



Aviation Investigation Final Report

Location:	Medford, Oregon	Accident Number:	WPR22FA055
Date & Time:	December 5, 2021, 16:52 Local	Registration:	N64BR
Aircraft:	Piper PA-31-350	Aircraft Damage:	Destroyed
Defining Event:	Unknown or undetermined	Injuries:	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airplane was departing into instrument meteorological conditions using a standard instrument departure. The takeoff instructions consisted of making a climbing right turn direct to a nondirectional beacon. After departing, the pilot made a radio communication to an air traffic controller asking if he will tell him when to turn. The controller replied that he would not be calling his turn and that the pilot should fly the departure as published making a climbing right turn to overfly the approach end of the runway. The pilot acknowledged the communication, which was his last transmission. The airplane made a 360° turn and descended below the cloud layer. The airplane then climbed back into the cloud layer and made an inverted loop, descending into the ground in a near-vertical attitude.

A postaccident examination of the airplane revealed no evidence of preimpact mechanical malfunctions or failures. Recorded audio of the airplane before the accident was consistent with the engines operating. The signatures on both propellers were consistent with one another and consistent with the engines operating at a similar rpm.

The pilot was qualified and recently underwent recurrent training. The reasons the pilot became spatially disoriented could not definitely determined. The pilot left the anti-collision lights on while in the clouds, which may have resulted in him having flicker vertigo.

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 aircraft control during the initial climb into clouds due to spatial disorientation, which resulted in an uncontrolled descent and collision with terrain.

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Personnel issues Personnel issues Aircraft control - Pilot Spatial disorientation - Pilot

Factual Information

 History of Flight

 Takeoff
 Unknown or undetermined (Defining event)

On December 05, 2021, at 1652, a Piper PA-31-350 Navajo Chieftain airplane, N64BR, was substantially damaged when it was involved in an accident in Medford, Oregon. The pilot and passenger were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot and passenger made a flight on November 24 from the airplane's home airport in Fallon, Nevada, to Medford. After landing, the pilot noticed the airplane was leaking a large amount of fuel from the right wing root. The pilot arranged to make the necessary repairs with a fixed based operator (FBO) at the airport and drove a rental car back home to Nevada. On December 4, a mechanic at the FBO notified the pilot that the maintenance to the airplane was completed. The pilot responded that he would plan to get to the airport about 1430 the following day (on the day of the accident). The pilot and passenger drove to Medford arriving about 1600.

The exact radio communication times could not be confirmed for the accident flight. The pilot received an instrument flight rules (IFR) clearance and was issued the BRUTE7 departure procedure with the LANKS transition. The published BRUTE SEVEN Standard Instrument Departure (SID) with a takeoff from runway 14 consisted of a "climbing right turn direct MEF [Medford] NDB [nondirectional beacon]," and continue to the BRUTE intersection on a bearing of 066°.

After receiving the clearance, the controller informed the pilot the overcast layer base was at 200 ft above ground level (agl) the tops of the layer was at 2,500 ft. After the airplane departed the pilot made a radio communication to the controller asking "will you be calling my turn for the BRUTE7?" The controller replied that he would not be calling his turn and that the pilot should fly the departure as published making a climbing right turn to overfly the approach end of runway 14 before proceeding to the BRUTE intersection (Figure 1 below). The pilot acknowledged the communication, which was his last transmission. Several seconds later, the controller stated that he was receiving a low-altitude alert that the airplane's altitude was showing 1,700 ft. He made several attempts to reach the pilot with no response.

TAKEOFF RUNWAY 14: Climbing right turn direct MEF NDB, depart MEF NDB bearing 066° to BRUTE INT. Thence. . . .

LANKS TRANSITION (BRUTE7.LANKS): From over BRUTE INT on OED VORTAC R-098 to LANKS DME.



