



Aviation Investigation Final Report

Location:	Pierce, Nebraska	Accident Number:	CEN18FA126
Date & Time:	March 21, 2018, 18:45 Local	Registration:	N741WT
Aircraft:	RANS INC S-16 SHEKARI	Aircraft Damage:	Substantial
Defining Event:	Aerodynamic stall/spin	Injuries:	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private pilot was approaching his private airstrip in his experimental amateur-built airplane when witnesses heard the sound of the engine stop. The airplane then impacted a field about ¼ mile from the approach end of the runway. The runway's usable length was limited due to standing water and mud; thus, the approach for landing would have necessitated a low-speed, low-altitude approach with low engine power to minimize airplane energy. The wreckage path and airplane damage were consistent with a low-speed, nose-low impact.

The accident occurred about 1 hour after the pilot fueled the airplane with 16.5 gallons of 100 low-lead (LL) fuel. Postaccident examination of the fuel tank found that it contained useable fuel. No indication of water was found in the fuel.

Recorded data from the airplane's electronic flight instrument system showed that the airplane's speed decreased below stall speed and engine operation continued until the airplane impacted terrain. The airplane was not equipped with a stall warning system, and there were no markings on airspeed instruments indicating the stall speed. Postaccident examination of the airplane revealed no mechanical anomalies that would have precluded normal operation.

The National Transportation Safety Board was unable to determine, from the available evidence, the number of hours that the pilot flew in the accident airplane make and model, which he had purchased 6 months before the accident.

Although the pilot's severe heart disease placed him at increased risk for an acute cardiac event, whether or not symptoms from such an event contributed to this accident could not be determined. Thus, the reason for the pilot's failure to maintain airspeed could not be determined.

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 airspeed during the approach for landing, which resulted in an aerodynamic stall and the airplane's impact with terrain.

Findings

Aircraft	Airspeed - Not attained/maintained
Aircraft	Angle of attack - Not attained/maintained
Personnel issues	Aircraft control - Pilot

Factual Information

History of Flight

Approach	Loss of control in flight
Approach	Aerodynamic stall/spin (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On March 21, 2018, about 1845 central daylight time, an experimental amateur-built Rans S-16 Shekari airplane, N741WT, was substantially damaged when it impacted terrain about ¼ mile from the approach end of runway 11 at a private airstrip near Pierce, Nebraska. The private pilot was fatally injured. The airplane was registered to and operated by the pilot under Title 14 *Code of Federal Regulations (CFR)* Part 91 as a personal flight; no flight plan was filed. Visual meteorological conditions prevailed at the time of the accident. The flight departed Norfolk Regional Airport/Karl Stefan Memorial Field (OFK), Norfolk, Nebraska, and was returning to the private airstrip, which was owned by the pilot, when the accident occurred.

A surveillance video from OFK showed that the airplane arrived at the fuel pump area about 1730 and that the pilot obtained fuel for his airplane. The OFK manager stated that the pilot purchased 16.5 gallons of 100 low-lead (100 LL) fuel. The surveillance video then showed that the pilot walked around the airplane from the left wing to the empennage and then the right wing. He then walked in the opposite direction and entered the airplane from the left side of the canopy. About 1740, the pilot closed the canopy. About 1741, the propeller began to rotate. About 1742, the airplane departed the fuel pump area and exited the camera's view.

A witness stated that she was outside of her home about 1845 when she heard the accident airplane and was waiting for the airplane to fly over her house as the pilot had done during past flights. She stated that she "knows the sound of the engine" and heard the engine "quit," "run again," and "then quit."

Another witness stated that he heard but did not see the accident airplane. He also stated that the engine noise "just stopped" and that "it was like the motor just died off."

Pilot Information

Certificate:	Private	Age:	69,Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	3-point
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 3 Without waivers/limitations	Last FAA Medical Exam:	September 6, 2017
Occupational Pilot:	No	Last Flight Review or Equivalent:	February 17, 2015
Flight Time:	(Estimated) 2000 hours (Total, all aircraft), 42 hours (Total, this make and model)		

No record showed that the accident pilot completed a flight review in the 24 months before the accident, as required by 14 *CFR* 61.56.

On September 6, 2017, on his application for his medical certificate, the pilot reported 2,000 hours total flight experience, of which 50 hours were in the 6 months.

Aircraft and Owner/Operator Information

Aircraft Make:	RANS INC	Registration:	N741WT
Model/Series:	S-16 SHEKARI	Aircraft Category:	Airplane
Year of Manufacture:	2007	Amateur Built:	Yes
Airworthiness Certificate:	Experimental (Special)	Serial Number:	1299018
Landing Gear Type:	Tricycle	Seats:	2
Date/Type of Last Inspection:	May 19, 2017 Condition	Certified Max Gross Wt.:	1600 lbs
Time Since Last Inspection:	66 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	207.5 Hrs at time of accident	Engine Manufacturer:	Lycoming
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	O-320-A2B
Registered Owner:		Rated Power:	160 Horsepower
Operator:		Operating Certificate(s) Held:	None

The previous airplane owner built the airplane, completing the build on February 5, 2007. The pilot purchased the airplane from the previous owner and applied for the aircraft registration on June 30, 2017. The registration was accepted by the Federal Aviation Administration (FAA) on September 19, 2017.

