

F-16 EPS system components were designed in the 1970s to 1980s and the current operational environment differs significantly from that considered during the original design specification. Collins continues to improve reliability on EPS products by applying current technology and offers upgrade kits to increase mean time between failure (MTBF).



**GENERATOR, MAIN (60 KVA/40 KVA)**



**GENERATOR, STANDBY (10 KVA)**



**CONSTANT SPEED DRIVE (CSD)**



**CSD UPGRADE KIT**

AllClear is the worldwide stocking distributor for Collins' F-16 generators and CSDs.

AllClear has signed a manufacturing license agreement with Collins for the F-16 CSD and generator unique and common parts and/or components for military applications, including U.S. Government Foreign Military Sales (FMS) solicitations.

AllClear has the right to manufacture, have manufactured, procure, test, use, sell, lease, and otherwise dispose of the F-16 CSD and generator components.

Collins provides electric power generating and control systems, fuel and special fluid pumps, engine control systems, gearboxes, auxiliary power units, environmental control systems, propeller systems, and electronic controls and components.

AllClear has significant inventory levels for all Collins F-16 EPS generators, CSD at the LRU and subcomponent levels. AllClear provides short lead times and competitive price advantages, due to higher quantity procurements and stands ready to support all spare parts and repair and overhaul needs.



# Generator

**F-16 A/B use 40 KVA and F-16 C/D use 60 KVA generator as main electric power.**

## F-16 40/60 KVA MAIN GENERATOR

The original 40/60 KVA generator rotor design is prone to wedge creep. Also, the original design uses diodes which are not adequate for more robust missions. The Collins upgrade kit addresses both of these issues by providing improved replacement rotor wedges and more robust and readily available diodes. Also included are a replacement wire tie, tape adhesive, and epoxy to enable a complete re-build. F-16 main generator upgrades include steel rotor wedges, diode upgrades, wire containment improvements, and EPA approved encapsulation material.

**F-16 A/B/C/D 40KVA/60KVA Generators Upgrade:** Collins made significant improvements on F-16 A/B/C/D generators to increase MTBF and issued under Collins MMB 1442 and 1492. These changes effected DLM technical manual, illustrated parts breakdown, and T.O. 8A6-8-11-4. These improvements are for 40KVA AC generator, part numbers 977J024-3/-4 and 977J330-3, used on F-16 A/B aircraft and for 60KVA AC generator used on F-16 C/D aircraft.

Improvements made by replacing old wedges and diodes with new stainless steel wedges (revising the winding procedure to eliminate tie breaking, and reducing out of balance limits) and new 1600V diodes (significantly reduces nuisance failures in the field). These upgrade kits are named as 174-37A for 40KVA and 174-38 for 60KVA generator.

AC generators modified according to MMB 1442 and 1492 bulletin are identified with the symbol MMB 1442 or MMB1492 on the identification plate. If the generator does not have MMB 1442 or MMB1492 marking on the name plate the generator needs this upgrade to obtain higher MTBF.

## 10 KVA BACKUP GENERATOR UPGRADE

This system was originally designed by Westinghouse Electric Company in the 1980s. The generator is high speed, air cooled, 10 KVA rated, PMG constant power, VSCF with converter. It operates whenever the engine is operating via the engine gearbox. Initial improvements were made with kit 179-04. The kit contained a new armature shaft assembly, new hardened insert (located in the end bell housing), new bearings with improved grease, and improved the clamping of the drive end bearing. It improved the MTBF but did not satisfy the customer expectations.

Collins finalized another modification program based on customer reports.

Collins engineering researched, tested and replaced all of the parts required to improve MTBF on the 10 KVA generator. Collins made this improvement by creating the 174-70 kit including a greater size high speed bearing. It should be implemented in the first overhaul cycle as a whole kit. This modification requires to change the bearing, end bell assembly, and fan cover to improve cooling. This reduces dry out condition and further improves balance. If all part numbers are not replaced during this installation, there is a risk to the integrity of the upgrade. To maintain the integrity of this kit, Collins only sells this as a complete kit. After initial implementation single parts from the 174-70 kit might fail and other parts still might still be reusable.

