



Aviation Investigation Final Report

Location:	Wheeling, Illinois	Accident Number:	CEN19LA220
Date & Time:	July 11, 2019, 20:42 Local	Registration:	N83BA
Aircraft:	ICON A5	Aircraft Damage:	Substantial
Defining Event:	Fuel exhaustion	Injuries:	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was conducting a personal cross-country flight when the airplane had a total loss of engine power while on a 3-mile base leg for the runway at the intended destination. The airplane collided with trees and terrain during the forced landing, which resulted in substantial damage to the composite fuselage and wings.

Based on recorded engine data, most of the flight was flown above the maximum continuous engine speed of 5,500 rpm and, as a result, the actual fuel consumption rate during the flight exceeded the fuel consumption rates listed in the *Pilot Operating Handbook* performance section. The engine operates between two modes, economy and power, which have significantly different fuel consumption rates. Although the airplane was equipped with an analog tachometer and analog fuel quantity indicator, it was not equipped to display instantaneous fuel flow rate, total fuel used, or the engine operating mode (economy vs. power).

Postaccident fuel consumption calculations, based on the engine running in power mode for 68.4% of the flight and economy mode for the remaining 31.6% of the flight, suggest that the engine likely used at least 15.2 gallons of fuel.

The pilot reported that the airplane's fuel gauge indicated 17 gallons before the flight, but postaccident testing revealed that the fuel gauge consistently indicated 1.0 to 1.5 gallons more than the amount in the fuel tank. The airplane likely had 15.5 to 16.0 gallons of fuel before engine start; as such, the pilot likely departed with less fuel than he thought was on board. However, the airplane would likely have had enough fuel to complete the flight had the pilot operated the engine at or below the airplane manufacturer's maximum continuous speed limit.

Probable Cause and Findings

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

The pilot's decision to operate the engine above its maximum continuous speed for most of the flight, which led to fuel exhaustion and a subsequent total loss of engine power.

Findings

Personnel issues	Use of equip/system - Pilot
Aircraft	Fuel - Fluid management
Aircraft	Fuel - Fluid level

Factual Information

History of Flight

Approach-VFR pattern base	Fuel exhaustion (Defining event)
Landing	Off-field or emergency landing

On June 11, 2019, about 2042 central daylight time, an amphibious ICON Aircraft A5 airplane, N83BA, was substantially damaged when it was involved in an accident near Wheeling, Illinois. 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 he and his wife own two identical ICON Aircraft A5 airplanes. Earlier in the day, they flew in their respective airplanes from St. Louis Downtown Airport (CPS), Cahokia, Illinois, to Eagle Creek Airpark (EYE), Indianapolis, Indiana, in a loose formation. Both airplanes departed CPS with 17 gallons of fuel, as indicated on each airplane's fuel quantity gauge, and had about 5 gallons of fuel remaining after completing the 3-hour flight from CPS to EYE. The distance between CPS and EYE was about 202 nautical miles (nm) according to the pilot's flight planning software.

After landing at EYE, each airplane was serviced with 12 gallons of fuel, and the fuel quantity gauge of each airplane indicated 17 gallons. The pilot's flight planning software estimated that 13 gallons of fuel was required for the planned 2.4 hour flight from EYE to Chicago Executive Airport (PWK), Wheeling, Illinois. The pilot noted that the distance between EYE and PWK was about 165 nm, and that he expected to land at PWK with at least 4 gallons of fuel remaining.

The pilot reported that the flight was uneventful for about 2.3 hours at which time the engine began to lose power. A total loss of engine power occurred while the airplane was on a 3-mile left base leg for runway 16 at PWK. The pilot made a forced landing in a forest preserve about 1.2 miles from the airport, during which the airplane collided with trees and terrain. The pilot's wife was able to safely land her airplane at PWK with about 1.4 gallons (1.3 gallons usable) of fuel remaining after completing her 2.4 hour flight.

Pilot Information

Certificate:	Private	Age:	70, Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	3-point
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 With waivers/limitations	Last FAA Medical Exam:	June 20, 2018
Occupational Pilot:	No	Last Flight Review or Equivalent:	December 29, 2018
Flight Time:	3406 hours (Total, all aircraft), 82 hours (Total, this make and model), 2706 hours (Pilot In Command, all aircraft), 135 hours (Last 90 days, all aircraft), 42 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	ICON	Registration:	N83BA
Model/Series:	A5	Aircraft Category:	Airplane
Year of Manufacture:	2018	Amateur Built:	
Airworthiness Certificate:	Special light-sport (Special)	Serial Number:	00051
Landing Gear Type:	Retractable - Tricycle	Seats:	2
Date/Type of Last Inspection:	September 11, 2018 Condition	Certified Max Gross Wt.:	1510 lbs
Time Since Last Inspection:	79 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	82 Hrs at time of accident	Engine Manufacturer:	Rotax
ELT:	C126 installed, activated, did not aid in locating accident	Engine Model/Series:	912is
Registered Owner:	CG 422 LLC	Rated Power:	100 Horsepower
Operator:	CG 422 LLC	Operating Certificate(s) Held:	None

The amphibious light sport airplane was powered by a Rotax 912iS Sport fuel injected 4-cylinder engine that was rated at 100 horsepower at 5,800 rpm. The engine was equipped with a dual-redundant ignition system and a fully digital engine control unit (ECU) that automatically adjusted the air-fuel mixture continuously to maintain optimal performance, efficiency, and low emissions. The throttle position is transmitted to the ECU where it is combined with environmental inputs to provide the requested power output.

