled that the visibility was lowest from the southwest through the north and was better to the east and southeast. He said that the worst weather was in the northwest, and that the weather seemed stationary. At 0818:12, he advised the accident airplane that, “[a] twin Cessna [that] just departed reported moderate low level windshear plus or minus one five knots.”

He said that the airplane did not come to a complete stop at the beginning of the runway, and that it was rolling when he gave the takeoff clearance. He stated that after becoming airborne the airplane appeared slower and lower than expected.

1.7.2.3 Other Eyewitness Statements

Eyewitnesses who observed all or part of the accident sequence reported that the weather conditions at that time were windy, with moderate to heavy mixed precipitation (rain, snow, and sleet), thunder and lightning. (Locations of eyewitnesses are noted on Figure 1.)

1.8 Aids to Navigation

Navigational aids did not pertain to this investigation and were not examined.

1.9 Communications

There were no known communications equipment difficulties.

1.10 Airport Information

The Cheyenne Airport is owned and operated by the Cheyenne Airport Board and is located in Laramie County, 1 mile north of the city of Cheyenne. The airport has a field elevation of 6,156 feet above sea level.

The airport has two 150-foot-wide runways, identified as 30-12, which is 6,691 feet long, and 26-08, which is 9,200 feet long. Runway 30 has a 0.5 percent uphill slope, and the centerline of the runway has a heading of 304 degrees magnetic.

1.11 Flight Recorders

The airplane was not equipped, nor was it required to be equipped, with either a cockpit voice recorder or a flight data recorder.

1.12 Wreckage and Impact Information

The airplane came to rest on the south edge of a level, residential street at the entrance to a private residential driveway. The initial ground impact point of the engine was coincident with its final resting place, and the engine was still attached to the airplane. The crash site was located bearing 321 degrees and 9,600 feet from the threshold of runway 30 at the Cheyenne Airport. (See Figure

1.) The wreckage distribution was largely confined to the immediate ground impact site, but a distribution of small fragments extended from the ground impact site southeast into a residential yard.

The airplane was found upright and was oriented along a southeasterly bearing. The nose section and forward cabin area were crushed and displaced rearward along the airplane's longitudinal axis. Both cabin doors exhibited crush lines indicative of a 67-degree nose down pitch attitude of the airplane upon impact with the ground. The vertical and horizontal stabilizers were relatively free of damage, as were their associated control surfaces and the stabilator trim tab.

The cockpit/cabin area was observed to be heavily compressed along its longitudinal axis. The right cabin door, which was separated from the airplane, was folded over. The axis of the fold line was measured relative to the lower edge of the door and was found to be approximately 113 degrees from the airplane's longitudinal axis.

The 2-bladed propeller was separated from the engine. One blade was beneath the left wing. The other blade was embedded in the ground impact crater. Both blades exhibited tip curl and blade twist, along with extensive chordwise scratching and small leading edge nicks.

The entire wing structure remained essentially intact from tip to tip but had separated from the airframe. The wing had been rotated to an inverted attitude during recovery of the occupants. The leading edges displayed extensive compressive deformation oriented along the chord line of the wing with the deformation more pronounced toward the wing tips. The flap jackscrew extension was measured at 2.1 inches, corresponding to a 10-degree flap extension. Control cable continuity for both elevator and rudder, as well as the ailerons, was confirmed.

The mixture control knob was found in the full rich position in the cockpit, and cable continuity was established between the mixture control knob and the carburetor.

The carburetor air box was crushed with the carburetor heat valve observed in the "cold" (off) position.

A damaged video recorder and two blank video tapes were found at the wreckage site. No video tape was found within the recorder unit at the crash site.

Approximately 15 pounds of navy-blue baseball caps were recovered at the site. The baseball caps displayed the pilot trainee's name in gold lettering along with the caption "Sea to Shining Sea" and "April 1996."

1.13 Medical and Pathological Information

Autopsies were performed on all three occupants by a forensic pathologist at the Wyoming State Crime Laboratory, Cheyenne, Wyoming, on the evening of April 11, 1996. The autopsy reports concluded that traumatic injuries were the cause of death for all three victims. For the pilot in command, autopsy evidence noted bilateral fractured wrists, bilateral fractured ankles, and bilateral fractured feet (multiple bones). The autopsy showed no wrist or ankle fractures for the pilot trainee but numerous fractures in the bones of the right foot. The autopsy report on the pilot trainee's father noted that the left breast shirt pocket contained "numerous slips of paper with appointment times and dates of TV interviews," including one scheduled for the evening of the accident in Ft. Wayne, Indiana, and another for the next evening in Massachusetts. The pocket also contained numerous business cards from various radio, TV stations, and networks.

The stomach of the pilot in command contained approximately 150 milliliters of partially digested food particles. Neither of the stomachs of the pilot trainee or the father contained partially digested food.

Toxicological tests of specimens taken from the pilot in command and the pilot trainee were negative, with the exception of a finding of 2.3 micrograms per milliliter of Acetaminophen³³ detected in blood for the pilot in command. No specimens were analyzed for the pilot trainee's father.

1.14 Fire

There was no fire.

³³A nonprescription pain killer (commonly sold under the trade name Tylenol).

1.15 Survival Aspects

The impact was not survivable for the three occupants.

1.16 Media Aspects

According to the pilot in command's wife, he mentioned the upcoming record-attempting flight to a reporter from the *Half Moon Bay Review*, and the newspaper printed a short article several weeks before the flight. According to the reporter, the newspaper received calls about the article from larger newspapers in the San Francisco area. These larger newspapers subsequently published stories about the record attempt, and, in that reporter's opinion, these stories might have sparked the tremendous national media attention that the story subsequently received. According to the pilot in command's wife, media interest started to be heavy about 1 week before the flight. The pilot in command participated in several airport interviews with the pilot trainee and her father, and media representatives often telephoned his house at late hours. On Saturday, April 6, the pilot in command participated in an afternoon news conference. On Sunday, April 7, he participated in another news conference at the Half Moon Bay Airport.

