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SELECTIVE MANAGEMENT OF SELECTED GAS TURBINE ENGINES

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This instruction implements AFPD 21-1, Air and Space Maintenance. It directs the management of selected gas turbine engines identified in technical order (T.O.) 00-25-254-1, the Comprehensive Engine Management System Engine Configuration Status and TCTO Reporting Procedures. This AFI describes the propulsion management responsibilities required to manage Air Force engines. The Air Force manages selected gas turbine engines (hereafter referred to as ―engines") as principal items, as defined by Regulation 4140.1-R, DoD Supply Chain Material Management Regulation, 23 May 2003. Being principal items, engines require special centralized management, including inventory control, computation of requirements, distribution, and information systems. The justification for these systems includes safety and reliability considerations which have a direct impact on successful mission completion, limited available assets, and high acquisition and logistics support costs. The Air Force serially manages and controls engines throughout their lifetime, cradle to grave, using technical order 00-25-254-1. USAF engines are purchased under the ―Life-of-Type Buy" concept, which means that procurement of engines after the acquisition program has ended is generally not economically feasible per DOD 4140.1-R. Thus, only finite quantities of engines are available to support the aircraft in which they are installed for their operational life. This instruction also provides

guidance and assigns responsibility for managing the Air Force Engine Trending and Diagnostics Program (ET&D). Technical Order 00-25-257 outlines the technical aspects of ET&D. Related policies include AFI 21-124, Oil Analysis Program. This instruction applies to all major commands (MAJCOMs), including the Air Force Reserve Command (AFRC). This publication does not apply to the Air National Guard (ANG). Waiver authority for this instruction is AF/A4M. MAJCOMs must coordinate any supplementing Command instructions with AF/A4M prior to publication. For questions on interpreting this instruction, first contact your MAJCOM maintenance policy activity. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with the Air Force Records Disposition Schedule (RDS) located at **https://afrims.amc.af.mil/.** Refer recommended changes and questions about this publication to AF/A4MM using the AF IMT 847, *Recommendation for Change of Publication*; route AF IMT 847s from the field through the appropriate functional's chain of command.

(LITTLEROCKAFB) This supplement implements and extends the guidance of AFI 21-104, 11 Dec 2007contains local procedures to be followed by those required to report data to engine management. This supplement applies to the 19th Maintenance Group and the 314th Maintenance Group, stationed on Little Rock AFB AR. This instruction does not apply to Air National Guard or Air Force Reserve units. Ensure that all records created as a result of processes prescribed in this publication are maintained In Accordance With (IAW) Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of IAW with the Air Force Records Information Management System (AFRIMS) located at **ttps://www.my.af.mil/gcss-af61a/afrims/afrims/**. 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 Form 847s from the field through the appropriate functional chain of command. This publication may be supplemented at any level, but all Supplements must be routed to the OPR of this publication for coordination prior to certification and approval.

SUMMARY OF CHANGES

This document is substantially revised and must be completely reviewed. It eliminates the role of Propulsion Product Group Manager and redistributes corresponding position responsibilities to the Director of Propulsion and the Single Managers under a reorganized USAF structure. Attachment 4, Engine Health Indicators, of this AFI supersedes PPGM OI 20-104, PPGM OI 21-102 and previous attachment 5. Chapter 5 has been revised to include requirements of AFI 21-132, AF Engine Trending and Diagnostics Program.

(LITTLEROCKAFB) Supplement has been revised to reflect date of new basic publication, reflect office symbol changes incurred from transfer of base from AETC to AMC and requires formal notification of aircraft transferring to and from a PDM location.

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Chapter 1

GENERAL INFORMATION

1.1. AF Engines: AF engines provide propulsion power to manned and unmanned aircraft. Technical order 00-25-254-1, Comprehensive Engine Management System Engine Configuration Status and TCTO Reporting Procedures, lists the specific engine Type, Model, Series, and Modifications (TMSM) that are managed according to this AFI.

1.1.1. Military derivative gas turbine engines in service on military aircraft and listed in T.O. 00-25-254-1 are subject to this AFI.

1.1.2. Reciprocating or turbine engines that provide auxiliary power, and ground-based engines are **not** subject to this AFI.

1.1.3. Commercial gas turbine engines, in-service on commercial derivative aircraft and certified by the Federal Aviation Administration and maintained by Contractor Logistics Support (CLS) to the manufacturer's specifications (e.g. installed on cargo and passenger aircraft that are essentially commercial models) are **not** subject to this AFI.

1.1.3.1. Commercial engines, operating under Performance Based Logistics (PBL) contract with CLS personnel and shown in the DoP portfolio shall be managed in accordance with contract requirements established by SM.

1.1.4. Engines installed on classified aircraft are **not** subject to this AFI.

Chapter 2

RESPONSIBILITIES

2.1. HQ USAF:

2.1.1. **AF/A4M**

2.1.1.1. Provides engine management policy and directives for in service engines, excluding engines in development.

2.1.1.2. Provides management assistance and maintenance direction for engines in development.

2.1.1.3. Provides policy to develop logistics plans to implement approved mobility operational concepts and objectives.

2.1.1.4. Approves maintenance concepts and management policies to support engine requirements and stock levels.

2.1.1.5. Ensures Reliability Centered Maintenance (RCM) and Engine Trending and Diagnostics (ET&D) concepts are integrated into approved operational, support, and mobility maintenance policies.

2.1.1.6. Provides RDAT scenario selections for use in PRS computation.

2.1.1.7. Provides final approved aircraft migration plans to DoP.

2.1.2. **AF/A4/7P:**

2.1.2.1. Approves funding requirements for depot level repair of Air Force engines.

2.1.3. **AF/A5XW:**

2.1.3.1. Typically, after completion of the PB each year, updates WMP-3, Part 1 and WMP-5 data.

2.1.3.2. Upon request, creates Requirements Daily Answer Tape (RDAT) output files for each scenario (or as requested) and makes the data available to 754 ELSG/LRW (the DO87Q Program Manager). 754 ELSG/LRW sends copies of the reformatted RDAT to, MAJCOM CEMs, and Propulsion SM's POC.

2.1.4. **AF/A8PE:**

2.1.4.1. Publishes the latest version of both the PA Documents, Volumes I and II, on the Secure Internet Protocol Network (SIPRNET) following the completion of each PB. Documents are located on the SIPRNET AF/A8P web page and require appropriate access.

2.1.4.2. Publishes the latest version of the USAF Program Installations, Units, and Priorities (PD) document following completion of each PB. Document is located on the SIPRNET AF/A8P web page and requires appropriate access.

2.1.5. **SAF/AQP:**

2.1.5.1. Provides policy and direction for development and procurement of engines for new aircraft programs.

2.1.5.2. Provides policy and direction for development of engine modifications and component improvements.

2.1.5.3. Monitors funding requirements for development and procurement of new engine models.

2.1.5.4. Monitors funding requirements for engine component improvements.

2.2. MAJCOMs:

2.2.1. Recommend improved logistic concepts, policies, and procedures for engines to AF/A4M.

2.2.2. Oversee Stock Record Account Number (SRAN) engine operations and appoint Command Engine Managers (CEM).

2.2.3. Redistribute command owned engines as required.

2.2.4. When designated, perform as Lead Command, (reference AFPD 10-9, *Lead Operating Command Weapons Systems Management*) for specific engine Type, Model, Series (TMS).

2.2.5. Work with Propulsion Single Manager to coordinate and approve engine TMS Engine Life Management Plans (ELMPs).

2.2.5.1. Establish ELMP Operational Safety, Suitability and Effectiveness (OSS&E) engine health measure goals for the individual engine TMSs.

2.2.5.2. Advocate for Component Improvement Program (CIP) and 3010 Mod budget to achieve agreed to ELMP goals.

2.2.6. Include engine plans in mobility planning directives, operating procedures, and logistics annexes and appendices.

2.2.7. Compute wartime engine removal rates in coordination with engine managers when wartime operating conditions (actual or anticipated) differ significantly from peacetime operating conditions.

2.2.8. Provide data requested by the Propulsion SM to compute worldwide stock-level requirements.

2.2.9. Use Air Force planning documents to provide the Propulsion SM with data to compute engine requirements.

2.2.10. Compute MAJCOM base stock-level requirements.

2.2.11. Forecast engine depot repair requirements prior to periodic negotiations.

2.2.11.1. Engine repair requirements will be validated and prioritized through MAJCOM A4M.

2.2.12. With the Propulsion SM, determine air-breathing drone engine unit-stock levels.

2.2.13. Obtain Propulsion SM concurrence for specific engine transfers between the USAF and other services, security assistance programs (to include Foreign Military Sales (FMS) programs), government agencies, and non-government organizations.

2.2.14. Coordinate all required Program Objective Memorandum (POM) inputs for Depot Purchased Equipment (DPEM) funds, Air Force Cost Analysis Improvement Group (AFCAIG) adjustments, and approved engine modifications implemented via CAM requirements through the Centralized Asset Management (CAM) office.

2.2.15. Lead MAJCOM Commanders are responsible for managing applicable TMS risk above the propulsion safety threshold and budget 3010 funding requests to reduce that risk. This includes funding to implement modifications. Lead commands will also take the lead in addressing new safety risks as they are identified. Lead commands will coordinate with other MAJCOMs affected by safety risks. Air Force Materiel Command (AFMC) program managers will coordinate with lead MAJCOMs on procedures addressing risk above the propulsion safety threshold.

2.2.16. All MAJCOM Commanders are responsible for managing risks above the propulsion safety threshold by applying risk mitigation, such as complying with Time Compliance Technical Orders (TCTOs) and accomplishing recurring engine inspections. They are responsible, in conjunction with the Enterprise/Central Asset Management (CAM) office for budgeting for 3400 funding requests to implement these activities.

2.2.17. MAJCOM staffs will ensure their commanders are updated on risks above the propulsion safety thresholds (PST). These updates will review risks over the propulsion safety thresholds identified in paragraph **2.5.9** and **Table 2.1** of this AFI that do not have well defined action plans or are not following the agreed to plan. Funding issues affecting corrective action plans should also be discussed to support MAJCOM and/or CAM office POM activities.

2.2.17.1. When the lead command A4MP is notified of a risk exceeding the DoP safety threshold, they will notify the lead command A4 and their supported commands of the over-threshold condition. The lead command A4MP is then responsible for coordinating with the AFMC program manager, contractor support, and supported commands to develop risk mitigation.

2.3. HQ AFMC:

2.3.1. Submit engine CIP requirements in command POM.

2.3.2. Reformat of RDAT.

2.3.3. Provide declassified flying hour program data.

2.3.4. When AFMC program managers determine that the baseline risk of NRIFSD or ERLOA exceeds the DoP safety threshold identified in Table 2.1. of this AFI, they will notify lead command A4MP in writing. Notification will include the aircraft/engine(s) affected, description of problem background, the root cause and specific failure mode(s), interim actions (if any), and recommended course of action. Also, notification will include the following data: total number of NRIFSD to date, total number of ERLOA to date, baseline risk, and interim risk (if applicable).

2.3.5. HQ AFMC/CAM will exercise governance over the Logistics Requirement Determination Process using the approved governance structure headed by the CAM Executive Committee (EC).

2.3.6. HQ AFMC/CAM will identify the timeline for defining requirements, validation and prioritizing requirements and publishing requirements.

2.3.7. HQ AFMC/CAM receives and validates flying hour data for CAM requirements determination. Coordinates with lead command for inputs.

2.3.8. HQ AFMC/CAM is responsible for understanding the requirements in order to defend them in the POM and APOM and develop a financial execution plan. Performs duties of lead command for all common product group requirements where no lead command has been previously designated.

2.4. SRAN Engine Manager:

2.4.1. Execute engine management policy and procedures. Develop MOA with SRANs at pre-positioned sites to manage engines. Also manages tenant spare engines according to AFI 25-201, *Support Agreements Procedures.*

2.4.2. Develop local engine management procedures to report and handle accountable engines and unaccountable items.

2.4.2.1. **(Added-LITTLEROCKAFB)** 19 CMS/MXMP will:

2.4.2.1.1. **(Added-LITTLEROCKAFB)** Transport engines to and from surface or airfreight within 24 hours of arrival.

2.4.2.1.2. **(Added-LITTLEROCKAFB)** Store built up serviceable engines in a protected environment with controlled access.

2.4.2.1.3. **(Added-LITTLEROCKAFB)** Ensure engine historical records are securely affixed to engines when being shipped. Shipping document and engine historical records will be removed from engines when received and brought to engine management.

2.4.2.2. **(Added-LITTLEROCKAFB)** 19 AMXS, 19 EMS/MXMTC, 19 CMS/MXMP and 314 AMXS will:

2.4.2.2.1. **(Added-LITTLEROCKAFB)** Document and coordinate all engine/propeller and on-wing module changes with engine management by providing an accurately completed LRAFB IMT 6A, *C-130E/H Equipment Change Sheet*, or LRAFB IMT 6B, *C-130J Equipment Change Sheet*, by close of business of the next business day after the transaction occurred. All engine status changes will be reported using AF Form 1534, *CEMS CDB Report.* AF Forms 1534 will be faxed, e-mailed or hand carried to engine management. Forward all TCTO, SI, TCI and other documentation requirements, to engine management for inclusion in historical records.

2.4.2.2.2. **(Added-LITTLEROCKAFB)** Hand carry AFTO Forms 95, *Significant Historical Data*, to engine management.

2.4.2.2.3. **(Added-LITTLEROCKAFB)** Fax, hand carry or e-mail to engine management, the serial number verification worksheet, of all modules and quick engine change (QEC) kit, at home-station checks (HSC) and isochronal inspections.

2.4.2.2.4. **(Added-LITTLEROCKAFB)** 19 MOS/MXOO will appoint in writing and forward to the base engine manager (BEM) the names of individuals serving as deployed engine monitors for each deployment. Deployed engine monitors will report to engine management not later than three days prior to departure, for briefing on duties and responsibilities.

2.4.2.3. **(Added-LITTLEROCKAFB)** 314 MOS/MXOOS and 19 MOS/MXOOP will formally notify the BEM/Engine Management Section, in writing, (i.e. e-mail) of all aircraft transferring to or returning from Programmed Depot Maintenance (PDM) upon aircraft official departure or arrival.

2.4.2.4. **(Added-LITTLEROCKAFB)** All maintenance schedulers will hand carry engine/propeller historical records to engine management for any aircraft, to include PDM returns and rotations, not later than the next duty day.

2.4.3. Track accountable engines in the SRAN sub-account according to T.O. 00-25-254-1, Comprehensive Engine management System (CEMS) Engine Configuration Status and TCTO Reporting Procedures.

2.4.4. Accountable for a shipped engine until the gaining unit documents receipt in CEMS. SRAN engine managers with gas turbine engines with propellers will conduct semi-annual accuracy validations of propeller data recorded in CEMS and update CEMS to reflect accurate condition, status, and location.

2.4.5. Prepares DD Form 1348-1A, *Issue Release/Receipt Document***,** or DD Form 1149, *Requisition and Inventory Shipping Document* for all engine shipments and transfers. Engines should be shipped on an FJ or EJ Transportation Control Number (TCN). All activities that have engines should have an FJ account assigned (EJ for a contractor facility) (reference para. 3.2.1). These TCNs are manually developed, they should have the SRAN of the shipping unit as the first six digits (FJ/EJ XXXX), the Julian date as the next four digits, a two digit sequence number (locally assigned), and completed with the two digit Alpha, Alpha/Numeric code as the engine ID, which is identified in TO 00-20-254-1 Table 9-15.

2.5. Director of Propulsion:

2.5.1. As appropriate, the DoP may delegate DoP responsibilities.

2.5.1.1. Has oversight of propulsion sustainment activities and provides recommendations to acquisition programs.

2.5.1.2. Develops propulsion long range goals and master plans.

2.5.1.3. Advocates for propulsion program resources and data systems.

2.5.2. The DoP is responsible for providing overarching policy, processes, guidance and coordination in the management of AF turbine engines.

2.5.3. Provides inputs for research and development of new engine technologies.

2.5.4. USAF principal on the Joint Propulsion Coordinating Committee (JPCC).

2.5.5. Chairs the Engine Advisory Board (EAB).

2.5.6. Oversees submission of Engine CIP POM inputs.

2.5.7. Oversees annual execution of engine CIP budget.

2.5.8. In conjunction with HQ USAF, develops most cost-effective engine maintenance repair policies to ensure Reliability Centered and Maintenance and Engine Trending and Diagnostics Plus tenets are appropriately applied across-the-board and optimum engine time-on-wing is achieved.

2.5.9. Prepares an annual message for MAJCOM/CCs summarizing the propulsion risks on all engines within the DoP portfolio that exceed the propulsion safety thresholds (see **Table 2.1**).

Table 2.1. Propulsion Safety Thresholds (PST) for Non-Recoverable In-Flight Shut-Down (NRIFSD) and Engine Related Loss Of Aircraft (ERLOA)

SINGLE/DUAL ENGINE	3 OR MORE ENGINES	ACTION
< 0.01 NRIFSD/100K EFH	<0.05 NRIFSD/100K EFH	**Review**
0.01 – 0.05 NRIFSD/100K EFH	>0.05-0.1 NRIFSD/100KEFH	**Monitor**
>0.05 NRIFSD/100K EFH	>0.1 NRIFSD/100K EFH	**Corrective Action Required**
>0.5 ERLOA mishaps over the remaining life of engine Type/Model/Series (TMS) in USAF inventory	>0.5 ERLOA mishaps over the remaining life of the engine Type/Model/Series (TMS) in USAF inventory	**Corrective Action Required**

2.5.9.1. Descriptions of the cause of the risk, risk levels, actions being taken, funding issues and any slips to the plan of action will be addressed.

2.5.9.2. Message will be sent to all MAJCOM/CCs. In addition, the message will be sent to the weapon systems Single Managers, the Air Force Chief of Safety (AF/SE) at the USAF Safety Center, and the HQ USAF Weapons Systems Division (AF/A4MY).

2.6. Senior Leader for Propulsion:

2.6.1. Serves as the senior technical authority for turbine engines.

2.6.2. Establishes and provides technical guidance and recommendation to USAF senior leaders, propulsion SM and Propulsion Chief and Lead Engineers on matters affecting engine safety, suitability and/or effectiveness.

2.6.3. Chairs the USAF propulsion technical reviews, Propulsion Engineering Councils and Propulsion Executive Independent Review Team.

2.6.4. Oversees the Propulsion Center of Excellence.

2.7. Propulsion Single Managers:

2.7.1. The Propulsion Systems Group commander/director at the Oklahoma City Air Logistics Center and Aeronautical Systems Center are designated as Propulsion Single Managers (SMs) for their assigned TMS turbine engines.

2.7.2. Support aircraft System Program Managers (SPMs) in determining Quick Engine Change (QEC) kit requirements.

2.7.3. Develop warranties in conjunction with the using commands and other government agencies according to AFMAN 64-110, *Manual for Weapon Systems Warranties*.

2.7.4. Manage engines throughout their life-cycle.

2.7.5. Manage engine inventories worldwide and support authorized engine stock levels for each SRAN by TMSM.

2.7.6. Maintain configuration control per AFI 21-303 and perform periodic review and comparison of life-limit data in CEMS against the published technical order life-limits.

2.7.7. Manage depot-level repair activities.

2.7.8. Develop engine factors.

2.7.9. Maintain a Propulsion Actuarial Forecasting Model (PAFM) that projects engine removal rates for the programming years based on age related engine removal histories derived from CEMS data and quantitative analysis techniques.

2.7.10. Manage CEMS and Engine Health Management Plus (EHM+, which includes RCM and ET&D requirements) programs.

2.7.11. Act as accountable officer for the Air Force Centralized Engine Account, SRAN FJ2031.

2.7.12. Establish and publish relaxed or expedited retrograde transportation factors (as conditions permit).

2.7.13. Develop and distribute the procedures and models for computing stock level acquisition and distribution requirements.

