



# Aviation Investigation Final Report

<b>Location:</b>	Stockton, California	<b>Accident Number:</b>	WPR20LA311
<b>Date &amp; Time:</b>	September 19, 2020, 19:25 Local	<b>Registration:</b>	N7946C
<b>Aircraft:</b>	North American B25N	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of engine power (total)	<b>Injuries:</b>	2 Serious, 1 Minor
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

## Analysis

While the airplane was in cruise flight and being flown by the copilot, the left engine fuel pressure fluctuated, which was followed by a brief loss of engine power. Concerned that the airplane might have a failed engine-driven fuel pump, the pilot turned the boost pumps to high and asked the passenger (the airplane's mechanic) to open the fuel cross-feed valve. As the airplane approached its intended destination, both fuel pressure needles began to fluctuate. The pilot assumed that fuel starvation to the engines was occurring and decided to make an off-airport landing to a field behind their airplane's position due to residential areas located between the airplane's location and the airport. The pilot stated that he took control of the airplane from the copilot and initiated a right turn toward the field, and that, shortly afterward, both engines lost total power. During the landing roll, the pilot observed a ditch in front of the airplane and was able to get the airplane airborne briefly to avoid the first ditch; however, he was not able to avoid a second, larger ditch. Subsequently, the airplane struck the second ditch, became airborne, and impacted the ground, which resulted in substantial damage to the fuselage.

Recovery company personnel reported that, during recovery of the wreckage, about 1 gallon of fuel was removed from the two forward and the two aft wing fuel tanks. Postaccident examination of the airplane revealed no evidence of any pre-existing anomalies that would have precluded normal operation of either engine except that all four main fuel tank fuel gauges displayed erroneous indications after each tank was filled with water. No leaks were observed throughout the fuel system. The airplane was last refueled on the day before the accident with 497.7 gallons. When the airplane was last refueled, the fuel tanks were reportedly filled to about 3 inches below the fuel filler neck. The investigation could not determine, based on the available evidence for this accident, how much of the airplane's fuel load (maximum capacity was 670 gallons) the airplane had onboard after it was refueled.

Additionally, the pilot reported that he commonly used a fuel burn rate of 150 gallons per hour for flight planning purposes; that figure included takeoff fuel burn. Recorded automatic dependent surveillance-broadcast data showed that the airplane had flown for 4 hours 1 minute since refueling and included six takeoffs and five landings (but did not include taxi times). As part of the investigation, the pilot

estimated that 485.9 gallons of fuel had been used since the last refueling. However, on the basis of the pilot's initial planned fuel load and recorded flight times, the airplane would have used about 600 gallons of fuel. The pilot later submitted an estimated fuel burn for the flights since refueling of 485.9 gallons. The flight manual did not have fuel burn references for the exact power settings and altitudes flown; thus, the hourly fuel burn could not be determined.

The pilot, copilot, and passenger did not visually verify the fuel levels in all four main fuel tanks before the accident flight. The pilot also underestimated the amount of fuel that would be used for the planned flights. As a result, fuel exhaustion occurred, which led to a total loss of engine power.

## Probable Cause and Findings

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

A total loss of engine power due to fuel exhaustion. Contributing to the accident was the erroneous fuel gauge indications and inadequate preflight planning and inspection

### Findings

<b>Personnel issues</b>	Preflight inspection - Flight crew
<b>Personnel issues</b>	Fuel planning - Pilot
<b>Personnel issues</b>	Decision making/judgment - Pilot
<b>Aircraft</b>	Fuel - Fluid level
<b>Environmental issues</b>	Rough terrain - Effect on operation

# Factual Information

## History of Flight

<b>Enroute</b>	Loss of engine power (total) (Defining event)
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On September 19, 2020, about 1925 Pacific daylight time, a North American B-25N, N7946C, was substantially damaged when it was involved in an accident near Stockton, California. The copilot and the passenger sustained serious injuries, and the pilot sustained minor injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* 91 personal flight.