During a television interview of the pilot trainee conducted at Half Moon Bay by ABC News shortly before the start of the flight, she stated that "I wanted to break the record and be the youngest pilot to go cross-country." The previous record holder, an 8-year-old pilot trainee, established his record the previous year. (See section 1.17.)

According to the pilot trainee's mother, 1 week before the flight, the pilot in command and the pilot trainee took several reporters flying. She said that on that flight they forgot the runup, and that the pilot trainee noticed in flight that the airplane door was open.

In another ABC News interview of both the pilot trainee and her father at Half Moon Bay, her father inquired, "who told you you wanted to fly across country?" and the pilot trainee responded, "you." Her father responded "oh, I did," at which time the ABC News correspondent conducting the video interview inquired "oh, did you come up with the idea dad, is that where it was?" The pilot trainee's father responded "I did originally, and I asked [the pilot trainee's] mom if it would be OK with her, if [the pilot trainee] flew across

country, and she said yes. And I asked [the pilot trainee] and said ‘hey, honey, you don’t have to answer me right away. You could think about this a little, but [the pilot trainee] said ‘No, that’s something I’d like to do.’”

An entry made by the pilot in command in the pilot trainee’s flight log, dated April 2, indicated that they had made a “low pass for photos.” An entry dated April 4 included a reference to “photo & news interviews.”

The pilot in command’s wife reported that by Monday, April 8, when he participated in an early morning television interview on a national news program, her husband was “flabbergasted” by the media coverage. The mother of the trainee said that no one expected the media attention to get so big.

ABC News provided a leased video recorder to the pilot trainee’s father along with three 120-minute blank video cassettes that were to be used to record the first day’s flight activities. The dates of receipt and projected return of the video recorder, under the lease agreement, were April 8 and 15, respectively. The first three tapes were to be returned to ABC News upon arrival at Cheyenne and were to be replaced with blank tape cassettes for recording the following day’s trip. The contract did not provide any monetary compensation for recording the videotapes.

Numerous media representatives were present at the airport on the morning of April 10, when the first flight of the trip departed Half Moon Bay, and a news helicopter flew overhead, according to several witnesses. The pilot trainee, her father, and the pilot in command were interviewed live on national television at 0530 that morning.

The airplane was met by several spectators and one newspaper reporter at its first stop in Elko. No media were present during the next stopover at Rock Springs. However, the airport manager at Rock Springs reported that the pilot trainee’s father placed a telephone call from a pay telephone in the airport lobby and remained on the telephone at least 30 minutes, even after the pilot was ready to go. According to the assistant airport manager, the pilot trainee’s father talked with a national media organization. When he got off the telephone, he made a comment that the pilot in command would not get to bed as early as he had hoped because they would have to wait at Cheyenne for the delayed arrival of a media crew.

Upon arrival at Cheyenne, the first overnight stop of the trip, a large number of spectators, including media persons, were present. There was a welcome presentation by the mayor, and media interviews that, according to the program manager for a local radio station, lasted over an hour. The program director for a Cheyenne radio station provided a ride to the hotel for the pilot, the trainee, and the pilot trainee's father following the media interviews.

On the morning of the accident, the airplane occupants participated in at least three media interviews. The pilot trainee was interviewed during a brief telephone call with the program director, and she also spoke with a television reporter. In addition, the pilot in command participated in a 2-minute interview with a television reporter outside on the ramp shortly before taking off.

1.16.1 Itinerary Planning

The idea for the “record”-attempting, cross-country flight was proposed by the pilot trainee's father in February, according to the pilot trainee's mother. The original plan was for the pilot trainee and the pilot in command to fly from California to Massachusetts and to complete the trip before the pilot trainee reached her 8th birthday on May 5. It was agreed that the pilot in command would be paid at his normal hourly rate for flight instruction, with additional compensation for the non-flight time. According to his wife, when the trip was first conceived, the pilot in command did not expect publicity. She said that he considered the flight a “non-event for aviation” and simply “flying cross country with a 7 year old sitting next to you and the parents paying for it.” She said that at that time, he planned to return from the East Coast with a business partner after the trip was over.

According to the pilot trainee's mother, about 1 month before the trip, the pilot trainee asked her father to accompany her on the trip and he agreed. Two or three weeks before the trip, the itinerary was expanded to include a return from Massachusetts to Half Moon Bay via 13 intermediate stops. On Sunday, March 31, the pilot in command met with the pilot trainee at her home, sat next to a large map of the United States, and planned the itinerary for the trip. It involved approximately 51 hours of flying over 8 days, with no days off, and included

planned visits to relatives³⁴ and other specific destinations and events. (See Figure 3.)

Documentation recovered from the accident site revealed that the intended transcontinental trip was to commence on the morning of April 10 from Half Moon Bay, California. The flight was projected to make intermediate fuel stops at Elko, Nevada, and Rock Springs, Wyoming, before making its first overnight stopover at Cheyenne, Wyoming.

The following chart displays the intended route of flight and projected daily flight times, as contained in an itinerary sheet found in the aircraft wreckage:

ORIGINATION	FINAL DESTINATION	INTERMEDIATE FUEL STOPS	DATE:	FLT TIME
Half Moon Bay, CA	Cheyenne, WY	Elko, NV; Rock Springs, WY	04/10/96	08.00 hours
Cheyenne, WY	Ft. Wayne, IN	Lincoln, NB; Peoria, IL	04/11/96	07.50 hours
Ft. Wayne, IN	Falmouth, MA	Cleveland, OH; Williamsport, PA	04/12/96	06.00 hours
Falmouth, MA	Clinton, MD	Frederick, MD	04/13/96	03.00 hours
Clinton, MD	Lakeland, FL	Raleigh, NC; Charleston, SC; Jacksonville, FL	04/14/96	06.75 hours
Lakeland, FL	Houston, TX	Marianna, FL; Mobile, AL	04/15/96	07.00 hours
Houston, TX	Sedona, AZ	San Angelo, TX; Albuquerque, NM	04/16/96	08.00 hours
Sedona, AZ	Half Moon Bay, CA	Lancaster, CA	04/17/96	05.00 hours

Documents recovered from the accident site also included a handwritten letter dated March 3, 1996, from the pilot trainee to the President of the United States, which stated, in part, “May I visit you at the White House and even more so will you fly with me for simply 15-20 minutes...? I am scheduled to arrive in D.C., on Saturday April 13, 1996.”³⁵ Also recovered from the accident

³⁴According to the pilot trainee’s mother, the pilot trainee wanted to visit her grandfather in Falmouth, Massachusetts, and an uncle in Houston, Texas.

