Aviation Investigation Final Report

Location:	OAKDALE, Wisconsin	**Accident Number:**	CHI98FA349
Date & Time:	September 16, 1998, 07:45 Local	**Registration:**	N4574Q
Aircraft:	Beech 58	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General aviation		

Analysis

At 8,100 feet mean sea level (msl), the pilot reported smoke coming from the aircraft at 0739:32 central daylight time. At 0743:14, the aircraft altitude was 3,000 feet msl. The last received transmission by the pilot was at 0743:01. The Beech 58 Pilot's operating manual, states, under ELECTRICAL SMOKE OR FIRE, that the Battery and Alternator Switches are to be selected in the OFF position. A resistor, similar in size, shape and color to two of the resistors in the door seal inflation system was found attached to the right cabin side wall. The area surrounding the resistor revealed that a black material attached to the interior side wall was absent. There was bubbling of the black material and outside paint. Black material similar to the material on the side wall was also present on the bottom of the resistor. Installation instructions referencing the resistor, state, 'mount to metal structure for heat sink'. An emergency descent from an altitude of 8,000 feet msl was performed in a flight training simulator and a descent rate of approximately 6,200 feet per minute was obtained. A simulated off airport landing, in a simulator, was completed in approximately 02:15 minutes. Airworthiness Directive 98-21-21 has been issued for the deactivating or the removing of all provisions of the inflatable door seal installation.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The installation of the door seal inflation system by company personnel. An additional cause was the emergency procedures not followed by the pilot-in-command. A contributing factor was the trees.

Findings

Occurrence #1: MISCELLANEOUS/OTHER
Phase of Operation: CRUISE

Findings
1. (C) MAINTENANCE,INSTALLATION - IMPROPER - COMPANY MAINTENANCE PERSONNEL
2. FUSELAGE,CABIN - SMOKE

Occurrence #2: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
3. (C) EMERGENCY PROCEDURE - NOT FOLLOWED - PILOT IN COMMAND
4. (F) OBJECT - TREE(S)

Factual Information

HISTORY OF FLIGHT

On September 16, 1998, at 0745 central daylight time (cdt), a Beech 58, N4574Q, operated by the State of Wisconsin's Department of Administration (DOA), impacted terrain while diverting to Volk Field (VOK), Camp Douglas, Wisconsin, after the airline transport rated pilot had declared an emergency and reported smoke in the aircraft. The aircraft was destroyed. Visual meteorological conditions prevailed at the time of the accident. The 14 CFR Part 91 business flight was operating on an instrument flight rule (IFR) flight plan. The pilot and two passengers sustained fatal injuries. The flight originated from the Dane County Regional Airport (MSN), Madison, Wisconsin, at 0653, and was en route to the Burnett County Airport (RZN), Siren, Wisconsin.

At 0653, the pilot called MSN Clearance Delivery and was issued an IFR clearance to Siren.

At 0711, the Local Controller cleared N4574Q for takeoff and told the pilot to contact departure; the pilot contacted Madison Departure Control and was climbed to 6,000 feet without incident or comment from the pilot.

At 0737, the pilot checked in again with Minneapolis Center, level at 8,000 feet. The specialist acknowledged and issued the Eau Claire altimeter setting. The specialist instructed the pilot to contact him on frequency 125.3. The pilot of N4574Q advised the Minneapolis Center specialist that this was the frequency he was on.