The airplane had made two previous flights on the day of the accident (as discussed later in this section.) For the accident flight, the pilot (who was in the right seat and not flying at the time) reported that, while the airplane was in cruise flight at 1,500 ft mean sea level (msl) and about 7 miles from its intended destination, the left engine fuel pressure fluctuated, and the left engine lost power momentarily but resumed operation. The pilot saw that the fuel pressure needle returned to normal, but he was concerned that an engine-driven fuel pump might have failed. The pilot subsequently turned the boost pumps to high and asked the passenger to open the fuel cross-feed valve. When the airplane was about 6 miles from its intended destination, both fuel pressure needles began to fluctuate. The pilot assumed that fuel starvation to the engines had occurred and decided to make an off-airport landing to a field behind the airplane's position due to residential areas between the location and the airport. The pilot stated that he took control of the airplane from the copilot (who was in the left seat) and initiated a right turn toward the field. Shortly afterward, the fuel pressure dropped below 10 pounds per square inch, and both engines lost power.

The right-seat pilot stated that, during the rollout after landing in the field, he observed ditches in front of the airplane. He was able to get the airplane airborne briefly to avoid one ditch but was not able to avoid a second large ditch. Subsequently, the airplane struck the second ditch, became airborne, and impacted the ground in a nose-low attitude. All three landing gear collapsed.

In postaccident statements, the pilot reported that he used a 150-gallons-per-hour fuel burn for flight planning purposes, which included the takeoff fuel burn. The pilot also stated that, before the accident flight, neither he nor the other airplane occupants had visually verified the fuel levels in the fuel tanks.

The copilot reported that, when he boarded the airplane before the flight, he questioned the pilot about the fuel level and was told that it was calculated to be more than 200 gallons of fuel, which was more than enough for the 20-minute flight. The copilot provided a photograph from inside the airplane before the loss of power, which showed a power setting of about 1,700 rpm and 27 inches of manifold pressure. The photograph also captured the front and aft fuel tank gauges. The front tank fuel gauges showed about 70 gallons on the left side and about 55 gallons on the right side. The aft gauges displayed 0 and were fully deflected to the bottom for both the left and right sides.

The passenger, who was also the airplane's mechanic, reported that, when the airplane was topped off with fuel at Brown Field (SDM), San Diego, California, the fuel level was about 3 inches below the bottom of the fuel filler neck. He further reported that, when he had arrived at Vacaville Airport (VCB),

Vacaville, California, he was told to board the accident airplane and prepare for departure. The passenger stated that, because he had rushed into the airplane, he did not accomplish his normal routine, which included checking fuel and oil levels. The passenger stated that he "always tops the tanks off, either to the top or maybe 2.5 inches from the top of the filler neck."

Refueling records showed that the airplane had been last refueled on September 18, 2020, with 497.7 gallons of fuel. No evidence showed the fuel level after refueling.

Automatic dependent surveillance-broadcast (ADS-B) data showed six flights since the airplane was refueled, as shown in table 1. The ADS-B times listed do not account for operational time before takeoff and after landing.

<b>Date</b>	<b>Departure</b>	<b>Destination</b>	<b>Flight Time (minutes)</b>
September 18, 2020	SDM	North Island Naval Air Station (NZY), San Diego, California	8
September 18, 2020	NZY	Local	33
September 19, 2020	NZY	Local	19
September 19, 2020	NZY	Chino Airport (CNO), Chino, California	38
September 19, 2020	CNO	VCB	127
September 19, 2020	VCB	Stockton, California	16
<b>Total Flight Time:</b>			<b>241 Minutes</b>

Table 1. Accident airplane flights after refueling.

The airplane was equipped with two interconnected forward and aft main fuel tanks in each wing, which could hold a total of 670 gallons of fuel. The flight handbook for the accident airplane stated, in part, "useable fuel is slightly less than quantity listed." Recovery company personnel reported that, during the recovery of the wreckage, about 1 gallon of fuel was removed from each forward and aft wing fuel tank.

