National Transportation Safety Board
Aviation Accident Final Report

Location:	WINCHESTER, VA	**Accident Number:**	NYC94FA064
Date & Time:	03/18/1994, 0050 EST	**Registration:**	N20PT
Aircraft:	SWEARINGEN SA-26AT	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General Aviation - Positioning		

Analysis

WHILE ON APP AT NIGHT, IN VMC, THE LEFT ENG LOST PWR DUE TO FUEL STARVATION. THE PROP WAS NOT FEATHERED, THE L/G WAS LEFT DOWN, AND THE A/C DRIFTED LEFT OF CRS, STRUCK TREES, AND THEN THE GND. ONE GAL OF FUEL WAS DRAINED FROM THE RT WING, ENG, & FUEL LINE. NO FUEL WAS FOUND IN THE LT WING, ENG & FUEL LINE. THE CO-PILOT SAID THE FUEL QTY SYS WAS ERRATIC WITH THE LT SIDE MORE ERRATIC, AND THE RT SIDE READING ABOUT 10 GAL MORE THAN THE LT SIDE. TESTING FOUND THE RT SIDE INDICATED ABOUT 45 GAL MORE THAN WAS PRESENT WHILE THE LT SIDE WAS INOP. THERE WAS NO REQUIREMENT FOR PERIODIC RECALIBRAION OF THE FUEL QTY SYSTEM. THE OWNER/PILOT HAD OPERATED THE A/C ON 32 FLTS, OVER 23 HRS, AND REFUELED 23 TIMES USING PARTIAL FILLS, SINCE HE HAD FULL TANKS. THE PILOT WAS CHECKED OUT 17 MONTHS PRIOR AND THE INSTR SAID THE PILOT WAS FINE, HOWEVER, HE WAS CAUTIONED HIM TO ENROLL IN RECURRENT TRAINING. THERE WAS NO RECORD HE DID. THE PILOT HAD RECEIVED AN FAA CHECKRIDE 19 MONTHS PRIOR TO THE ACCIDENT, WHICH HE PASSED.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: THE PILOT'S DECISION TO OPERATE THE AIRPLANE WITH KNOWN DEFICIENCIES IN THE FUEL QUANTITY MEASURING SYSTEM WHICH RESULTED IN A POWER LOSS DUE TO FUEL STARVATION, FOLLOWED BY IMPROPER EMERGENCY PROCEDURES WHICH RESULTED IN A LOSS OF CONTROL INFLIGHT AND UNCONTROLLED CONTACT WITH THE GROUND. FACTORS WERE THE LACK OF A REQUIREMENT FOR PERIODIC CALIBRATION OF THE FUEL QUANTITY MEASURING SYSTEM FROM THE MANUFACTURER, AND THE ERRATIC AND INACCURATE FUEL QUANTITY MEASURING SYSTEM.

Findings

Occurrence #1: LOSS OF ENGINE POWER(PARTIAL) - NONMECHANICAL
Phase of Operation: APPROACH - VFR PATTERN - FINAL APPROACH

Findings
1. (F) FUEL SYSTEM,FUEL QUANTITY FLOAT/SENSOR - ERRATIC
2. (F) FUEL SYSTEM,FUEL QUANTITY FLOAT/SENSOR - FALSE INDICATION
3. (C) OPERATION WITH KNOWN DEFICIENCIES IN EQUIPMENT - PERFORMED - PILOT IN COMMAND
4. (F) FLUID,FUEL - STARVATION
5. (C) IN-FLIGHT PLANNING/DECISION - INADEQUATE - PILOT IN COMMAND

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

Findings
6. (C) EMERGENCY PROCEDURE - IMPROPER - PILOT IN COMMAND
7. (C) DIRECTIONAL CONTROL - NOT MAINTAINED - PILOT IN COMMAND
8. (C) AIRSPEED - NOT MAINTAINED - PILOT IN COMMAND
9. (C) STALL/MUSH - INADVERTENT - PILOT IN COMMAND

