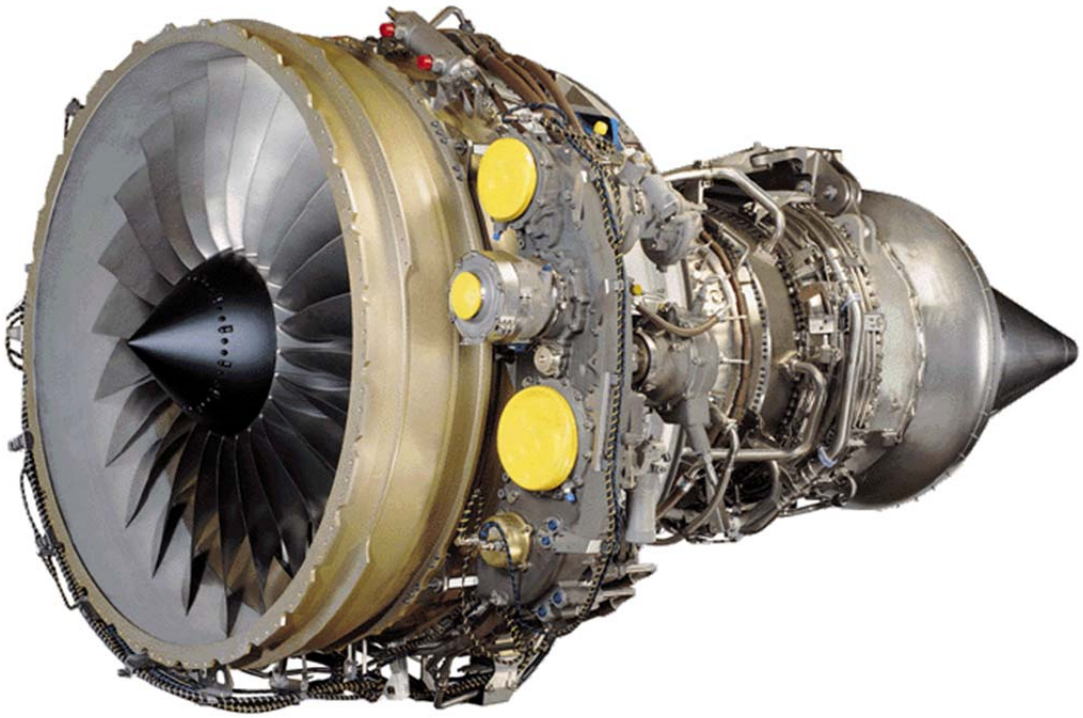
CF34-10A

Commercial Engine Service Memorandum 002



CF34-10A On-Wing Engine Maintenance Program

CESM 002

Revision 0, July 01, 2015

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GE AVIATION

CF34-10A COMMERCIAL ENGINE SERVICE MEMORANDUM 002, REVISION 0

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This page transmits the basic issue of the CF34-10A On-Wing Engine Maintenance Program dated July 01, 2015.

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On-Wing Engine Maintenance Program

1. Introduction

This CESM contains the On-Wing Engine Maintenance Program and provides a listing of GE Aviation's recommended scheduled inspection and servicing intervals applicable to installed CF34-10A engines. Its purpose is for maintenance planning only. Procedures, limits, and specific requests are defined in the referenced publications.

NOTE: This CESM is referenced by ESM 71-00-00, Engine Maintenance Program (TASK 71-00-00-800-801).

This document is intended for use as a maintenance planning aid to be used by CF34-10A operators to establish an on-condition maintenance program in accordance with their regulatory responsibilities and to control engine reliability and operating costs. The inspections and the inspection intervals are based upon engine fleet history gathered by GE over the life of the engine service. To maintain the applicability and effectiveness of the on-wing scheduled maintenance program, this field data is analyzed using MSG-3 guidelines and the inspection intervals revised as required.

NOTE: If there is a conflict between this CESM and the associated AMM Maintenance Planning Document (MPD), the MPD takes precedence.

The recommendations included this CESM are based on operation in typical revenue service. If engines are operated in unusual service (pilot training, high cycle-to-hour service, etc.) or in detrimental environmental conditions (hot and harsh, sandstorms, heavy construction, undeveloped airstrips, etc.), GE recommends that the operator develop a customized inspection and servicing plan. GE Aviation is available to assist in developing a customized inspection and servicing plan, if required.