Figure 1: The Airplane's Flight Track Overlayed a Visual Depiction of the BRUTE7 Departure

The radar and automatic dependent surveillance-broadcast (ADS-B) information indicated that the airplane arrived in the run-up area for runway 14 about 1643 and then continued onto the runway about 6 minutes thereafter. The airplane departed about 1649:30 and, after crossing over the south end of the runway, it climbed to about 1,550 ft mean sea level, equivalent to 200 ft agl (Figure 2 below). The airplane then began a gradual right turn and climbed to 1,950 ft, maintaining an airspeed between 120-130 kts. As the airplane turn continued to the north, the altitude momentarily decreased to 1,650 ft (about 350 ft agl) with the airspeed increasing to 160 kts. Thereafter, the airplane then increased the bank angle and made a 360-degree turn, initially climbing to 2,050 ft. At the completion of the turn, the airplane descended to 1,350 ft, consistent with it maneuvering below the cloud layer. The airspeed increased to about 160 kts and several seconds later, the airplane climbed to 2,250 ft with the derived airspeed showing below 15 kts. Six seconds later was the last radar return, located about 990 ft north-northwest of the accident site.



Figure 2: The Airplane's ADS-B Flight Track

Video footage was obtained from several fixed security cameras on buildings around the accident site. A review of the footage revealed that the airplane descended below the cloud layer and then climbed back up. About 16 seconds thereafter, the airplane is seen descending in a near-vertical attitude (Figure 3 below). The airplane's position and strobe light appeared to be illuminated throughout the video.



Figure 3: Excerpts of Security Camera Footage

Pilot Information

Certificate:	Commercial	Age:	69,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	4-point
Instrument Rating(s):	Airplane	Second Pilot Present:	
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	August 6, 2021
Occupational Pilot:	No	Last Flight Review or Equivalent:	November 4, 2021
Flight Time:	2167 hours (Total, all aircraft), 1520 hours (Total, this make and model), 2089 hours (Pilot In Command, all aircraft), 2 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

The pilot had previously owned a PA-31-350 and purchased the accident airplane in 2013. According to his electronic logbooks he had amassed about 1,520 hours in a PA-31-350 of which 273 hours was in actual instrument meteorological conditions. The logbooks indicated that the pilot had departed from Medford in August 2018 and 2019 by way of the JACKSON1 and EAGLE6 departure procedures, respectively. In early November 2021 the pilot went to recurrent SIMCOM training. The training consisted of 4 flight hours; 2 hours of simulated IMC, both of which is in the same make and model.

During the exchange of the clearance instructions on the accident flight, the pilot requested the controller read back the departure procedure and transition phonetically. The pilot's family and a business associate stated this was very normal for the pilot and he would often have people clarify names and instructions.

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N64BR
Model/Series:	PA-31-350	Aircraft Category:	Airplane
Year of Manufacture:	1977	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	31-7752124
Landing Gear Type:	Retractable - Tricycle	Seats:	8
Date/Type of Last Inspection:	August 18, 2021 Annual	Certified Max Gross Wt.:	7000 lbs
Time Since Last Inspection:	2 Hrs	Engines:	2 Reciprocating
Airframe Total Time:	8809 Hrs at time of accident	Engine Manufacturer:	Lycoming
ELT:	Installed, not activated	Engine Model/Series:	TIO-540-J2B
Registered Owner:	On file	Rated Power:	
Operator:	On file	Operating Certificate(s) Held:	None

The Piper PA-31-350 Navajo Chieftain (Panther conversion), airplane was manufactured in 1977 and was powered by two Lycoming TIO-540-J2B series engines driving two, four-bladed Q-Tip propellers. The airplane was equipped with a Garmin GNS 530W and an autopilot.

The last examination was recorded as being completed on December 04, 2021, at a tachometer time of 1,754.4 hours. The invoice stated that an auxiliary hose assembly was replaced the day before the accident following a leak. The mechanic that replaced the fuel line could not recall the position that he left the fuel selector after completing the maintenance.

The airplane's Pilot Operating Handbook stated, "Anti-collision lights should not be operating when flying through cloud, fog or haze, since the reflected light can produce spatial disorientation."

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Day
Observation Facility, Elevation:	KMFR,1313 ft msl	Distance from Accident Site:	1 Nautical Miles
Observation Time:	16:55 Local	Direction from Accident Site:	0°
Lowest Cloud Condition:		Visibility	
Lowest Ceiling:	Overcast / 200 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:	30.39 inches Hg	Temperature/Dew Point:	4°C / 4°C
Precipitation and Obscuration:	In the vicinity - None - Mist		
Departure Point:	Medford, OR	Type of Flight Plan Filed:	IFR
Destination:	Fallon, NV (FLX)	Type of Clearance:	IFR
Departure Time:		Type of Airspace:	Class D

Video footage revealed that the airplane disappeared into a cloud layer and then reappeared immediately before the accident.

