



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	MARIETTA, PA	<b>Accident Number:</b>	NYC98FA179
<b>Date &amp; Time:</b>	09/04/1998, 2040 EDT	<b>Registration:</b>	N600JB
<b>Aircraft:</b>	Smith, Ted Aerostar TS-600	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>		<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General Aviation - Positioning		

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## Analysis

The airplane departed at night after maintenance was performed on the left engine. The pilot attempted to return to the airport and while on base leg struck the ground inverted and nose down. The left engine propeller was found feathered. On the left engine, the # 5 cylinder was off the engine and the # 5 piston with the connecting rod still attached were found nearby. Interviews revealed that during maintenance, the # 1,3,5, and 6 cylinders had been removed and reinstalled; however, the # 5 cylinder had not been tightened. Several people had worked on the airplane at various stages of the work. The maintenance facility did not have a system to pass down what had been accomplished, and the FAA did not require the tracking of work accomplished in other than 14 CFR Part 121, or 14 CFR Part 145 facilities.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of the pilot to maintain airspeed during a precautionary landing which resulted in a loss of control while operating with one engine shutdown. An additional cause was the improper maintenance procedures that resulted in the #5 cylinder not being tightened down. A factor was the night conditions.

## Findings

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Occurrence #1: LOSS OF ENGINE POWER(PARTIAL) - MECH FAILURE/MALF  
Phase of Operation: TAKEOFF - INITIAL CLIMB

### Findings

1. 1 ENGINE
2. (C) MAINTENANCE,INSTALLATION - IMPROPER - OTHER MAINTENANCE PERSONNEL
3. (F) LIGHT CONDITION - NIGHT
4. (C) ENGINE ASSEMBLY,CYLINDER - SEPARATION
5. ENGINE SHUTDOWN - PERFORMED - PILOT IN COMMAND

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Occurrence #2: LOSS OF CONTROL - IN FLIGHT  
Phase of Operation: APPROACH - VFR PATTERN - BASE TURN

### Findings

6. (C) AIRSPEED(VMC) - NOT MAINTAINED - PILOT IN COMMAND

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Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER  
Phase of Operation: DESCENT - UNCONTROLLED

### Findings

7. TERRAIN CONDITION - CROP

## Factual Information

### HISTORY OF FLIGHT

On September 4, 1998, about 2040 eastern daylight time, a Ted Smith, TS-600, N600JB, struck the ground during a precautionary landing at Donegal Springs Airpark, Marietta, Pennsylvania. The airplane was destroyed, and the certificated private pilot was fatally injured. Night visual meteorological conditions prevailed for the flight that had departed about 2035. No flight plan had been filed for the flight, which was destined for Wings Field, Philadelphia, Pennsylvania, and was conducted under 14 CFR Part 91.

The airplane had been at the Donegal Springs Airpark for maintenance on the left engine. A witness to the accident had flown to Wings Field, picked up the accident pilot, and returned him to Donegal Springs Airpark. The witness described the accident pilot as relaxed and upbeat, and his pre-flight inspection as thorough.

The witness reported that during the run-up, the engines sounded normal. He observed the airplane depart from Runway 27, with the navigation lights illuminated. He first became concerned after the airplane became airborne, and he heard the first power reduction. He described it as greater than he was used to hearing.

The witness continued to watch the airplane depart straight out and then turn to a left crosswind. As the airplane turned downwind, it angled toward the airport building, but stayed south of a road. The witness watched the airplane as it passed near the building and he estimated its altitude to be 400 feet above the ground. He could see the airplane illuminated against the sky, but could not determine if the landing gear was extended, or if one engine was shut down. Based on the sound, he thought both engines were operating at that time. As the airplane passed the building, the witness observed it turn away from the runway, as though the pilot was increasing the airplane's distance from the runway prior to turning base leg.

The witness reported that shortly after the airplane turned a left base for Runway 27, it disappeared from view behind another building. A few seconds later, he heard an increase in power, similar to full throttle, followed by a thud or impact sound about 1 second later. He could not hear the airplane after that, and called 911.

The airplane was found in a field near the approach end of Runway 27. The accident occurred during the hours of darkness at 40 degrees, 5.5 minutes north latitude, and 76 degrees, 33.81 minutes west longitude.

