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MANDATORY SERVICE BULLETIN

DATE: October 4, 2012 Service Bulletin No. 533B
(Supersedes Service Bulletin No. 533A)
Engineering Aspects are
FAA Approved

SUBJECT: Recommended Action for Sudden Engine Stoppage, Propeller/Rotor Strike or Loss of Propeller/Rotor Blade or Tip

MODELS AFFECTED: All Lycoming direct drive reciprocating aircraft engines

TIME OF COMPLIANCE: BEFORE FURTHER FLIGHT

NOTE

Incomplete review of all the information in this document can cause errors. Read the entire Service Bulletin to make sure you have a complete understanding of the requirements.

This Service Bulletin identifies propeller/rotor damage conditions and gives corrective action recommendations for aircraft engines that have had propeller /rotor damage as well as any of the following:

- Separation of the propeller/rotor blade from the hub
- Loss of a propeller or rotor blade tip
- Sudden stoppage

A propeller strike includes:

- Any incident, whether or not the engine is operating, where repair of the propeller is necessary
- Any incident during engine operation where the propeller has impact on a solid object which causes a decrease in RPM and also makes a structural repair of the propeller necessary. This incident includes propeller strikes against the ground. Although the propeller can continue to rotate, damage to the engine can occur, possibly with progression to engine failure
- Sudden RPM drop on impact to water, tall grass, or similar yielding medium where propeller damage does not usually occur

A propeller strike can occur at taxi speeds, during touch-and-go operations with propeller tip ground contact. In addition, propeller strikes also include situations where an aircraft is stationary and a landing gear collapse occurs causing one or more blades to be bent, or where a hangar door (or other object) hits the propeller blade. These instances are cases of sudden engine stoppage because of potentially severe side loading on the crankshaft flange, front bearing, and seal.



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CAUTION

BASED UPON THE ACCUMULATED ENGINEERING, TECHNICAL AND HISTORICAL DATA AVAILABLE, LYCOMING ENGINES **PROHIBITS** STRAIGHTENING OR GRINDING OF BENT CRANKSHAFT FLANGES TO RESTORE MAXIMUM RUN-OUT SPECIFICATION AS NOTED IN THE LATEST REVISION OF THE TABLE OF LIMITS, SSP-1776. IF THE CRANKSHAFT FLANGE IS BENT, REPLACE THE CRANKSHAFT. **DO NOT TRY TO STRAIGHTEN OR GRIND THE CRANKSHAFT FLANGE.**

Recommended Corrective Action for Propeller Strikes



CAUTION

DAMAGE TO A PROPELLER IS SERIOUS AND CAN CAUSE THE ENGINE TO BE UNAIRWORTHY.

Circumstances of a propeller strike cannot always be used as predictors for the extent of engine damage or its future reliability. There can be varying degrees of damage to an engine and propeller from a propeller strike. The initial damage can be hidden but becomes progressive and worsens with time and wear.

Given these possibilities and the fact that there is no identified clear, quantifiable threshold limit or gradient standard to reliably measure the extent of damage to an engine, Lycoming Engines can only recommend BEFORE FURTHER FLIGHT, that you complete the tasks in the sequential order shown in the Engine Inspection Checklist After Propeller Strike included in this Service Bulletin as the corrective action for a propeller strike.

NOTE

The agency that returns the aircraft to service is responsible for the decision to operate an engine that had a propeller strike. Lycoming Engines does not take the responsibility for the decision to return the engine to service after a propeller strike.

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Make a copy of this checklist; complete it and keep it as a service record. Record all results and any corrective action taken in compliance as per the revision of this Service Bulletin in the engine logbook.

Engine Inspection Checklist After Propeller Strike						
Engine Model:			Engine Serial Number:			
Date Inspection Started:			Date Inspection Completed:			
Sequential Task		Additional Information			Corrective Action Done/Comments	
1.	Remove the propeller.					
2.	Examine the propeller for extent of damage; record condition of propeller.	Condition of Propeller/Corrective Action: <input type="checkbox"/> Propeller satisfactory <input type="checkbox"/> Repair propeller in accordance with propeller manufacturer's instructions <input type="checkbox"/> Replace propeller in accordance with the airframe manufacturer's instructions.				
3.	Remove the engine.	In accordance with the airframe manufacturer's instructions.				
CRANKCASE P/N:			MATCH NO:			
4.	Disassemble the engine where the crankshaft counterweights, camshaft, connecting rods, crankshaft gears, and internal steel parts are removed.	In accordance with the applicable Lycoming Engine Overhaul Manual				
5.	Complete blast cleaning of the crankcase with 17 grit walnut shells at 35 to 45 psi (241 to 310 kPa); remove all coatings on the crankcase and engine mount bosses.	Make sure there is no dirt, debris, sludge, paint, or any other substance that could prevent reliable fluorescent (FPI) or dye penetrant inspection (DPI) or subsequent oil flow.				
6.	Complete blast cleaning of the oil sump and engine mount bosses with 17 grit walnut shells at 35 to 45 psi (241 to 310 kPa) (on six and eight-cylinder engines).	Make sure there is no dirt, debris, sludge, paint, or any other substance that could prevent reliable fluorescent or dye penetrant inspection or subsequent oil flow.				
7.	Complete blast cleaning of the engine mount brackets (on six-cylinder engines) and, if used, the lower mount rings (on helicopter engines) with 17 grit walnut shells at 35 to 45 psi (241 to 310 kPa).	Make sure there is no dirt, debris, sludge, paint, or any other substance that could prevent reliable fluorescent or dye penetrant inspection or subsequent oil flow.				
8.	On six cylinder engines, complete blast cleaning of the accessory housing with 17 grit walnut shells at 35 to 45 psi (241 to 310 kPa).	Make sure there is no dirt, debris, sludge, paint, or any other substance that could prevent reliable fluorescent or dye penetrant inspection or subsequent oil flow.				

