DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, D.C. 20350-2000

IN REPLY REFER TO

OPNAVINST 4442.3C
N41
05 May 2006

OPNAV INSTRUCTION 4442.3C

From: Chief of Naval Operations

Subj: GUIDELINES FOR COMPUTING SPARE AIRCRAFT ENGINE AND ENGINE MODULE REQUIREMENTS

Ref: (a) DoD Directive 4140.1-R of 23 May 2003
(b) Propulsion Management Board Charter dated 18 Nov 1998
(c) OPNAVINST 4614.1f

Encl: (1) Input parameters worksheet
(2) Engine and module repair process and standards

1. Purpose. To implement reference (a) policies and procedures governing the programming, budgeting and procurement of aircraft engines and modules. OPNAVINST 4442.3C has been administratively revised and should be reviewed in its entirety.

2. Cancellation. OPNAV Instruction 4442.3B.

3. Scope and Applicability. This instruction will be the definitive document in determining Navy/Marine Corps Aircraft Engine/Module stocking levels at all retail sites. The following data points will be used in determining each budget submission during the PR/POM process.

a. Material Management. Reference (a) prescribes procedures for the uniform management of DoD material. The DoD components shall establish and pursue the goal of provisioning sufficient support items to meet end item readiness objectives at minimum investment cost.

b. Spare Engine and Module Requirements. The following data elements will be used to compute spare aircraft engine and module requirements. These elements, along with the data provided using enclosure (1), will be used as inputs to the Retail Inventory Module of ARROWs for Aviation (RIMAIR) model.

(1) Site Data. The Aircraft Planning Data File (APDF) will be used to obtain the number and distribution of operating aircraft and sites supported. The Weapon System Planning Document (WSPD) will be used to obtain support sites and repair sites.

(2) Flight Hours. The current version of the Budget Analysis Report (BAR) from the Flying Hour Projection System (FHPS) will be used for all spare engine and module computations.

(3) Utilization Rate. Utilization rates will be 100% for all TMS (engines and modules) unless otherwise directed by CNO (N88).

(4) Protection Level. Spare engine and module requirements will be computed using a protection level in the RIMAIR model. This protection level provides a probability that the number of engines and modules programmed will be sufficient to meet projected demand. Protection levels for all aircraft will be set at 90% unless otherwise directed by CNO (N88).

c. Repair Pipeline Standards

(1) In accordance with reference (b), Naval Air Systems Command (NAVAIRSYSCOM) will develop and submit to CNO (N88) "in-work" times for all engines and modules. This data will be submitted to CNO (N881) no later than 31 January each year.

(2) NAVAIR Program Managers (Aviation) (PMAs) must use enclosure (1). PMAs must ensure inefficiencies within the logistics system are not captured within the sparing parameters, and ensure that additional sparing requirements are not computed to mask or compensate for these inefficiencies, i.e. transportation, awaiting parts, manpower, tooling, PSE, etc. Submission of enclosure (1) will be outlined in the CNO (N41) POM/PR spares call letter issued prior to the kickoff of each budget review but no later than 31 July.

d. Mean Engine Flight Hours Between Repairs. NAVAIR will develop Mean Engine Flight Hours Between Repairs (MEFHBR) projections. These MEFHBR projections are to be updated yearly and validated by the Propulsion Management Board chartered by reference (d). MEFHBR projections will be provided in enclosure (1), using the following guidance:

(1) Newly Developed Engines. Engine maintenance plans will be used where available. Best engineering practice will be used when maintenance-planning data is not available.

(2) Mature Engines. Historical data modified by anticipated major Engineering Change Proposal (ECP) incorporations as will be used as appropriate.

e. Transportation Times. Transportation times are governed by reference (c), the Uniform Material Movement and Issue Priority System (UMMIPS). Transportation times will be obtained from reference (a) Appendix 8, Table AP8.T2, "Time-Definite Delivery Standards for Category 2 Requisitions."

f. Modular Type Spare Engine Requirements. Engines designed for disassembly into major sub-components that allow for rapid return of the whole engine to ready for issue status. Although modular engines offer more rapid RTATs than conventionally configured engines, aircraft operational availability requirements dictate that a level of built up spare engines be maintained for immediate installation in aircraft in addition to spare engine modules. Spare engine and module requirements will be computed based upon the parameters outlined in section 3-b-3 of this instruction. In work time for a given engine or module should reflect the advantages of the modular maintenance concept and thereby minimize the number of spare engines required.

