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Supply

**FUNCTIONS AND RESPONSIBILITIES
OF THE EQUIPMENT SPECIALIST
DURING PROVISIONING**

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OPR: HQ AFMC/LGIM (Emil F. Schumaier)

Certified by: HQ AFMC/LGI
(Col William E. Robinson)

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This instruction provides guidance for the assignment of source, maintenance, and recoverability (SMR) codes. It establishes the criteria for assigning maintenance and overhaul rates to support items entering the Air Force via the initial provisioning process. This instruction implements AFMCPD 23-1, *Sustainment Materiel Acquisition Policy*. This instruction does not apply to Air Force Reserve or Air National Guard units or members.

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1. General. The equipment specialist (ES), engineering and reliability function, holds a key role in developing and maintaining logistics support for Air Force systems and equipment. This responsibility commences during the conceptual phase of system or equipment development (DODI 5000.2/AF Supplement, *Defense Acquisition Management Policies and Procedures*) and continues until the system is removed from the inventory. Of critical importance is the ES role during the acquisition phase of system or equipment development. The technical decisions required during the early periods determine the effectiveness of future logistics support capabilities and impact future reliability and maintainability (R&M) of an item from cradle to grave. This instruction is directed primarily toward the ES responsibilities in the areas of SMR coding, and the assignment of maintenance and overhaul replacement rates. The impact of design on these decisions and their relationship with support activities requires these relationships and interfaces be identified and briefly described.

2. Objective. Effective support will be provided for all new weapon systems, support systems, or end articles of equipment entering the Air Force operational inventory. The availability of support in time to meet delivery schedules of the end article requires that maintenance and logistics planning and programming be started with and accomplished progressively from the conception phase. This planning will result in formal provisioning actions (AFMCR 65-5, *Air Force Provisioning Policies and Procedures*) being started during the engineering and manufacturing development (EMD) phase, so that shortly after production contract award, spare orders can be submitted. This approach will assure effective support at the earliest possible time. The ES must participate in technical interchange meetings covering repair level analysis (RLA) and logistics support analysis (LSA). The early integration of the ES is essential to ensure both the contractor and the Air Force reach a mutual understanding of the maintenance concept. This establishes a precedence for the contractor recommended SMR codes, indentures, etc., that will be submitted on the provisioning technical documentation (PTD).

3. Maintenance Planning. One of the biggest problems facing Air Force Materiel Command (AFMC) maintenance activities is maintaining the capacity to accomplish the maintenance support mission in an exploding technological era. To effectively accomplish mission requirements, it is essential the ES play an active and influential role during the design and development phases of the system as well as the acquisition process to include the LSA process. It is vital that they take a critical and thorough look at equipment during design and development to study and plan concepts of maintenance and techniques of repair and to influence the design to improve reliability, maintainability, and supportability. Delays in determining and acquiring concurrent and compatible support requirements for organizational, intermediate, and organic depot maintenance can be averted through active participation.

4. Safety Planning. The design, development and production of end items of equipment must meet federal safety and health standards. The ESs representing the air logistics centers (ALCs) for engineering inspection and configuration review have the opportunity to identify potential safety and environmental problems. Costly retrofit or modification can be averted by alerting the design agency of problems before the production base line is established. Development of maintenance programs must also include the close coordination and support of the ALC safety and environmental offices to assure safety and environmental considerations are integrated into the programs.

5. Responsibilities. When the ES becomes involved in acquisition processes depends on the complexity of the system or equipment being procured, the degree of advance engineering required by the contractor to produce the end item for the Air Force, and the contractual requirements levied upon the contractor.

ESs involved in acquiring support for less than major system acquisition programs may not have available data from engineering studies and must rely on their experience and judgment in developing support capability. They must strive to obtain the most current predicted and proven reliability data, in the interest of accurately forecasting initial spares operational requirements, because reliability of previous generations of equipment may be considerably lower than the current generation. The activities and responsibilities outlined below are those associated with acquiring major systems or equipment and may not be totally applicable to all programs:

- 5.1. Participate in the development of maintenance concepts, maintenance engineering plans and supply support plan. Support the logistics input to the program management plan (PMP) and LSA (MIL-STD-1388-2B, *DOD Requirements for a Logistics Support Analysis Record*, or its replacement), tailored to limit the data requirement to only those data elements needed to identify and compute repair part support, data delivery format and media. This includes participation in R&M and reliability centered maintenance (RCM) initiatives which are used in developing logistics programs.
- 5.2. Provide or recommend specific maintainability requirements, goals, and inspection and test requirements for inclusion in specifications beginning with request for proposals (RFP). Coordinate and participate at CCB proceedings for specification authentication of maintainability requirements.
- 5.3. Provide ALC representation in source selection evaluation board proceedings.
- 5.4. Review contractor mathematical logistics models for operational maintenance implications.
- 5.5. Review maintainability and maintenance analysis data provided by contractor to verify consistency with Air Force maintenance policies and practices.
- 5.6. Coordinate on requests for deviations from technical order (TO) specifications to ensure that logistics support impacts on the operational inventory are considered.
- 5.7. Analyze test program results for maintenance implications.
- 5.8. Provide ALC representative for engineering inspections and other reviews; for example, preliminary design reviews, critical design reviews (CDR), and the functional and physical configuration audits. Attendant to these reviews and inspections is the need for the ESs to identify potential candidates for interim contractor support.
- 5.9. In conjunction with engineering specialists, identify test objectives and test data requirements (AFI 99-102, *Operational Test and Evaluation*) pertaining to engineering and logistics. Participate in the test force when AFMC participation is required to achieve stated test objectives. Collaborate with the test force to ensure that failure data are directed to all action agencies, and incorporate required changes into logistics planning for the operational inventory as early as practicable. Define maintenance tests needed to validate equipment allowance guides, including depot-level tools, test and calibration equipment.
- 5.10. Verify -6 TO inspection and work card procedures and requirements, including decision logic analysis and base level repair capabilities.
- 5.11. Provide assistance for in-process and prepublication reviews and participate in verification review of TOs (DODI 5000.2/AF Supplement) and automatic test equipment (ATE) software.
- 5.12. Determine reparability of all items of material, assign SMR codes consistent with the maintenance concept, and establish maintenance and overhaul replacement rates for Air Force spare and repair parts support. Assign other codes such as item management codes (IMC), and materiel manage-

ment aggregation codes (MMAC). This is started as early as possible in EMD when LSA is done and providing data is available, normally after CDR.

5.13. Pay special attention to source coding of simple maintenance aids, holding fixtures and devices, hand tools and noncomplex bit and piece parts. The ES will:

5.13.1. Determine the complexity and criticality of each item.

5.13.2. Breakout those noncomplex, noncritical items.

5.13.3. Consider base or depot fabrication or local purchase.

5.14. Ensure establishment of the indentured application of each part for the weapon system or end item in the applications/programs indenture (API) as required.

5.15. Assist in the establishment of repair requirements for reparable items, such as:

5.15.1. Government furnished aerospace equipment (GFAE) common.

5.15.2. GFAE peculiar.

5.15.3. Defense Logistics Agency (DLA) managed items.

5.15.4. Government furnished property (GFP) bailed GFP.

5.15.5. Ammunition and explosives.

5.16. Provide ALC input for preparation of test support plans.

5.17. Participate in the resolution of maintenance interface problems among contractors, the using command, AFMC, and other services pertaining to the operational phase, including test programs.

5.18. Assist in the identification and selection of special purpose recoverables authorized to maintenance (SPRAM) items required to support the system/ equipment (AFM 67, Volume I, Part One, Chapter 11).

5.19. Participate in the development of initial spares support list (ISSL), readiness spares package (RSP), and assignment of standard reporting designators (SRD).

5.20. Assist in the preparation of the depot support concept (DSC) when tasked by the program action directive (PAD) to the program management directive (PMD) or other AFMC tasking. The DSC will be prepared early in the program to identify logistics requirements to be satisfied by the system program director (SPD), (DODI 5000.2/AF Supplement).

5.21. Assist provisioning personnel in LSA/logistics support analysis record (LSAR) review to assure provisioning requirements are adequately addressed. Also, review RLA input data report accuracy and output results for influence of recommended SMR codes provided during the LSA process, where possible, to eliminate duplication of effort subsequent to ES SMR code review/approval at the provisioning conference.

