

**BY ORDER OF THE COMMANDER
AIR FORCE GLOBAL STRIKE
COMMAND**

**AIR FORCE GLOBAL STRIKE
COMMAND INSTRUCTION 21-152**



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Maintenance

**ENGINE TRENDING & DIAGNOSTIC
(ET&D) PROGRAM**

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This instruction implements AFPD 21-1, *Managing Aerospace Equipment Maintenance*. It prescribes policies and procedures for monitoring jet engine internal performance and supplements AFGSC units responsibilities to include program requirements IAW TO 00-25-257, *Engine Health Management (EHM+) General Information User's Manual*. This program applies to all AFGSC units, and is applicable to the Air National Guard (ANG) and the Air Force Reserve Command (AFRC) Classic Associations. Supplements to this AFGSCI are not authorized. The authorities to waive wing/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See AFI 33-360 for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the Publication OPR for non-tiered compliance items. Ensure that all records created as a result of processes prescribed in this publication are maintain in accordance

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(WHITEMANAFB) This instruction implements AFGSC 21-1, *Managing Aerospace Equipment Maintenance* and Air Force Global Strike Command Instruction 21-153, *Engine Trending and Diagnostic (ET&D) Program*. It prescribes policies and procedures for monitoring jet engine internal performance and supplements AFGSC units responsibilities to include program requirements IAW TO 00-25-257, *Engine Health Management (EHM+) General Information User's Manual*. This program applies to all AFGSC units, and is applicable to the Air National Guard (ANG) and the Air Force Reserve Command (AFRC) Classic Associations. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate functional chain of command. Ensure that all records created as a result of processes prescribed in this publication are maintained IAW Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of IAW the Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS). The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force. See **Attachment 1** for Glossary of References and Supporting Information. Requests for waivers must be submitted with justification to publication OPR.

SUMMARY OF CHANGES

This document has been substantially revised and must be completely reviewed. Major changes include the addition of E4-B units into AFGSC and AFGSC Form 73 being added. This instruction updates policies and procedures to be followed by applicable AFGSC units.

1. Purpose.

1.1. The ET&D program is intended to further the safe operation, performance reliability, and lower maintenance operating costs of installed gas turbine engines. The program analyzes trends in all available engine parameters to detect the onset of engine internal failures and shifts in instrumentation calibration or accuracy. When properly administered, this is an effective management tool that allows maintenance personnel to take corrective actions before an engine failure or expensive secondary damage occurs. **(T-2)**.

2. AFGSC/A4AA Responsibilities.

2.1. AFGSC/A4AA is designated as the AFGSC Office of Primary Responsibility for this program and will: **(T-2)**.

2.1.1. Participate in major ET&D conferences, meetings, and committees to identify and discuss relevant ET&D issues and policies. **(T-2)**.

2.1.2. Identify specific requirements to assist the ET&D programs through all available technology channels and processes. **(T-2)**.

2.1.3. Ensure units operating ET&D programs have sufficient manning positions and appoint qualified, experienced persons as ET&D Project Managers at each operating base. Identify this position with an SEI code of 600 (B-1), 604(B-2), 612(B-52) or 639(E4-B) on the Unit Manning Document (UMD). **(T-2)**.

2.1.4. Ensure owning units submit accurate and timely quality deficiency reports to the applicable engine program offices on all equipment requiring any maintenance activity due to an ET&D recommendation and on all ET&D component failures where no ET&D maintenance recommendation was made. **(T-2)**.

2.1.5. Ensure that each unit provides timely and accurate metrics to the Central Engine Management System/Central Engine Trending and Diagnostic System (CEMS IV/CETADS) database. **(T-2)**.

2.1.6. Ensure that all applicable programming documents (budget, facilities, manpower, maintenance, etc.) include the need for ET&D support. **(T-2)**.

2.1.7. Coordinate all proposed changes to this publication with appropriate AFGSC staff. **(T-2)**.

2.1.8. Coordinate between AFMC and the other MAJCOMs on matters concerning ET&D. **(T-2)**.

3. Operations Group Commander (OG/CC) Responsibilities.

3.1. **[2 BW and 5 BW only]** The OG/CC will define aircrew responsibilities for the program and ensure compliance. **(T-2)**.

