HONDA PERFORMANCE DEVELOPMENT, INC.

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F4 Engine Thrust Bearing Wear
Technical Bulletin # F4-2017-EN005

Approval

This Technical Bulletin contains information regarding F4 engine thrust bearing wear.

During the past two events, there have been two engine failures. In both instances, there is evidence relating to heavy crankshaft thrust bearing wear. HPD has identified several contributing factors, the most prominent being overuse of the clutch. This document is intended to share relevant information with the teams to help prevent any more failures, and identify if an engine is at risk of failure.

1. Mechanism of the Failure

A number of forces act on the rear of the crankshaft and these forces are resisted by the rear thrust bearing, which helps prevent the crankshaft from moving too far forward. As the rear thrust bearing wears, the crankshaft is able to move further forward until the thrust clearance is large enough to allow either of the two thrust bearings to escape.

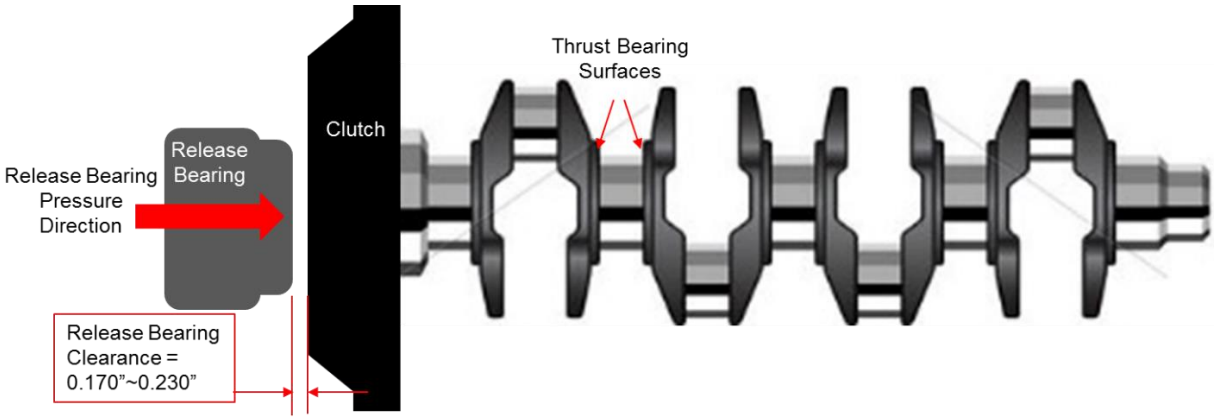

Figure 1: Crankshaft, Clutch, and Release Bearing Layout

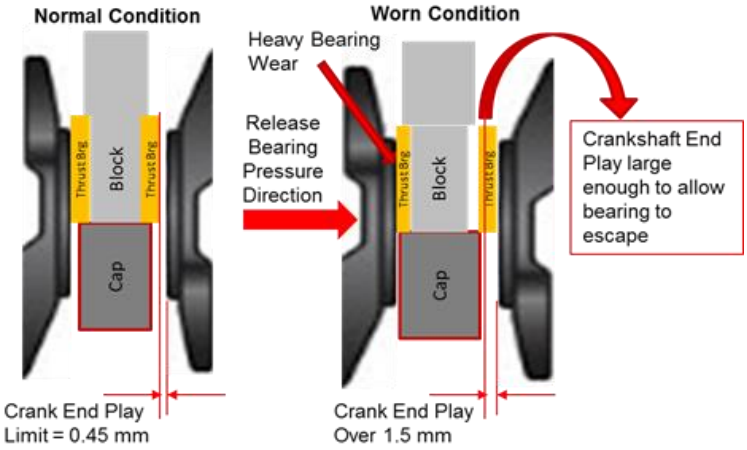

Figure 2: Thrust Bearing Layout

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2. **Wear Contributors**
   a. **Clutch Pressure –** clutch pressure will push the crankshaft forward, resulting in thrust bearing wear. There are several ways in which the clutch pressure can be wrongfully applied:

      i. **Riding the Clutch –** while on track some drivers can have the tendency to rest their left foot on the clutch pedal, causing pressure to be applied to the clutch, and subsequently on the rear thrust bearing. HPD & Onroak highly recommend installing the dead pedal (CCF4-02-029A Foot Rest Assembly ref Tech Bulletin F4.02.11.23) available from Onroak to help prevent drivers from resting their foot on the clutch pedal. The photo below shows heavy wear, grooved fingers on the clutch pressure plate,

Figure 3: Heavy wear on clutch fingers

which is a good indication of riding the clutch.

      ii. **Overuse of Clutch –** The clutch has relatively high spring load in order to transmit the torque of the engine to the drive wheels especially during standing starts. Because of this, the clutch should not be overused or held in any time other than to get the car moving. If the car is sitting still, the driver should place the car in neutral and release the clutch.

      iii. **Insufficient Release Bearing Clearance –** The clutch release bearing should be installed with a clearance of .170”-.230” (4.3-5.8 mm) to the clutch fingers. As the clutch wears, the fingers move rearward. If there is insufficient clearance for the fingers to move rearward without bottoming

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out the release bearing, it effectively results in a similar condition as the driver riding the clutch. If the new installed clearance is less than the specification, there is a plastic shim inside the slave cylinder that can be removed to add .050" of clearance. Refer to the Tilton instructions that come with the release bearing for more details.