2.7.14. Identify to MAJCOMs data necessary to accomplish stock-level computation.

2.7.15. Maintain overall responsibility for propulsion systems financial management.

2.7.16. Compute worldwide stock-level requirement, including depot and safety level stocks.

2.7.17. Develop engine repair and overhaul requirements.

2.7.18. Develop retention, reclamation, and disposal computations.

2.7.19. Dispose of out-of-production engines during aircraft or missile phase out cycle.

2.7.20. Maintain cognizance of all engine deficiency reports under TO 00-35D-54.

2.7.21. Establish a **Maintenance Planning Working Group (MPWG)** for each engine TMS to review and validate the maintenance plan developed according to DoD Instruction 5000.2, *Operation of the Defense Acquisition System* and AFI 21-102, *Depot Maintenance Management* and to include EHM+ (RCM / ET &D) principles. Membership includes Propulsion SM, TMS manager, and representatives from the SOR facility, the operating MAJCOMs, and the engine manufacturer.

2.7.22. Establishes an **Engine Review Organization (ERO)** for each TMS engine to review and validate whole engine forecasted factors. Membership includes the Propulsion SM (chairperson), appropriate product and engine production center personnel, operating MAJCOMs (including ANG), and the engine manufacturer.

2.7.23. Once the USAF Program Aerospace Vehicle Flying Hours (PA) is released the Propulsion SM will be responsible for distributing the unclassified K008, peace document, as prepared by actuarial unit, to the commands.

2.7.24. Manage engines throughout their life-cycle using Engine Life Management Plans/ Engine Health Indicators, for each engine TMS in his/her portfolio.

2.7.25. Ensure that each engine TMS manager has an ELMP developed in accordance with latest guidance from the DoP.

2.7.25.1. Work with responsible MAJCOMs to coordinate and approve each engine TMS ELMP.

2.8. System Program Managers:

2.8.1. Responsible for POM inputs for initial spares, initial common support equipment, interim contractor support and engine modifications funded through procurement accounts.

2.8.2. Responsible for the resolution of all deficiency reports under T.O. 00-35D-54, *USAF Deficiency Reporting and Investigating System*.

2.8.3. Coordinate on applicable TMS engine life management plan(s).

2.8.4. Support propulsion SMs in the conduct of mission usage surveys.

2.8.5. Notify propulsion SMs of force structure and mission changes.

2.9. Planning Groups:

2.9.1. **Engine Advisory Board (EAB).** The EAB is chaired by the DoP. The EAB reviews and endorses budget year Component Improvement Program (CIP) project prioritization and investment plan. This board also reviews each TMS Engine Life Management Plan and status as required. Membership includes operating MAJCOMs, ANG, AFRC, and AF/A4M

2.9.2. **Propulsion Center of Excellence (COE).** Membership is comprised of highly skilled Air Force propulsion engineering personnel. The group is immediately managed out of ACSSW/PRSS by the Senior Leader for Propulsion. The COE conducts studies of the most complex Air Force engine issues and presents the findings to the DoP.

2.9.3. **Engine Health Management Plus (EHM+) Working Group.** A team chartered to facilitate development and implementation and sustainment of EHM+ objectives, policies, training and practices. The Working Group was organized as a result of Condition Based Maintenance Plus (CBM+) policy in DoDI 5000.2. Membership includes the DoP, Air Staff, MAJCOMs, Propulsion SMs, AFRL and others as identified by the EHM+ Chair.

2.9.4. **Engine Requirement Review Board (ERRB).** The ERRB is a group that reviews AF whole engine workload technical requirements and is co-chaired by HQ AFMC/A4P, DoP and AF/A4MY. The board conducts fiscal year reviews of OC-ALC and contractor engine work requirements brochures. AFMC Financial Management Reference System Volume III, Process Document Chapter 100 discusses the ERRB responsibilities.

2.9.5. **Engine Modification Management Integrated Product Team (Eng Mod MGT IPT**). Each Single Manager will have an Engine Modification IPT to manage the respective engines for which they are responsible. The Eng Mod IPT coordinates and integrates program processes for propulsion modifications with respective aircraft System Program

Managers, Propulsion TMS managers, MAJCOMS and the prime engine contractors. This process facilitates the optimization and affordability of modifications and the road maps contained in the ELMP. Modifications restore or enhance engine performance, safety, reliability, maintainability, or reduce life cycle costs. Engine modifications frequently include configurations developed and qualified in the CIP program and require updates in ELMP.

Chapter 3

ENGINE MANAGEMENT

3.1. Engine Asset Management. SRAN engine managers input CEMS data by serial numbers according to T.O. 00-25-254-1 for all accountable and non-accountable tracked items. SRAN and MAJCOM engine managers use this data to evaluate the health of engines in individual accounts and to predict removals, repair and spare engines. The Propulsion SMs, engineers, actuaries, engine managers, and item managers use this data to help manage the engines, predict requirements (for acquisition, distribution, repair, and retention), maintain repair facilities, and manage spare parts to repair engines and components.

3.1.1. **Whole Engine Repair Enterprise Network** will be implemented using the Repair Enterprise for the 21st century (RE21) concept which utilizes centralized management of all like item repair functions, maximizing synergistic benefits and focuses on increasing the velocity of the repair and distribution process to satisfy pipeline requirements.

3.1.1.1. **Logistics Support Center (LSC) C2 Cell:** The LSC C2 Cell will provide prioritization, induction, and distribution of RE21 assets in the repair enterprise and transportation pipelines. This cell will be responsible for coordinating repair actions with supported command functional managers and SOR to ensure a common understanding of current priorities and asset status. The cell will use established guidance in Chapter 6, Centralized Intermediate Repair Facility for Engines, to manage requirements and oversee daily operations.

3.2. Whole Engine Accountability. This instruction identifies accountability requirements for whole engines and selected critical engine parts. The Air Force uses the standard supply system to account for critical engine parts.

3.2.1. **Engine SRANs:** The Propulsion SM manages all engines identified in Master SRAN FJ2031. SRAN EJXXXX or FJXXXX (as specified in TO 00-25-254-1) is a sub account to SRAN FJ2031 and provides accountability for engines. Activities possessing CEMS accountable engines require a SRAN. Air Force, AFRC, and ANG activities are FJXXXX SRANs. Contractors and inter-service support activities are EJXXXX SRANs. Procedures for obtaining or deleting SRANs are in TO 00-25-254-1.

3.3. Engine Life-cycle Management Plans (ELMP):

3.3.1. Propulsion SMs are responsible for assuring each of their TMS engines currently active in the USAF inventory, excluding missile (e.g. Air Ground Missile (AGM)) and drone engines, will have an ELMP updated and on file. The ELMP is a living, dynamic, documented strategy to ensure the operational safety, suitability and effectiveness (OSS&E) goals are established, in coordination with operating MAJCOMS, and achieved throughout the life cycle of the engine at an affordable cost.

3.3.2. Each engine system is different and the individual ELMP will vary depending on life cycle progress. However, the general format and content of each ELMP is defined by the DoP.

3.4. Whole Engine Requirements.

3.4.1. Propulsion Requirements System (PRS)**:** The Air Force uses PRS to compute whole engine requirements. Chapter 7 details the whole engine requirements process.

3.5. Engine Manufacturers Warranty Program: (Consider warranties for each new TMS engine acquisition). Warranties must be easily understandable, enforceable, affordable, and not disrupt existing procedures for logistics support or data systems, nor require extensive new data systems to administer.

3.6. Engine Repair and Overhaul Requirements: Propulsion SMs, Engine Item Managers (EIM) and MAJCOMs forecast engine repair and overhaul requirements prior to periodic negotiations with engine depots. Procedures and models are established to forecast requirements to support the stock level policy, special projects, security assistance programs support, and consolidate worldwide engine repair and overhaul requirements. Compute repair and overhaul requirements in accordance with Chapter 7.

3.7. Retention, Reclamation, and Disposal: Propulsion SMs are directed to use AFI 23-501, Retaining and Transferring Materiel, as it identifies requirements for retention of spare engines. Reclamations are excess to Air Force, other services, and FMS system support needs. The only exception is for engines on the save list of donated aircraft and missiles (see AFMAN 23-110, USAF Supply Manual).

3.8. Excess Engines: If there are excess engines in production, terminate or modify the contract to eliminate the excess. If the engines are out of production, dispose of the engines during the phasing out of the aircraft or missile. Reclamation engines and residue are transferred to the local Defense Reutilization and Marketing Office (DRMO) activity for disposal according to AFMAN 23-110.

3.9. Packaging, Handling, Storage and Transportation: Protect engines from corrosion, shock, vibration damage during transportation, handling and storage according to T.O. 2J-1-18 and T.O. 00-85-20. Report damaged items due to improper packaging according to T.O. 2J-1-18, AFMAN 24-204(I), Preparing Hazardous Materials for Military Air Shipment, and AFJI 23-215, Reporting of Supply Discrepancies. T.O. 00-85-20 specifies shipping devices for the TMS engine.

3.10. DD Form 1348-1A/DD Form 1149, Special Preparation Instructions for Engines: The SRAN Engine Managers prepare DD Form 1348-1A, Issue Release/Receipt Document, or DD Form 1149, Requisition and Inventory Shipping Document for all engine shipments and transfers. Retain this form until CEMS records are updated. Prepare a form for each shipment and transfer in accordance with TO 00-25-254-1.

3.11. Comprehensive Engine Management System (CEMS) (DSD D042): CEMS provides a wide range of automated information system capabilities for engine management. All engines are to be reported in CEMS. TO 00-25-254-1 provides CEMS reporting requirements and procedures and TO 00-25-254-2 provides procedures on using data in CEMS. CEMS identifies owning SRAN, status, condition, and configuration information for all CEMS accountable engines by serial number and Configuration Item Identifier (CII). CEMS also incorporates the

Engine Configuration Management System (ECMS). The ECMS capabilities of CEMS include the following:

3.11.1. Configuration accounting and control by serial number and CII for CEMS accountable whole engines and CEMS non-accountable tracked items.

3.11.2. Management of TCTO including serialized applicability and completion status.

3.11.3. Tracks life limits and life expended for life limited parts; also reference TO 00-20-5-1-X series.

3.12. Engine Health Management Plus (EHM+): EHM+ is the USAF Propulsion program that is used to optimize operational readiness through affordable, integrated, embedded diagnostics and prognostics. EHM+ is implemented to improve maintenance ability and responsiveness, increase operational availability, and reduce life cycle total ownership costs. The goal of EHM+ is to tie together Engine Trending and Diagnostics and Reliability Centered Maintenance to enable the commander to make decisions based on weapon system capability to meet real-time operational needs.

3.12.1. **Engine Trending and Diagnostics (ET&D).** The Engine Trending and Diagnostics Working Group (ET&D-WG) is designed to involve all stakeholders (to include the AF engineering community and MAJCOM Headquarters representatives) in activities that impact ET&D policies, practices and processes. In addition, the ET&D-WG will ensure that newly developed Type Model Series engines will be compatible with ET&D concepts contained in TO 00-25-257.

3.12.2. **Reliability Centered Maintenance (RCM)**. The RCM Working Group (WG) has been established to facilitate the implementation of RCM principles in life management for all engines covered by this instruction. The WG will interface with and establish contacts with other services and engine maintainers for mutual pursuit of best practices. RCM WG composition is specified in the WG Charter and additional participants can be invited on an as needed basis. Scheduled RCM WG meetings are to be conducted on a semi-annual basis.

Chapter 4

RELIABILITY CENTERED MAINTENANCE (RCM)

4.1. General Policy. RCM is an integral part of engine life management for all engines covered by this instruction. RCM is an analytical process to determine the appropriate failure management strategies, including preventive maintenance requirements and other actions that are warranted to ensure safe operations while balancing readiness and costs.

4.1.1. Through utilizing the RCM process, managers learn to optimize Expected Time On Wing (ETOW) through disciplined analysis and structured processes to identify cost effective and technically sound maintenance policies. These policies may affect field or depot maintenance, supply, training, engineering, operator procedures, technical data, and other areas to ensure the most effective maintenance practices are used.

4.2. Responsibilities:

4.2.1. **AF/A4M**:

4.2.1.1. Publish policy integrating RCM concepts into operational, support and deployed maintenance.

4.2.1.2. Coordinate Air Force RCM requirements within Air Staff.

4.2.1.3. Ensure RCM maintenance policies are coordinated.

4.2.2. **Air Force Materiel Command**:

4.2.2.1. **Director of Propulsion (DoP):**

4.2.2.1.1. Assign a RCM Project Manager as co-chair facilitator to the EHM+ (ET&D and RCM) working group with the Engine Trending and Diagnostics (ET&D) working group facilitator.

4.2.2.1.2. Identify a menu of acceptable tools to be used to implement RCM processes into maintenance plans for engines throughout the propulsion community.

4.2.2.1.3. Recommend policy which will ensure RCM is implemented in applicable USAF propulsion systems.

4.2.2.1.4. Provide template format to Propulsion SM to build an annual roadmap for RCM.

4.2.2.1.5. Establish reliability goals.

4.2.2.1.6. Develop RCM analysis tools.

4.2.2.1.7. Establish metric and tracking.

4.2.2.2. **Propulsion SMs:**

4.2.2.2.1. Assign appropriate personnel to manage and implement an RCM program for each engine TMS.

4.2.2.2.2. Include RCM guidance in engine specific technical orders and updates.

4.2.2.2.3. Appoint appropriate personnel to be members of the RCM working group.

4.2.2.2.4. Ensure assigned RCM personnel participate in EHM+ conferences, meetings, and committees. Identify and discuss operational issues and policies.

4.2.2.2.5. Ensure assigned personnel are trained and have established procedures to optimize expected time on wing using RCM concepts.

4.2.2.2.6. Ensure assigned personnel participate in MPWG and champion support for customer required RCM tools and processes.

4.2.2.2.7. Ensure ELMP incorporates RCM requirements and specifies the analytical approach and goals for each TMS. Review new programs for RCM applicability.

4.2.2.2.8. Consolidate applicable programming documents (budget, facilities, manpower, etc.) which include the need for Air Force RCM support.

4.2.2.2.9. Prepare and submit RCM funding requirements and budgets to satisfy the requirements, including sources of funding.

4.2.2.2.10. Identify and resolve operational issues and develop processes and procedures for review and acceptance by chief engineers.

4.2.2.3. **Air Force Research Laboratory**.

4.2.2.3.1. Assign an RCM program manager.

4.2.2.3.2. Participate in RCM conferences, meetings, and committees to identify and discuss RCM technologies, policy, issues and practices.

4.2.2.3.3. Accomplish RDT&E of RCM technologies.

4.2.2.3.4. Evaluate cost effectiveness through the completion of a Business Case Analysis (BCA), of emerging RCM technologies.

4.2.3. **Major Commands (MAJCOMS):**

4.2.3.1. Identify headquarters RCM OPR for each major command.

4.2.3.2. Participate in RCM conferences, meetings, and committees to identify and discuss relevant RCM issues and policies.

4.2.3.3. Lead Command will supplement this AFI with Command Instructions as necessary to achieve program objectives, provide guidance necessary to execute the RCM program, and ensure that subordinate organizations understand and properly execute their RCM responsibilities.

Chapter 5

ENGINE TRENDING AND DIAGNOSTICS

5.1. General: Engine Trending and Diagnostics (ET&D) is a program integrating hardware, software, technical documents, training, maintenance, and diagnostic/prognostic processes to quantify and monitor/manage engine health. Effective use of ET&D can reduce engine flight safety risk, improve reliability, and optimize life cycle costs. The purpose of ET&D is to:

5.1.1. Predict, detect and conduct pre-emptive analysis of adverse trends.

5.1.2. Forecast time and material requirements days or weeks in advance to optimize Engines Not Mission Capable Supply (ENMCS) rates and maintenance man-hours.

5.1.2.1. Logistics center, product center and OEM engineers and technicians use ET&D to develop engine trend algorithms and provide support to field users by diagnosing engine performance problems. When requested, depot and product center engineers and technicians use ET&D to determine engine operational parameters in support of mishap investigations.

5.1.3. Ensure all reportable deficiencies on engines hardware and software covered by this AFI shall be documented, reported, and resolved in accordance with TO 00-35D-54.

5.1.4. Reduce established shop flow days and serviceable spare engine levels to meet customer requirements and funding.

5.1.5. Reduce life cycle costs and optimize reliability by improved measurement of life used on critical Components.

5.1.6. Improve established customer reliability by phasing out time-based removals and increasing ATOW or MTBR.

5.2. Program Participation:

5.2.1. The ET & D Working Group (ET&D WG) is the principle organization to develop implementation plans, identify technological opportunities related to Engine Health Management, initiate technical order support for all ET&D processes and procedures and provide for personnel training, among other responsibilities.

5.2.1.1. The ET&D WG is composed of the following membership: Senior Leader for Propulsion, AFRL representative, DoP representative, Chief Engineer from Development and Sustainment Groups, ET&D Program Manager, Propulsion National Security System (NSS) Software Program Manager, Major Command Logistics Liaison Officers, Sustainment Group Lead Engineers, Technicians, TMS Managers, Propulsion Organic Software Support Engineering, Maintenance Engineering, International United States Air Force Representative/s and Aircraft SPM's flight data recorder representatives.

5.3. Program Goal: The primary goal of the ET&D program is to prevent or limit damage to turbine engines by prediction or early detection of performance degradation and/or failures. This is done by monitoring engine operating parameters, engine wear-metal analysis, visual inspections, and comparison to engine maintenance records data. Enhancements may include comparison of installed engine performance to that of a model serving as a base line.

5.3.1. An equally important goal is to minimize the ET&D deployment footprint by standardizing ET&D hardware, software, test instrumentation, techniques and procedures, and consolidating base level tasks.

5.3.2. Secondary goals include on-board automated data collection and analysis to improve accuracy of detection and prediction.

5.4. Program Guidance: ET&D assists all levels of maintenance in making informed maintenance decisions based on engine operating data. The ET&D program is designed to determine if maintenance must be performed before the next flight and/or before the next scheduled engine removal.

5.4.1. ET&D include maintenance activities performed by propulsion and Non-Destructive Inspection (NDI) technicians to monitor and predict engine health, performance and structural integrity. The ET&D System is comprised of various hardware, technical orders, training, and software components including on-board aircraft and engine data collection devices and test cell data collection devices. Additional data sources may include maintenance and oil analysis data available from other data systems. ET&D uses a variety of software applications on ground-based computers to process data and diagnose and monitor engine health.

5.5. Responsibilities.

5.5.1. **AF/A4M:**

5.5.1.1. Publish Air Force ET&D policy.

5.5.1.2. Coordinate Air Force ET&D requirements within the Air Staff.

5.5.1.3. Ensure ET&D maintenance policies are coordinated.

5.5.2. **Air Force Materiel Command:**

5.5.2.1. **Director of Propulsion (DoP**)

5.5.2.1.1. Recommends policy to AF/A4M.

5.5.2.1.2. Coordinate with Air Force Research Laboratory (AFRL) to assess existing and/or potential ET&D technologies.

5.5.2.1.3. Implement ET&D.

5.5.2.1.4. Provide ET&D tools.

5.5.2.2. **Propulsion Single Managers**

5.5.2.2.1. Assign an ET&D program manager.

5.5.2.2.2. Assign appropriate personnel for ET&D issues on each TMS engine.

5.5.2.2.3. Assign personnel to the ET& D working group.

5.5.2.2.4. Participate in major ET&D conferences, meetings, and committees to identify and discuss operational issues and policies. Build an annual EHM+ roadmap which incorporates ET&D and RCM, resolve operational issues and develop processes and procedures.

5.5.2.2.5. Ensure assigned personnel are trained and have established procedures to review engine health and performance limits, diagnostics and prognostics.

5.5.2.2.6. Establish and maintain diagnostic criteria based on a periodic review of data from equipment tear down and overhaul findings.

5.5.2.2.7. Identify potential projects to assist CIP Research, Development, Test and Evaluation (RDT&E) and sustainment activities of the ET&D programs in order to improve current ET&D processes and techniques.

5.5.2.2.8. Participate in MPWG for all EHM+ (which identifies ET&D and RCM) requirements.

5.5.2.2.9. Ensure ELMP incorporates EHM+ (which identifies ET&D and RCM) requirements. Review new programs for EHM+ (which identifies ET&D and RCM) applicability.

5.5.2.2.10. Develop and provide accurate performance criteria for each engine TMS. These criteria will provide the basis for interpreting and understanding the ET&D data.

5.5.2.2.11. Coordinate with the Air Force Safety Center (AFSC) to ensure ET&D analysis is integrated into mishap analysis and corresponding recommendations are assessed and incorporated into appropriate policy and guidance.

5.5.2.2.12. Ensure applicable programming documents (budget, facilities, manpower, etc.) include the need for Air Force ET&D support.