**F-16 C/D 10 KVA Upgrade:** Collins issued MMB-1476 for F-16C/D 10KVA generator part number 948F463-4, 948F463-5, and 948F463-6 to implement parts kit 174-70. These MMB-1476 changes effected DLM technical manual, illustrated parts breakdown, and technical order (T.O.) 8A6-5-10-3. AC generators modified according to this bulletin are identified with the symbol MMB1476 in the ID plate. If the generator does not have the MMB 1476 marking on the name plate, the generator needs this upgrade to obtain higher MTBF.

APPLICABLE PLATFORM	PRODUCT	MMB	KIT P/N	APPLICATION P/N	APPLICATION NSN	T.O.	PURPOSE OF KIT
F-16A/B	40 KVA GEN	1442	174-37A	977J024-3, 977J024-4	6115-01-141-5801	T.O. 8A6-8-11-3	STAINLESS STEEL WEDGES, NEW 1600V DIODES
F-16A/B	40 KVA GEN		174-52	977J024-3, 977J024-4	6115-01-141-5801	T.O. 8A6-8-11-3	SHOP ITEMS FOR 10 REWINDS
F-16C/D	60 KVA GEN	1492	174-38	977J330-3	6115-01-236-8434	T.O. 8A6-8-11-4	STAINLESS STEEL WEDGES, NEW 1600V DIODES
F-16C/D	10KVA GEN	1476	174-70	948F463-4, 948F463-5, 948F463-6	6115-01-148-0483, 6115-01-246,5622, 6115-01-246-5622	T.O. 8A6-5-10-3	NEW ANTI-DRIVE BEARING END BELL, FAN COVER, SPACER, WASHER

# CSD

F-16 A/B and F-16 C/D use different version of CSDs.

CSDs are designed in 1980s and Collins intergrates all the improvements in commercial and military CSDs.

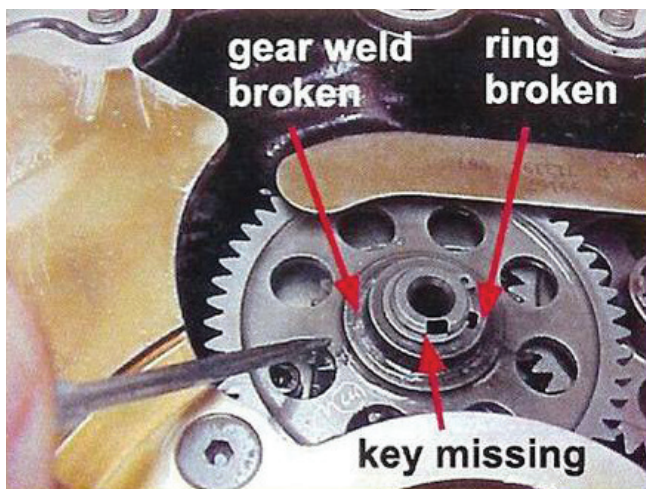
## F-16 CONSTANT SPEED DRIVE (CSD) IMPROVEMENTS

**F-16A/B CSD Upgrade:** Collins issued MMB-1472 for F-16A/B CSD, part number 727429 series. These MMB-1472 changes affected DLM Overhaul Instructions in Technical Order T.O. 9H6-3-36-13 and CSD illustrated parts breakdown T.O. 9H6-3-36-14. Collins issued parts kits 174-44 and 174-72 for this modification. These kits should be implemented in the first overhaul cycle as a whole kit. If all the part numbers are not replaced during this installation, there is a risk to the integrity of the upgrade. This modification is to incorporate improvements using commercial technology consisting of TiN coated wobblers, improved slippers, crowned pistons, and an extended service filter. These improvements are standard CSD design and will improve the MTBF for this assembly. If not already done, a more robust idler shaft assembly is incorporated.

The CSD modified according to this MMB 1472 bulletin are identified with the symbol MMB 1472 on the identification plate. If the CSD does not have the MMB 1472 marking on the name plate then the CSD needs this upgrade to obtain higher MTBF.

**F-16 C/D CSD Upgrade:** Collins issued MMB-1452 for modification of F-16C/D CSD, part numbers 734556 or 734556A NSN 1650-01-145-0046. These MMB-1452 changes affected DLM overhaul instructions in technical order T.O. 9H6-3-36-13 and CSD illustrated parts breakdown T.O. 9H6-3-36-14. Collins issued parts kits 174-44 and 174-55 for this modification. These kits should be implemented in the first overhaul cycle as a whole kit. If all part numbers are not replaced during this installation, there is a risk to the integrity of the upgrade. This modification is to incorporate improvements to the input shaft, center housing, and input housing assemblies. The improvement to elimination failure mode that leads to generator rotor overspeed, laser hardened slippers, TiN coated wobblers, and crowned pistons/slippers for reduced wear and improves MTBF.

