

National Transportation Safety Board

Office of Aviation Safety
Central Region



CEN24FA338

WRECKAGE EXAMINATION SUMMARY

ACCIDENT

Location: Camden, Colorado
Date: September 5, 2024
Time: 1014 mountain daylight time
Airplane: Air Tractor AT-602, Registration No. N602BA

PARTICIPANTS

Investigator-In-Charge	Andrew Todd Fox National Transportation Safety Board Denver, Colorado
Group Member	Roy H. Dandy Federal Aviation Administration - Denver FSDO Denver, Colorado
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Group Member	Kyle J. Schroeder Air Tractor Olney, Texas
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Group Member	Les Doud Hartzell Propeller Piqua, Ohio

ACCIDENT SYNOPSIS

On September 5, 2024, about 1014 mountain daylight time, an Air Tractor AT-602 airplane, N602BA, was substantially damaged when it was involved in an accident near Camden, Colorado. The pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* (CFR) Part 137 agricultural flight.

A witness to the accident reported seeing the airplane complete an initial A-B line, followed by the first spray pass (presumably to the east) of the sugar beet field. The airplane then made a turn toward the west and began its second spray pass along the northern edge of the sugar beet field on a west heading. The witness noted that the airplane appeared to pitch up to fly over a grouping of large cottonwood trees, when it rolled to the right and descended into the cornfield north of County Rd W.

WRECKAGE EXAMINATION TIMELINE

On September 6, 2024, the National Transportation Safety Board (NTSB) Investigator-in-Charge (IIC) traveled onsite to examine the wreckage. The NTSB IIC was assisted onsite by two FAA inspectors and two Air Tractor factory engineers. A Hartzell Propeller investigator assisted remotely via mobile phone. At the completion of the onsite examination, the wreckage was recovered by Beegles Aircraft, Greeley, Colorado, where it was stored securely until July 7, 2026, when the NTSB IIC released the airplane to a representative of the insurance company.

AIRPLANE DESCRIPTION

The airplane was a 2009 Air Tractor AT-602, serial number (s/n) 602-1173, registration number N602BA. A 1,050 shaft-horsepower Pratt & Whitney Canada PT6A-65AG engine, s/n PCE-PN0099 provided thrust through a five-blade, controllable pitch, full-feathering, reversing, Hartzell HC-B5MP-3F/M11276NS propeller, s/n EVA3027. The low-wing airplane was of conventional aluminum and welded steel-tube construction with a fixed conventional (tailwheel) landing gear and wing flaps. The airplane's basic empty weight and maximum takeoff weight were 6,004 lbs and 12,500 lbs, respectively. The airplane's useful load was 6,496 lbs.

On March 27, 2009, the FAA issued the airplane a Special Airworthiness Certificate in the restricted category for the purpose of agricultural and pest control and/or dispensing of firefighting materials.

MAINTENANCE SUMMARY

Recent Maintenance

The airplane maintenance records were provided by the operator during the onsite investigation. Based on a review of the available maintenance documentation, on May 7, 2024, an annual inspection was completed at 6,278.5 hours airframe total time (AFTT). The HOBBS meter indicated 6,278.5 hours at that time.

On June 18, 2024, a 100-hour inspection of the airplane, engine, and propeller completed at 6,454.0 hours AFTT.

The airplane's HOBBS hour meter was damaged during impact and, as such, the airplane's total airframe and engine times at the time of the accident could not be accurately determined. However, based on a notepad recovered from the cockpit that listed various engine parameters used for performance trend analysis, the HOBBS meter indicated 6,712.3 hours before the first flight on the day of the accident.

Recent Maintenance Discrepancies

A review of available maintenance documentation did not reveal any unresolved issues with the airplane.

WRECKAGE EXAMINATION (SEPTEMBER 6, 2024)

Accident Site Description

A survey of the field immediately south of County Rd W revealed that the airplane's outboard 3 ft of the right wing struck a power transformer that was mounted on a power pole. The pole was located at 40.320186° north latitude, 103.562870° west longitude. The elevation at the base of the power pole was 4,185 ft msl.

