Aviation Investigation Final Report

Location:	Belmont, Ohio	**Accident Number:**	CEN12FA217
Date & Time:	March 30, 2012, 18:40 Local	**Registration:**	N8060J
Aircraft:	OLIVER JOSEPH ZODIAC CH 601XL	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot had previously flown the experimental, amateur-built airplane cross-country to a potential buyer; the sale was not completed and the airplane did not fly for several months until arrangements could be made to return the airplane. The pilot was ferrying the airplane on the return flight. A witness reported seeing the airplane in cruise flight when its engine “cut out” and its attitude dipped slightly then leveled; the airplane then nosed over and descended straight down, impacting the ground in a residential yard. Another witness reported that the engine “roared loudly” and sped up just before the airplane nosed over. A review of the airplane maintenance records revealed an annotation dated about 4 months before the accident indicating that the pilot had previously performed a precautionary landing due to a rough running engine. The reason for the rough running engine and any repairs made were not found in the airplane records.

A postcrash examination of the airplane’s engine showed heavy sooting and contaminants in the carburetor inlet, the inlet side of the carburetor slide, the outlet side of the butterfly valve, and the lower outlet portion of the venturi, which exhibited a distinct washing of the soot. The inlet side of the venturi had minor sooting. The outlet side of the slide was relatively free of sooting but exhibited a varnish or gum-type build-up. The slide was found in the closed position and did not move freely; however, it would move if a prying force was applied to the bottom of the slide. Sooting patterns on the outlet side of the engine components are usually indicative of a leaking intake valve, which could cause blowback of gases into the intake manifold and carburetor. If severe enough, this blowback could result in engine failure. In addition, the build-up observed on the carburetor slide was much more than normal and could have caused the slide to stick open during the accident flight. If the throttle were reduced while the slide was stuck, air flow would be reduced while fuel flow remained high, resulting in a rich

mixture that could stop the engine. The engine would again run at full throttle but not at any reduced throttle setting. Although the carburetor slide was found in the closed position, a problem with engine operation would be expected with a slide that does not move freely. Based on the examination of the carburetor and other engine components, it is likely that the engine experienced a loss of power. The witness statements indicating the airplane's sudden drop in altitude suggest that the pilot's attention was focused on the engine problem rather than maintaining airplane control, resulting in the airplane entering a rapid descent and impacting terrain.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The loss of engine power and the pilot's diverted attention to the engine power loss, which resulted in a rapid descent and impact with terrain.

Findings

Aircraft	(general) - Not specified
Personnel issues	Attention - Pilot

Factual Information

History of Flight

Enroute-cruise	Loss of engine power (total) (Defining event)
Enroute-cruise	Loss of control in flight

HISTORY OF FLIGHT

On March 30, 2012, about 1840 eastern daylight time, a kit built Zodiac CH 601XL, N8060J, departed cruise flight and impacted a residential yard near Belmont, Ohio. The commercial rated pilot, the sole occupant, was fatally injured and the airplane sustained substantial damage. The airplane was registered to the Wings of Hope (WOH), Chesterfield, Missouri, and operated by a private individual. Day visual meteorological conditions prevailed and no flight plan was filed for the 14 Code of Federal Regulations Part 91 cross country flight. The flight originated from the Mifflin County Airport, (KRVL) Pottstown, Pennsylvania, about 1700 EST and destined for the Spirit of St. Louis Airport (KSUS), Chesterfield, Missouri, via unknown routing.

The pilot had flown the airplane to Pennsylvania several months earlier for WOH, who had a buyer for the airplane. The purchase of the airplane was not completed and the airplane did not fly for about four months until arrangements with the pilot were made to return the airplane to Missouri.

Witnesses reported that the airplane was in cruise flight. Some reported that the engine stopped, restart, and speeded up. The airplane's attitude dipped slightly, leveled, then nosed over and came straight down.

PERSONNEL INFORMATION

The pilot held commercial pilot certificates for airplane single-engine land and sea, multiengine land and instrument-airplane ratings, as well as, commercial pilot ratings for gliders and rotorcraft-helicopter. He also held flight instructor ratings for single, multi-engine and instrument airplane, and mechanic certificate with airframe and power plant ratings.

