



National Transportation Safety Board Aviation Accident Final Report

Location:	SNOQUALMIE PASS, WA	Accident Number:	SEA93FA026
Date & Time:	11/21/1992, 0935 PST	Registration:	N100EK
Aircraft:	BEECH A60	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	6 Fatal

Flight Conducted Under: Part 91: General Aviation - Personal

Analysis

WHILE CLIMBING IN MOD ICING CONDS AFTER TAKEOFF, PLT WAS CLEARED TO 17,000'. RADAR DATA SHOWED ACFT CLIMBED AT AN INDCD AIRSPEED (IAS) OF 82 TO 123 KTS. A BEECH SAFETY INFO BOOKLET STATED THAT A MIN AIRSPEED OF 140 KTS MUST BE MAINTAINED IN ICING CONDS. CLIMBING AT REDUCED AIRSPEED WOULD HAVE INCREASED ANGLE OF ATTACK & ALLOWED ICE TO ACCUMULATE UNDER THE WINGS & AFT OF THE DE-ICING BOOTS. ACFT CLIMBED TO 13,500', DESCENDED MOMENTARILY TO 13,300', THEN CONTINUED CLIMBING AS AIRSPEED DECREASED ABRUPTLY. AFTER SLOWING TO 60 KTS IAS AT 13,700', THE ACFT ENTERED A STEEP DESCENDING TURN & ACCELERATED TO HIGH SPEED (ABOVE VNE). AN EMERGENCY WAS DECLARED, STATING THE AIRCRAFT 'LOST AN ENGINE.' SOON THERE- AFTER, RADAR CONTACT WAS LOST & THE ACFT CRASHED. PIECES OF EMPENNAGE SURFACES SEPARATED IN FLIGHT & WERE FOUND AT REMOTE LOCATION FROM THE MAIN WRECKAGE. BOTH COUNTERWEIGHTS SEPARATED FROM THE ELEVATORS. POST-CRASH TESTS DISCLOSED NO MECHANICAL EVIDENCE OF ENGINE MALFUNCTION. LOW CEILING, FOG, LIGHT RAIN, SNOW & ICING CONDITIONS WERE RPRTD IN AREA.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: FAILURE OF THE PILOT TO MAINTAIN CONTROL OF THE AIRCRAFT, HIS FAILURE TO PREVENT THE AIRCRAFT FROM EXCEEDING THE NEVER EXCEED SPEED (VNE), AND SUBSEQUENT EXCEEDING OF THE DESIGN STRESS LIMITS OF THE AIRCRAFT. FACTORS RELATED TO THE ACCIDENT WERE: WEATHER CONDITIONS (INCLUDING ICING CONDITIONS), IMPROPER AIRSPEED, AND LOSS OF ENGINE POWER FOR UNDETERMINED REASON(S).

Findings

Occurrence #1: IN FLIGHT ENCOUNTER WITH WEATHER
Phase of Operation: CLIMB - TO CRUISE

Findings

1. (F) WEATHER CONDITION - FOG
 2. (F) WEATHER CONDITION - RAIN
 3. (F) WEATHER CONDITION - SNOW
 4. (F) WEATHER CONDITION - ICING CONDITIONS
 5. (F) AIRSPEED - IMPROPER
 6. (F) WING - ICE
-

Occurrence #2: LOSS OF ENGINE POWER
Phase of Operation: CLIMB

Findings

7. (F) REASON FOR OCCURRENCE UNDETERMINED
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Occurrence #3: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: CLIMB

Findings

8. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
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Occurrence #4: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: DESCENT - UNCONTROLLED

Findings

9. (C) AIRSPEED(VNE) - EXCEEDED - PILOT IN COMMAND
 10. (C) DESIGN STRESS LIMITS OF AIRCRAFT - EXCEEDED - PILOT IN COMMAND
 11. HORIZONTAL STABILIZER SURFACE - OVERLOAD
-

Occurrence #5: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings

12. TERRAIN CONDITION - MOUNTAINOUS/HILLY

Factual Information

HISTORY OF FLIGHT

On November 21, 1992, at approximately 0935 Pacific standard time (PST), a Beech A 60, N100EK, impacted the terrain about two miles west of Snoqualmie Pass, Washington. The FAA certificated commercial pilot and his five passengers received fatal injuries, and the aircraft was destroyed. The pleasure flight, which departed Boeing Field/King County International Airport at 0917 PST, was in instrument meteorological conditions at the time of the accident. The aircraft, which was on an instrument flight plan to Pullman, Washington, was located as the result of the activation of the ELT.