4. Responsibilities

a. CNO (N41) is responsible for approving models used for sparing computation and analysis.

b. CNO (N43) is responsible for providing flight hours from the FHPS.

c. CNO (N88) is responsible for providing guidance for the computation of aircraft engine and module requirements, to include the approval and validation of model input parameters (enclosure 2), site data, utilization rates, and the protection level.

d. Commander, Naval Air Systems Command (COMNAVAIRSYSCOM) AIR-4.0 is responsible for providing repair pipeline in-work times and MEHFBRs using enclosure (1). NAVAIR shall obtain program guidance for computation of aircraft engine and module requirements from CNO (N88) and will review all proposed input parameters with Commander Naval Air Forces (CNAF).

e. Navy Inventory Control Point (NAVICP), as NAVAIR's agent, is responsible for developing requirements in accordance with the worksheet provided in enclosure (1) and inputs provided by OPNAV and NAVAIR.

f. CNAF is responsible for reviewing all proposed input parameters for consistency with Fleet goals. Type Commanders (TYCOMs) are responsible for managing all RFI and NRFI engines and modules.

5. Documentation. Computations made to achieve all of the above requirements will be calculated and displayed in accordance with reference (a). Review of enclosure (1) will be coordinated by NAVAIR 4.0 and CNO (N88), and updated recommendations provided to NAVICP via CNO (N41) in a periodicity not to exceed two years.

A. S. THOMPSON
By direction

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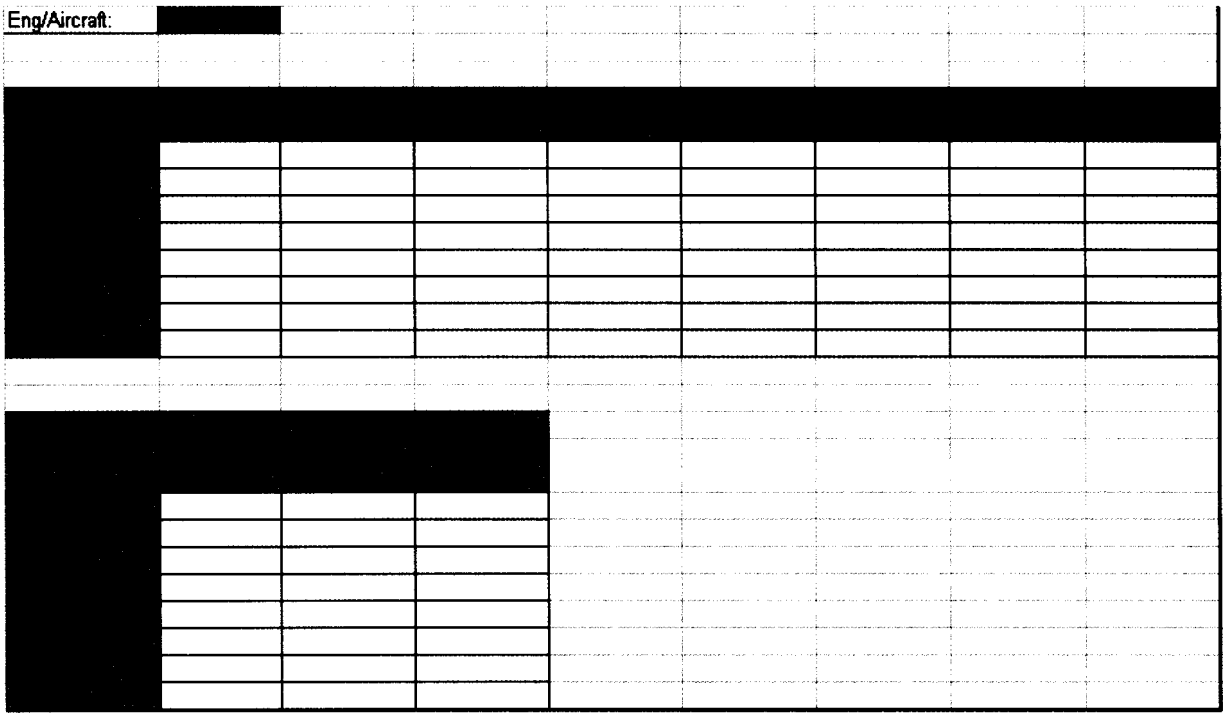
Input parameters worksheet



Enclosure (1)

ENGINE AND MODULE REPAIR PROCESS AND STANDARDS

1. Background. The following information is a detailed description of the elements that make up the repair process and provides OPNAV standards to be used when computing spare engine and module requirements.