A first-class Federal Aviation Administration, (FAA) medical was issued on February 7, 2012. An electronic excel spreadsheet logbook was provided. The pilot had approximately 3,355 total flight hours, 2,333 in single-engine airplane, 430 in multiengine airplanes and about 82 hours in rotorcraft. The pilot's records indicated that he flew the accident airplane for 7.7 hours, excluding the accident flight. The most recent time in the accident airplane was about four months earlier.

AIRCRAFT INFORMATION

The Zodiac 601 airplane is an all-metal, side-by-side, two-seat, fixed landing gear airplane, that could either be assembled as a kit by a builder or produced by Aircraft Manufacturing and Design (AMD) as a Special – Light Sport (S-LSA) airplane per ASTM standard. The accident airplane was produced from a kit by a builder and received its airworthiness certificate in the Experimental – Amateur Built category on August 4th, 2004, as a Oliver Joseph, model Zodiac CH 601XL. The airplane was powered by a 120 horsepower, Jabiru 3300a engine which turned a Sensenich wooden, fix-pitch, two bladed propeller.
According to maintenance records, the airplane's most recent annual condition inspection was completed by a WOH mechanic on November 8, 2011, with an airframe total time of 210.0 hours. The review of the maintenance records also revealed that the airplane had been involved in a prior precautionary landing due to a rough running engine, and was annotated in the November 8, 2011 entry. The problem or specific corrective actions were not noted in the log.

The Zodiac CH 601XL and CH650 were subject to Special Airworthiness Information Bulletin (SAIB) CE-10-08, dated November 7, 2009, that identified a concern with regards to the airplane's wing structure. To address the SAIB, the kit manufacturer provided a wing upgrade modification package for builders/owners to incorporate into their airplanes. Examination of the accident airplane revealed that wing modification had been accomplished.

METEOROLOGICAL INFORMATION

At 1853, the automated weather observation facility located at the Wheeling Ohio County Airport (KHLG) about 20 miles northeast of the accident site, reported wind from 180 degrees at 8 knots, visibility 10 miles, scattered clouds at 9,000 feet, temperature 64 Fahrenheit (F), dew point 48 F, and a barometric pressure of 29.70 inches of mercury.

A review of the carburetor icing probability chart, located in the FAA's Special Airworthiness Information Bulletin CE-09-35, dated June 30, 2009, and relevant meteorological data, revealed that the weather conditions for carburetor icing, in the general area, were favorable for serious icing at glide power and just outside conditions for serious icing at cruise power.

The engine manufacturer representative stated that the Jabiru engines are generally not susceptible to icing, unless conditions are just right, such as moisture present. He added that the carburetor is located behind the muffler and it helps keep the area warm.

COMMUNICATIONS and RADAR INFORMATION

The pilot was not in contact with air traffic control and there were no reported distress calls from the pilot. Review of radar data revealed the airplane heading westbound at a consistent altitude/airspeed, with the last radar return at 1840, with the airplane at 3,200 feet.

WRECKAGE AND IMPACT INFORMATION

The National Transportation Safety Board, and inspectors from the Federal Aviation Administration (FAA), examined the airplane wreckage on site. The airplane came to rest in a residential yard, just a few feet from a home. All major components of the airplane were accounted for on scene. There was no post-impact fire.

The airplane wreckage and wing outline was consistent with a near vertical, high energy impact with the ground. The fuselage, wings, and engine all displayed extensive crushing. The shape of the ground damage was consistent with wings that were intact and straight at impact.

The both wings remained attached to the fuselage with extensive damage along the leading edge. The both wing fuel tanks was breached and absent of fuel, vegetation blight consistent with fuel contamination was present.

The propeller hub remained bolted to the engine crankshaft however; the wooden blades had disintegrated on impact

The empennage exhibited extensive damage to the horizontal and vertical stabilizers, and their respective control surfaces. The rudder, elevator and trim tab, remained attached via their respective hinges.

MEDICAL AND PATHOLOGICAL INFORMATION

Due to the violent nature of the impact, the Belmont County Coroner’s office was unable to conduct an autopsy on the pilot.

The FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, could not perform toxicological tests on the specimens for carbon monoxide or cyanide. The specimens were negative for ethanol and tested drugs.

TEST AND RESEARCH

Further examination of the airframe revealed that the airplane did not exhibit the flutter or structural signatures that were identified in airplanes that brought about the SAIB.

Control continuity was established from each of the respective control surfaces to the front section of the fuselage.