According to information retrieved from a recording of the pilot's weather briefing, the purpose of the flight was to attend a college football game in Pullman, Washington. The pilot indicated to the briefer that it was his intention to fly to Pullman for the game, remain overnight in the Pullman area, and then to return to the Seattle area the following day.

At about 0650 PST, on the day of the flight, the pilot telephoned Seattle Flight Service and requested a briefing for an IFR flight from Boeing Field to Pullman, Washington. He received a standard briefing from Flight Service, and then filed his IFR flight plan.

At 0909 PST, the pilot of 100EK received his IFR clearance from Boeing Tower, followed one minute later by his taxi clearance. At 0916 the flight was cleared for takeoff, and then after departure was given a frequency change to Seattle Departure at about 0919. Seattle Departure issued the pilot an initial climb clearance to 4,000 feet, directed the pilot to turn left to a heading of 100 degrees to join Victor Airway #120, and then issued a further clearance to climb to 15,000 feet. At 0929 the flight was handed off to Seattle Center.

On initial contact with Center, 100EK was cleared to climb to 17,000 feet, after which the pilot requested a clearance for PULLMAN direct when Center was able to give it to him. At 0930:05, Seattle Center advised the pilot of 100EK to expect BIDDY direct in about eight miles, and requested his current altitude. The pilot responded that he was passing through 10,700 feet at that time. For the next four minutes there was no radio communication with 100EK. Then, at 0934:26 Seattle Center cleared 100EK direct BIDDY direct PULLMAN. The pilot did not make a radio response to this clearance, and no transmissions were received from 100EK for a period of 14 seconds after the clearance was transmitted by Center. Then, at 0934:40, a noisy radio transmission, with a considerable amount of background cockpit noise, was received by Seattle Center. A later review of the audio tape revealed that the person making the transmission had declared, "...this is zero echo declaring an emergency, lost an engine." The center controller immediately asked the aircraft that had declared an emergency to identify itself, and then tried numerous times, both directly and through other aircraft, to contact 100EK, but there was no response. Soon thereafter 100EK disappeared from Center's radar screen.

METEOROLOGICAL INFORMATION

When the pilot called for his weather briefing, he was advised that the first significant winter storm of the year was moving into the area. He was advised of airmets for obscuration of mountainous terrain, moderate rime icing in the clouds, moderate turbulence, and low level wind shear on the west side of the Cascade Mountains.

The current weather at Boeing Field at the time of the briefing was a measured ceiling of 3,500

feet overcast, visibility six miles with light rain and fog, temperature 42 degrees, dew point 40 degrees, calm winds, and an altimeter of 29.72 inches.

The forecast for western Washington was for 2,000 to 3,000 overcast, layered through 25,000 feet; changing by 1000 PST to 1,500 to 2,000 feet scattered to broken, with overcast of 3,000 to 3,500 feet, visibility three to five miles in light rain and fog or moderate rain, occasionally with snow above 3,000 feet. The forecast also called for an area of high surface winds to be moving in from the coast by 0900 PST. These winds were forecast to be 30 to 40 knots, with gusts into the fifties.

The forecast for the Columbia Basin was 3,000 to 4,000 scattered to broken, 7,000 broken, with widely scattered areas of light rain through 1300 PST. The forecast for the remainder of eastern Washington was for 8,000 scattered, 12,000 overcast, cloud tops to 20,000 through 1100 PST, and areas of rain or mixed rain and snow by 1200 PST.

Because there is no terminal forecast issued for Pullman, the pilot was given the terminal forecast for Lewiston, Idaho. This forecast showed 1,200 scattered, 4,500 overcast, winds 120 degrees at 13 knots gusting to 25 knots, with a chance of ceilings 1,200 overcast, visibility down to two miles in light rain and fog.

The Surface Weather Observation for Boeing Field taken at 0945, approximately 30 minutes after the departure of 100EK, was reporting an estimated ceiling of 3,000 overcast, five miles visibility, light rain and fog, a temperature of 43 degrees and a dewpoint of 41 degrees, wind of 130 degrees at four knots, and an altimeter setting of 29.91.

The Automatic Meteorological Observation (AMO) taken at Stampede Pass (3,800 feet MSL), about 9 miles southeast of the accident site, at 0849 PST, reported an indefinite ceiling 100 feet, sky obscured, visibility one eighth mile, snow and fog, temperature 26 degrees, dewpoint 25 degrees, wind 090 degrees at 14 knots, altimeter 29.65 inches. The AMO taken at the same location at 1009 PST, showed indefinite ceiling 100 feet, sky obscured, visibility one eighth mile, snow and fog, temperature 26 degrees, dew point 25 degrees, wind 100 degrees at 17 knots, altimeter 29.62 inches.