5.5.2.2.13. Establish process for documenting ET&D funding requirements, and budgeting to satisfy the requirements, including sources of funding.

5.5.2.2.14. Provide the specific engine ET&D course requirements to AETC for course development and training.

5.5.2.3. **Support Equipment and Vehicle Management Directorate.**

5.5.2.3.1. Support EHM+ (which identifies ET&D and RCM) activities with a Support Equipment and Vehicle Management (642 CBSG) program manager, equipment specialist, and engineer to address common support equipment program issues.

5.5.2.3.2. Provide applicable ET&D support equipment technical orders and updates. ET&D SE requirements and funding will be worked jointly with the Propulsion SMs.

5.5.2.3.3. Ensure there is adequate interface control between ET&D programs and applicable support equipment programs throughout the program life.

5.5.2.3.4. Provide a representative to the ET&D working group.

5.5.2.3.5. Participate in major ET&D conferences, meetings and committees to identify and discuss operational issues and policies.

5.5.2.3.6. Support RDT&E to improve current ET&D support equipment processes and hardware.

5.5.2.3.7. Ensure assigned personnel are aware of ET&D objectives.

5.5.2.3.8. Support requirements to ET&D support equipment.

5.5.2.3.9. Participate in the development, testing and transfer of ET&D propulsion support equipment that is destined for WR-ALC management.

5.5.2.3.10. Participate in the MPWGs and engine user conferences.

5.5.2.4. Air Force Research Laboratory.

5.5.2.4.1. Assigns an ET&D program manager. Ensures ET&D working group is kept updated on status.

5.5.2.4.2. Participates in major ET&D conferences, meetings, and committees to identify and discusses ET&D and Research, Development, Test and Engineering (RDT&E) technologies, policy, issues and practices.

5.5.2.4.3. Accomplishes RDT&E of ET&D technologies.

5.5.2.4.4. Evaluates cost effectiveness of developing ET&D technologies.

5.5.2.4.5. Establishes proof-of-concept test programs where needed.

5.5.2.4.6. Develops ET&D technology and methods for a proof-of- concept engine validation test.

5.5.2.4.7. Serves as focal point for all RDT&E initiatives in support of ET&D requirements.

5.5.2.4.8. Support the transition of technologies from AFRL to engine programs.

5.5.2.4.9. Provides a planning team member for transition of technologies from AFRL to engine programs.

5.5.2.4.10. Serves as technology center for contractors to contact for ET&D marketing evaluation from contractors to the Air Force.

5.5.3. **MAJCOMs:**

5.5.3.1. Establish a headquarters OPR for EHM+ (which identifies ET&D and RCM) responsibilities.

5.5.3.2. Participate in ET&D conferences, meetings, and committees to identify and discuss relevant ET&D issues and policies.

5.5.3.3. Lead Command will supplement this AFI with Command Instructions as necessary to achieve program objectives, to provide guidance necessary to execute the ET&D program, and ensure that subordinate organizations understand and properly execute their ET&D responsibilities.

5.5.3.4. Ensure units implement ET&D programs.

5.5.3.5. Ensure applicable programming documents (e.g. budget, facilities, manpower, maintenance etc.) include the need for Air Force ET&D support.

5.5.3.6. Wing Commander:

5.5.3.6.1. Responsible for overall ET&D activities.

5.5.3.7. Operations Group Commander:

5.5.3.7.1. Responsible to ensure aircrew personnel capture appropriate flight data when automated data collection methods are not inoperable and transfering this data to ET&D personnel for analysis.

5.5.3.7.2. Appoints an ET&D POC(s) within each flying squadron.

5.5.3.8. Maintenance Group Commander.

5.5.3.8.1. Responsible for managing the ET&D program.

5.5.3.8.2. Appoints an ET&D program Manager and Monitor(s), who will monitor engine health for trends, perform diagnostics, and monitor systems according to T.O. 00-25-257 series.

5.5.3.8.3. Ensures ET&D program manager, and monitor(s) are formally trained (within 6 months of assignment) in ET&D policies and practices.

5.5.3.8.4. Ensures flightline personnel collect raw engine data and transfer data to the ET&D manager or monitor for analysis.

5.5.3.8.5. Ensures NDI and test cell personnel send oil and test cell analysis program data to the ET&D manager or monitor for inclusion in ET&D analysis data that will be forwarded to the Engine Health Management Plus Data Center.

5.5.4. **Air Education and Training Command (AETC):**

5.5.4.1. Provide follow-on training after Propulsion SMs develop each engine specific ET&D course. Propulsion SMs teach the specific course one full year prior to transferring course responsibility to AETC. AETC working with MAJCOM OPRs and the Propulsion SMs form the team that is responsible for maintaining and updating course material.

5.5.4.2. Appoints lead-training group and Training Manager. Responsibilities will include:

5.5.4.2.1. Participating in Training Planning Team (TPT), ET&D working group and related product teams.

5.5.4.2.2. Team member of engine specific ET&D working group to define engine specific training requirements by instructional system development analysis according to AFI 36-2201 and AF Handbook 36-2235 volumes 1 through 11 and AETC training regulations.

5.5.4.2.3. Developing training to complement maintenance management concepts, policies and proficiency requirements of MAJCOMs.

5.5.4.2.4. Providing formal training on selected engine TMS through Field Training Detachments, mobile training teams or technical schools.

5.5.4.2.4.1. Training will supplement other forms of training available through On-the-Job Training (OJT), Air Force Engineering Technical Service (AFETS) or Contract Engineering Technical Service (CETS) Type 1 courses.

5.5.4.3. AETC/A3

5.5.4.3.1. Review and coordinate on training requirements as submitted by Propulsion Single Managers, establishing supportability of technical training requirement.

Chapter 6

CENTRALIZED INTERMEDIATE REPAIR FACILITY FOR ENGINES

6.1. General Policy. Centralized Intermediate Repair Facilities (CIRF) are designed to take advantage of existing repair centers to sustain in garrison or deployed forces, which are congruent with AF Vision 2020 doctrine to reduce the forward support footprint. The CIRF provides a consistent regional repair support during steady-state or contingency operations. A CIRF may be theater-based (OCONUS) or steady-state (CONUS). Engine requirements for CIRFs will be calculated using the PRS and allocated annually.

6.2. Centralized Engine Rotable Pool (CERP). A CERP will be established and maintained at all CIRF locations. CERP management, control and procedures may vary depending on specific logistic characteristics of engine type and type aircraft. The designated engine manager will maintain accountability of CERP engines and report status.

6.2.1. **Command and Control**. The command and control of CIRF engine pools resides with both the CIRF supporting CEM appointed by the CIRF supporting MAJCOM A4 and LSC C2 Cell appointed by the CIRF supporting LSC/CC.

6.2.1.1. The CIRF supporting LSC C2 Cell will designate a supply and transportation point of contact to assist the CIRF engine manger in supply and transportation CIRF issues.

6.2.1.2. All MAJCOMs using the CIRF will assign an engine manager to interact with both the CIRF supporting CEM and LSC C2 Cell.

6.2.1.3. Separate SRANs will be established for each CIRF location.

6.2.2. **CERP Management.** The dynamic global environment and engine type will dictate where and what type of centralized rotable engine spares pools should be established. The extent to which rotable engine pools are used lies with the combatant command that may task a supporting command to provide CIRF capabilities and additional commands to provide assets (engines, personnel and equipment) to the centralized rotable engine pools. Once valid requirements are established, the CIRF supporting CEM and LSC C2 Cell will manage and control all engine types assigned to their respective engine pools.

6.2.3. **Final Authority.** In the instance of contingency tasked forces, the combatant command A4 has final authority on whether to send a CERP engine to a contingency location. The CIRF supporting—command A4 will work with the combatant command A4 Logistics Readiness Center to ensure mission requirements are met.

6.2.3.1. The supporting CIRF activity will receive additional engines to populate the rotable engine pool from supporting Combat Air Forces (CAFs) or Mobility Air Forces (MAFs) based on requirements provided by the CIRF supporting command and approved by the combatant command. From these requirements, the supporting activity will calculate the number of spares required to support the operation. Deliberate planning is required and should entail consideration for the entire repair cycle.

6.2.3.2. Established rotable spare engine pool locations may be expanded or shifted from one theater to another based on need.

6.2.3.3. During steady state operation it is possible that maintenance, beyond the capability of the CIRF, is required on CIRF tasked engines. When this occurs, the CIRF supporting—CEM and LSC C2 Cell will coordinate with applicable MAJCOM's to develop a course of action for repair.

6.3. Reliability Centered Maintenance. Each CIRF location will implement RCM for each CIRF repairable engine based on supportability (deployed units mission needs/time involved) and parts availability. CIRF Propulsion Flight Chief and Engine Management will determine the best maintenance plan for each repairable engine, to include TCTOs and coordinate with LSC C2 Cell and MAJCOM CEM as necessary.

6.4. Logistics Support Center (LSC) C2 Cell Prioritization, Induction, and Distribution of CIRF assets: The CIRF concept requires a robust command and control architecture and processes to prioritize, induct, and distribute CIRF-repaired assets to supported units. Specific CIRF Operational level C2 decisions include:

6.4.1. Managing and prioritizing CIRF activities based on established weapon system goals (e.g., spare levels, etc…) for CIRF-supported units.

6.4.2. Allocating serviceable assets to the CIRF Centralized Engine Rotable Pool (CERP) and CIRF-supported units.

6.4.3. Coordinating and tracking movement of assets between supported units and the CIRF, to include reparables, repaired parts, cannibalized parts, time change items, TCTO kits, etc….

6.4.4. Integrating depot repair production with CIRF repair capability.

6.4.5. Coordinating retrograde and sustainment actions with other MAJCOM or Combatant Command Mission Support Teams, Item Managers or Depot.

6.4.6. Monitoring production at each CIRF location.

6.4.7. Coordinating special transportation requirements between CIRF FSL and supported unit FOLs (e.g., diplomatic clearance, transportation mode, timeline, etc…)

6.5. LSC C2 Cell Decision Authority.

6.5.1. Unless otherwise specified in CIRF governing instructions, serviceable assets will be distributed in the following priority order: Units engaged in combat operations, units engaged in homeland defense, units engaged in other JCS project-coded operations, units within window to deploy for an AEF rotation, all other units.

6.5.2. Serviceable assets produced at in-theater CIRFs will generally be held for theater use by supported units unless a higher priority demand exist, as indicated above or in the CIRF governing instruction. GLSC will determine fulfillment of out-of-theater demand (i.e. lateral support) and assure coordination among the gaining and loosing MAJCOM CEMs.

6.5.3. The supported command retains final authority on asset distribution to their assigned and attached units. In the event of a dispute between two or more combatant command A4 Liaison Elements supported by the same LSC, HAF CSC may provide resolution.

6.5.4. Provide equitable distribution of ~~"h~~igh time" assets. High time serviceable assets have limited service life remaining until the next major inspection, maintenance or overhaul. High time assets impact maintenance planning by introducing turbulence and un-forecasted requirements into maintenance schedules. Units submitting reparables with ~~"l~~ow time" should not repeatedly receive back ~~"h~~igh time" assets. The goal of the LSC C2 Cell should be to minimize induced disruption to maintenance plans and schedules. Where not possible, the distribution of high time assets across supported units should be equitable.

Chapter 7

WHOLE ENGINE SPARE REQUIREMENTS COMPUTATION

7.1. General Policy. Whole spare engine requirements computations establish acquisition and distribution of spare engine levels. The acquisition computation establishes the quantity of whole spare engines the Air Force needs to buy to support the weapons system until retirement. The distribution computation establishes the quantity and locations where the Air Force will place its spare engines based on current planning policy and engine reliability. In addition, other computations are accomplished for repair and retention requirements. The Air Force standard system used for the computation of whole spare engine requirements is PRS (D087Q).

7.1.1. **Documentation**. Adequate supporting documentation must be maintained for the whole spare engine requirements computations to establish an effective system of management controls. This includes documentation to support assumptions made, verify the accuracy of data used, validate the currency/applicability of data, identify data (factor) changes and trends, and re-create the requirements computation if required. The PRS functional manager will document all sources used and pertinent assumptions made during the computation of whole spare engine requirements. Supporting documentation will be in written form (e.g., letter, e-mail, MFR, etc.), and retained with the computation results for the required time period per the following retention matrix.

Table 7.1. Engine Documentation Retention Matrix.

Retention Matrix		
If Document is from…	Retain for…	After…
Acquisition Computation	2 years	The data is replaced in the computation.
Distribution/Retention Computation	2 comp cycles plus current	The data is replaced in the computation.
Buyout Acquisition Computation	10 Years	The day the buyout computation is approved.

7.1.2. **Roles and Responsibilities.**

7.1.2.1. AF/A4M: Provides oversight and policy for the management of AF engines including the PRS computation process.

7.1.2.2. AF/A8P: Sends latest version of the USAF Program Aerospace Vehicles and Flying Hours (PA) file to 754 ELSG/LRW after submission of each PB. Format the PA and D087Q according to the MOA between AF/A8PE and 754 ELSG/LRW. Publish the latest version of both the PA Documents, Volumes I and II, on the SIPRNET following the submission

7.1.2.3. **USAF/A5X**: Makes available the most current version of the Requirements Daily Answer Tape (RDAT) to 754 ELSG/LRW after completion of the President's Budget each year, due NLT 1 February. Format War Mobilization Plan (WMP) 3&5 and D087 according to the memorandum of agreement (MOA) between AF/A5XW and 754 ELSG/LRW in support of the distribution computation.

7.1.2.4. **754 ELSG/LRW:** The Air Force program manager for PRS is 754 ELSG/LRW (WSMIS Program Office). Loads appropriate input data into the PRS database. Sends copies of the PA and RDAT to MAJCOM CEMs, PRS, FM, and SMs after formatting for input into PRS in support of the distribution computation

7.1.2.5. **Director of Propulsion:** The Air Force functional manager for PRS. He assures computation policies established by AF/A4M are complied with, audits accuracy of the computation, and initiates and monitors the process and manages the schedule for the spare whole engine distribution computation, as required, at least annually. If updated flying hour data is unavailable, he notifies MAJCOMs and Propulsion SMs which document is available to use for annual distribution computations. He oversees the proper documentation of whole engine computation model software, PRS logic, and processes.

7.1.2.6. **MAJCOM CEM:** Reviews and coordinates all computation inputs. Accomplishes the individual MAJCOM distribution computations.

7.1.2.7. **Propulsion SM**: Accomplishes spare whole engine stock level acquisition computations and roll-up spare whole engine stock level distribution computations for the TMS engines they manage. Forecasts actuarial removal intervals for use in the whole engine stock level distribution and overhaul computations.

7.1.2.8. **Acquisition Engine Review Organization (ERO**):

7.1.2.8.1. Purpose. The primary purpose of having an Acquisition ERO is to collect, develop, and coordinate factors used in the spare engine requirements acquisition / distribution computations for engines still in production.

7.1.2.8.2. Membership. The chairperson of the ERO will be the Propulsion SM Chief/Lead Engineer. Other members of the ERO include designee's from the using MAJCOMs, SM's TMS Program Management Team and OEM, as appropriate.

7.1.2.8.3. Responsibilities. The ERO is responsible for insuring that factors used in spare engine acquisition and distribution computations are current and complete.

7.1.2.8.4. Frequency. The chairperson will call an ERO meeting, depending on the changes the engine has experienced in such areas as operational deployment, maintenance concepts, reliability and maintainability trends, major modification/configuration changes, and general logistics support.

7.1.2.8.5. Minutes. Minutes will be kept by the chairperson and will include an attendee list, a copy of the agenda, briefings presented, documentation clearly specifying decisions reached, and an action item summary. Minutes will be provided to each attendee, the Propulsion SM, and DoP.

7.1.2.8.6. Factors. Factors will be developed to reflect the transition from peace to surge to sustained war. The chairperson of the ERO will determine the need to develop mature or actual factors, or both. The peace, surge, and sustained war factors that fall under the ERO responsibility are; Shop Visit Rate (SVR), Not Reparable This Station (NRTS), and Pipeline Times as provided by the MPWG, to include Base Repair In Work Times and Depot Repair In Work Times

7.1.2.8.6.1. Although transportation times are not developed by the ERO, transportation standards should be reviewed because of their significant impact on

spare engine requirements. Questions that arise concerning transportation standards should be passed to the Propulsion SM's office for review and action.

7.1.2.8.6.2. Within each type factor, values are required for three time frames: peacetime, war surge, and war sustained. Factors are established from data analysis supported by documented assumptions and rationale. The sustained values may be the same as the peacetime values when data are not available. Maintain permanent documentation of supporting data, rationale, assumptions, and decisions as an appendix to the ERO meeting minutes. Decisions without supporting data must be fully explained in the documentation.

7.1.2.8.6.3. Mathematical modeling and computer simulation are used to develop factors whenever practical.

7.1.2.8.6.4. The factors are developed using the assumptions that engines have a zero wear out rate and that all unserviceable spare engines are capable of being repaired.

7.1.2.8.6.5. Engine factor changes are approved for use in requirements calculations when coordination has been obtained from the Lead Command and the Propulsion SM.

7.1.2.8.6.6. Review factors at least annually and update as necessary.

7.1.2.8.6.7. Release engine factors on any manufacturer's engine to another manufacturer only with OEM concurrence.

7.1.2.8.6.8. Consider using the official factors for engine acquisition programs when there is significant military or commercial performance and reliability experience.

7.1.2.8.6.9. Develop factors for the TMSM or combined TMSM at either worldwide or command level due to mission, operation, support differences, or requirements calculations methods.

7.1.2.8.6.10. Develop estimated repair pipeline times for the engine to flow through each segment of the pipeline per T.O. 2-1-18 guidance. This is the average time to accomplish all necessary pipeline processes. Elements are frequency of occurrence, required manpower, facilities, tools, equipment, parts and technical data. Standard pipeline times for mature engine TMS are documented in T.O. 2-1-18. Standard pipeline times serve as a goal for each maintenance, transportation and supply activity to achieve and should not consider delays for induction to maintenance and supply.

7.1.2.8.7. Maturity. Spare engine computations representing maturity will use standard pipeline times and a mature SVR. The SVR will reflect the point in the engine's life cycle when only small changes are expected to occur in the slope of the unscheduled engine removal rate curve per flying hour. Scheduled engine removals (SER) will be evaluated to determine if there is a stable slope, or if ~~"p~~eaks and valleys" exist. If a stable SER exists, that value will be used in the computation. Where ~~"p~~eaks and valleys" are expected to exist, the EPM will make a recommended buy decision after considering the impact at points such as 1) the peak SER value, 2)

the minimum SER value and 3) selected mid-range values between the peak and minimum.

7.1.2.8.8. Interfaces. Other sanctioned groups exist that also review and develop factors needed to operate PRS. Groups such as the Engine Advisory Board, Senior Steering Groups, Maintenance Planning Working Group, Readiness Working Groups and Source Selection Teams may also be charged with developing official factors that can be used to compute spare engines. It is permissible for the factors developed by an officially sanctioned group to be incorporated into spare engine computations with approval of the ERO.

7.1.2.9. **Aerospace Engine Life (AEL) Committee.** Reviews and approves changes to factors used in development of Actuarial Removal Interval (ARI) tables for the distribution computation. Recommends/approves changes to factors based on the changes in engine reliability, employment of the weapon system, and maintenance philosophies that affect the ARI table development.

7.1.2.9.1. **Membership**: The membership will consist of the Propulsion SM's chairperson, TMS management team and all CEM operating the engine TMSM.

7.1.2.9.2. **Meeting Frequency**: The AEL will be held annually at the call of the chairperson or when deemed necessary to correct accuracy of forecasting ARI Tables. Timing of meetings should allow incorporation of approved factor changes in the development of ARI tables to be used in the next PRS repair computation cycle used for budget purposes and the distribution computation cycle.

7.1.2.9.3. **Factors for Review**: AEL members will review the following factors: Projected peace flying hours, Scheduled/Unscheduled Engine Removal Rates, Non-usage removal rates, Changes in operating limits and component life expectancy, Changes in operating limits and component life expectancy, JEIM Return Rates, Changes in force structures and utilization rates, Application percentages, Base and Depot screens, Hour to Cycle ratios, Periodic inspection requirements.