3.1.1. Aircrew will correctly fill out AFGSC FORM 264, In Flight Data (IFD) or AFGSC Form 73, Engine Condition Sheet (ECS) as applicable per instructions on back of IFD or ECS sheet. **(T-2)**.

3.1.1. **(WHITEMANAFB)** The 509 OG/CC will ensure aircrew correctly fills out AFGSC FORM 264, In Flight Data (IFD) per instructions on back of IFD sheet. **(T-2)**.

4. Maintenance Group Commander (MXG/CC) Responsibilities.

4.1. The MXG/CC is responsible for managing the ET&D program, and will publish local Wing Instruction outlining administrative procedures to be used in conjunction with this AFGSCI. **(T-2)**.

4.1. **(WHITEMANAFB)** The 509 MXG/CC is responsible for managing the ET&D program, and will publish local Wing Instruction outlining administrative procedures to be used in conjunction with AFGSCI 21-152. **(T-2)**.

4.2. Appoint a NCO Propulsion system supervisor as ET&D Project NCO. The specific duties of the Project NCO are at Section 7. Identify this position with an SEI code of 600(B-1), 604(B-2), 612(B-52) or 639(E4-B) on the UMD. **(T-2)**.

4.2. **(WHITEMANAFB)** Appoint a NCO Propulsion system supervisor as ET&D Project NCO. The specific duties of the Project NCO are at Section 7. Identify this position with an SEI code of 604 (B-2) on the UMD. **(T-2)**.

4.3. Appoint a primary and alternate ET&D Monitor. The alternate position should be considered additional duty for appointed individual. The specific duties of the ET&D Monitor are at Section 8. **(T-2)**.

4.3. **(WHITEMANAFB)** Appoint a primary and alternate ET&D Monitor. The alternate position should be considered additional duty for appointed individual. The specific duties of the ET&D Monitor are at Section 8. (T-2).

4.4. Ensure the primary and alternate ET&D Monitor receive the ET&D on-the-job training within 6 months of assignment of duty. **(T-2)**.

4.4. **(WHITEMANAFB)** Ensure the primary and alternate ET&D Monitor receive the ET&D on-the-job training within 6 months of assignment of duty. (T-2).

4.5. Ensure ET&D computers are not modified or used for non-ET&D applications without permission from AFGSC/A4AA. **(T-2)**.

4.5. **(WHITEMANAFB)** Ensure ET&D computers are not modified or used for non-ET&D applications without permission from AFGSC/A4AA. (T-2).

4.6. Units are to follow the specific instructions for each engine type as detailed in the respective engine supplements of TO 00-25-257, *Engine Health Management (EHM+) General Information User's Manual*. **(T-2)**.

4.6. **(WHITEMANAFB)** Units are to follow the specific instructions for each engine type as detailed in the respective engine supplements of TO 00-25-257, *Engine Health Management (EHM+) General Information User's Manual*. (T-2).

5. Aircraft Maintenance Squadron Commander (AMXS/CC) Responsibilities.

5.1. Ensure a propulsion system Point of Contact (POC) is designated (minimum 7-level) for each Aircraft Maintenance Unit (AMU). The POC will assist the MXG Project NCO in resolving all "On-Wing" issues. **(T-2)**.

5.1. **(WHITEMANAFB)** The 509 AMXS/CC will ensure a propulsion system Point of Contact (POC) is designated (minimum 7-level) for each Aircraft Maintenance Unit (AMU). The POC will assist the MXG Project NCO in resolving all "On-Wing" issues. (T-2).

5.2. Ensure discrepancies on "watch" or ET&D problem engines are corrected. **(T-2)**.

5.2. **(WHITEMANAFB)** Ensure discrepancies on "watch" or ET&D problem engines are corrected. (T-2).

5.3. **[2 BW, 5 BW and 595 CACG only]** Ensure that accurate, complete, and timely data is completed by aircrew operating aircraft with engines which do not have onboard diagnostic systems. The respective AMU Debriefing Section ensures applicable engine data forms are completed for each flight and forwarded to the ET&D Monitor in a timely manner. **(T-2)**.

