



National Transportation Safety Board Aviation Accident Factual Report

Location:	Globe, AZ	Accident Number:	WPR15LA020
Date & Time:	10/24/2014, 0800 MST	Registration:	N244SW
Aircraft:	WINSTON W WALKER THUNDER MUSTANG	Aircraft Damage:	Substantial
Defining Event:	Loss of engine power (total)	Injuries:	1 Serious
Flight Conducted Under:	Part 91: General Aviation - Personal		

HISTORY OF FLIGHT

On October 24, 2014, about 0800 mountain standard time, an experimental amateur-built Winston W. Walker Thunder Mustang airplane, N244SW, was substantially damaged after colliding with terrain while attempting to make a forced landing following a loss of engine power about five nautical miles (nm) north of Globe, Arizona. The commercial pilot/owner, who was the sole occupant, sustained serious injuries. The airplane was being operated in accordance with 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed at the time of the accident, and no flight plan was filed. The local flight departed La Cholla Airpark (57AZ), Tucson, Arizona, about 0700.

In a statement provided to the National Transportation Safety Board (NTSB) investigator-in-charge (IIC), the pilot reported that the purpose of the flight was to practice instrument approaches. The pilot stated that after making the GPS 27 approach to San Carlos Apache Airport (P13), Globe, Arizona, he made a low approach, which was followed by executing the published miss approach procedure, and then leveling off at 6,500 ft mean sea level (msl). The pilot reported that shortly thereafter he felt a power reduction, as if the throttle was pulled all the way back; he then read the rpm gage indication of 0. The pilot opined that not being able to maintain altitude sufficient to make it to the nearest airport, which was about 13 nm to the southeast, he elected to land in what he termed "the least unfriendly ground." The pilot reported that on short final he was forced to fly under some wires, during which the landing gear touched the road and impacted a guard rail as the right wingtip collided with a telephone pole. The pilot stated that the airplane landed in brush-covered terrain, and seemed to stop immediately, coming to rest upright. The pilot added that the engine stopped [in flight] with no advance indications, aural warnings, or panel warning signs.

Information provided to the NTSB IIC by a Federal Aviation Administration aviation safety inspector, revealed that the airplane came to rest upright on an easterly heading in a dry river bed, covered by scrub brush. There was no postcrash fire. The airplane was recovered to a secured storage facility for further examination.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with airplane single-engine land, multiengine land, and instrument airplane ratings. He reported that he had accumulated a total of 5,089 hours of flight time, including 353 hours in the accident airplane make and model. His most recent flight review was completed on October 7, 2014, and his most recent FAA third-class airman medical certificate was issued on August 4, 2014.

AIRCRAFT INFORMATION

The airplane, serial number GITM025, was a kit-built, scale model version of the WWII North American P-51 fighter. Construction of the airplane was completed in 2008.

The fuselage was constructed primarily of composite-type material. Conventional flight controls were actuated by pushrods directly linked to the cockpit controls for the elevator and ailerons, and by cables for the rudder.

The airplane was equipped with a custom-designed 12 cylinder Falconer V-12 engine (serial number RFI 12018). The engine, which produced 640 horsepower, had accumulated a total time of 352.6 hours, with 190.4 since its most recent overhaul, and 14.6 hours since its most recent conditional inspection.

Most engine accessories were mounted on or near the aft face of the engine, and were driven by three one-inch wide serpentine belts. Additionally, the engine was equipped with two MoTec brand M-48 engine control units (ECU), and an Electronic Data Monitor (EDM) MVP-50. A detailed description of each unit is presented in the Test and Research section of this report.

During a postaccident examination of the engine's maintenance records, it was revealed that on December 16, 2009, at an engine total time in service of 149.3 hours, the logbook entry stated, "11/22, flight showed rough engine, #11 cylinder went cold. All fuel and electrical tested good. #11 exhaust valve pushrod was worn and came loose. Replace pushrod with factory new "long" pushrod. Checked oil filter and chip detector. Showed no metal. Runup check good. Return to service." The entry was signed off by the pilot/owner. The next engine logbook entry occurred on January 9, 2010, at a total time in service of 153.4 hours, which noted the replacement of a seal on the hydraulic pump, and a test run with no leaks noted.