Occurrence #3: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: DESCENT - UNCONTROLLED

Findings
10. OBJECT - TREE(S)

Occurrence #4: ON GROUND/WATER ENCOUNTER WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

HISTORY OF FLIGHT

On March 18, 1994, at 0050 eastern standard time, a Swearingen SA-26AT, Merlin IIB, N20PT, experienced a partial power loss and collided with the ground while attempting to land at the Winchester Regional Airport (W16), Winchester, Virginia. The pilot, the sole occupant, received fatal injuries, and the airplane was destroyed. Visual meteorological conditions prevailed and no flight plan was filed for the positioning flight which was being conducted under 14 CFR Part 91.

There was no record of the airplane receiving any services prior to departure. The flight departed from Dulles International Airport (IAD), at 0029. The pilot requested and received visual flight rules advisories from Dulles Approach Control until he reported Winchester Regional Airport in sight at 0036, and was cleared to leave the frequency. A pilot waiting in the pilot lounge of the Winchester Airport, reported he heard the pilot of N20PT, call on UNICOM frequency, that he was turning final for runway 32. He said he heard no other transmissions from the pilot.

A witness, reported she heard a "whoosh" followed by a "thump" and looked out her window and saw the airplane in the yard. She said she did not remember smelling fuel when at the accident site. A person at the accident site said he, "did not detect a strong odor of fuel."

The accident occurred during the hours of darkness at location 39 degrees, 08 minutes North and 78 degrees, 08 minutes West.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with limitations for airplanes single and multi-engine land, and instrument airplane. In addition, he held a 2nd class FAA airman medical certificate, issued on March 7, 1994.

The last entry in the pilot's log book was dated February 23, 1993. The log book showed a total flight time of 2672 hours, with 178 hours in the Swearingen SA-26AT. Based upon hours flown that were recorded in the maintenance records, the pilot was estimated to have flown the airplane an additional 390 hours.

AIRCRAFT INFORMATION

The airplane was a 1969 year model Swearingen SA-26AT, Merlin IIB. It was powered by two Garrett TPE-331-1-151G engines which developed 665 horse power. It was maintained under a manufacturers inspection program. The total time on the airframe was 5869 hours and the airplane had flown 67 hours since the last inspection.

METEOROLOGICAL INFORMATION

Visual meteorological conditions prevailed. The airport was served by an Automatic Weather Observation Service (AWOS) which recorded the following weather at 0045: clear below 12,000 feet, visibility 10 miles, temperature 36 degrees F, dewpoint 12 degrees F, wind from 270 degrees at 5 knots, altimeter 29.81 in/hg.

WRECKAGE AND IMPACT INFORMATION

The airplane was examined at the accident site on March 18 - 20, 1994. The airplane had

struck trees prior to ground contact and then impacted on the lawn of an unoccupied residence, 250 feet short of the approach end of runway 32 and 1100 feet to the left of runway centerline, on a heading of 270 degrees. The fuselage was rolled 15 degrees left.

The fuselage was intact and crushing was visible on the lower portion. Both horizontal stabilizers and elevators were bent downward and touched the ground. The vertical stabilizer and rudder were separated from the airframe and laying behind the left elevator. All flight control cables were intact.

The landing gear was extended. The nose landing gear was driven forward and the two main landing gear were driven aft. The wing flaps were extended to 30 degrees. The fuel shutoffs were open and the crossflow valve was closed. Both RPM levers were in the high position. The left power lever was in the low position and the right power lever was midrange. Both stop and feather buttons were in the closed position (non-feather).

On the left engine, the propeller was not feathered. Two propeller blades were bent rearward and one blade showed no evidence of ground contact. The left engine fuel filter and line leading to it were empty. Small particles of mud were found impregnated on the igniter plug cooling holes, and mud was found in the engine inlet. The leading edge of the impeller blades in view were straight with no visible nicks, or foreign object damage.