At 0739:32, the pilot transmitted, "minneapolis seven four quebec we're gonna return we're gonna go into ah volk we got some smoke comin outa this thing"

At 0739:33, radar data indicated the aircraft's position to be at latitude 44 10'03"N longitude 090 29'25" W or approximately, 11.5 nautical miles (nmi) on a magnetic bearing of 360 degrees from Bloyer Field (Y72) near Tomah, Wisconsin, 16.5 nmi on a magnetic bearing of 041 degrees from Sparta/Fort McCoy (CMY) near Sparta, Wisconsin, 16.8 nmi on a magnetic bearing of 326 degrees from VOK. At 0739:40, Minneapolis Air Route Traffic Control Center (ZMP5R) transmitted, " 'kay ah baron seven four quebec youre cleared to volk field ah left or right turn your discretion ah im showin volk six oclock and ah fifteen miles right now"

At 0739:53, the pilot transmitted, "four quebec okay and ah i guess you could declare it as an emergency we're not gonna fool around we got some sm (clipped)"

At 0739:59, ZMP5R transmitted, "kay seven four quebec descend at pilots discretion then and maintain ah six thousand and ah is it comin out of an engine"

At 0740:05, the pilot transmitted, "no its comin out of a heater it seems"

At 0740:29, ZMP5R transmitted, "kay seven four quebec ah descend at pilots discretion maintain four thousand left or right or left turn your discretion reverse course direct volk when youre able"

At 0740:44, the pilot transmitted, "and four quebec we're gonna go ahead and head for volk ah we should be pretty much headed right at it now i think"

At 0740:50, ZMP5R transmitted, "seven four quebec rodger contact me on one two eight point six for better frequency coverage one two eight point six again i know youre busy sorry about that"

At 0740:56, the pilot transmitted, "twenty eight six"

At 0740:57, ZMP5R transmitted, "(clipped) k you"

At 0741:50, ZMP5R transmitted, "baron seven four quebec report volk field in sight please when youre able"

At 0741:53, the pilot transmitted, "four quebec"

At 0742"13, ZMP5R transmitted, "baron seven four quebec report volk field in sight please"

At 0742:17, the pilot transmitted, "four quebec"

At 0742:24, ZMP5R transmitted, "baron seven four quebec contact chicago center now one three three point three thirty three three theyre aware of the situation"

At 0742:30, the pilot transmitted, "four quebec"

At 0742:57, Chicago Air Route Traffic Control Center transmitted, "november four five seven four quebec chicago"

At 0743:01, the pilot transmitted, "seven four quebec go ahead bud"

There were no further radio transmissions received by Chicago Air Traffic Control Center, VOK Tower or by aircraft that participated in the communications search after this time.

A witness, who also reported that he is a pilot, stated that he heard an aircraft go over his shop at approximately 600 feet above ground level (agl) when dark smoke came out of the centerline of the aircraft. He further stated that the aircraft appeared to be steady with the landing gear up and that it crashed 1-1/2 miles away and was heading in a southwesterly

direction.

A second witness reported that he saw the aircraft approximately 500 feet to 600 feet agl heading from the northeast to the southwest with the landing gear up. The witness also stated that the aircraft seemed under control when he saw black smoke pouring out of the aircraft's backend. The witness went on to say that the aircraft landed about a mile or more from his house.

The wreckage location was located at latitude 43 59.52'N longitude 90 26.25'W or approximately 2.2 nmi on a magnetic bearing of 064 degrees from Y72, 13.1 nmi on a magnetic bearing of 081 degrees from CMY and 13.1 nmi on a magnetic bearing of 295 degrees from VOK.

PERSONNEL INFORMATION

A search of the pilot's FAA records indicated no history of accidents, incidents, or enforcement actions.

The pilot, age 52, was hired as a pilot by the State of Wisconsin's Department of Natural Resources (DNR) on July 8, 1985 and was subsequently transferred to Department of Administration (DOA) on July 3, 1988. He held an airline transport pilot certificate with airplane multiengine and single engine land ratings in addition to commercial rotorcraft and instrument helicopter ratings and their respective flight instructor ratings. He also held a ground instructor certificate with advanced and instrument ratings. The pilot served as a pilot-in-command and an instructor under FAR Part 91 on Beech Queen Air aircraft and under FAR Part 135 on Beech King Air 200.

