Aviation Investigation Final Report

Location:	MAYVILLE, New York	**Accident Number:**	NYC00FA239
Date & Time:	August 25, 2000, 06:20 Local	**Registration:**	N7269S
Aircraft:	Cessna 206H	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	1 Serious
Flight Conducted Under:	Part 91: General aviation		

Analysis

The airplane climbed to 4,000 feet. After level-off, the pilot checked that the gauges were 'in the green,' set the power to 2,400 rpm and 24 inches of manifold pressure, and engaged the autopilot. The engine was running smoothly, with no vibrations. About 35 to 40 seconds later, there was a loud explosion, and blue and yellow flames emanated from both sides of the engine compartment. The pilot turned the airplane towards a field he had seen earlier. During the turn, there was a second explosion. The engine, which had continued to run smoothly after the first explosion, quit. The cabin became engulfed in black smoke, and forward visibility was nil. The pilot then made a forced landing, but due to limited visibility out the side window, the airplane struck trees during the approach, stalled, and hit the ground. Post-accident investigation revealed fire damage to the accessory section of the engine, the firewall, and the interior surface of the left engine cowling. Unburned oil residue was found on the interior surface of the right engine cowling. Oil was also found on the undersides of the fuselage and wings. The oil filler tube, on the right side of the engine, was burned away; however, the majority of the oil dipstick was still in place, in the engine. The interior surface of the left cowling was sooted and scorched. The bottom plate of the engine driven fuel pump was burned away, and the fuel boost pump was sooted. There was a breach in the engine casing, in the vicinity of the number 6 connecting rod. All of the connecting rod ends exhibited heat damage, consistent with a loss of lubrication, with the most severely damaged being the number 6 rod end. The oil pump housing and impellers exhibited light scoring. The main bearings were undamaged. The pilot stated that during his preflight inspection, he checked three times that the oil cap was secure. Additionally, no oil leaks were found on the ramp. Another pilot, with the same airframe/engine configuration as the accident airplane, reported that his oil cap had come loose during flight on several occasions. However, even though it came loose, there was no oil leakage.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: An engine compartment explosion due to a fuel/fuel vapor leak of undetermined origin. A secondary explosion resulted from a lack of lubrication to the number 6 connecting rod bearing. Contributing to the pilot's injuries was his reduced visibility during the forced landing, resulting from a heavy concentration of smoke in the cockpit.

Findings

Occurrence #1: FIRE/EXPLOSION
Phase of Operation: CRUISE

Findings
1. (C) FLUID,FUEL - LEAK
2. (C) FLUID,FUEL - EXPLODED

Occurrence #2: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: DESCENT - EMERGENCY

Findings
3. FLUID,OIL - LEAK
4. FLUID,OIL - EXHAUSTION
5. ENGINE ASSEMBLY,BEARING - OVERTEMPERATURE
6. ENGINE ASSEMBLY,CONNECTING ROD - FRACTURED
7. ENGINE ASSEMBLY,CRANKCASE - FRACTURED

Occurrence #3: FORCED LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Occurrence #4: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
8. (F) FUSELAGE,CREW COMPARTMENT - SMOKE
9. (F) VISUAL LOOKOUT - REDUCED - PILOT IN COMMAND
10. OBJECT - TREE(S)

Factual Information

HISTORY OF FLIGHT

On August 25, 2000, at 0615 Eastern Daylight Time, a Cessna 206H, N7269S, was destroyed after an in-flight explosion, and a subsequent forced landing to a field in Mayville, New York. The certificated commercial pilot was seriously injured. Visual meteorological conditions prevailed at the time of the accident, and no flight plan had been filed for the flight, between Chautauqua County Airport (DKK), Dunkirk, New York, and Port Meadville Airport (GKJ), Meadville, Pennsylvania. The business flight was conducted under 14 CFR Part 91.

The pilot reported that he departed Dunkirk at 0610. According to two Federal Aviation Administration (FAA) inspectors who interviewed the pilot while he was in the hospital, the pilot stated that, after takeoff, he climbed the airplane to 4,000 feet. Just after level-off, the pilot checked the gauges "and found them to be all in the green." His power setting was 2,500 rpm and 25 inches of manifold pressure, and "as he was accustomed, he backed the throttle a hair to 24/24." The pilot then engaged the autopilot, and the engine was running smoothly, with no vibrations. "All was fine for about 35 to 40 seconds. Then he heard a loud explosion ('Kaboom!!') followed by an increase in engine rpm."

During the explosion, the pilot saw the engine cowls "bow up". The cowl fasteners also blew out, and fire came out through the fastener holes.

The pilot started to turn the airplane towards a field he had seen earlier. Meanwhile, "blue and yellow flames were constantly coming from the engine compartment and coming right around the window." During the turn, there was a second explosion. The pilot thought the engine was still running until that time, and quit after the second blast. After the second explosion, the cabin became completely engulfed in smoke. The pilot cracked the left window, and found an area where he could "sip" fresh air. The view ahead of him was completely black due to the amount of smoke.