INSTALLATION

Bearing clearance and mounting

1. Some applications may require you to cut the pilot tube off the gearbox input shaft bearing retainer. You may need to remove the bearing retainer from the gearbox to do this.
2. As received in the box, the bearing piston may not be fully retracted. You will need to compress it before taking any measurements. The small lip on the outside diameter of the piston is intended to bottom against the orange wiper seal.
3. Position the bearing assembly on the surface you wish to mount it so one port points directly up. This will be the port to which you attach the bleed line. Both ports are identical, so either one can be placed in the upward position. The other port will be attached to the supply line. Its orientation is not critical. Position the lines so they are clear of the clutch and flywheel.
4. Prepare the mounting surface to which the assembly will be attached. Three bolts (1/4" or 6 mm) hold the assembly in place. Accurate positioning should be done by utilizing the register found on the underside of the HRB body. This register should be on center with the input shaft within .010" (.25 mm).
5. Check the bearing clearance. A clutch assembly with worn friction discs will not provide accurate results, so make sure new friction discs are used when taking measurements. The bearing clearance must be in the range of .170"-.230" (see **Diagram 1**). If the clearance is less than this range, there will not be enough room to allow for the full wear range of the clutch since clearance reduces with clutch wear.
6. If the assembly is too short or too long, Tilton has pistons available in a range of lengths (see drawing). Also, note that the plastic shim under the bearing (.050" thick) may be removed for additional clearance if needed). If the shortest piston and removal of the shim still makes the assembly too long, the three legs of the hydraulic base can be accurately trimmed on a lathe. Block all ports to prevent chip entry if any machining is to be performed.

Diagram 1

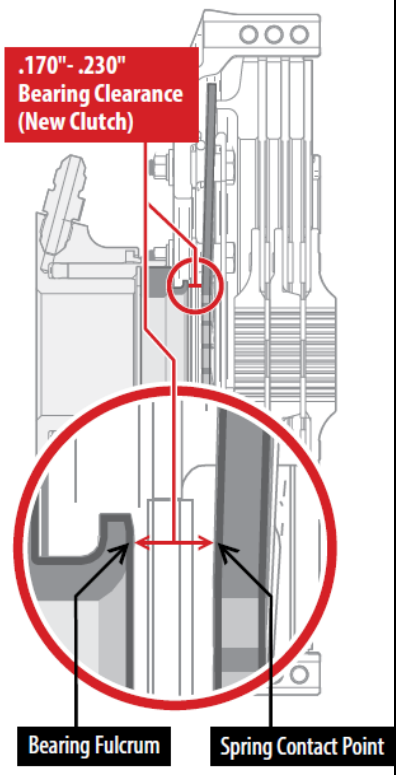

Figure 4: Tilton HRB Installation Instructions – Clutch Finger Clearance

b. Input Shaft Contact with Crankshaft – Due to variation in the pilot hole depth of the crankshaft, there is a potential for the input shaft to bottom out in the crankshaft, pushing it forward into the rear thrust bearing. In order to evaluate this, first measure crankshaft end play with the gearbox installed, then measure again with the gearbox removed. If the values are different, contact Onroak for recommendations on modifying the input shaft to increase clearance.

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c. **Pilot Bushing Damage –** HPD has observed several occurrences of pilot bushing damage. If the bushing is damaged to the point that it will not allow the input shaft to move in and out freely, it may result in any input shaft thrust being transmitted to the engine thrust bearing. HPD recommends using a clutch alignment tool (contact HPD for part number and availability) when installing a clutch, and using a high level of caution when removing and installing the gearbox to avoid damaging the pilot bushing. Use a very light application of anti-seize or grease to ease installation. If there is any damage observed, replace the pilot bushing.

3. Measuring Crankshaft End Play

In order to determine if an engine is out of specification due to thrust bearing wear, teams can measure crankshaft end play. In order to eliminate any impact from the input shaft or release bearing, it is best to remove the gearbox. End play is measured by prying the crankshaft forward and backwards and measuring the total movement. In the car, this is best done by prying on the crank pulley or the flywheel, being careful not to damage either component.

In order to obtain an accurate measurement, the use of a dial indicator is required, using the bell housing mating surface as a base, and measuring the total movement on the flywheel surface. A rough measurement can be obtained by using a fine scale against the firewall and measuring the crank pulley movement, or against the bell housing mating surface and measuring the flywheel movement.

Good	Worn - Needs Replacement	Highly Worn - Risk of Failure
0.10-0.45 mm (0.0039-0.0177")	0.45-1.50 mm (0.0177-0.0591")	>1.50 mm (>0.0591")

Figure 5: Crankshaft End Play Measurement

If you have any questions regarding the content of this bulletin, please contact Jeff Barrow at jbarrow@hra.com or GRMS Admin at GRMSAdmin@hra.com.