Pilots who flew near the area of the accident that morning, either prior to or after the mishap, reported that their aircraft picked up moderate mixed ice while in the clouds. Two of the pilots, both of which fly this portion of Victor 120 on a regular basis, said that the ice was accumulating faster and building up thicker than they were used to experiencing in this area. All agreed that the clouds were layered from about 3,000 feet above ground level (AGL) to as high as 21,000 feet. The pilot of an aircraft which departed Boeing Field for the same destination about five minutes after 100EK, reported very strong updrafts and moderate turbulence through 4,000 feet, and moderate mixed icing in the clouds to about 17,000 feet. A pilot of a turbojet aircraft, who also made an easterly departure from Boeing Field that morning, said that "It was pretty tough going in the ice and turbulence," until he got on top of the cloud layers at about 20,000 feet.

WRECKAGE AND IMPACT INFORMATION

The aircraft impacted the terrain at approximately the 3,800 foot level of the southeasterly slope of Granite Mountain. According to the rescue personnel who responded to the scene, the aircraft impacted two or three large trees, and came to rest buried in about four feet of snow, with an additional two feet of fresh snow on top of the wings. A line drawn through the primary impact scar and the remains of the main wreckage, in the direction of the aircraft nose,

measured 10 degrees magnetic. The instrument panel, main cabin, nose cargo compartment, and the inboard portion of the left wing were destroyed by fire. The inboard portion of the right wing also received considerable fire damage. The empennage, nose wheel well area, outboard four feet of the left wing, and the right wing, from the inboard end of the aileron to the wing tip, did not have significant fire damage.

The outboard section of the right wing showed rearward crushing and wing skin accordioning in the area forward of the aileron. The front wing spar had separated at a point that was forward of the midpoint of the aileron, and the rear wing spar had separated about even with the inboard aileron hinge. The rearward crushing present in the wing continued back about half way through the chord of the aileron, which had separated from the rear wing spar and was located at the site of the main wreckage. The inboard section of the right wing had been destroyed forward of the rear wing spar. The flap, which was in the up position, was still connected to the remaining aft portion of the wing, and about 18 inches of the most outboard section of the rear spar running through this portion of the wing was bent upward approximately 90 degrees.

The outboard portion of the left wing, from the inboard aileron hinge to the wing tip, showed minimal impact damage, and the aileron was still connected to the rear wing spar. Both the front and aft wing spars had separated from the more inboard portion of the wing, just inboard of the aileron inboard hinge. The inboard part of the wing skin, and the inboard end of both spars running through this section of the wing, showed melting from the fire. The only inboard portion of the wing remaining intact was about a two foot section of the aft wing spar, and an attached section of flap. The lower attach point of this aft spar had fractured.

Major portions of both horizontal stabilizers had separated from the aircraft and were located uphill from the impact site (see NTSB Form 6120.4 Supplement I). Both elevators had separated from their respective stabilizers, and the right elevator was also located uphill from the impact site. The separated portions of stabilizer and elevator showed very little impact damage. The left elevator counterweight had separated from the elevator, and was located in a separate uphill location. Most of the left elevator itself was found near the empennage at the main wreckage. The counterweight from the right elevator had also separated, but was not able to be located at the accident site. Portions of the skin from both stabilizers had been ripped away, and had separated from the stabilizer stingers where they are bonded by an adhesive. The skin around the upper and lower edges of the elevator hinge clearance cutouts on both elevators showed dents and tearing beyond the limits of the structural cutouts. The eye on the aft end of the section of the elevator control rod that attaches to the elevator had sheared.

The rudder remained attached to the vertical stabilizer, but skin from near the top of the rudder had also been torn away, and the rudder trim tab had separated from the rudder. Most of the torn pieces of rudder skin were located uphill from the impact area, as was the rudder trim tab.

The engines had both separated from the wings, and were located just forward of where the wings had impacted the terrain. Both propellers were still attached to their respective engines, as were most of the engine accessories. All three propeller blades from the left engine were bent aft along most of their length. One blade showed tearing, indentations, and a small sheared portion along about the last six to ten inches of the tip. A second blade showed longitudinal twisting, and slight leading edge indentation and "S" curving near the tip. The third blade showed "S" curving and a slight amount of longitudinal twisting. Non of the blades showed any

significant chordwise scarring.