On the right engine, the propeller was not feathered. All three blades were bent rearward and twisted opposite the direction of rotation. The right engine fuel filter and line leading to it were full of fuel. Brown organic matter was found adhered to the igniter plug and impregnated in the cooling holes. Mud was found in the engine inlet. The leading edge on two impeller blades had curled corners opposite the direction of rotation with leading edge nicks.

Approximately one gallon of fuel was drained from the right wing of the airplane. No fuel was found in the left wing which was damp. Both wings tanks had ruptures.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was conducted on March 18, 1994, by Francis P. Field, M.D., Office of the Chief Medical Examiner, Northern Virginia District, Fairfax, Virginia.

Toxicological testing was conducted by the Commonwealth of Virginia, and the FAA Civil Aeromedical Institute, in Oklahoma City, Oklahoma, and was negative for drugs and alcohol.

TESTS AND RESEARCH

The outboard left fuel float (L-4) was examined by the Safety Board Metallurgical Laboratory. The wiper which contacts the surface of the rheostat, had separated from the wiper arm. According to Metallurgist's Factual Report 94-111,

...The microscopic fracture features on the fracture face...were almost completely obliterated by post- separation rubbing...Small relatively undamaged regions of the fracture...contained dimpled fracture characteristics, consistent with overstress separations...."

Both engines were shipped to Allied Signal in Phoenix, Arizona, for teardown which was witnesses by the FAA. According to the summary of findings on the right engine from Allied Signal, "...Engine operation at the time of ground impact was evidenced by the heat discolored dirt and debris on the inside surfaces of the combustion chamber and the turbine rotor blades and stator vanes. Additional evident of engine operation was the fractured planetary gear

carrier mounting lugs." According to the summary of findings on the left engine from Allied Signal, there was engine rotation at ground impact.

Six soil samples were taken from under the wings and one was taken from a control site away from the main wreckage where one gallon of jet fuel had been poured on the ground. Samples 1, 2 and 3, were taken under the left wing and produced readings of 1,037 mg/kg, 759 mg/kg, and 522 mg/kg. Samples 4, 5, and 6 were taken under the right wing and produced readings of 17,600 mg/kg, 38,300 mg/kg, and 255 mg/kg. The test sample reading was 10,409, mg/kg. These readings measured the hydrocarbon level in milligrams per kilogram of earth. All samples were all taken at similar depths of 6 inch depth below the ground.

ADDITIONAL DATA/INFORMATION

FUEL SYSTEM Fuel was contained in two wing tanks, connected by a cross- flow valve which when opened, allowed fuel to flow between the two tanks, seeking an equal level. The total fuel capacity of the tanks was 388 gallons with a useable amount of 386 gallons (2624.8 lbs @ 6.8 lbs/gal). According to airplane log book records, the empty weight of airplane was 6604 lbs, and the maximum gross takeoff weight was 10,000 lbs.

Fuel quantity was determined by four float-type transmitters, and one adjustable potentiometer, per wing. Each transmitter was a variable rheostat in which the resistance increased with fuel quantity. The cumulative resistance of each wing was displayed in the cockpit as fuel quantity on a dual needle gauge.

Two types of float transmitters were used. Two were in the 0 - 15 ohm range and two were in the 0 - 30 ohm range for each wing. The system is calibrated when empty. The adjustable potentiometer is adjusted until the indicator needle points to 0 gallons. Once calibrated, it takes an additional 82 ohms to show a full tank (193 gallons). The fuel quantity gauge would increase 2.3 gallons for each ohm of resistance. There were no external wing-mounted fuel gauges, or other items to determine the fuel in the wing tank during pre-flight.

The cumulative total of resistance (ohms) from the float transmitters, for the right side fuel system when empty was 19.8 ohms, which at 2.3 gal/ohm equals 45.5 gallons. The cumulative total of resistance (ohms) from the float transmitters, for the left side of the fuel system was not determined due to an inoperative fuel float transmitter, however, the total for the three operative floats was 9.4 ohms.