CF34 Product Support Engineering may require one-time or repetitive inspections applicable to certain engines, depending on configurations, accumulated hours/cycles, operation conditions, or a combination of all these items. Note the items that follow:

- The inspections are usually of limited duration, and are not required after replacement or upgrade of the affected hardware.
- The inspections will usually be transmitted via Service Bulletin.

2. Accomplishment Instructions

(A) General

(1) The engine must be operated and maintained in accordance with the approved GEAE-published instructions, and in accordance with the life limit requirements given in TASK 05-11-00-200-801 (05-11-00, Time Limits) and TASK 05-21-00-200-801 (05-21-00, Mandatory Inspections).

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(2) The scheduled maintenance tasks and frequencies given in this section may be adjusted by the operator to meet the needs of their specific fleet. Changes depend on the experience of the operator, and the condition of the maintenance record. Changes must be in accordance with the appropriate local airworthiness authority practices and their approval.

(3) For any part that is repaired or replaced, the inspection interval for that part is reset to the initial threshold for new parts.

(4) CF34 Product Support Engineering will provide technical assistance and guidance, as necessary, when requested by the operator.

(B) Definitions

(1) General Visual Inspection (GVI). A visual examination that will detect obvious unsatisfactory conditions and discrepancies. A GVI may require removal of other components to gain access (for example, fillets, fairings, access panels/doors, etc.). Special equipment may be required to gain access (for example, work stands, ladders, etc.).

(2) Detailed Inspection (DI). An intensive visual examination of a specified detail, assembly, or installation. A DI will detect evidence of irregularities with the use of satisfactory lighting and, when necessary, inspection aids (for example, mirrors, hand lenses, etc.). Surface cleaning and elaborate access procedures may be required.

(3) Special Detailed Inspection (SDI). An intensive examination of a specific location that is similar to the DI. An SDI includes examinations that require some special technique, such as non-destructive testing (for example, dye penetrant inspection, high-powered magnification inspection, borescope inspection, etc.), and examinations that require disassembly.

(C) Engine Maintenance Program Initiation Requirements.

(1) Implement one-time requirements before the CF34-10 turbofan engine is started on the engine maintenance program if either of these conditions exist.

(a) If the engine has not been maintained in accordance with the Engine Maintenance Program, as defined in this CESM.

(b) If the maintenance history of the engine is unknown or suspect.

(2) CF34 product support engineering will provide technical assistance and guidance, as necessary, when requested by the operator.

(D) Engine Maintenance Program Requirements

(1) Do the scheduled inspections. Refer to Table 802.

(2) Refer to the referenced section for detailed instructions.

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Table 802. Table of Recommended On-Wing Maintenance Actions.

Task	Maintenance/Inspection	Recommended Interval	Reference	Purpose
GVI of aft core cowl pressure relief door	GVI for proper position	Daily	Refer to AMM[1]	An open ACC door may indicate an air management system duct leak, or damage to the ACC door latch assembly
Update engine performance trend	Download engine condition trend monitoring (ECTM) data from the aircraft computer and update engine performance trend	2 weeks or 100 flight cycles, whichever occurs first. If download occurs after more than 100 flights, data will be lost	Use an approved trend monitoring procedure (refer to paragraph 3.)	Early detection of engine deterioration is of critical importance to schedule timely maintenance action
Visual check of electrical chip detector indication on the multi-function display (MFD)	Visual check for activation of indicator	120 flight hours	Refer to AMM[1]	Metal particles in the lubrication system may be an indication of wear. The chip detector traps and removes magnetic particles from the oil stream and displays an MFD message to provide early warning of possible impending failure so that maintenance can be performed on a timely basis.
DI of the engine air turbine starter drain plug chip detector	DI for condition and security	600 flight hours	TASK 72-00-00-600-801 (72-00-00, Servicing 001)	The chip detector traps and removes magnetic particles from the oil stream, major metal findings indicate possible failure in the lubrication system and are not acceptable