2. Definitions

Engines. Repairable assemblies, when installed in aircraft, are primarily responsible for driving the propulsion system (propeller, or rotors) or providing the thrust necessary for the aircraft to fly. Engines are procured with APN-6 funds and are considered end items.

Engine Modules. Major repairable subassemblies of aircraft engines that when removed and replaced can quickly return an engine to service. Engine modules differ from components, in that they are procured with APN-6 funds and are considered end items.

Components. Repairable assemblies that cannot be repaired by Intermediate or Organizational level activities. These assemblies are normally 7R Cognizance (COG) material and managed by NAVICP.

Newly Developed Engines. The period in the engine life cycle prior to the stabilization of demand and re-supply rates and before the effects of significant engineering and support concept changes have been discovered and incorporated.

Mature Engines. The period in the engine life cycle in which demand and re-supply rates have stabilized and the effects of significant engineering and support concept changes are known and incorporated.

ARROWs Model. Retail Inventory Module of ARROWs for Aviation (RIMAIR) is the OPNAV approved allowance computation model authorized for sparing computation and analysis for whole aircraft engines and modules.

Attrition. Engines and modules are considered to have zero wearout rate. All unserviceable spares will be assumed to be capable of repair or overhaul.

Organizational Level Maintenance (O-Level). Includes the removal and reinstallation of engines and propulsion systems in aircraft.

I-Level Engine Repair. Involves the disassembly of engines, to include Quick Engine Change Kit (QECKs), replacement of modules or components, and returning the engine to service.

I-Level Module Repair. Involves the disassembly of engine modules, replacement of components and consumable parts to return the module back to a Ready For Issue (RFI) status so it could be installed in another engine.

Depot Engine Repair. Involves the disassembly of engines, replacement of consumable parts to return the engine to an RFI status. Generally does not include the replacement of modules and repairable components. If these items require repair, the Depot further disassembles these components and their defective parts are replaced.

Depot Module Repair. Involves the disassembly of engine modules and replacement of consumable and repairable parts to return the module to an RFI status.

3. Application to Specific T/M/S engines

When modeling the repair process for a specific T/M/S engine, the Maintenance Concept may not match that depicted here, but generally the processes, procedures, and maintenance actions described here will be performed for every engine. These processes and actions may not take place at the same activities that are depicted here, but the processes that occur should still be considered either I-Level or Depot, and the repair process modeled to include these activities regardless of the name of the activity performing the work.

For example, a commercial depot may perform both the functions of I-Level repair and Depot repair. If they utilize a pool of repairable components to repair engines and quickly return them to service, then they have an I-Level repair function. If they do both, then both I-level and Depot repair are being performed, and spares should be computed with this in mind. If they do not have a pool of repairable components to support repair and they are required to repair or replace all of the parts of an engine or module before reassembling it, then they are considered strictly a Depot repair activity.

In another case, if all engines are being repaired utilizing a pool of built up components, then the engine would be considered to be 100% I-Level repair, and there would be no Depot repair of the engine or module regardless if the work was done at a Fleet I-level Activity, a contractor's facility, or a Naval Depot.

4. Modular Engine Considerations

Engine and module requirements are computed separately. Engine requirements are computed for all sites that operate the aircraft and would perform maintenance. Engine requirements are computed based upon the authorized number of aircraft that are expected to operate at that site.

Module requirements will be computed for only those sites that would use engine modules to repair engines. Engine module requirements will be computed based upon the total number of aircraft supported by the site. That would include sites that do not have I-level repair, but forward their engines to the I-level site for repair. Examples are deployed detachments on ships that do not have engine repair capability; shore sites with no I-Level capability; and shore sites where I-level capability is limited.

5. Engine and Module Removals

Engine and module removals have a large impact on the number of spare engines and modules required to support the repair process. The following elements are used to compute the engine and module removals for each T/M/S engine.

