Aviation Investigation Final Report

Location:	Leesburg, Virginia	**Accident Number:**	IAD03FA035
Date & Time:	March 1, 2003, 14:45 Local	**Registration:**	N700PP
Aircraft:	Socata TBM 700	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General aviation		

Analysis

The private pilot, who sat in the left seat, was executing the LOC RWY 17 instrument approach in actual instrument meteorological conditions, when the airplane decelerated, lost altitude, and began a left turn about 2 miles from the airport. Subsequently, the airplane collided with terrain and came to rest on residential property. The radar data also indicated that the airplane was never stabilized on the approach. A witness, a private pilot, said the airplane "appeared" out of the fog about 300-400 feet above the ground. It was in a left bank, with the nose pointed down, and was traveling fast. The airplane then "simultaneously and suddenly level[ed] out," pitched up, and the engine power increased. The witness thought that the pilot realized he was low and was trying to "get out of there." The airplane descended in a nose-high attitude, about 65 degrees, toward the trees. Radar data indicates that the airplane slowed to 80 knots about 3 miles from the airplane, and then to 68 knots 18 seconds later as the airplane began to turn to the left. Examination of the airplane and engine revealed no mechanical deficiencies. Weather reported at the airport 25 minutes before the accident included wind from 140 degrees at 5 knots, visibility 1 statute mile, and ceiling 500 foot overcast. Weather 5 minutes before the accident included wind from 140 degrees at 5 knots, visibility 1 statute miles, and ceiling 300 foot overcast.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to fly a stabilized, published instrument approach procedure, and his failure

to maintain adequate airspeed which led to an aerodynamic stall.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: APPROACH - FAF/OUTER MARKER TO THRESHOLD (IFR)

Findings
1. (C) UNSTABALIZED APPROACH - CONTINUED - PILOT IN COMMAND
2. (C) AIRSPEED - NOT MAINTAINED - PILOT IN COMMAND
3. STALL - INADVERTENT

Occurrence #2: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: APPROACH - FAF/OUTER MARKER TO THRESHOLD (IFR)

Findings
4. OBJECT - TREE(S)

Factual Information

HISTORY OF FLIGHT

On March 1, 2003, about 1445 eastern standard time, a Socata TBM-700, N700PP, was substantially damaged when it collided with trees, during an instrument approach to Leesburg Executive Airport (JYO), Leesburg, Virginia. The certificated airline transport pilot, the private pilot, and the passenger were fatally injured. The airplane was owned and operated by High Performance Technologies, Incorporated, Arlington, Virginia. An instrument flight rules (IFR) flight plan was filed for the flight that originated at Greenville-Spartanburg International Airport (GSP), Greer, South Carolina, about 1230. Instrument meteorological conditions prevailed for the business flight conducted under 14 Code of Federal Regulations Part 91.

Several witnesses observed and heard the airplane. According to one witness, a private pilot and an airplane owner based at Leesburg, he was in his truck approaching a stop sign when he first saw and heard the airplane. He said the airplane "appeared" out of the fog about 300-400 feet above the ground, directly in front of where he was located. The airplane was in a "slight left bank" (10-15 degrees), with the nose pointed "slightly down" (about 20-25 degrees), and traveling fast. The airplane was in a left turn, moving south to east, and toward the north.

The witness then observed the airplane to "simultaneously and suddenly level out," pitch up (20-25 degrees), and increase power. The change in engine sound was similar to when an airplane applied power for take-off. The witness thought that the pilot realized he was low and was trying to "get out of there."

The airplane continued to descend in the nose-high attitude toward the trees. The witness estimated the descent angle of the airplane to be 65 degrees, before he lost sight of it as it descended behind trees.

The witness described the attitude of the airplane. He said, "It looked as if he got on the backside of the power curve... If he had had more altitude, he may have recovered. But, even if he did recover, there was still a ridge directly in front of his position that he would have had to clear, and I am not sure if he would have been able to do that." The witness also noted that the engine was operating normally, and the weather was foggy with low visibility.

A second witness stated that she was on her back porch about 1/8 mile from the accident site, when she heard an airplane engine getting "louder and louder." She then stepped off her porch and went out into her backyard. When she looked up, the airplane flew directly overhead going east bound, and it was about five stories above the ground. The belly of the airplane was parallel to the ground and was colored blue. The landing gear was not extended. The engine sounded "loud and constant" the entire time.