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Task	Maintenance/Inspection	Recommended Interval	Reference	Purpose
Service air turbine starter oil system	Replace the air turbine starter system oil	600 flight hours	TASK 72-00-00-600-801 (72-00-00, Servicing 001)	Inadequate lubrication due to oil leakage can cause the starter shaft to seize, causing significant secondary damage. Replacing the ATS oil at the recommended interval will reduce the rate of failure
Visual check for engine fault messages	Visual check of the multi-function display (MFD) for engine fault messages	600 flight hours	Refer to AMM[1]	Dispatch is permitted with long time faults present, but must be corrected on a periodic basis to maintain engine performance. All faults must be corrected at the specified interval
GVI of the engine inlet cowl	GVI of the inlet cowl for obvious damage, including the NACA scoops	600 flight hours	TASK 71-00-11-450-803 (71-00-11, Inspection 001)	Damage to the inlet cowl may reduce airflow for FADEC and fan cowl compartment cooling resulting in over temperature of those components
GVI of pressure pop-up indicator for anti-ice inner duct failure indication	GVI for failure condition	600 flight hours	Refer to AMM[1]	Leakage from duct failure may cause a functional failure of the anti-icing system, causing deteriorated engine performance
DI of the translating cowl latches	DI for condition and security	600 flight hours	TASK 78-30-00-200-802 (78-30-00, Inspection 001)	Damaged latches may cause a functional failure of the translating cowl, causing deteriorated engine performance

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Task	Maintenance/Inspection	Recommended Interval	Reference	Purpose
GVI of fan blades, fan abradable, spinner cone, and visible areas of the fan stator case for FOD or other damage	GVI for condition (especially the leading edges)	600 flight hours	TASK 72-00-00-200-806 (72-00-00, Inspection 004, steps E, F, I, and J)	If there is evidence of FOD, or there are engine performance issues, perform the GVI to detect airfoil or other damage. Airfoil damage affects the ability of the engine to generate thrust
Waterwash engine	Waterwash on a regular interval. Waterwash when a visual inspection of the engine inlet shows a buildup of dirt, carbon, salt, or oil-based deposits, or for performance loss	Customer established interval (see NOTE below). Also wash as necessary for performance	TASK 72-00-00-100-801 (72-00-00, Cleaning 001)	The engine waterwash restores engine performance and compressor operability margin. Removal of deposits in the engine flowpath also reduces fuel consumption and the emission of CO2 during operation, recovers EGT margin, and extends engine life

NOTE: GE recommends a maximum waterwash interval of 2000 flight hours. If the engine is operating in a harsh environment*, the maximum recommended waterwash interval is 1000 flight hours. The interval should be reduced if the engine is operating in a polluted environment, is exposed to non-naturally occurring fluids (including, but not limited to, deicing fluid, or in accordance with the operator's experience.

* Harsh environment is defined as follows:
Engines that have operated for more than 50 percent of their departures within: Algeria, Bahrain, Chad, Egypt, Ethiopia, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Mali, Mauritania, Morocco, Niger, Nigeria, Oman, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, Western Sahara, or Yemen.

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Task	Maintenance/Inspection	Recommended Interval	Reference	Purpose
Replace engine oil filter element	Remove and replace the engine oil filter element	2000 flight hours	TASK 79-00-00-800-826 (79-00-00, Removal 004)	An oil filter impending bypass indication in the cockpit will require corrective action before next dispatch, with possible delay or cancellation. Regular replacement will reduce the rate of failure
Replace main igniter plug	Remove and replace main igniter plug	3000 flight hours	TASK 74-00-00-800-813 (74-00-00, Removal 004)	Since each engine has two igniters, one of them could experience a hidden failure. If the second igniter also fails, the engine will not start, with possible delay or cancellation. Regular replacement will reduce the rate of failure
Replace engine fuel filter	Remove and replace engine fuel filter element	4000 flight hours	TASK 73-00-00-800-825 (73-00-00, Removal 007)	A fuel filter impending bypass indication in the cockpit will require corrective action before next dispatch, with possible delay or cancellation. Regular replacement will reduce the rate of failure
SDI of the compressor rotor and stator assemblies	SDI of the stages 2, 4, 6, and 8 compressor rotor blades and visible areas of the stator vanes for evidence of FOD, rubs, tip curls, and internal damage using a borescope	6000 flight hours	TASK 72-00-00-200-805 (72-00-00, Inspection 002, Paragraph 5.)	The intent of the borescope inspection is to determine when an event occurs which might affect the operation and performance of the high pressure compressor