³⁵The itinerary indicated that on April 13, the airplane was scheduled to land at Clinton, Maryland, which is approximately 8 miles from Washington, D.C.

site was a letter dated March 21, 1996, from the U. S. Congresswoman from the 14th District of California to the pilot trainee that stated, in part, “[u]nfortunately, I will not be in Washington, D.C., when you are here and therefore unable to meet you on your arrival. Please call...my office...prior to your departure to arrange a tour of our nation’s Capitol.” Also, the itinerary indicated that they planned to arrive at Lakeland, Florida, on the afternoon of April 14.³⁶ This coincided with the opening of the annual “Sun ’n Fun” Experimental Aircraft Association’s fly-in at Linder Regional Airport.

A local pilot, who encountered the pilot in command on Sunday, April 7, at the Half Moon Bay Airport, reported that he inquired as to why the flight was to be conducted via a northerly routing. The pilot in command replied that “it was planned around scheduled ‘events,’ visits of friends and relatives” and “the Sun ’n Fun fly-in.” According to the local pilot, when he expressed concern about the weather along the northern route at that time of year, the pilot in command assured him that he would stop and wait out any adverse weather. When the local pilot inquired as to why the flight was scheduled for this time of the year, the pilot in command responded that the pilot trainee “would turn 8 years old in early May.” According to the pilot in command’s wife and a friend (the co-owner of the accident airplane), the pilot in command indicated to them that the trip might take longer than planned.

1.17 Previous Record Attempt

In an attempt to understand the effects of the itinerary and media attention on similar flights, Safety Board staff interviewed the father of an 8 year old who flew with his father back and forth across the United States in July 1995 and set the youngest “pilot”³⁷ flight “record,”³⁸ which the accident flight was attempting to beat.

He reported that the local newspaper published a short article about the flight 1 day before it began. According to the father, within 1 hour, the family was contacted by two radio stations, and by the time of the trip’s first takeoff,

³⁶No arrivals were to be accepted at Lakeland, Florida, after 1300 local time on that day.

³⁷The 8-year-old boy did not hold a pilot certificate. (See footnote 2.)

³⁸In fact, no official record is kept for the youngest pilot. (See footnote 4.)



Figure 3.--Proposed route of flight.

there was a media “frenzy” at the airport inspired by the newspaper article. He said one reporter explained that “we’re looking for a happy story on kids.”

According to the father, the parents were besieged by media requests on the first day of the flight. He stated that the flight did not have a fixed itinerary and that their route was determined largely by weather, with many deviations. He said that there were several days on which they stopped flying early because of weather problems. He said that flight legs were limited to 2 hours or less because of his 8-year-old son’s bladder needs. He stated that the trip took 10 days, and involved 49.5 hours of flight time.

The father said that media requests to the family for information about the intended route of flight were difficult to answer because of the lack of an itinerary, and they eventually advised the media to contact FAA Flight Service for updates on the airplane’s position. He said that they did not seek out media attention, but that there were media people waiting for the flight at nearly every stop. He said that they were distracting, irritating, asked the same questions all the time, and became a major distraction from flying duties.

1.18 Postaccident FAA Action and Legislative Changes

On April 24, 1996, the Administrator of the FAA issued a letter to all certified flight instructors (CFIs) reiterating their responsibilities, especially with regard to unusual training requests and student pilots. The letter stated, in part:

One key concept which you must demonstrate to all your students is set forth in Title 14 of the Code of Federal Regulations, Section 91.3, Responsibility and authority of the pilot in command. That regulation states, in part, that the pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft. It is one regulation that leaves little to interpretation; it means everything you do as pilot in command affects the safe conduct of the flight—your preparation, your judgements, your decision making affects not only your life but that of your student, your passengers, and, in many cases, the public. It is a responsibility and authority not to be taken lightly....

You know how to make the decision to take the controls from a student pilot so that the safety of the flight is not compromised. But a more subtle and difficult responsibility for you is to withstand the pressure exerted by parents, the media, or the child to initiate or complete something that you know is questionable. You must not let your enthusiasm for teaching people to fly cloud your judgement....

In October 1996, the U. S. Congress enacted Title VI of the Federal Aviation Authorization Act of 1996, which amended Title 49 of the United States Code to include the Child Pilot Safety Act. This Act provides, in part, as follows:

Sec. 44724. Manipulation of Flight Controls

(a) PROHIBITION. - No pilot in command of an airplane may allow an individual who does not hold -

(1) a valid private pilots certificate issued by the Administrator of the Federal Aviation Administration under Part 61 of title 14, Code of Federal Regulations; and

(2) the appropriate medical certificate issued by the Administrator under part 67 of such title, to manipulate the controls of an airplane if the pilot knows or should have known that the individual is attempting to set a record or engage in an aeronautical competition or aeronautical feat, as defined by the Administrator.

Another part of the Act requires that the Administrator of the FAA conduct a study of the impacts of children flying aircraft and issue a report within 6 months of enactment. The Act also requires the Administrator to issue a report on the results of the study and to issue recommendations on whether the statutory restrictions should be modified.

These statutory restrictions were developed, in part, in response to the present accident.

2. ANALYSIS

2.1 General

The pilot in command was properly certificated and qualified for the intended cross-country trip. Additionally, the evidence indicates that the pilot in command was wearing corrective lenses at the time of takeoff, as required by the limitation on his current medical certificate.

