Aviation Investigation Final Report

Location:	Fort Lauderdale, Florida	**Accident Number:**	ERA13FA168
Date & Time:	March 15, 2013, 16:21 Local	**Registration:**	N63CA
Aircraft:	Piper PA-31T	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General aviation - Flight test		

Analysis

The multiengine airplane had not been flown for about 4 months and was being prepared for export. The pilot was attempting a local test flight after avionics upgrades had been performed. Shortly after takeoff, the pilot transmitted that he was experiencing an "emergency"; however, he did not state the nature of the emergency. The airplane was observed experiencing difficulty climbing and entered a right turn back toward the airport. It subsequently stalled, rolled right about 90 degrees, and descended. The airplane impacted several parked vehicles and came to rest inverted. A postcrash fire destroyed the airframe. Both engines were destroyed by fire and impact damage. The left propeller assembly was fire damaged, and the right propeller assembly remained attached to the gearbox, which separated from the engine. Examination of wreckage did not reveal any preimpact malfunctions. It was noted that the left engine displayed more pronounced rotational signatures than the right engine, but this difference could be attributed to the impact sequence. The left propeller assembly displayed evidence of twisting and rotational damage, and the right propeller assembly did not display any significant evidence of twisting or rotational damage indicative of operation with a difference in power. The lack of flight recorders and the condition of the wreckage precluded the gathering of additional relevant information.

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 airplane control following an emergency, the nature of which could not be determined because of crash and fire damage, which resulted in an aerodynamic stall.

Findings

Not determined	(general) - Unknown/Not determined
Aircraft	Airspeed - Not attained/maintained

Factual Information

History of Flight

Initial climb	Unknown or undetermined
Initial climb	Aerodynamic stall/spin
Initial climb	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On March 15, 2013, about 1621 eastern daylight time, a Piper PA-31T (Cheyenne), N63CA, owned by M.A.S. Inc., was destroyed after it impacted the ground shortly after takeoff from the Fort Lauderdale Executive Airport (FXE), Fort Lauderdale, Florida. The airline transport pilot and two passengers were fatally injured. Visual meteorological conditions prevailed and no flight plan had been filed for the local maintenance test flight that was conducted under the provisions of 14 Code of Federal Regulations Part 91.

According to information obtained from the Federal Aviation Administration (FAA), and personnel interviews, the airplane was purchased by its current owner during November 2012, for a third party in Columbia, and was being prepared for export. The pilot planned to conduct a local test flight after avionics upgrades had been performed. The passengers were a father and son, who both worked at the company that performed the avionics upgrades.

Another pilot reported that he was asked by one of the passengers to conduct a test flight in the airplane 2 days before the accident. The pilot stated that he did not have time to conduct a test flight; however, he sat in the cockpit during a ground check of the right engine to troubleshoot a faulty oil temperature gauge. The engine performed normally, with the exception of the oil temperature gauge reading below zero. In addition, a functional check of the avionics was performed with no discrepancies noted.

The owner reported that the airplane had undergone engine ground checks during the 4 days prior to the accident. He was not aware of any maintenance issues with the airframe or engines, which underwent detailed inspections at the time of the purchase.

The airplane departed from runway 8, a 6,002-foot-long, asphalt runway, and was expected to turn to the left for a northwest departure. Shortly after takeoff, witnesses observed the airplane make a steep right turn back toward the airport. The pilot transmitted that he was experiencing an "emergency;" however, he did not state the nature of the emergency prior to the accident. One witness, who was a pilot in an airplane that was parked in the mid-field run-up area at FXE, stated that the accident airplane had difficulty climbing and barely cleared the obstacles located off the departure end of the runway. The airplane turned to the right, and "began to shake as if it was near stall speed." The airplane then appeared to stall, roll to the right about 90 degrees, and descend straight down toward the ground. Nearby surveillance video depicted the airplane entering a right roll that was at or about 90 degrees before it descended out of camera view.

Radar data obtained from the FAA depicted a target consistent with the airplane at an altitude about 100 feet mean sea level (msl), about 3,600 feet from the beginning of runway 8, about 200 feet off the right side of the runway. The radar target continued to drift to the right, and reached a maximum ground speed about 110 knots, and a maximum altitude about 300 feet. The target then entered a progressively steepening right bank, and slowed to a ground speed about 90 knots before radar contact was lost about 800 feet east-northeast of the accident site.

Pilot Information

Certificate:	Airline transport	**Age:**	65
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	May 7, 2012
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	10000 hours (Total, all aircraft)		

The pilot, age 65, held an airline transport pilot certificate, with ratings for airplane single-engine land, airplane multiengine land, and instrument airplane. He also held a flight instructor certificate with ratings for airplane single-engine land, airplane multiengine land and instrument airplane. The pilot also held type ratings for HS-125, CE-500, CE-650, CL-600, DA-200, G-1159 and Lear Jet series airplanes.

