



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

Location:	Fargo, North Dakota	Accident Number:	CEN16LA098
Date & Time:	January 8, 2016, 09:00 Local	Registration:	N779CC
Aircraft:	Cessna 441	Aircraft Damage:	Substantial
Defining Event:	Hard landing	Injuries:	1 None
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The airline transport pilot reported that the accident flight was the airplane's first flight after a phase maintenance check, and that he was repositioning the airplane to an airport about 40 nautical miles away. While en route, the airplane experienced a series of avionics and fuel-related anomalies. The pilot eventually declared an emergency and was cleared to land at the destination airport. The first approach for landing in instrument meteorological conditions resulted in a missed approach. The pilot reported that, about this time, the airframe was accumulating ice and he cycled the deice boots.

During the second approach, the airplane broke out of the clouds, and the pilot proceeded to land. The pilot reported that, before he initiated the landing flare, he reduced engine power to idle, fully extended the flaps, and flared the airplane. He stated the airplane was shaking and shuddering, but no stall warning horn sounded, and then the "bottom fell out." The airplane landed hard, and the left engine's propeller blades struck the runway. The airplane incurred wing spar and propeller damage.

A postflight examination of the airplane revealed between ½ to 1 inch of rime ice on the leading edge surfaces of both wings, the horizontal stabilizer, and the vertical stabilizer. The pilot's operating handbook for the airplane stated that the deicing boots should be cycled as necessary when ice accumulation reached between ¼ and ½ inch. The amount of ice on the wing and empennage surfaces after the accident was consistent with the pilot not cycling the deice boots as prescribed, which resulted in an excessive ice accumulation on approach and a subsequent aerodynamic stall during the landing flare.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's failure to cycle the surface deice boots during the instrument approach in icing conditions, which led to ice accumulation on the leading edges of the wings and empennage, and resulted in an aerodynamic stall and subsequent hard landing.

Findings

Personnel issues	Incorrect action performance - Pilot
Aircraft	Airfoil anti-ice, deice - Not used/operated
Aircraft	Angle of attack - Capability exceeded
Environmental issues	Drizzle/mist - Contributed to outcome

Factual Information

History of Flight

Approach	Structural icing
Landing-flare/touchdown	Aerodynamic stall/spin
Landing-flare/touchdown	Hard landing (Defining event)

On January 8, 2016, about 0900 central standard time, a Cessna 441, N779CC, sustained substantial damage during a hard landing at the Hector International Airport (FAR), Fargo, North Dakota. The airline transport rated pilot, the sole occupant, was not injured. The airplane was owned and operated by Northern Meridian LLC under the provisions of the 14 Code of Federal Regulations Part 91 as a positioning flight. Instrument meteorological conditions prevailed and an instrument flight rules flight plan was filed. The flight departed from the Detroit Lakes Airport (DTL), Detroit Lakes, Minnesota, about 0830 and was destined for FAR.

The pilot reported that this was the first flight after a phase maintenance check and he was positioning the airplane to FAR which was about 40 nm from DTL. After departure, he climbed to 4,000 ft above mean sea level (msl) and engaged the autopilot in preparation for landing at FAR. He stated that he heard a "thumping" in the left rudder pedal and noted a 20-degree angle of bank to the left on the attitude indicator. He disengaged the autopilot, rolled wings level, and started to troubleshoot the problem. Then the left fuel pressure low light illuminated. Thinking it was an indication problem, he switched to the left AUX pump and then back to the main pump, and the light went out.

The air traffic controller (ATC) cleared the flight to descend to 2,800 ft msl, but the pilot requested a climb to 5,000 ft msl to get out of icing conditions and "sort out the problems." During the climb, the pilot noticed a discontinuity message between the headings on the Avidyne Entegra flight displays. Once at 5,000 ft msl, the pilot engaged the autopilot and the airplane made a 180-degree turn to the right. The pilot disengaged the autopilot again and turned back towards FAR. The left fuel pressure low light and the left X-FER pump fail light illuminated. The pilot declared an emergency and ATC cleared the flight to descend to 2,800 ft msl and provided vectors for the ILS Runway 36 approach to FAR. The pilot stated that as the airplane was descending through 4,000 ft msl, the left engine started to surge. The pilot reported that the engine never failed during the flight, but he thought an engine failure was imminent.

The pilot programmed his flight instruments for the approach and activated the vectors to final, but the discontinuity message light illuminated again. He flew through the localizer of the ILS Runway 36 approach, and he subsequently requested ATC to fly the RNAV (GPS) 32 approach instead. The pilot reported that about this time the airplane was picking up ice accumulation and he cycled the deice boots. The ATC controller vectored the airplane back to the southeast for the RNAV (GPS) 32 approach.

The airplane intercepted the final approach course for the RNAV (GPS) 32 approach and was cleared by ATC for the approach. The airplane broke out of the clouds about 600 - 700 ft above ground level (agl)

at 120 kts and less than a mile from the runway, and the pilot lowered the landing gear. The pilot reported that before he started the flare, he closed the throttle, selected the last notch of flaps, and flared at 110 kts. He stated there was shaking and shuddering, but no stall warning horn, and then the "bottom fell out." The airplane landed hard and the left propeller blades struck the runway. While taxiing to the ramp, the pilot noted that it was necessary to forcefully kick in the right rudder pedal to turn right.

