Aviation Investigation Final Report

Location:	Farmingdale, New Jersey	**Accident Number:**	ERA10FA140
Date & Time:	February 15, 2010, 15:42 Local	**Registration:**	N12NA
Aircraft:	Cessna T337G	**Aircraft Damage:**	Substantial
Defining Event:	Aircraft structural failure	**Injuries:**	5 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

One of the pilots announced over the airport's common traffic advisory frequency his intention to perform a low pass over the runway, and ground witnesses observed the airplane fly about 50 feet above the runway with the landing gear retracted. Global positioning system data recovered from the wreckage indicated that the airplane's ground speed at that time was about 160 knots (kts) (184 mph). Witnesses observed the airplane's nose pitch up just before the outboard 6-foot section of the right wing separated, and the airplane descended uncontrollably and impacted the ground. Although the pilot/owner seated in the left front seat was not rated to operate a multi-engine land airplane, he was known to perform ostentatious maneuvers in the accident airplane on previous occasions. The pilot seated in the right front seat was rated to operate a multi-engine land airplane. A placard above the airspeed indicator indicated, "Maneuvering --- 135 KTS (155 MPH)"; therefore, the pilot's low pass and subsequent pitch up maneuver, consistent with an ostentatious display, was performed at an airspeed that exceeded this operating limitation. Postaccident metallurgical examination of airplane's structure revealed that the right wing forward spar upper cap failed in compressive buckling. Although the left wing did not fail in flight, it showed buckling characteristics similar to the right wing, indicating that both wings were overloaded in upward bending. The airplane was modified under 22 different supplemental type certificates (STCs), which included separate STCs for a short field take-off and landing (STOL) kit, an extended wingtip fuel tank, and winglets. The investigation found evidence that the combined effects of the multiple STC modifications on the accident airplane may have adversely affected the airplane's wing structure because the combined effects of the STCs were not accounted for. For example, although not a factor in the in-flight breakup, skin fatigue cracks were observed at certain stations on the wing, which indicate that the airplane was subjected to vibratory stresses. Therefore, although each individual STC modification did not pose a concern, the combination of STCs on the accident airplane created wing loads that were not initially evaluated. As a result of this accident investigation, the Federal Aviation Administration (FAA) reevaluated the STCs and determined that revised operating limitations should be disseminated and implemented for this airplane; the FAA issued airworthiness directives (ADs) 2010-21-18 and 2011-15-11 to help address these issues. These ADs are available from the FAA's website at . In addition, concurrent with this investigation, the NTSB investigated another accident (NTSB identification ERA10FA404)involving an airplane with multiple STCs installed and discovered that the

FAA does not provide any guidance to an STC installer to help the installer determine the interrelationship between multiple STC modifications.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilots' failure to adhere to the airplane's operating limitations, which resulted in overload failure of the right wing. Findings of the investigation were the adverse effects of multiple supplemental type certificates (STC) to the airframe wing structure that were not evaluated at the time the STCs were installed and the lack of guidance by the Federal Aviation Administration for multiple STC interaction evaluation.

Findings

Aircraft	Spar (on wing) - Capability exceeded
Personnel issues	Incorrect action sequence - Flight crew
Organizational issues	(general) - FAA/Regulator

Factual Information

History of Flight

Maneuvering-low-alt flying	Abrupt maneuver
Maneuvering-low-alt flying	Aircraft structural failure (Defining event)
Maneuvering-low-alt flying	Part(s) separation from AC
Uncontrolled descent	Collision with terr/obj (non-CFIT)

History of Flight

On February 15, 2010, about 1542 eastern standard time, a Cessna T337G, N12NA, collided with terrain following an in-flight separation of the outboard section of the right wing while overflying runway 32 at the Monmouth County Executive Airport (BLM), Farmingdale, New Jersey. The three adults and two minors on board were killed. The airplane incurred substantial damage. The flight was operated by a private individual under the provisions of Title 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed and no flight plan was filed for the local flight. The flight originated at 1526 from the same airport.

Information obtained by the local authorities revealed the flight was intended to be a pleasure flight around the local area. Three of the passengers were visiting from abroad. Relatives of the passengers remained behind at the pilot/owner's hangar, which faces and provides a clear view of runway 32, to watch the departure.

The flight crew of a helicopter flying in the area heard an unknown person onboard N12NA announcing over the common traffic advisory frequency (CTAF) that the airplane was to depart from runway 32. Minutes later, one of the crewmembers of the helicopter and a pilot of another airplane in the area heard an announcement over the CTAF that N12NA was intending to do a low pass over runway 32.

Several witnesses on the ground observed the airplane fly over runway 32, with the landing gear retracted, at an estimated altitude of 50 feet above the ground and at a much higher rate of speed than normal. The airplane was about one third down the runway when the nose of the airplane pitched up and a section of the airplane separated. . The airplane rolled and veered toward the right, away from the runway. The airplane impacted the ground and continued sliding and rolling as debris separated from the airplane. The airplane came to a stop inverted and against a snow embankment on a taxiway near the pilot/owner's hangar.

