Aviation Investigation Final Report

Location:	Ruthton, Minnesota	**Accident Number:**	CEN16LA326
Date & Time:	August 19, 2016, 08:07 Local	**Registration:**	N40499
Aircraft:	THRUSH AIRCRAFT INC S2R T660	**Aircraft Damage:**	Destroyed
Defining Event:	Low altitude operation/event	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 137: Agricultural		

Analysis

The commercial pilot was conducting an agricultural spraying flight in the airplane. GPS data recovered from a Satloc system on board the airplane indicated that the pilot made 16 north-south spray passes over the accident field. Three northbound passes went directly over an approximate 200-ft-tall tower located near the southwest corner of the field before the airplane descended into the field for spray runs. Following the north-south passes, the pilot completed a perimeter pass along the north border of the field on a westerly heading and entered a left turn. Due to buffering of the data by the Satloc unit, the final portion of the recorded track did not extend to the accident site; however, the final portion of the track was consistent with the pilot setting up for a perimeter pass along the south border of the field on an easterly heading; the last recorded location of the airplane was about 0.7 mile from the tower.

Examination of the accident site revealed that the airplane struck a guy-wire of the tower near the southwest corner of the field and came to rest about 600 ft east of the tower. A section of the guy-wire was wrapped around the right wing of the airplane. No evidence of any preimpact mechanical anomalies that would have precluded normal operation of the airplane was found.

The evidence is consistent with the pilot failing to see and avoid the tower guy-wire during the final spray pass. The pilot was aware of the tower and its location as evidenced by previous passes that were made over the tower before descending into the field. At the time of the accident, the sun was 16.3° above the horizon and 88.1° east of north; the GPS data indicate that the airplane would have been heading toward the sun on the final spray pass; however, there was an overcast layer that would have mitigated the effects of the sun on the pilot's visual capability.

Probable Cause and Findings

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

The pilot's failure to see and avoid the tower guy-wire during an agricultural spraying operation.

Findings

Personnel issues	Incorrect action selection - Pilot
Personnel issues	Monitoring environment - Pilot
Environmental issues	Tower/antenna (incl guy wires) - Response/compensation
Aircraft	Altitude - Not attained/maintained

Factual Information

History of Flight

Maneuvering-low-alt flying	Collision with terr/obj (non-CFIT)
Maneuvering-low-alt flying	Low altitude operation/event (Defining event)

On August 19, 2016, at 0807 central daylight time, a Thrush S2R-T660 agricultural airplane, N40499, was destroyed when it impacted a tower guy-wire and the ground during aerial spraying operations near Ruthton, Minnesota. The commercial pilot was fatally injured. The airplane was registered to Arnt Aerial Spraying, Inc., and it was operated by the company under the provisions of Title 14 *Code of Federal Regulations* (*CFR*) Part 137 as an aerial application flight. Visual meteorological conditions prevailed for the flight, and a flight plan was not filed. The local flight originated from Worthington Municipal Airport (OTG), Worthington, Minnesota, at 0651.

A Satloc agricultural aerial guidance system that included a GPS receiver was installed on the airplane. Review of the downloaded flight track data from the Satloc system showed that the airplane departed OTG, flew about 50 miles to the northwest, and sprayed a field about 1.5 miles west of the accident site. At 0749, the airplane flew from the first field to the field where the accident occurred. The airplane made 16 spray passes over that field in a north-south direction using a race-track type pattern. Several of those passes were near a tower located near the southwest corner of the field. During three of the passes to the north, the airplane passed over the tower before descending into the field. After the 16th pass, which was conducted on a northerly heading, the airplane made a 270° right turn to a westerly heading for a perimeter spray pass along the northern border of the field. After completing the perimeter pass, the airplane began a left turn. The final data point was recorded at 0807:48 and showed the airplane located about 0.75 mile and 300° from the accident site. The tower that was struck was located about 600 ft. west of the accident site. The final recorded location and flight path were consistent with a turn for a perimeter pass along the south border of the field.

The manufacturer reported that the Satloc unit buffered data before saving the data to non-volatile memory and that the amount of buffered data depends on the update rate and the available memory.

Pilot Information

Certificate:	Commercial	**Age:**	68,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Single
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	April 26, 2016
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 8, 2015
Flight Time:	16791 hours (Total, all aircraft)		

The pilot, age 68, held a commercial pilot certificate with airplane single- and multi-engine land, and instrument airplane ratings. He also held a flight instructor certificate with an airplane single-engine rating. His most recent Federal Aviation Administration (FAA) second-class medical certificate was issued on April 26, 2016, with a limitation to wear corrective lenses when exercising the privileges of his airman certificate.

The pilot's logbook was reviewed; he did not record each individual flight, and no entries for 2016 were recorded. The most recent logbook entry had a note "2015 spray season" and listed 16,791 hours total flight experience. This was the same flight experience that the pilot reported at the time of his most recent medical examination. Records indicated that the pilot's most recent flight review was conducted on April 8, 2015.