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Task	Maintenance/Inspection	Recommended Interval	Reference	Purpose
SDI of the combustion chamber assembly and fuel injectors	SDI (borescope inspection) for burns, cracks, fragmentation, or other damage	6000 flight hours for first inspection; 3000 flight hours for following inspections	TASK 72-00-00-200-805 (72-00-00, Inspection 002, Paragraph 7.)	The combustion liner protects the hardware outside of the combustion chamber. Burn through can cause an overheating of the adjacent hardware that may require replacement. Mechanical or thermal stress-related damage may cause fragmentation that results in downstream damage
SDI of the HPT nozzle assembly and HPT rotor blades leading edge	SDI (borescope inspection) for burns, cracks, fragmentation, or other damage	6000 flight hours for first inspection; 3000 flight hours for following inspections	TASK 72-00-00-200-805 (72-00-00, Inspection 002, Paragraph 8.)	The intent of the borescope inspection is to detect mechanical or thermal stress-related damage may cause fragmentation that results in downstream damage
SDI of the HPT rotor blades trailing edge and HPT shroud/LPT nozzle assembly	SDI (borescope inspection) for burns, cracks, fragmentation, or other damage	6000 flight hours for first inspection; 3000 flight hours for following inspections	TASK 72-00-00-200-805 (72-00-00, Inspection 002, Paragraph 9.)	The intent of the borescope inspection is to detect mechanical or thermal stress-related damage may cause fragmentation that results in downstream damage
OPC of engine ignition switch	Operational check of engine ignition switch	6000 flight hours	Refer to AMM[1]	Since each engine has two ignition exciters, one of them could experience a hidden failure. If the second exciter fails also, the engine will not start, resulting in delay or cancellation

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Task	Maintenance/Inspection	Recommended Interval	Reference	Purpose
GVI of fan blades, fan rotor spinner, and fan rotor spinner support	GVI for condition and security	6000 flight hours	TASK 72-00-01-200-802 (72-00-01, Inspection 001, Paragraphs 5.A, 5B, and 5.G)	Cracks, missing coating, missing nuts and other damage may cause increased wear into the parent material, increased vibration due to imbalance, and possible spinner liberation
GVI of fan stator containment case	GVI of visible areas for condition and security	6000 flight hours	TASK 72-00-00-200-806 (72-00-00, Inspection 004, Paragraphs G, H, and I)	Cracks, missing coating, excessive rubs, and other damage may cause decreased ability to contain a liberated fan blade
DI of the aft fan case	DI of the visible areas of the engine aft fan case mount clevis pads for cracks and condition	6000 flight hours	TASK 72-00-01-200-802 (72-00-01, Inspection 001, Paragraph 5.K)	Cracks, distortion, and structural damage may cause reduced structural integrity as the clevis mounts are a primary support attaching the engine to the airframe
GVI of outlet guide vanes and fairing	GVI of visible areas of the engine outlet guide vanes and fairing for condition and security	6000 flight hours	TASK 72-00-00-200-806 (72-00-01, Inspection 004, Paragraph L)	Cracks, leading and trailing edge gouges, missing material, and other damage may cause loss of efficiency and reduced structural integrity as the OGV frame supports the forward engine mounts

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Task	Maintenance/Inspection	Recommended Interval	Reference	Purpose
DI of visible areas of engine mount system and attaching hardware	DI for cracks, distortion, security, and general condition	6000 flight hours	TASK 71-00-20-200-813 (71-00-20, Inspection) and TASK 72-00-00-200-806 (72-00-00, Inspection 004, Paragraph AO)	Cracks, distortion, and structural damage may cause reduced structural integrity as the mount system provides the support attaching the engine to the airframe
GVI of compressor case	GVI of the visible external surface of the engine compressor case for condition and security	6000 flight hours	TASK 72-00-00-200-806 (72-00-00, Inspection 004, Paragraphs Y, Z, AA, and AB)	Cracks, missing flange bolts, and internal rubs may cause a functional failure of the compressor module, causing deteriorated engine performance
GVI of external fuel distribution system components	GVI of the external fuel distribution system components for evidence of leakage, condition, and security	6000 flight hours	TASK 72-00-00-200-806 (72-00-00, Inspection 004, Paragraphs AV, AW, AX, AY, AZ, and BA)	Cracks, structural damage, loose hoses and fittings, and leaks may cause a functional failure of the fuel distribution system, causing deteriorated engine performance
FNC of the engine fuel filter impending bypass sensor	Do a functional check of the sensor	6000 flight hours	Refer to AMM[1]	A nonfunctioning bypass sensor may prevent early warning of possible impending failure of the fuel system. A functional check of the bypass sensor will reduce the rate of failure to provide early warning
GVI of low pressure turbine rear frame	GVI of the engine low pressure turbine rear frame for condition and security	6000 flight hours	TASK 72-00-00-200-806 (72-00-00, Inspection 004, Paragraphs AM, AN, and AO)	Cracks or missing material may cause a functional failure of the turbine rear frame, causing deteriorated engine performance