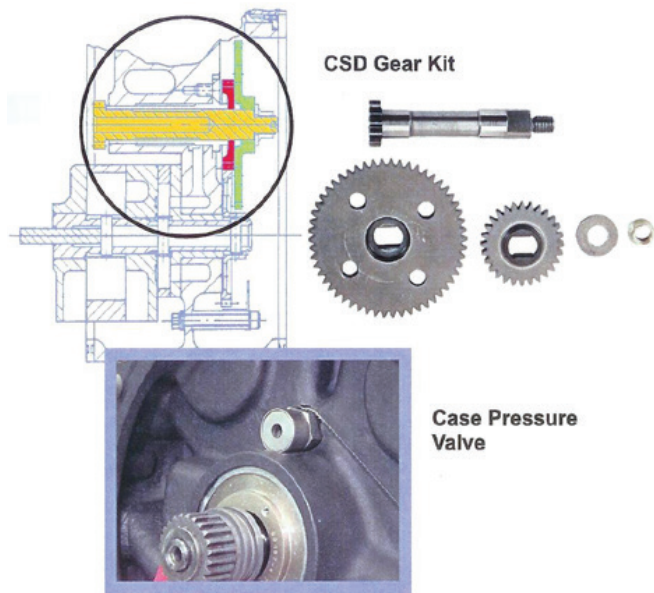
The CSD modified according to this MMB 1452 bulletin are identified with the symbol MMB1452 on the identification plate. If the CSD does not have the MMB1452 marking on the name plate then the CSD needs this upgrade to obtain higher MTBF.



**CSD PREVIOUS GEAR FAILURE**



**CASE OVERPRESSURE FAILURE**



APPLICABLE PLATFORM	PRODUCT	MMB	KIT P/N	APPLICATION P/N	APPLICATION NSN	T.O.	PURPOSE OF KIT
F-16C/D	CSD		174-122	734556, 734556A, 734556B	1650-01-145-0046, 1650-01-228-9276, 1650-01-228-9276	T.O. 9H6-3-44-3	ROLLER RETAINER UPGRADE
F-16A/B	CSD	1472	174-44, 174-72	727429	1650-01-085-2887	T.O. 9H6-3-36-13	TIN COATED WOBBLERS, IMPROVED SLIPPERS, CROWNED PISTONS, AND AN EXTENDED SERVICE FILTER
F-16A/B	CSD		174-149	727429	1650-01-085-2887	T.O. 9H6-3-36-13	ROLLER RETAINER UPGRADE
F-16C/D	CSD	1452	174-44, 174-55	734556, 734556A, 734556B	1650-01-145-0046, 1650-01-228-9276, 1650-01-228-9276	T.O. 9H6-3-44-3	LASER HARDENED SLIPPERS, TIN COATED WOBBLERS AND CROWNED PISTONS/SLIPPERS FOR REDUCED WEAR WHICH IMPROVES MTBF
F-16	FREQUENCY CONVERTER	1648	914-191	948F455-1	6130-01-140-8200		DUE TO COMPONENT OBSOLESCENCE, SERVAL PARTS
F-16A/B	GCU, 40 KVA			947F310-3	6110-01-552-9513		REPLACEMENT UNIT
F-16C/D	GCU, 10 KVA			948F456-4	6110-01-165-6844		REPLACEMENT UNIT
F-16C/D	GCU, 60 KVA			948F450-4	6110-01-391-6067		REPLACEMENT UNIT

## QUALITY & COMPLIANCE

AllClear Aerospace & Defense is committed to quality, continuous improvement, and full regulatory compliance at every level of the organization through AS9120 and ISO 9100:2008 certifications, implementing lean processes, continuous quality improvement training initiatives, and a customer service focused business model. Our in-house legal and compliance teams maintain robust processes and procedures to comply with all federal, state, and local regulations including ITAR, EAR, and the FCPA.

For the most current information on our latest capabilities and partnerships, visit [goallclear.com/brochure-library/](http://goallclear.com/brochure-library/)