A witness stated that he was aware that the pilot/owner flew the accident airplane low over the runway on several occasions. He also viewed photos and videos of the accident airplane in flight, with the accident pilot/owner at the controls. He reported that, based on his observation

of the photos and video, the pilot/owner would perform low passes over the runway followed by rocking the wings or pitch-up maneuvers.

Personnel Information

The pilot/owner was seated in the left front seat. He held a private pilot certificate, based on a foreign pilot certificate issued in Poland, with an airplane single engine land rating. He was required to be English-proficient and carry his foreign certificate while operating an airplane. All limitations and restrictions of his foreign certificate applied. He was issued a Federal Aviation Administration (FAA) third-class medical certificate on January 26, 2010, with no limitations. At that time, he reported a total of 870 civilian flight hours. His flight logbooks were not located.

The pilot, seated in the right front seat, held an airline transport pilot certificate with a multi-engine land rating, a commercial pilot certificate with an airplane single engine land rating, and a flight instructor, single engine land, certificate. He was issued a FAA first class medical certificate on May 11, 2009, with no limitations. A review of the pilot's flight logbooks revealed that he had 3,162 total flight hours, of those hours, 551 of multi-engine time.

Aircraft Information

The pressurized, in-line thrust, airplane was manufactured in 1973. It was being operated with a standard airworthiness certificate in the normal category. The airplane was equipped with two Continental TSIO-520-series engines, each rated at 300 horsepower, and Hartzell three-bladed, constant-speed propellers.

The airplane was modified with a total of 22 Supplemental Type Certificates (STC's), including a Horton short field take-off and landing (STOL) kit, an Aviation Enterprises wingtip fuel tanks, and Aviation Enterprises winglets. The Aviation Enterprises STC included the addition of two, 3 foot long, 20 gallon fuel tanks that were attached to the outboard ends of the original wings. The winglet was then attached to the outboard end of each fuel tank.

The airplane was on an annual inspection maintenance program, which was last performed on March 10, 2009, at 2,435 hours total time in service. At that time, both engines had accumulated 619 hours since overhaul.

Weight and Balance

Fueling records obtained from the self service fueling station at BLM revealed that the airplane was fueled with 90 gallons of aviation fuel (100LL) about one hour prior to the flight. The exact quantity and location of fuel onboard the airplane could not be determined. Based on the passengers' weights, the minimal fuel required for the accident flight, and estimated baggage and equipment on the airplane, the airplane was overweight and the center of gravity (C.G) was aft of the limitations for the Aviation Enterprises STC.

Meteorological Information

The surface weather observation at BLM at 1535 included the following: winds from 250 degrees at 7 knots, visibility 10 statute miles, sky condition clear, temperature 3 degrees Celsius, and altimeter 29.76 inches of mercury.

Aerodrome Information

BLM airport was a public airport with no control tower. Runway 32 was 7,300 feet long and 100 feet wide. The published traffic pattern altitude was 1,000 feet mean sea level with left traffic.

Wreckage and Impact Information

A 6-foot section of the outboard right wing was located on runway 32, near the runway 14/32 and 03/21 intersections, along with a small amount of debris from the right wing. A section of the right aileron, which originated from the separated 6-foot wing section, was located in the snow off to the left of runway 32 and was found parallel to the separated right wing section. The separated wing section exhibited a round indentation impact mark similar in shape to the rear engine nacelle/fuselage structure of the airplane at the center leading edge area. The trailing edge of the wing section, at the wingtip tank, exhibited two cuts which were similar in size and shape to propeller slashes.

Examination of the main wreckage showed the energy path was on a 360-degree heading. At a distance of 633 feet from the location of the separated right wing section, a 3-foot deep crater was observed consistent with the initial ground impact. From that point wreckage debris fanned out, up to 50 feet at the widest point, up to the main wreckage. The main wreckage was found against a snow embankment, with the front of the airplane facing east. The distance from the initial impact crater to the main wreckage was 184 feet. The rear engine's propeller assembly hub separated at the crankshaft flange and was located 80 feet from the main wreckage. The blades exhibited twisting and were bent at mid span. The rear engine remained attached to the fuselage. The lower portion of the right clam shell door was in place. The damaged left wing, left tail boom, and sections of the horizontal stabilizer remained with the main wreckage. The forward engine separated from the firewall, and the propeller assembly remained attached. One of the blades on the forward engine propeller separated from the hub assembly. The engine was located several feet forward of the main wreckage along with the separated blade.

The fuselage incurred extensive damage and came to rest inverted. The upper portion of the fuselage, from the left wing attachment points to the bottom of the right side window belt, was separated into numerous sections. The belly of the fuselage remained intact and remained attached to the cabin floor. The cockpit windows and the upper portion of the cockpit side walls exhibited impact damage and were separated into numerous sections. The forward firewall was pushed aft into the cabin area. The cabin floor exhibited deformation in the area

of the front seats. Both front seats remained partially attached to their seat tracks. The aft bench seat and the rear single seat separated from the fuselage. The lap belt for the front right seat was found latched, with the shoulder harness disconnected.