Aircraft logbook entries showed that the airplane's two previous condition inspections before the accident were dated October 22, 2013, at a Hobbs time of 38.6 hours and a tachometer time of 27 hours, and May 19, 2017, at a Hobbs time of 41.1 hours and a tachometer time of 28.5 hours. An aircraft

logbook entry stated to add a tachometer time of 112.8 hours for the airplane's total time.

The airplane was not equipped with a stall warning system (nor was it required to be), and the airspeed indicator and electronic flight instrument system (on the Dynon FlightDEK-D180 display) did not have any markings to indicate the stall speeds for the airplane. .

According to the airplane builder, the airplane had a stall speed of about 45 mph, and he would not fly the airplane below 50 mph. He stated that he would maintain a speed of about 63 mph when the airplane crossed the runway numbers and that he landed the airplane only on hard-surface runways that were at least 2,500 ft in length.

The Rans S-16 Shekari Specifications and Performance document indicated that, at sea level conditions and the airplane's maximum gross weight, the stall speeds with no flaps and with flaps were 62 and 58 mph, respectively, and the landing roll on hard-surface runways was 525 ft. The Rans S-16 Shekari Specifications and Performance document also stated the airplane was equipped with two 16-gallon fuel tanks.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	OFK,1573 ft msl	Distance from Accident Site:	17 Nautical Miles
Observation Time:	18:56 Local	Direction from Accident Site:	153°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	6 knots /	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	130°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	30.06 inches Hg	Temperature/Dew Point:	11°C / 1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Norfolk, NE (OFK)	Type of Flight Plan Filed:	None
Destination:	Pierce, NE (PVT)	Type of Clearance:	None
Departure Time:		Type of Airspace:	Class G

Airport Information

Airport:	Private PVT	Runway Surface Type:	Dirt;Grass/turf
Airport Elevation:	1621 ft msl	Runway Surface Condition:	Soft;Standing water;Wet
Runway Used:	11	IFR Approach:	None
Runway Length/Width:	2365 ft / 70 ft	VFR Approach/Landing:	

The private airstrip was located at the pilot's residence and was where the pilot stored the airplane. The airstrip had one turf runway, 11/29, that was about 2,365 ft long and 70 ft wide. The elevation at the approach end of runway 11 was about 1,641 ft mean sea level (msl). From

about 935 ft down the runway to the end of the runway, areas of standing water and mud, estimated to be upward of $\frac{1}{2}$ inch deep, were present; thus, runway 11 would have had a usable length of about 935 ft. The elevation about 935 ft down the runway was 1,631 feet.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	42.238609,-97.597221(est)

The airplane impacted a field that was about $\frac{1}{4}$ mile from the extended centerline of runway 11 at an elevation of about 1,609 ft msl. The airplane was upright and oriented on a tail-to-nose heading of about 330°. The airplane canopy was attached and closed. Ground scarring extended from about 42 ft behind the airplane tail along a heading that was similar to that of the airplane. From about the 42-ft point to about 26 ft behind the airplane tail, there were three parallel linear marks in the ground in the direction of the airplane, consistent with impressions from the main and nose landing gear wheels. These three marks were followed by a mud- and water-filled hole that was about 1 ft deep. The edge of the hole nearest to the airplane tail contained a propeller blade. The landing gear marks, the location and depth of the hole, and the propeller blade location were consistent with a nose-low impact attitude. The bottom nose cowl and nose landing gear were crushed upward into the engine.

The two-blade wood propeller was broken off at the blade roots and separated through in areas along the span of the propellers. The propeller hub was securely attached to the engine crankshaft propeller hub flange.

Flight control continuity was confirmed from the control surfaces to both cockpit control sticks and rudder pedals. The cockpit control sticks were undamaged. The wing flaps were extended to 40°, and the cockpit flap control handle was in the 40° flap extended position. The cockpit elevator trim position indicator was about mid-travel along the jackscrew traversed by the indicator.

The master switch and electrical auxiliary fuel pump switches were in the ON position before they were turned off by first responders. Both magnetos were in the ON position. The electric auxiliary fuel pump was removed and connected to a car battery, and air was drawn into and expelled from the pump. No mechanical anomalies were found.