In a statement submitted to the NTSB IIC on January 3, 2016, the pilot/owner/builder of the accident airplane reported that on January 14, 2010, during a local flight the #12 cylinder went cold. It was discovered that a roller lifter on the cylinder had rotated in its bore and made a deep groove in the camshaft, which had resulted in the rocker arm and push rod to separate on the cylinder. The pilot stated that at this time he grounded the airplane for repairs, and with the assistance of an airframe and powerplant mechanic, removed the engine and accessories, and transported the engine to a local marine shop to be repaired. The pilot further stated that on July 30, 2010, he retrieved the repaired engine up from the marine shop and transported it back to his personal hangar for installation. The pilot opined that over the next couple of months he reinstalled the accessories on the back of the engine, including the pulley that had failed on the date of the accident flight, October 24, 2014. The pilot reported that he carefully followed the engine manufacturer's repair manual in all aspects, including a proper torquing of

the three bolts holding the pulley on, as well as the application of Loctite per the maintenance repair manual. The pilot stated, "I have the proper experience and tools, including torque wrenches to perform the work, and the torque wrenches were accurately calibrated." The pilot added that all of the appropriate work was completed on October 19, 2010, after which he returned the airplane to service.

METEOROLOGICAL INFORMATION

At 0751, the automated weather observation facility at Phoenix-Mesa Gateway Airport (IWA), Phoenix, Arizona, which is located about 42 nm west-southwest of the accident site, reported wind calm, visibility 45 miles, sky clear, temperature 19° C, dew point 10° C, and an altimeter setting of 30.08 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

A postaccident examination of the airplane's engine was performed on October 7, 2015, at the facilities of Air Transport, Phoenix, Arizona. The examination was attended by representatives from the NTSB, FAA, and the engine manufacturer, Ryan Falconer Industries.

As a result of the examination, it was revealed that one of the 3 bolts that secures the main crank drive pulley to the associated damper was observed to have separated from the pulley; the bolt was not recovered during the examination. Additionally, the 2 bolts that remained in the main crank drive pulley were loose. Subsequent to the removal of the bolts from the pulley, a visual inspection revealed a lack of "Loctite," a substance, which according to the repair manual, is to be applied to each bolt prior to reassembly of the pulley. The representative for the engine manufacturer stated during the examination that the overhaul manual for the engine specifically denotes that the proper installation of the pulley would have included the application of "Loctite" and the torqueing of each bolt to 35 foot pounds of pressure.

According to the engine manufacturer's representative, the examination also revealed that signatures on the main crank pulley's reluctor teeth (7) were indicative of having made contact with the idler pulley, which then would have resulted in the idler arm having separated from the pulley. The representative added that this would have resulted in 2 accessory belts becoming unsecured, which would have further resulted in both crank sensor plugs becoming dislodged. The dislodged crank sensor plugs would have then interrupted the ignition source and resulted in the complete engine stoppage; both sensor plugs were observed dislodged during the examination.

The detailed examination of the engine also revealed that when all 12 cylinders were examined, there was no indication that any of the pistons had collided with their associated valves. Additionally, all push rods were intact with no anomalies noted.

All 12 spark plugs, exclusive of the #5 plug, were removed and visually examined. The majority were observed to be wet and corroded to a moderate extent. The engine representative opined that this condition was consistent with the engine having been contaminated by first responders spraying the airplane down with a liquid material, as well as the fact that the airplane had been stored outside in a salvage yard for almost a year after the accident had occurred.

All 12 fuel injectors were removed and visually inspected. Each was observed to be clear of any foreign material, with no anomalies noted.

The 3 accessory drive belts were accounted for during the examination. Each was observed not to have been compromised in any manner that would have precluded normal operation.

TEST AND RESEARCH

Main Crank Drive Pulley and Securing Bolts

Subsequent to the examination of the engine, the main crank drive pulley, with 2 of the 3 recovered securing bolts, was sent to the NTSB Materials Laboratory in Washington, D.C., for examination by a Senior NTSB metallurgist. As a result of the examination the metallurgist reported the following:

Visual examinations found that the pulley was intact, but the attaching holes were damaged. As referenced in the Materials Laboratory Factual Report, Report No. 16-041, which is appended to this report, for identification purposes, the holes were arbitrarily labeled "A", "B" and "C".

Hole "A" was least damaged with slight ovalization and light thread marks on the hole bore. The bolt head contact area had a contact pattern with minor material displacement. Holes "B" and "C" showed significant damage, including significant material removal from the bolt head contact surfaces, and large ovalization of the hole diameters. Both faces of the holes are displayed in figures 3, 4 and 5 of the appended report.

The pulley's inner diameter wall adjacent to holes "B" and "C" also showed marks consistent with bolt head contact, as shown in figure 6 of the appended report. The position of the marks was as if the bolts were only partially threaded into the crankshaft flange.

The two received bolts were intact. The bolt threads were not damaged but had aluminum material trapped in several of the thread roots. The sides of the bolt heads were locally polished, which was consistent with the previously noted contact marks on the inner wall of the pulley. The washer faces under the bolt heads were also heavily polished, indicative of relative motion with the mating pulley surfaces.