Aircraft Flight Hours. The current version of the Budget Analysis Report (BAR) from Flying Hour Projection System (FHPS) will be used for all spare engine and module computations. The BAR expresses the aircraft flight hours for each T/M/S aircraft in terms of an average number of flight hours flown per month. When computing spares requirements for aircraft programs that are increasing or decreasing in size, the budgeted monthly flight hours for each year can be used to calculate the spares requirements for each year. Mature programs can use a multi-year average to compute spares requirements.

Engine Flight Hours. The Engine Flight Hours will be computed by multiplying the budgeted aircraft flight hours by the number of engines installed in the aircraft.

Mean Engine Flight Hours Between Removal (MEFHBR) Goal. The MEFHBR is a measure of the number of times an engine has to be removed for repair because it has failed. The MEFHBR Goal should be calculated and expressed in terms of Engine Flight Hours as computed above. The MEFHBR Goal should represent a reasonable estimate of the expected failure rate for the engine given the current status of the engine program and anticipated reliability improvements. For engine programs that are experiencing an increase or decrease in MEFHBR due to age, significant reliability improvement, or changes in maintenance concept, the MEFHBR used to compute engine and module spares requirements should be updated annually.

6. Engine Repair Process Modeling and Standards

Figure 1 depicts the elements of the engine repair process. It describes in detail the elements of the process and standards to be used when computing spare engine requirements:

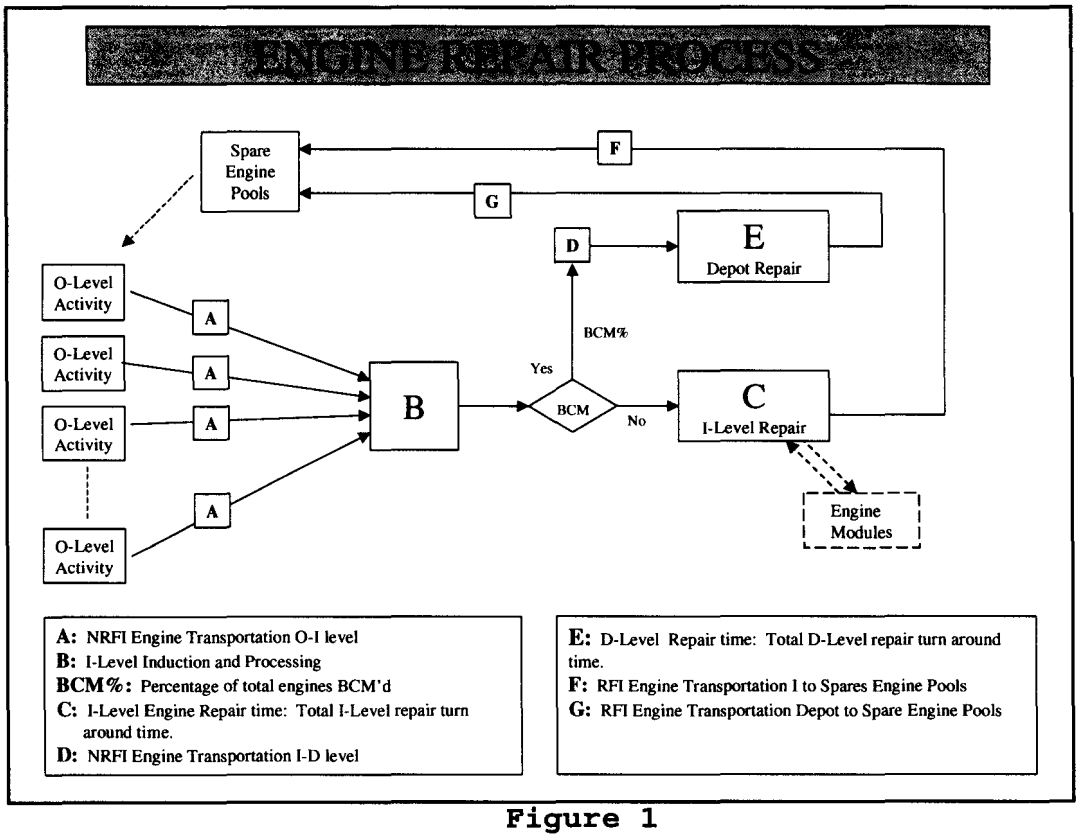


Figure 1

A. NRFI Engine Transportation O-level to I-level. Includes the removal, processing, packaging, and transportation time to I-level repair activity that normally supports that site. Transportation time standards include time required to ship an RFI engine replacement engine. Transportation times determined by UMMIPS.