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Engine Inspection Checklist After Propeller Strike

Engine Model:		Engine Serial Number:	
Date Inspection Started:		Date Inspection Completed:	
CRANKSHAFT P/N:		S/N:	
<p>NOTE</p> <p>Examine, the crankshaft counter-bored recess, the alignment dowel, the bolt hole threads, and the crankshaft gear for wear, galling, corrosion, and fretting. Refer to the latest revision of Service Bulletin No. 475. If the bolt hole threads are damaged, they cannot be repaired.</p> <p>NOTE</p> <p>Remove and discard the existing gear retaining bolt and lockplate, and install a new bolt and lockplate.</p>			
Sequential Task		Additional Information	Corrective Action Done/Comments
9.	Disassemble and examine the crankshaft.	Refer to the Lycoming Engine Overhaul Manual for the crankshaft disassembly and inspection procedures.	
10.	Clean the crankshaft, camshaft, crankshaft gears, counterweights, rollers and bushings.	Make sure there is no dirt, debris, sludge, paint, or any other substance that could prevent reliable magnetic particle inspection or subsequent oil flow.	
11.	Clean the following internal parts made of steel: <ul style="list-style-type: none"> • Flat tappets • Piston pins • Rocker shafts • Accessory drive gears • Magneto gears • Idler and oil pump shafts • Shaft gears and impellers 		
12.	Measure the flange run-out on the crankshaft.	Record measurement. Refer to the applicable Lycoming Overhaul Manual for measurement instructions.	<input type="checkbox"/> Use crankshaft <input type="checkbox"/> Replace crankshaft
<div style="text-align: center;">  CAUTION </div> <p>BASED UPON THE ACCUMULATED ENGINEERING, TECHNICAL AND HISTORICAL DATA AVAILABLE, LYCOMING ENGINES <u>PROHIBITS</u> STRAIGHTENING OR GRINDING OF BENT CRANKSHAFT FLANGES TO RESTORE MAXIMUM RUN-OUT SPECIFICATION AS NOTED IN THE LATEST REVISION OF THE TABLE OF LIMITS SSP-1776. IF THE CRANKSHAFT FLANGE IS BENT, REPLACE THE CRANKSHAFT. <u>DO NOT TRY TO STRAIGHTEN OR GRIND THE CRANKSHAFT FLANGE.</u></p>			
13.	Measure the bearing run-out on the crankshaft.	Record measurement. Refer to the applicable Lycoming Overhaul Manual for measurement instructions. Refer to the latest revision of the Table of Limits SSP 1776 for dimensions.	<input type="checkbox"/> Repair crankshaft <input type="checkbox"/> Use crankshaft <input type="checkbox"/> Replace crankshaft

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Engine Inspection Checklist After Propeller Strike