The pilot continued toward what he thought was the field, based on his available vision to the side. However, during the final approach, the airplane struck trees. The pilot was surprised, and pulled full back on the yoke. The airplane then stalled, and fell straight to the ground.

After the pilot was released from the hospital, he provided amplifying information to the Safety Board. In a telephone interview, he stated that during the preflight, he checked the oil cap three times to make sure it was in and locked.

The pilot also confirmed that there was no problem with the engine prior to the first explosion. "It was purring like a kitten." After he leveled off the airplane, he set the power and engaged

the autopilot. Less than a minute later, it seemed like a stick of dynamite went off. Blue flames and fire came through the cowling. The engine continued to run smoothly, and may have even sped up a little. There were no "clanking" sounds emanating from the engine before the first explosion.

Immediately after the explosion, the pilot put the flaps down, and turned towards a field he had seen. During the turn, a second explosion occurred. The dash was blown in, and there was so much fire and smoke, that visibility within the cockpit was reduced to the blackness of night. The pilot couldn't breathe, and he couldn't see, except out the side window. After the second explosion, the engine quit running.

A witness to the accident stated that he was inside his house when he heard the sound of the airplane's engine, then a "pop sound." He looked outside, and saw the airplane "about treetop high, and the right front side was on fire...near the engine." He saw the airplane make several left turns, then lost sight of it behind the trees, and eventually located the wreckage by following rising smoke.

The accident occurred during civil twilight, about 20 minutes before sunrise.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with ratings for single engine land and multi-engine land airplanes. He reported that he had about 3,135 hours of flight time, and 100 hours in make and model. His latest second class medical certificate was issued on February 16, 2000.

AIRCRAFT INFORMATION

The airplane was manufactured in May 1999, and according to the operator, had about 340 hours of operating time. The engine was a Textron Lycoming IO-540-AC1A5.

According to maintenance records, the "New Reciprocating Engine Certificate" was dated January 1, 1999. The engine was serviced with mineral oil for the first 50 hours. An annual inspection was completed on November 26, 1999, at 100.0 hours. On March 7, 2000, a Tanis engine preheater system was installed. Another annual inspection was completed on March 17, 2000, at 201.7 hours. On May 22, 2000, all six of the cylinder assemblies were removed and replaced due to high oil consumption. On July 28, 2000, another annual inspection was completed, at 300.0 hours.

WRECKAGE AND IMPACT INFORMATION

On the day of the accident, an on-scene examination was conducted by a Rochester Flight Standards District Office (FSDO) FAA inspector, who was joined by the operator. According to the FSDO inspector, there were broken limbs in tree line near the wreckage. There was also a

gash in the ground, from the tree line, about 50 feet, to the wreckage. The wreckage had been sprayed with water and foam by a local fire company. The airplane's cockpit, instrument panel, and fuselage were destroyed by fire. All three landing gear were collapsed. The right engine cowling was found on the left side of the airplane, near the propeller, while the left engine cowling was still attached. Removal of the left cowling revealed a 5-inch crack in the engine case, in the vicinity of the number 6 cylinder.

The engine was subsequently moved to a hangar owned by the operator, and the airframe was moved to a different location, belonging to a salvage company.

On August 28, 2000, arrangements were made to have representatives from Cessna Aircraft Company and Textron Lycoming, along with another FSDO inspector and an FAA inspector from the Wichita Aircraft Certification Office, join the FSDO inspector in examining the wreckage on the following day.

On August 29, 2000, the group proceeded to operator's hangar for an engine examination. The oil suction screen was pulled, and metal particles and debris were found on it. The oil sump plug was removed and a mixture of water and a small amount of oil were drained out.

Fire damage was noted to the accessory case and the firewall, with fire damage more severe on the left side of the engine. The bottom of the engine-driven fuel pump was missing. The oil filler tube and the top portion of the oil dipstick were missing.

The engine was prepared for shipment to Textron Lycoming, Williamsport, Pennsylvania, for a teardown examination.

On August 30, 2000, the group stopped at Dunkirk Airport to examine the ramp area and the airplane's parking spot. No oil was noted in either place. The group then proceeded to the salvage yard, and found the remainder of the wreckage still on the flatbed truck that had transported it.

Examination of the airframe remnants revealed that there was oil on the bottom surfaces of the wings and the empennage. The right engine cowling had oil on it in the vicinity of the oil filler cap. The left engine cowling exhibited evidence consistent with heat damage.

On August 31, 2000, the engine underwent the teardown examination under Safety Board supervision at Textron Lycoming. The examination revealed that the engine's rear accessory section was fire-damaged, and both the right and left magnetos were melted. The oil filler tube was missing; however, the dipstick was still inserted into the engine. The oil filter was fire-damaged, and the bottom of the engine driven fuel pump was burned away. The fuel boost pump was intact. Externally, the engine oil pump was rusted and fire-damaged. There was light scoring on the internal body walls, but no damage to the impellers.