B. NRFI Engine I-level Processing. Includes the receipt, screening, and processing of a NRFI engine for induction for I-level repair, or Beyond Capability of Maintenance processing.

C. Engine I-level Repair Turn-Around-Time (RTAT). Includes the time required to remove and replace defective modules, components, and parts, testing, and processing time required to return the engine back to service. For those engines that require QECKs to make them RFI and ready for O-level installation, the amount of time required to remove and install the QECK is included in the I-level RTAT. For modular engines, the engine I-level RTAT includes the amount of time required to remove and replace NRFI modules and components. The time required to repair the modules is accounted for in the module repair pipeline and it is assumed that RFI modules are available for installation on the engine. RTAT standards exclude Awaiting Induction, Awaiting Maintenance, or Awaiting Parts time.

Engine Beyond Capability of Maintenance (BCM) Percentage. A percentage of engines that will be repaired at Depot vs. I-level. For modular engines and engines with robust I-level repair capability, this percentage should be small. The majority of engine repairs should be performed at the I-level unless build standards, cost effectiveness, or other considerations dictate that a higher percentage of engines return to the Depot. Observed I-level and Depot repair rates, are adjusted to reflect changes in maintenance concept, repair capabilities, and build standards.

D. NRFI Engine Transportation I-level to Depot. Includes the transportation time from an I-level repair activity to the Depot that normally supports that engine. Efforts should be made to minimize the number of times a engine is handled and shipped, therefore, unless an engine's maintenance concept dictates that all engines must be processed by an I-level prior to forwarding to a Depot for repair, it is assumed that the I-level to Depot transportation time is zero and the engine's transportation time to reach it's ultimate repair activity is accounted for in the O-level to I-level transportation time.

E. Engine Depot Repair Turn Around Time (RTAT). Includes the time required to dissemble an engine, modules, and components as required, remove and replace defective parts, reassemble, test, and return the engine back to service. For those engines that require Quick Engine Change Kits (QECKs) to make them RFI and ready for O-level installation, the amount of time required to remove and install the QECK is included in the Depot RTAT. Since removing modules or modular engines and replacing them with RFI ones is by definition I-level repair, the Depot repair of modular engines includes disassembling the engine completely and replacing parts, regardless of whether it is contained in a module. RTAT standards exclude Awaiting Induction, Awaiting Maintenance, and Awaiting Parts time.

F and G. RFI Engine Transportation I-level and Depot to Pools. The transportation time for an RFI engine from I-level or Depot repair activity to a TYCOM designated spare engine pool site. This time is accounted for in the O-Level to I-Level transportation time.

7. Engine Module Repair Process Modeling and Standards

Figure 2 depicts the elements of the engine module repair process. It describes in detail the elements of the process and standards to be used when computing spare engine module requirements:

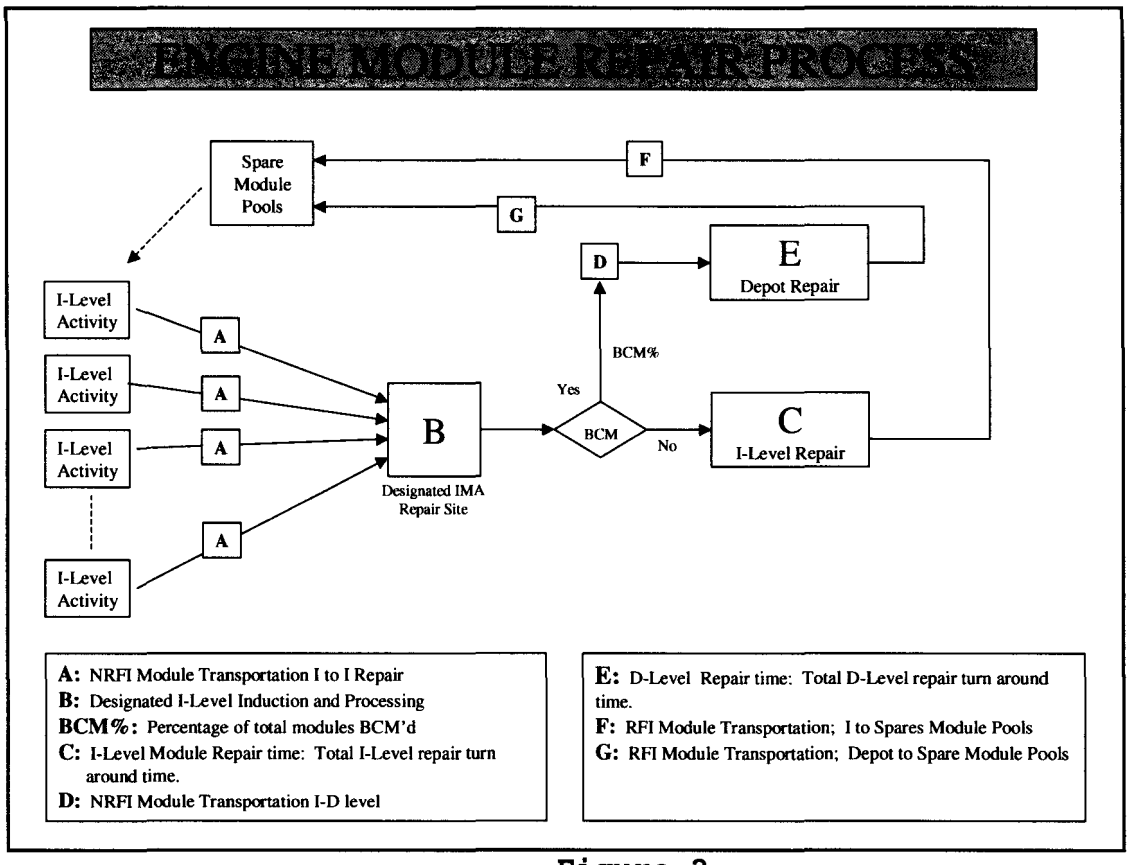


Figure 2

A. NRFI Module Transportation 3rd Degree I-level to 1st Degree I-level. Includes processing, packaging, and transportation time for a module from a 3rd Degree I-level activity to the 1st Degree repair activity that normally supports that site. Transportation time standards include time required to ship an RFI replacement engine module. Removal time is accounted for in the RTAT of the engine.

B. NRFI Engine Module 1st Degree Prime I-level Processing. Includes the receipt, screening, and processing of a NRFI engine module for induction for 1st Degree I-level repair, or Beyond Capability of Maintenance processing.

C. Engine Module 1st Degree I-level Repair Turn-Around-Time (RTAT): Includes the time required to remove and replace defective components and parts, testing, and processing time required to return the engine module back to service. It is assumed that RFI components and parts are readily available for installation on the engine. Repair turn around time standards exclude Awaiting Induction, Awaiting Maintenance, and Awaiting Parts time.

D. Engine Module Beyond Capability of Maintenance (BCM) Percentage. A percentage of engine modules that will be repaired at Depot vs. 1st Degree I-level. For modular engines with robust 1st Degree I-level repair capability, this percentage should be small. The majority of engine module repairs should be performed at the 1st Degree I-level unless build standards, cost effectiveness, or other considerations dictate that a higher percentage of engines return to the Depot.

E. NRFI Engine Module Transportation 1st Degree I-level to Depot. Includes the transportation time from a 1st Degree I-level repair activity to the Depot that normally supports that engine. Efforts should be made to minimize the number of times an engine module is handled and shipped, therefore, unless an engine's maintenance concept dictates that all engine modules must be processed by a 1st Degree I-level prior to forwarding to a Depot for repair, it is assumed that the 1st Degree I-level to Depot transportation time is zero and the engine's transportation time to reach the Depot, its ultimate repair activity, is accounted for in the 3rd Degree I-level to 1st Degree I-level transportation time.

F. Engine Module Depot Repair Turn Around Time (RTAT). Includes the time required to disassemble an engine module and components as required, remove and replace defective parts, reassemble, test, and make the module ready to reinstall in an engine. Since removing components and replacing them with RFI ones is by definition I-level repair, the Depot repair of engine modules includes disassembling the module completely and replacing parts. RTAT standards exclude Awaiting Induction, Awaiting Maintenance, and Awaiting Parts time.

G and H. RFI Engine Module Transportation I-level and Depot to Pools: The transportation time for an RFI engine module from 1st Degree I-level or Depot repair activity to a TYCOM designated spare engine pool site. This time is accounted for in the 3rd Degree I-Level to 1st Degree I-Level transportation time.