The outboard right fuel float (R-4) had the highest minimum reading which was 13.5 ohms. When opened and inspected, oxidation and discoloration was found on the coil. In a written report, John DeLisi, Systems and Structures Group Chairman said, "...According to the float manufacturer (the AC Spark Plug Division of General Motors), it is not uncommon for the resistance of a potentiometer to increase due to oxidation as the unit ages."

Examination of the forms used for the airplane inspection revealed there was no requirement for a periodic recalibration of the fuel quantity measuring system.

PILOT TRAINING & PROFICIENCY The pilot had previously owned a Beech C-90 King Air. The pilot received initial training in December, 1990, from Flight Safety, Inc., in Wichita, Kansas. The following comments were found in his training records, "...Progress, but very slow...things still progressing slow...somewhat slow in responding to emergency procedures...still has problems areas that he should continue self study and recommend recurrent [training] after some [additional] time aircraft...not unsafe, just needs continued

study in systems and procedures...."

The pilot returned in November, 1992 for recurrent training. According to records, he completed one simulator session, and did not complete the training.

According to FAA records, the pilot had held an FAA Air Taxi (ATCO) certificate for on demand charter. It was issued on January 7, 1992, using the name, Eagle Aviation Inc., and voluntarily surrendered to the FAA in January, 1993. The airplane used was a Beech C90 King Air. The certificate was held by the FAA Flight Standards District Office, in Winston-Salem, North Carolina. The FAA inspector who gave the pilot his flight checks reported that on the initial flight check, the pilot did not pass; however, he passed on the second attempt. With subsequent checkrides, the flying improved. His last FAA flight check was given on August 4, 1992. The FAA inspector remembered the pilot's proficiency as, "...not exemplary, with minimum standards...."

The pilot completed ground school on the SA-26AT at Macar Enterprises, in San Antonio, Texas, on September 20, 1992. The ground school was taught using the curriculum developed by Swearingen Aircraft Company, by a former Swearingen Aircraft Company employee. The course was set up for a two day period and did not specify hours of training.

The pilot received 25 hours of flight training in the SA- 26AT from a flight instructor. The flight instructor signed off the pilot's log book indicating that he had given him 10 hours of ground instruction, including all normal and abnormal and emergency procedures, 3 hours of CPT training, including 2 pilot crew coordination, 25 hours of dual flight in aircraft N20PT, including 15 landing, and 4 hours of actual instrument flight. The checkout was not signed off as a biennial flight review in the pilot log book.

The flight instructor reported he had cautioned the pilot about the inaccuracies of the fuel gauges on the SA-26AT. He said the pilot did fine in the flight training, had no problems with emergencies, and at the completion of the flight training his proficiency was satisfactory. However he cautioned the pilot to enroll in a recurrent training program, to maintain his proficiency.

According to the pilot's insurance application, he had completed a biennial flight review in June 1993, however, no supporting documents were found to verify this. The last documentable biennial flight review occurred on August 4, 1992.

Nothing was found to indicate that the pilot had engaged in a recurrent training program for the Swearingen SA-26AT. Additionally no records were found to indicate the pilot had engaged in any other type of recurrent training program.

CO-PILOT INTERVIEW The co-pilot reported both sides of the fuel quantity measuring system were erratic, with the left side being more erratic, and right side reading higher than the fuel present in the right tank. The right side would usually indicate 10 gallons more than the left, and sometimes a greater amount. These discrepancies had been present since he had been flying on the airplane. He reported the pilot was concerned about the situation, and could not figure out why they were erratic; however, he kept flying the airplane.

According to the co-pilot, the last time the airplane had been fully fueled, totaling 386 gallons (topped off), occurred on March 5, 1994. The airplane was subsequently operated on 32 flights, over a period of 23.4 hours which terminated in the accident. In the 23.4 hours, the airplane was refueled 23 times at various airports, for a total of 1600 gallons being added.

Based upon the total fuel used, 1886 gallons, during the 23.4 hours, the average fuel burn was 84.9 GPH.

The co-pilot reported that when he did the flight planning, he used 67 gallon per hour, as a figure for fuel burn, which he obtained from the flight manual. Additionally, the co-pilot reported he had received systems training from the previous co-pilot and had received no formal or factory ground or flight training in the airplane.