Based on the wreckage distribution, the airplane was flying west along the north edge of the field when the right wing struck the power transformer, as shown in figure 1. According to the power company, the power pole's first cross support was about 37 ft above ground level (agl) and the second cross support was 39 ft agl, as shown in figure 2. The power transformer exhibited evidence of impact-related damage, as shown in figure 3, consisting of dents, yellow paint chips, and yellow paint transfers.

After the airplane struck the power transformer, a wreckage debris path began from the power pole and continued west in the uncultivated portion of the field south of County Rd W. There were numerous yellow paint chips located directly underneath the power pole and scattered along wreckage debris path. Also found along the debris path were the right aileron counterbalance weight with mounting bracket, right wingtip, outboard half of the right aileron, and right-wing aileron cove skin. The right wingtip was found about 240 ft west-southwest of the power pole.

After the airplane struck the power transformer, it continued 1,232 ft to the west-northwest (282°) where it impacted inverted in a cornfield, as shown in figure 4. The airplane remained inverted and slid 116 ft to the west-northwest (290°). There was no evidence of a postimpact fire.

The main wreckage came to rest about 1,350 ft west-northwest of the power pole, as shown in figure 5. The airplane came to rest at 40.320997° north latitude, 103.567581° west longitude, at 4,188 ft msl.

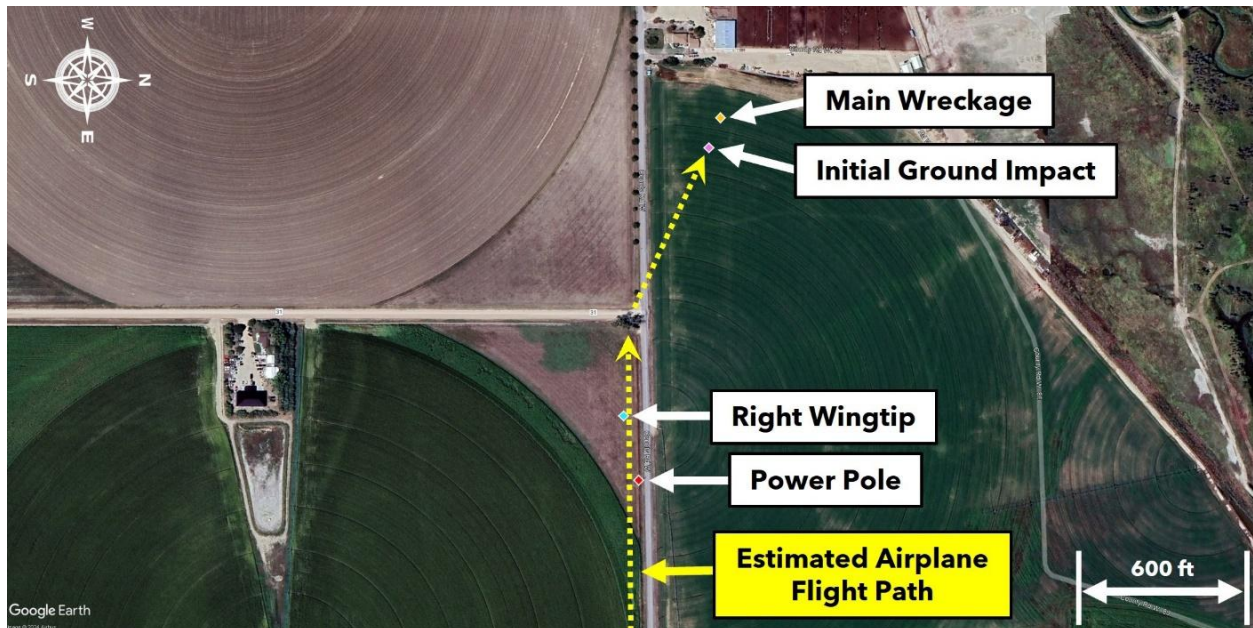


Figure 1 - Estimated airplane flight path and impact sequence.