His first-class medical was issued on July 7, 1998, with the limitation, "holder shall wear glasses which correct for near/intermediate vision while exercising the privileges of his airman certificate." Records provided by the DOA indicate that the pilot had accumulated approximately 14,800 total flying hours. He had logged 1,200 hours in the Beech Baron, of which 101 hours were in the previous year and 18 hours were in the previous 90 days from the date of the accident. The pilot received an in-house proficiency check conducted by the DOA in July of 1997.

The DOA described the pilot's duty time for a 72-hour period before the accident. On September 13, 1998, he was on duty from 1430-2030 with a 2.1 hour flight in a Beech Queen Air. On September 15, 1998, the pilot was on duty from 0700-1500 for a flight which later cancelled. On September 16, 1998, the pilot was scheduled to begin duty at 0600 for a 0700 departure to RZN.

AIRCRAFT INFORMATION

The 1973 Beech Baron 58, serial number TH-374, N4574Q, registered to the State of

Wisconsin, had a total airframe time of 7,766 hours. The aircraft was equipped with a 24-volt electrical system powered by a battery and two gear-driven alternators. The aircraft was maintained by the DOA under the Beechcraft continuing care inspection program since September 30, 1986 and had completed period 6 of 12 on July 2, 1998 at an airframe time of 7,735 hours.

The left engine, Teledyne Continental IO-520-CB, serial number 282177-R, is a fuel injected, air cooled six cylinder engine rated at 285 horsepower at 2,700 rpm. The engine was overhauled on February 20, 1992 and had accumulated 1,550 hours since its last overhaul.

The right engine, Teledyne Continental IO-520-CB, serial number 172847-H, is a fuel injected, air cooled six cylinder engine rated at 285 horsepower at 2,700 rpm. The engine was overhauled on June 18, 1997 and had accumulated 206 hours since its last overhaul.

An electric door seal inflation system, STC SA4184WE, manufactured by Bob Field's Aerocessories was installed by the DOA on November 21, 1994 at an arm of 42 inches.

WRECKAGE AND IMPACT INFORMATION

The wreckage was orientated on a heading of 082 degrees on level terrain with approximately one foot tall grass and adjacent to a wooded area. A 95 foot by 16 foot ground scar bearing 220 degrees from the wooded area preceded the aircraft. A broken path of trees at an inclination of 20 degrees through the wooded area was noted. Charring of the vegetation along the ground scar and on a leafless tree located 40 feet from the beginning of ground scar was evident. The aircraft's left wing was found in the wooded area and was separated outboard of the left engine nacelle. The smell of fuel was present in an area around the wing section. Both engines were separated from the airframe and along the wreckage path. The left propeller was unearthed in loose soil and the right propeller was attached to the right engine.

Inspection of the nose section did not find heat stress or combustion residue on the radar unit and items which were reported to have been stored in the nose. Examination of the heater found no heat stress to be present on the fuel line and electrical wiring leading to the heater. There was a light blue colored fluid in the heater's fuel line up to the heater solenoid. The heater's combustion chamber wall did not have any punctures or fractures. The area between the combustion chamber wall and heater's outer wall did not have any soot similar to the soot observed on the cockpit avionics and interior windshield.

A resistor, similar in size, shape and color to two of the resistors in the Bob Field's Aerocessories door seal system, was found attached to the right cabin side wall above, by one nut, approximately 3 inches aft of a panel separating the aircraft's nose and cabin sections. The pump motor and other resistor was not found. Inspection of the area surrounding the resistor revealed that a black material attached to the interior side wall was absent in an area extending four inches aft of the resistor. There was bubbling of the black material and outside

paint approximately 2 inches above the resistor. The attached resistor was removed and upon examination, a portion of the black material similar to the material on the side wall was also present on the bottom of the resistor.

The cockpit carpeting which surrounded the pilot's and copilot's rudder pedals and extended to the crew seating exhibited black areas predominantly around the right side of the copilot's rudder pedals and right side wall carpeting. Wood that underlies the carpeting did not have any evidence of burn through.

