



# Aviation Investigation Final Report

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<b>Location:</b>	Auburn Hills, Michigan	<b>Accident Number:</b>	CEN23LA067
<b>Date &amp; Time:</b>	December 21, 2022, 14:47 Local	<b>Registration:</b>	N8768U
<b>Aircraft:</b>	Cessna 172F	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of engine power (total)	<b>Injuries:</b>	1 Minor
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

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## Analysis

The pilot reported that shortly after takeoff, as the airplane was climbing through about 3,000 feet, the engine “coughed and shuddered and started to run rough.” After unsuccessfully troubleshooting the engine, the pilot decided to conduct an emergency landing on a nearby road. During the landing the airplane’s left wing clipped trees, causing the airplane to veer left and flip over. The airplane sustained substantial damage that included damage to both wings, horizontal and vertical stabilizers, fuselage, and engine mounts.

Postaccident examination revealed a trail of oil from the airplane’s hangar, down the taxiway, leading to the departure runway. The underside of the airplane was covered in engine oil, and the externally mounted engine oil cooler exhibited fresh oil leakage. The No. 4 cylinder connecting rod was separated and there were holes through the engine crankcase above the No. 4 cylinder, consistent with catastrophic failure due to a lack of lubrication.

The outside air temperature at the time of the accident was about 28°F. According to the airplane manufacturer, engine oil with a viscosity of SAE 20 was to be used at temperatures below 40°F and SAE 40 was to be used for temperatures above 40°F. However, the oil in the airplane’s engine had a viscosity of SAE 50, with an operating temperature range of 60° to 80° F. Although the pilot added an oil additive to “thin the engine oil,” the aircraft manufacturer noted that the use of any oil additives during cold weather operation is not recommended.

Additionally, the engine manufacturer indicated that operation of the engine without preheat could lead to oil congealing and engine failure, and operation of the engine above 1,700 rpm without first reaching minimum oil temperature could also lead to engine failure. The pilot reported that during the engine runup and takeoff roll the engine oil temperature gauge

indication was “not registering,” and he did not remember whether the oil pressure gauge indication was in the normal operating range. It is likely that the pilot’s failure to preheat the engine before starting it, in combination with his failure to warm the engine to operating temperature before takeoff, resulted in the engine failure.

## Probable Cause and Findings

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

The catastrophic engine failure due to lack of oil lubrication, which resulted from the pilot’s failure to follow the airplane and engine manufacturers’ guidance for cold weather operation.

### Findings

<b>Aircraft</b>	Oil - Fluid condition
<b>Personnel issues</b>	Incorrect action performance - Pilot

## Factual Information

### History of Flight

<b>Prior to flight</b>	Aircraft servicing event
<b>Enroute-cruise</b>	Powerplant sys/comp malf/fail
<b>Enroute</b>	Loss of engine power (total) (Defining event)
<b>Emergency descent</b>	Loss of engine power (total)
<b>Landing</b>	Collision with terr/obj (non-CFIT)

On December 21, 2022, about 1447 eastern standard time, a Cessna 172F, N8768U, received substantial damage when it was involved in an accident near Auburn, Michigan. The pilot sustained minor injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot stated that the accident flight was a proficiency flight, and he was planning to perform steep turns, stalls, and two landings. Before the flight, he added Marvel Mystery Oil to the 7 quarts of engine oil that was in the engine to “thin the engine oil.” He said that the airplane hangar was close to the departure runway and that during the engine runup and takeoff roll, the engine oil temperature gauge indication was “not registering.” He did not remember whether the oil pressure gauge indication was in the normal operating range. He stated that during the departure climb to cruise altitude, the engine “coughed, shuddered, and started to run rough.” The engine speed decreased to 1,700 rpm, and the pilot then diverted the flight to the departure airport. His attempts to regain engine power were unsuccessful, and he performed an approach for an off-airport landing, during which the engine seized when he reduced engine power to idle. He said the airplane was high and fast on the approach, and it clipped trees along a road that he intended to land the airplane on. The airplane sustained substantial damage to both wings, horizontal and vertical stabilizers, fuselage, and engine mounts.