Figure 2 - Location of power pole as seen facing west along County Rd W.

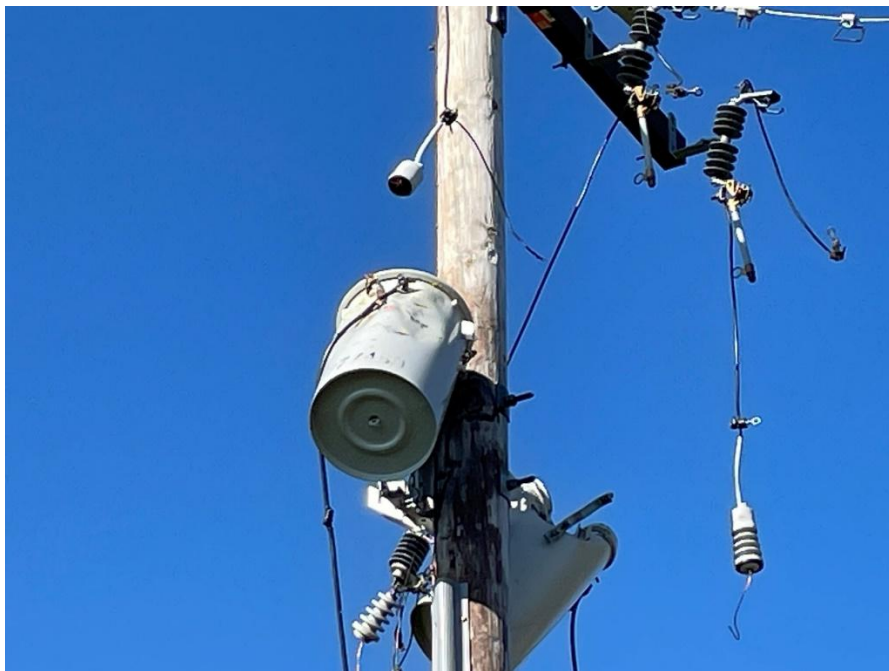


Figure 3 - Damaged power transformers.



Figure 4 - Overhead photo of the initial ground impact and main wreckage. (Photo courtesy of Morgan County Sheriff's Office)



Figure 5 - Main wreckage at the accident site.

Fuselage

The portion of the fuselage located aft of the cockpit did not exhibit significant damage. The fuselage between this and the wing spar connection was heavily damaged with broken fuselage frame tubes and significant crush damage. No significant damage or scoring was noted on the belly skins aft of the wings. The fuselage steps and the fuselage-mounted spray plumbing remained in place on the inverted belly of the aircraft.

Portions of the fiberglass hopper were found throughout the debris field. The agricultural gatebox and lower portions of the hopper were found about 60 ft northwest of the main fuselage wreckage. There was no significant impact damage to these components. The agricultural spray booms were heavily damaged and found with the main wreckage.

Firewall-forward components of the fuselage were heavily segmented and found throughout the debris field.

Cockpit, Crew Seat, Restraints, and Airbags

The aircraft was equipped with a 5-point pilot restraint system that included AmSafe inflatable (airbag) restraints in the shoulder harnesses. The restraints were found with the buckles fastened. The webbing and the airbag hoses were found cut in a manner consistent with extrication activities by the first responders. All attachment hardware was found installed. The airbags were deployed. There were multiple holes and damaged areas in the airbags and adjacent areas of the should harness webbing.

Occupiable space was not maintained in the cockpit. Components of the cockpit canopy, overturn structure, windshield, and doors were located near the beginning of the debris path, consistent with an inverted impact. The instrument panel was displaced aft toward the pilot with indications that it had contacted the pilot's head. The cockpit seat was found with the seatback bent aft an estimated 45°. In situ, the seatback was resting against the ground surface. The pilot's helmet separated during the impact and was located along the wreckage debris path.