His most recent FAA first-class medical certificate was issued on May 7, 2012. At that time, he reported a total flight experience of "10,000+" hours, which included 95 hours during the previous 6 months.

The pilot's current logbook was not located. According to an FAA inspector, the accident pilot regularly flew several types of airplanes, including the Piper PA-31 series airplanes. Logbook excerpts current as of June 13, 2012, revealed about 70 hours logged since January 1, 2012, which included 12 hours in PA-31 series airplanes.

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N63CA
Model/Series:	PA-31T	**Aircraft Category:**	Airplane
Year of Manufacture:	1978	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	31T-7820033
Landing Gear Type:	Tricycle	**Seats:**	8
Date/Type of Last Inspection:	January 31, 2012 Continuous airworthiness	**Certified Max Gross Wt.:**	9000 lbs
Time Since Last Inspection:	23 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	5006 Hrs as of last inspection	**Engine Manufacturer:**	P&W Canada
ELT:	C126 installed, not activated	**Engine Model/Series:**	PT6A-28
Registered Owner:	M.A.S. Inc.	**Rated Power:**	680 Horsepower
Operator:	M.A.S. Inc.	**Operating Certificate(s) Held:**	None

The twin-engine, retractable-gear, low wing, all metal turbine powered airplane, serial number 31T-7820033, was manufactured in 1978. It was powered by two Pratt & Whitney Canada PT6A-28, 680-horsepower engines, equipped with three-bladed Hartzell constant-speed propeller assemblies.

The airplane was equipped with a Stability Augmentation System (SAS) designed to automatically improve the static longitudinal stability of the airplane by providing variable elevator force. This was accomplished through tension changes in an elevator down spring. An angle of attack sensing vane located on the right side of the fuselage nose section signals the SAS computer, which powers the elevator down spring servo. Other functions of the SAS computer are activation of the stall warning horn and providing the signal for the visual stall margin indicator on the upper left side of the instrument panel. The stall margin indicator receives its signal from the angle-of-attach vane through the conditioning computer and presents a visual indication of the ratio of present speed to the stall speed in the same configuration.

According to the airplane Pilot Operating Handbook, the listed Air Minimum Control Speed (Vmca), which was the lowest airspeed at which the airplane is controllable with one engine operating and no flaps was an indicated airspeed of 91 knots. The single engine best rate of climb speed was 113 knots.

The airplane was equipped with four interconnected fuel tanks in each wing, in addition to a respective wingtip fuel tank. The right and left wing fuel systems were independent of each other and fuel was supplied to the engines by its respective inboard fuel cell. The total fuel system capacity was 374 gallons. According to fueling records, the airplane was refueled 51 gallons of Jet-A fuel prior to the accident flight. A line serviceman reported that approximately 25 gallons of fuel was added to the left and right wingtip fuel tanks. The total amount of fuel onboard the airplane at the time of the accident could not be determined.

At the time of the accident, the airplane had been operated for about 5,030 total hours, which included about 25 hours since its most recent documented phase inspections, which were performed on January

31, 2012. The airplane was operated for about 12 total hours during 2011.

In addition, at the time of the accident, the right and left engines had been operated for about 1,430 hours since they were overhauled during November 2000. The right propeller had been operated for about 3 hours since it was installed after overhaul during November 2012, and the left propeller had been operated for about 135 hours since it was installed after overhaul during November 2008.

The registered owner reported that the airplane had flown about 3 additional hours in November, after the airplane was delivered from Sarasota, Florida, to FXE.

Review of maintenance records did not reveal a current annual inspection for the airplane.

An airframe and powerplant mechanic reported that he was hired by one of the passengers to conduct a 100 hour inspection of the airplane, which he worked on during the month prior to the accident, but was not completed due to the avionics work that was being performed at the time. He further stated that the airplane still required a landing gear swing, weight and balance check, and a flight control system check before the inspection could be completed and logged. The mechanic was not provided any "squawks" and was not aware of an issue with the right engine oil temperature gauge.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	FXE,13 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	16:39 Local	**Direction from Accident Site:**	135°
Lowest Cloud Condition:	Scattered / 4000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	60°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.15 inches Hg	**Temperature/Dew Point:**	21°C / 8°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Fort Lauderdale, FL (FXE)	**Type of Flight Plan Filed:**	None
Destination:	Fort Lauderdale, FL (FXE)	**Type of Clearance:**	None
Departure Time:	16:20 Local	**Type of Airspace:**	

The reported weather at FXE, elevation 13 feet, at 1639, was: wind 060 degrees at 7 knots, visibility 10 statute miles; scattered clouds at 4,000 feet; temperature 21 degrees Celsius (C); dew point 8 degrees C; altimeter 30.16 inches of mercury.