6. Reparable Decisions:

6.1. Of the many maintenance decisions required of the ES during the acquisition process, the most basic and critical decisions are those involving repair and levels of repair. These decisions control the development of initial maintenance support programs, and impact the dollars that must be spent in buying this support. The reparable decisions must be based on and be consistent with the maintenance

concept for the system (two levels, three levels, etc.). In the Air Force, maintenance concepts in the past have been designed around three levels of maintenance: organizational, intermediate, and depot (as accomplished organically by AFMCs Technology Repair Center (TRC), interservice or contractor). The decision to repair at any one of these levels generates a requirement to plan and procure support equipment (SE), SE for SE training, spares, repair parts, TOs, etc., to sustain maintenance. New systems being developed or existing systems being modified are being designed for two levels of maintenance. The ES must be aware of the maintenance concept and be careful not to change the concept through source of repair decisions.

6.2. The level of repair decision impacts the total maintenance support program. The ESs decision should be made an integral part of the system or equipment development. The analysis associated with a contractor's repair recommendations, and the Air Force's repair decision should be made as soon as the equipment preliminary design has been determined. The analysis should continue until a final hardware design is reached. This requires ES participation during the LSA, as required by DODI 5000.2/AF Supplement.

6.3. There are several advantages to incorporating repair decisions with the design effort. The ES must participate in or be aware of R&M programs for their obvious effect on maintenance programs. The inventory management specialist/system support manager (IMS/ SSM) ES must also be aware of CCB decisions that impact maintenance areas. In short, the ES must provide aggressive maintenance management. An advantage of integrating repair decisions into the design effort is the opportunity to mold maintenance experience into the design of the item. Another benefit is early identification of those items requiring SE, TOs, etc. The early identification of SE requirements is particularly important because lead times to design and produce SE can be as long as that of the end item. Delaying the establishing of a repair plan until a production contract or a provisioning conference could cause delivery of contractor furnished SE to slip past the operational need date.

6.4. The definition, development, and implementation of a comprehensive repair program must consider those factors which significantly influence support costs and cost of ownership over the life cycle of the system or support needs. On major systems or equipment, analyzing repair alternatives in terms of cost requires systematic evaluation of the engineering process. A valuable tool in identifying the economical advantages or disadvantages or repair alternatives is MIL-STD-1390, *Level of Repair Analysis (LORA)*. The techniques and processes outlined in MIL-STD-1390 or its replacement are primarily directed toward application by contractors. More specifically, they are an integral part of the contractor's R&M programs, for it is these design parameters which strongly influence and are influenced by the maintenance program. ESs must not only use RLA results in their decision processes but must actively participate in reviewing and developing the contractor's RLA plans. RLA direction is contained in AFMCR 800-28, *Repair Level Analysis (RLA) Program*.

6.5. For those equipment programs that are not of sufficient size or complexity to warrant the application of RLA, the ES uses the economic analysis procedures outlined in **paragraph 17**. An economic analysis should always be considered as a supplement to the technical and operational considerations which can and do effect maintenance decisions. Design of the item, flight safety, mission success, or established maintenance policy are of primary consideration on the repair decision. This precludes a decision based only on economic constraints.

6.6. The repair decision is documented through the use of the maintenance repair level (MRL) codes (TO 00-25-195, *AF Technical Order System Source, Maintenance and Recoverability Coding of Air Force Weapons, Systems and Equipment*). This TO contains an SMR coding matrix and a listing of

acceptable SMR code combinations. This TO implements a joint service regulation known in the Air Force as AFR 66-45, *Joint Regulation Governing the Use and Application of Uniform Source, Maintenance and Recoverability Codes*. SMR codes based on an approved RLA must not be changed later at a provisioning conference without an approved change to the established repair level decision and consideration of the impact on the maintenance and support plan. Complete coordination between the SPD, the ALC SSM, and the ES for the end item will be accomplished prior to any formal change action.

6.7. In conjunction with the assignment of the maintenance code the ES must assign a single digit expendability, recoverability, reparability, category (ERRC) code (AFM 67-1, Volume I, Part Four, Chapter 1). The ERRC code is used by supply personnel to categorize inventory into various management groupings. These groupings determine the type of management employed throughout the item's logistics life, identifies the method to be employed in computing requirements, and are used in the accumulation and reporting of asset and usage data. The ERRC code must be compatible with the SMR coding decisions.

7. Source Coding Fundamentals:

7.1. Source codes have three fundamental functions: provide maintenance activities a means of identifying authorized methods of support; identify to the supply system those items maintenance considers logical spare/repair parts or SE; and control, to a degree, the demands placed on the manufacturing capability of the Air Force. Complete details regarding the SMR codes authorized for use within the Air Force are contained in TO 00-25-195. The general categories of source codes are:

P - Procured items.

