Aviation Investigation Final Report

Location:	ISANTI, Minnesota	**Accident Number:**	CHI98LA150
Date & Time:	May 13, 1998, 14:15 Local	**Registration:**	N7140H
Aircraft:	Cessna A185F	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot of a single-engine amphibious float-equipped airplane said her propeller RPM began to flucuate during cruise flight. She said when she attempted to adjust the RPM '...the engine clunked a couple of times and lost all power.' The pilot made a forced landing on a grassy field. She said the airplane touched down on the main float wheels that '...dug into the soft ground... .' The nosewheels touched down and the airplane nosed over on its back according to the pilot. The airplane's pilot operating handbook states that a '...landing on land without engine power [should be made] with the landing gear UP on soft or rough ground... and DOWN on firm or smooth ground.' An examination of the engine revealed it had been installed on another airplane before being put onto the accident airplane. The crankshaft had completely failed at the forward radius of the number 3 main bearing journal. The number 3 main bearing had shifted forward. The engine had 1,056-hours since it had been factory remanufactured.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the soft terrain condition. A factor was the failure of the crankshaft.

Findings

Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: CRUISE - NORMAL

Findings

1. ENGINE ASSEMBLY,BEARING - SHIFTED
2. ENGINE ASSEMBLY,CRANKSHAFT - FAILURE,TOTAL

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY LANDING

Occurrence #3: NOSE OVER
Phase of Operation: LANDING - ROLL

Findings
3. TERRAIN CONDITION - GRASS
4. (C) TERRAIN CONDITION - SOFT

Factual Information

On May 13, 1998, at 1415 central daylight time (cdt), a Cessna A185F, N7140H, piloted by an airline transport rated pilot, was substantially damaged when it nosed over during a forced landing following a loss of engine power while in cruise flight. Visual meteorological conditions prevailed at the time of the accident. The 14 CFR Part 91 personal flight was not operating on a flight plan. The pilot reported no injuries. The flight departed a restricted landing area near Webster, Minnesota, at 1315 cdt.

According to the pilot's written statement, "...the propeller RPM started to increase..." while the airplane was at cruise altitude. She said she adjusted the propeller control to reduce its RPM and the "...engine seemed to settle down." While attempting to adjust the mixture, RPM and manifold pressure the propeller RPM increased again. The pilot said the propeller RPM went to its limit and "...the engine clunked a couple of times and lost all power."

The airplane was equipped with amphibious float landing gear. The pilot said she chose a grassy field for the forced landing. As the airplane touched down the main landing gear tires "...dug into the soft ground [followed by] the nosewheels... causing the airplane to flip onto its back."

According to the Cessna 185 Skywagon Pilot's Operating Handbook Supplement, "Emergency Landing On Land Without Engine Power, 1) Landing gear-- UP on soft or rough ground. DOWN on firm and smooth ground." The handbook continues, "The landing approach attitude and flare is the same for an airplane equipped with a tricycle gear."

According to the engine logbook, the engine was a factory overhauled on March 15, 1990. The engine was installed on a Piper PA-31 Navajo, N3590Z, on April 27, 1990. The engine was removed from N3590Z on November 25, 1991. N3590Z was destroyed when a large hangar fell on it during July 1993.

N3590Z's left engine was installed on N7140H on April 9, 1992. At that time, the engine had 536.1-hours since its factory overhaul. The engine had 1,056-hours since factory overhaul at the time of the accident. It had received a top overhaul on May 1, 1995, when it had 789.3-hours since its factory overhaul.

N7140H's engine crankcase halves, fractured crankshaft, piston and connecting rod assembly for the number 3 and 5 cylinders were sent to the NTSB's Materials Laboratory in Washington, D.C., for examination. The examination revealed that the crankshaft had separated through the number 4 crank cheek and the number 6 crank cheek. The report states, "The fracture through the number 4 crank cheek intersected the forward radius of the number 3 rod journal and the aft radius of the number 2 main [bearing] journal. The fracture through the number 6

crank cheek intersected the forward radius of the number 3 main bearing journal and the aft radius of the number 4 rod journal."

The report continues, "Binocular microscopic examination of this crankshaft fragment revealed the surface of number 3 main bearing journal and its forward and aft radius contained moderate circumferential scoring marks. The fracture through number 6 crank cheek contained crack arrest positions typical of fatigue cracking that emanated from multiple origins at the forward radius of number 3 main bearing journal... . The fracture surface in the vicinity of the fatigue origin contained ratchet marks that were coincident with ladder crack... . These ladder cracks were noted all around the forward radius of the number 3 main bearing journal. Fatigue propagation was in the forward direction, through the thickness of the crank cheek... ."

The report said "The cap for the number 5 connecting rod... fracture contained fatigue cracks that emanated from multiple origins... [and] were nearly as wide as the width of the cap and propagated through as much as 60-percent of the wall thickness... ." The metallurgists factual report is appended to this report.

A review of the Federal Aviation Administration's Service difficulty Report Data for the Lycoming IO and O-540 series engine revealed 22 reports of a broken crankshaft at either one or more of the journals or flange. The reports covered the period between 1986 through June 1998.

According to a Lycoming representative there are no material or hardness differences between the crankshafts for the O-540, the IO-540, or TIO-540 series engines. Regarding the dimensional and configuration aspects of the crankshafts, the representative stated, "The difference between the three crankshafts could be bearing journal dimensions, stroke, or counterweight applications." His letter is appended to this report.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	46,Female
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	December 11, 1997
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	14300 hours (Total, all aircraft), 1200 hours (Total, this make and model), 7000 hours (Pilot In Command, all aircraft), 160 hours (Last 90 days, all aircraft), 65 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N7140H
Model/Series:	A185F A185F	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	18503351
Landing Gear Type:	Amphibian	**Seats:**	4
Date/Type of Last Inspection:	August 1, 1997 Annual	**Certified Max Gross Wt.:**	3350 lbs
Time Since Last Inspection:	30 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1891 Hrs	**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	TIO-540J2BD
Registered Owner:	HENRY L. DIDIER	**Rated Power:**	350 Horsepower
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Not reported
Observation Facility, Elevation:	CBG ,945 ft msl	**Distance from Accident Site:**	7 Nautical Miles
Observation Time:	14:15 Local	**Direction from Accident Site:**	360°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	170°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	-7°C / 7°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	WEBSTER , MN (1MN8)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	13:15 Local	**Type of Airspace:**	Class G

Airport Information

Airport:		**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	Dry;Vegetation
Runway Used:	0	**IFR Approach:**	
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	45.479385,-93.250679(est)

Administrative Information

Investigator In Charge (IIC):	Gattolin, Frank
Additional Participating Persons:	SAM WEATHERFORD; MINNEAPOLIS , MN
Original Publish Date:	May 19, 1999
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=10875