The airplane then made a sharp left bank and started to turn toward the north. It continued to increase the left bank, when the nose dropped down into the trees, and the witness lost sight of it.

The witness also described the weather as a gray overcast, but not foggy.

A third witness was in his yard, which he stated was about 1/4 mile from the accident site. He first heard an airplane flying low overhead. When he looked up, he saw it exiting the clouds, about four stories above the ground, in a level attitude, headed east. The airplane then made a sharp left bank and started to turn towards the north. The nose of the airplane "was being pulled up" while in the turn. It then dropped, and pointed down toward the ground. The witness did not see the airplane hit the ground, but noted that the engine sounded as if it was "cutting in-and-out" before impact. The witness also noted that the weather was "very foggy."

A fourth witness was in her backyard, located across the street from the accident site. She heard the sound of an airplane engine "revving up and down." The witness then looked up and saw the airplane on its side, descending through the trees. It was "teetering" back and forth as it descended, and the top of it was facing her direction. The witness also described the weather as foggy.

A fifth witness said that he heard an airplane that sounded really low, but could not see it. The engine sounded "normal", then faded for about 10 seconds, then began to "surge" or "race". Two to 3 seconds later, he heard a crashing sound. The witness also stated that the weather was extremely cloudy and foggy.

A sixth witness was in his home, which was located "very nearly under" the localizer approach and about 3 miles from runway 17 at Leesburg Executive Airport. He first heard the sound of the engine, which he described to be in "approach" mode or idle RPM. The witness thought the airplane was at the same altitude as his home, about 250 above ground level. The witness moved to the front of his home and looked outside in an attempt to see the airplane, but the visibility was less than 100 feet. Based on what he heard, and where he residence was located, the witness stated, " the airplane had descended considerably below the minimum descent altitude far short of the runway."

A review of air traffic control communications revealed that the pilot received radar vectors to intercept the localizer course for the LOC RWY 17 approach.

At 1429, an approach controller provided the current altimeter setting and asked the pilot if had the current weather conditions. The pilot acknowledged the altimeter setting and reported that he had the current weather information.

At 1440, the approach controller instructed the pilot to intercept the localizer course, and the pilot acknowledged. About 1 minute later, the approach controller advised the pilot that he

was located 3 miles north of WARDE intersection (final approach fix), to maintain 3,000 feet until established, and that he was cleared for the LOC RWY 17 approach. The pilot acknowledged.

At 1442, the approach controller advised the pilot to cancel IFR services with Leesburg Flight Service Station (FSS) once on the ground, and approved a change in radio frequency for airport advisories. The pilot acknowledged, and there were no further communications from the pilot.

A review of radar data revealed an instrument flight rules (IFR) target approaching the Leesburg Airport from the north west. Examination of the last 4 minutes of radar data revealed the target turned toward the south about 9 miles from the end of runway 17. At that time the target was at an altitude of 3,100 feet msl and at a ground speed of 180 knots.

As the target continued to maneuver toward the south, it made a series of left and right hand turns along the localizer course. When the target was about 5 miles north of the runway, it was at an altitude of 1,700 feet msl and at an airspeed of 130 knots.

As the airplane continued to proceed toward the airport, it continued to make left and right hand turns along the course.

As the airplane crossed over the final approach fix, about 4 miles north of the airport, it was at an altitude of 1,700 feet msl, at a ground speed of 91 knots.

When the target was approximately 3 miles north of the airport, it was at an altitude of 800 feet msl, at a ground speed of 80 knots.

Eighteen seconds later, the target began a left turn to the east before the data ended at 1445:29. The last radar target was located at 38 degrees, 57 minutes north latitude, and 77 degrees, 27 minutes west longitude, at an altitude of 700 feet msl, and at a ground speed of 68 knots.

The accident occurred during the hours of daylight approximately 39 degrees, 07 minutes north latitude, and 77 degrees, 34 minutes west longitude.

PERSONNEL INFORMATION

The pilot in the left seat held a private pilot certificate with ratings for single engine land and instrument airplane. His most recent Federal Aviation Administration (FAA) second class medical certificate was issued on August 09, 2002. At that time, he reported 730 hours of flight experience.