K - Items purchased as part of a maintenance/overhaul kit.

M - Items to be manufactured.

A - Items to be assembled.

X - Items not practical for either procurement, manufacture, or assembly.

SMR codes are initially entered in PTD or engineering data and then incorporated into the illustrated parts breakdown (IPB) TO. Conditions affecting initial SMR code assignments are dynamic and changes may be necessary to provide a viable maintenance program. Extreme variations in an item's cost, design change, and new operational requirements are among the many factors that can provide justification for an SMR code change. SMR code changes must be approved by the IMS/SSM ES.

7.2. The ES from the engineering and reliability function, is responsible for the selection of spares, repair parts, part kits, and SE required for maintenance overhaul programs. Proper SMR coding reduces part number requisitions, limits manufacture of parts to low usage/casual replacement type items that are practical to manufacture, and generally enhances the entire logistics support of systems and equipment. To make effective decisions, the ES requires engineering data for provisioning (EDFP) (drawings, schematics and diagrams, etc.), sample articles, logistics data packages, and depending upon the complexity of the item, equipment, or system involved, the assistance of or advice from contractor technical/engineering personnel.

7.3. AFMC maintenance facilities are established primarily for repair of Air Force equipment and materials. Organic facilities may be used for manufacture of items only when a clear determination is made that one or more of the circumstances in AFI 21-102, *Depot Maintenance Management*, exists.

7.4. The correct assignment of SMR codes depends on the availability of technical information, projected operational requirements, and the ability of the ES to correlate this information with previous experience on similar operational equipment. Listed below are types of data and information which can influence an SMR coding decision. It is not all inclusive nor will all of the list apply to all items, equipment, and systems. It is intended as an example.

7.4.1. Mission and priority of the end item, equipment, or system. Flight/operational hours:

7.4.1.1. Sorties per flight hours.

7.4.1.2. Starts per flight/operational hour.

7.4.2. Planned deployment and environmental conditions and geographical constraints.

7.4.3. Programmed life in the Air Force inventory.

7.4.4. Complexity of the item under consideration and its accessibility, functional, and physical interface with the next higher assembly.

7.4.5. Maintenance concepts and plans.

7.4.6. Maintenance resources and facilities required, the projected date of their availability and any new technology involved.

7.4.7. SE plan for the equipment/system, particularly new peculiar SE. The status of its development and at what level of maintenance each item will be authorized and when it will be available.

7.4.8. Results of reliability testing and maintainability demonstrations, if a contractual requirement.

7.4.9. Results of qualification testing.

7.4.10. Results of development test and evaluation and operational test and evaluation.

7.4.11. Results of physical and functional configuration audits.

7.4.12. RLA data.

7.5. With tools and information listed in the above paragraphs available, the ES should be able to assign logical SMR codes. The sequence in assigning SMR codes is to begin with the topmost drawing and part number, then code the items in disassembly order. The group assembly parts list is prepared in this order. Drawings should be available in the same order. Sample articles should be available. Review the parts list, drawing, and sample article simultaneously, consulting contractor engineering personnel as required. With program and testing information in mind, assign SMR codes. Some examples to be used as guidelines for the assignment of SMR codes follow:

7.5.1. Normally chassis and main frame assemblies are not replacement items.

7.5.2. Direct current (DC) motor brushes, brush caps, holders, and bearings are considered repair parts.

7.5.3. Lamp receptacles, dust covers, waveguides, etc., are normally considered repair parts, but because of their imperviousness to wear out, their replacement factor is based on loss, mishandling, vulnerability to damage, etc.

7.5.4. Armatures, if they exceed 50 percent of the cost of the motor, are not considered replacement items.

7.5.5. All electronic/electrical parts are logical repair parts, unless they are part of a higher assembly that is to be discarded upon failure.

7.5.6. Matched sets of items such as resistors, diodes, coil and resistor, and certain types of mechanical items, if they are logical repair parts, are source coded PA and the individual items of the matched set are coded XA.

7.5.7. Crystals are normally considered logical repair parts and should be source coded PA. There are two categories of crystals, categories A and B. Category A crystals are included in the equipment when it is delivered, and identified in the provisioning document by frequency, type number, or part number. Spare category A crystals can be stocked, stored, and issued in the same manner and on the same schedule as other spare parts. Category B crystals are identified in the provisioning document by basic type number, but without frequency information. Frequency of category B crystals is dependent upon operational requirements of the using activity of the end item. These crystals are not available from supply channels until using activities submit part number requisitions with attendant frequency requirements. Source code PA is applicable to both A and B crystals.