The pilot conducted a post-accident examination of the airplane stated that there was about 1/2 to 1-inch of rime ice accumulated on the leading edge surfaces of both wings. Photographs of the airplane on the ramp after the accident indicated that there was ice accumulated on the leading edge surfaces of the horizontal stabilizer and vertical stabilizer as well. The examination of the airplane revealed there was substantial damage to the wing spar and damage to the left propeller blades from the propeller strike. The stall warning horn was tested on the ground and it operated.

The pilot stated that he normally enters the flare at 95 kts between 5 – 10 ft agl, and he just holds the nose off, and the airplane typically floats onto the runway.

The Cessna 441 Pilot Operating Handbook (POH) states that the stall speed for the airplane in the landing configuration at 9,360 lbs is 74 kts indicated airspeed.

The Cessna 441 POH states that the following about the airplane's deice boot system:

"The deice boot system consists of pneumatic air operated boots, an annunciator light to monitor system operation and necessary hardware to complete the system.

The deice boots are attached to the leading edges of the wings and horizontal and vertical stabilizers. The boots expand and contract, using pressure and vacuum generated by engine bleed air. Normally, vacuum is applied to all of the boots to hold them against the leading edge surfaces. When a deice boot is cycle is initiated, the vacuum is removed and bleed air pressure is applied to inflate the boots. The change in contour will break ice accumulation on the leading edges. Ice formation aft of this area will then be removed by normal in-flight air forces. A normal boot inflation sequence is 6 seconds for empennage boots followed by 6 seconds for the wing boots. The system should be cycled when ice accumulates to between 1/4 to 1/2 inch.

The deice boot are inflated each time that the deice boot switch is activated. The RESET position is used to stop the cycle, should it ever become necessary. A light on the annunciator panel, marked SURFACE DEICE, will illuminate when the tail boots become inflated to a pressure of 11 PSI or more, extinguishes momentarily and illuminates again when the wing boots inflate. If less than 11 PSI is available, the light will not illuminate, indicating that icing conditions should be avoided. Prior to flight in icing conditions, operation of the boots should be functionally checked on the ground or in flight with the OAT above -40 degrees Celsius."

The Cessna 441 POH states that the following about the Surface Deice Boots Switch:

"Surface Deice Boots Switch – ON when ice accumulates between 1/4 to 1/2 inch. Repeat as necessary. Do not actuate prematurely. Monitor the SURFACE DEICE annunciator to assure proper system operation."

The POH added this NOTE:

"Prestall buffet and stall speeds can increase when deice boots are actuated."

At 0853, the surface weather observation at FAR was: wind 340 degrees at 19 kts, 5 miles visibility, mist, overcast at 700 ft, temperature -7 degrees C, dew point -9 degrees C, altimeter 29.98 inches of mercury.

Pilot Information

Certificate:	Airline transport; Commercial	Age:	54, Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	4-point
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 1 With waivers/limitations	Last FAA Medical Exam:	September 28, 2015
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	August 7, 2014
Flight Time:	2274 hours (Total, all aircraft), 82 hours (Total, this make and model), 65 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N779CC
Model/Series:	441	Aircraft Category:	Airplane
Year of Manufacture:	1980	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	4410155
Landing Gear Type:	Retractable - Tricycle	Seats:	9
Date/Type of Last Inspection:	December 6, 2015 AAIP	Certified Max Gross Wt.:	9850 lbs
Time Since Last Inspection:		Engines:	2 Turbo prop
Airframe Total Time:	6226 Hrs as of last inspection	Engine Manufacturer:	HONEYWELL
ELT:	C126 installed	Engine Model/Series:	TPE 331-10N
Registered Owner:	On file	Rated Power:	1000 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Day
Observation Facility, Elevation:	FAR,901 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	08:53 Local	Direction from Accident Site:	0°
Lowest Cloud Condition:	Clear	Visibility	5 miles
Lowest Ceiling:	Overcast / 7000 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	19 knots / None	Turbulence Type Forecast/Actual:	/
Wind Direction:	340°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.97 inches Hg	Temperature/Dew Point:	-7°C / -9°C
Precipitation and Obscuration:	Moderate - None - Mist		
Departure Point:	Detroit Lakes, MN (DTL)	Type of Flight Plan Filed:	IFR
Destination:	Fargo, ND (FAR)	Type of Clearance:	IFR
Departure Time:	08:30 Local	Type of Airspace:	

Airport Information

Airport:	Hector International Airport FAR	Runway Surface Type:	Concrete
Airport Elevation:	901 ft msl	Runway Surface Condition:	Dry
Runway Used:	36	IFR Approach:	Global positioning system
Runway Length/Width:	9001 ft / 150 ft	VFR Approach/Landing:	Full stop

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 None	Latitude, Longitude:	46.920555,-96.815834(est)

Administrative Information

Investigator In Charge (IIC):	Silliman, James
Additional Participating Persons:	Gary Kwasniewski; FAA Fargo FSDO; Fargo, ND
Original Publish Date:	January 18, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=92691

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The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).