7.1.2.9.4. **AEL Process**: The Propulsion SMs POC will forward necessary data to the MAJCOM CEMs prior to the meeting for review of proposed factor changes for use in development of the ARI tables. The data will include rationale for the changes and projected impacts of the changes in the removal forecasts. Only those engine programs with factor changes require presentation at the AEL meeting. The CEMs will review and assess the impacts of the proposed changes and provide any alternative or additional factor change recommendations to the actuaries for inclusion in the review process. They will be prepared to present supporting data and rationale for their proposal at the AEL meeting. Proposed changes and impacts will be presented and discussed at the AEL meeting. The committee members affected by the proposed changes will review, evaluate, and vote on approval and incorporation of the proposed changes in the development of ARI tables. If consensus of affected MAJCOMs and the Propulsion SM is not achieved, the Lead Command A4 will be the final approval/disapproval authority for any factor changes proposed. The Propulsion SM, for audit trail purposes, will maintain documentation of rationale/justification for approved factor changes.

7.1.3. **General Stock Level Computation Requirements:**

7.1.3.1. **Unit Level Requirements Modeling**: PRS computes safety stock levels at the lowest supply level.

7.1.3.1.1. **For units that fly and fight in place**: PRS considers peacetime assets as available to support wartime pipeline requirements and stocks the unit with the greater of their peace or war requirement.

7.1.3.1.2. **For those units that deploy**: The entry of a ―J-Day" (JEIM availability day) determines if peacetime assets are available or not to support wartime pipeline requirements.

7.1.3.1.2.1. A ―J-Day" of 1 means that peacetime assets are available and PRS stocks the unit with the greater of their peace or war requirement.

7.1.3.1.2.2. A ―J-Day" entry greater than 1 means PRS will compute the unit stock considering that maintenance will not be available until the J-Day indicated, PRS then stocks these units with the sum of their peace and war requirement.

7.1.3.1.3. The total number of spare engines required at a specific base, with more than one unit with the same MDS and TMSM combination is the sum of each unit's peace or war requirement.

7.1.3.2. **Safety Stock Levels**: Safety stock protects against pipeline shortages due to the uncertainty in the forecasted demand, repair production processes, and transportation pipeline performance. PRS computes safety stock levels for:

7.1.3.2.1. The depot(s) based on repair and retrograde pipelines. PRS does it for each depot repair facility if there is more than one

7.1.3.2.2. Each unit with an independent deployment or operational capability for both base repair and depot re-supply pipelines.

7.1.3.2.3. Centralized JEIM repair facilities based on base repair, retrograde from the supported unit(s) and depot re-supply pipelines.

7.1.3.2.4. Each Forward Operating Location (FOL) and Forward Supply Point (FSP) based on the serviceable re-supply pipeline from the JEIM site.

7.2. Acquisition Stock Level Computation: The purpose of the acquisition computation is to determine the number of spare whole engines to be procured in support of each MDS/TMS.

7.2.1. **Policy**: Spare whole engine acquisition requirements will be computed using PRS. The requirements computation process requires active involvement and support of the CEM, the Propulsion SM and, the engine manufacturer. The computations will be accomplished in accordance with this instruction. The USAF acquisition authority must obtain and review PRS initial acquisition computation prior to establishing an engine spares requirement for a new weapon system. For Contractor Logistics Supported (CLS) engines, PRS may be used to validate the contractor spare engine requirements estimates. Differences between Contractor and PRS spare engine requirements should be resolved, if necessary, between the Lead MAJCOM and the acquisition authority for the CLS program.

7.2.1.1. Limit spare engine acquisition to the smallest number of engines essential to support the largest programmed requirement for each increment of the weapons system's production contract.

7.2.1.2. During System Development and Demonstration phase, perform an analysis to determine the cost effectiveness of making a buyout decision for the TMSM engine. If the TMSM engine is a commercial or commercial derivative engine, conduct a life cycle cost analysis considering the benefits of a fixed inventory and the associated costs for support and modifications. Before engine production ends, procure the quantity necessary to support the weapon system's life cycle.

7.2.2. **Types of Acquisition Computations**: There are four types of acquisition computations.

7.2.2.1. **Initial:** The initial computation is the first computation performed for a new TMS. The Propulsion SM will determine when sufficient data are available to perform the baseline (initial) PRS computation.

7.2.2.2. **Annual:** A computation will be performed annually after the initial computation to address any changes (program data, pipelines, maintenance concept, and actuarial data) that have occurred. The results shall be published in the ELMP.

7.2.2.3. **Buyout:** The Propulsion SM performs a buyout computation to determine the final procurement quantity of spare whole engines for the TMS prior to the end of the engine production run. Buyout computations will be completed lead-time away from the closure of the engine production line.

7.2.2.4. **Others:** Any changes to the force structure, weapon system procurement schedules, mission, or overall program changes could drive additional computations during the acquisition cycle.

7.2.3. **Acquisition Computation Process Description:** This process is followed for any type of acquisition computation (see **Figure 7.1**).

7.2.3.1. **Initiate Computation:** The Propulsion SM is responsible for the whole spare engine acquisition computation, and will initiate a review of the PRS model input factors to determine if an updated computation is required. If required, the EPM will initiate the action necessary to produce the updated computation. War planning scenario used for computation shall be consistent with current distribution war scenario policy. The CEM will provide any unique command requirements such as additives, FOLs, etc. Adequate written justification must be provided for all engine additives.

7.2.3.2. **Peace Flying Hours:** The peacetime program is extracted from the latest PA document by the Propulsion SM's POC. The force structure bed-down reflected in the PA document is updated by the Propulsion SM's POC to reflect the latest approved bed-down changes. If the PA document does not contain the needed peacetime information, the CEMs will obtain and provide the peacetime information (flying hours and basing structure) to be used in the computation. Any force structure bed-down changes not contained in the latest PA must have adequate documentation and justification for inclusion in the computation.

7.2.3.3. **War Flying Hours:** The wartime program is extracted from the RDAT based on the latest war computation policy provided by AF/A4M. Wartime hours related to the squadrons will be revised to maintain consistency with any changes identified in the peacetime program information. If the RDAT does not contain the needed wartime information, the MAJCOMs CEMs will obtain and provide the wartime information (flying hours and basing structure) to be used in the computation. Any force structure bed-down changes not contained in the latest RDAT must have adequate documentation and justification for inclusion in the computation.

7.2.3.4. **Actuarial Removal Intervals:** The ARIs are developed by the ERO as previously detailed.

7.2.3.5. **Repair Pipeline Times:** The field level and depot repair pipeline times are developed by the ERO for new programs with no experience.

7.2.3.6. **Transportation Pipeline Times**: The transportation pipeline times are standards published by the Uniform Material Movement and Issue Priority System (UMMIPS).

7.2.3.7. **Maintenance Concept:** The MPWG will provide the maintenance concept (both peace and war), including NRTS rate, to be used in the computation, once approved by the ERO.

7.2.3.8. **Concurrence of Computation Input Factors:** Prior to accomplishing the computation, the Propulsion SM's POC must obtain concurrence of the input factors from the ERO membership.

7.2.3.9. **Acquisition Stock Level Computation:** The Propulsion SM's POC or designated analyst will load the information into PRS and run the model.

7.2.4. **Coordination and Approval of Results:** The Propulsion SM's POC will seek MAJCOM review and coordination. The computation will be briefed to the Propulsion SM, and then the Wing Commander for review and endorsement, prior to review and approval by the SPM, and the PEO or applicable ALC Commander.

7.2.5. **Implementation Plan:** The Propulsion SM will develop a plan to implement the results of the process.

7.2.6. **Buyout Support Period:** Before the closure of the engine production line, a buyout computation will be performed to determine the number of spare engines required to support the applicable MDS during its planned life. The buyout computation will document whether the computation reflects maturity **(Maturity=fleet age>500,000EFH)** or another support period.

7.2.6.1. During engine production, it is important to know the actual number of spare engines required to support a MDS. The Propulsion SM is authorized to initiate a computation that will reflect the actual number of spare engines required to support a MDS over a period of time (e.g., the next two to three years, with the requirement normally being computed quarter-by-quarter). This computation is beneficial when near term supportability problems are expected to occur and may result in the Propulsion SM making a spare engine procurement recommendation.

7.2.6.2. The computation will reflect maturity when the engine has matured according to the information contained in paragraph 7.1.2.8.7. , above.

7.2.6.3. When required to perform a buyout computation for an immature engine **(Immature=fleet age<500,000EFH)**, the first step requires identifying the time period when the MDS should be fully supported, from a spare engine perspective. Unless separately identified by either AF/XO or the lead MAJCOM, the period to be fully supported begins with the delivery of the last MDS with the TMS being computed. Actuarial factors and pipeline times representing the supported period will be developed for use in the buyout computation. Depending on the estimated period of immaturity in years, it may be desirable to evaluate the requirement at various points, such as 1) the beginning of this period, 2) some interim period on the road to maturity (e.g. after completion of the next scheduled depot visit), and 3) at maturity. Computation results will be used by the Propulsion SM in recommending a spare engine procurement quantity.

7.2.7. **Small Fleet Policy:** Before a TMS reaches maturity, it is important to know the actual number of spare engines required to support a MDS. The small fleet policy allows for the computation of spare engines using the projected ~~"a~~ctual" SVR and pipeline times. The intent is to show the actual number of spare engines required to support the MDS over the next two to three year time period, normally by computing the requirement quarter-by-quarter. The Propulsion SM may initiate a small fleet computation when near term supportability problems are expected to occur.

7.2.8. **Special Stock Levels:** Engine managers generate special stock levels for:

7.2.8.1. Engines with small inventories.

7.2.8.2. Air breathing drone engines.

7.2.8.3. Use the following percentages to establish stock levels when 10 or fewer new MDS aircraft are to be procured or remain in the inventory:

7.2.8.3.1. For single engine aircraft, use 50 percent.

7.2.8.3.2. For twin-engine aircraft, use 40 percent.

7.2.8.3.3. For aircraft with more than two engines, use 30 percent.

7.2.8.4. The owning MAJCOM and Propulsion SM jointly determine the operating unit's stock level for air breathing drone engines. These stock levels are based on the operational and maintenance concept and the number of drones authorized for each location.

7.3. Distribution Stock Level Computation: The purpose of the distribution computation is to determine spare whole engine operational requirements and distribution for using MAJCOMs and Propulsion SM.

7.3.1. **Policy:** Spare whole engine distribution stock level requirements will be computed using PRS in accordance with this instruction. If required, prior to the beginning of the distribution computation AF/A4M will provide additional written direction to address war scenario criteria or other policy changes not specifically addressed in this document.

7.3.2. **Distribution Stock Level Computation Process Description**: The computation is conducted annually and is one of several events in the whole engine requirements process (see **Figure 7.2**). The computation requires a classified processing capability. Participants

include MAJCOM CEMs, Propulsion SM's POC, PRS functional manager, and DO87Q and WSMIS representatives.

7.3.2.1. **Peacetime Flying Hours**: The peacetime program is extracted from the latest PA document from the PB. The data contains the peacetime flying hours for each MDS along with the current basing structure. The data is downloaded electronically by 754 ELSG/LRW and formatted for input into the PRS database. If the PA document does not contain the needed peacetime information, the MAJCOM CEMs will obtain and provide the peacetime information (flying hours and basing structure) to be used in the computation. Any force structure bed-down changes not contained in the latest PA must have adequate documentation and justification for inclusion in the computation. Hard copies or electronic versions are forwarded to all participants for review and approval prior to the computation. The data is classified.

7.3.2.2. **War Flying Hours**: The wartime program is extracted from the RDAT based on the latest war computation policy provided by AF/A5XW. The data is downloaded electronically by 754 ELSG/LRW and formatted for input into the PRS database. If the RDAT does not contain the needed wartime information, the MAJCOMs CEMs will obtain and provide the wartime information (flying hours and basing structure) to be used in the computation. Any force structure bed-down changes not contained in the latest RDAT must have adequate documentation and justification for inclusion in the computation. Hard copies or electronic versions are forwarded to all participants for review and approval prior to the computation. The data is classified.

7.3.2.3. **Actuarial Removal Interval (ARI)**: An ARI is developed for engine scheduled and unscheduled removals at any maintenance level. ARIs should be developed for both peace and war by Propulsion SM through mathematical models, simulations, statistical trends, and historical analysis. Forecast ARIs using factors approved by the AEL. Propulsion SM will:

7.3.2.3.1. Maintain permanent documentation of supporting data, rationale, assumptions, and decisions as an appendix to the published ARI tables.

7.3.2.3.2. Screen engine removals to exclude engine removals that merely facilitate other maintenance (FOM).

7.3.2.3.3. Consider maintenance policies that govern the removal of life-limited components.

7.3.2.3.4. Furnish ARI data for PRS computation by the end of March of each year.

7.3.2.4. **Repair Pipeline Times:** TO 2-1-18 contains repair pipeline standards used during the PRS computation process. The TMS MPWG will review pipeline times at least annually and recommend changes to the standards contained in TO 2-1-18 when required. Recommended changes will be developed via guidance in T.O. 2-1-18, briefed to the Propulsion SM's Chief/Lead Engineer and when approved by the Propulsion SM's Chief/Lead Engineer and the Lead MAJCOM A4M, incorporated into TO 2-1-18.

7.3.2.5. **Transportation Pipeline Times**: The Uniform Material Movement and Issue Priority System (UMMIPS) publish the transportation pipeline times.

7.3.2.6. **Basing/Maintenance Concept**: The computation will use the basing structure contained within the PA/RDAT document and the current AF/A4M approved maintenance concept. Addition of bases required to account for spare engines pre-positioned at enroute locations to support transiting strategic airlift aircraft may also be included as FOL. Units that have multiple configurations of engines that cannot be interchanged due to engineering or safety of flight considerations may also be considered in basing concept.

7.3.2.7. **Concurrence of Computation Input Factors:** All input factors will be coordinated with the MAJCOM CEMs and Propulsion SM. Prior to accomplishing the computation, the Propulsion SM must obtain concurrence of the input factors from the MAJCOM A4Ms.

7.3.2.8. **Distribution Stock Level Computation**: 754 ELSG/LRW will load the information into PRS .The MAJCOM CEM will run the computation for their individual command. The Propulsion SM's POC will accomplish a roll-up computation across all MAJCOMs for their given TMS.

7.3.2.8.1. During the computation, all participants will review the inputs and results for accuracy. The PRS functional manager will insure that Air Force policy is complied with.

7.3.2.9. **Post Computation Actions**: The Propulsion SM's POC will review the output and determine spare engine availability vs. requirement immediately following the computation.

7.3.2.9.1. **Non-Constrained Allocations**: If engine availability is non-constrained, engines are allocated to using commands in accordance with the PRS computations or approved additives. Adequate written justification for additives must be obtained from the MAJCOM.

7.3.2.9.2. **Constrained Allocations:** A constrained engine is when the computed spare engine requirements exceed the total available spare engine inventory. If engine availability is constrained, the lead command will convene an IPT to coordinate an equitable allocation. The IPT will be comprised of one core member from each of the TMSM using commands and the Propulsion SM. The lead command MAJCOM/A4 is the final approval authority for constrained engine allocations.

7.3.2.9.2.1. The following Constrained Spare Engine Allocation Process is a basic framework for constrained engine allocation IPT meetings (it is not all inclusive and may be modified for unique requirement and needs):

7.3.2.9.2.1.1. **TMS Manager:** Prior to IPT: Review Propulsion Requirements System (PRS) computed rolled up levels. Allocate 100% against peacetime requirement (BSL and Repair Cycle Requirement). Determine negotiated/projected Depot returns. Adjust Depot pipeline requirement (if required). Compute wartime percentage against remaining engines. Determine depot safety levels allocation. Propulsion SM's POC submits computed level in standard format and suggested allocation to lead command—include depot requirements (peace and war time) by unit.

7.3.2.9.2.1.2. **Lead Command:** Prior to IPT conference: Review Propulsion SM's POC recommended BSL/WRE allocation levels. Chair constrained engine allocation IPT. Allocate 100% against peacetime requirement for all locations. Coordinate equitable allocations of WRE and address any open issues.

7.3.2.9.2.1.3. **MAJCOMs:** Prior to IPT conference: Provide justification for additives (if required). Identify command specific requirements and issues. Participate in IPT proceedings.

7.3.2.9.2.1.4. **PRS Functional Manager:** Following the IPT conference: Consolidate PRS Computed and Allocated Engine Levels in Single Document.

7.3.2.9.3. **Approval Process:** After establishing the recommended engine allocations, the following actions will be accomplished:

7.3.2.9.3.1. MAJCOM CEMs will coordinate allocated levels with their respective MAJCOM/A4

7.3.2.9.3.2. Propulsion SM POCs will obtain coordination on allocated levels from their Propulsion SM..

7.3.2.9.3.3. Non-concurrence of distribution stock levels based on the USAF approved computation and allocation process will be resolved by the lead MAJCOM/A4.

7.3.2.9.4. **Notification:** The DoP will prepare official correspondence advising each MAJCOM CEM of their authorized Base Stock Level and War Readiness Engines. In turn, MAJCOM CEM will prepare official notification to all their assigned bases of their approved base stock level engines and applicable WRE engine levels with information copy to respective Propulsion SM. These levels remain in effect until the next computation cycle, unless changes have occurred requiring a mid-cycle re-computation, or as a result of negotiations between the MAJCOM CEM and the Propulsion SM.

7.3.2.9.5. **Redistribution of Engines:** In some instances the computation or allocation will require a redistribution of spare engines. The lead MAJCOM CEM will be responsible for developing a redistribution plan to include the TMSM, the losing MAJCOM, the gaining MAJCOM, and the schedule for transfer. All engine transfers will be in accordance with T.O. 2-1-18. The plan will be provided by message to all users and the Propulsion SM.

7.3.2.9.6. **Schedule:** All input factors should be available for review by mid April. PRS computation should be conducted by end of May, based on availability of the input factors. Coordination review period should begin immediately following the computation and allocation IPT. Complete approval should be obtained prior to implementation of the engine levels at the beginning of the fiscal year.

7.4. Whole Engine Requirements Considerations for QEC Kit Acquisition: SPM with Propulsion SM input will determine the quantity of QEC kits to be bought. They are bought as life-of-type items and are regulated by the quantity of spare engines.

7.4.1. **QEC Configurations:** If there is more than one engine configuration, determine the requirement for each configuration by computing the proportions of each configuration installed on each aircraft. Then take the total raw computational requirement and multiply by the portion of each configuration (do not round off the requirement). Then take each new requirement to the ready rate table to determine requirement for each configuration and determine support requirement. Finally, add all configurations requirements together to determine total requirement.

7.5. Target Serviceable Requirement (TSR): For Combat Coded Units the TSR is equal to the WRE requirement. For Non-Combat Coded Units, TSR is a portion of the computed peacetime requirement that is necessary to be serviceable in support of special requirements. TSR is not an additive requirement.

7.5.1. **Establishing a TSR:** TSR is established at MAJCOM discretion. Computation of TSR is accomplished by analyzing PRS model results using 70% ready rate as a baseline and varying ready rates up to 99%. The delta between 70% and the higher ready rate would become TSR.

7.6. Additive Requirements: An Additive is a requirement not computed through normal computational methodology and manually added to the PRS requirement. If PRS can compute the requirement with validated rates and factors then an additive is not appropriate. Additive requirements for retaining assets otherwise considered for disposal or termination are not appropriate.

7.6.1. **Examples of Additive Requirements:**

7.6.1.1. **Training:** Assets required to provide a spare engine(s) used by Air Education and Training Command field training teams or detachments that do not have flying hours considered by PRS.

7.6.1.2. **Special Projects/Unit Segmentation:** Assets required to provide spare engine(s) in support of undefined tasks as directed by AF or MAJCOMs.

7.6.1.3. Small fleet multi engine aircraft where FOD/Bird-strike history combined with a normal failure could exceed computed BSL.

7.6.2. **Documentation of Additive Requirements:** Documentation of all additives should fully explain how the additive quantity was determined and why the requirement could not be expressed through the conventional methodology (i.e., PRS). The requesting MAJCOM CEM and the TMS manager will keep all documentation as long as the additive is required and for two years after the additive is removed.

7.6.3. **Validation and Approval of Additives:** Propulsion SM's POC will validate an additive requirement as long as the requirement does not cause the engine to become constrained. Once an additive causes an engine to become constrained it will be validated by the appropriate constrained engine allocation IPT. Any approved additives that cover a period of more than one year will be validated annually with the submitting activity, in writing, to the governing body even when the requirements didn't change.

