Aviation Investigation Final Report

Location:	Fulton, New York	**Accident Number:**	NYC08LA280
Date & Time:	August 16, 2008, 15:40 Local	**Registration:**	N31BF
Aircraft:	Socata MS894A	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	2 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot stated that he was level at 400 feet above ground level when he heard a "bang," the airplane began to vibrate, and the engine stopped. He lowered the nose for the airplane's best glide speed and initiated a forced landing to a nearby open field. While on final approach to the field the airplane collided with trees and then the ground. The crankshaft and connecting rod were forwarded to the Safety Board's Metallurgical Laboratory for further analysis. Examination of the crankshaft's ten bearing journals revealed surface finishes that were consistent with a turning operation but not with a grinding operation as specified in the overhaul manual. Examination of the engine assembly revealed that the crankshaft and the No. 3 engine cylinder connecting rod had failed. The examination revealed that the crankshaft failed in fatigue and initiated in machining marks in the rear radius of the No. 3 and 4 connecting rod bearing journals. An engine logbook entry indicated that the main and rod bearing journals had been "turned" and their diameter reduced by 0.010-inch in accordance with the Franklin overhaul manual. Journal diameters were measured and were consistent with 0.010-inch begin removed; however, the table in the overhaul manual specified a tolerance of 0.0010-inch and the dimensions indicated a tolerance of 0.0020-inch, which was contrary to the overhaul manual. The overhaul manual also recommends that the crankshafts be returned to the factory for grinding and re-nitriding. No logbook entries were located to verify that re-nitriding had been carried out.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A loss of engine power due to fatigue failure of the crankshaft and the No. 3 engine cylinder connecting rod as a result of improper machining of the engine crankshaft during engine overhaul by maintenance personnel.

Findings

Aircraft	Recip engine power section - Failure
Personnel issues	Repair - Maintenance personnel
Personnel issues	Incorrect action performance - Maintenance personnel

Factual Information

History of Flight

Approach-VFR pattern crosswind	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Emergency descent	Collision with terr/obj (non-CFIT)

On August 16, 2008, at 1540 eastern daylight time, a Socata MS894A, N31BF, was substantially damaged during a forced landing following a loss of engine power, approximately 2 miles south of the Oswego County Airport (FZY), Fulton, New York. The certificated private pilot and passenger sustained minor injuries. Day visual meteorological conditions prevailed and no flight plan was filed for the personal local flight. The flight was conducted under the provisions of Title 14 Code of Federal Regulations Part 91.

The airplane was owned by the pilot and based at FZY. It had been fueled on the morning of the accident with 22.2 gallons and a report from the lineman was that it was "topped off."

According to the pilot after making a low pass along the drop zone, he pulled up and leveled off at about 400 feet above ground level. He then heard a "bang," followed by vibration, and then the engine stopped. He immediately pitched for a "glide speed of 90 miles per hour," and flew toward a field. On the final leg of the approach, the airplane impacted trees, nosed over on touchdown, and then rotated approximately 180 degrees.

Examination of the airplane by a Federal Aviation Administration inspector revealed that control continuity was confirmed to all control surfaces from the control column and rudder pedals. Both propeller blades had slight "S-bending." Left had gear assembly was separated and located in front of the airplane. Inside the cockpit the throttle, propeller, and mixture controls were in the off or minimum position and the trim indicator was

A preliminary inspection of the engine revealed that a hole was located in the case in the area near the number three piston and the No. 2 connecting rod was separated and located approximately 20 feet from the airplane along the direction of travel. Continuity could not be confirmed through the crankshaft and a further teardown examination revealed that the crankshaft was fractured at the connection point of the number three connecting rod. The oil filter was removed, examined, and contained metal particles throughout.

According to the airplane's maintenance logbook the engine was overhauled on December 17, 2004. On April 2, 2005 due to a bearing recall the engine was disassembled, cleaned, and inspected. The crankshaft was "turned .010 on mains, .010 on rods" and was overhauled with a tachometer time of 1,548.63 hours. An annual inspection for the airplane was recorded on

April 9, 2008 with a tachometer time of 1,576.81 hours. According to the pilot the airframe had a total time of 1,599 hours at the time of the accident.

The recovered crankshaft and connecting rods were submitted to the National Transportation Safety Board Materials Laboratory Division. Examination of the fracture faces on cheek C4 revealed mechanical damage and three zones that displayed relatively smooth surfaced and arced cracked arrest marks which are consistent with fatigue. Measurements of the bearing journals revealed that the diameter of main journals M1 to M4 ranged between 2.2405 and 2.2385 inches a tolerance of 0.0020-inch, and the diameter of the rod journals ranged between 1.9280 and 1.9260 inches a tolerance of 0.0020-inch. According to the table limits in the overhaul manual the tolerance on the main and rod journals was 0.0010-inch. Examination of the connecting rod bearings revealed the numbers "18020" and according to the illustrated parts catalog, the standard bearing was "17739." Bearing journal R3 was cut adjacent to cheek C5 and revealed an arced initiation that followed a circumferential machining mark in the radius between the journal and the cheek. Bearing journals and crankshafts are normally surface hardened by a nitriding process and a sample from journal R3 was metallurgically mounted, polished and etched. Metallographic examination of the polished and etched sample revealed a uniform acicular (needle-like) structure in the base material and in the surface layer, consistent with tempered martensite.

Pilot Information

Certificate:	Private	**Age:**	77,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
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:**	August 1, 2007
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	August 1, 2008
Flight Time:	4316 hours (Total, all aircraft), 27 hours (Total, this make and model), 4146 hours (Pilot In Command, all aircraft), 18 hours (Last 90 days, all aircraft), 7 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Socata	**Registration:**	N31BF
Model/Series:	MS894A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal; Utility	**Serial Number:**	11682
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	April 1, 2008 Annual	**Certified Max Gross Wt.:**	2425 lbs
Time Since Last Inspection:	23 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1599 Hrs at time of accident	**Engine Manufacturer:**	Franklin
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	6A-350-C1
Registered Owner:	On file	**Rated Power:**	220 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	FZY,475 ft msl	**Distance from Accident Site:**	2 Nautical Miles
Observation Time:	15:54 Local	**Direction from Accident Site:**	185°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	11 knots / 17 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.94 inches Hg	**Temperature/Dew Point:**	24°C / 14°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Fulton, NY (FZY)	**Type of Flight Plan Filed:**	None
Destination:	Fulton, NY (FZY)	**Type of Clearance:**	None
Departure Time:	15:00 Local	**Type of Airspace:**	

Airport Information

Airport:	Oswego County Airport FZY	**Runway Surface Type:**	Asphalt
Airport Elevation:	475 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	35	**IFR Approach:**	None
Runway Length/Width:	5197 ft / 100 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Minor	**Latitude, Longitude:**	43.32389,-76.385833(est)

Administrative Information

Investigator In Charge (IIC):	Etcher, Shawn
Additional Participating Persons:	Kevin P Kuc; Rochester FSDO; Rochester, NY
Original Publish Date:	October 21, 2010
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=68711