The cockpit avionics were found separated from the main wreckage and were noted to have soot on their exterior with colored insulation present on their respective external wiring located at the backs of the units. Internal inspection of each of the units found no melting or burning, but soot streaking in a diagonal direction along the circuit boards was noted. A storm scope, which was reported by the DOA to have been installed in an area between the pilot's control column and the throttle quadrant, had less soot relative to the avionics stack which was located on the right side of the Baron's instrument panel.

Pieces of the aircraft's front right side windshield and the pilot's side storm window were retrieved near the beginning of the ground scar and away from the main wreckage. The interior of the pilot's storm window exhibited less soot than the interior right side of the front windshield. The edges of the broken windshield pieces did not have any soot.

A flap selector handle with its respective bracket was found in the main wreckage and separated from its mounting location. The selector was in the retracted position. The gear selector and the cockpit engine controls were destroyed.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was conducted by Monroe County, Wisconsin on September 17, 1998, at 0800.

Toxicological tests were negative for all substances tested.

FIRE

VOK fire fighters sprayed the wreckage area with an aqueous fire fighting foam in a 20 gallon to 400 gallon water mix.

TEST AND RESEARCH

Examination of the aircraft engines revealed no anomalies that would preclude operation.

A second electric door seal inflation pump system, manufactured by Bob Fields Aerocessories, was installed on another Beech Baron 58, N17979, operated by the DOA. The system was located under the right side of the aircraft's instrument panel and forward of the copilot's door.

The system's resistors and pump motor were mounted on top of the aircraft's insulation which was covered by a white liner. The area that was underlying the pump motor had black lines, similar in color and dimension to the fins on the side of the pump motor housing, present on the liner. Examination of a hole in the white liner, which was underlying the pump motor's resistors, revealed charring around the edges of the hole.

The pump motor system was bench tested with a 5-amp supply of power. After approximately 45 minutes of continuous operation, the pump motor temperature was measured to be about 220 degrees Fahrenheit (F) with a resistor temperature of approximately 750 degree F. The pump motor ceased to operate at approximately 51 minutes at which point the pump motor temperature was about 200 degrees F and the resistor temperature was about 760 degrees F.

The Bob Field's Aerocessories Installation Instructions states, "...Read all general notes on the F.A.A. approved engineering drawings". A review of the engineering drawings shows note 5, for the resistor assembly, to state, "mount to metal structure for heat sink".

Based upon a transponder code of 3211, radar data indicated that N4574Q's msl altitude at the following times was:

Time (cdt)	Altitude (feet)	0739:43	8,100	
0739:53	8,100	0740:13	7,600	0740:23	7,300
0740:39	6,800	0740:50	6,500	0741:02	6,300
0741:14	6,000	0741:25	5,800	0741:37	5,400
0741:49	5,100	0742:00	4,900	0742:24	4,400
0742:35	4,100	0742:47	3,800	0743:14	3,000

The transponder, communications and navigation equipment were connected to the aircraft's electrical system.

GPS memory was downloaded by Trimble under the supervision of the FAA and found to contain a 0.00 Easting, a 0.00 Northing and a 0.00 Up/Down velocity at a position of latitude 44 0.017 N longitude 90 25.991 W on Wednesday, September 16, 1998 at 0743:56. The second closest airport in the database is VOK, located 119 degrees at 8.24 nmi.

The Beech 58 Pilot's operating manual, under Section III, Emergency Procedures, states, under ELECTRICAL SMOKE OR FIRE, that the Battery and Alternator Switches are to be selected in the OFF position. Also, the operating manual indicates the emergency descent procedure stipulates the landing gear to be DOWN and the flaps be at APPROACH (15 degrees).

