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# Excess Crank End Play, or what is commonly referred to as Crank Walk

## History

All crankshafts have to have a small amount of end play. Why? Because as the engine heats up the crank expands (grows), and there has to be additional room for the crank to go during this expansion, so the crank does not bind on the crankcase. A typical crank end play would be 0.006" to 0.008" (0.15mm to 0.20mm).

Crank thrust surfaces are typically in the middle of the crankcase, so that during expansion the engine only has to accommodate half the crank's overall dimensional change.

The crank thrust surface looks like a big bronze washer, right next to one of the main bearings. The thrust surface is 'built into' one of the main bearings in the crankcase. It mates to a polished thrust surface on the crank. As you push on the clutch pedal, to disengage the clutch the crank's thrust surface is pushed into the thrust bearing.

As long as there is oil pressure, everything works as advertised. Just like any other bearing in the engine, bearings need pressurized oil to prevent metal to metal contact. The crank 'floats' on a thin film of oil. The thrust surface also requires a thin film of oil which prevents metal to metal contact, and as stated above… everything works as advertised, as long as there is oil pressure!

## Problems with the thrust bearing

Some automobile manufacturers have been known to have thrust bearing problems. This is due to the thrust bearing having a surface area which is too small, or a poor selection of bearing material which will not stand up to the designed thrust loads. (Mitsubishi is one such manufacturer who had a thrust bearing recall on their 4G63 engines.)

A disreputable clutch manufacturer (either done purposefully, or through what we will politely call engineering ineptitude) will often raise the clamp force of a clutch cover, through the use of an unusually stiff spring (or two!). The obvious reason for doing this is that increased clamp force raises the torque capacity of the clutch. What they don't consider is that raising the clamp force also raises the clutch's release force. Damage to the customer's thrust bearing, crank, rods, etc, etc, is the inevitable result.

All automobile manufacturers today have a starter / clutch interlock. This simply means that when you go to start the engine, the key will not engage the starter motor, unless the driver's foot is depressing the clutch pedal. Why is this important? In an engine which is lubricated with pressurized oil, there is NO OIL PRESSURE when the engine is not running. So, when you go to start the engine, you are pushing the crank tightly up against the crank thrust surface WITH NO OIL PRESSURE, and then turning the key to start the engine rotating. You cannot ask for a more disastrous combination of events, when it comes to shortening the life of the engine thrust bearing. You are forcing metal to metal contact, and then rubbing the two parts together with no oil pressure. This is an open invitation to thrust bearing failure.

The solution to the starter / clutch pedal interlock is to disable the interlock, and then start the engine while the transmission is in neutral, while NOT DEPRESSING THE CLUTCH PEDAL. Simple solution, but we have heard of many Mitsubishi owners who learned this lesson one thrust bearing and thousands of dollars too late…

## Damage caused by Thrust bearing problems

The smaller the thrust bearing surface area, the higher the unit pressure there is when the clutch pedal is depressed. If the bearing material is defective, and wears away, this allows the crank to have excessive end play, or what is commonly called 'crank walk'. When the crank has excessive end play bad things happen. The crank usually moves far enough to side load one (or more) or the rods, causing them to fail. If the situation is not caught in time, the results can be disastrous.

## Thrust Limits

All automobile engine manufacturers set a limit on the amount of force which can safely be put on the end of their cranks. General Motors has called out this limit as 800 pounds force (3,560 newtons). PowerTrain Technology makes a point of never building a clutch which exceeds an 800 pound (3,560 Newton) force, when the clutch is actuated. We encourage a high performance clutch customer to openly question any potential clutch manufacturer about excessive thrust loading. If that clutch manufacturer cannot satisfactorily answer your questions, run away.

PTT welcomes any and all technical questions about all products we manufacture.