The engine would not rotate; however, engine continuity was confirmed, with the exception of

the separated number 6 connecting rod. There was metal contamination in the oil sump. Internal timing could not be verified due to heat and rust damage to the accessory drive gears. All spark plugs were gray in color, with the exception of an oil/water-wet number 2 bottom plug, and a corroded number 4 top plug.

The connecting rod bearings had an appearance consistent with oil starvation and wiping. The number 6 connecting rod bearing was in pieces, in the sump. No damage was noted to any of the main bearings. The crankcase oil galley and oil holes were open and free of debris.

TESTS AND RESEARCH

The number 3, 5, and 6 connecting rod assemblies were forwarded to the Safety Board Materials Laboratory for examination. According to the metallurgist's factual report, the pieces from the number 6 rod were darkly discolored, "as if severely overheated." Further examination revealed that "mechanical damage completely obliterated fracture features on the smaller separated pieces of the connecting rod and cap."

One of the number 6 connecting rod bolts was separated. "The separated ends of the bolt were deformed by bending." The facture face of the head portion was completely destroyed by "post-separation damage," while the fracture face on the shank had "cup and cone features, typical of tensile overload. The 'intact' bolt from the connecting rod...was also deformed by bending."

The report also stated:

"The crankshaft ends of connecting rods numbers 5 and 3 also had evidence of heat discoloration; however, significantly less severe than in rod number 6. The connecting rod bolts in both rods were intact but the bearing shells were deformed and heavily scored."

ADDITIONAL INFORMATION

Photographic evidence of the interior side of the right cowling revealed oil residue on the aft, bottom quadrant. The residue appeared generally to be unburned; however, there were specks of soot on, or imbedded in, the residue. There was also some light sooting on the aft, top quadrant of the interior side of the cowling, with heavy sooting near the cowling's aft, top edge.

Photographic evidence of the interior side of the left engine cowling revealed heavy sooting on the aft, upper quadrant. There was also scorching within the aft, upper part of that quadrant.

In a September 12, 2000, email, another Cessna 206H owner stated that the dipstick/oil filler cap on his airplane's engine required a "real firm" tightening, or it would back itself out. The owner also noted that two or three times he came back from flights, and the cap was "completely open." However, even though the cap was open, there was "no oil loss or indications of oil spewing out."

On February 20, 2001, Textron Lycoming issued Mandatory Service Bulletin number 545, which required oil filler tube and clamp replacement on certain IO-540-AC1A5 engines. The serial number of the oil filler tube adapter determined which engines were affected; however, the accident engine was not one of them.

On August 25, 2000, the FAA inspector in charge released the airframe to the operator. On September 1, 2000, the Safety Board investigator released the engine to the engine manufacturer.

Pilot Information

Certificate:	Commercial	**Age:**	44,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	February 16, 2000
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	3135 hours (Total, all aircraft), 100 hours (Total, this make and model), 2960 hours (Pilot In Command, all aircraft), 255 hours (Last 90 days, all aircraft), 61 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N7269S
Model/Series:	206H 206H	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	20608033
Landing Gear Type:	Tricycle	**Seats:**	6
Date/Type of Last Inspection:	July 28, 2000 Annual	**Certified Max Gross Wt.:**	3614 lbs
Time Since Last Inspection:	40 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	340 Hrs	**Engine Manufacturer:**	Lycoming
ELT:	Installed	**Engine Model/Series:**	IO-540 AC1A5
Registered Owner:	BANC ONE LEASING	**Rated Power:**	300 Horsepower
Operator:	DUNKIRK AVIATION	**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:**	Dawn
Observation Facility, Elevation:	ERI ,730 ft msl	**Distance from Accident Site:**	30 Nautical Miles
Observation Time:	06:51 Local	**Direction from Accident Site:**	255°
Lowest Cloud Condition:	Clear	**Visibility**	9 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	200°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	13°C / 12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	DUNKIRK , NY (DKK)	**Type of Flight Plan Filed:**	None
Destination:	MEADVILLE , PA (GKJ)	**Type of Clearance:**	None
Departure Time:	06:10 Local	**Type of Airspace:**	Class E

Airport Information

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

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	In-flight
Ground Injuries:	N/A	**Aircraft Explosion:**	In-flight
Total Injuries:	1 Serious	**Latitude, Longitude:**	42.249111,-79.499488(est)

Administrative Information

Investigator In Charge (IIC):	Cox, Paul
Additional Participating Persons:	MARCIA BROOKS; ROCHESTER , NY DAVID MOORE; WILLIAMSPORT , PA EMILE LOHMAN; WICHITA , KS LOUIS NALBONE; DUNKIRK , NY
Original Publish Date:	July 10, 2001
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=53368

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

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.