Cockpit door components were found throughout the debris field. The cockpit door latches and emergency door release components were damaged to the point that their positions could not be determined. The preimpact position of powerplant control levers and trim controls could not be determined due to impact damage.

Landing Gear

The main gear springs remained attached to the carry-through fuselage structure which separated from the main fuselage during impact. These components were located about 36 ft past the main fuselage wreckage and about 160 ft from the initial ground impact.

These landing gear springs were equipped with aftermarket wire cutter assemblies on the leading edges of each spring. No dents or damage to the cutting edges of the wire cutters were noted. The axles, wheels, and tires remained installed on each gear spring. The brakes and brake hoses remained installed on the main gear with the lefthand remaining fully intact. The righthand brake hose and the rear caliper set of the righthand brakes remained installed. The forward caliper set on the righthand side had separated from wheel and was found nearby in the debris field. Other than the separated caliper, there was no evidence of significant impact on the main landing gear.

The tail landing gear remained attached to the aft fuselage with no discernable impact damage or impact signatures.

Wings

The wings remained in their normal location and orientation relative to the airframe which was found inverted.

As discussed previously, the right wingtip was in the debris field near the power pole, as shown in figure 6. The outboard 3 ft section of right aileron was in the debris field near the power pole, as shown in figure 7. The right aileron counterweight was in the debris field near the power pole. The inboard section of the aileron was located with the right wing and main wreckage. The right-wing flap remained in its proper location. The leading edge of the right wing had downwards and aft crush damage.

The left wing fiberglass wingtip was located immediately adjacent to the initial ground impact in the cornfield. The outboard 22 inches of aluminum let wing structure separated from the wing and was found adjacent to the left wing with the main wreckage. The wing flap and aileron remained attached the left wing supports. The leading edge of the left wing exhibited aft and downward crush damage.



Figure 6 - Right wingtip as found along the wreckage debris path.



Figure 7 - Outboard 3 ft of right aileron and the aileron trim surface.

Empennage

The horizontal stabilizers, elevators, and trim/boost tabs were remained connected and installed on the empennage although the righthand elevator trim tab was partially dislodged from its hinges and there was corresponding damage to the righthand side of the rudder surface.

The right horizontal stabilizer exhibited a large area of crush damage to the outboard 18 inches from an unidentified source.

The outboard end of the right elevator was deflected down by about 10° spanwise.

The left horizontal stabilizer exhibited nose up torsional damage, along with bending in the lefthand elevator.

The elevator balance weights and control horns were found in place. The V-struts remained in place and attached.

The vertical fin remained attached to the aft fuselage. The fin was bent to the left in two places. A bottom section of the rudder remained attached to the fin rear spar at the lower and middle hinges. The upper section of the rudder (from just above the middle hinge to the tip) separated from the fin and was located about 100 ft northwest of the main fuselage wreckage. The rudder trim tab remained attached to the rudder but was damaged.

Flight Controls

All primary (elevators, ailerons, and rudder) flight control surfaces with their respective trim tabs and counterbalance weights, and the flaps were accounted for during the onsite investigation. Flight control continuity from the cockpit to the ailerons and elevator could not be confirmed due to damage; however, all observed push/pull control tube damage was consistent with impact-related overstress damage or were cut to facilitate wreckage recovery. The rudder cables were continuous from the rudder horn to their respective pedal in the cockpit. The flaps remained attached to their respective wing and appeared to be in the fully retracted position.

Elevator Controls

The elevator controls are manually operated by steel and aluminum pushrods connecting the control stick to the elevator control horns through two control idlers.

The first elevator control push rod forward and aft bearings separated from the control stick attachment and the forward elevator push rod idler, respectively. The second elevator push rod forward rod end bearing was found separated from the rod end. The second elevator push rod was continuous from the forward rod end bearing separation to the elevator control horns.

Rudder Controls

The rudder controls are manually operated by stainless steel cables running directly from the rudder pedal assemblies to the rudder control horns. The left and right rudder controls were continuous from the rudder pedals to the rudder control horns.