An engine examination was performed. The inspection of the engines did not reveal any anomalies that would have prevented the engines from producing rated horsepower. Both propeller assemblies showed damage consistent with power being applied, and at low pitch angle, at the time of impact. All flight control surfaces were accounted for. Flight control continuity was established from the cockpit to the flight control surfaces. Flight control cables that were observed were separated from tension overload or cut during the wreckage recovery process. The flap jack screw was observed in the flaps full up (retracted) position. The landing gear was observed in the retracted position. The elevator trim was observed in the full nose up position; however, the components of the elevator trim system were damaged from impact forces making it an unreliable indication.

Examination of the right wing revealed that the outboard right wing section separated at approximately wing station 177, where the horizontal flange of the forward spar upper cap exhibited deformation consistent with a compression buckle. The deformation was consistent with a failure of the wing in upward bending.

Sections of the airplane's right wing spars, left wing spars, and horizontal stabilator structure were retained and sent to NTSB Materials Laboratory for metallurgical analysis.

Test and Research

The metallurgical examination of the retained structure sections revealed the right wing forward spar upper cap failed in compressive buckling. Although one-half of the fracture surface was not located, the downward bend in the upper cap, the shear lip along the upper edge of the fracture, and the similarity to the compression buckle on the left wing at the same station found during the initial wreckage examination, indicated a compression buckle at this location; the wing was overloaded in upward bending. The remaining damage to the right wing and horizontal stabilizer were from secondary physical deformation.

The NTSB Vehicle Recorders Division retrieved data from a hand-held Garmin Global Positioning System (GPS) that was located within the wreckage. The data revealed that the accident flight departed from BLM at 15:26:49 and the flight continued until 15:42:45, as recorded by the GPS internal clock. The data indicated the airplane was flown to the ocean shore line, east of the airport, and then back to BLM. At 15:41:31, the airplane's ground speed was recorded at 147 knots, as the airplane was approaching the runway. At 15:42:23, while overflying the runway, the airplane's ground speed was 162 knots (186 miles per hour (mph)). The last recorded ground speed was at 15:42:45, at 160 knots (184 mph), as the airplane was over the runway at the lowest altitude before the impact.

The Aviation Enterprises wing tip fuel tank STC requires the installation of the following

placard near the airplane's airspeed indicator: "When tip tanks are empty, Reduce the Maneuvering speed to 117 KIAS (137 mph IAS)" and "Vne-Never exceed speed 187.5 KIAS (216 mph IAS)" . The accident airplane was placarded as follows, above the airspeed indicator: "MANUVERING --- 135 KTS (155 MPH)" and "MAX AIRSPEED CAS -- Vne 187.5 KIAS". The airplane was equipped with an airspeed indicator that registered in knots.

During the initial structural examination, fatigue cracks were found in the left wing upper skin which indicated the airplane's wing was subject to stresses that warranted further investigation. A re-evaluation of the STC's by the Federal Aviation Administration revealed that revised operating limitations should be disseminated and implemented based on the findings in this investigation.

Medical and Pathological Information

The Medical Examiner's Office in Freehold, New Jersey, conducted a postmortem examination of the pilots and passengers. The cause of death for all occupants was blunt force trauma.

The FAA Civil Aeromedical Institute (CAMI) conducted toxicology testing on specimens from the pilot/owner and the pilot-rated passenger. No ethanol or drugs were detected.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	46,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	May 11, 2009
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	3162 hours (Total, all aircraft), 33 hours (Total, this make and model), 60 hours (Last 90 days, all aircraft)		

Other flight crew Information

Certificate:	Private	**Age:**	45,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	January 26, 2010
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 870 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N12NA
Model/Series:	T337G	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	P3370020
Landing Gear Type:	Retractable - Tricycle	**Seats:**	5
Date/Type of Last Inspection:	March 10, 2009 Annual	**Certified Max Gross Wt.:**	5120 lbs
Time Since Last Inspection:	27 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	2462 Hrs at time of accident	**Engine Manufacturer:**	CONT MOTOR
ELT:	C91A installed, activated, did not aid in locating accident	**Engine Model/Series:**	TSIO-520 SER
Registered Owner:	On file	**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	BLM,159 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	15:35 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	250°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.76 inches Hg	**Temperature/Dew Point:**	3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Farmingdale, NJ (BLM)	**Type of Flight Plan Filed:**	None
Destination:	Farmingdale, NJ (BLM)	**Type of Clearance:**	None
Departure Time:	15:25 Local	**Type of Airspace:**	

Airport Information

Airport:	Monmouth Executive Airport BLM	**Runway Surface Type:**	Asphalt
Airport Elevation:	159 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	32	**IFR Approach:**	Visual
Runway Length/Width:	7300 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	3 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	5 Fatal	**Latitude, Longitude:**	40.189445,-74.119163(est)

Administrative Information

Investigator In Charge (IIC):	Obregon, Jose
Additional Participating Persons:	Charles A Emering; FAA / FSDO; Teleboro, NJ Henry J Soderlund; Cessna Aircraft Company; Wichita, KS Rodney Martinez; Continental Motors, Inc.; Mobile, AL Owen Bell; Aviation Enterprises; Whites Creek, TN
Original Publish Date:	March 8, 2012
Last Revision Date:	July 11, 2024
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=75362