The cockpit throttle control was about $\frac{1}{2}$ inch forward of its aft stop position. The mixture control was about $\frac{1}{2}$ inch from the forward stop. The carburetor heat cockpit control was at the OFF position. Throttle and mixture control continuity to the engine was confirmed.

The fuel tank filler cap was in place and secure. The fuel tank filler cap was removed at the accident site,

and the fuel tanks were found to be about 7/8 full with a liquid consistent in smell and color with 100 LL fuel. The fuel tank comprised of two tanks, left and right, that were oriented laterally with a bottom interconnect between them. Neither tank was deformed and/or collapsed, and the 1/4-inch fuel tank vent line was unobstructed. Upon recovery of the airplane, fuel drained out of the fuel tank. (The left and right tank interconnect had broken open, which caused the fuel to drain during the recovery of the airplane.) Both tanks were cut open and swabbed along the bottom with water-sensing paste. The swabbing showed no indication of water. Both tanks contained dark-colored debris consistent in appearance with dirt/sediment. Both feed lines had in-line valves that were in the ON position and were connected to the single main fuel supply line. All the fuel lines from the fuel tanks to the engine were attached and intact.

The gascolator was about 1/4 full of a liquid consistent with 100 LL fuel. This liquid was tested with water-sensing paste, and no indication of water was found. The bottom of the gascolator bowl had debris that was estimated to be less than 1% of bowl volume and was similar in appearance to the debris in the left and right sides of the fuel tank. The gascolator screen was unobstructed.

The airplane was equipped with a Lycoming O-320-A2B engine, serial number L-12206-27. The top spark plugs were removed, and the engine was rotated by hand through the attached propeller. During the rotation, a spark was obtained from each ignition harness lead. Air was expelled out of and drawn into each top spark plug hole, and compression was felt through the top spark plug holes during the rotation. The intake and exhaust valves opened and closed sequentially. Ignition timing was checked with a timing light that confirmed that the timing was in accordance with the engine manufacturer's specifications. The spark plugs displayed features of normal engine operation.

The engine-driven fuel pump was removed from the engine, and about 15 mL of liquid consistent with 100 LL fuel was drained from the inlet and exit ports. The drained liquid was tested with water-sensing paste, and no indication of water was found. When the pump actuating arm was actuated using hand pressure, air was drawn into the inlet and expelled from the outlet, and actuation of the diaphragm was heard. The pump was disassembled, and the pump and diaphragm did not display any mechanical or material anomalies that would have precluded normal operation, and there was no debris.

The airplane was equipped with a Precision Airmotive Corporation model MA-4SPA carburetor, serial number BL-18-7306. The carburetor float chamber was broken off, and the brass-colored float was attached to a piece of the chamber housing by the carburetor float arm. The throttle control cable was attached to the carburetor throttle control arm, which was attached to a piece of the carburetor housing. The float was crushed inward and did not exhibit any holes and contain fluid. The carburetor fuel screen was removed, and it contained debris consistent with that of the debris in the gascolator and the left and right sides of the fuel tank. The debris on the fuel screen covered less than 5% of the screen with the remainder of the screen unobstructed.

Medical and Pathological Information

An autopsy of the pilot was performed by Pathology Medical Services of Siouxland, Sioux City, Iowa. The pilot's cause of death was "multiple acute blunt force traumatic injuries.". The autopsy identified that the pilot had severe coronary artery disease.

Toxicology testing performed at the FAA Forensic Sciences Laboratory identified carvedilol and chlorthalidone (blood pressure medications) in the pilot's blood and urine specimens and losartan (a blood pressure medication) and atorvastatin (a cholesterol medication) in his urine specimens. None of these medications are considered to be impairing. The pilot's blood specimens were negative for ethanol and carbon monoxide.

Tests and Research

The Dynon FlightDEK-D180 display was sent to the NTSB's Vehicle Recorders Laboratory for the download of nonvolatile memory data. The download showed the following:

About 48 seconds before the last recorded data, the airspeed was 60 knots (69 mph), the engine speed was 987 rpm, and the manifold pressure was 9.43 inches of mercury.

About 38 seconds before the last recorded data: the airspeed was 35.5 knots (41 mph), the engine speed was 1,117 rpm, and the manifold pressure was 12.2 inches of mercury.

About 30 seconds before the last recorded data, the airspeed was 49.3 knots (57 mph), the engine speed was 1,815 rpm, and the manifold pressure was 22.4 inches of mercury.

The last three recorded data points occurred over a period of 20 seconds and indicated an airspeed of 0 knots at a pressure altitude between 1,623 and 1,625 ft msl.

Administrative Information

Investigator In Charge (IIC):	Gallo, Mitchell
Additional Participating Persons:	Darrin Divis; Federal Aviation Administration; Lincoln FSDO; Lincoln, NE John Butler; Lycoming Engines; Williamsport, PA
Original Publish Date:	April 13, 2020
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=96918

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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](#).