



# Aviation Investigation Final Report

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<b>Location:</b>	Parma, New York	<b>Accident Number:</b>	ERA14FA327
<b>Date &amp; Time:</b>	July 5, 2014, 12:11 Local	<b>Registration:</b>	N76850
<b>Aircraft:</b>	Cessna 140	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of control on ground	<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

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## Analysis

The commercial pilot of the tailwheel-equipped airplane was performing touch-and-go landings at his private airport with a right quartering tailwind. During landing roll, the pilot lost directional control, and the airplane departed the left side of the runway into a wheat field where it nosed over. Examination of the runway revealed that a prominent row of trees was located directly adjacent to the right side of the runway, and, given the prevailing wind, there would have been associated turbulence due to the disruption of the ambient wind flow as it passed over the trees. Tire marks and ground scars indicated that, when the airplane veered off the left side of the runway, it was carrying considerable energy, as the airplane traveled 390 ft from its touchdown point to where it nosed over.

Examination of the airplane revealed no evidence of any anomalies that would have precluded normal operation. The crown of the fuselage above the pilot's seat displayed an outward bulge indicating that, during the nose over, the pilot's head contacted the overhead area of the cockpit interior, which likely caused the cervical spine fracture and positional asphyxiation injuries described in the pilot's autopsy report. Examination of the pilot's 4-point restraint system revealed that the aluminum center safety belt bracket, which was likely installed when the airplane was manufactured in 1946, had failed in shearing overstress during the nose over. This resulted in the pilot being partially released from the restraint system and subsequently contacting the crown of the airplane. Examination of the airplane manufacturer's records revealed that shortly after the airplane was manufactured in 1946, the manufacturer began installing a steel center safety belt bracket in new production airplanes. Following this accident, the manufacturer issued a service bulletin that called for inspection of the center seat belt bracket on all Cessna 120 and 140 airplanes to determine if the latest type (steel) bracket was installed and replacement of any older type (aluminum) brackets found with the latest type.

## Probable Cause and Findings

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

The pilot's decision to land with a quartering tailwind and his failure to maintain directional control during the landing roll. Contributing to the severity of the pilot's injuries was the failure of the aluminum center safety belt bracket.

## Findings

<b>Personnel issues</b>	Aircraft control - Pilot
<b>Aircraft</b>	Directional control - Not attained/maintained
<b>Environmental issues</b>	Tailwind - Effect on operation
<b>Aircraft</b>	Seat/cargo attach fitting - Failure

## Factual Information

### History of Flight

<b>Landing-landing roll</b>	Loss of control on ground (Defining event)
<b>Landing-landing roll</b>	Runway excursion
<b>Landing-landing roll</b>	Collision with terr/obj (non-CFIT)
<b>Landing-landing roll</b>	Nose over/nose down
<b>Landing-landing roll</b>	Sys/Comp malf/fail (non-power)

On July 5, 2014, about 1211 eastern daylight time, a Cessna 140; N76850 was substantially damaged when it nosed over during a runway excursion after landing at Ridge Road West Airport (7NK4), Parma, New York. The commercial pilot was fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the local personal flight, conducted under the provisions of Title 14 Code of Federal Regulations Part 91.

According to an employee who worked at a restaurant located on the south side of 7NK4, , he first observed the tailwheel equipped airplane doing touch and go landings on Runway 18. He did not observe the airplane again until about 1245, when he saw the airplane upside down next to the east side of runway 18, and called 911.

### Pilot Information

<b>Certificate:</b>	Commercial; Flight instructor	<b>Age:</b>	88, Male
<b>Airplane Rating(s):</b>	Single-engine land; Single-engine sea	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	Glider	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane single-engine	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 3 With waivers/limitations	<b>Last FAA Medical Exam:</b>	April 9, 2014
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	April 8, 2014
<b>Flight Time:</b>	2583 hours (Total, all aircraft), 438 hours (Total, this make and model), 2460 hours (Pilot In Command, all aircraft), 6 hours (Last 90 days, all aircraft), 4 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

According to Federal Aviation Administration (FAA) records, the 88-year-old pilot held a commercial pilot certificate with ratings for airplane single-engine land, airplane single-engine sea, glider, and instrument airplane. He also held a flight instructor certificate with a rating for airplane single-engine. His most recent FAA third-class medical certificate was issued on April 9, 2014. According to pilot records, he had accrued approximately 2,583 total hours of flight experience, 438 of which was in

tailwheel equipped airplanes.