Aircraft and Owner/Operator Information

Aircraft Make:	THRUSH AIRCRAFT INC	**Registration:**	N40499
Model/Series:	S2R T660 T660	**Aircraft Category:**	Airplane
Year of Manufacture:	2005	**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	T660-113
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:	April 12, 2016 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	Turbo prop
Airframe Total Time:	4042 Hrs as of last inspection	**Engine Manufacturer:**	Pratt & Whitney
ELT:		**Engine Model/Series:**	PT6A-65AG
Registered Owner:	ARNT AERIAL SPRAYING INC	**Rated Power:**	1300 Horsepower
Operator:	ARNT AERIAL APPLICATION	**Operating Certificate(s) Held:**	Agricultural aircraft (137)
Operator Does Business As:		**Operator Designator Code:**	PUJG

The 2005-model-year airplane, serial number T660-113, had fixed conventional (tailwheel) landing gear, provisions for one occupant, and was intended for use as an agricultural spray platform. It was powered by a 1,220-horsepower Pratt & Whitney PT6A-65AG turboprop engine, serial number PCE32627, driving a 5-blade, constant-speed Hartzell HC-B5MP-3F propeller, serial number EVA2873.

The airplane maintenance records indicated that the most recent annual inspection was completed on April 12, 2016, at an airframe total time of 4,042 hours.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PQN,1736 ft msl	**Distance from Accident Site:**	16 Nautical Miles
Observation Time:	13:01 Local	**Direction from Accident Site:**	215°
Lowest Cloud Condition:	Scattered / 2400 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 3400 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	2 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.94 inches Hg	**Temperature/Dew Point:**	19°C / 18°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Worthington, MN (OTG)	**Type of Flight Plan Filed:**	None
Destination:	Worthington, MN (OTG)	**Type of Clearance:**	None
Departure Time:	06:51 Local	**Type of Airspace:**	Class G

At 0901, the weather conditions recorded at Pipestone Municipal Airport, Pipestone, Minnesota, located about 16 miles southwest of the accident site, included wind from 290° at 2 knots, visibility 10 miles, scattered clouds at 2,400 ft above ground level (agl), overcast clouds at 3,400 ft agl, temperature 19°C, dew point 18°C, and an altimeter setting of 29.69 inches of mercury.

According to data from the U.S. Naval Observatory's Astronomical Applications Department, at 0810, the sun was 16.3° above the horizon and 88.1° east of north.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	44.217224,-96.077224

The airplane came to rest facing east in a nose-down attitude about 600 ft east of a tower that was estimated to be about 200 ft tall. The tail section of the airplane was completely separated and was located near the main wreckage. The flight control cables within the tail section had separated, and the breaks were consistent with overload failures. The wings remained attached to the fuselage. The left aileron remained attached to the left wing. The right aileron was separated from the wing and was located near the main wreckage. A portion of a tower guy-wire cable was found wrapped around the right wing. The cable portion started about 3 ft from the wing root and extended along the wing's bottom surface to about 7 ft from the wing root where it wrapped around the wing leading edge. The cable loosely wrapped back over the wing trailing edge and under the fuselage. An 8-ft section of the tower, with guy-wire cables still attached, was found about 30 to 40 ft east of the airplane.

The propeller assembly separated and was located about 400 ft and 120° from the main wreckage. Four propeller blades remained attached to the propeller hub, and one blade had separated. The separated blade was found about 370 ft and 310° from the main wreckage about 6 weeks after the accident by the farmer during crop harvesting. Several of the blades that remained attached to the hub exhibited leading edge scratching and scoring consistent with impact with a foreign object during rotation. The separated blade recovered by the farmer was damaged by farm equipment during crop harvesting.

Examination of the airplane did not reveal any anomalies that could be attributed to a preimpact mechanical deficiency.

Medical and Pathological Information

The pilot had reported a history of hypertension to the FAA and on his last medical certificate application reported using a combination of amlodipine and benazepril for treatment. Both of these blood pressure medications are not considered impairing. No significant abnormalities were identified during his physical exam.

The Ramsey County Medical Examiner, Saint Paul, Minnesota, performed an autopsy of the pilot. The pilot's death was attributed to multiple traumatic injuries.

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicology testing that was negative for all tested-for substances. The lab was unable to test for any evidence of exposure to the pesticide agents being sprayed by the pilot at the time of the crash, which were lambda cyhalothrin and chloryrifos.

Tests and Research

The tower location did not appear in the FAA Digital Obstacle File, nor was it depicted on the Omaha Sectional Aeronautical Chart that included the accident site location. The tower location was within the bounds of a windmill farm depicted on the Omaha Sectional Chart. The windmill farm was listed as

having a top elevation of 2,380 ft above mean sea level (msl); the ground elevation at the accident site was about 1,900 ft msl.

Title 14 *CFR* Part 77, titled "Safe, Efficient Use, and Preservation of the Navigable Airspace," specifies the following information.

- The requirements to provide notice to the FAA of certain proposed construction or the alteration of existing structures.
- The standards used to determine obstructions to air navigation and navigational and communication facilities,
- The process for aeronautical studies of obstructions to air navigation or navigational facilities to determine the effect on the safe and efficient use of navigable airspace, air navigation facilities, or equipment.
- The process to petition the FAA for discretionary review of determinations, revisions, and extensions of determinations.

Title 14 *CFR* 77.9, "Construction or alteration requiring notice," states that any construction or alteration of a structure that is more than 200 ft agl requires notification of the FAA.

Title 14 *CFR* 77.17, "Obstruction Standards," stipulates the standards used to determine if an object is an obstruction to air navigation. The criteria used for determination includes a height of more than 499 ft agl in general or a height of 200 ft agl or more if within 3 miles of an airport.

The accident tower height was estimated to be about 200 ft agl, but the exact height was not determined during the investigation. There were no airports within 3 miles of the accident site.

Administrative Information

Investigator In Charge (IIC):	Brannen, John
Additional Participating Persons:	David Nelson; FAA - MSP FSDO; Minneapolis, MN
Original Publish Date:	November 13, 2018
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=93857