7.7. Overhaul Computation: The Overhaul Computation process includes a whole engine repair computation and negotiations of repair quantities to determine the number of whole engines that will require depot or 2 Level Maintenance (2LM) for the current and next 6 years.

These repair quantities are used to determine the levels of spare parts required to repair those engines and also the manpower and facilities required. Based on these forecasted numbers, production capabilities, and budget authority the MAJCOM CEMs and Propulsion SM will negotiate a production requirement for each TMSM. The amount of available MAJCOM/CAM office funding drives the number of overhauls/repairs negotiated. Once the negotiated repair levels are set, the operating commands and/or the CAM office in conjunction with operating command priorities, commit to funding the inductions of the negotiated number of engines during a particular time, and the repair facilities agree to repairing and returning, as serviceable, an agreed to number of whole engines.

7.7.1. **Policy**: Whole engine repair computations will be accomplished in accordance with this instruction. Repair computations will be conducted once a year, in preparation for the annual Reimbursable Conference. An out of cycle repair computation may be accomplished at the discretion of the SM's POC. Use of AFMC Form 538 is required for all TMSM with a NRTS rate greater than zero.

7.7.2. **Repair Computation Process**: The Propulsion SM's POC performs the repair computation using an AFMC Form 538. See **Attachment 2** for a detailed description of the computation.

7.7.3. **Approval Process**: The AFMC repair computation will be reviewed and approved by the Propulsion SM.

7.7.4. **Increases to Computed Requirements**: A negotiated increase is a requirement not computed through normal computational methodology and manually added to the computed repair requirement.

7.7.5. **Documentation of Increased Repair Requirements**: Increased repair requirement documentation will be prepared by the requesting organization. The documentation must fully explain how the additional repair requirement was determined and why the requirement could not be determined via the repair computation process. The requesting MAJCOM CEM and the Propulsion SM's POC will keep all documentation as long as the increased repair is required and for two years after the increase is removed.

7.7.6. The results of the repair conference will be documented on AFMC Form 533, which converts the Overhaul Output requirement to an Input and Funding requirement.

7.7.7. **Post Conference Repair Requirement Increases:** Repair requirement increases subsequent to the repair conference require documentation per para.7.7.5.. Retention of post conference repair increase documentation will also be retained in accordance with above guidance.

7.7.8. Approval of Repair Increases: Repair requirement increases shall be approved in writing. Level of approval shall be commensurate with AFMC Justification and Approval levels for full and open competition for a proposed contract. Any increase in requirement will be forwarded to the AFMC CAM office to see if adequate and appropriate funding is available prior changing any actual workload. Level of approval will be based upon annual cumulative increased requirement.

7.7.8.1. For a proposed increase not exceeding $550,000, the Propulsion SMs POC will serve as approval official.

7.7.8.2. For a proposed increase over $550,000 but not exceeding $11,500,000, the Propulsion SM will serve as approval official.

7.7.8.3. For a proposed increase over $11,500,000 but not exceeding $78,500,000, the approval official will be a general or flag office; or, a civilian in the Senior Executive Service.

7.8. Retention Computation: The purpose of the retention computation is to identify engine retention requirements, inventory long supply and potential excess quantities for planning appropriate management action.

7.8.1. **Policy**: Retention computations will be conducted annually, following the PRS computation cycle or as needed to cover special program needs. The ALC EIM performs the retention computation.

7.8.2. **Approval Process**: The Propulsion SM is the final approval authority for excess decisions. The Propulsion SM may delegate this authority as necessary. Potential excess quantities identified by the computation will be staffed through the Propulsion SM for approval. The Propulsion SM will approve or disapprove the excess quantity proposal. If Propulsion SM disapproves proposal, no further action is required. If Propulsion SM approves excess quantities the Propulsion SM's POC coordinates with other DoD agencies to ensure a valid requirement does not exist for the TMS. Then, if appropriate, completes a FMS system support buy-out offer. All remaining excess engines are reviewed for possible reclamation and disposal action.

Figure 7.1. Acquisition Computation Flow Chart.

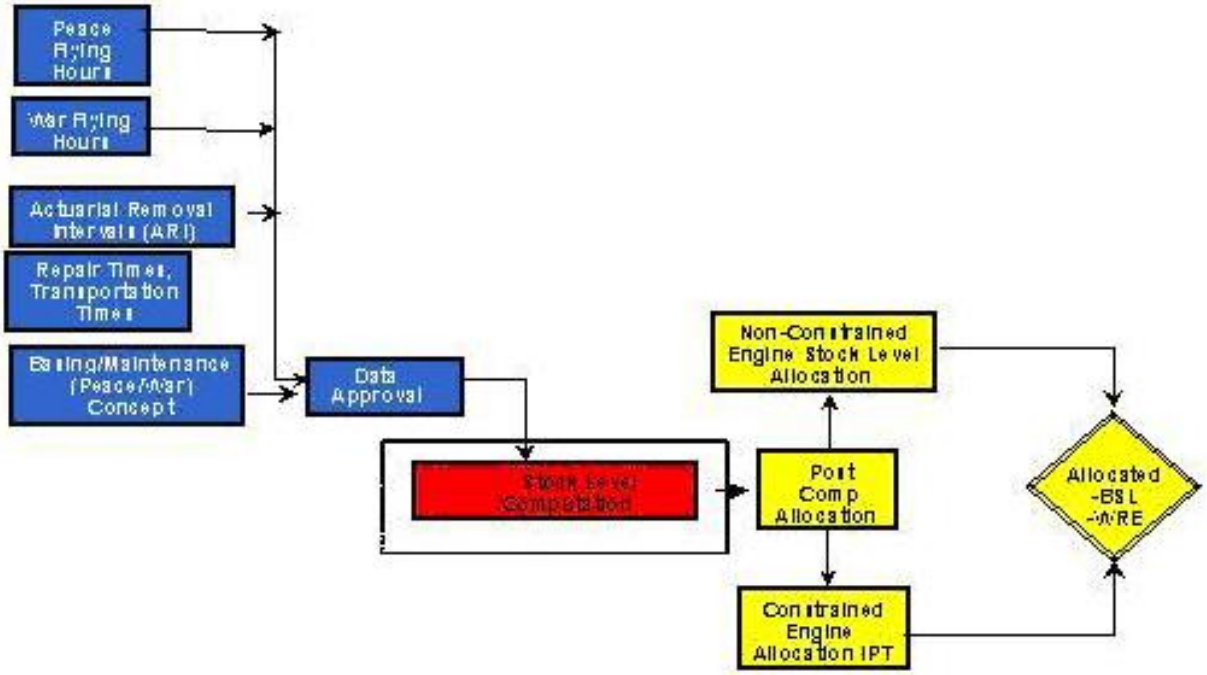
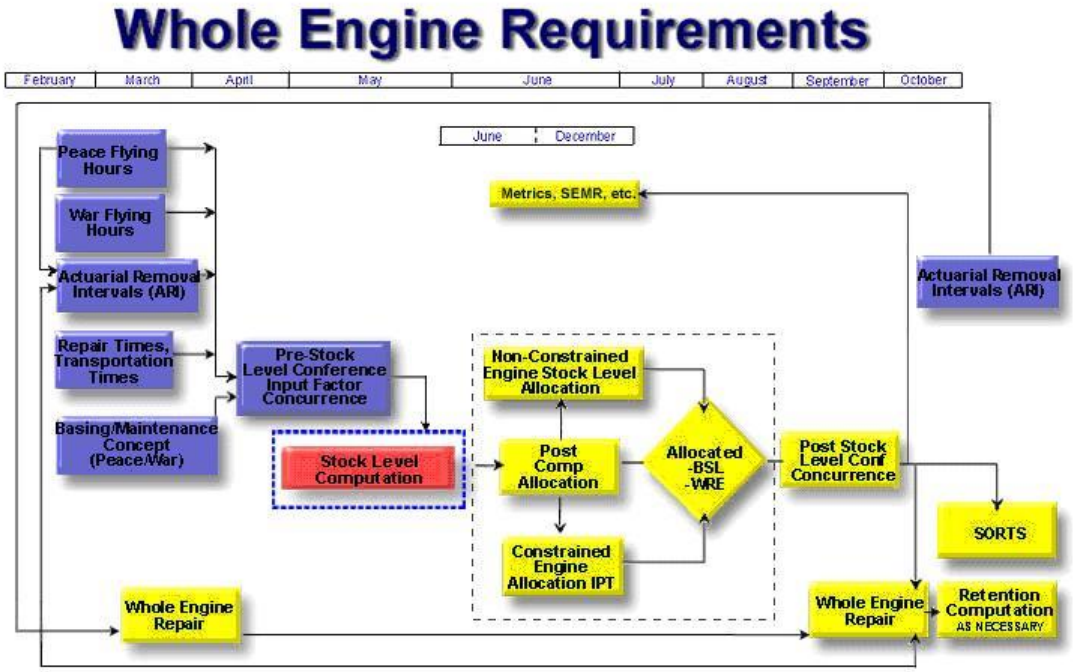


Figure 7.2. Whole Engine Requirements.



Chapter 8

RECLAMATION AND DISPOSAL

8.1. General Policy Guidance:

8.1.1. Engines are sent to reclamation only when it has been determined requirements for whole engines do not exist within DOD, and a valid FMS system support buy-out offer has been accomplished.

8.1.2. The Propulsion SM will assume control of engine assets on aircraft held in storage codes XS or XT which transfer to XX or XV. Management control of the on-wing engines will transfer to the Propulsion SM to coincide with the storage code change. The engines will then be added into the Engine Requirements Retention Computation model. The available engines can then be used to offset whole engine requirements, be put into reclamation projects, or be disposed of through Defense Reutilization and Marketing Office (DRMO). The Propulsion Single manager will be responsible for assuring all engine managers coordinate with the aircraft system program director to determine if AMARC-stored engines are needed to support aircraft mission or potential reuse and direct engine managers to dispose of engines no longer needed to support the Air Force mission, reclamation or foreign military sales.

8.1.3. The Propulsion SM's POC initiates reclamation action.

8.1.3.1. When excess engines are available, before procuring engine spare parts, the Propulsion SM will review engine reclamation programs. The Propulsion SM will review the total reclamation requirement by engine TMS. The Propulsion SM will approve or disapprove the reclamation requirements. Reclamation items will be entered into the requirements system.

8.1.4. The Propulsion SM is required to maintain visibility of their inactive engines. The Propulsion SM's POC will evaluate the need for inactive engines identified on the annual AMARC engine listing in conjunction with the annual Distribution Stock Level Computation. The Propulsion SM's POC will also be responsible for notifying AMARC officials of any disposal requirements based on this annual review.

8.2. Reporting. Engines reclaimed will be reported as losses in the CEMS DO42 database. Additionally, TMS Managers are required to provide a biannual reclamation projects report by TMS to Propulsion SM. The report should include as a minimum:

8.2.1. Engine TMS.

8.2.2. Number of engines changing storage code.

8.2.3. Engine price.

8.2.4. Cost of reclamation project.

8.2.5. Estimated cost savings against parts requisition.

8.3. General Disposal Procedures. All reclamation residue and engines for which no reclamation requirements exist will be transferred to the local DRMO activity for disposal (see AFI 23-110CD). Exceptions may apply concerning engines that have resale value to OEM. In addition, any residue resulting from engine reclamation that might be potential hazardous waste will be turned in per AFI 32-7042, Solid and Hazardous Waste Compliance and/or potential supplements or installation policies.

Chapter 9

ENGINE LEAD THE FLEET-PACER/ANALYTICAL CONDITION INSPECTION (ACI) PROGRAM

9.1. Engine Lead the Fleet: The purpose of the Lead the Fleet (LTF) and Pacer/Analytical Condition Inspection (ACI) engine programs are to determine actual distress modes of an engine and its subsystems in the field. Only by monitoring engines/modules/LRUs/SRUs in field operations can engineers understand all of the potential distress modes encountered by an engine during operational use. Once these distress modes are identified, proper maintenance planning can be conducted to allow the fleet to continue to operate safely.

9.1.1. **The Pacer Program** is an accelerated mission usage program that can assist in maturing the engines/modules and its subsystems. The Pacer program provides early intelligence on engines/modules/LRUs/SRUs integrity, reliability, and maintainability before the majority of the fleet is impacted. The program is also designed to provide engineering data and procurement lead times for orderly updating and modification of the engine, as well as for the engine controls & accessories. The Propulsion SMs, MAJCOM representatives and Pacer Committees manage the program. Pacer engines/modules/LRUs/SRUs may also be used to test flight worthy new durability hardware that has been qualified by USAF and Original Equipment Manufacture (OEM) engineering.

9.2. Pacer Program Objectives:

9.2.1. Accelerate usage of Pacer engines/modules/LRUs/SRUs ahead of the remaining fleet to identify potential premature engine component failures, enable early analysis of trends, failure modes/rates, and assist in defining the required corrective actions prior to maturity of the remaining fleet.

9.2.2. Accurately update scheduled maintenance requirements. Safely extend Technical Order hardware inspection limits.

9.2.3. Rapidly advance engine/module/accessory maximum life limits, so that they are consistent with the capability of the hardware.

9.2.4. Enable early analysis of trending data to improve planning and forecasting in procuring initial and follow-on spares.

9.2.5. Identify hardware service life deficiencies and the areas that require re-design/re-work before extensive production commitments are made and/or limited funds exhausted on obsolete hardware. Develop tasks to address design deficiencies. Generate CIP repair tasks to address wear out modes and allow for rework and re-use of hardware, reducing the need for new parts procurement. Repair procedures implemented in advance of scheduled inductions significantly reduces the maintenance cost, and benefit the commands.

9.2.6. Identify hardware life impacts on systems support costs.

9.2.7. Detect any unique durability problems that might force special scheduled inspections.

9.2.8. Evaluate the engine controls and accessories to include engine monitoring systems.

9.2.9. Provide lead-time for solving maintenance issues, developing maintenance plans, and resource provisioning.

9.2.10. Analytical Condition Inspection (ACI) programs must be closely coupled with the Pacer engines and are included in AFMCI 21-102, Analytical Condition Inspection Programs.

9.2.11. The Pacer and ACI programs support the overall ELMP.

9.3. Active Pacer Engine/Module Groups.

9.3.1. For immature fleets (<500,000 EFH) use full engines as assets for the Pacer program as designated by the Pacer committee. Pacer committees will establish Active Engine/Modules Group. The Senior Leader for Propulsion may decide if a program needs to use a different definition of mature.

9.3.2. For mature fleets (>500,000 EFH) consider using modules for Pacer program.

9.3.3. Pacer engines/modules should have roughly the same TAC/CCY per EFH, hot time per EFH, mission time/operations time, and augmentor usage per EFH as compared to the rest of the fleet. Only the number of sorties/month should be affected by its status as an active Pacer asset.

9.4. Passive Pacer Engine/Module Group.

9.4.1. Pacer committees will establish Passive Engine/Module Group.

9.4.2. Passive Engine/Module Group is comprised of engines/modules that have greater than average number of cycles, but are not members of the Active Engine/Module Group.

9.4.3. Pacer committee will consider replacing an Active Engine/Module with a Passive Engine/Module Group when an Active Engine/Module Group needs replacement due to failure or excessive maintenance down-time.

9.5. Analytical Condition Inspection

9.5.1. A program prescribed by AFMCI 21-102 to reveal defects that may not otherwise be detected through normal technical order and programmed depot maintenance inspections. It also provides the opportunity to evaluate changes to the technical orders and possible life extensions.

9.5.2. ACIs are normally required to substantiate a life limit extension. These inspection results in conjunction with historical failure data, failure mode and analysis are used to generate a safety analysis. This assessment quantifies the potential risk of the life limit increase.

9.5.3. There are two basic types of ACIs; intermediate level and depot level

9.5.3.1. **Intermediate Level**

9.5.3.1.1. Performed at the JEIM by depot and/or OEM engineering.

9.5.3.1.2. Typically performed to examine one area of the engine (e.g., hot section).

9.5.3.1.3. Depot and OEM engineering inspect the engines and record findings.

9.5.3.1.4. Excellent method to determine what is happening with a small number of engines without the downtime associated with a depot level ACI.

9.5.3.2. **Depot Level**

9.5.3.2.1. Performed at the depot or OEM overhaul facility by depot and/or OEM engineering.

9.5.3.2.2. Complete look at all parts of the engine for an extensive engineering review.

9.5.3.2.3. ACIs are performed in two primary steps.

9.5.3.2.4. Dirty layout – engine is disassembled into modules and laid out for engineering evaluation.

9.5.3.2.5. Clean layout – engine is disassembled to the piece part level and cleaned.

9.5.3.2.6. ACIs will identify potential issues with the engine design and also the possibility for extending life intervals.

9.6. Lead the Fleet/Pacer/ACI Program Management Responsibilities:

9.6.1. **Propulsion SM:**

9.6.1.1. A Pacer Committee will be formed in the early stages of the Pacer Program, chaired by the responsible Propulsion SM or designated representative, with membership from the TMS management teams, MAJCOM/A4M, OEM, and other individuals/agencies designated by the committee chair.

9.6.1.2. Committees will establish meeting frequency. In order for meetings to be effective full participation from all members is required. Where possible, meetings should be held in conjunction with Component Improvement, Logistics Planning Conference, User's Conference or Maintenance Planning Working Group meetings.

9.6.1.3. Assist the MAJCOM/A4Ms in distributing Pacer engines evenly among the operational squadrons to ensure full range of missions and environments are encountered by the Pacer fleet.

9.6.1.4. Determine and establish predetermined intervals for engines/modules brought in for ACI to assess the condition of the engines/modules.

9.6.1.5. Implement, monitor, and manage the overall Pacer Program and work through the Pacer Committee to secure decisions and make changes to the program.

9.6.1.6. Designate a primary and alternate Pacer program monitor for each engine type.

9.6.1.7. Ensure that contractual and financial vehicles are in place to accomplish ACIs.

9.6.1.8. Secure appropriate funding from MAJCOMs/CAM office to support ACIs unless otherwise stated (e.g., MOA, etc.).

9.6.1.9. Assure that all Pacer assets are processed expeditiously through the depot. This includes priority processing for normal maintenance as well as ACIs

9.6.1.10. Coordinate all parts requisitions for backordered parts with the individual unit monitor. The requisition number, part number, national stock number, and quantity of

each item required will then be handled through the individual item managers for expedited shipment to the requesting unit.

9.6.1.11. Preview trending data from Pacer engines/modules/LRUs/SRUs. Provide the logistics community with the results of the ACI to allow provisioning within lead-time for supportability of findings.

9.6.1.12. Request supply Project Codes from HQ AFMC for Pacer part requisitions.

9.6.1.13. Draft memorandum of agreements between using MAJCOM/A4Ms, describing Pacer Program management and responsibilities. MOAs will be reviewed every 2 years or as changes require for currency.

9.6.1.14. Coordinate with participating field units to schedule the latest TCTO configurations to be installed at the earliest opportunity after TCTO release on all Pacer engine/ components.

9.6.2. **MAJCOMs:**

9.6.2.1. Designate a primary and alternate Pacer program monitor for each engine type. These individuals will be members of the Pacer Committee.

9.6.2.2. Assist the Pacer program committees in designating units who will be required to participate in the Pacer Program and all related meetings.

9.6.2.3. Assure that participating field unit requirements are met.

9.6.2.4. Provide assistance, as required, to depot Propulsion SMs, OEM, and field units to conduct the Pacer Program.

9.6.2.5. Assure that participating field units are aware of program requirements and direct efforts to meet these goals.

9.6.2.6. Assure that Pacer Program monitoring systems and policies are established at the appropriate numbered Air Force units and participating field units.

9.6.2.7. Provide assistance, as required, to the depot and field units for conducting the Pacer Program.

9.6.3. **Participating Field Units:**

9.6.3.1. Strive to accelerate pacer engines at twice the normal flying rate until the engine/modules/accessories are, at a minimum, two years ahead of the top 10% (high time) fleet engines. The engines/modules/accessories are then to continue leading the fleet by two years. The goal of ~~"t~~wice the normal flying rate" will be calculated by doubling the average monthly total operating time for the squadron's passive engines. As a minimum, the field units should fly the Pacer engines at least 2x the unit fleet average per month or the set goal determined by the TMSM PACER committee to achieve and maintain the desired lead time over high time passive engines.