There was no evidence that airplane maintenance was a factor in the accident.

Postaccident examination of the wreckage revealed that the airplane's engine was developing power at the time of the accident, and that the flaps had been set at the preferred takeoff setting of 10 degrees. Additionally, there was no evidence of any airframe or control malfunction during the takeoff and subsequent crash.

Because the ground temperature was above freezing up to the time of the takeoff, and because of the short duration of the flight, airframe icing was not likely a factor in this accident.

There were no air traffic control factors that contributed to the cause of the accident.

Casper Automated Flight Service Station (AFSS) provided a weather briefing to the pilot in command. A review of the briefing transcript revealed that the briefer adhered to agency guidelines and provided a comprehensive weather briefing to the pilot in command. As a result, the Safety Board concludes that the pilot in command was provided with a satisfactory weather briefing prior to departing Cheyenne.

Although the pilot in command stated that he was unable to access the most recent ATIS broadcast on his radio, this was not a factor in the accident because he received all significant weather information from the tower controller and the AFSS weather briefer.

2.2 Analysis of the Accident Sequence

2.2.1 Operation of the Airplane's Controls

Autopsy findings of multiple wrist, ankle and feet fractures to the pilot in command indicate that he was handling the flight controls at the time of impact, and the absence of such injuries to the pilot trainee suggests that she was not handling the flight controls at the time of impact.

It is unknown whether the pilot in command assumed control of the airplane just prior to the impact, or whether he was flying during the entire takeoff and accident sequence. The portrayal of the trip as an attempt to break the transcontinental trip record by the youngest "pilot" suggests that the pilot trainee would be doing the flying herself. Consistent with this portrayal, she was seated in the left seat in front of the flight and navigation instruments, which is the seat generally occupied by the person who is operating the controls. However, it is known that the pilot trainee had not, in fact, done all of the flying herself on the first day of the flight.³⁹ Further, strong crosswinds, moderate turbulence, and gusty winds existed at the time of the takeoff. As indicated by the control difficulties experienced by the Cessna 414 pilot, who took off just before the accident flight, the weather conditions at the time the airplane took off were challenging even for experienced pilots, and it is unlikely that the pilot trainee could have handled them without some assistance.

Therefore, the Safety Board concludes that the pilot in command was at least assisting the pilot trainee (if he was not the sole manipulator of the controls) during the takeoff and climb-out sequence, and, at the time of impact, the pilot in command was the sole manipulator of the airplane's controls.

2.2.2 The Accident Scenario

The statements provided by witnesses indicated that the airplane's climb rate and speed were slow and that after the airplane transitioned to an easterly heading, it rapidly rolled off on a wing and descended steeply to the ground in a near vertical flightpath, consistent with a stall. The Safety Board

³⁹The pilot trainee's father told her mother at the end of the first day that the pilot trainee had slept for part of the trip, and that the pilot in command had assisted her in one of the landings because of strong winds.

analyzed the factors that may have increased the airplane's stall speed and reduced its climb speed to the point at which it stalled. These factors include the weather, the airplane's attitude and weight, and the high density altitude.

Eyewitnesses described moderate to heavy rain and a mixture of ice and snow pellets occurring at the accident site. Doppler reflectivity returns indicate heavy to very heavy precipitation in the same area.

Analysis of radar and ASOS data and eyewitness reports show that the accident airplane was most likely encountering light to moderate rain as it began its takeoff roll. As the plane proceeded down the runway, rotated, and exited the runway environment, the Doppler reflectivity patterns show that the airplane encountered increasing amounts of precipitation until the time of the accident. In addition, the reflectivity returns in the accident area shown at 0823 indicate that the airplane was experiencing a maximum precipitation rate of 3.146 inches per hour just prior to the accident. Based on airplane performance data provided by NASA, such rainfall could reduce the airplane's lift by as much as 3 percent.⁴⁰ This would increase the airplane's stall speed by about 1.5 percent.

Lightning was observed west of the airport by pilots prior to the accident. In addition, witnesses saw occasional lightning west of the airport around the time of the accident. Archived information indicated cloud-to-ground lightning strikes at 0820, 1 to 2 miles south of the accident site. There is no evidence of lightning strikes affecting the airplane. However, from the evidence of lightning, along with the Doppler radar data indicating composite reflectivity in the area (see section 1.7.1.4), the Safety Board concludes that the accident sequence took place near the edge of a thunderstorm.

The Cessna 414 pilot who departed just prior to the accident flight indicated that he turned about ½ mile after takeoff because of the approaching storm. The pilot in command of the accident flight also turned shortly after takeoff. The Safety Board concludes that the pilot in command decided to turn right immediately after takeoff to avoid the nearby thunderstorm and heavy precipitation that would have been encountered on a straight-out departure. The

⁴⁰As noted in section 1.7.1.4, the melting of frozen precipitation results in a greater reflectivity return than the same volume of liquid precipitation. It is known that the precipitation at the time of the accident was at least partly, if not totally, frozen. Therefore, to the extent that the precipitation at the time of the accident sequence was frozen, the precipitation rate, and therefore the loss of lift, would be less.

witness statements indicate that the turn to the east was gradual; this is consistent with a bank angle of about 20 degrees. With the flaps at 10 degrees, a 20-degree bank angle would increase the stall speed about 3 mph, from about 59 mph for steady level flight to about 62 mph.

Using the total weights of the clothed occupants, a full load of fuel, personal baggage and miscellaneous items (food and fluids) plus the airplane's basic empty weight, the Safety Board concludes that the airplane was 96 pounds over the maximum gross takeoff weight at takeoff, and 84 pounds over the maximum gross takeoff weight at the time of the impact. The additional weight would have increased the airplane's stall speed about 2 percent.

The combined effect of the rain, the excess weight and the bank angle of the airplane could have increased the airplane's stall speed to about 64 mph. The airplane's best rate of climb speed at sea level is 87 mph (with a climb rate of 685 feet per minute). However, the high density altitude at the airport and the overweight condition of the airplane would have affected the airplane's climb performance.

