Aviation Investigation Final Report

Location:	Middletown, New York	**Accident Number:**	ERA18FA141
Date & Time:	May 5, 2018, 09:05 Local	**Registration:**	N84396
Aircraft:	Aeronca 7AC	**Aircraft Damage:**	Substantial
Defining Event:	Aerodynamic stall/spin	**Injuries:**	1 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The pilot and flight instructor were conducting a flight review in an airplane owned by a flying club. Shortly after takeoff, when the airplane was about ½ mile from the departure end of the runway, a witness reported that the airplane "suddenly went nose down." The airplane impacted a row of trees on the edge of a field in a near-vertical nose-down attitude. No ground scars were found, and no tree damage was found other than that directly above the wreckage, consistent with little or no forward speed. Thus, the airplane had likely exceeded its critical angle of attack, resulting in an aerodynamic stall from which the pilot was unable to recover.

Witness marks on the engine's crankcase nose seal area, were consistent with a directly aft impact by the propeller mounting bolt nuts and showed no indications of scraping or rotation. In addition, there was no chordwise scratching and relatively little leading edge damage to the propeller blades. The lack of any chordwise scratching and relatively little leading edge damage to the propeller blades, while not conclusive, is suggestive of slow or no rotation of the propeller as descended through the trees. Examination of the airframe and engine otherwise revealed no evidence of preimpact failures that would have precluded normal operation.

The rear seat shoulder harness anchor separated from its attachment point to the fuselage tubing during the accident sequence. Although the bolt securing the anchor was not installed in accordance with the manufacturer's instructions (the bolt head was facing up instead of the nut), the installation error likely did not cause the failure. Instead, the failure was due to the anchor sliding forward between the fuselage tubes. The investigation could not determine if the rear seat shoulder harness anchor failed due to a design issue or loads beyond the design criteria.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's exceedance of the airplane's critical angle of attack during climbout, which resulted

in an aerodynamic stall from which the pilot could not recover.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	Angle of attack - Not attained/maintained

Factual Information

History of Flight

Initial climb	Aerodynamic stall/spin (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On May 5, 2018, about 0905 eastern daylight time, an Aeronca 7AC, N84396, was substantially damaged when it was involved in an accident near Randall Airport (06N), Middletown, New York. The pilot was fatally injured, and the flight instructor was seriously injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 instructional flight.

According to the flight instructor, the purpose of the flight was to perform a flight review for the pilot. The flight instructor and the pilot discussed his currency and the status of his medical certificate, which was valid, and agreed that the pilot would be the pilot-in-command for the flight. Before moving the airplane out of the hangar, the pilot performed a preflight inspection. The flight instructor recalled that the pilot had measured the amount of fuel in the single fuel tank and reported that it was "slightly more than a half tank." They moved the airplane out of the hangar, started the engine (the flight instructor performed the cockpit duties as the pilot hand-propped the engine), and then taxied toward the runway. The pilot was in the front seat, and the flight instructor was in the back seat. The flight instructor did not recall any further information about the flight.

A witness, who was driving on the road adjacent to the accident site, observed the airplane flying in a westerly direction when it "suddenly went nose down." She then stopped her car, saw that the airplane had impacted a wooded area, and called 911.

Pilot Information

Certificate:	Commercial	**Age:**	53,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	Glider	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	June 21, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	April 10, 2017
Flight Time:	737 hours (Total, all aircraft), 11.8 hours (Total, this make and model), 649 hours (Pilot In Command, all aircraft), 5 hours (Last 90 days, all aircraft), 1.2 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Flight instructor Information

Certificate:	Commercial; Flight instructor	**Age:**	65,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Rear
Other Aircraft Rating(s):		**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	March 13, 2018
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 13, 2018
Flight Time:	(Estimated) 8150 hours (Total, all aircraft), 300 hours (Total, this make and model), 7209 hours (Pilot In Command, all aircraft), 70 hours (Last 90 days, all aircraft), 41 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

According to his logbook, the pilot had accumulated 737 total hours of flight experience, 11.9 hours of which were in the accident airplane make and model. He had flown 2 solo flight hours accident airplane make and model. Before the accident flight, the pilot's last flight in the accident airplane occurred on December 4, 2016. The pilot had logged about 10 hours during the year preceding the accident, none of which were in the accident airplane make and model.

Aircraft and Owner/Operator Information

Aircraft Make:	Aeronca	**Registration:**	N84396
Model/Series:	7AC NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	1946	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	7AC-3089
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	December 20, 2017 Annual	**Certified Max Gross Wt.:**	1220 lbs
Time Since Last Inspection:	5 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4841.9 Hrs as of last inspection	**Engine Manufacturer:**	Continental Motors Inc
ELT:	C91A installed	**Engine Model/Series:**	A-65-8F
Registered Owner:		**Rated Power:**	65 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

The tandem two-seat, high-wing, airplane was constructed of welded tubes covered by fabric. The wooden wing spars were replaced with aluminum spars in December 2017. Flight and engine controls

could be manipulated by either the front or rear seat occupant. The airplane was not equipped with a stall warning system or instruments for a rear-seat pilot.

The airplane was shared by members of a flying club. According to handwritten fueling records that the club kept, the airplane was last refueled on April 11, 2018, with 5.1 gallons. It had been flown once since that time, on April 14, 2018, for a total of 0.57 hour, with an ending tachometer time of 1,333.36 hours. The tachometer reading at the time of the accident was 1,333.47 hours. A review of the fuel records revealed that the airplane used an average of 4 gallons per tachometer hour. The fuel tank capacity was 13 gallons.