### PERSONNEL INFORMATION

The pilot held a private pilot certificate with ratings for airplane single and multiengine land, and instrument airplane. He was issued a Federal Aviation Administration (FAA) Third Class Airman Medical Certificate, with no limitations on August 25, 1998. According to his pilot log book, which was current through August 14, 1998, he had logged a total time of 1,185.2 hours, 1,067.6 hours as pilot-in-command, and 397.9 hours in multiengine airplanes, all in accident airplane.

A check of the pilot's logbook revealed that he had received his multiengine rating on June 13, 1992, with a total multiengine time of 41.4 hours. He received his multiengine instrument rating on December 22, 1992, with a total multiengine time of 82.7 hours. Following that check ride, between November 2, 1993, and November 23, 1993, he received

eight training flight which included instrument approaches. The last recorded dual instruction flight occurred on November 23, 1996.

#### AIRCRAFT INFORMATION

The airplane was a 1967 Ted Smith Aerostar 600. The airplane was serial number 60-0001, the original production prototype for the type certificate data sheet A17WE. The airplane was maintained under an annual inspection program.

Maintenance logbooks found in the airplane revealed that the last recorded annual inspection occurred on February 27, 1995. The last recorded inspection of the engines occurred on February 29, 1996. A check with the executor of the pilot's estate and a search of the pilot's residence failed to find any additional logbooks.

A check of the maintenance records from the facility that performed the maintenance failed to find a record of an annual inspection more recent than the inspection found in the airplane maintenance logbooks.

The weight of the airplane at takeoff was computed at 4,481.8 pounds. The maximum allowable takeoff weight was 5,500 pounds.

According to the FAA Approved airplane flight manual, the minimum single engine airspeed was 92 miles per hour calibrated airspeed, or 97 miles per hours indicated airspeed.

#### AIRDROME INFORMATION

Donogal Springs Airpark was located in a rural area. The surrounding area was devoted to farming and the lighting was minimal. The single runway was 9/27, and was 3,250 feet long, 50 feet wide, and had an asphalt surface. The runway was equipped with medium intensity edge lights.

#### WRECKAGE AND IMPACT INFORMATION

The airplane was examined at the accident site on September 5 and 6, 1998. The examination revealed that the airplane had impacted in a cornfield, and came to rest in an adjacent soybean field, 365 feet south of the runway centerline, and 1,400 feet east of the approach end of Runway 27. The debris path was 67 feet long, and pointed toward the approach end of Runway 27. The right engine alternator was found on the left side of the debris trail. The remnants of the left side cabin door with the door handle in the locked position, and the locking pins bent, were found on the right side of the debris trail.

Flight control continuity was confirmed to the rudder, ailerons, and elevator. The rudder trim was in the neutral position, and the elevator trim tab was trailing edge tab down (elevator up) position.

The nose of the airplane was crushed rearward. The landing gear was extended, and the wing flaps were in a retracted position. The right engine was separated from its mount, and the right engine propeller was separated from the engine, similar to a torsion shear. The right engine propeller was not feathered. Chordwise scoring marks were observed on the front of the propeller blades.

The left engine was bent up from the engine mounts, and the propeller, which was still attached, was in the feathered position. The number 5 cylinder and piston had separated from the engine and were found along the debris path. The piston, with the connecting rod still

attached, was separated from the crankshaft. Impact marks were found on the piston that corresponded to the retaining studs used to hold the cylinder in place. Oil streaking was visible on the top and bottom of the wing behind the engine. The paint in the exhaust area was blistered.

#### MEDICAL AND PATHOLOGICAL INFORMATION

A Forensic Pathologist, for the Office of the Coroner, Lancaster County, Pennsylvania conducted an autopsy on the pilot on September 7, 1998.

The toxicological testing report from the FAA Toxicology Accident Research Laboratory, Oklahoma City, Oklahoma was negative for drugs and alcohol for the pilot.

#### TESTS AND RESEARCH

The cylinder nuts on the left engine were checked for torque by use of a dial indicator calibrated torque wrench, applied in a tightening motion until the nut moved. The torque on some of the nuts was lower than the specified value. The investigation could not determine if the lower values were the result of improper torquing or the result of the impact forces during the accident.