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Task	Maintenance/Inspection	Recommended Interval	Reference	Purpose
GVI of accessory gearbox mounts	GVI of the engine accessory gearbox mounts and attachments for condition and security	6000 flight hours	TASK 72-00-00-200-806 (72-00-00, Inspection 004, Paragraph D)	Cracks and damage may reduce the structural integrity of the mounts and cause looseness in the AGB/engine connection. This can result in excessive vibration and wear to the AGB components due to misalignment
GVI of the variable geometry system	GVI of the engine variable geometry system actuators, linkage, and actuating rings for condition and security	6000 flight hours	TASK 72-00-00-200-806 (72-00-00, Inspection 004, Paragraphs AC, AD, AE, AF, AG, and AH)	Cracks, distortion, missing bolts, and incorrect attachment may cause a functional failure of the variable geometry system, causing deteriorated engine performance
GVI of the variable bypass system	GVI of the engine variable bypass system for condition and security	6000 flight hours	TASK 72-00-00-200-806 (72-00-00, Inspection 004, Paragraphs W and X)	Cracks in the actuating ring and leaking connectors on the VBV actuator may cause a functional failure of the system, causing deteriorated engine performance
GVI of the transient bleed valve	GVI of the engine transient bleed valve for condition and security	6000 flight hours	TASK 72-00-00-200-806 (72-00-00, Inspection 004, Paragraph BE)	Looseness and leaks on the connectors may cause a functional failure of the transient bleed valve, causing deteriorated engine performance

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Task	Maintenance/Inspection	Recommended Interval	Reference	Purpose
GVI of the lube system	GVI of the engine lube system, oil tank, and AGB assembly components for leakage, condition, and security	6000 flight hours	TASK 72-00-00-200-806 (72-00-00, Inspection 004, steps AP and AQ)	Cracks or leaks at the accessory gearbox or the external areas of the oil lube system may cause a functional failure, causing deteriorated engine performance
FNC of the engine master chip detector	Functional check of the engine master chip detector system for proper operation	6000 flight hours	TASK 79-00-00-800-825 (79-00-00, Removal 006, Paragraph 4.E)	A nonfunctioning chip detector may prevent early warning of possible impending failure of the lubrication system. A functional check of the chip detector will reduce the rate of failure to provide early warning
FNC of the engine oil filter impending bypass sensor	Do a functional check of the sensor	6000 flight hours	CMM 79-31-00 (SEI-851) or to Subtask 77-00-00-750-004 (77-00-00, Removal 016)	A nonfunctioning bypass sensor may prevent early warning of possible impending failure of the lubrication system. A functional check of the bypass sensor will reduce the rate of failure to provide early warning
GVI of exhaust centerbody	GVI of the engine exhaust centerbody for condition and security	6000 flight hours	TASK 78-10-02-200-802 (78-10-02, Inspection 001)	Cracks, nicks, dents and other damage, and blocked drain holes may cause a functional failure of the exhaust centerbody, causing deteriorated performance
GVI of the thrust reverser assembly, aft core cowl, thermal blanket, and fire seals	Inspect engine fire zone for condition and security	6000 flight hours	TASK 78-30-00-200-802 (78-30-00, Inspection 001)	Leaks, missing parts, and structural damage may cause a functional failure of the thrust reverser module, causing deteriorated performance

