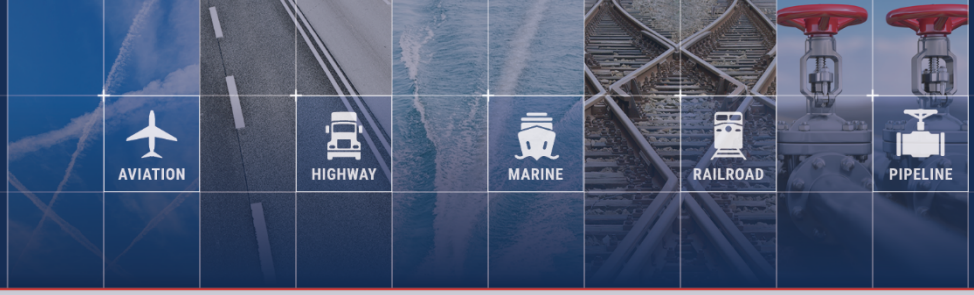

Aviation Investigation Final Report

Location:	Bedford, New Hampshire	**Accident Number:**	ERA22FA086
Date & Time:	December 10, 2021, 23:30 Local	**Registration:**	N54GP
Aircraft:	Swearingen SA226	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled		

Analysis

During an instrument approach at night in a twin-engine turboprop airplane, the pilot reported an engine failure, but did not specify which engine. About 9 seconds later, the airplane impacted terrain about ¼-mile short of the runway and a postcrash fire consumed a majority of the wreckage. During that last 9-second period of the flight, the airplane's groundspeed slowed from 99 kts to 88 kts, as it descended about 400 ft in a slight left turn to impact (the airplane's minimum controllable airspeed was 92 kts). The slowing left turn, in conjunction with left wing low impact signatures observed at the accident site were consistent with a loss of control just prior to impact.

Postaccident teardown examination of the left engine revealed that the 1st stage turbine rotor had one blade separated at the midspan. The blade fracture surface had varying levels of oxidation and the investigation could not determine if the 1st stage turbine blade separation occurred during the accident flight or a prior flight. The 2nd stage turbine was operating at temperatures higher than the 1st stage turbine, which was consistent with engine degradation over a period of time. Additionally, the 2nd stage turbine stator assembly was missing vane material from the 6 to 12 o'clock positions, consistent with thermal damage. All of these findings would have resulted in reduced performance of the left engine, but not a total loss of left engine power. The teardown examination of the right engine did not reveal evidence of any preimact anomalies that would have precluded normal operation. Examination of both propellers revealed that all blade angles were mid-range and exhibited evidence of little to no powered rotation. Neither propeller was in a feathered position, as instructed by the pilot operating handbook for an engine failure. If the pilot had perceived that the left engine had failed, and had he secured the engine and feathered its propeller (both being accomplished by pulling the red Engine Stop and Feather Control handle) and increased power on the right

engine, the airplane's performance should have been sufficient for the pilot to complete the landing on the runway.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's failure to secure and feather the left engine and increase power on the right engine after a perceived loss of engine power in the left engine, which resulted in a loss of control and impact with terrain just short of the runway. Contributing to the accident was a reduction in engine power from the left engine due to a 1st stage turbine blade midspan separation and material loss in the 2nd stage stator that were the result of engine operation at high temperatures for an extended period of time.

Findings

Personnel issues	Lack of action - Pilot
Aircraft	Turbine section - Damaged/degraded
Personnel issues	Decision making/judgment - Other

Factual Information

History of Flight

Approach-IFR final approach	Loss of engine power (partial)
Approach-IFR final approach	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On December 10, 2021, about 2330 eastern standard time, a Swearingen SA-226AT, N54GP, was destroyed when it was involved in an accident near Bedford, New Hampshire. The commercial pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 135 on-demand cargo flight.

According to information provided by the Federal Aviation Administration, the airplane was on the instrument landing system approach to runway 6 at Manchester Boston Regional Airport (MHT), Manchester, New Hampshire. During the approach, the pilot reported an engine failure at 2330:42 but did not specify which engine. Radio and radar contact were lost at 2330:51, when the airplane was about 1/4 mile from the runway. Review of ADS-B data revealed that during that last 9-second period, the airplane's groundspeed slowed from 99 kts to 88 kts, as it descended about 400 ft in a slight left turn to impact.

Video from a residential security camera recorded a portion of the airplane's approach, but only the airplane's navigation lights could be seen in the distance on a portion of a video; however, a sound spectrum study was performed on recorded engine noise. The sound spectrum study revealed that the engine noise was constant at about 2,000 rpm. As the airplane increased its distance from the camera, the audio data became unreliable for the study. The last reliable data was recorded at 2330:28, 14 seconds before the pilot reported an engine failure.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	23,Male
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:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	February 25, 2021
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 1, 2021
Flight Time:	2257 hours (Total, all aircraft), 118 hours (Total, this make and model), 2198 hours (Pilot In Command, all aircraft), 331 hours (Last 90 days, all aircraft), 108 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Review of information provided by the operator revealed that the pilot had a total flight experience of 2,257 hours, of which 496 hours were in multi-engine airplanes. Of the 496 hours in multi-engine airplanes, 118 hours were in the accident make and model airplane.

Review of the operator’s pilot flight and duty report revealed that the pilot had 14.8 hours of off-duty rest before reporting for work at 1930.

