

National Transportation Safety Board

Office of Aviation Safety
Central Region



CEN21LA386

WRECKAGE EXAMINATION SUMMARY

ACCIDENT

Location: Fishers, Indiana
Date: August 25, 2021
Time: 1822 eastern daylight time (2222 UTC)
Airplane: Acro Sport II, Registration No. N169BF

PARTICIPANTS

Andrew Todd Fox
National Transportation Safety Board
Denver, Colorado

Louis Soto
Federal Aviation Administration - Indianapolis FSDO
Indianapolis, Indiana

Brian Harless
Airplane owner/pilot/mechanic
Fishers, Indiana

ACCIDENT SYNOPSIS

On August 25, 2021, about 1822 eastern daylight time, an Acro Sport II experimental airplane, N169BF, was substantially damaged when it was involved in an accident near Fishers, Indiana. The pilot was not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that the purpose of the post-maintenance flight was to break-in two engine cylinders that were replaced the day before the accident. Based on the pilot's statement and fueling documentation, the airplane's 23-gallon fuel tank was topped off before the flight. The pilot reported that the engine was operated at maximum speed (2,800 rpm) with a full rich mixture setting throughout the flight, and that the airplane had a total loss of engine power "a little over an hour" after takeoff. The forward right side of the fuselage impacted a street signpost during the forced landing, resulting in substantial damage to a structural fuselage tube.

WRECKAGE EXAMINATION TIMELINE

The National Transportation Safety Board (NTSB) Investigator did not travel to the accident site. The NTSB gave permission for the airplane to be recovered to the pilot's hangar at Indianapolis Metro Airport (UMP), Fishers, Indiana, where it could be examined.

On August 26, 2021, Federal Aviation Administration (FAA) Airworthiness Inspector Soto examined the airplane in the pilot's hangar. On August 30, 2021, the pilot/owner conducted an engine test run at the request of the NTSB.

AIRPLANE DESCRIPTION

The airplane was an experimental (amateur built) Acro Sport II, serial number (s/n) 1392, registration number N169BF. The biplane was designed for aerobatic flight. The airplane was equipped with a Lycoming IO-360 engine that was modified with oversized cylinders and pistons. The engine was considered experimental and had no data plate or serial number.

MAINTENANCE SUMMARY

Condition Inspection

According to maintenance documentation, the airplane's last condition inspection was completed on March 21, 2021. At that time, the airframe total time (AFTT) and engine time since overhaul (TSOH) were 640.9 hours and 59.8 hours, respectively.

Recent Maintenance

On October 17, 2017, the engine was overhauled and modified with oversized cylinders and pistons to increase the maximum power to 205 horsepower.

On March 31, 2020, the engine was installed on the airplane with 0.0 hours TSOH.

On March 22, 2021, during the last condition inspection, the tachometer was reset to 0.0 hours. At that time the AFTT and engine TSOH were 640.9 hours and 59.8 hours, respectively.

On August 24, 2021, cylinder Nos. 3 and 4 were replaced after being refurbished due to low compression. The mechanic, who was also the pilot/owner, reported that there were no issues noted during his engine runup following the cylinder replacements. At that time the AFTT and engine TSOH were 668.9 hours and 87.8 hours, respectively.

Based on a review of air traffic control radar data, on August 25, 2021, the pilot flew the airplane about 1 hour 15 minutes 24 seconds (1.26 hours) during the accident flight.

Based on available information, at the time of the accident, the AFTT and engine TSOH were 670.2 hours and 89.1 hours, respectively.

WRECKAGE EXAMINATION

Thursday, August 26, 2021

The airplane was initially examined by Federal Aviation Administration (FAA) Inspector Louis Soto of the Indianapolis Flight Standards District Office (FSDO). Inspector Soto reported that the forward right side of the fuselage impacted a street signpost during the forced landing, resulting in a bent/buckled a structural steel tube.

The airplane's fuel tank was found empty, and only 2-3 fluid ounces of fuel was recovered when the fuel system was drained during the examination.

Engine control continuity was confirmed from the cockpit controls to the throttle arm and mixture control at the fuel servo. Additional examination revealed that the fuel inlet fitting to the fuel control unit (FCU) was "finger tight." Other than the loose fuel inlet fitting, there were no mechanical anomalies identified during the examination.

Mr. Brian Harless (airplane owner/pilot/mechanic) subsequently discovered evidence of a fuel leak within the engine compartment (structural tubes, firewall, control cable clamps) and on the exterior lower fuselage skins aft of the firewall. The evidence of a fuel leak included areas of fuel pooling, droplets of fuel dripping from control cable clamps, a fuel sheen on the firewall, and fuel streaking on the exterior lower fuselage skins aft of the firewall.

Monday, August 30, 2021

The National Transportation Safety Board (NTSB) Investigator-in-Charge (IIC) asked Mr. Harless to conduct an engine ground test with a known amount of fuel to determine the fuel consumption at maximum static engine rpm.

The loose fuel inlet fitting was reinstalled and tightened in preparation for an engine test, and the fuel system was pressurized at least 2 times which confirmed there were no other leak sources.

Four gallons of 100LL aviation fuel were added to the empty fuel tank and there was no evidence of a fuel system leak with the electric fuel pump turned on. The 4 gallons of fuel was pumped out of the fuel system to return it to an empty state.

A measured 2 gallons (256 fluid ounces) of 100LL aviation fuel was added to the empty fuel tank. Any air in the fuel system was purged by running the electric fuel pump with the throttle full-forward and the mixture full-rich until fuel discharged from the FCU overboard tube, which was collected and returned to the fuel tank to ensure the full 2 gallons of fuel remained available during the engine test run.

The engine was started and immediately brought to maximum static rpm (2,260 rpm) with the throttle full-forward and the mixture control full-rich. The engine was run for 5 minutes at maximum static rpm with the throttle full-forward and the mixture control full-rich. During the test run, the engine operated normally without any hesitation, stumbling or interruption in power.

There was no evidence of a fuel system leak following the engine test. The remaining fuel in the system was pumped into a plastic container, recovering 110 fluid ounces (0.86 gallons) of fuel.

2 gallons - 0.86 gallons = 1.14 gallons of fuel used during the 5-minute (0.0833 hour) engine run.

1.14 gallons / 0.0833 hour = 13.69 gallons per hour (gph) at maximum static engine rpm (2,260 rpm).

The pilot/owner stated the maximum engine rpm for the engine was 2,800 rpm.

$(2,800 - 2,260) / 2,260 = 23.9\%$ difference between static and maximum engine rpm.

Assuming a linear increase in fuel consumption between static and maximum engine speed, $13.69 + (0.239 * 13.69) = 16.96$ gph at maximum engine speed.

Based on a 16.96 gallon per hour fuel consumption rate, the expected fuel endurance for the 23 gallon fuel load during the accident flight, as reported by the pilot/owner, would have been about 1.35 hours (1 hour 21 minutes) at maximum engine power (2,800 rpm).

According to the pilot, the total flight time (from takeoff to accident) was 1 hour 7 minutes. The pilot noted that he did not have a prolonged taxi or engine run-up before takeoff. Based on a review of air traffic control radar track data, the flight was airborne about 1 hour 15 minutes 24 seconds (1.26 hours).