A Beech 58 flight training simulator was used with a State of Wisconsin Party Representative to the investigation, acting as pilot-in-command, who executed the emergency descent procedure in the Beech 58 Pilot's Operating Handbook. The emergency procedure states the landing gear to be down and the flaps to be at 15 degrees. An emergency descent from an altitude of 8,000 feet msl was performed in the simulator and a descent rate of approximately

6,200 feet per minute was obtained. A simulated off airport landing was completed in approximately 02:15 minutes. ADDITIONAL INFORMATION

DOA pilot's do not receive Beech 58 simulator training on an initial nor recurring basis.

An Aircraft Discrepancies Log, retrieved from the accident site, contained a discrepancy for "door seal leakage". The corrective action that was taken on August 24, 1998 states, "replaced 2 bad door coil hoses ops check good". A second discrepancy was logged for a, "door ajar light comes on in flight when we blew door seal up". Corrective action was taken on September 9, 1998 by the adjustment of a switch.

A search of Service Difficulty Reports for a period beginning 1990 for Beech 58 aircraft indicated four occurrences of smoke from the door seal pump. A National Transportation Safety Board (NTSB) Recommendation, A-98-109 through -110 was issued on September 14, 1998, which recommended to the FAA:

"Issue an airworthiness directive to require that all owner and operators of airplanes equipped with electric door seal inflation pump systems manufactured by Bob Field's Aerocessories immediately disconnect them from the airplanes' electrical systems..."

"Review all supplemental type certificates that provide for the installation of electric door seal inflation pump systems manufactured by Bob Fields Aerocessories, and require revisions, as necessary, to ensure that the hazards associated with in-flight fire and/or smoke in the cockpit during flight are eliminated..."

AD 98-21-21effective October 30, 1998 was issued by the FAA for the deactivating or the removing of all provisions of the Bob Fields Aerocessories inflatable door seals installation.

The State of Wisconsin's Aviation Organization is comprised of the DNR, the DOA and the Department of Transportation (DOT). The DNR operates 16 aircraft, 3 of which are operated as Public Use with the remainder being operated under 14 CFR Part 91. The DOA operates 7 aircraft, 4 of which are operated under 14 CFR Part 91 and 3 are operated under 14 CFR Part 135. The DOT operates 7 aircraft of which 4 are operated as public use. The total flight hours flown by the three departments as of October 26, 1998 for the previous year was 7,253 hours.

The FAA, State of Wisconsin, and Raytheon Aircraft were parties to the investigation.

The aircraft wreckage was released to the State of Wisconsin on October 26, 1998.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	52,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Helicopter; Instrument airplane; Instrument helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	July 7, 1998
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	14800 hours (Total, all aircraft), 1200 hours (Total, this make and model), 95 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N4574Q
Model/Series:	58 58	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	TH-374
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	July 2, 1998 Continuous airworthiness	**Certified Max Gross Wt.:**	5424 lbs
Time Since Last Inspection:	32 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	7735 Hrs	**Engine Manufacturer:**	Continental
ELT:	Installed	**Engine Model/Series:**	IO-520-CB
Registered Owner:	STATE OF WISCONSIN	**Rated Power:**	285 Horsepower
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	VOK ,910 ft msl	**Distance from Accident Site:**	13 Nautical Miles
Observation Time:	07:55 Local	**Direction from Accident Site:**	295°
Lowest Cloud Condition:	Scattered / 8000 ft AGL	**Visibility**	7 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	150°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	14°C / 13°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	MADISON , WI (MSN)	**Type of Flight Plan Filed:**	IFR
Destination:	SIREN , WI (RZN)	**Type of Clearance:**	
Departure Time:	06:53 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	VOLK FIELD VOK	**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	
Runway Length/Width:		**VFR Approach/Landing:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	2 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	Unknown
Total Injuries:	3 Fatal	**Latitude, Longitude:**	43.980991,-90.50077(est)

Administrative Information

Investigator In Charge (IIC):	Gallo, Mitchell
Additional Participating Persons:	EDWARD STACONIS; MILWAUKEE , WI JOHN M DORCEY; MADISON , WI HAROLD R BARRENTINE; WICHITA , KS
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