One of the blades from the right engine was bent aft, another was bent forward, and the third was essentially straight. The blade which was bent aft had an aft curling leading edge indentation near its tip. The blade which was bent forward showed two forward curling indentations along about the last six inches of its tip. The third blade showed no significant impact scarring or bending.

TESTS AND RESEARCH

ENGINES: The propellers were removed from both engines, and the engines were shipped to the Textron Lycoming Engine Division at Williamsport, Pennsylvania, where custody was assumed by FAA AEA FSDO 13. At that facility, initial inspections and engine test runs were supervised by Mr. Frank Gurish and Mr. Robert Stoll, both of FAA AEA FSDO 13. Impact and fire damaged components were inspected, removed and/or repaired, and the engines were subjected to test cell runs. Both engines were able to be run to rated power with normal engine operation indicated. No evidence of power loss, pre crash malfunction, or impending engine failure was noted (see FAA AEA FSDO 13 report). The damaged variable absolute pressure controller, magnetos, and fuel injector servo from engine L 954 59 were shipped to other facilities where they were subjected to further inspection under the direction of FAA/NTSB.

FUEL SERVO: Fuel injector servo serial number 53962, from engine L 954 59, was taken by Mr. Orrin Anderson, NTSB Northwest Region, to Precision Airmotive Corporation, Everett, Washington. At that facility Mr. Anderson supervised a teardown and inspection of this unit by Mr. Roger Hall, Fuel Systems Engineer. This inspection revealed no pre impact malfunctions or anomalies.

MAGNETOS: Both magnetos, Type SGLN 1208, serial number A145916, and Type SGRN 1209, serial number A145954, from engine L 954 59, were shipped to Teledyne Continental Motors, Atlanta, Georgia, where a teardown inspection was supervised by Mr. Richard Arnett, FAA MIDO, Atlanta, Georgia. The inspection, which was performed by Mr. Bruce Gordon of Teledyne Continental Motors, did not reveal any pre crash malfunctions or abnormalities.

PRESSURE CONTROLLER: Variable absolute pressure controller serial number DHR0231, from engine L 954 59, was subjected to a teardown inspection by Mr. Orrin Anderson and Mr. Michael Stockhill, NTSB Northwest Region. That inspection did not reveal any pre impact malfunctions or discrepancies.

PROPELLERS: The propellers from both engines were shipped to the facilities of Hartzell Propellers Incorporated, Piqua, Ohio. At that location a teardown inspection was supervised by Mr. Paul Warner of the FAA MIDO, Cincinnati, Ohio. According to the report from this teardown, which was conducted by Mr. Roger Stallkamp of Hartzell, neither propeller was feathered or in a windmilling power off position on impact. The report indicated that scarring and crush markings show that both propellers were absorbing engine power on impact, and were operating at a position somewhere less than maximum normal operation pitch, and somewhere greater than minimum normal operating pitch. No evidence of pre impact malfunction was found.

RADIO TRANSMISSIONS: An audio cassette tape supplied by the FAA, which contained recordings of the transmissions from N100EK, was delivered to the audio laboratory of the NTSB. A filtered spectral analysis of two radio transmissions was made in an attempt to ascertain the rpm of the propellers prior to and during the last radio transmission. The study

showed no traces in the expected frequency ranges that could be attributed to the propellers.

RADAR DATA STUDY: At the request of the NTSB IIC, a Radar Data Study was completed by Mr. Charles Pereira, Aerospace Engineer, NTSB Office of Research and Engineering. For the study, recorded radar data was obtained from Seattle Terminal Radar Approach Control (TRACON), weather data was obtained from the Man computer Interactive Data Access System (McIDAS), airplane design data was obtained from Beech Aircraft, and an agreed on estimated gross weight of 5,800 pounds was used. According to this study, 100EK was climbing through approximately 13,500 feet MSL, at an airspeed of about 100 knots indicated, when it experienced at least two abrupt altitude deviations. It then entered a steep descending left turn from about 13,700 feet. During this turn, the aircraft's pitch attitude decreased to about 70 degrees nose down as it passed through about 12,000 feet, and its airspeed began increasing rapidly. Although there was an indication of an increase in pitch attitude, the last radar returns showed 100EK descending through 5,900 feet at a rate of descent of approximately 23,000 feet per minute, and an airspeed of 295 knots indicated. According to Mr. Jerry Stabb, a representative of the manufacturer, this is 60 knots greater than the 235 knot Never Exceed Speed (Vne) published by Beech.