The Cheyenne Airport has a field elevation of 6,156 feet msl. Taking into account the temperature, the density altitude at the time of the takeoff and accident was 6,670 feet msl. According to airplane performance data from Cessna, the high density altitude and the airplane's overweight condition would have decreased the airplane's best rate-of-climb speed to 81 mph; with a climb rate of 387 feet per minute.

Thus, the combination of the effects of the rain, the overweight condition, and the gradual bank angle of the airplane would have increased the airplane's stall speed from about 59 mph to about 64 mph, and, along with the high density altitude, decreased its best rate-of-climb speed from 84 mph to about 81 mph. However, the airplane should have been able to climb and turn safely. Thus, the Safety Board analyzed the possible reasons why this did not occur. These include a possible reduction in engine power from carburetor icing or an over-rich fuel/air mixture, and the effects of fluctuating winds, poor visibility and the lack of sufficient experience in takeoffs from high density altitudes on the pilot in command's ability to operate the airplane.

As noted in section 1.6.1, it is necessary to lean the fuel mixture at higher altitudes to allow maximum engine performance; an over-rich mixture can

result in an appreciable loss of power and reduced climb performance capability. The mixture control knob was found in the full rich (forward) position at the accident site, thus suggesting that it was in that position prior to impact, although it is possible that the knob was out and impact forces moved the knob forward without bending the rod. The pilot's failure to stop at the end of the runway before his takeoff roll, which would have been the most common and appropriate time to adjust the fuel/air mixture, further suggests that he did not properly lean the mixture.

Further, carburetor icing conditions existed at the time of takeoff (the temperature was 40 degrees, the dew point was 32 degrees, and there was moisture in the air). Thus, without the application of carburetor heat during taxi and runup, ice may have formed in the carburetor and reduced the available power at takeoff. The carburetor heat valve was found in the "off" position at the accident site. The pilot's failure to stop at the end of the runway before his takeoff roll suggests that he did not perform a pretakeoff checklist, which would have included a magneto and carburetor heat check (turning on the carburetor heat.) However the Safety Board could not conclusively determine its position during the takeoff sequence.

Either or both of these conditions could have reduced the engine power sufficiently to cause a loss of climb capability. However, because the settings of the mixture control knob and the carburetor heat valve during the takeoff could not be determined positively, the Safety Board cannot conclusively determine whether a power reduction from an over-rich mixture and/or carburetor icing existed at the time of the accident.

ASOS ceilometer data and eyewitness reports indicate that the cloud bases in the accident area were probably around 1,500 feet agl. Additionally, numerous eyewitnesses stated that the airplane was visible until the accident. Personnel in the tower, about 1.2 nautical miles from the accident location, observed the accident sequence.

The Safety Board concludes that although horizontal in-flight visibility at the time of the stall was most likely substantially degraded due to precipitation, eliminating a visible horizon, the pilot in command could have maintained visual ground reference by looking out the side window. However, this could have been disorienting to the pilot because of the need to scan to his left to see flight instruments in front of the pilot trainee and to his right to see the ground, as he attempted to operate the airplane at low speed, with a lower-than-

normal climb rate, with the distraction of rain and ice impacting the airplane, and in instrument meteorological conditions.

Analysis of weather data indicate that the winds were generally westerly at the surface and near-surface at speeds that varied between 15 and 30 knots. In addition, there is evidence of significant crosswinds of 21 to 23 knots on runway 30 at the time of the accident flight's takeoff. (See sections 1.7.1.2 and 1.7.2.1.)

Wind data from ASOS showed that wind speeds were most likely about 5 knots higher around the takeoff time of the accident flight than when the Cessna 414 departed, reporting to the tower controller moderate low level windshear and airspeed fluctuations of +/- 15 knots. This report was acknowledged by the pilot in command of the accident flight. The Safety Board concludes that the airplane experienced strong crosswinds, moderate turbulence and gusty winds during its takeoff and attempted climb, and that the pilot in command was aware of these adverse wind conditions prior to executing the takeoff.

Although airplane control problems associated with crosswinds would exist during the initial takeoff roll, control problems associated with turbulence and gusty winds would have affected the airborne portion of the flight as well. Specifically, these wind conditions would make it more difficult to maintain a constant airspeed and rate of climb and could result in an unintended reduction in airspeed to below the airplane's stall speed.

The wind conditions may also have affected the pilot's perception of his airspeed after the right turn. What was initially a crosswind during the takeoff roll and initial airborne phase became a tailwind after the airplane began its right turn. Because the pilot was most likely looking outside the airplane during the VFR departure, he may not have been adequately monitoring the airspeed indicator or he may have had difficulty monitoring it because of airspeed fluctuations, and he may have misperceived the increased ground speed as an increase in airspeed. Accordingly, the Safety Board concludes that the right turn into a tailwind may have caused the pilot in command to misjudge the margin of safety above the airplane's stall speed. In addition, the pilot may have increased the airplane's pitch angle to compensate for the perceived decreased climb rate, especially if the pilot misperceived the apparent ground speed for airspeed, or if the pilot became disoriented.

The pilot in command had only performed a total of ten known takeoffs out of airports at elevations exceeding 4,500 feet msl, and only five of those flights were performed from airports over 6,000 feet msl. Higher density altitudes result in a reduction of aerodynamic (wing and propeller) and powerplant performance during takeoff and initial climb, and in a longer takeoff run and slower rate of climb. This reduced rate of climb might well prompt a person who was inexperienced with high density altitude takeoffs to raise the nose of the airplane in an attempt to increase the rate of climb, thereby further decreasing the airspeed. Therefore, the Safety Board concludes that the high density altitude and possibly the pilot in command's limited experience with this type of takeoff contributed to the loss of airspeed that led to the stall.

The Safety Board has been unable to determine which of the above factors, or a combination of factors, resulted in the reduction in the climb speed to below the stall speed. However, the Safety Board concludes that the pilot in command failed to ensure that the airplane maintained sufficient airspeed during the initial climb and subsequent downwind turn to ensure an adequate margin above the airplane's stall speed, resulting in a stall and collision with the terrain.