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Task	Maintenance/Inspection	Recommended Interval	Reference	Purpose
DI of the thrust reverser including the actuation system, latches, sliders, and hinges	DI of the thrust reverser including the latches, sliders, and hinges for condition and security	6000 flight hours	TASK 78-30-00-200-802 (78-30-00, Inspection 001)	Accidental damage and excessive wear may cause a functional failure of the thrust reverser, causing deteriorated performance
OPC of the thrust reverser locking system	Perform an operational check of the thrust reverser locking system	6000 flight hours	TASK 78-30-00-800-802 (78-30-00, Special Procedure 78-005)	The servicing is to ensure proper operation of the thrust reverser mechanism. The operational check will ensure the thrust reverser will be secured within normal operational parameters
GVI of the drain tubes	GVI of the fan case and core area pylon drain lines for general condition	6000 flight hours	TASK 71-00-71-200-805 (71-00-71, Inspection 001)	Corrosion, cracks, coking, and damaged threads may cause a functional failure of the drain tubes, causing deteriorated engine performance
GVI of the nacelle fire seals	GVI of vertical firewall seals, pylon fairing seals, and fan cowl seals for condition and security	6000 flight hours	Refer to AMM[1]	Cracks, tears, deformation, dislocation, and other damage may cause a functional failure of the fire seals, causing deteriorated engine performance

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Task	Maintenance/Inspection	Recommended Interval	Reference	Purpose
GVI of the inlet cowl anti-ice ducts	GVI of the inlet cowl ducts	6000 flight hours	TASK 71-00-30-200-802 (71-30-00, Inspection 001)	Leakage and incorrect installation may cause a functional failure of the anti-icing system, causing deteriorated engine performance
GVI of the nacelle anti-ice system	GVI of the nacelle anti-ice system ducts and valves for leakage, condition, and security	4000 flight hours	TASK 71-00-30-200-802 (71-30-00, Inspection 001)	Leakage and incorrect installation may cause a functional failure of the anti-icing system, causing deteriorated engine performance
Fan blade lubrication	Lubricate the fan blades	1500 to 3000 flight cycles	TASK 72-00-00-030-808 (72-00-00, Removal 017)	The servicing is to ensure proper operation of the fan module. Inadequate lubrication of the fan blades can cause excessive vibrations that will require unscheduled maintenance

[1] The AMM Maintenance Planning Document contains the necessary TASK references corresponding to this maintenance requirement.

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3. Performance Trend Monitoring

(A) General Guidelines

(1) Performance trend monitoring is required every 100 flights, as part of the On-Condition Monitoring of the engine. Performance trend monitoring makes it easier to predict and to schedule maintenance for performance restoration. Therefore, flight schedule interruptions will be prevented.

(2) If the trend data download from the central maintenance computer (CMC) at the 100-flight interval is not usable, the CMC download issue should be corrected and the aircraft should be permitted to continue service for a maximum of 3 days or 30 flights, whichever comes first. The trend data should then be downloaded and the engine performance should be checked. If after the extension the Trend data download from the CMC is still not usable, a Ground Power Assurance Check must be done before continued service and every 100 flights until the CMC provides usable data to the Trend Program.

(3) CF34 Product Support Engineering, in conjunction with the airframe manufacturer, provides the necessary calculation procedures to determine the performance of installed engines. Operators should use an approved trend monitoring procedure to monitor the performance of the CF34 engine. CF34 Product Support Engineering or the airline Customer Support Manager will provide a method for Trend Monitoring.

(4) Performance trend monitoring procedures require collection that does not exceed 100 flights of certain engine parameters and ambient conditions that are recorded during a high-power setting. From these parameters, a takeoff performance margin (given in degrees of interstage turbine temperature (ITT) is calculated. The results are recorded and a performance trend is established.

(B) Specific Guidelines

(1) Operators must determine the performance of all installed engines. A history of these checks must be kept as part of the permanent record of the engine.

(2) The rate of deterioration of the engine must be established. If necessary, the frequency of the performance checks must be increased to make sure that adequate ITT margin is available at every takeoff, taking into account the deterioration rate.

(3) Operators can make a record of the data that is required for the performance calculation. If the aircraft is so equipped, get the data from the on-board data acquisition system.

(4) You must troubleshoot and/or do maintenance on engines that do not demonstrate a satisfactory margin (refer to TASK 72-00-00-810-801 (72-00-00, Fault Isolation)).

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4. Exposed Hardware Inspection Requirements

(A) An individually licensed technician, or a licensed repair station (if there is no individually licensed technician), is required to do a visual inspection of all engine parts that can be seen before the engine is assembled again. This includes the items that follow.

(1) All parts that are removed from the engine that will be installed again.

(2) All parts that are not removed from the engine that can now be seen.

(B) The inspection of these parts must be thorough, and the parts must meet the serviceable limits given in the inspection tables that are applicable for the level of maintenance.

(C) A part does not have to be further disassembled if the area that can be seen is within the serviceable limits.