### Previous Landing Accident

Review of NTSB records indicated that on August 23, 1997, the pilot had been involved in a landing accident (NTSB Case No. NYC97LA189). According to the NTSB factual report, this previous accident had occurred when the pilot was flying a Piper PA-12; N7682H, when he made a three-point landing on the same runway at 7NK4. The wind was from the west at 7 knots. After touchdown, the airplane drifted left. The pilot was unable to correct the left drift and the airplane continued to drift left into rough terrain, before the pilot reduced the engine power to idle. The right main landing gear collapsed under the fuselage. The right wing contacted the ground, and the outboard 2 1/2 feet of the right wing was damaged. The NTSB determined that the probable cause of the accident was the failure of the pilot to maintain directional control of the airplane, while landing. The crosswind was a related factor.

### Interviews with Friends and Family Members

According to friends and family members, the pilot was also involved in another accident with N7682H, which was not reported to the NTSB. While landing on runway 27 at 7NK4, when during rollout the airplane became airborne and mashed in to the trees.

They advised that generally, the pilot liked to touch down near midfield point of the runway, and would always land in a slip with the Cessna 140 regardless of wind. The pilot had damaged three wingtips in the recent past, and had to have work done on the left aileron. Additionally, they advised that he liked to land downwind, considered it a challenge, and typically used runway 18 for landing regardless of wind, as it allowed him to rollout directly to his hangar so he did not have to back taxi.

### Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N76850
<b>Model/Series:</b>	140	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1946	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	11284
<b>Landing Gear Type:</b>	Tailwheel	<b>Seats:</b>	2
<b>Date/Type of Last Inspection:</b>	June 11, 2014 Annual	<b>Certified Max Gross Wt.:</b>	1601 lbs
<b>Time Since Last Inspection:</b>	4 Hrs	<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	3893.9 Hrs at time of accident	<b>Engine Manufacturer:</b>	CONT MOTOR
<b>ELT:</b>	C91 installed, not activated	<b>Engine Model/Series:</b>	C85-12F
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	85 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

The accident aircraft was a tail wheel-equipped, two-seat, strut-braced, high wing, single-engine,

airplane of conventional metal construction, manufactured in 1946. It was powered by a 4 cylinder, 85-horsepower; air cooled, horizontally opposed, Continental C95-12F engine.

According to Civil Aeronautics Board (CAB), NTSB, and maintenance records, the airplane had been involved in three previous accidents:

-The first accident with the airplane occurred on May 16, 1964, in Belgrade, Montana and was investigated by the CAB, which determined that the airplane was substantially damaged after a ground loop during landing roll.

-The second accident occurred on August 4, 1990, in Middlesex, New York (NTSB Case No. NYC90LA185), when the "airplane approached high, hot, and long," then ran off the runway into high grass and nosed over.

-The third accident with the airplane was not reported to the NTSB, and occurred in 1991. Review of the airplane maintenance records revealed that on June 4, 1991 the airplane was, "rebuilt after a landing incident."

The airplane was purchased by the pilot on May 29, 2002.

The airplane's most recent annual inspection was completed on June 11, 2014. During that inspection, the left wing tip was replaced with a serviceable tip, and the left outboard wing required repair of the fabric covering.

At the time of the accident, the airplane had accrued approximately 3,893 total hours of operation, and the engine had accrued approximately 970 total hours of operation since major overhaul.

### Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	ROC,559 ft msl	<b>Distance from Accident Site:</b>	8 Nautical Miles
<b>Observation Time:</b>	11:54 Local	<b>Direction from Accident Site:</b>	135°
<b>Lowest Cloud Condition:</b>	Few	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	12 knots / 16 knots	<b>Turbulence Type Forecast/Actual:</b>	/ None
<b>Wind Direction:</b>	300°	<b>Turbulence Severity Forecast/Actual:</b>	/ N/A
<b>Altimeter Setting:</b>	30.2 inches Hg	<b>Temperature/Dew Point:</b>	24°C / 12°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Parma, NY (7NK4)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Parma, NY (7NK4)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	11:47 Local	<b>Type of Airspace:</b>	Class G

The reported weather at Greater Rochester International Airport (ROC), located 8 nautical miles

southeast of the accident site, at 1154, included: winds 300 degrees at 12 knots gusting to 16 knots, 10 miles visibility, few clouds at clouds at 25,000 feet, temperature 25 degrees C, dew point 12 degrees C, and an altimeter setting of 30.21 inches of mercury.

Examination of runway 18, revealed that the approach end was surrounded by trees, with a prominent row of trees approximately 1,233 feet-long, located directly adjacent to the right side of the runway, extending from the approach end of the runway to almost midfield. Mechanical disruption of the ambient wind flow was present as it passed over the row of trees on the right side of the runway.