The torquing specifications indicate that the bolts were to be torqued with "Loctite 242" thread locking compound. "Loctite 242" is a blue compound when wet and when dried. No material similar to this was visually apparent in the bolt threads. Further, Fourier Transform Infra-Red Spectrography spectra of material in the thread was not similar to the spectra of locally procured "Loctite 242".

In addition to the attachment hole damage, the pilot shaft on the engine side of the pulley was worn unevenly and deformed. The pilot shaft was also partially displaced from the pulley, as if the pulley was tilted relative to the shaft. Deformation of the pilot shaft was also consistent with the tilting.

Onboard Electronic Devices

During the postaccident investigation of the airplane, three onboard electronic devices were recovered: 1 Electronics International MVP-50 electronic engine data monitor (EDM), and 2 MoTec M48 Engine Control Units, "A" and "B". Each of the three components was shipped to the NTSB Vehicle Recorders Laboratory in Washington, D.C., for examination and download of any non-volatile memory (NVM) data. An NTSB Vehicle Recorder Specialist who examined the units reported the following:

Electronic Data Monitor (EDM) MVP-50

The EDM records parameters related to engine operations, including Exhaust Gas Temperature (EGT), Cylinder Head Temperature (CHT), Oil Pressure and Temperature, Manifold Pressure, Outside Air Temperature, Engines Revolution Per Minute, Fuel Flow, Fuel Levels, and Battery Voltage and Amperage. The unit was received with minimal damage observed. The internal CF card that contains the NVM was located, removed, and read out. The EDM recorded the entire flight from 6:55:00 to 7:44:45 on October 24, 2014. The EDM recorded a sharp drop in oil pressure at 7:43:06, from 68 to 0 psi over 3 seconds.

MoTec M48 ECUs

The ECU's primary function is to control engine fuel injection and ignition timing for up to eight engine cylinders. In addition to its primary function, the ECU contains a data logging feature that captures engine parameters and internal ECU faults. The accident airplane was equipped with two MoTec M48 ECUs, each installed in such a way that one ECU controlled the left bank of cylinders, and the other controlled the right bank of cylinders. The left and right sides are designated respectively as "A" and "B", and are installed to operate independently of each other, in that data logged by the respective ECU pertains only to that unit and the portion of the engine it controls. Exclusive to ECU "A" is the oil pressure signal. Recorded data for ECU "A" ended at 7:43:00, with recorded data for ECU "B" ending 3 seconds following the end of ECU "A". (Refer to the NTSB Vehicle Recorder Specialist's Factual Report, which is appended to the docket for this accident.)

Pilot Information

Certificate:	Commercial	Age:	71, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Front
Other Aircraft Rating(s):	None	Restraint Used:	4-point
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 Waiver Time Limited Special	Last FAA Medical Exam:	08/04/2014
Occupational Pilot:	No	Last Flight Review or Equivalent:	10/07/2014
Flight Time:	5089 hours (Total, all aircraft), 352 hours (Total, this make and model), 4953 hours (Pilot In Command, all aircraft), 18 hours (Last 90 days, all aircraft), 4 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	WINSTON W WALKER	Registration:	N244SW
Model/Series:	THUNDER MUSTANG	Aircraft Category:	Airplane
Year of Manufacture:	2008	Amateur Built:	Yes
Airworthiness Certificate:	Experimental	Serial Number:	GITM025
Landing Gear Type:	Retractable - Tailwheel	Seats:	2
Date/Type of Last Inspection:	09/01/2014, Condition	Certified Max Gross Wt.:	3600 lbs
Time Since Last Inspection:	15 Hours	Engines:	1 Reciprocating
Airframe Total Time:	352.6 Hours at time of accident	Engine Manufacturer:	Ryan Falconer Racing Engines
ELT:	C91A installed, activated, did not aid in locating accident	Engine Model/Series:	Falconer V12
Registered Owner:	Air Walker LLC	Rated Power:	640 hp
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	IWA, 1384 ft msl	Distance from Accident Site:	50 Nautical Miles
Observation Time:	0751 MST	Direction from Accident Site:	258°
Lowest Cloud Condition:	Clear	Visibility	45 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	Calm /	Turbulence Type Forecast/Actual:	/ None
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.08 inches Hg	Temperature/Dew Point:	19° C / 10° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Tucson, AZ (57AZ)	Type of Flight Plan Filed:	None
Destination:	Tucson, AZ (57AZ)	Type of Clearance:	None
Departure Time:	0700 MST	Type of Airspace:	Class G

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Serious	Latitude, Longitude:	38.400833, -110.831111

Administrative Information

Investigator In Charge (IIC):	Thomas Little
Additional Participating Persons:	Jack G Major; Federal Aviation Administration; Scottsdale, AZ Ryan Falconer; Ryan Falconer Racing Engines; Chino Valley, AZ
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=90296