Aircraft and Owner/Operator Information

Aircraft Make:	Swearingen	**Registration:**	N54GP
Model/Series:	SA226 AT	**Aircraft Category:**	Airplane
Year of Manufacture:	1975	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	AT034
Landing Gear Type:	Retractable - Tricycle	**Seats:**	11
Date/Type of Last Inspection:	November 30, 2021 Continuous airworthiness	**Certified Max Gross Wt.:**	12500 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo prop
Airframe Total Time:	10633 Hrs as of last inspection	**Engine Manufacturer:**	Honeywell
ELT:	Installed, not activated	**Engine Model/Series:**	TPE331-10UA-511G
Registered Owner:	CASTLE AVIATION INC	**Rated Power:**	840 Horsepower
Operator:	CASTLE AVIATION INC	**Operating Certificate(s) Held:**	Commuter air carrier (135)
Operator Does Business As:		**Operator Designator Code:**	CSJA

Review of maintenance information provided by the operator revealed that the most recent maintenance inspection performed on the airplane was a 100/150, 200, and 450-hr inspection, completed 10 days before the accident, on November 30, 2021. At the time of the accident, the left engine had accrued 15,419 total hours of operation, of which 3,339 hours were since major overhaul. The right engine had accrued 12,155.5 total hours of operation, of which 2,871 were since major overhaul (time between overhaul was 5,400 hours).

The published minimum controllable airspeed (Vmc) on the airplane’s airspeed indicator was 92 kts.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	MHT,221 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	23:21 Local	**Direction from Accident Site:**	74°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 1700 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.16 inches Hg	**Temperature/Dew Point:**	-2°C / -5°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Caldwell, NJ (CDW)	**Type of Flight Plan Filed:**	IFR
Destination:	Bedford, NH	**Type of Clearance:**	IFR
Departure Time:	22:50 Local	**Type of Airspace:**	Class C

Airport Information

Airport:	MANCHESTER BOSTON RGNL MHT	**Runway Surface Type:**	Asphalt
Airport Elevation:	266 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	06	**IFR Approach:**	ILS
Runway Length/Width:	7651 ft / 150 ft	**VFR Approach/Landing:**	Straight-in

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	N/A	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	42.926696,-71.45179

The wreckage was located on a river sand jetty, oriented north, and a postcrash fire consumed the cockpit, cabin, and both wings. No debris path was observed. A crater about 6 ft long, 3 ft wide, and 2 ft deep was observed at the beginning of the sand jetty. The left aileron was recovered in the water near the crater. The empennage was located just beyond the crater. The

empennage remained intact, with the elevator and rudder attached and undamaged except for the right elevator tip. The right wingtip was located near the empennage and an outboard left-wing section was located 60 ft left of the main wreckage. Three landing gear were located near the main wreckage and the radome was located at the end of the sand jetty, in water. Elevator control continuity was confirmed from the elevator to the cockpit area. Rudder control continuity was confirmed from the rudder to the cabin area. No aileron cables were identified.

The left engine was located in the main wreckage. The left propeller had separated and was partially embedded in mud to the left of the left engine. All three blades remained attached to the hub. The right engine was located forward and left of the main wreckage. The right propeller remained attached to the right engine and all three propeller blade roots remained attached to the hub and were charred. Both engines and propellers were retained for further examination.

Teardown examination of the left engine revealed that a 1st stage turbine blade separated mid-span. The fracture surface of the blade exhibited varying levels of oxidation, and the investigation could not determine if the blade separated during the accident flight or a prior flight. Microscopic examination of the blades revealed that the 1st stage was operating at a temperature near 1,700° F, and the 2nd stage was operating at a temperature near 2,200° F, for a period of 10 to 100 hours. The 2nd stage operating at temperatures higher than the 1st stage was consistent with engine degradation over a period of time. The 2nd stage turbine stator assembly was missing vane material from the 6 to 12 o'clock positions, consistent with thermal damage over a period of time. Rotational scoring was documented throughout the engine, including the propeller shaft, compressor impellers and shrouds, and turbine rotor blade tips. Sand debris was observed throughout the gas path.

Teardown examination of the right engine did not reveal any anomalies that would have precluded normal operation. Rotational scoring was documented at multiple locations in the engine, including the propeller shaft, compressor impellers/shrouds, and turbine stages. Sand debris was observed throughout the gas path and was accumulated in the combustor and outer transition liner.

Teardown examination of both propellers revealed no anomalies that would have precluded normal operation. All blade angles were mid-range (not feathered) and exhibited evidence of little to no powered rotation. For more information see Powerplants Group Chair's Factual Report and Propellers Examination Report in the public docket for this investigation.

Additional Information

Review of a pilot operating handbook for the make and model airplane revealed:

"…WARNING

IN THE EVENT OF AN ENGINE FAILURE OR POWER LOSS, THE ENGINE NEGATIVE TORQUE SYSTEM (NTS) ONLY ROVIDES PARTIAL DRAG REDUCTION BUT NOT TO THE EXTENT OF A FULLY FEATHERED PROPELLER.

PILOT MUST TAKE ACTOIN TO FULLY FEATHER THE PROPELLER (ON THE AFFECTED ENGINE) TO REDUCE PROPELLER DRAG.

1. ENGINE STOP AND FEATHER CONTROL (failed engine)..... PULL…"

Administrative Information

Investigator In Charge (IIC):	Gretz, Robert
Additional Participating Persons:	Justin Gierka; FAA/FSDO; Portland, ME Dana Metz; Honeywell; Phoenix, AZ Les Doud; Hartzell Propeller; Piqua, OH
Original Publish Date:	December 6, 2023
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=104386