### Airport Information

<b>Airport:</b>	RIDGE ROAD WEST 7NK4	<b>Runway Surface Type:</b>	Grass/turf
<b>Airport Elevation:</b>	400 ft msl	<b>Runway Surface Condition:</b>	Dry;Vegetation
<b>Runway Used:</b>	18	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	1800 ft / 45 ft	<b>VFR Approach/Landing:</b>	Traffic pattern

Ridge Road West Airport was owned by the pilot and was a private use, non-towered airport. It was located three miles northwest of Spencerport, New York. The airport elevation was 400 feet above mean sea level. There were two runways oriented in an 18/36 and 9/27 configuration. For noise control, runway 36 was the preferred runway for takeoffs, and runway 18 was preferred for landings. Runway 18 had a left traffic pattern and was turf, in good condition. The total length was 1,800 feet-long and 45 feet-wide. At the time of the accident, only 1,151 feet was usable, as 649 feet of the north end of the runway had not been mowed

A hangar where the pilot would keep the airplane was located off the departure end of runway 18.

### Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal	<b>Latitude, Longitude:</b>	43.222778,-77.812225

Review of recorded images from a motion-activated security camera system located at the airport revealed that prior to the accident one of the cameras had been activated three times by the shadow of an airplane passing by the camera, with the shadow activating the camera for the last time at 1205.

Tire marks and ground scars on runway 18 indicated, that on the last landing, the airplane touched down 1,123 feet down the runway to the left of centerline, veered of the left side of the runway into a wheat field, and then nosed over, 390 feet from the touchdown point, approximately 41 feet east of the centerline of the runway.

Examination of the airplane revealed that after nosing over, it came to rest on a magnetic heading of 013 degrees. The outboard portion of the left wing leading edge displayed crush and compression damage,

and the wingtip was crushed and bent downward, the right wing was twisted along the length of its span, and displayed wrinkling on the top and bottom surfaces. The left wing flap was bent downward on the inboard end and the left aileron was bent upward on the outboard end. The left wing lift struts were bowed slightly downward and the right wing lift struts, displayed compression damage and were bent. The top of the vertical stabilizer and rudder were bent and crushed, the fuselage was dented and wrinkled on the right side forward of the windshield pillar, and the crown of the fuselage above the pilot seat displayed an outward bulge. The lower left portion of the engine nose bowl cowling was dented in. One blade of the propeller was bent aft, and both blades displayed gouging and chordwise scratching.

Examination of the fuel system revealed that fuel consistent in color and odor with automotive gasoline was present in the fuel tanks, fuel strainer, and carburetor float bowl. When coupons containing water finding paste were brought in to contact with the fuel, they did not change color indicating that water was not present.

Examination of the engine revealed that there was oil in the galleries and sump. Spark was obtained from all towers on the magnetos. The spark plugs (though some were oil fouled due to the airplane coming to rest upside down), appeared normal. Drivetrain continuity was confirmed, and thumb compression was present on all four cylinders.

Examination of the flight control system did not reveal any evidence of preimpact malfunction or failure, and control continuity was established from the flight control surfaces to the control wheel and rudder pedals.

Examination of the cockpit revealed that the wing flaps were in the full down position, the throttle was at idle, the carburetor heat was on, and the fuel selector was in the "RIGHT TANK" position, The master switch was found in the "ON" position and had been shut off by an FAA inspector. The magneto switch was found in the "BOTH" position and was turned off by a first responder.

## **Medical and Pathological Information**

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An autopsy was performed on the pilot by the Office of the Medical Examiner, Monroe County, New York. The listed cause of death was multiple injuries.

Toxicological testing of the pilot was conducted at the FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma. The specimens from the pilot were negative for carbon monoxide, basic, acidic, and neutral drugs. Testing for Cyanide was not performed.

## **Survival Aspects**

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Restraint System Examination

On arrival at the accident site, first responders had discovered that the pilot was lying on his back, was only partially buckled in to his restraint system, and was deceased. Examination of the crown of the fuselage revealed that it was bulged outward above the pilot seat, in a manner consistent with the pilot having made contact with the crown of the fuselage during the nose over. According to the pilot's autopsy report, the most significant blunt force injury identified was a cervical spinal fracture at C6/C7 with compression of the spinal cord. Additionally, evidence of positional asphyxiation on the pilot's head and upper body was noted during the autopsy.

According to FAA and airplane maintenance records, on May 24, 2003, the airplane's "existing seat belt restraints" were removed and "Aero Fabricators shoulder harnesses & seat belts" had been installed per Supplemental Type Certificate (STC SA1429GL).

Examination of the pilot's 4-point restraint system revealed that the shoulder harness was intact, the bar slide was still in place, and the shoulder harness assembly was still attached by the triangular end fitting to wing spar.