According to the ICON Aircraft A5 *Pilot Operating Handbook* (POH), the maximum continuous engine speed is 5,500 rpm, and engine operation at 5,800 rpm is limited to 5 minutes or less. The POH listed the expected fuel consumption rates from sea level to 12,000 ft pressure altitude at engine speeds between 4,000 and 5,500 rpm. According to the POH's cruise performance tables, the expected fuel consumption rate was about 5 gallons per hour at a cruise altitude of 3,000 ft with a standard temperature lapse rate and an engine speed of 5,500 rpm. The POH did not provide fuel consumption rates for engine speeds above 5,500 rpm.

According to the operating manual for the Rotax 912iS engine, the engine operated between two modes, economy and power, which have “significantly” different fuel consumption rates. The manual notes that the switchover between the economy and power modes occurs when the throttle position is advanced above 97%. In economy mode, the expected fuel consumption rate is about 4.8 gallons per hour at 5,500 rpm and a manifold pressure of 27 inches of mercury. In power mode, the expected fuel consumption rate is about 6.9 and 7.3 gallons per hour at 5,500 and 5,800 rpm, respectively.

Although the airplane was equipped with an analog tachometer and analog fuel quantity gauge in the cockpit, the airplane was not equipped to display instantaneous fuel flow, total fuel used, or the engine operating mode (economy or power).

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Dusk
Observation Facility, Elevation:	KPWK, 629 ft msl	Distance from Accident Site:	1.2 Nautical Miles
Observation Time:	20:52 Local	Direction from Accident Site:	216°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	3 knots / None	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	80°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	29.98 inches Hg	Temperature/Dew Point:	19°C / 13°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Indianapolis, IN (EYE)	Type of Flight Plan Filed:	None
Destination:	Wheeling, IL (PWK)	Type of Clearance:	VFR
Departure Time:	19:32 Local	Type of Airspace:	Class D

Airport Information

Airport:	Chicago Executive Airport PWK	Runway Surface Type:	Asphalt
Airport Elevation:	647 ft msl	Runway Surface Condition:	Dry
Runway Used:	16	IFR Approach:	None
Runway Length/Width:	5001 ft / 150 ft	VFR Approach/Landing:	Forced landing;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	1 None	Latitude, Longitude:	42.134723,-87.89167

A postaccident examination revealed that the airplane's fuel tank did not contain any usable fuel and that the low fuel annunciator light was illuminated. After the airplane was recovered to a hangar, water was added to the fuel tank in 1-gallon increments to verify the accuracy of the fuel quantity gauge in the cockpit. The test results revealed that the low fuel light turned off after adding 1.75 gallons to the empty tank and that the fuel quantity gauge consistently indicated 1.0 to 1.5 gallons more than what was in the fuel tank. At the request of the NTSB investigator, the pilot conducted a similar test on his wife's airplane and found that the fuel quantity gauge for her airplane consistently indicated 0.5 to 1.2 gallons more than what was in the fuel tank.

Additional Information

Engine Data Summary

The airplane was equipped with a digital data module that recorded GPS, engine, and flight parameters. According to the recovered data, the pilot started the engine at 1824:18 and increased the throttle to 100% at 1832:20 for takeoff on runway 3 at EYE. After takeoff, the

pilot flew the airplane north-northwest toward PWK at a cruise altitude of about 3,000 ft mean sea level (msl) and at engine manifold pressures of 26.5 to 27 inHg. The elapsed time between engine startup and the end of the recorded data was about 2.31 hours.

Further review of the engine data revealed that the pilot exceeded the maximum continuous speed limitation of 5,500 rpm for about 1.4 hours or 60.5% of the flight. Additionally, the recorded throttle position was at or above 97% (where the engine switches between economy and power modes) for about 1.7 hours or 74.6% of the flight, the throttle position was at 100% for about 1.2 hours or 52.5% of the flight, and the engine was in power mode for about 1.6 hours or 68.4% of the flight.

Administrative Information

Investigator In Charge (IIC):	Fox, Andrew
Additional Participating Persons:	William Borah; Federal Aviation Administration - Greater Chicago; Des Plaines, IL Bret Davenport; ICON Aircraft; Vacaville, CA Jordan Paskevich; Rotech Flight Safety Ltd.; Vernon
Original Publish Date:	August 19, 2022
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=99827

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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](#).