The pilot provided more detailed postaccident calculations of the accident airplane's fuel burn, which indicated that the airplane would have used 485.9 gallons of fuel after the airplane had been last refueled (not including fuel usage for taxi and runup). The pilot reported that he used power settings of 30 inches of manifold pressure and 2,000 rpm for takeoff and 20 inches manifold pressure and 1,800 rpm for cruise flight. The flight handbook for the accident airplane model contained no specific data for performance charts and fuel burn data for the pilot's power settings in cruise flight at the altitudes flown (as shown in the ADS-B data for the accident flight).

Postaccident examination of the recovered wreckage revealed that the fuselage was substantially damaged. The left and right forward and aft main fuel tanks were undamaged. Both main forward and main aft fuel gauges were removed from the instrument panel and connected to their respective center section wiring with external power applied. Each fuel tank was subsequently filled with water, and fuel gauge indications were captured at various water levels. All four fuel gauges displayed erroneous indications at almost all levels measured. No leaks were observed throughout the fuel system. Table 2 shows the fluid levels that were captured at the top and bottom of each fuel pickup port for all four fuel tanks.

<b>Fuel tank</b>	<b>Bottom of pickup port (gallons)</b>	<b>Top of pickup port (gallons)</b>
Left forward	1.1	14.3
Left aft	1.5	7.0
Right forward	1.5	14.3
Right aft	1.2	7.0

Table 2. Fuel tank fluid levels during postaccident examination.

Impact damage to both carburetors precluded a functional check and a determination of the fuel flow setting.

### Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	57, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane multi-engine; Airplane single-engine	<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	January 6, 2020
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	January 16, 2020
<b>Flight Time:</b>	5100 hours (Total, all aircraft), 296 hours (Total, this make and model), 4800 hours (Pilot In Command, all aircraft), 18 hours (Last 90 days, all aircraft), 12 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

### Co-pilot Information

<b>Certificate:</b>	Airline transport	<b>Age:</b>	25, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>		<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>	Class 1	<b>Last FAA Medical Exam:</b>	
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>			

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	North American	<b>Registration:</b>	N7946C
<b>Model/Series:</b>	B25N	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1944	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Limited (Special)	<b>Serial Number:</b>	44-28938
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	
<b>Date/Type of Last Inspection:</b>	July 23, 2020 Continuous airworthiness	<b>Certified Max Gross Wt.:</b>	35000 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	2 Reciprocating
<b>Airframe Total Time:</b>	8099.1 Hrs as of last inspection	<b>Engine Manufacturer:</b>	Wright
<b>ELT:</b>		<b>Engine Model/Series:</b>	R2600
<b>Registered Owner:</b>		<b>Rated Power:</b>	1700
<b>Operator:</b>		<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KSCK,33 ft msl	<b>Distance from Accident Site:</b>	4.4 Nautical Miles
<b>Observation Time:</b>	18:55 Local	<b>Direction from Accident Site:</b>	104°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	8 knots /	<b>Turbulence Type Forecast/Actual:</b>	None / None
<b>Wind Direction:</b>	310°	<b>Turbulence Severity Forecast/Actual:</b>	N/A / N/A
<b>Altimeter Setting:</b>	29.85 inches Hg	<b>Temperature/Dew Point:</b>	28°C / 10°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Vacaville, CA (VCB)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Stockton, CA	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	19:06 Local	<b>Type of Airspace:</b>	Class G

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Serious, 1 Minor	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	1 Serious	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>		<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 Serious, 1 Minor	<b>Latitude, Longitude:</b>	37.909216,-121.34045(est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Cawthra, Joshua		
<b>Additional Participating Persons:</b>	Matthew DeSeelhorst; Federal Aviation Administration; Oakland, CA		
<b>Original Publish Date:</b>	February 3, 2023	<b>Investigation Class:</b>	3
<b>Note:</b>	The NTSB did not travel to the scene of this accident.		
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=101996">https://data.nts.gov/Docket?ProjectID=101996</a>		

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