National Transportation Safety Board
Aviation Incident Final Report

Location:	Matinicus Islnd, ME	**Incident Number:**	NYC06IA226
Date & Time:	09/01/2006, 1230 EDT	**Registration:**	N8411Q
Aircraft:	Cessna 206F	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	3 None
Flight Conducted Under:	Part 135: Air Taxi & Commuter - Non-scheduled		

Analysis

After engine start, the pilot heard "an abnormal engine mechanical noise." He shut down the engine and requested a mechanic. During a subsequent engine start, the mechanic confirmed the mechanical engine noise, and the engine was again shut down. Hand propping revealed that the engine would sometimes "mechanically jam," and further examination revealed the fracture of two crankshaft gear teeth. Both gear teeth exhibited signatures consistent with overload. Corresponding starter adapter gear teeth, that would have meshed with the crankshaft gear teeth during the startup, were cracked on the loaded side. All evaluated metallurgical requirements were met, including core hardness, surface hardness and case depth. Although a single "kick back" while cranking could cause the failure of components of the cranking system, there was no evidence as to why a kick back may have occurred.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: An engine kick back of undetermined origin during engine start.

Findings

Occurrence #1: MISCELLANEOUS/OTHER
Phase of Operation: STANDING - STARTING ENGINE(S)

Findings
1. (C) MISCELLANEOUS,ENGINE - FRACTURED
2. REASON FOR OCCURRENCE UNDETERMINED

Factual Information

On September 1, 2006, about 1230 eastern daylight time, a Cessna 206F, N8411Q, operated by Waters Aero Marine, incurred minor damage during an engine start at Matinicus Island Airport (35ME), Matinicus Island, Maine. The certificated airline transport pilot and the two passengers were not injured. Visual meteorological conditions prevailed. The on-demand air taxi flight was operating on a company visual flight rules flight plan to Knox County Airport (RKD), Owls Head, Maine, under 14 Code of Federal Regulations Part 135.

According to the pilot, as soon as the engine began idling after start, he heard "an abnormal engine mechanical noise." He then shut down the engine and requested a mechanic.

During a subsequent engine start, the mechanic confirmed the mechanical engine noise, and the engine was again shut down. Hand propping revealed that the engine would sometimes "mechanically jam," and that the alternator drive pulley would turn freely at various points during engine rotation. Further examination revealed a damaged crankshaft gear with two teeth missing, and an "abnormal wear groove on an adjoining third tooth."

The Teledyne Continental IO-520-series engine was forwarded to the manufacturer for a teardown examination under National Transportation Safety Board oversight. Aside from the missing crankshaft gear teeth, no other gear damage was noted. The oil sump was removed and the two crankshaft gear teeth were recovered. The oil sump did not contain any additional debris or foreign material.

Magneto timing was found to be 25 degrees before top dead center on the left and 23 degrees before top dead center on the right. Both magnetos exhibited normal impulse coupling engagement when rotated in the normal direction of rotation. Installation of the magnetos on a test bench revealed that the left magneto impulse coupling would disengage at 350 rpm and the right magneto impulse coupling would disengage at 360 rpm.

A metallurgical examination of the crankshaft gear, the starter adapter gear, and the two fractured crankshaft gear teeth was performed by the engine manufacturer. According to the manufacturer's report, all evaluated metallurgical requirements were met, including core hardness, surface hardness, and case depth. Both crankshaft gear teeth exhibited signatures consistent with overload. Corresponding starter adapter gear teeth, that would have meshed with the crankshaft gear teeth during startup, exhibited "fine" cracking on the loaded side.

Teledyne Continental Motors (TCM) Mandatory Service Bulletin MSB94-8C required that magneto timing be performed in accordance with manufacturer instructions every 100 hours. It also noted: "CAUTION: A single 'kick back' while cranking can cause failure of components of the cranking system. Kick back can be caused by intermittent operation of the impulse couplings." The Bulletin also noted that for the IO-520-series engine, both magnetos should be set at 22 degrees before top dead center.

The engine had 167 hours since rebuild by TCM, and 10 hours since the annual/100 hour inspection.

No additional information was available to determine if any maintenance or pilot actions might have resulted in a kick back.

Pilot Information

Certificate:	Airline Transport	**Age:**	64, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane Single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 2	**Last FAA Medical Exam:**	08/01/2006
Occupational Pilot:		**Last Flight Review or Equivalent:**	09/01/2005
Flight Time:	9000 hours (Total, all aircraft), 2000 hours (Total, this make and model), 8500 hours (Pilot In Command, all aircraft), 184 hours (Last 90 days, all aircraft), 71 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N8411Q
Model/Series:	206F	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	U206F03271
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	08/01/2006, 100 Hour	**Certified Max Gross Wt.:**	3600 lbs
Time Since Last Inspection:	10 Hours	**Engines:**	1 Reciprocating
Airframe Total Time:	7198 Hours at time of accident	**Engine Manufacturer:**	Teledyne Continental
ELT:	Installed, not activated	**Engine Model/Series:**	IO-520-F
Registered Owner:	Telford Aviation, Inc.	**Rated Power:**	300 hp
Operator:	Waters Aero-Marine	**Operating Certificate(s) Held:**	On-demand Air Taxi (135)
Operator Does Business As:	Penobscot Island Air	**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	20 Miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	Calm /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	18°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Maticus Island, ME (45ME)	**Type of Flight Plan Filed:**	Company VFR
Destination:	Owls Head, ME (RKD)	**Type of Clearance:**	None
Departure Time:	EDT	**Type of Airspace:**	

Airport Information

Airport:	Matinicus Island Airport (35ME)	**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	NA	**IFR Approach:**	Unknown
Runway Length/Width:		**VFR Approach/Landing:**	Unknown

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Minor
Passenger Injuries:	2 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 None	**Latitude, Longitude:**	43.873333, -68.894722

Administrative Information

Investigator In Charge (IIC):	Paul R Cox	**Report Date:**	02/28/2008
Additional Participating Persons:	Edward F Angelo; FAA/FSDO; Portland, ME		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		