Several requests were made to the family to obtain the pilot's personal logbooks. However, they were not made available for review.

SECOND PERSONNEL INFORMATION

The pilot in the right seat held an airline transport pilot certificate for airplane multi-engine land, with ratings for the ATR-42, ATR-72, B-737, and DHC-7. He also held a commercial pilot certificate for airplane single engine land, a certified flight instructor certificate for airplane single engine land, airplane multi-engine land, and instrument airplane. His most recent FAA second class medical certificate was issued on November 18, 2002. At that time, he reported 8,375 hours of flight experience.

According to the pilot's wife, he carried a logbook with him during trips, in a jacket pocket. However, the jacket and logbook were never located.

Both pilots completed TBM-700 ground and simulator/flight proficiency training at SIMCOM International, Inc. Pilot Training Center, Orlando, Florida, in December 2002. A review of training records revealed that both pilots practiced IFR procedures, which included a LOC approach.

According to a representative of the owner's insurance company, the pilot's insurance policy required a second pilot to be in the cockpit anytime the pilot was flying the airplane.

AIRCRAFT INFORMATION

The Socata TBM 700 was a single-engine turboprop, 6-7 seat, high-performance, pressurized, fixed-wing airplane. Examination of maintenance records revealed that the airplane and the Pratt and Whitney Canada PT6A-64 (750 SHP) engine underwent an annual inspection on May 24, 2002, at a total time of 1,049.1 hours each.

At the time of the accident, the engine and airplane had each accrued a total of 1,175 hours.

METEOROLOGICAL INFORMATION

Weather reported at the airport, at 1400, included winds from 150 degrees at 5 knots, temperature 37 degrees F, dewpoint 35 degrees F, and altimeter setting 30.14 inches Hg. The visibility was 1 statute mile and the ceiling was 500 feet overcast.

Weather reported at the airport, at 1420, included winds from 140 degrees at 5 knots, temperature 37 degrees F, dewpoint 35 degrees F, and altimeter setting 30.13 inches Hg. The visibility was 1 statute mile and the ceiling was 500 feet overcast.

Weather reported at the airport, at 1440, included winds from 140 degrees at 5 knots,

temperature 37 degrees F, dewpoint 35 degrees F, and altimeter setting 30.13 inches Hg. The visibility was 1 statute mile and the ceiling was 300 feet overcast.

Weather reported at the airport, at 1500, included winds from 140 degrees at 4 knots, temperature 37 degrees F, dewpoint 35 degrees F, and altimeter setting 30.12 inches Hg. The visibility was 1 statute mile and the ceiling was 300 feet overcast.

AIDS TO NAVIGATION

The published inbound course for the LOC RWY 17 approach was 171 degrees magnetic, and the minimum descent altitude was 720 feet above mean sea level (msl). The crossing altitude at WARDE intersection was 1,800 feet msl. The distance between WARDE and the missed approach point, which was located at the end of runway 17, was 3.9 nautical miles. The airport elevation was 389 feet msl.

The published weather minimums for the LOC RWY 17 approach included a 400-foot ceiling and 1-mile visibility.

AERODROME INFORMATION

Leesburg Executive Airport runway 17 was a 5,500-foot-long and 100-foot-wide asphalt runway, which was equipped with a 4-light precision approach path indicator (PAPI) system, medium intensity runway lights (MIRL), a five-light omni-directional approach lighting system (ODALS), but no runway end identifier lights (REIL).

According to the Airport Manager, the Localizer and the Automated Weather Observing System (AWOS) were examined after the accident, and no anomalies were noted. Both systems were re-certified and put back into service.

WRECKAGE AND IMPACT INFORMATION

The airplane wreckage was examined at the site on March 1-3, 2003. All major components were accounted for at the scene. The airplane came to rest upright, in the backyard of a private residence, on a heading of 045 degrees, at a ground elevation of approximately 395 feet msl, about 2 nautical miles north of the airport.

Initial tree impact scars started about 75 feet from the main wreckage, and several broken tree branches were located at the base of the approximately 75-foot trees. Tree impact scars became progressively lower on the trees in the direction of the main wreckage.

