# Aviation Investigation Final Report

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| **Location:** | Bronson, Michigan | **Accident Number:** | CEN18FA339 |
| **Date & Time:** | August 18, 2018, 17:27 Local | **Registration:** | N502RL |
| **Aircraft:** | Air Tractor AT502 | **Aircraft Damage:** | Destroyed |
| **Defining Event:** | Aerodynamic stall/spin | **Injuries:** | 1 Fatal |
| **Flight Conducted Under:** | Part 137: Agricultural | | |

## Analysis

The pilot was conducting an agricultural application flight in the turboprop-equipped airplane. Data from an onboard GPS unit showed that the airplane had completed 10 spray passes on a field, making right 180° turns after each pass to align the airplane for the subsequent pass. The airplane would climb between 500-700 ft during the first 90° of the turn, then descend during the second 90° of the turn. The airplane's groundspeed decayed to between 37 kts and 63 kts during the previous turns; however, the data did not capture the accident turn. A witness stated that he saw the airplane complete a spray pass, pull up into a near-vertical attitude, then become inverted. The airplane descended straight down and was starting to pull up when it hit the ground.

The airplane impacted terrain in a wings-level, nose-low attitude. No preimpact anomalies of the airframe, engine, or propeller were found. Based on the available evidence, it is likely that the pilot failed to maintain sufficient airspeed during a turn following a spray pass, which resulted in exceedance of the airplane's critical angle of attack, an aerodynamic stall, and loss of airplane control at an altitude too low for recovery.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain airspeed while maneuvering, which resulted in exceedance of the airplane's critical angle of attack, an aerodynamic stall, and loss of control at an altitude too low for recovery.

## Findings

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| **Aircraft** | Airspeed - Not attained/maintained |
| **Aircraft** | Angle of attack - Capability exceeded |
| **Aircraft** | (general) - Not attained/maintained |
| **Personnel issues** | Aircraft control - Pilot |

# Factual Information

## History of Flight

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| **Maneuvering-low-alt flying** | Aerodynamic stall/spin (Defining event) |
| **Maneuvering-low-alt flying** | Collision with terr/obj (non-CFIT) |

On August 18, 2018, about 1727 eastern daylight time, an Air Tractor AT-502B airplane, N502RL, was destroyed when it was involved in an accident near Bronson, Michigan. The pilot was fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 137 aerial application flight.

The airplane was equipped with an AgNav Guia Platinum P771 agricultural GPS unit. Data for the accident flight indicated that the pilot completed 10 spray passes in an east/west direction over the field, conducting a right turn after each pass. Each 180° turn comprised a climb through the first 90° with about 500-700 ft of altitude gain, followed by a descent through the second 90° turn to align the airplane for the subsequent pass. The airplane's groundspeed during spray passes was between 130 and 135 knots (kts). During the turning maneuvers, the groundspeed would decrease as the airplane reached its peak altitude for each turn. The lowest groundspeed reached during each turn varied between 37 and 63 kts. The final data point at 1727:11 was about 0.1 nautical mile and 320° from the accident site as the airplane was climbing after completing a pass.

A witness stated that the airplane was making turns near his location in conjunction with spraying operations in a nearby field. The witness stated that he saw the airplane complete a spray pass to the east then pull up into a near-vertical attitude, after which the airplane became inverted. The airplane then descended straight down and was starting to pull up when it hit the ground.

## Pilot Information

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| **Certificate:** | Commercial | **Age:** | 26,Male |
| **Airplane Rating(s):** | Single-engine land | **Seat Occupied:** | Single |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | 5-point |
| **Instrument Rating(s):** | None | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | Yes |
| **Medical Certification:** | Class 1 Without waivers/limitations | **Last FAA Medical Exam:** | June 5, 2018 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | |
| **Flight Time:** | 1870 hours (Total, all aircraft), 280 hours (Total, this make and model) | | |

The pilot's flight logbook was not available for review during the investigation. The operator reported that the pilot had 880 hours of flight experience in agricultural operations.