9.6.3.2. Publish local instructions that, as a minimum, establish scheduling, maintenance, records keeping functions, parts requisition procedures, and reporting procedures for Pacer engines/modules/LRUs/SRUs.

9.6.3.3. Maintenance Group Commanders will designate a primary and alternate Pacer Program monitor. Unit monitors and alternates will be identified to MAJCOM and engine program manager via email/formal message to include name, rank, organization, phone number, and e-mail. Pacer Program monitors will be established in both organizational and intermediate units. Their function will be to ensure Pacer engines/modules/LRUs/SRUs receive priority attention and all maintenance actions are properly documented. Pacer monitor representatives will be appointed and briefed on their responsibilities prior to deployment.

9.6.3.4. Units will establish maintenance management procedures to ensure Pacer engines/modules/LRUs/SRUs are dedicated to the flying schedule to the maximum extent possible. Measures to ensure Pacer engines/modules/LRUs/SRUs meet set goals/standards are: Pacer engine status presented at weekly maintenance meeting. Pacer engines removed from any aircraft that is down for maintenance more than 10 duty days should be reinstalled into an aircraft active in the flying schedule.

9.6.3.5. The applicable TMS manager will be notified immediately when accessories or major components are removed for maintenance. Removal of major components from a Pacer engine for cannibalization to another engine or consideration of the Pacer engine's maintenance waivers for continued service requires prior approval of the Propulsion SM.

9.6.3.6. Field units will clearly mark all Pacer Program assets being returned to the depot or to the contractor. The reason for removal and a description of the defects noted will be included. Engine specific Pacer Project Code will be used when requisitioning and shipping assets.

9.6.3.7. Pacer components will be requisitioned through normal supply channels. When components are requisitioned, unit Pacer monitors will contact applicable TMS manager and give part number, national stock number, quantity, and requisition number (off-base requisition number).

9.6.3.8. Replacement of Pacer engine parts and/or components with earlier released versions is not authorized without prior approval of the Propulsion SM.

9.6.3.9. TMS managers will report monthly status of their Pacer engine/modules/LRUs/SRUs to their MAJCOM/A4M and Propulsion SM. Reports are due by the 7th duty day of each month. Reports will include, but not limited to, engines/modules/LRUs/SRUs serial number, average TACs accumulated for the wing, TAC's accumulated (Month & Total) for the Pacer engines/modules/LRUs/SRUs, any maintenance performed on the Pacer engines/modules/LRUs/SRUs and a brief explanation why the engines didn't meet the desired flying goal. Pacer Committee will determine any additional reporting requirements.

9.6.3.10. Provide assistance (manpower, facilities, and expendables) in performing Mini-ACIs. The mini-ACI permits a quick turnaround on engines that do not require a complete teardown. Requested ACI support shall be within the capabilities of each field maintenance unit. When mini-ACI is to be performed at intermediate level, contact the MAJCOM committee member and Propulsion SM for a list of expected parts fall out, and requisition accordingly.

9.6.4. **Original Equipment Manufacture:**

9.6.4.1. Provide a person for the Pacer Committee.

9.6.4.2. Contractor field service representatives will monitor Pacer activity and provide technical assistance upon request by host base.

9.7. Forms Adopted.

9.7.1. Adopted Forms. DD Forms 1348-1A, Issue Release/Receipt Document, and DD Form 1149, Requisition and Inventory Shipping Document.

9.7.1. **(LITTLEROCKAFB)** Forms Adopted: AF Form 1534, *CEMS CDB Report* and AFTO Form 95, *Significant Historical Data.*

9.7.2. **(Added-LITTLEROCKAFB)** Forms Prescribed: LRAFB IMT 6A, *C-130E/H Equipment Change Sheet* and LRAFB IMT 6B, *C-130J Equipment Change Sheet.*

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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

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Abbreviations and Acronyms

LM—Two Level Maintenance

ACI—Analytical Condition Inspection

AEL—Aerospace Engine Life

AFCAIG—Air Force Cost Analysis Improvement Group

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFMC—Air Force Materiel Command

AFPD—Air Force Policy Directive

AFRC—Air Force Reserve Command

AFRL—Air Force Research Laboratory

AFSC—Air Force Safety Center

AFTOC—Air Force Total Ownership Cost

AGM—Air-to-Ground Missile

ALC—Air Logistics Center

AMARC—Aerospace Maintenance and Regeneration Center

AMT—Accelerated Mission Test

ANG—Air National Guard

ARI—Actuarial Removal Interval

ATOW—Average Time on Wing

BSL—Base Stock Level

CAF—Combat Air Forces

CEM—Command Engine Manager

CEMS—Comprehensive Engine Management System

CERP—Centralized Engine Rotable Pool

CII—Configured Item Identifier

CIP—Component Improvement Program

CIRF—Centralized Intermediate Repair Facility

CLS—Contractor Logistics Support

COE—Center of Excellence

CONUS—Continental United States

CPEFH—Cost Per Engine Flying Hour

DCS—Deputy Chief of Staff

DOD—Department of Defense

DODI—Department of Defense Instruction

DoP—Director of Propulsion

DPEM—Depot Purchased Equipment Maintenance

DRMO—Defense Reutilization and Marketing Office

DR—Deficiency Report

DSD—Data System Designator

EAB—Engine Advisory Board

ECMS—Engine Configuration Management System

EFH—Engine Flying Hours

EHM+—Engine Health Management Plus

EHMS—Engine Health Management System

EIM— Engine Item Manager

ELM—Engine Life Management

ELMP—Engine Life-cycle Management Plan

ENMCS—Engine Non Mission Capable Supply

EPM—Engine Program Manager

ERLOA—Engine Related Loss of Aircraft

ERRB—Engine Requirement Review Board

ERO—Engine Review Organization

ET&D—Engine Trending and Diagnostic

ETOC—Engine Total Ownership Cost

ETOW—Expected Time On Wing

FMS—Foreign Military Sales

FOD—Foreign Object Damage

FOL—Forward Operating Location

FOM—Facilitate Other Maintenance

FSC—Federal Stock Class

FSP—Forward Supply Point

GLSC—Global Logistics Support Center

IPT—Integrated Product Team

JEIM—Jet Engine Intermediate Maintenance

JPCC—Joint Propulsion Coordinating Committee

LRU—Line Replaceable Unit

LSCC C2— Logistics Support Center C2

LTF—Lead The Fleet

MAF—Mobility Air Forces

MAJCOM—Major Command

MDS—Mission Design Series

MIL-STD—Military Standard

MOA—Memorandum of Agreement

MPWG—Maintenance Planning Working Group

MSD—Maintenance Support Division

MTBR—Mean Time Between Removals

NDI—Non-Destructive Inspection

NMCS—Non Mission Capable Supply

NRIFSD—Non Recoverable In-Flight Shut Down

NRTS—Not Reparable This Station

OC-ALC—Oklahoma City Air Logistics Center

OCONUS—Outside Continental United States

OEM—Original Equipment Manufacturer

O&M—Operations and Maintenance

OSS&E—Operational Safety, Suitability and Effectiveness

PA—USAF Program Aerospace Vehicle Flying Hours

PACS—Propulsion Actuarial Client Server

PAFM—Propulsion Actuarial Forecasting Model

PB—President’s Budget

PD—USAF Program Installations, Units, and Priorities

PEO—Program Executive Officer

PMR—Program Management Review

POC—Point of Contact

POM—Program Objective Memorandum

PQDR—Product Quality Deficiency Report

PRS—Propulsion Requirements System

PSMP—Product Support Management Plan

PST—Propulsion Safety Threshold

QEC—Quick Engine Change

RCM—Reliability Centered Maintenance

RDAT—Requirements Daily Answer Tape

RDS—Records Disposition Schedule

RDT&E—Research, Development, Test and Evaluation

RE21— Repair Enterprise for the 21st Century

REALM—Requirements/Execution Availability Logistics Module

REMIS—Reliability and Maintainability Management Information System

R&M—Reliability and Maintainability

RM&D—Reliability, Maintainability, and Durability

SAE—Society of Automotive Engineers

SAF—Secretary of the Air Force

SAM—Sustainability Assessment Module

SDD—System Development and Demonstration

SE—Support Equipment

SER—Scheduled Engine Removal

SIPRNET—Secret Internet Protocol Router Network

SM—Single Manager

SORTS—Status of Resources and Training

SPM—System Program Managers

SPO—System Program Office

SRAN—Stock Record Account Number

SRRB— System Review Requirement Board

SRU—Shop Replaceable Unit

SVR—Shop Visit Rate

TCTO—Time Compliance Technical Order

TDR—Tear-Down Deficiency Report

TMS—Type, Model and Series

TMSM—Type, Model, Series and Modification

TO—USAF Technical Order

TOW—Time On Wing

TSR—Target Serviceable Requirement

UER—Unscheduled Engine Removal

UMMIPS—Uniform Material Movement and Issue Priority System

USAF—United States Air Force

WMP—War and Mobilization Plan

WRE—War Reserve/Readiness Engines

WSMIS—Weapon System Management Information System

Terms

Acquisition Stock Level Computation Process—The acquisition stock level computation process determines the number of whole spare engines required to be procured in support of each MDS/TMS.

Actuarial Removal Interval (ARI)—Factor that is the number of flying hours per scheduled and unscheduled removals for any maintenance level. ARIs are inputs into the overhaul and retention computations.

Aerospace Engine Life (AEL) Committee—Group whose purpose is to validate/review changes to factors used in developing ARI tables. Factors affecting the assessment are: engine reliability, weapon system employment and maintenance philosophies

Average Time On Wing (ATOW)—This metric will be reported in the ELMP, the annual ELMP review and elsewhere. ATOW is the fundamental indicator of an engine's reliability.

The formula for ATOW is:

ATOW = ∑ EFH removed engine / # removals

Command Engine Manager (CEM)—The focal point for engine management matters for the assigned command.

Comprehensive Engine Management System (CEMS)—This system provides WSMIS/SAM (D087C) with inventory data (both on hand and authorized), Family Group Codes, and Engine MS, to accomplish integrated unit level assessments for the Status of Resources and Training Systems (SORTS)

Cost Per Engine Flying Hour (CPEFH)—A flying hour metric for an engine TMS. The values for calculating CPEFH are a subset of the cost categories obtained from the Engine Cost Analysis Improvement Group (CAIG) product of the AF total ownership cost database. CPEFH will include all Federal Stock Classes (FSC)s specific to engine expenses, e.g., 28 and 29, made by flying units in Element of Expense/Investment Category Code (EEIC) 64402 (flying hour spares) and consumption data (MSD, EEIC 644 & General Supply Division (GSD), EEIC 609) for parts needed to repair engines. The formula is (MSD plus GSD)/(aircraft flying hours x installed engines).

Constrained Engines—When computed spare engine requirements exceed total available spare engine inventory.

Current Factors—The current engine actuarial and pipeline factors developed from actual operational experience. (TO 2-1-18).

Distribution Stock Level Computation—The computation that determines the whole spare engine requirements for using MAJCOMs and ALCs.

Director of Propulsion (DoP)— Develops/deploys policy, guidance, processes and coordinates propulsion activities for organizations with execution responsibilities for Air

Force aircraft and missile turbine engine acquisitions, sustainment, test, and R&D activities.

Engine Health Management Plus(EHM+)—EHM+ is a program integrating hardware, software, maintenance, processes and people to diagnose, quantify and monitor engine health. Engine Health Management is performed at the unit level, base level, MAJCOM level, product centers and depot level.

Engine Health Management System (EHMS)—The EHMS is a suite of tools used to perform/execute Engine Health Management. EHM Systems are comprised of various hardware and software components, including but not limited to, on-board aircraft and engine data collection devices and test cell data collection devices. Additional data sources may include, but are not limited to, maintenance and oil analysis data available from other data systems. EHM Systems use a variety of software applications on ground-based computers to process data and diagnose and monitor engine health.

Engine Total Ownership Cost (ETOC)—Provides total cost to operate an engine type. The formula is (Depot Level Reparables (DLR) (fly) + GSD + Depot Purchased Equipment Maintenance (DPEM) + 0 Level labor + I Level labor)/engine flying hours. Future includes mod, CIP, 3400, CEMS feed into ETOC. Source is Air Force Total Ownership Cost (AFTOC) database. ETOC is a subset of engine cost categories contained in the Cost Analysis Improvement Group (CAIG).

Expected Time on Wing (ETOW)— ETOW is the projected average time on wing expected to result from application of a specific maintenance workscope to a specific engine. ETOW is calculated from the statistical distribution of times on wing predicted for a specific engine build. ETOW is a forward looking indicator, as opposed to ATOW which is a historical indicator.

Factor—A value used in computing requirements and doing assessments. Factors are developed for peace (readiness), and for war (surge and sustained).

Forecasted Factors—Factors developed which predict what the official factors will be when the engine has reached stability. Engine stability on most development programs is achieved by 0.75 to 1.0 million engine hours of fleet operation or 5 to 7 years of operation. Forecast factors are used to predict the total number of engines required to support the weapons system throughout its life cycle.

Jet Engine Intermediate Maintenance (JEIM)— **Intermediate** level maintenance facility.

JEIM Return Rates—The percentage of engines that will be repaired and returned to service by the JEIM (TO 2-1-18).

Life—of-Type Buy (Buyout)—Acquisition of enough total spares required to support the entire planned weapons system's life cycle prior to ceasing engine production.

Mission, Design, and Series (MDS)—Standard nomenclature for both aircraft and missiles.

Non—Constrained Engines—When total spare engine inventory meets or exceeds computed spare engine requirements.

Non—Usage Removal—An engine removal which is management directed for required maintenance action.

Not Repairable This Station (NRTS)—Percent of engine repairs not accomplished at an operating units' repair location.

Operating Unit—A term used in determining requirements. Defined as the lowest level tasked in planning documents for independent deployment or operational capability.

Peacetime Assets—Assets for day-to-day peacetime operations.

Propulsion Requirements System (PRS)—(WSMIS/REALM/PRS (D087Q)) is the Air Force standard system for the computation of:

a. Whole engine stock levels for both acquisition and distribution.

b. Overhaul requirements.

c. Retention requirements.

PRS must provide WSMIS/SAM (D087C) with the computational data needed to assess whole engines and modules for SORTS.

Propulsion Safety Threshold (PST)— A risk management term used to refer to the DoP defined Risk Thresholds for Non-Recoverable In-flight engine Shutdown (NRIFSD) and Engine Related Loss of Aircraft (ERLOA). It is used to determine if/when corrective action is necessary to reduce risk to an acceptable level.

Quick Engine Change (QEC) Kit—Externally mounted components needed to adapt and install the engine to the weapon system.

Repair Enterprise 21— (RE21): Centralized management of all like item repair functions maximizing synergistic benefits and focuses on increasing the velocity of the repair and distribution process to satisfy pipeline requirements. RE21 establishes a single enterprise-wide organic repair network, encompassing all Sources of Repair (SOR), for selected engines managed by a single supply chain, providing optimum support to the war-fighter.

Reparable Engines—An engine requiring maintenance action before being a serviceable asset.
Requirements Computation Periods:

a. **Peace**: Computes spare assets needed for readiness capability.

b. **War Surge**: Computes spare engine assets needed to sustain the war effort until pipelines are filled and repair facilities are available.

c. **War Sustained**: Spare engine assets needed to sustain the war effort for a long duration.

Retrograde— The time it takes an engine or item to be returned from the operating unit to source of repair.

Scheduled Engine Removal (SER)—A planned engine removal due to required maintenance actions.

Scheduled Maintenance—Periodic prescribed inspection and/or servicing of equipment accomplished on a calendar, cycles, or hours of operation basis.

Serviceable Engine—An engine ready to be built-up or installed.

Single Manager (SM)— The single face to the customer for a system or product group. The SM directs one or more programs and is accountable to the Program Executive Officer or Designated Acquisition Commander.

SRAN Engine Manager—Manages all engines possessed by the SRAN and is responsible for CEMS reporting.

Sustainability Assessment Module (SAM)—SAM predicts the combat capability of tactical, strategic, and airlift weapon systems for a given set of operations plans, logistics assets, and logistics performance factors. SAM provides insight into how well the on-hand-logistics resources (spares, engines, and consumables) support the wartime tasking. SAM also identifies potential logistics limitations (i.e., resources and processes) which need to be improved to increase the probability that required performance levels will be met.

Target Serviceable Requirement (TSR)—For combat coded units, TSR is equal to the WRE quantity; for non-combat coded units, TSR may be the portion of the computed peacetime requirement that is necessary to be serviceable in support of special requirements.

Type, Model, Series Modification (TMSM)—Standard nomenclature for engines according to MIL-STD-879.

Unscheduled Engine Removal (UER)—An unplanned engine removal due to failure or malfunction.

Unscheduled Maintenance—Unplanned maintenance actions required.

War Readiness Engines (WRE) Levels—The quantity of net serviceable engines required to sustain an operational unit's war effort until pipelines are filled and repair facilities are available.

Attachment 1 (LITTLEROCKAFB)

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

***Abbreviations and Acronyms* (Added)**

CDB – Central Database

SI – Special Inspection

TCI – Time Change Item

TDY – Temporary Duty

Attachment 2

COMPUTATION OF ENGINE REPAIR REQUIREMENT

Figure A2.1.

ENGINE OVERHAUL REQUIREMENTS COMPUTATION

ENGINE TYPE, MODEL AND SERIES	A/C MISSION DESIGN AND SERIES	FLYING HOUR PROGRAM	DATE OF PROGRAM

Line		Begin	FY01-4	FY02-1	FY02-2	FY02-3	FY02-4	FY03-1	FY03-2	FY03-3	FY03-4	FY04	FY05	FY06	FY07
1	Engine Hours - Peace														
2	ARI Factor Table Date														
3	Usage Change		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	Base Stockage Obj														
5	Safety Level Req														
6	Total Stockage Req		0	0	0	0	0	0	0	0	0	0	0	0	0
7	Asset Variance														
8	Serv Oblig - Loss														
9	Serv Oblig - Other														
10	Gross Overhaul Req		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
11	Proj Serv Receipt														
12	Net Overhaul Req		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
13	Current Schedule/Adj Req														
						0				0					

	Gen.	Ship
FY01/1		
FY01/2		
FY01/3		
	0	0

NOTES:

COMPUTED BY:	ENGINE INVENTORY MANAGER:	ANALYZED BY:	APPROVED BY:

AFMC FORM 538 COMPUTER GENERATED

A2.1. (Line 1) Engine Hours – Peace: The whole engine repair requirements computation begins with the flying hours for the engine and Major Command (MAJCOM) being projected. These flying hours represent the peacetime flying hours projected for the engine and are based on the PA tape received from Air Staff.

A2.2. (Line 2) ARI Factor: For the purposes of calculating the whole engine repair requirement, only the Overhaul Removal Interval (OHRI/WMT) is used. The OHRI/WMT reflects the average number of flying hours between engine overhauls and/or 2-Level Maintenance (2LM) repairs which both occur at a depot or contractor facility.

A2.3. (Line 3) Usage Change: The result of this calculation (Line 1 divided by Line 2) represents the usage changes for overhaul and/or 2LM action for the engine for the computed period.

A2.4. (Line 6) Total Stockage Requirement: In addition to the whole engines required to support the projected flying hour program, a certain number are needed to maintain a certain stock level for the applicable MAJCOM. This total stockage level is comprised of a Base Stock Level (BSL) objective and the depot safety level requirement:

A2.5. (Line 4) Base Stockage Objective: The BSL objective represents the number of engines a MAJCOM is required to have available or ~~"in~~ stock" at their installations. BSL can be either

computed by the Propulsion Requirements System (PRS) or negotiated by the engine ALC EIM and MAJCOM

A2.6. (Line 5) Safety Level Requirement: The safety level represents the number of engines a MAJCOM is required to maintain over and above their BSL to support the unevenness of generations. These are usually maintained at the depot/repair facility.

A2.7. (Line 6) Beginning Inventory (line 6, 1st Column): The beginning inventory represents the adjusted MAJCOM spare asset position at the end of the period prior to the time frame being computed.