Several cut tree branches were found along the wreckage path. Examination of the branches

revealed that the ends were cut at approximately 45-degree angles. The surface of the cuts exhibited black paint transfer marks.

The outboard section of the right elevator, a section of right wing fuel tank, the right main landing gear without its tire, and the inboard section of the left wing were found scattered along the wreckage path.

The main fuselage was relatively intact. Examination of the fuselage revealed some wrinkles starting after the engine compartment and back toward the tail along the left and right side of the fuselage. The base of the vertical stabilizer was cracked and buckled.

The right wing was separated outboard of the wing root. An approximately 4-foot section of the forward and rear wing spars remained attached to the fuselage at the wing root, and were displaced aft.

The right wing came to rest inverted and was sitting underneath the fuselage. The flap and aileron were separated, exhibited impact damage, and were located near the right wing.

The left wing was separated at the wing root, except for a small portion of structure, which supported the left main landing gear. The wing structure was fragmented. A 5- to 6-foot long inboard section of the wing came to rest next to the tail section, and exhibited leading edge impact damage. The flap also separated, and exhibited impact damage. The remaining portion of the wing, with the aileron intact, came to rest up against a fence located to the left of the main wreckage.

Flight control continuity was established for both ailerons to the wing root. However, the cables were separated, and exhibited "broomstraw" ends, consistent with overload.

The vertical stabilizer was intact, and did not exhibit any impact damage.

The rudder was intact, but the base of the rudder trim exhibited some impact damage.

The horizontal stabilizer remained partially attached to the tail cone, was tilted to the left, and was displaced downward. Examination revealed some leading edge impact damage on both sides. The left elevator and left trim tab were intact. The inboard section of the right elevator and trim tab were separated. The left elevator push-pull tube remained attached to the elevator lever arm. The right elevator push-pull tube remained attached to the elevator lever arm, but the elevator lever arm was separated.

Flight control continuity was established from the tail control surfaces to the aft cabin area.

Examination of the engine revealed that it was intact in the airframe nacelle. The engine mount was separated from the firewall structure at the lower right, upper right, and upper left locations. The upper rear cowling was separated and was lying immediately forward of the

main engine. There was no fire damage. All engine-to-airframe connections were intact.

The propeller and propeller shaft were separated and came to rest approximately 15 feet forward of the engine. The propeller servo piston and cylinder were fractured from the hub. The blades rotated freely on the hub mounts.

One blade was bent forward approximately 30 degrees from approximately mid-span, and the tip was slightly deformed toward low pitch. The second blade was positioned toward low pitch and slightly aft from approximately mid-span. The third blade was bent aft toward low pitch starting at the blade root. The fourth blade was also bent aft and toward low pitch from approximately mid-span, and the tip was wrinkled toward the tip.

Each blade exhibited leading edge nicks and chordwise scratching.

The engine was examined on July 8-9, 2003, at the Pratt & Whitney Canada Service Investigation Facilities at St. Hubert, Quebec, Canada, under the supervision of the Safety Board.

Circumferential scoring was displayed by the compressor impeller, the impeller shroud, the compressor turbine, the first stage power turbine vane ring, the first stage power turbine due to their making axial contact with their adjacent components under impact loads and external housing deformation. The compressor shrouds, the compressor turbine shroud, and the power turbine shrouds displayed extensive circumferential rubbing and scoring due to their making contact with their adjacent rotors under impact loads and external housing deformation. The reduction gearbox propeller shaft was fractured in torsion due to power absorbed during the impact.

Examination of the fuel heater revealed the thermal valve to be in the full hot position. The thermal element was found to be non-responsive.

Examination of the pneumatic air lines, compressor discharge (P3), and the power turbine control (Py) revealed that the Py line was intact from the fuel control fitting to the torque limiter. The propeller governor fitting exhibited impact damage.

The chip detector was recovered separately in its mounting boss. The magnetic elements were clean. The oil, fuel, and P3 filters were also absent of debris.

The fuel heater, the fuel control unit and the fuel pump were functionally tested, and no anomalies were noted

The propeller governor was functionally tested, with minor deviations attributable to field adjustment. The overspeed governor could not be tested because the flyweights were impact damaged.

The torque limiter was functionally tested and no anomalies were noted.

Examination of the pilot and co-pilot altimeters revealed that both were set at 30.13 inches Hg.

