

CFM56-All -- Engine Rotor Seizures (99-07-7252-04)

During maintenance inspection of the engine, some operators have reported few cases of engine rotor(s) seizure. Different types of rotor(s) seizures can be experienced on CFM56 engines; this seizure phenomenon is mainly encountered on low-time engines (new or refurbished engines). Seizure duration can be for a time period up to eight hours without impacting the engine serviceability.

The LP and HP rotors can be found locked together during post-flight inspection:

When rotating the fan rotor by hand, the core rotor is also driven (exhibited as AGB gear noise). Such experience was felt as a concern in some instances. CFMI has collected over the years similar experiences on CFM56 engine's family in the factory and in revenue service operation. This lock-up is attributed to an interaction between LP/HP rotating air seals (HPT aft rear rotating seal with the LPT forward rotating seal). The clearance of these air seals is very tight and therefore in some specific operating conditions resulting to engine carcass distortion (depending on the way the engine was cooled down prior to shutdown) the running clearance of the seals may become too tight thus locking up the fan and core rotors together. Such a phenomenon is not detrimental to the engine and is not a sign of hardware deterioration. There is no specific maintenance action required unless the flight crew reported an abnormal engine misbehavior during the last flight leg such as a high level of vibration or a magnetic chip was detected by either chip detector visual inspection or fault message annunciated in the cockpit interface (for specific engine models).

In case the phenomenon is experienced the rotors can eventually be broken loose by either:

- Performing a dry motoring of the engine for 2 minutes.
- Holding the core through the handcranking pad (using locking adapter tool) while rotating the fan by hand.

This phenomenon is mainly experienced on low-cycle engines but can also be encountered on high-time engines. The rotors don't break loose as the engine cools down.

The core rotor is found seized:

When trying to start the engine, the engine doesn't start (no rotation at all of the core). Seizure of the core rotor can then be confirmed when trying to manually rotate it through the hand cranking pad. This case is very rare. It can potentially be experienced following specific flight operation such as flight training requiring several touch and go's. In this case, the engine is usually shut down with insufficient cooldown (usually achieved during descent) thus leading to a core rotor bow. This lock-up is attributed to an interaction between the HPT aft rotating air seal and the stage 1 LPTN forward stationary inner seal. Such a phenomenon is not detrimental to the engine and is not a sign of hardware deterioration. If such a problem is encountered, it's recommended to attempt every 15 minutes to rotate the core through the handcranking pad until the core starts to break-up. Then a two-minute dry-motoring can be performed before to start the engine and resume revenue service. By rotating the fan module by hand you will significantly reduced the time needed to free the HPC rotor.

The fan rotor is found seized:

(This phenomenon is unlikely for FADEC engines with auto start abort function.)

This lock-up is attributed to an interaction between the rotating and stationary air/oil seals of the aft sump. Such a phenomenon is not detrimental to the engine and is not a sign of hardware deterioration. If the rotation of the fan rotor is not possible by hand, it's then recommended to perform a two-minute dry-motoring while monitoring the fan for rotation. Further engine motoring sequences might be necessary until free rotation of the fan is observed.