6. Operations Group Point of Contact Responsibilities.

6.1. Provide liaison with the ET&D Project NCO on the ET&D program. **(T-2)**.

6.1. **(WHITEMANAFB)** The 509 Operations Group will provide liaison with the ET&D Project NCO on the ET&D program. (T-2).

6.2. Determine appropriate actions to ensure that aircrews have an understanding of the ET&D program and benefits of an effective program. **(T-2)**.

6.2. **(WHITEMANAFB)** Determine appropriate actions to ensure that aircrews have an understanding of the ET&D program and benefits of an effective program. (T-2).

6.3. Advertise results of the ET&D program. **(T-2)**.

6.3. **(WHITEMANAFB)** Advertise results of the ET&D program. (T-2).

6.4. **[2 BW, 5 BW and 595 CACG only]** . Ensure sufficient quantities of applicable engine data forms are readily available. **(T-2)**.

7. ET&D Project NCO Responsibilities.

7.1. Advise, manage, coordinate, and maintain the ET&D program for the MXG/CC and OG/CC. **(T-2)**.

7.1. **(WHITEMANAFB)** ET&D Project NCO advises, manages, coordinates, and maintains the ET&D program for the 509 Maintenance Group Commander (509 MXG/CC) and 509 Operations Group Commander (509 OG/CC). (T-2).

7.2. Administer the ET&D program in accordance with this instruction and applicable technical orders. **(T-2)**.

7.2. **(WHITEMANAFB)** Administer the ET&D program in accordance with AFGSCI 21-152 and applicable technical orders. (T-2).

7.3. Establish a visible program through continual coordination between operations and maintenance, thus providing a close loop system for information and maintenance repair actions. **(T-2)**.

7.3. **(WHITEMANAFB)** Establish a visible program through continual coordination between operations and maintenance, thus providing a close loop system for information and maintenance repair actions. (T-2).

7.4. Provide feedback from the ET&D program to aircrew and the operations staff. **(T-2)**.

7.4. **(WHITEMANAFB)** Provide feedback from the ET&D program to aircrew and the operations staff. (T-2).

7.5. Act as the single POC in each wing for all recommended changes to this instruction. **(T-2)**.

7.5. **(WHITEMANAFB)** Act as the single POC in each wing for all recommended changes to this instruction. (T-2).

7.6. Manage the ET&D workload, schedule, and ET&D data management and analysis to ensure continual evaluation and daily flow of ET&D data. **(T-2)**.

7.6. **(WHITEMANAFB)** Manage the ET&D workload, schedule, and ET&D data management and analysis to ensure continual evaluation and daily flow of ET&D data. (T-2).

7.7. Validate the ET&D Monitor's recommendations for engine maintenance as a result of program trending or analysis. **(T-2)**.

7.7. **(WHITEMANAFB)** Validate the ET&D Monitor's recommendations for engine maintenance as a result of program trending or analysis. (T-2).

7.8. Submit program software improvement recommendations to AFGSC/A4AA and coordinate with appropriate agencies to resolve problems with the ET&D program. **(T-2)**.

7.8. **(WHITEMANAFB)** Submit program software improvement recommendations to AFGSC/A4AA and coordinate with appropriate agencies to resolve problems with the ET&D program. (T-2).

7.9. If necessary, perform a Field Service Evaluation (FSE) to determine the effectiveness of a program and/or current software configuration. Obtain FSE requirement through AFGSC/A4AA. **(T-2)**.

7.9. **(WHITEMANAFB)** If necessary, perform a Field Service Evaluation (FSE) to determine the effectiveness of a program and/or current software configuration. Obtain FSE requirement through AFGSC/A4AA. (T-2).

7.10. Maintain a register of where the ET&D equipment is located. **(T-2)**.

7.10. **(WHITEMANAFB)** Maintain a register of where the ET&D equipment is located.