Airport Information

Airport:	Fort Lauderdale Executive FXE	**Runway Surface Type:**	Asphalt
Airport Elevation:	13 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	08	**IFR Approach:**	None
Runway Length/Width:	6002 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	2 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Fatal	**Latitude, Longitude:**	26.191667,-80.156112

The airplane impacted the ground and several parked vehicles, and came to rest inverted on a heading of about 275 degrees, about .6 miles southeast of the departure end of the runway. A postcrash fire consumed the airframe, with the exception of the right wingtip fuel tank, which was located about 20 feet south of the main wreckage, was not fire damaged, and contained about 3 quarts of fuel consistent with Jet-A. Both wings, the vertical stabilizer, rudder, horizontal stabilizer, elevators and trim tabs were destroyed. Due to the fragmented and fire damaged postaccident condition of the wreckage, flight control continuity could not be confirmed from the cockpit to the respective flight control surfaces. The right landing gear was found retracted in its respective gear well, while the structure around the nose and left main landing gears was compromised. The left and right flap actuator jackscrews indicated the flaps were in the retracted position. Recovered components from the stability augmentation system were impact and fire damaged; however, the control arm was observed in the up (airplane stalled) position.

Both engines were destroyed by impact and fire damage. They were located amongst the main wreckage, attached to their mounts and partially attached to their respective firewalls. Examination of both engines did not reveal evidence of any preimpact mechanical malfunctions that would have precluded normal operation. The left engine displayed compressive deformation to the exhaust duct, combustion chamber liner, power turbine shaft housing, and the gas generator case. The propeller shaft and the compressor rear hub coupling displayed torsional overload and bending fractures. The right engine displayed compressive deformation to the exhaust duct, combustion chamber liner, power turbine shaft housing, and the gas generator case. The front reduction gearbox flange was partially fractured and the gearbox had separated from the engine. The left and right engine's compressor turbine and power turbine displayed rotational signatures indicative of rotation at impact. The damage was consistent with rotation somewhere between the low to mid-range power setting. It was noted that the left engine displayed more pronounced rotational signatures than the right engine. According to the engine manufacturer, the difference in rotational signatures between the left and right engine could be attributed to compression differences in the external cases and the internal components adjacent to the rotating components that occurred during the impact sequence.

The left propeller assembly sustained severe thermal damage and separated at the engine shaft. One blade was fractured off the hub. Two blades remained attached and displayed rotational scoring and twisting damage. The right propeller remained attached to the gear box, which separated from the engine. One propeller blade was fractured off the hub. The two remaining blades exhibited mild bending with no twisting damage. Examination of both propeller assemblies did not reveal evidence of any preimpact mechanical malfunctions that would have precluded normal operation. According to representative of the propeller manufacturer, damage to the right propeller was consistent with "low to no power," while damage to the left propeller was consistent with "power on."

Flight recorders

The airplane was not equipped, nor was it required to be equipped with a cockpit voice recorder or flight data recorder.

Medical and Pathological Information

Autopsies were performed on the pilot and passengers by the Broward County Medical Examiner, Fort Lauderdale, Florida. The autopsy reports indicated the cause of death as "multiple blunt force injuries."

Toxicological testing was performed on the pilot by the FAA Bioaeronautical Science Research Laboratory, Oklahoma City, Oklahoma, with no anomalies noted.

Tests and Research

Sound Spectrum Study

Three audio transmissions were received from the accident airplane during the flight. The audio transmissions were provided to the NTSB Vehicle Recorder Division's Laboratory for sound spectrum evaluation pertinent to engine operation. The first two transmissions were made while the airplane was operating on the ground prior to takeoff. The last transmission was made after the airplane became airborne, when the pilot reported that he was experiencing an emergency. Based on the evaluation of the transmissions, and information provided by the engine manufacturer, lines of energy observed in the first two transmissions were consistent with at least one engine operating at or near rotation rates consistent with a ground power idle setting. Lines of energy observed during the third transmission were consistent with at least one engine operating at or near rotation rates consistent with a takeoff power

setting [Additional information can be found in the Sound Spectrum Study located in the public docket].

Administrative Information

Investigator In Charge (IIC):	Schiada, Luke
Additional Participating Persons:	Jose M Santiago; FAA/FSDO; Miramar, FL Ron Maynard; Piper Aircraft; Vero Beach, FL Dan Boggs; Hartzell Propeller; Piqua, OH Jeff Davis; Pratt & Whitney Canada; Bridgeport, WV
Original Publish Date:	November 5, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=86432