MEDICAL AND PATHOLOGICAL INFORMATION

Autopsies were performed on both pilots, on March 3, 2003, by the Medical Examiner's Office, Fairfax, Virginia.

Toxicological testings were conducted by the FAA Toxicology Accident Research Laboratory, Oklahoma City, Oklahoma.

ADDITIONAL INFORMATION

In the past 6 years, there were 4 fatal airplane accidents in and around Leesburg, Virginia. Three of the accidents, including this accident, involved pilots who had been cleared by air traffic control (ATC) to execute the LOC RWY 17 non-precision instrument approach. The other accident involved a pilot who reported an engine problem. Three of the accidents occurred within 9 months of each other, and 2 of the accidents occurred within 3 weeks of each other.

Since the events of September 11, 2001, overall general aviation (GA) traffic has experienced a downturn of about 5-10 percent. However, Leesburg Airport's traffic has seen an increase relative to the overall GA industry, especially in the high-end categories of jet, turboprop, and high performance piston aircraft. Because of new security requirements around Washington, many of the operators who would have formerly used Reagan National airport now use Leesburg. According to airport authorities, based aircraft comprise about 5 percent jet aircraft, which is far more than the usual 1-2 percent ratio for airports with similar activity levels.

On April 21, 2003, the Safety Board presented a safety suggestion to the manager of the Leesburg Executive Airport to incorporate a vertical guidance system to the existing instrument landing approach at the airport. Such vertical guidance could have been provided by the installation of glide slope equipment with appropriate procedures, and/or by the incorporation of global positioning system (GPS) LNAV/VNAV (lateral/vertical navigation) and Wide Area Augmentation System (WAAS) enhanced GPS.

In December 2003, the President of the United States signed an appropriation bill, which allocated the FAA 1 million dollars to install an Instrument Landing System (ILS) at Leesburg Executive Airport. According to a representative of the airport, as of January 2003, the town was in negotiations to purchase the land needed for the installation of the ILS equipment shack. Once the land was acquired, the FAA would conduct an environmental assessment and have the system designed and installed.

The airplane wreckage was released on July 16, 2003, to a representative of the salvage company.

Pilot Information

Certificate:	Private	**Age:**	58,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	August 9, 2002
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	730 hours (Total, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	42,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 multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	November 18, 2002
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	8375 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Socata	**Registration:**	N700PP
Model/Series:	TBM 700	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	59
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	May 24, 2002 Annual	**Certified Max Gross Wt.:**	4050 lbs
Time Since Last Inspection:	134.6 Hrs	**Engines:**	1 Turbo prop
Airframe Total Time:	1049.1 Hrs as of last inspection	**Engine Manufacturer:**	Pratt & Whitney Canada
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	PT6A-64
Registered Owner:	High Performance Technologies Inc	**Rated Power:**	750 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	JYO,389 ft msl	**Distance from Accident Site:**	2 Nautical Miles
Observation Time:	14:40 Local	**Direction from Accident Site:**	45°
Lowest Cloud Condition:		**Visibility**	1 miles
Lowest Ceiling:	Overcast / 300 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	140°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.12 inches Hg	**Temperature/Dew Point:**	3°C / 2°C
Precipitation and Obscuration:	N/A - None - Fog		
Departure Point:	Spartanburg, SC (GSP)	**Type of Flight Plan Filed:**	IFR
Destination:	Leesburg, VA (JYO)	**Type of Clearance:**	IFR
Departure Time:	12:30 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	Leesburg Exectutive Airport JYO	**Runway Surface Type:**	Asphalt
Airport Elevation:	389 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:	17	**IFR Approach:**	Localizer only
Runway Length/Width:	5500 ft / 100 ft	**VFR Approach/Landing:**	Unknown

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Fatal	**Latitude, Longitude:**	39.116664,-77.571388

Administrative Information

Investigator In Charge (IIC):	Yeager, Leah
Additional Participating Persons:	BARRY BARBINI; FAA/FSDO; DULLES, VA THOMAS BERTHE; PRATT AND WHITNEY CANADA; BURLINGTON, VT WAYNE MILLER; EADS SOCATA AIRCRAFT COMPANY; PEMBROKE PINES, FL
Original Publish Date:	August 31, 2004
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=56555