A2.8. (Line 7) Asset Variance: The total stockage requirement is compared to the assets on hand or projected to be on hand at the beginning of the period being calculated (end of the previous quarter). The delta between the requirement and the beginning inventory represents the additional engines that must be repaired to maintain the stock level. If more engines are in the inventory at the beginning of a computation period than are required to meet the stock level of the MAJCOM, these assets can be used to offset either the flying hour requirement or other obligations. This calculation will normally only result in a delta during the first quarter of the computation or of a fiscal year since a new BSL is only established once a year.

A2.9. (Lines 8 and 9) Serviceable Obligation–Loss and Serviceable Obligation–Other: Engines may also be obligated for other uses which will increase the overhaul requirement. Service Obligation–Loss refers to those serviceable assets that have been obligated to another use such as a training requirement or a FMS customer. Service Obligation–Other represents those serviceable assets that have been obligated to another service within the DoD, payback to another MAJCOM, Programmed Depot Maintenance (PDM), etc.

A2.10. (Line 10) Gross Overhaul Requirements: The Gross Overhaul Requirement is calculated using the sum of the following:

A2.10.1. The engines need to support the peacetime flying hour program (Line 3).

A2.10.2. The assets needed to cover the difference between the BSL plus safety requirements and the inventory on hand at the beginning of the period being computed. (Line 7).

A2.10.3. The engines obligated by the MAJCOM for another use (Lines 8 and 9).

A2.11. (Line 11) Projected Serviceable Receipts: Prior to the calculation of the final (net) overhaul output requirement, the Gross Overhaul Requirement is offset by any serviceable assets the MAJCOM expects to receive from any source (e.g., new production, return of low time assets from AMARC, etc.).

A2.12 (Line 12) Net Overhaul Requirements: The net overhaul requirement is the Gross Overhaul Requirement (Line 10) offset by the Projected Serviceable Receipts (Line 11). This requirement represents the number of engines that must be available as output from the depot level repair facility to satisfy all of the MAJCOMs requirements for that engine during the period.

A2.13. (Line 13) Current Schedule/Adjusted Requirements: This requirement considers any adjustment between the current scheduled production and the repair requirement. In the first quarter, enter the current project directive (or contract) negotiated output quantity. Compare this quantity with the figure on line 12. If the current schedule is greater than line 12, subtract the

overage from the next quarter entry on line 12 and enter the result. Continue until the overage is absorbed. If the current schedule is less than the figure on line 12, the shortage will be added to the next quarter line 12 requirement. After the initial adjustment has been accomplished, lines 12 and 13 will be equal. These quantities become the Adjusted Requirement. This number serves as the basis for the negotiation process and is eventually converted to the number of engines that must be input into the repair pipeline. The input requirement is what is ultimately converted to a dollar requirement for publication into the DPEM Brochure.

Attachment 3

ENGINE HEALTH INDICATORS

A3.1. General Information: This information applies to all DoP portfolio engine programs. It defines the engine health indicators that will be used for propulsion systems health reporting and explains the criteria for evaluating these metrics. The objective of this instruction is to drive a desired program behavior with standardized engine metrics, providing leadership a comprehensive overview of readiness and sustainment issues. The metrics and indicators are organized by the capability or attribute that they are intended to measure.

A3.1.1. **Secondary Notes:**

A3.1.1.1. Each Metric/Indicator is divided into four sections:

A3.1.1.1.1. Metric Objective

A3.1.1.1.2. Metric Description

A3.1.1.1.3. Metric Methodology

A3.1.1.1.4. Metric Interpretation

A3.1.1.1.4.1. Those metrics that have established goals will display stoplight indicators on the same page as the graph and support data. The goals will be generated for each Type Model Series Modification (TMSM, i.e. engine type). The stoplight indicators cover the current reporting period, however, stoplight indicators for future periods are subjective assessments and require management decision.

A3.1.1.1.4.2. Some metrics provide a historical trend and will not be assigned a goal and relevant stoplight indicators.

A3.2. Safety:

A3.2.1. **Engine System Safety (ESS**):

A3.2.1.1. **Metric Objective**: The Engine System Safety metric is a composite over-arching measurement of safety risk for a given TMS. ESS tracks all the safety issues on each TMS and establishes an overall system risk related to the individual risk of each identified safety issue. The goal of risk management of aircraft gas turbine engines is to help to maintain highly reliable and effective engines while minimizing flight safety and operational impacts. The goal of the ESS metric is to minimize flight safety.

A3.2.1.2. **Metric Description:** The ESS metric tracks all known safety issues for a given TMS. The issues identified by this metric are those that are identified by the Gas Turbine Engine Risk Management Process, detailed in the Propulsion Center of Excellence, Best Practice manual, BP 99-06, Revision A.

A3.2.1.2.1. A safety issue can be identified from a number of sources, to include, Deficiency Reports (DR), In-flight Shutdowns (IFSD), Non-Recoverable In-flight Shutdowns (NRIFSD), Engine Related Loss of Aircraft (ERLOA), test and evaluation, research and development, field, overhaul, and mishaps.

A3.2.1.2.2. Once identified, the issue is assessed for its relative risk.

A3.2.1.2.3. Assessed risk can then be mitigated through several different methods, to include material changes, process changes and maintenance/inspection practices. Each risk mitigation action is tracked via the ESS metric.

A3.2.1.3. **Metric Interpretation:** The ESS presents the number of known safety issues, grouped according to their risk color code defined by PCOE BP 99-06, Appendix B, and presented in a stacked bar chart posted quarterly for each TMS.

A3.2.1.3.1. Each Individual Safety Issue is assigned a stoplight indicator of Red, Yellow, or Green according to its assessed risk level and its related risk mitigation actions. TMS's that have 1 or more red issues are scored an overall engine safety status score of red. TMS's that have zero red issues but 1 or more yellow issues are scored an overall score of yellow. TMS's that have zero red issues and zero yellow issues are considered green.

A3.2.2. **Non-Recoverable In-Flight Shut-Down (NRIFSD**):

A3.2.2.1. **Metric Objective**: This safety indicator allows quarterly trending of NRIFSD rate for a given TMS. Action required when for exceeding established the PST on this indicator can be found in PCoE BP 99-06, Aircraft Gas Turbine Engine Flight Safety Risk Management Process. The goal of this metric is to minimize the NRIFSD rate.

A3.2.2.2. **Metric Description**: Any engine shutdown in-flight, either due to an engine malfunction or by the aircrew following flight manual procedures whereby: The engine is unable to restart, or further investigation determines that a restart attempt would not have been successful, or further investigation determines that continued operation would have caused the engine to fail, or the aircraft cannot maintain level flight at a safe altitude as determined by the situation. (AFI 91-204, *Safety Investigations and Reports*, 14 Feb 2006)

A3.2.2.3. **Metric Methodology**: NRIFSD rate is calculated as the number of NRIFSD in the fleet within a time interval divided by the EFHs within the same interval, multiplied by 100,000. This metric will show the 6 quarter rolling average and a cumulative value for each quarter of the fiscal year. Number of NRIFSD is defines as the NRIFSD rate within a time interval times the EFHs within the same interval divided by 100,000.

A3.2.3. Engine Related Loss of Aircraft (ERLOA):

A3.2.3.1. **Metric Objective**: This safety indicator allows quarterly trending of ERLOA for a given TMS. Action required when for exceeding established the PST on this indicator can be found in PCoE BP 99-06, Aircraft Gas Turbine Engine Flight Safety Risk Management Process.

A3.2.3.2. **Metric Description**: An engine related mishap resulting in destruction of an Air Force aircraft.

A3.2.3.3. **Metric Methodology**: ERLOA is calculated as the number of engine related loss of aircraft in the fleet life per 100,000 engine flying hours. ERLOA will show the 6 quarter rolling average and cumulative value per quarter for each fiscal year. Mishap data is obtained from the AFSAS database maintained by the USAF Safety office.

A3.3. Availability:

A3.3.1. **War Readiness Engine (WRE):**

A3.3.1.1. **Metric Objective:** To determine if there are sufficient serviceable spare engines to support the Air Force wartime mission.

A3.3.1.2. **Metric Description:**

A3.3.1.2.1. War Readiness Engines (WRE): The number of net serviceable engines available to support the Air Force's war tasking. These engines are to be available to support a weapon system from the start of the war until re-supply (via base, intermediate and /or depot repair) is established.

A3.3.1.2.2. Required WRE: WRE determined by the completed Propulsion Requirements System process to support a worst case Air Force war tasking. (Required WRE is determined with the Propulsion Requirements System (PRS) Distribution computation)

A3.3.1.2.3. Allocated WRE: WRE established when there are insufficient assets or other constraints to support Required WRE; or established to support an increase to Required WRE when additives and/or Target Serviceable Requirements (TSR) are applied to the Required WRE. Available assets are allocated against the requirement. This quantity is determined by the Engine Allocation Integrated Process Team, which is chaired by the Lead Command with members from all using MAJCOMs.

A3.3.1.2.4. Non-combat coded units utilize a Target Serviceable Requirement (TSR) instead of WRE. TSR values will be treated like WRE requirements and follow established goals like WRE.

A3.3.1.3. **Metric Methodology:**

A3.3.1.3.1. Data for computing the WRE metric can be found in the Propulsion Automatic Re-supply Report in CEMS. Any new CEMS users can contact the CEMS office at Tinker AFB (448 CBSG/PE) to start a new account and obtain CEMS educational opportunities or introductory briefings. CEMS website is;

https://cews.tinker.af.mil/.

A3.3.1.3.2. Basic instructions for navigating to the Propulsion Automatic Re-supply Report. At the primary menu press:

"B" for Browse a Product; hit [ENTER] then
"C" for DO42C Automatic Re-supply Products; hit [ENTER] then
"3" (C004) for the Automatic Resupply Report
hit [ENTER] (if you ever see *** then hit [ENTER])

A3.3.1.3.3. WRE (Weekly Snapshot) = Total WRE – RAW + Total Serviceable Due In

NOTE: Serviceable Due Ins must be in a SB status = Serviceable Built Up
Obligations to base possessed aircraft are already excluded in the net serviceable computation. Obligations to Depot possessed aircraft will also be excluded for those aircraft in depot that exceed the base level Backup Aircraft Inventory (BAI).

A3.3.1.3.4. WRE (Monthly Average) = $\frac{\text{Sum of Weekly Snapshots}}{\text{Number of Weeks in Month}}$

A3.3.1.3.5. WRE (Quarterly Average) = $\frac{\text{Sum of Monthly Averages}}{3}$

A3.3.1.4. **Metric Interpretation:** Constrained programs use Allocated levels and unconstrained programs use Required levels.

Green: WRE is greater than or equal to Allocated or Required WRE. There are enough serviceable spare engines to meet a worse case war mission.

Yellow: WRE is less than the Required WRE and greater than or equal to the Allocated WRE. The ALC/Product Center and MAJCOM operating units are meeting their allocated supportability level.

OR
A subjective assessment of yellow may be given based on other supportability issues even though WRE meets or exceeds Required WRE.

Red: WRE is less than the Required or Allocated WRE. If there is no Allocated WRE value and WRE is less than Required WRE then a color rating of red applies. The ALC/Product Center and MAJCOM operating units are not meeting their Required/Allocated supportability levels.

***NOTE*:** In the event the Allocated WRE is set ABOVE the Required level, color ratings are:

Green: At or above the ALLOCATED level

Yellow: Below the ALLOCATED level but at or above the REQUIRED level

Red: Below the REQUIRED level

A3.3.2. **Base Stock Level (BSL):**

A3.3.2.1. **Metric Objective:** To determine if there are sufficient spare engines to support the Air Force peace and war mission to an 80% ready rate for combat coded units and a 70% for non-combat coded units.

A3.3.2.2. **Metric Description:**

A3.3.2.2.1. Engine Base Stock Level (BSL) is the number of spare engines (serviceable and unserviceable) required at the bases to support the Air Force mission (both peace and war) to an 80% ready rate for combat coded units and a 70% ready rate for non-combat coded units.

NOTE: WRE is a subset of BSL

A3.3.2.2.2. Required BSL: BSL determined by the completed Propulsion Requirements System Process to support the Air Force mission (both peace and war)

to an 80% ready rate for combat coded units and a 70% ready rate for non-combat units. (Required BSL is determined with DISTRIBUTION computations).

A3.3.2.2.3. Allocated BSL: The BSL established due to insufficient assets or other constraints to support of the Required BSL. Available assets are allocated against the requirement. This quantity is determined by the Constrained Engine Integrated Process Team, which is chaired by the Lead Command with members from all using MAJCOMs.

A3.3.2.2.4. On Hand: Actual number of spare engines at the bases that are available to count against the BSL, including engines in-transit to the base (both repairable and serviceable). The ON Hand in this metric is the average for the quarter.

A3.3.2.3. **Metric Methodology**:

A3.3.2.3.1. Data for BSL Computations can be found in the Propulsion Automatic Re-supply Report in CEMS. Refer to WRE section for CEMS navigation.

A3.3.2.3.2. Metric Computations: On Hand BSL (Weekly Snapshot) equals the Tot. Qty NET On Hand + Tot. Qty Serviceable D/I + Tot. Qty Repairable D/I

***NOTE*:** Serviceable Due Ins Must be in a SB status = Serviceable Built Up

Obligations to base possessed aircraft are already excluded in the net serviceable computation. Obligations to Depot possessed aircraft will also be excluded for those aircraft in depot that exceed the base level Backup Aircraft Inventory.

A3.3.2.3.3. On Hand BSL (Monthly Average) = $\frac{\text{Sum of Weekly Snapshots}}{\text{Number of Weeks in Month}}$

A3.3.2.3.4. On Hand BSL (Quarterly Average) = $\frac{\text{Sum of Monthly Averages}}{3}$

A3.3.2.4. **Metric Interpretation:**

Green: On Hand assets greater than or equal to 90% of the Required BSL spare engines to meet the weapon systems war and peace mission.

Yellow: On Hand Assets are less than 90% of the Required BSL and greater than or equal to 90% of the Allocated BSL. Center is meeting supportability goals established by the MAJCOMs. OR A subjective assessment of yellow may be given based on other supportability issues even though On Hand assets meet or exceeds 90% of the Required BSL.

Red: On Hand is less than 90% Allocated BSL. If there is no Allocated BSL value and On Hand is less than 90% Required, then a color rating of red applies. The Center is not meeting the supportability goals established by the MAJCOMs.

Note: Occasionally the Allocated BSL is set ABOVE the Required level. Although this is a rare occurrence, Color Ratings in this event are:

Green: At or above 90% of the ALLOCATED level

Yellow: Below 90% of the ALLOCATED level but at or above 90% of the required level

Red: Below 90% of the REQUIRED level

A3.3.3. **Engine Not Mission Capable for Supply (ENMCS):**

A3.3.3.1. **Metric Objective:**

A3.3.3.1.1. Determine if the flow of parts is adequate to support the field's need for those parts in their current operating environment.

A3.3.3.1.2. An engine is considered ENMCS if it is an uninstalled engine undergoing repair or build-up where work stoppage resulted because spare parts from local resources were not available and the required parts have been requisitioned from the source of supply. An engine is not considered ENMCS when it is in work and a work stoppage occurs for lack of manpower, tools, work space, or parts that are in repair cycle processing (Due In from Maintenance, DIFM) and a valid ENMCS situation does not exist. ENMCS only apply to uninstalled engines.

A3.3.3.2. **Metric Description**:

A3.3.3.2.1. Average quantity and/or percent of uninstalled engines that are in work stoppage condition awaiting parts from the supply system over a given time period.

A3.3.3.2.2. ENMCS GOAL: Acceptable quantity and/or percent of the uninstalled engines that are in NMCS status and/or the acceptable number of engines in NMCS status. (10% ENMCS and or 10 engines. Trainer engines (J85, J69 only) are measured 20% ENMCS and/or 20 engines)

A3.3.3.2.3. ENMCS%: The average percent of the uninstalled engines that were ENMCS during a given time period.

A3.3.3.2.4. # ENMCS Engines: The average quantity of ENMCS engines during the time period.

A3.3.3.3. **Metric Methodology:**

A3.3.3.3.1. Data Collection: Data for ENMCS% can be found in the NMCS Uninstalled Engine Status Report in CEMS. Basic instructions you can use to navigate to the NMCS Uninstalled Engine Status Report. At the primary menu press,

~~B~~" for Browse a Product; hit [ENTER] then

~~B~~" for DO42B Inventory Product; hit [ENTER] then

~~2 (~~B004) for NMCS Engine Status Report (by ALC); hit [ENTER] (if you ever see *** then hit [ENTER])

A3.3.3.3.2. ENMCS% = $\frac{\text{NMCS Days}}{\text{Asset Days}}$

(ENMCS DAYS: Total number of days of serviceable and reparable engines ENMCS within the reporting period)

(ASSET DAYS: Total number of days serviceable and reparable engines were uninstalled within the reporting period)

A3.3.3.3.3. CEMS computes and displays the monthly NMCS percent on the end of month report.

A3.3.3.3.4. #ENMCS Engines (Monthly average) = $\frac{\text{NMCS Days}}{\text{\# of Days in reporting period}}$

A3.3.3.3.5. #ENMCS Engines (Quarterly Average)= $\frac{\text{Sum of monthly ENMCS engines}}{3}$

***NOTE*:** Take the total number of NMCS days divided by the number of days in the reporting period.

A3.3.3.4. **Metric Interpretation:** Green: Less than 10% ENMCS percent

Yellow: 10% or more ENMCS percent, and less than 10 engines in ENMCS status.

Red: 10% or more ENMCS percent and 10 or more engines in ENMCS status.

NOTE: Training Engines (J85, J69 only) are measured applying the same grading criteria but using 20 % and 20 Engines.

A3.4. Reliability:

A3.4.1. **Average Time On Wing (ATOW) and Mean Time Between Removal (MTBR):**

A3.4.1.1. **Metric Objective:** ATOW and MTBR are similar metrics that provide a macro-level indication of engine reliability.

A3.4.1.2. **Metric Description:**

A3.4.1.2.1. Time on wing is the fundamental indicator of an engine's reliability. An effective maintenance plan based upon principles of Reliability Centered Maintenance (RCM) will drive up the time on wing of an engine to the hardware's inherent capability. Depot, MAJCOMs, and field units will use ATOW or MTBR as the primary metric to measure RCM program effectiveness and overall engine reliability health.

A3.4.1.2.2. Engine programs will report both total and inherent time on wing or MTBR. Both measures exclude all serviceable built up removals. The inherent time on wing or MTBR will also exclude removals for FOD, fuel/oil contamination, and other maintenance faults exclusive of the design.

A3.4.1.3. **Metric Methodology:**

A3.4.1.3.1. Engine programs can use either MTBR or ATOW to measure engine reliability. The goals for MTBR and ATOW are the same. The charts will be titled to reflect the method selected.

A3.4.1.3.2. Mean Time Between Removal (MTBR) is defined as:

$$MTBR = \frac{EFH_{fleet}}{\#removals}$$

Where engine flying hours for the fleet (EFH_{fleet}) and number of engine removals were captured over some period of time, typically each quarter year.

A3.4.1.3.3. Average Time on Wing (ATOW) is defined as:

$$ATOW = \frac{\sum EFH_{removed_engine}}{\#removals}$$

Where the engine flying hours for removed engines ($\sum EFH_{removed_engine}$) is the sum of flying hours since the last removal on only the engines removed in a given quarter. CEMS and Propulsion Actuarial Client/Server (PACS) do not report this number automatically; it must be calculated manually.

A3.4.1.3.4. Quarterly data from the Comprehensive Engine Management System (CEMS) is used for EFH and number of removals. Engine flying hours can be found on CEMS product G232, Aircraft Engine Experience Analysis Report. Removals are taken from CEMS product G341, Aircraft Engine Removal and Loss Report.

A3.4.1.3.5. ATOW or MTBR will be posted quarterly using a 4 quarter rolling average to smooth any seasonal variation.

A3.4.1.3.6. MTBR or ATOW are undefined if no engines are removed in a quarter. This can be a problem for small engine programs, or when looking at the ATOW or MTBR of a sub-population, such as RCM builds. Ignore such quarters in the 4 quarter rolling average calculation.

A3.4.1.3.7. Each program will report both a Total and Inherent reliability value for each quarter. If the ATOW methodology is used to represent reliability for an engine program, then the Total and inherent reliability values will be represented as TOTAL ATOW and INHERENT ATOW. If the MTBR methodology is used to represent reliability for an engine program, then the Total and Inherent reliability values will be represented as TOTAL MTBR and INHERENT MTBR.