The Safety Board notes that the pilot in command had limited experience operating out of high density altitude airports, such as Cheyenne, and that this should have prompted him to be cautious. He had expressed concern about the predicted storm that was to move in from the west, and he had wanted to leave early enough to avoid the storm. Further, just prior to departure, the pilot knew the wind conditions reported by a pilot who had just departed.

Accordingly, the Safety Board concludes that the pilot in command inappropriately decided to take off under conditions that were too challenging for the pilot trainee and, apparently, even for him to handle safely. Therefore, the Safety Board attempted to analyze the human performance factors that might have caused the pilot in command to depart under those conditions. These factors include the possible effects of fatigue, the emphasis placed on media events, and the desire to adhere to the programmed itinerary.

2.3 Human Performance Aspects

2.3.1 Fatigue

The pilot in command's sleeping schedule in the days before the accident flight 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.⁴¹ 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,⁴² 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 PDT), 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 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.⁴³ The number and variety of these

⁴¹Extra 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.

⁴²See 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)

⁴³Specifically, he started the airplane engine while the nosewheel was still chocked; requested a taxi clearance without having obtained the 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" clearance.

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.⁴⁴ 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.

2.3.2 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 literature⁴⁵ 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 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

⁴⁴It 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.

⁴⁵See Fatigue Symposium Proceedings, November 1-2, 1995, National Transportation Safety Board and NASA Ames Research Center. Washington, D.C.: National Transportation Safety Board.

Fatigue in the 90's," was prepared by the 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,⁴⁶ 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,⁴⁷ the Safety Board recommended that the FAA:

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 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

⁴⁶See Safety Study, "A Review of Flightcrew-Involved, Major Accidents of U.S. Air Carriers, 1978 Through 1990" (NTSB/SS-94/01)

⁴⁷See 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)

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.

2.3.3 Media Attention and Itinerary Pressure

When the trip was proposed, the pilot in command told his wife that the flight would be a “non-event for aviation” and simply “flying cross country with a 7 year old next to you and the parents paying for it.” The evidence indicates that he was surprised and awed by the media attention that developed. However, according to his wife, he was pleased by the media attention.

The media interest apparently began from an article in a local paper. Media interviews began several days before the trip, and included numerous telephone calls at home and early morning live television interviews on national news programs. Media representatives were present at nearly every stop on the trip, and the time spent participating in media events interfered with other activities that could have affected flight safety.⁴⁸ For example, the media events at Cheyenne the night before the accident resulted in a delayed arrival at the hotel, thus delaying the opportunity for the participants to obtain much needed rest. Also, on the morning of the accident, the pilot in command’s preflight inspection and preparation of the airplane was interrupted by a television reporter’s

⁴⁸In addition, the father videorecorded parts of the first day’s flight from the back seat of the airplane for use by a national news service, providing a regular reminder of the news value of the flight.

interview, possibly degrading the thoroughness of the preflight preparations.⁴⁹ The airplane occupants also participated in two other media interviews, further delaying the departure. Further, slips of paper found in the shirt pocket of the pilot trainee's father indicated that they had media interviews scheduled for that evening in Ft. Wayne, Indiana, and the following evening in Massachusetts.

On the morning of the accident, the weather was changing. There was a cold front approaching Cheyenne, but the weather to the east was good. If the airplane had departed ahead of the storm, it would have encountered good weather along its intended route. If the airplane had waited until after the storm passed, its intended route would have been blocked by the storm. The pilot had made it clear the night before that he wanted to depart ahead of the cold front, but their departure was delayed by a later-than-planned checkout from the hotel and by the media interviews. By the time the airplane was ready for takeoff, the only way to avoid being held up by the storm, and therefore to maintain the tightly scheduled itinerary, was to fly for several minutes in the deteriorating and potentially unsafe weather conditions associated with the storm.

Self-induced pressures from media attention can degrade decision making, increasing the perceived importance of maintaining the schedule compared to other factors. It would have been a normal human response for the pilot in command to have been affected by the media attention.

The Safety Board concludes that the airplane occupants' participation in media events the night before and the morning of the accident flight resulted in a later-than-planned takeoff from Cheyenne under deteriorating weather conditions. The Safety Board further concludes that the presence of media at the Cheyenne Airport and media interviews scheduled for the next two overnight stops probably also added pressure to attempt the takeoff and maintain the itinerary.

The planned itinerary for the trip involved approximately 51 hours of flying time (with 3 to 8 hours of flight time scheduled per day), more than 8 days, and no days off. In contrast, the father of the 8-year-old child, who had set the previous youngest "pilot" flight "record," indicated that they followed no fixed

⁴⁹For example, if he had been fully attentive to the preflight preparations, he might have questioned whether the numerous bags and other items being loaded on the airplane would result in an overweight condition.

itinerary, and that their route was flexible. He said that their flight legs were limited to 2 hours or less to accommodate the child's physiological needs.

It is not clear why the pilot in command agreed to an itinerary that was so demanding and had so little flexibility. He had flown long trips before and must have known that weather can be difficult to predict. When another pilot expressed concern about the itinerary, especially about weather through the mountains at that time of the year,⁵⁰ the pilot assured him that he would stop and wait out any adverse weather. The pilot also acknowledged to his wife and another friend that the trip might take longer than planned. But he did not build any reserve time into the itinerary that would allow for such delays.

The Safety Board concludes that the itinerary was overly ambitious, and that a desire to adhere to it may have contributed to the pilot in command's decision to take off under the questionable conditions at Cheyenne.

2.3.4 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,⁵¹ the Board recommended that the FAA:

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."

⁵⁰The trip was planned for April because the pilot trainee would turn 8 years old in May, and she would break the previous "record" only if the flight were completed before then.

⁵¹See Safety Study, "Commercial Emergency Medical Service Helicopter Operations" (NTSB/SS-88/01)

Following its investigation of a midair collision involving a Piper Aerostar PA-60 airplane and a Bell 412 helicopter that occurred on April 4, 1991,⁵² 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."