Automated 5-minute observations were generated by an Automated Surface Observation System (ASOS) at the Medford Airport. The 5-minute observation generated at 1650 included wind calm; visibility of 3 statute miles; mist; an overcast cloud layer at 200 feet. It recorded the temperature at 39 degrees Fahrenheit; dew point 39 degrees Fahrenheit and an altimeter setting of 30.39 inHg. High-Resolution Rapid Refresh (HRRR) model sounding for near the accident site at 1700 indicated cloud tops for the cloud layer nearest the surface around MFR was about 2,200 to 2,500 feet above mean sea level.

Airport Information

Airport:	ROGUE VALLEY INTL - MEDFORD MFR	Runway Surface Type:	Asphalt
Airport Elevation:	1335 ft msl	Runway Surface Condition:	Dry
Runway Used:	14	IFR Approach:	ADF/NDB;None
Runway Length/Width:	8800 ft / 150 ft	VFR Approach/Landing:	None

Investigators compiled a comparison of ADS-B data from two airplanes that departed before the accident airplane (at 1507 and 1556) and two that departed after (1734 and 1813). A

comparison of flight tracks from the three airplanes that departed runway 14 revealed that the accident airplane had started its right turn earlier than the other three airplanes, and the radius of its turn was tighter than the other three airplanes. (Figure 4 below).



Figure 4: Other Departures Flight Paths Before and After the Accident Flight

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	1 Fatal	Aircraft Fire:	On-ground
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	42.36066,-122.87706

The accident site was adjacent to the garage bays of an automobile dealership located about 2,800 ft west-southwest from the departure end of runway 14. A majority of the wreckage had been consumed by fire and sustained major crush deformation. Various items in the cockpit were not burned, including numerous paper sectionals and IFR charts, of which there were several current departure procedure plates for the Medford Airport.

Investigators could not completely confirm control continuity because of the impact and thermal damage. All the propeller blades on both engines exhibited chordwise scoring, leading edge chips, and were twisted and bent. The signatures on both propellers were consistent with one another and consistent with the engines operating at a similar rpm.

The fuel caps were found secure in the wings. In the wing root area of the right wing, the fuel system components had sustained damage from both impact and thermal effects. The fuel selector valve was found positioned to the outboard tank, and the firewall shutoff valve was found in the open position. Within the wing root area of the left wing, the fuel system components had suffered damage from both impact and thermal effects. The fuel selector valve was located near the outboard tank; the firewall shutoff valve was found in the closed position, and the cross-feed valve was open. The fuel selector in the cockpit was thermally damaged and the positions could not be determined. It is unknown if the positions of the fuel selector valves were positioned in that way prior to impact or why the pilot would have configured the selectors in that manner.

A postaccident examination of the airplane revealed no evidence of preimpact mechanical malfunctions or failures.

Tests and Research

The National Transportation Safety Board's Performance Division reviewed the audio from recorded videos. A performance engineer stated that the engine speeds were estimated retrospectively through spectral analysis of sound recorded by a camera on a nearby commercial building. This analysis revealed that the estimated engine speed remained consistent within the range of 2,500±100 rpm throughout the time before the accident, consistent with normal operation. From the sound analysis alone, it was not possible to ascertain whether the recorded sound originated from both engines operating at the same speed or from a single engine.

Additional Information

According to a publication from the Flight Safety Foundation:

"Flicker vertigo is an imbalance in brain-cell activity caused by exposure to the low-frequency flickering (or flashing) of a relatively bright light (such as a rotating beacon; a strobe light; or sunlight seen through a windmilling propeller). Flicker vertigo can result in nausea, dizziness, headache, panic, confusion, and — in rare cases — seizures and loss of consciousness, which could result in a pilot's loss of control of an aircraft" ... and "Flicker vertigo also can develop in someone viewing strobe lights or rotating beacons — or their reflections off clouds or water."

Administrative Information

Investigator In Charge (IIC):	Keliher, Zoe
Additional Participating Persons:	Elaine Soule; Federal Aviation Administration; Hillsboro, OR Kathryn Whitaker; Piper Aircraft; Phoenix, AZ Mark Platt; Lycoming Engines; Phoenix, AZ Les Doud; Hartzell Propellers
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Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=104346

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