Postaccident examination of the airplane by a Federal Aviation Administration (FAA) aviation safety inspector revealed that the underside of the airplane was covered in engine oil. The No. 4 cylinder connecting rod was separated, and there were holes through the engine crankcase above the No. 4 cylinder. The externally mounted engine oil cooler exhibited fresh oil leakage that exited from the bottom engine cowl. The airplane was not equipped with a Cessna winterization kit for cold weather operations below 20° F, nor was it required to be.

The FAA inspector stated there was a trail of oil leading from the airplane’s hangar down the taxiway to the runway. The pilot did not preheat the engine before start and did not warm the

engine to operating temperatures before takeoff in accordance with the procedures for cold weather operations in the Airplane Owner's Manual.

In 2013, an Aviation Development Corporation remote oil filter and an externally mounted oil cooler were installed onto the engine under an FAA field approval. The engine oil was last changed by the pilot using Aeroshell 100 (SAE 50) engine oil when the airplane was based in Las Vegas, Nevada, about 3 months before the accident. Aeroshell 100 has an operating temperature range of 60° to 80° F. The Airplane Owner's Manual states that SAE 20 oil is to be used at temperatures below 40°F. The temperature at the time of the accident was 28°F. According to Textron Aviation, Cessna and Continental Motors do not recommend the use of any additive to the oil during cold weather operations.

Teledyne Continental Motors Service Information Letter (SIL) 03-1, Cold Weather Operation – Engine Preheating, issued on January 28, 2003, stated, in part:

*Failure to properly preheat a cold-soaked engine may result in oil congealing within the engine, oil hoses, and oil cooler with subsequent loss of oil flow, possible internal damage to the engine, and subsequent engine failure.*

*Superficial application of preheat to a cold soaked engine can cause damage to the engine. An inadequate application of preheat may warm the engine enough to permit starting but will not de-congeal oil in the sump, lines, cooler, filter, etc. Congealed oil in these areas will require considerable preheat. The engine may start and appear to run satisfactorily but can be damaged from lack of lubrication due to the congealed oil blocking proper oil flow through the engine. The amount of damage will vary and may not become evident for many hours. However, the engine may be severely damaged and may fail shortly following application of high power.*

The SIL further stated that "operation of the engine above 1700 RPM before reaching minimum oil temperature may result in engine malfunction, engine failure, injury or death."

## Pilot Information

<b>Certificate:</b>	Airline transport; Flight instructor	<b>Age:</b>	63, 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>	No
<b>Instructor Rating(s):</b>	Airplane single-engine	<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	August 11, 2020
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	May 31, 2022
<b>Flight Time:</b>	3929 hours (Total, all aircraft), 421 hours (Total, this make and model), 3317 hours (Pilot In Command, all aircraft), 29 hours (Last 90 days, all aircraft), 2 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N8768U
<b>Model/Series:</b>	172F	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1965	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal; Utility	<b>Serial Number:</b>	17252691
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	December 1, 2021 Annual	<b>Certified Max Gross Wt.:</b>	2300 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	8776 Hrs at time of accident	<b>Engine Manufacturer:</b>	Continental
<b>ELT:</b>	C91 installed, activated, aided in locating accident	<b>Engine Model/Series:</b>	O-300-D
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	145
<b>Operator:</b>	On file	<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>	PTK,981 ft msl	<b>Distance from Accident Site:</b>	8.4 Nautical Miles
<b>Observation Time:</b>	13:53 Local	<b>Direction from Accident Site:</b>	260°
<b>Lowest Cloud Condition:</b>	Scattered / 17000 ft AGL	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	Broken / 23000 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	/	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>		<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.38 inches Hg	<b>Temperature/Dew Point:</b>	-2°C / -11°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Troy, MI (VLL)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Troy, MI (VLL)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	14:30 Local	<b>Type of Airspace:</b>	Class E

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Minor	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>		<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Minor	<b>Latitude, Longitude:</b>	42.67112,-83.22053(est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Gallo, Mitchell
<b>Additional Participating Persons:</b>	Larry McKillop; FAA FSDO; MI
<b>Original Publish Date:</b>	June 22, 2023
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class 3</a>
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.ntsb.gov/Docket?ProjectID=106483">https://data.ntsb.gov/Docket?ProjectID=106483</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).