Aileron Controls

The aileron controls are manually operated by steel pushrods connecting the control stick to the aileron control horns through a torque tube, and bellcranks. In addition, the AT-602 ailerons incorporate a drooping feature that lowers both ailerons in conjunction with extension of the flaps. The aileron drooping controls are documented below under "Flap System".

The right-wing aileron controls were continuous from the control stick to an impact-related separation in the steel aileron push rod. The steel aileron push rod was continuous from the separation to the aileron control horn.

The left-wing aileron controls were continuous from the control stick to the aileron by movement of the left aileron and examination of the system.

Flap System

The flap control system was continuous from the flap actuator to the left and right flaps. The flap actuator jackscrew extension was about 0.125 inch, which corresponds to a fully retracted (0°) position. The aileron drooping system components exhibited continuity.

Fuel System

Each wing was equipped with a 108-gallon fuel tank for a total of 216 gallons. Both the right and left fuel tank caps were found in place.

Both wing fuel tanks and the 2.5-gallon header tank were breached during impact. Jet-A fuel was observed to drain from left wing fuel line to the header tank. Additionally, Jet-A fuel was observed to drain out of the main fuel supply line from the airframe boost pump to the engine.

Engine

The engine was confirmed to be a Pratt & Whitney PT6A-65AG engine, serial number PCE-PN0099. The gas generator s/n was GG-PN0099 and the power section s/n was PS-PN0099. The engine and engine mount were separated in multiple places. The engine exhibited significant impact-related damage, as shown in figure 8.

The engine separated at the engine "A" Flange, just forward of the exhaust duct. A planetary ring gear and planet gear assembly were found loose in the wreckage near the reduction gearbox.

The engine was also separated at the inlet struts near the aft end of the engine. The accessory gearbox was found separated and heavily damaged with the internal gears easily visible, as shown in figure 9. The gearbox accessories such as the FCU/high pressure pump, starter/generator, oil and fuel pumps were separated from the accessory gearbox and were found in multiple places within the debris field between the initial impact location and the location of the accessory gearbox.

The remaining middle section of the engine contained the exhaust duct aft to the engine inlet. The exhaust case and exhaust pipes were crushed aft against the

engine case. A view of the first stage compressor blades appeared to be consistent with operation under power at the time of the impact, as shown in figure 10.

The engine reduction gear box second stage planetary carrier fractured from the propeller shaft during impact. The fracture points were distorted consistent with rotation and engine torque at impact.



Figure 8 - Overview of the engine after recovery from the accident site.



Figure 9 - Engine accessory gearbox.



Figure 10 - Engine first stage compressor section.

Propeller

The propeller assembly remained attached to the engine reduction gearbox which separated from the engine during impact, as shown in figure 11. Two blades impact-separated from the propeller hub, but only one of the separated blades were found in the debris field. One of the three blades that remained attached to the assembly exhibited forward-bending in the thrust direction, twisted towards high pitch. Two of the three blades that remained attached to the hub assembly exhibited S-shaped bending. All recovered propeller blades exhibited varying degrees of chordwise/rotational scoring, burnishing, and leading-edge gouging, as shown in figures 12-14.



Figure 11 - Propeller hub assembly with 3 blades at the accident site.



Figure 12 - Propeller hub assembly with 3 blades after recovery.



Figure 13 - Propeller hub assembly with 3 blades attached after recovery.



Figure 14 - Propeller blade found separated from hub assembly.

Agricultural Spray System and GPS Device

The airplane's Verifly spray system computer, spray system display (tablet), and remnants of the spray system light bar were located at the accident site. Additionally, a Garmin Aera GPS device was also recovered from the debris path.

Based on the witness description of the airplane's flight path immediately before the accident and the physical evidence located near the power pole, the team determined that there was no investigative need to submit the recovered digital devices to the NTSB Vehicle Recorder Laboratory for additional examination and data extraction. The digital devices were placed together in a white wreckage debris bag and left with the Beegles Aircraft recovery team.