Calculations using the weight and balance documentation found in the airplane, FAA records of the pilots' weight, and an assumption of 7 gallons of fuel (based on the pilot's statement to the flight instructor that the tank was half full) indicated that the airplane would have weighed about 1,324 pounds. The maximum gross weight listed in the weight and balance documentation was 1,220 pounds; thus, the airplane weighed 104 pounds more than the maximum gross weight during the accident flight.

The rear seat shoulder harness was installed pursuant to a supplemental type certificate in December 2016.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	MGJ,365 ft msl	**Distance from Accident Site:**	8 Nautical Miles
Observation Time:	08:54 Local	**Direction from Accident Site:**	51°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	330°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.07 inches Hg	**Temperature/Dew Point:**	16°C / 6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Middletown, NY (06N)	**Type of Flight Plan Filed:**	None
Destination:	Middletown, NY (06N)	**Type of Clearance:**	None
Departure Time:	09:00 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	RANDALL 06N	**Runway Surface Type:**	Asphalt
Airport Elevation:	522 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:	26	**IFR Approach:**	None
Runway Length/Width:	2811 ft / 60 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal, 1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 Serious	**Latitude, Longitude:**	41.426109,-74.403892

The airplane impacted a row of trees and rocky terrain at the edge of a field about 1/2 mile from the departure end of the runway and about 300 ft to the left of the extended runway centerline. The airplane came to rest in a near-vertical nose-down attitude with the wings oriented on a magnetic heading of about 250°. Several tree branches were broken directly above the airplane, and no ground scars led toward or away from the main wreckage. The damage to the tree branches in the surrounding area was not consistent with rotating propeller strikes.

Examination of the wreckage revealed that all major components of the airplane were present at the accident site. The nose section and engine were partially separated from the fuselage and displaced to the right and aft. Both wings had leading edge crush damage along their span. The empennage was bent about 40° to the left and aft of the baggage area. The rudder, elevator, and horizontal and vertical stabilizers were mostly intact. Flight control continuity was established from the ailerons and elevator to the rear seat control stick. The elevator moved freely; both ailerons moved with some binding. The main control tube was separated due to fracture between the front and rear control sticks, consistent with bending overload. Flight control continuity was also established from the rudder cables to both rear seat rudder pedals, through a recovery cut in the attachment bracket on the right pedal. All cable ends remained intact. The rudder moved in both directions with some binding.

The fuel tank, firewall, and engine cowling were damaged by impact. Indentations (in the aft direction) in the crankcase nose seal area, directly behind the propeller mounting bolt nuts, were consistent with the size and shape of nuts. The indentations did not exhibit any rotational signatures. Both propeller blades were fractured and splintered in several pieces. One blade was fractured in the aft direction near the root. The other blade had one dent in the metal leading edge about 4 inches from the tip. The spinner was crushed aft with no rotational damage. The magneto switch was in the "both" position, and the fuel control lever was in the "on" position. The fuel valve outlet fitting was separated from the valve due to fracture.

The throttle linkage remained attached at the carburetor. The carburetor heat knob was in the "cold" position. The carburetor heat control cable remained attached to the air intake assembly. The air filter was damaged and unobstructed. The carburetor screen was unobstructed. No fuel was present in the carburetor bowl. The float assembly was intact, and the inlet needle valve functioned normally. Because the carburetor inlet fitting was cracked, during postaccident testing, the carburetor bowl was filled with water. With the carburetor upright and the bowl full, no water leaked out of the broken inlet fitting. When the bowl was about ¾ full, the floats lowered, and water flowed through the inlet fitting.

The fuel tank was crushed and was punctured and torn in several locations. No fuel was present in the tank. The fuel tank outlet fitting was fractured and separated from the tank. The gascolator drain was closed, the inlet fitting was fractured, and the screen was unobstructed. No fuel was present in the gascolator or its outlet fuel line.

Examination of the engine and airframe found no preimpact anomalies that would have precluded normal operation.

The rear seat shoulder harness anchor was found separated from the airframe tubes to which it was clamped. The anchor components were intact, but the upper bracket was bent upward on both sides. Examination of the anchor components revealed sliding marks on the brackets consistent with sliding forward asymmetrically along the airframe tubes, which were oriented triangularly such that they were farther apart looking forward. The harness buckle attachment arms that connected the two shoulder harness straps to the buckle were bent. The right harness buckle arm was bent more than the left harness buckle arm, consistent with asymmetrical loading. The webbing components and stitching of the shoulder harness remained intact. The center bolt, which clamped the brackets together, was found installed upside down (with the bolt head facing up instead of the nut facing up) and, according to the installation specifications, was missing a washer.

The front seat left-side lap belt webbing was separated in two places near its attach point. Examination of the fracture surfaces revealed damage consistent with overload.

Medical and Pathological Information

The Office of the Medical Examiner, County of Orange, Goshen, New York, performed an autopsy of the pilot. The pilot's cause of death was blunt force injuries, including to the head and torso. Toxicology testing performed at the FAA Forensic Sciences Laboratory was negative for drugs, ethanol, and carbon monoxide.

Administrative Information

Investigator In Charge (IIC):	Brazy, Douglass
Additional Participating Persons:	Tom Mancuso; FAA/FSDO ; Teterboro, NJ Nicole Charnon; Continental Aerospace Technologies; Mobile, AL
Original Publish Date:	May 19, 2020
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=97172

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available here.