Damage to the aircraft engine appeared consistent with impact damage. Continuity from the propeller through the crankshaft and pistons, camshaft and starter ring gear was established. The two distributors had separated from the engine. The left distributor shaft was bent and

would not rotate. The rocker covers were removed and the valves were free to move. The valve seats were clean and appeared normal. The exposed valve heads and piston heads had varying degrees of heavy corrosion, becoming more severe on the forward pistons. Under the corrosion the piston heads appear to have a light sooting consistent with normal operation. A stain between the number five and six cylinders was present, indicating leaking between the cylinder heads and cylinders. Heavy rain had passed over the accident site, before the airframe and engine were recovered and the left front cylinder exhibited a “water mark” as if the cylinder was partially full of water while in a nose-down attitude. The oil reservoir had separated from the engine exposing the lower part of the engine.

A piece of filter material was found in the airflow divider. The piece appeared similar to a section of filter material from a NAPA 1394 oil filter. Review of the engine log noted that a NAPA 1394 oil filter had been installed at the last oil/filter change. The material did not match the air filter material typically used in the engine installation. The oil filter is positioned in front of the airflow divider.

A Bing carburetor was installed on the engine. The carburetor inlet, the sides of the carburetor slide and needle facing the inlet (filter side) exhibited moderate to heavy sooting/contamination. The outlet or engine side of the slide was relatively free of sooting. However, there was a varnish or gum type build up on the outlet side of the slide. The bottom of the slide was contaminated with sooting on the outlet side. The slide was found in the closed position and did not move freely, but would move if a prying force was applied to the bottom of the slide.

The outlet or engine side of the butterfly valve was heavily sooted and darkened. The lower outlet portion of the venturi was sooted below the butterfly with a distinct washing of the soot at the bottom dead center.

The carburetor bowl was clean and the floats were free to move. The needle valve was free to move and remained attached to the floats. The engine driven fuel pump’s rubber diaphragm was supple and intact; the pump shaft was free to move.

The engine manufacturer’s representative stated that the sooting patterns on the engine side of the components are typical of a leaking intake valve. A leaking intake valve could cause blow back into the intake manifold and carburetor. The representative added that the blowback could stop the engine if severe enough. The representative had not seen the type of contamination noted in the inlet and on the inlet sides of the slide and needle. There was a massive head to cylinder barrel leak on cylinder number six, and small leaks on several others. The head to cylinder barrel leaks were not likely to cause engine stoppage, but could have caused a rough running engine from an overly lean mixture. He also added that the amount of buildup on the carb slide was much more than he was accustomed to seeing. This buildup could have caused the slide to stick open. With the slide stuck open the fuel metering needle would stay up and allow fuel flow sufficient for full throttle operation. If the throttle was reduced while the slide was stuck open, the air flow would be reduced but fuel flow would

remain high resulting in a rich mixture which could stop the engine. It would again run at full throttle but not at any reduced throttle setting. The slide was found in the closed position.

Pilot Information

Certificate:	Commercial	**Age:**	56,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Glider; Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	February 7, 2012
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	October 24, 2011
Flight Time:	(Estimated) 3355 hours (Total, all aircraft), 8 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	OLIVER JOSEPH	**Registration:**	N8060J
Model/Series:	ZODIAC CH 601XL	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	64848
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	November 8, 2011 Condition	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	210 Hrs as of last inspection	**Engine Manufacturer:**	Jabiru
ELT:	Installed	**Engine Model/Series:**	3300A
Registered Owner:	Wings of Hope	**Rated Power:**	120 Horsepower
Operator:	Wings of Hope	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KHLG	**Distance from Accident Site:**	20 Nautical Miles
Observation Time:	18:53 Local	**Direction from Accident Site:**	45°
Lowest Cloud Condition:	Scattered / 9000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	180°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.7 inches Hg	**Temperature/Dew Point:**	18°C / 9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Mifflin County, PA (KRVL)	**Type of Flight Plan Filed:**	None
Destination:	Spirit of St L, MO (KSUS)	**Type of Clearance:**	VFR
Departure Time:	17:00 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	40.019451,-81.040214(est)

Administrative Information

Investigator In Charge (IIC):	Hatch, Craig
Additional Participating Persons:	Mark Harden; FAA FSDO; Cleveland, OH Pete Krotje; Jabiru USA ; Shelbyville, TN John Clark; NTSB; Washington, DC
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