In 1993, following its investigation of an accident involving a Scenic Air Tours Beech Model E18S near Maui, Hawaii, on April 22, 1992,⁵³ 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

⁵²See 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)

⁵³See 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)

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 making⁵⁴ have focused on decision making involving real life situations, in which decisions must often be made rapidly in response to changing and ambiguous 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 (AOPA) 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 (NAFI) 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.

This accident demonstrates the need for continued efforts in the area of aeronautical decision making for general aviation pilots. The circumstances of this accident could be instructive to other general aviation pilots in raising their

⁵⁴See Judith Orasanu and Terry Connolly, "The Reinvention of Decision Making" in Gary A. Klein, Judith Orasanu, Roberta Calderwood, and Caroline E. Zsombok (Eds.), *Decision Making in Action: Models and Methods*. Norwood, N. J.: Ablex Publishing Corporation.

awareness of potential decision making errors. Therefore, the Safety Board believes that AOPA, the Experimental Aircraft Association (EAA), and NAFI should disseminate information about the circumstances of this accident and continue to emphasize to their members the importance of aeronautical decision making.

The Safety Board recognizes that the FAA's letter of April 24, 1996, to flight instructors 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.

2.4 Recent Legislative Changes

As noted in section 1.18, 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.

3. CONCLUSIONS

3.1 Findings

1. The pilot in command was properly certificated and qualified for the intended cross-country trip.
2. The pilot in command was wearing corrective lenses at the time of takeoff, as required by the limitation on his current medical certificate.
3. There was no evidence that airplane maintenance was a factor in the accident.
4. The airplane's engine was developing power at the time of the accident, and the flaps had been set at the preferred takeoff setting.
5. There was no evidence of airframe or control malfunction during the takeoff and subsequent crash.
6. Airframe icing was not likely a factor in this accident.
7. There were no air traffic control factors that contributed to the cause of the accident.
8. The pilot in command was provided with a satisfactory weather briefing prior to departing Cheyenne.
9. The pilot in command was at least assisting the pilot trainee (if he was not the sole manipulator of the controls) during the takeoff and climb-out sequence, and, at the time of impact, the pilot in command was the sole manipulator of the airplane's controls.
10. The accident sequence took place near the edge of a thunderstorm.

11. The pilot in command decided to turn right immediately after takeoff to avoid the nearby thunderstorm and heavy precipitation that would have been encountered on a straight-out departure.
12. The airplane was 96 pounds over the maximum gross takeoff weight at takeoff, and 84 pounds over the maximum gross takeoff weight at the time of the impact.
13. Although horizontal in-flight visibility at the time of the stall was most likely substantially degraded due to precipitation, eliminating a visible horizon, the pilot in command could have maintained visual ground reference by looking out the side window. However, this could have been disorienting to the pilot.
14. The airplane experienced strong crosswinds, moderate turbulence and gusty winds during its takeoff and attempted climb, and the pilot in command was aware of these adverse wind conditions prior to executing the takeoff.
15. The right turn into a tailwind may have caused the pilot in command to misjudge the margin of safety above the airplane's stall speed. In addition, the pilot may have increased the airplane's pitch angle to compensate for the perceived decreased climb rate, especially if the pilot misperceived the apparent ground speed for airspeed, or if the pilot became disoriented.
16. The high density altitude and possibly the pilot in command's limited experience with this type of takeoff contributed to the loss of airspeed that led to the stall.
17. The pilot in command failed to ensure that the airplane maintained sufficient airspeed during the initial climb and subsequent downwind turn to ensure an adequate margin above the airplane's stall speed, resulting in a stall and collision with the terrain.

18. The pilot in command inappropriately decided to take off under conditions that were too challenging for the pilot trainee and, apparently, even for him to handle safely.
19. The pilot in command suffered from fatigue on the day before the accident.
20. 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.
21. The airplane occupants' participation in media events the night before and the morning of the accident flight resulted in a later-than-planned takeoff from Cheyenne under deteriorating weather conditions.
22. The presence of media at the Cheyenne Airport and media interviews scheduled for the next two overnight stops probably also added pressure to attempt the takeoff and maintain the itinerary.
23. The itinerary was overly ambitious, and a desire to adhere to it may have contributed to the pilot in command's decision to take off under the questionable conditions at Cheyenne.

3.2 Probable Cause

The National Transportation Safety Board determines 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.

4. RECOMMENDATIONS

As a result of the investigation of this accident, the National Transportation Safety Board makes the following recommendations:

--to the Aircraft Owners and Pilots Association, the Experimental Aircraft Association, and the National Association of Flight Instructors:

Disseminate information about the circumstances of this accident and continue to emphasize to your members the importance of aeronautical decision making. (A-97-19)

--to 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)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

James E. Hall
Chairman

Robert T. Francis II
Vice Chairman

John Hammerschmidt
Member

John J. Goglia
Member

George W. Black, Jr.
Member

March 11, 1997

5. APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The National Transportation Safety Board's Northwest Region was notified of the accident by the FAA's Northwest Mountain Region Operations Center at 0758 Pacific daylight time on April 11, 1996. The Safety Board's investigator in charge departed for the site on the first available commercial flight. Safety Board personnel from the South Central Field Office, Denver, Colorado, were the first investigators to reach the site, arriving shortly after noon.

Investigation groups were formed for human performance and meteorology.

Parties to the investigation were the Federal Aviation Administration, Cessna Airplane Company, and Textron Lycoming.

2. Public Hearing

There was no public hearing held or formal depositions taken for this accident.

APPENDIX B

TRANSCRIPT OF AFSS WEATHER BRIEFING



U.S. Department
of Transportation
Federal Aviation
Administration

Memorandum

CASPER AFSS
3777 Airport Parkway
Casper, Wyoming 82604

Subject: INFORMATION: Transcription concerning
the accident involving N35207 Cessna Cardinal
on April 11, 1996 at 1424 UTC

Date: April 16, 1996

From: ATM, Casper AFSS

Reply to
Attn. of:

To: This transcription covers the Casper AFSS Preflight 4 position for the time
period from April 11, 1996, 1356 UTC to April 11, 1996, 1413 UTC.