On September 8, 1998, a check of the calibrated torque wrenches used by the maintenance facility revealed that they were within specification.

The left engine was examined at the Textron-Lycoming plant in Williamsport, Pennsylvania on September 24, 1998. The examination found no evidence of a mechanical failure or malfunction other than previously listed. A portion of one cylinder hold down nut was found inside the engine case.

#### ADDITIONAL INFORMATION

A certificated mechanic who held airframe and powerplant certificates, along with Inspection Authorization (IA) owned the maintenance shop that performed the work on the left engine. In addition, there was another mechanic who held identical certificates, and inspection authorization. Other mechanics employed by the maintenance facility did not hold inspection authorization.

During the maintenance on the left engine, a mechanic removed the numbers 1,3, 5, and 6 cylinders. The shop owner then honed the cylinders and installed new rings on them. After replacing the rings, he reinstalled the number 5 and 6 cylinders. He tightened the retaining nuts to finger tight, but did not torque them. The shop owner and the other IA then installed the number 1 and 3 cylinders. After the installation, the shop owner asked the other IA to torque the retaining nuts on the cylinders. The shop owner did not specify which cylinders were to be torqued, and the other IA did not ask which cylinders needed to be torqued. The other IA tightened the nuts on the numbers 1,3, and 6 cylinders. When finished, he remounted the engine to the airframe.

The engine was then given a ground run by the shop owner. During the engine run, the "P" lead on the left magneto of the left engine was found to be disconnected, and was reconnected.

The shop owner then conducted a second engine run, this time to full power, and afterwards the engine was again checked for leaks. The lower cowling was reinstalled, and the aft fuselage tank was serviced with 28 gallons of 100 LL aviation grade gasoline.

When interviewed, the other IA reported that when he started to work on the engine, he noticed that the valve covers, pushrods, pushrod tubes, lifters and baffles were off the numbers 1, 3, and 5 cylinders on the right side. He was unaware that the number 5 cylinder had been removed and attributed the missing components on that cylinder to the mechanic who had removed the other cylinders as doing more work than needed. He reported that after he torqued the numbers 1, 3, and 6 cylinders, he replaced everything on the numbers 1,3, 5 and 6 cylinders, including the valve covers, lifters, pushrods, pushrod tubes, and baffles.

A check of the maintenance facility's procedures revealed that there were none in place for the tracking of information on work already initiated, yet not completed. A check of FAA regulations revealed that the tracking of maintenance information was only required for maintenance shops that were certificated as repair stations under 14 CFR Part 145, or in 14 CFR Part 121 operations. The maintenance facility that performed the work did not fit either classification.

Examination of the airplane maintenance logbooks revealed no entry for the work performed. Additionally, no maintenance release had been prepared by the maintenance facility.

According to Advisory Circular AC 43-9B MAINTENANCE RECORDS, dated January 9, 1984: MAINTENANCE RECORD REQUIREMENTS:

"a. Responsibilities. Aircraft maintenance record keeping is a responsibility shared by the owner/operator and maintenance persons, with the ultimate responsibility assigned to the owner/operator by FAR 91, Section 91.165. Sections 91.165 and 91.173 set forth the requirements for owners and operators, while FAR Part 43, Sections 43.9 and 43.11 contain the requirements for maintenance persons. In general, the requirements for owners/operators and maintenance persons are the same; however, some small differences exist...."

"b. Maintenance Record Entries Required. Section 91.165 requires each owner or operator to ensure that maintenance persons make appropriate entries in the maintenance records to indicate the aircraft has been approved for return to service. Thus, the prime responsibility for maintenance records lies with the owner or operator. Section 43.9(a) requires persons performing maintenance, preventive maintenance, rebuilding, or alternation to make entries in the maintenance record of the equipment worked on. Maintenance persons, therefore, share the responsibility for maintenance records."