INDICATED AIRSPEED ANALYSIS: As part of the NTSB Radar Data Study, output data was printed which showed the indicated airspeed of the aircraft approximately every five seconds throughout the climb. Two similar studies were completed by Beech Aircraft Corporation which also show the aircraft's speed in the climb. According to Beech, the winds aloft used for their first study were determined by a meteorologist's analysis of published weather data, and the winds aloft used for the second study were calculated by comparing radar derived groundspeeds of other aircraft in the area to the climb airspeeds those aircraft would be expected to hold.

During the investigation, the indicated airspeed data from the NTSB study was compared with the indicated airspeed data from both Beech studies. For this comparison, the indicated airspeeds at each 1000 feet, from 5,000 to 14,000 feet, were referenced. This comparison showed that in both cases there was an average deviation between the Beech studies and the NTSB study of approximately 3 knots.

The data from all three of these studies show the aircraft's indicated airspeed, during the climb from 5,000 to 14,000 feet, to be in a range from 93 to 118 knots. This range is from 22 to 47 knots slower than the 140 knot minimum speed for flight in icing conditions published in the 1990 edition of the Beechcraft Twin Engine (Piston) Airplanes Safety Information pamphlet.

This pamphlet states that during flight in icing conditions, the pilot of this model aircraft "must" maintain at least 140 knots indicated airspeed. It further states that if the pilot allows the airspeed to become slower than this minimum, he will increase the angle of attack of the aircraft to a point where ice may build up under the wings in an area aft of that protected by the boots. According to the pamphlet, the fact or extent of the ice build up in these unprotected areas can not be directly observed from the cockpit. The result of such a build up would be a distortion of the wing airfoil, increased drag, decreased lift, an increase in the stall speed, and inaccurate stall warning devices which could not be relied upon as long as the ice remained.

All three studies show that the indicated airspeed of the aircraft deteriorated to somewhere between 73 and 78 knots just prior to entering its uncontrolled descent. This is seven to twelve knots slower than the 85 knot Minimum Normal Operating Speed (Green Arc) published in the

FAA Approved Flight Manual for this model aircraft.

ADDITIONAL DATA AND INFORMATION

The aircraft was released to Specialty Aircraft of Redmond, Oregon, a representative of the owners estate, on November 8, 1993.

The following individuals are additional participants in this investigation:

GORDON, BRUCE FLETCHER, DANIEL B. TELEDYNE CONTINENTAL
MOTORS LYCOMING ENGINES ATLANTA, GA WILLIAMSPORT,
PA

NETTERBLADE, LEE LYCOMING ENGINES WILLIAMSPORT, PA

Pilot Information

Certificate:	Commercial	Age:	48, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land; Single-engine Sea	Seat Occupied:	Unknown
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 3 Valid Medical--w/ waivers/lim.	Last FAA Medical Exam:	10/06/1992
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	3250 hours (Total, all aircraft), 7 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	BEECH	Registration:	N100EK
Model/Series:	A60 A60	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	P-209
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	08/17/1992, Annual	Certified Max Gross Wt.:	6725 lbs
Time Since Last Inspection:		Engines:	2 Reciprocating
Airframe Total Time:		Engine Manufacturer:	LYCOMING
ELT:	Installed, activated, aided in locating accident	Engine Model/Series:	TIO-541-E1C4
Registered Owner:	HUBER, JAMES D.	Rated Power:	380 hp
Operator:	HUBER, JAMES D.	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	Condition of Light:	Day
Observation Facility, Elevation:	SMP, 3800 ft msl	Distance from Accident Site:	9 Nautical Miles
Observation Time:	1009 PST	Direction from Accident Site:	128°
Lowest Cloud Condition:	Unknown / 0 ft agl	Visibility	0.13 Miles
Lowest Ceiling:	Obscured / 100 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	17 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	100°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29 inches Hg	Temperature/Dew Point:	-3° C / -4° C
Precipitation and Obscuration:			
Departure Point:	SEATTLE, WA (BFI)	Type of Flight Plan Filed:	IFR
Destination:	PULLMAN, WA (PUW)	Type of Clearance:	IFR
Departure Time:	0919 PST	Type of Airspace:	Class E

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	5 Fatal	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	6 Fatal	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	ORRIN K ANDERSON	Report Date:	07/11/1994
Additional Participating Persons:	DONALD BIRD; SEATTLE, WA FRANK GURISH; NEW CUMBERLAND, PA RICHARD ARNETT; ATLANTA, GA RON FOSNOT; CINCINNATI, OH		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).