Agencies Making Transmissions
Casper AFSS, Preflight 4
Pilot of Cessna Cardinal N35207

Abbreviations
PF
N35207

I hereby certify that the following is a true transcription of the recorded conversations pertaining to the
subject aircraft accident involving N35207:

John A. Holley
Quality Assurance Specialist
April 16, 1996

1356

1357

1358

1359

1400

1401

1401:20 PF casper flight service

1401:21 N35207 good morning this is cardinal three five two zero seven at uh

1401:24 PF (unintelligible)

CYS-ATCT-182
N35207
Page 2 of 6

1401:25 N35207 like a weather briefing for a v f r flight from hereto lincoln nebraska and will be direct

1401:31 PF go ahead

1401:34 PF *(uhhh)

1401:41 PF at this time we have an airmet for icing moderate below twenty thou twenty four thousand in wyoming airmet for turbulence both uh along the route possibly severe below eighteen otherwise moderate i f r flight precautions are in effect likewise along that route of flight theres a cold front just to the north of your position actually they depict it through there now

1402:03 N35207 yea its startin to rain here

1402:07 PF okay and with regards to the rain showers is it we have uh on the cheyenne uh oh bad time for my radar to die ha dog gone it *(let) me try this other machine theres some tops above thirty thousand just uh on uh virtually a line of it on a north south line just west of your position an there movin from south to north at this time so we have thunderstorms icing and i f r and urn not looking for a lot of improvement cheyennes currently twenty six hundred broken three thousand overcast ten miles with light rain scotts bluff automated weather is twenty one hundred no is twelve hundred scattered seven miles winds north east at twenty gust to twenty three i hate these awoses every every one of them out there thu other than scotts bluff *(is the) same ogalalas north platte there all clear below twelve thousand sidney nebraska is grand island is clear below twelve sidney clear below twelve well if in fact its that good out there

1403:40 N35207 yea probably looks good out there from here lookin (unintelligible) lookin east looks like the suns shining as a matter of fact

1403:47 PF yea lets take a look at that airmetthats been issued again for the

CYS-ATCT-182
N35207
Page 3 of 6

i f r see it says from dikenson to scotts bluff to fifty south west
of scotts bluff to laramie to bozeman i f r conditions

- 1404:03 N35207 yea i can imagine that
- 1404:04 PF okay forecast for cheyenne thru seventeen z calls for two
thousand scattered to broken four thousand broken and light rain
thunderstorms after seventeen z lowering ceilings fifteen
hundred feet along your route of flight uh scotts bluff just to the
north there calls for from fourteen to seventeen z i f r conditions
and rain and fog over at north platte ten thousand scattered until
seventeen z which is three hours from now then they say at north
platte thunderstorms four thousand scattered to broken
- 1404:42 N35207 uh huh
- 1404:43 PF lincoln uh this morning twenty five thousand broken chance of
thunderstorms by two p m mountain time and grand island
forecasting cirrus clouds thunderstorms late afternoon so if its if
you can venture out of there and go get east it looks
- 1405:01 N35207 yea it looks pretty good actually
- 1405:03 PF and stay south lets see what akrons got yea akrons clear below
twelve so i don't have any weather
- 1405:10 N35207 okay
- 1405:11 PF other than whats right at cheyenne uh adverse conditions
- 1405:14 N35207 yea its raining here pretty good right now i mean its you know
steady but nothin nothin bad and to the east it looks real good
- 1405:21 PF (unintelligible) you get winds at nine thousand at two thirty at

CYS-ATCT-182
N35207
Page 4 of 6

startin out at about twenty and then omahas two forty at thirty
five so youll get a good push

1405:35 N35207 Yea

1405:36 PF theres a notam at lincoln theres a tower boy this just a huge
thing twelve hundred feet a g 1

1405:43 N35207 wuh

1405:44 PF nineteen east no lights on it

1405:48 N35207 this is lincoln

1405:49 PF yea

1405:50 N35207 okay

1405:56 PF that would be the notams that i see here

1405:57 N35207 okay

1406:00 PF what else can i get for ya

1406:02 well (unintelligible) thats it we'll file

1406:04 PF go ahead sir

1406:06 N35207 its a v f r its uh cardinal three five two zero seven its a uh uh one
seven seven b slash uniform true air speed a hundred twenty nice
a hundred twenty knots departure point is cheyenne proposed is

CYS-ATCT-182

N35207

Page 5 of 6

within the next uh half hour cruise altitude will be probably uh somewhere around probably five thousand five hundred er no seven thousand five hundred and route of flight will be direct to uh to lincoln uh d uh d theres uh uh five uh five and a half hours of fuel on board uh and uh the estimated time enroute is uh im sorry is uh will be four hours and uh the the uh my name is joe reid r e i d home airport is half moon bay thats h uh hotel alpha foxtrot my telephone number there is four one five seven two six three four one seven theres three souls aboard and weve got we're red white and blue

1407:08 PF wheres is that located uh half moon bay

1407:11 N35207 just south of san francisco about uh twenty five miles

1407:15 PF okay flight plans filed

1407:19 N35207 okay thank you sir and where do we call

1407:21 PF call us on twenty two i got to look five i think it is

1407:27 N35207 twenty two what

1407:30 PF no one twenty two three

1407:33 N35207 three oh okay and uh whos flight following who do i call for flight following

1407:36 PF denver center

1407:39 N35207 okay do you have that number for around here

1407:39 PF one two five point nine

CYS-ATCT-182

N35207

Page 6 of 6

1407:41 N35207 twenty five niner thank you very much sir

1407:43 PF have a good one

1407:44 N35207 see ya la thanks bye

1408

1409

1410

1411

1412

1413

End Of Transcript

***This portion of the rerecording is not entirely clear, but this represents the best interpretation possible under the circumstances.**