The left (outboard) portion of the pilot's lap belt was intact and secured to its bracket. The right (inboard) portion of the pilot's lap belt was also intact, but was not secured to the center safety belt bracket that was used to attach the right (inboard) portion of the pilot's lap belt and the left (inboard) portion of the copilot's lap belt, to the fuselage. Examination of the center safety belt bracket revealed that it was broken. Further examination revealed that the left side of the bracket was deformed and a 45-degree fracture existed on the portion of the bracket where the right (inboard) portion of the pilot's lap belt would have attached. The center safety belt bracket was removed from the airplane and forwarded to the NTSB Materials Laboratory for further examination.

## Tests and Research

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### Center Safety Belt Bracket Examination

Examination of airplane maintenance records and the center safety belt bracket by the NTSB Materials Laboratory indicated that the bracket was most likely an original part (P/N 0425132) that was installed during manufacture of the airplane in 1946.

The left side tang of the bracket was fractured adjacent to the forward foot for the left seat belt attachment. The fracture was oriented about 45-degrees at the juncture between the tang and the foot. Magnified optical examinations revealed fracture features and deformation patterns indicative of shearing overstress separation. The deformation patterns on the left tang also showed deformation patterns consistent with both pre and post fracture deflections, with no indications of preexisting cracking or corrosion.

Chemical analysis and metallographic cross section confirmed that the bracket was made from either 2014 or 2024 Alclad aluminum alloy, and hardness and conductivity measurements of the core material were consistent with either a T3 or T4 temper condition for either alloy.

### Review of Engineering Drawings and Changes



Review of the airframe manufacturer's Engineering Drawing, 0425132, Bracket-Seat Belt, indicated that the drawing became inactive in 1966. The latest drawing specified the bracket material as Society of Automotive Engineers (SAE) 4130 alloy steel, normalized after forming. The drawing also depicted a shape with two different widths. The drawing showed a forward 0.88-inch-wide section with a 0.75-inch-wide aft section. In comparison, the bracket recovered from the accident airplane measured 0.75-inch-wide along its entire length. The widths of the tangs on the fractured bracket also measured smaller than the drawing dimensions, 0.215 inch versus 0.25 inch on the drawing. Other dimensions including hole sizes, thickness, and bend angles appeared to be consistent with the recovered bracket and the original, pre-1966 drawing.

Based on the 45-degree fracture across the tang, the bracket from the accident airplane had approximately 7-percent less cross sectional area than the latest version of the bracket.

A review of Drawing Change Notices (DCN) also found a material change from "24ST ALC" to normalized SAE 4130 alloy steel. Further review also revealed that on October 21, 1946, DCN 6886A cited the material change and stated "Strengthen Part" as the reason. Additionally, DCN 9155, dated November 27, 1946, also showed the two width shape of the steel bracket and further listed the applicability as Cessna model 140 serial number 13582 on (with 3 exceptions) and Cessna model 120 serial number 13563 on. No drawings were found showing the shape and dimensions of the previous version of the bracket.

#### Review of FAA Aircraft Registry Database

A review of the FAA aircraft registry database found that approximately 2,310 Cessna model 140s and 862 Cessna model 120s were registered in the United States.

Of these about 1,594 (69%) of the Cessna model 140s and 701 (81%) of the Cessna model 120s, were manufactured before the effectivity of the material change from Alclad 2024 T3 to SAE 4130 alloy steel.

#### Aerospace Structural Metals Handbook

According to the 1995 version of the Aerospace Structural Metals Handbook:

- Alclad 2024 T3 typically has a yield strength of 40,000 pounds per square inch (psi).
- Normalized (1,600-degree F) 4130 alloy steel typically has a yield strength of 68,000 psi.

This represented a nearly 40% increase in yield strength for the steel bracket compared to the aluminum bracket.

### **Additional Information**

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In order to improve safety, the airframe manufacturer took the following actions:

1. Issued an Owner Advisory notifying Cessna 120 and 140 owners that they wished to update the seat belt bracket for airplanes in the field to the latest design.
2. Issued a mandatory Single Engine Service Bulletin: SEB-25-03, affecting Cessna 120s (S/N 8000 thru 15075) and Cessna 140s (S/N 8000 thru 15075), requiring that within the next 100-hour or 12 months (annual type) inspection, that the seat belt bracket be inspected to determine if the latest type of seat belt bracket was installed, and if not installed, to replace the seat belt bracket with the new P/N 0425132 seat belt bracket, and to discard the old one.

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Gunther, Todd
<b>Additional Participating Persons:</b>	John Liccini; FAA/FSDO; Rochester, NY Andrew Hall; Cessna Aircraft Corporation; Wichita, KS
<b>Original Publish Date:</b>	December 15, 2016
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB traveled to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=89607">https://data.nts.gov/Docket?ProjectID=89607</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

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](#).