A3.4.1.3.8. Total and Inherent reliability values are calculated the same way when using ATOW or MTBR. Total and Inherent reliability values differ based upon what removals are counted.

A3.4.1.3.9. Calculate Total reliability using all removals reported in CEMS except Transaction Condition Code LB.

A3.4.1.3.10. Calculate the Inherent reliability by excluding all non-inherent (or induced) removals. Non-inherent removals are either those with Transaction Condition Code LB or with the HOW MAL codes (HMCs) shown in the table below.

A3.4.1.3.11. The total reliability is useful to MAJCOM planners as an overall indicator of reliability. Engine program managers can control Inherent reliability and

will be accountable for optimizing it. SRAN engine managers must be trained and understand their crucial roll in the reporting procedure. Clean, accurate data is vital.

A3.4.1.3.12. TCTO compliance may be scheduled or unscheduled maintenance usually to correct or mitigate design problems and therefore is chargeable to the engine Inherent reliability. All TCTO removals will be included in Inherent reliability, unless transaction condition code LB applies.

A3.4.1.3.13. Note, an ―unserviceable removal" is defined as an action that drives the engine into I-level maintenance. Maintenance performed entirely at the O-level is not reported as a removal in CEMS, and likewise not counted in ATOW or MTBR.

A3.4.1.3.14. The Maintenance Planning Working Group (MPWG), through the lead command, is responsible for addressing inaccurate reporting of engine removals.

Figure A3.1. Non-Inherent HOW MAL CODES (HMC)

045	Battery replaced	476	Solid FOD (metal, stone)	812	No defect - associated equip
086	Improper handling/shipping	477	Semi-solid FOD (ice)	867	TO 2-1-18 Transfer time limit
116	Cut	478	Semisolid FOD (rags, plastic)	868	Failed external component
127	Adjustment/alignment improp	479	Damage from simulated combat	870	Research, test, diagnostic
157	Thrust reverser failure	480	Damage by accident/incident	872	PDM
167	Tension or torque incorrect	481	Exposure to fire extinguisher	874	Storage damage / deterioration
174	QEC discrepancy	482	Excessive G-force inspection	875	Cannibalization
198	Contaminated fuel	483	Dummy engine transaction	876	Non-T.O. directed removal
210	Servicing with wrong fuel or oil	602	Damage by associated equip	877	T.O. identified components
230	Contaminated by foreign mat'l	731	Battle damage	890	Lightening strike
300	Foreign object (no damage)	750	Missing	911	TCTO compliance error
301	FOD or sabotage	796	No defect - TCTO not applicable	943	Data error
303	Semisolid FOD (bird)	797	No defect - TCTO already done	988	Loss of vacuum
410	Lack of / improper lubrication	799	No defect	298	Domestic Object – No Damage
425	Pitted, nicked, chipped, scored	800	No defect - FOM		

A3.4.1.4. **Metric Interpretation:**

A3.4.1.4.1. Inherent Design Reliability (IDR) provides a baseline for establishing a TMSs reliability goal in collaboration with the Lead MAJCOM.

A3.4.1.4.2. The IDR for immature fleets (<500,000EFH) / populations is determined as follows: Use the engine's first run interval, where the first run interval is the anticipated average EFH on all engines when first removed for maintenance, including UERs. A higher number may be appropriate when major upgrades are incorporated or a lower number may be appropriate when thrust is increased.

A3.4.1.4.3. The IDR for mature fleets (>500,000EFH) / populations is determined as follows: If historical data is not sufficient or applicable to determine the first run interval, inherent reliability will be assumed to be such that 10% of the engines are currently on wing longer than the inherent reliability. This may be done using a recent time-on-wing histogram and locating the 90th percentile.

A3.4.1.4.4. All programs must submit their IDR with justification and a graph of the ATOW or MTBR metric looking back 3 years to the Propulsion Engineering Council for review by the Propulsion Senior Leader and approval by the DoP.

A3.4.1.4.5. Programs will submit a graph of Total ATOW or MTBR and Inherent ATOW or MTBR, with a color rating based on the inherent ATOW or MTBR relative to the goal established in collaboration and agreement with the Lead MAJCOM.

Green: Inherent ATOW or MTBR≥ Goal Established by Lead MAJCOM

Yellow: Inherent ATOW or MTBR is less than 100% of goal and greater than75% of the goal

Red: Inherent ATOW or MTBR is less than 75% of goal

A3.4.2. **Shop Visit Rate (SVR):**

A3.4.2.1. **Metric Objective**: The Shop Visit rate is another indicator used to measure a TMS's reliability.

A3.4.2.2. **Metric Description:** This indicator tracks the number of engines removed from aircraft and subsequently sent to an intermediate maintenance shop or a depot for repair.

A3.4.2.3. **Metric Methodology:** The number of engines removed from aircraft for all reasons (SER + UER + TCTO ER) and subsequently sent to an intermediate maintenance shop or a depot for repair within a time interval divided by the EFH within the same interval, multiplied by 1000.

A3.4.2.4. **Metric Interpretation:** The total SV rate is considered to be the inverse of the total ATOW or total MTBR; therefore the goals for total SV are the inverse of those goals listed for the total ATOW or total MTBR.

A3.4.3. **Scheduled Engine Removals (SER):**

A3.4.3.1. **Metric Objective**: The SER rate is a trend metric, therefore this indicator will be presented to show the historical trend of SER.

A3.4.3.2. **Metric Description:** Scheduled Engine Removals (SER) are removals scheduled by the applicable TO. Scheduled removals for TCTO compliance are not included.

A3.4.3.3. **Metric Methodology:** The number of engines removed from aircraft and subsequently sent to an intermediate maintenance shop or a depot for repair as scheduled by the applicable TO within a time interval divided by the EFH within the same interval, multiplied by 1000.

A3.4.4. **Unscheduled Engine Removals (UER):**

A3.4.4.1. **Metric Objective**: The UER rate is a trending metric, therefore this indicator will be presented to show the historical trend of UER.

A3.4.4.2. **Metric Description**: Unscheduled Engine Removals (UER) are removals caused by an inherent engine malfunction(s). Engine removals resulting from TCTO inspections performed with engine uninstalled is classified as UER.

A3.4.4.3. **Metric Methodology**: The number of engines removed from aircraft and subsequently sent to an intermediate maintenance shop or a depot for repair as scheduled by the applicable TO within a time interval divided by the EFH within the same interval, multiplied by 1000.

A3.4.5. **Line Replaceable Unit Rate (LRU).**

A3.4.5.1. **Metric Objective**: This indicator measures reliability of an engine's LRUs.

A3.4.5.2. **Metric Description**: The LRU rate is a trending metric, therefore this indicator will be presented to show the historical trend of LRU. LRU rate measures the number of times an LRU must be removed or replaced because of an inherent malfunction or time change requirement.

A3.4.5.3. **Metric Methodology**:

A3.4.5.3.1. The number of components on each TMS's specified LR list which are removed or replaced at the organizational level of maintenance as result of an inherent malfunction or time change requirements within the time interval divided by the EFH within the same interval, multiplied by 1000.

A3.4.5.3.2. The LRU removals caused by an inherent malfunction or out of limit condition which cannot be duplicated by subsequent investigations at shop/depot, and does not occur in subsequent operation shall be counted.

A3.4.5.3.3. Multiple identical LRUs removed or replaced at the same time are considered as a single event. If LRUs fail independently, each failure shall be counted separately.

A3.4.5.3.4. The LRU removal rate is as reported in the REMIS G050 –Health of Weapon System" Report in the LRU line divided by the EFH within the same interval, multiplied by 1000.

A3.4.5.3.5. The specified list of LRUs are those that are considered –chargeable" to the engine. This list is found in the –06 list of Work Unit Codes (WUC) for each engine. The Algorithm that will be used by REMIS G050 is as follows:

A3.4.5.3.5.1. If a WUC from the specified LRU list is entered into CAMS and has a chargeable HOWMAL Code (as listed as being chargeable to the LRU rate in Appendix A of Propulsion Center of Excellence Best Practice 00-09) and the

action take code is P or R then, the TMS LRU rate will be charged for that event (quantity: one per replaced LRU per JCN).

A3.4.6. **Abort Rate:**

A3.4.6.1. **Metric Objective**: The Abort rate is a trending metric, therefore this indicator will be presented to show the historical trend of Aborts. This indicator measures the impact of an engine's reliability on the user's ability to complete their mission.

A3.4.6.2. **Metric Description:** Aborts for engine causes are chargeable to this metric.

A3.4.6.3. **Metric Methodology**:

A3.4.6.3.1. The number of aborts for engine cause within a time interval divided by the EFH within the same interval, multiplied by 1000.

A3.4.6.3.2. DRAFT: The number of aborts can be found on line 5 of the REMIS G050 –Health of Weapons System (HOWS)" Report, titled TOTAL ABORTS.

A3.5. Maintainability:

A3.5.1. **Maintenance Man-hours Per Engine Flying Hour (MMH/EFH):**

A3.5.1.1. **Metric Objective**: This is a macro level metric aimed at measuring the maintainability of a TMS.

A3.5.1.2. **Metric Description:** This metric measures man-hours required for fault isolation and checkout, engine removal and replacement, engine buildup and teardown, module component and part repair or adjustment, component removal and replacement, installed maintenance and all scheduled inspections, service and maintenance include TCTO accomplishments.

A3.5.1.3. **Metric Methodology**: Total MMH/ EFH rate is as reported in the REMIS G050 –Health of Weapon System" Report in the TOTAL MAINT MH/FH.

A3.5.1.4. **Metric Interpretation:** The MMH/EFH goal is recommended by each TMS manager at their respective Maintenance Planning Working Group and finalized through coordination with the MAJCOMS.

Green: MMH/EFH is at or below the established goal

Yellow: MMH/EFH is between 100% and 115% of the established goal

Red: MMH/EFH exceeds 115% of the established goal

A3.5.2. **Organizational Maintenance Man Hours per Engine Flying Hours (OMMH/EFH):**

A3.5.2.1. **Metric Objective:** The OMMH/EFH metric is a trending metric, therefore this indicator will be presented to show the quarterly trend of OMMH/EFH. This indicator is aimed at measuring the operational maintainability of a TMS.

A3.5.2.2. **Metric Description:** This metric measures man-hours required for activities chargeable to engines that take place at the operational level of maintenance.

A3.5.2.3. **Metric Methodology:** Organizational MMH/ EFH rate is as reported in the REMIS G050 ―Health of Weapon System" Report in the OP MAINT MH/FH line.

A3.5.2.4. **Metric Interpretation:**

A3.5.2.4.1. The OMMH/EFH goal is recommended by each TMS manager at their respective MPWG and finalized through coordination with the MAJCOMs.

A3.5.3. **Intermediate Maintenance Man Hours per Engine Flying Hours (IMMH/EFH):**

A3.5.3.1. **Metric Objective:** The IMMH/EFH metric is a trending metric therefore, this indicator will be presented quarterly to show the historical trend of IMMH/EFH. This indicator is aimed at measuring maintainability of a TMS at the intermediate level

A3.5.3.2. **Metric Description:** This indicator measures man-hours required for those activities chargeable to engines that take place at the intermediate level of maintenance. .

A3.5.3.3. **Metric Methodology:** The IMMH/ EFH rate is as reported in the REMIS G050 ―Health of Weapon System" Report in the INT MAINT MH/FH line.

A3.5.3.4. **Metric Interpretation:**

A3.5.3.4.1. The IMMH/EFH goal is recommended by each TMS manager at their respective Maintenance Planning Group and finalized through coordination with the MAJCOMS.

A3.5.4. **TCTO Maintenance Man Hours per Engine Flying Hours (TCTO MMH/EFH):**

A3.5.4.1. **Metric Objective:** The TCTO MMH/EFH metric is a trending metric therefore, this indicator will be presented quarterly to show the historical trend of TCTO MMH/EFH. This indicator is aimed at measuring the TCTO related maintenance activities of a TMS.

A3.5.4.2. **Metric Description:** This metric measures man-hours required for those activities chargeable to engines that take place as a result of TCTOs.

A3.5.4.3. **Metric Methodology:** TCTO MMH/ EFH rate is as reported in the REMIS G050 ―Health of Weapon System" Report in the TCTO MAINT MH/FH line.

A3.5.4.4. **Metric Interpretation:**

A3.5.4.4.1. The TCTO MMH/ EFH goal is recommended by each TMS manager at their respective Maintenance Planning Group and finalized through coordination with the MAJCOMS.

A3.6. Affordability:

A3.6.1. **Engine Total Ownership Cost (ETOC):**

A3.6.1.1. **Metric Objective:**

A3.6.1.1.1. Monitor overall costs to support and operate an engine TMS in support of weapon system mission and objectives.

A3.6.1.1.2. Determine if the Air Logistics Centers and MAJCOM operating units are working effectively to control and reduce operating and support costs.

A3.6.1.2. **Metric Description:**

A3.6.1.2.1. ETOC provides the total ownership cost to operate an engine type. ETOC is calculated by the TMS Manager using the following formula:

(Depot Level Reparables + GSD + DPEM + O & I Level Maintenance + CIP and Modifications) / Engine Flying Hours

A3.6.1.3. **Metric Methodology:**

A3.6.1.3.1. Information required for calculation is obtained from a variety of sources:

Comprehensive Engine Management System (CEMS)
Air Force Total Ownership (AFTOC) database
Component Improvement Program Funds Manager
Modification Program Funds monitor

A3.6.1.3.2. AFTOC elements used include Level 2 and 3 Cost Analysis Improvement Group (CAIG) elements and can be obtained at **https://aftoc.hill.af.mil**/ :

Depot Level Reparables (Flying DLR) – CAIG element 2.3.1
Consumables (General Supply Division (GSD)) – CAIG element 2.2.1
Depot Maintenance (not DLRs) – CAIG element 4.0
Organizational Maintenance – CAIG element 1.2.1
Intermediate Level Maintenance – CAIG element 1.2.2

A3.6.1.3.3. CIP investment costs (3600 funds) are not currently tracked and maintained in an Air Force Legacy system and must be manually obtained from the CIP Manager.

A3.6.1.3.4. Modification costs (3010 funds) must be obtained from the funding source and manually added to the calculation. The funding source can be the System Program Office (SPO), or Low Cost Modification Manager or Internal Group funded. It is imperative to include all 3010 funding sources as to not omit program costs when calculating ETOC.

A3.6.1.3.5. Engine Flying Hours are as reported in CEMS and are available on the Actuarial Webpage (https://wwwmil.tinker.af.mil/448csw/Common/Actuarial/actsupp.htm) for each Engine Management Group.

A3.6.1.3.6. Once cost information is obtained from AFTOC for a given TMS it must be inflated to Current Year dollars. Inflation indices can be obtained from AFI 65-503 Cost and Planning Factors, Inflation Indices (A45-1 through A49-1 and are available through the AFTOC website. Indices are superceded in January of each year when new tables are issued. A separate inflation rate is identified for each fund appropriation and year. For 3400, 3600 and 3010 funds use the weighted index. See table below for an example:

Figure A3.2. Inflation Factors Then Year to FY05

Fiscal Year	Weighted 3400 (O&M)	Weighted 3010 A/C Proc	Weighted 3600 RTD&E
2001	0.949	0.958	0.949
2002	0.958	0.968	0.958
2003	0.970	0.983	0.971
2004	0.991	1.003	0.992
2005	**1.010**	**1.023**	**1.012**
2006	1.031	1.045	1.032
2007	1.053	1.067	1.054
2008	1.075	1.089	1.076
2009	1.097	1.112	1.099
2010	1.120	1.135	1.122

A3.6.1.3.7. Establish the baseline for each TMS using the 2 to 5 (depending on accuracy of AFTOC data) previous year's data (initially establish using FY01 thru FY05). Use the baseline to establish the Goal for each TMS. Each TMS must take into consideration known workscope changes and projected reliability. A standard methodology for projecting the future does not exist. Inputs to be considered include the age of the engine and the standard workscope to be accomplished at the next scheduled maintenance event. Investments for engine upgrades and modifications will result in increased costs and improved reliability in the future. An estimate of when the improved reliability will occur should be reflected in the TMS Goal.

***NOTE*:** Verify the accuracy of AFTOC data for the Depot Maintenance (CAIG Element 4.0) by comparing to actual historical data. Check each fiscal year whole engine input schedule and sales price, if the resulting amount is within +/- 5% of the AFTOC amount, no further action is required. If the variance exceeds +/- 5%, then use the actual historical data. In addition, action should be taken to notify AFTOC and the MAJCOM of the discrepancy and request a review by AFTOC to determine the source of the discrepancy. An analysis of the historical data should be conducted to ensure that the most accurate material costs are used. If your material cost varied significantly from year to year and did not correspond with your ERRB and SRRB inputs, use your discretion in selecting appropriate years to establish your baseline and forecast projections. Material cost have been influenced by multiple factors including changes in pricing formulas for Stock Fund and DMAG process, raw materials (specialty metals) cost increases and DMAG repair cost increases in excess of ERRB forecast.

A3.6.1.4. **Metric Interpretation:** The ETOC goal is recommended by each TMS manager at their respective Maintenance Planning Working Group and finalized through coordination with the MAJCOMS.

Green: ETOC is at or below the established goal

Yellow: ETOC is between 100% and 115% of the established goal

Red: ETOC exceeds 115% of the established goal.

A3.6.2. **Cost Per Engine Flying Hour (CPEFH):**

A3.6.2.1. **Metric Objective:**

A3.6.2.1.1. Track historical cost associated with supporting and maintaining an engine program in support of weapon system mission and objectives.

A3.6.2.1.2. Determine if the Air Logistics Centers and MAJCOM operating units are working effectively to control and reduce operating and support costs.

A3.6.2.2. **Metric Description:**

A3.6.2.2.1. CPEFH is a flying hour metric for an engine type and is a subset of Weapon System Cost Per Flying Hour (CPFH). CPEFH is calculated by the TMS Manager using the following formula:

$$\frac{\text{Depot Level Reparables (Flying DLR) + Consumables (GSD)}}{\text{Engine Flying Hours}}$$

A3.6.2.3. **Metric Methodology:**

A3.6.2.3.1. Information required for calculation is obtained from a variety of sources:

Comprehensive Engine Management System (CEMS)
Air Force Total Ownership (AFTOC) database

A3.6.2.3.2. AFTOC elements used include Level 3 Cost Analysis Improvement Group (CAIG) elements and can be obtained at **https://aftoc.hill.af.mil**/ :

Depot Level Reparables (Flying DLR) – CAIG element 2.3.1
Consumables (General Supply Division (GSD)) – CAIG element 2.2.1

A3.6.2.3.3. Engine Flying Hours are as reported in CEMS and are available on the Management Summaries of the Actuarial Webpage at the following link ; (**https://wwwmil.tinker.af.mil/448csw/Common/Actuarial/actsupp.htm**) for each Engine Management Group.

A3.6.2.3.4. Once cost information is obtained from AFTOC for a given TMS it must be inflated to Current Year dollars. Inflation indices can be obtained from AFI 65-503 Cost and Planning Factors, Inflation Indices (A45-1 through A49-1 and are available through the AFTOC website. Indices are superceded in January of each year when new tables are issued. A separate inflation rate is identified for each fund appropriation and year. For 3400 Funds use the weighted index. See table below for an example:

Figure A3.3.Inflation Indices.

Inflation Indices Then Year to FY05 Base Year

Fiscal Year	Weighted 3400 (O&M)
2001	0.949
2002	0.958
2003	0.970
2004	0.991
2005	**1.010**
2006	1.031
2007	1.053
2008	1.075
2009	1.097
2010	1.120

A3.6.2.3.5. Establish the baseline for each TMS using the 5 previous year's data (initially establish using FY01 thru FY05). Use the baseline to establish the Goal for each TMS. Each TMS must take into consideration known workscope changes planned for the TMS. A standard methodology for projecting the future does not exist. However, outputs of the ERRB and SRRB processes should be utilized.

A3.6.2.4. **Metric Interpretation:** The CPEFH goal is recommended by each TMS manager at their respective Maintenance Planning Working Groups and finalized through coordination with the MAJCOMS.

Green: CPEFH is at or below 100% of the established goal

Yellow: CPEFH is between 100% and 115% of the established goal

Red: CPEFH exceeds 115% of the established goal.