According to Advisory Circular AC 61-21A - FLIGHT TRAINING HANDBOOK, Chapter 16 - Transition to other airplanes \ Engine Out Procedures:

"There is no better way to develop skill in single engine emergencies than by continued practice. The fact that the techniques and procedures of single engine operation are mastered thoroughly at one time during a pilot's career is no assurance of being able to cope successfully with an engine out emergency unless review and practice are continued. Some engine out emergencies may be so critical that there may be no safety margin for lack of skill or knowledge. Unfortunately many light twin pilots never practice single engine operation after receiving their multiengine rating."

"Basically, when one engine fails the pilot must overcome the asymmetrical thrust...created by the operating engine by setting up a counteracting moment with the rudder. When the rudder is fully deflected, it yaw power will depend on the velocity of airflow across the rudder - which in turn is dependent on the airspeed. As the airplane decelerates it will reach a speed below

which the rudder moment will no longer balance the thrust moment and directional control will be lost."

"With full power applied to the operative engine, as the airspeed drops below Vmc, the airplane tends to roll as well as yaw into the inoperative engine. This tendency becomes greater as the airspeed is further reduced. Since this tendency must be counteracted by aileron control, the yaw condition is aggravated by aileron yaw (the 'down aileron' creates more drag than the 'up' aileron). If a stall should occur in this condition, a violent roll into the dead engine may be experienced. Such an event occurring close to the ground could be disastrous. This may be avoided by maintaining airspeed above Vmc at all times during single engine operation. If the airspeed should fall below Vmc - for whatever reason - then power must be reduced on the operative engine and the airplane must be banked at least 5 degrees toward the operative engine if the airplane is to be safely controlled.

The airplane was released to the Susquehanna Regional Police Department on September 6, 1998.

### Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	52, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 3 Valid Medical--no waivers/lim.	<b>Last FAA Medical Exam:</b>	08/25/1998
<b>Occupational Pilot:</b>	<b>Last Flight Review or Equivalent:</b>		
<b>Flight Time:</b>	1185 hours (Total, all aircraft), 398 hours (Total, this make and model), 1068 hours (Pilot In Command, all aircraft), 24 hours (Last 90 days, all aircraft), 11 hours (Last 30 days, all aircraft)		

## Aircraft and Owner/Operator Information

Aircraft Make:	Smith, Ted Aerostar	Registration:	N600JB
Model/Series:	TS-600 TS-600	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	60-0001
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	02/27/1995, Annual	Certified Max Gross Wt.:	5500 lbs
Time Since Last Inspection:		Engines:	2 Reciprocating
Airframe Total Time:		Engine Manufacturer:	Lycoming
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	IO-540-G1B5
Registered Owner:	DAVID C. BLESSING	Rated Power:	290 hp
Operator:	DAVID C. BLESSING	Operating Certificate(s) Held:	None

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Night/Bright
Observation Facility, Elevation:	MDT, 310 ft msl	Distance from Accident Site:	11 Nautical Miles
Observation Time:	2050 EDT	Direction from Accident Site:	314°
Lowest Cloud Condition:	Clear / 0 ft agl	Visibility	12 Miles
Lowest Ceiling:	None / 0 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	Calm /	Turbulence Type Forecast/Actual:	/
Wind Direction:	Variable	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29 inches Hg	Temperature/Dew Point:	20°C / 15°C
Precipitation and Obscuration:			
Departure Point:	(N71)	Type of Flight Plan Filed:	None
Destination:	PHILADELPHIA, PA (N67)	Type of Clearance:	None
Departure Time:	2035 EDT	Type of Airspace:	Class G

## Airport Information

Airport:	DONEGAL SPRINGS AIRPARK (N71)	Runway Surface Type:	Asphalt
Airport Elevation:	458 ft	Runway Surface Condition:	Dry
Runway Used:	27	IFR Approach:	None
Runway Length/Width:	3250 ft / 50 ft	VFR Approach/Landing:	Precautionary Landing



## Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	

## Administrative Information

Investigator In Charge (IIC):	ROBERT L HANCOCK	Report Date:	08/27/1999
Additional Participating Persons:	CHUCK MARTIN; HARRISBURG, PA JOE GREEN; HARRISBURG, PA JAMES BROWN; WILLIAMSPORT, PA		
Publish Date:			
Investigation Docket:	NTSB accident and incident docket serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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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](#).