Engine Model:		Engine Serial Number:		
Date Inspection Started:		Date Inspection Completed:		
CRANKSHAFT P/N:		S/N:		
Sequential Task		Additional Information		Corrective Action Done/Comments
14.	Measure the polished dimensions on the main journals.	Record measurement. Refer to the applicable Lycoming Overhaul Manual for measurement instructions. Refer to the latest revision of the Table of Limits SSP 1776 for dimensions.		
15.	Measure the polished dimensions on the pin journals.	Record measurement. Refer to the applicable Lycoming Overhaul Manual for measurement instructions. Refer to the latest revision of the Table of Limits SSP 1776 for dimensions.		
16.	Complete a check of the connecting rod parallelism.	Record measurement. Refer to the applicable Lycoming Overhaul Manual for measurement instructions.		
<p>NOTE</p> <p>The magnetic particle inspection must be done by a qualified and certified technician as per the latest revision of Service Instruction No. 1285.</p>				
17.	Complete a magnetic particle inspection on the crankshaft.	Record test results.	<input type="checkbox"/> Repair crankshaft <input type="checkbox"/> Use crankshaft <input type="checkbox"/> Replace crankshaft	
18.	Complete a magnetic particle inspection on the crankshaft counterweights. Examine the counterweight bushing bores in both the counterweights and the crankshaft.	Record test results.	Replace all counterweight pins, bushings, end plates and snap rings - regardless of their condition.	
19.	Complete a magnetic particle inspection on the camshaft.	Record test results.	<input type="checkbox"/> Use camshaft <input type="checkbox"/> Replace camshaft	
20.	Complete a magnetic particle inspection on the connecting rods.	Record test results.	Replace connecting rod bolts and nuts - regardless of condition. Refer to the latest revision of Service Instruction 1458 for assembly instructions.	
21.	Complete a magnetic particle inspection on the crankshaft gears; examine the gear end as per the latest revision of Service Bulletin No. 475.	Record test results.	<input type="checkbox"/> Use crankshaft gears <input type="checkbox"/> Replace crankshaft gears	
22.	Complete a magnetic particle inspection on the following internal parts made of steel: <ul style="list-style-type: none"> • Accessory drive gears • Magneto gears • Idler and oil pump shafts • Shaft gears and impellers • Piston pins 	Record test results.	Use Replace <input type="checkbox"/> <input type="checkbox"/> Accessory drive gears <input type="checkbox"/> <input type="checkbox"/> Magneto gears <input type="checkbox"/> <input type="checkbox"/> Idler and oil pump shafts <input type="checkbox"/> <input type="checkbox"/> Shaft gears and impellers <input type="checkbox"/> <input type="checkbox"/> Piston pins	

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Engine Inspection Checklist After Propeller Strike

Engine Model:		Engine Serial Number:	
Date Inspection Started:		Date Inspection Completed:	
Sequential Task	Additional Information	Corrective Action Done/Comments	
<p>NOTE</p> <p>Complete the visual inspection and fluorescent (FDI) or dye penetrant (DPI) inspection in the next five steps.</p>			
23.	Complete either a fluorescent or dye penetrant inspection on the crankcase. Refer to the latest revision of Service Instruction No. 1285. Closely examine the forward crankcase bearing support and adjacent structure.	Record test results.	<input type="checkbox"/> Use crankcase <input type="checkbox"/> Replace crankcase
24.	Complete either fluorescent or dye penetrant inspection on the oil sump (on six and eight-cylinder engines).	Record test results.	<input type="checkbox"/> Use oil sump <input type="checkbox"/> Replace oil sump
25.	Complete either a fluorescent or dye penetrant inspection on the engine mounts (on six-cylinder engine) and, if used, the lower mount rings (on helicopter engines).	Record test results.	<input type="checkbox"/> Use engine mounts <input type="checkbox"/> Replace engine mounts
26.	Complete either a fluorescent or dye penetrant inspection on the accessory housing (on six-cylinder engine).	Record test results.	<input type="checkbox"/> Use accessory housing <input type="checkbox"/> Replace accessory housing
27.	Complete either a fluorescent or dye penetrant inspection on the aluminum oil pump impeller.	Record test results.	<input type="checkbox"/> Use impeller <input type="checkbox"/> Replace impeller
28.	Complete a fluorescent penetrant inspection on each flat tappet. Refer to the latest revision of Service Instruction No. 1011.	Record test results.	<input type="checkbox"/> Tappets acceptable <input type="checkbox"/> Replace tappets
29.	Examine the magneto in accordance with the magneto manufacturer's instructions.	Record test results.	<input type="checkbox"/> Replace magneto <input type="checkbox"/> Overhaul magneto
30.	Examine the pistons as per instructions in the Direct Drive Overhaul Manual and the latest revision of Service Instruction No. 1243.	Record test results.	<input type="checkbox"/> Pistons acceptable <input type="checkbox"/> Replace pistons
<p>NOTE</p> <p>Roller tappets, counterweight rollers, and bushings must be replaced.</p>			
31.	Refer to the latest revision of Service Bulletin No. 240 to identify any parts that must be replaced.	Record parts that must be replaced.	
32.	Assemble and install the engine. Install the propeller and test the engine. Complete an operational check of the engine.	In accordance with instructions in the applicable Lycoming Engine Overhaul Manual and the latest revision of Service Instruction No. 1427.	

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Engine Inspection Checklist After Propeller Strike

Engine Model:		Engine Serial Number:		
Date Inspection Started:		Date Inspection Completed:		
Sequential Task		Additional Information		Corrective Action Done/Comments
33.	Review the documents of all the rotating components on the engine, propeller governor, magnetos (if installed), etc. for instructions on what to do for components exposed to sudden engine stoppage.			
UNAIRWORTHY PARTS:				
ADDITIONAL WORK/INSPECTIONS NECESSARY:				
OUTCOME OF INSPECTION SUMMARY NOTES:				

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