8. ET&D Program Monitor(s) Responsibilities.

8.1. Must have a 2A671 AFSC or civilian equivalent. MXG/CC can appoint individuals who do not meet the AFSC requirement but possess the expertise and knowledge of the engine as ET&D Monitors. **(T-2)**.

8.1. **(WHITEMANAFB)** ET&D Program Monitors must have a 2A671 AFSC or civilian equivalent. 509 MXG/CC can appoint individuals who do not meet the AFSC requirement but possess the expertise and knowledge of the engine as ET&D Monitors. (T-2).

8.2. Locally obtain a suitable desktop computer for ET&D use. Initial provision of CEMS IV/CETADS software is from the CEMS IV/CETADS Project Manager at OC-ALC. **(T-2)**.

8.2. **(WHITEMANAFB)** Locally obtain a suitable desktop computer for ET&D use. Initial provision of CEMS IV/CETADS software is from the CEMS IV/CETADS Project Manager at OC-ALC. (T-2).

8.3. Enter engine performance data in the ET&D computer no later than the end of the next flying day. **(T-2)**.

8.3. **(WHITEMANAFB)** Enter engine performance data in the ET&D computer no later than the end of the next flying day. (T-2).

8.4. An engine categorized as a "watch" engine will have the following entry made in AFTO FORM 781A, *Maintenance Discrepancy and Work Document*, identifying the "watch", and placed on a red dash. Each entry will begin: "Engine position/serial number ___ - ___ on ET&D watch status". Also, enter the reason for "watch" status in sufficient detail to explain the basis for this action. The AFTO FORM 781A entries will be amended after each review, and action taken noted in the "corrective action" block. If an engine is continued in "watch" status, a new entry will be made and begin: "Engine position/serial number ___ - ___ continued on watch status". Enter reason in sufficient detail to explain basis for this action. "Watch" engine discrepancies will not be transferred to AFTO FORM 781K, Aerospace

Vehicle Inspection, Engine Data, Calendar Item Inspection and Delayed Discrepancy Document. **(T-2)**.

8.4. **(WHITEMANAFB)** An engine categorized as a "watch" engine will have the following entry made in AFTO FORM 781A, *Maintenance Discrepancy and Work Document*, identifying the "watch", and placed on a red dash. Each entry will begin: "Engine position/serial number ___ - ___ on ET&D watch status". Also, enter the reason for "watch" status in sufficient detail to explain the basis for this action. The AFTO FORM 781A entries will be amended after each review, and action taken noted in the "corrective action" block. If an engine is continued in "watch" status, a new entry will be made and begin: "Engine position/serial number ___ - ___ continued on watch status". Enter reason in sufficient detail to explain basis for this action. "Watch" engine discrepancies will not be transferred to AFTO FORM 781K, Aerospace Vehicle Inspection, Engine Data, Calendar Item Inspection and Delayed Discrepancy Document. (T-2).

8.4.1. Ensure corrective actions on "watch" or ET&D problem engines are accomplished. **(T-2)**.

8.4.1. **(WHITEMANAFB)** Ensure corrective actions on "watch" or ET&D problem engines are accomplished. (T-2).

8.4.2. Submit and monitor Deficiency Reports (DRs) on parts replaced to correct ET&D discrepancies. If a deficiency has been previously identified through a local unit DR system, and the respective Air Logistics Center (ALC) is addressing the issue, then no DR is required. **(T-2)**.

8.4.2. **(WHITEMANAFB)** Submit and monitor Deficiency Reports (DRs) on parts replaced to correct ET&D discrepancies. If a deficiency has been previously identified through a local unit DR system, and the respective Air Logistics Center (ALC) is addressing the issue, then no DR is required. (T-2).

8.5. When the engine trend plot indicates maintenance or engine removal is required, coordinate with the project NCO, Maintenance Operation Center, and Wing Plans & Scheduling to assure the appropriate work orders are provided and scheduled. **(T-2)**.

8.5. **(WHITEMANAFB)** When the engine trend plot indicates maintenance or engine removal is required, coordinate with the project NCO, Maintenance Operation Center, and Wing Plans & Scheduling to assure the appropriate work orders are provided and scheduled. (T-2).