AIRPLANE FLIGHT MANUAL According to the flight manual, Page VI-3, 67 GPH is a fuel flow for Twin Engine Cruise, Bleed Air On, while cruising at 20,000 feet under ISA temperature conditions. The figure of 67 GPH does not compensate for fuel used on the ground, in takeoff, or in the initial climb to altitude. The total fuel burn for a trip is controlled by several different items including cruise altitude, ground time, outside air temperature, distance flown, and power setting used.

According to the flight manual, Page I-4, the fuel quantity indicator is listed as a required item which must be installed and operating for VFR-DAY flights.

According to the flight manual, Page III-1, Emergency Operating Procedures, Items 1, 2, & 3, are as follows:

SECURING AN INOPERATIVE ENGINE-CRUISE OPERATION 1. Determine inoperative engine by torque or T.I.T 2. Secure Inoperative engine as follows: Engine Stop & Feather.....PULL Generator.....OFF Boost Pump.....OFF Fuel Shut-off Valve.....CLOSED 3. Adjust Power on Operating Engine as Necessary

FLIGHT OF MARCH 17 & 18, 1994 The co-pilot reported that on March 17, 1994, when they arrived at the airport, the fuel gauges indicated 170 gallons of fuel. Eighty gallons was added prior to departure. The co-pilot reported 63 gallons was burned on the flight to Clarksville, Virginia, and 65 gallons was burned on the return flight which were .7 hour each way, for a total of 1.4 hours. He also reported the fuel gauges indicated 120 to 130 gallons of fuel on the airplane at IAD when he and the passengers deplaned, and he estimated the airplane would burn between 20 and 30 gallons to make the flight to Winchester.

AIRCRAFT RELEASE The aircraft wreckage was released to the Crittendon Adjustment Company.

Pilot Information

Certificate:	Commercial	**Age:**	39, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim.	**Last FAA Medical Exam:**	03/07/1994
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	3382 hours (Total, all aircraft), 568 hours (Total, this make and model), 3330 hours (Pilot In Command, all aircraft), 67 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	SWEARINGEN	**Registration:**	N20PT
Model/Series:	SA-26AT SA-26AT	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Provisional; Normal	**Serial Number:**	T26-128
Landing Gear Type:	Retractable - Tricycle	**Seats:**	10
Date/Type of Last Inspection:	01/16/1994, Continuous Airworthiness	**Certified Max Gross Wt.:**	10000 lbs
Time Since Last Inspection:	67 Hours	**Engines:**	2 Turbo Prop
Airframe Total Time:	5869 Hours	**Engine Manufacturer:**	GARRETT
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	TPE-331-1-151
Registered Owner:	BOBBY R. VENABLE	**Rated Power:**	665 hp
Operator:	BOBBY R. VENABLE	**Operating Certificate(s) Held:**	None
Operator Does Business As:	EAGLE AVIATION	**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Night/Dark
Observation Facility, Elevation:	W16, 721 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	0045 EST	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Unknown / 0 ft agl	**Visibility**	10 Miles
Lowest Ceiling:	Unknown / 0 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	270°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	2°C / -11°C
Precipitation and Obscuration:			
Departure Point:	WASHINGTON, DC (IAD)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	0029 EST	**Type of Airspace:**	Class G

Airport Information

Airport:	WINCHESTER REGIONAL (W16)	**Runway Surface Type:**	Asphalt
Airport Elevation:	721 ft	**Runway Surface Condition:**	
Runway Used:	32	**IFR Approach:**	None
Runway Length/Width:	5500 ft / 100 ft	**VFR Approach/Landing:**	Full Stop; Straight-in

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:**	11/18/1994
Additional Participating Persons:	BILL OSBORNE; WASHINGTON, DC ROGER STALLKAMP; PIQUA, OH STEVE MACON; PHOENIX, AZ JACK MORGAN; SAN ANTONIO, TX		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets 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 pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		