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | Air Tractor | **Registration:** | N502RL |
| **Model/Series:** | AT502 B | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | 2012 | **Amateur Built:** | |
| **Airworthiness Certificate:** | Restricted (Special) | **Serial Number:** | 502B-2823 |
| **Landing Gear Type:** | Tailwheel | **Seats:** | 1 |
| **Date/Type of Last Inspection:** | May 5, 2018 100 hour | **Certified Max Gross Wt.:** | |
| **Time Since Last Inspection:** | 310 Hrs | **Engines:** | 1 Turbo prop |
| **Airframe Total Time:** | 2200 Hrs at time of accident | **Engine Manufacturer:** | Pratt & Whitney Canada |
| **ELT:** | | **Engine Model/Series:** | PT6A-34AG |
| **Registered Owner:** | | **Rated Power:** | 750 Horsepower |
| **Operator:** | | **Operating Certificate(s) Held:** | Agricultural aircraft (137) |
| **Operator Does Business As:** | | **Operator Designator Code:** | NIXG |

The airplane flight manual listed stall speeds for various bank angles, flap positions, and airplane weights. The lowest listed stall speed was 58 kts, with 0° bank and wing flaps extended at 5,600 lbs gross weight. The stall speed increased with bank angle, retracted flaps, and higher weights.

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | IRS,925 ft msl | **Distance from Accident Site:** | 14 Nautical Miles |
| **Observation Time:** | 21:35 Local | **Direction from Accident Site:** | 263° |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 3 knots / | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | 330° | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 29.95 inches Hg | **Temperature/Dew Point:** | 28°C / 17°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Shipshewana, IN (IN65) | **Type of Flight Plan Filed:** | None |
| **Destination:** | Shipshewana, IN (IN65) | **Type of Clearance:** | None |
| **Departure Time:** | | **Type of Airspace:** | Class G |

At 1735, the recorded weather conditions at Kirsch Municipal Airport (IRS), Sturgis, Michigan, about 14 nautical miles west of the accident site, included wind from 330° at 3 kts; 10 statute miles visibility; clear skies; temperature 28°C; dew point 17°C; altimeter setting 29.96 inches of mercury.

## Wreckage and Impact Information

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| **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:** | 41.843055,-85.119163 |

The airplane came to rest upright in a soybean field on a heading about 340°. All major components of the airplane were accounted for at the accident site. The forward fuselage and the leading edges of both wings exhibited aft and upward crushing indicative of a wings-level, nose-low impact with the ground. Both main landing gear were separated from the fuselage and found beneath the wreckage. The wing remained in one piece with the flaps and ailerons attached. The vertical stabilizer remained attached to the fuselage and the rudder was attached by the lower two hinges. The upper half of the rudder was bent left about 90°. The left and right horizontal stabilizers were partially separated from the fuselage at the spar attachments. The elevators remained attached to the stabilizers.

Continuity of the elevator control system was verified from the control stick in the cockpit aft to the

elevator control surfaces. The rudder control cables were intact from each of the rudder pedals in the cockpit aft to the rudder control surface. The mixing system for the drooping aileron system incurred impact damage and several of the control pushrods housed in the lower fuselage exhibited bending due to impact; however, no preimpact anomalies were observed. Measurement of the flap actuator corresponded to about 5° of flap extension.

The engine was broken in half at the "F" flange. The exposed broken shaft revealed fracture surfaces with 45° shear lips consistent with overload failure. One propeller blade was visible above the ground and remained attached to the hub. The remaining two blades were found buried beneath the engine. One of the buried blades remained attached to the hub, while the other was separated. The separated blade showed chordwise scratching and a deep gouge in the leading edge. A portion of the blade tip was separated.
Upon removal of the airplane from the site, a wing impact imprint was found in the soil beneath the wing about 2 ft aft of the wing leading edge.

## Medical and Pathological Information

An autopsy of the pilot was performed by the Spectrum Health Laboratory Services, Elsie, Michigan. The pilot's death was attributed to multiple blunt injuries.

Toxicology testing performed by the FAA's Forensic Sciences Laboratory was negative for all substances in the screening profile.

## Administrative Information

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| **Investigator In Charge (IIC):** | Brannen, John |
| **Additional Participating Persons:** | Mike Matthews; Grand Rapids FSDO; Grand Rapids, MI<br>Kyle Schroeder; AirTractor, Inc.; Olney, TX |
| **Original Publish Date:** | May 19, 2020 |
| **Note:** | The NTSB traveled to the scene of this accident. |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=98097 |