8.6. Submit aircraft engine instrument maintenance and check requests through Wing Plans & Scheduling or Integrated Maintenance Data System (IMDS). **(T-2)**.

8.6. **(WHITEMANAFB)** Submit aircraft engine instrument maintenance and check requests through Wing Plans & Scheduling or Integrated Maintenance Data System (IMDS). (T-2).

8.7. Forward trend data to ALCs when requested. **(T-2)**.

8.7. **(WHITEMANAFB)** Forward trend data to ALCs when requested. (T-2).

8.8. Issue an automated IMDS product against the probable engine or related system malfunction after notification by the ET&D Project NCO or ET&D Monitor. **(T-2)**.

8.8. **(WHITEMANAFB)** Issue an automated IMDS product against the probable engine or related system malfunction after notification by the ET&D Project NCO or ET&D Monitor. (T-2).

8.9. Monitor the return of IFD forms by aircrews to maintenance debriefings and ensure all IFD forms are returned to the ET&D Monitor (as applicable). **(T-2)**.

8.9. **(WHITEMANAFB)** Monitor the return of IFD forms by aircrews to maintenance debriefings and ensure all IFD forms are returned to the ET&D Monitor (as applicable). (T-2).

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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFPD 21-1, *Maintenance of Military Material*, 29 Oct 2015

AFI 33-324, *The Air Force Information Collections and Reports Management Program*, 6 March 2013

AFI 33-360, *Publications and Forms Management*, 1 Dec 2015

AFMAN 33-363, *Management of Record*, 1 March 2008

TO 00-25-257, *Engine Health Management (EHM+) General Information User's Manual*, 15 Oct 2007

Prescribed Forms

AFGSC 264, *B-52 In-Flight Data (IFD)*

(Added-WHITEMANAFB) N/A

AFGSC 73. *Engine Condition Sheet (ECS)*

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

(Added-WHITEMANAFB) AF Form 847, *Recommendation for Change of Publication*, 22 Sept 09

(Added-WHITEMANAFB) AFGSC 264, *B-52 In-Flight Data (IFD)*, 30 Jul 2012

AFTO FORM 781A, *Maintenance Discrepancy and Work Document*

(Added-WHITEMANAFB) AFTO FORM 781A, *Maintenance Discrepancy and Work Document*, 11 Jul 13

AFTO FORM 781K, *Aerospace Vehicle Inspection, Engine Data, Calendar Item Inspection and Delayed Discrepancy Document*

(Added-WHITEMANAFB) AFTO FORM 781K, *Aerospace Vehicle Inspection, Engine Data, Calendar Item Inspection and Delayed Discrepancy Document*, 25 Mar 16

Abbreviations and Acronyms

(Added-WHITEMANAFB) **509 AMXS/CC—509** Aircraft Maintenance Squadron Commander

(Added-WHITEMANAFB) **509 MXG/CC—509** Maintenance Group Commander

(Added-WHITEMANAFB) **509 OG/CC—509** Operations Group Commander

AFGSC—Air Force Global Strike Command

AFGSCI—Air Force Global Strike Command Instruction

AFI—Air Force Instruction
AFMAN—Air Force Manual
AFMC—Air Force Material Command
AFPD—Air Force Policy Directive
AFRC—Air Force Reserve Command
AFRIMS—Air Force Records Information Management System
AFTO—Air Force Technical Order
ALC—Air Logistics Center
AMU—Aircraft Maintenance Unit
AMXS—Aircraft Maintenance Squadron
ANG—Air National Guard
CEMS—Central Engine Management System
CETADS—Central Engine Trending and Diagnostic System
DR—Deficiency Reports
ECS—Engine Condition Sheet
ET&D—Engine Trending & Diagnostic
FSE—Field Service Evaluation
IFD—In Flight Data
IMDS—Integrated Maintenance Data System
MAJCOM—Major Command
(Added-WHITEMANAFB) NCO—Noncommissioned Officer
OPR—Office of Primary Responsibility
POC—Point of Contact
RDS—Records Disposition Schedule
(Added-WHITEMANAFB) SEI—Special Experience Identifier
UMD—Unit Manning Document