7.5.8. Cable and hose assemblies should be considered for assembly rather than procurement. The decision to assemble rather than to procure should be made with the knowledge that the assembled item will function properly and maintain system requirements (for example, flight safety). For those cable and hose assemblies source coded for assembly, the hoses and cables within these assemblies will normally be made up from bulk material.

7.5.9. Decalcomanias (decals), film markings, metal markings, etc., are not considered stockage items. These items are normally listed in the IPB, but procedures for their acquisition is contained in AFI 37-162, *Managing the Processes of Printing, Duplicating and Copying*.

7.5.10. Springs, gaskets, control knobs, shafts, couplings, dials, etc., in most cases, are maintenance items.

7.5.11. Bulk items and material, both commercial and military standard items such as hardware and fittings, general purpose hardware, wire, phenolic tubing, soft consumables, etc., are considered repair parts.

7.5.12. Low usage items such as spacers, housings, pump and valve bodies, etc., can be obtained through reclamation, when required.

7.5.13. Cables, special tools, and extender boards designed as maintenance aids will be classified as SE and source coded accordingly.

7.6. The SMR codes are recorded in the group assembly parts list, and will be entered in the earliest possible issue of the IPB TO. Proper source coding reduces part number requisitions, control service manufacture, and enhances the entire logistics support of systems and equipment.

8. Development of Repair Kits. The development of repair kits to support equipment can prove to be the most effective and economical method of supply support. This approach, while readily adaptable to equipment subject to wear or age deterioration, should be used with caution on electronic equipment because they do not follow a wear-out pattern, nor do they have a predictable life. The ES must consider the levels of repair and repair techniques used, economics of support kits, and the effect on related aspects of logistics management. Shelf-life items are not included in the kit unless the shelf life equals or exceeds

the time between overhaul of the component to which it is being applied. It is also incumbent on the ES to periodically review the parts kits programs to ensure their compatibility with current usage information, change in maintenance concepts, or change in operational requirements. Specific guidance as to parts kits policies and procedures is outlined in AFMCM 65-42, *Repair Parts Kits (D031) Users Manual*.

9. Support Equipment (SE):

9.1. All equipment (mobile or fixed) required to support the operation and maintenance of the system, including associated multiuse end items, ground handling and maintenance equipment tools, metrology and calibration equipment, test equipment and ATE, are within the SE arena. The identification and acquisition of SE is one of the most difficult support tasks associated with the system or equipment acquisition process. Identification by contractors of SE requirements early in the design development process, consistent with the operational and maintenance concepts and documenting these requirements to the Air Force for validation is paramount to the SE management program. The Air Force evaluation criteria must complement system or equipment design requirements, training requirements, operational requirements and projected maintenance programs.

9.2. It is an AFMC responsibility to edit SE proposals to identify those that could be satisfied by SE currently in the inventory or modifying available SE to satisfy the requirement. To identify existing SE that may satisfy the requirement, the ES can use FEDLOG. Selection of SE will be made in the following order:

9.2.1. Standard item.

9.2.2. Preferred item.

9.2.3. Items already in the government inventory or being developed under government contract.

9.2.4. Commercially available items that meet technical or logistic requirements.

9.2.5. Modification of any of the above.

9.2.6. Development of new items.

9.3. Additionally, the use of Air Force depot manufacturing capabilities can be effective in developing SE requirements. Centralized depot level manufacture of simple low cost SE and modifications of hand tools is frequently more cost effective than procurement from a contractor. Designation of an item for depot level manufacture or modification must be based on the following criteria:

9.3.1. A cost effective analysis that verifies the decision.

9.3.2. Availability of material and the necessary manufacturing data.

9.3.3. The process of manufacture or modification is compatible with tools, equipment, or available skills.

9.3.4. Quantities required do not impose an undue workload.

9.3.5. SE will be available by need date.

9.4. The IMS/SSM ES, as the AFMC focal point for evaluating contractor SE proposals, is responsible for:

9.4.1. Evaluating the comments and recommendations from the other ALC offices and the using commands.

9.4.2. Assimilating this information from personal experience and knowledge of system or equipment maintenance requirements.

9.4.3. Based on these findings, perform the following:

9.4.3.1. Select the standard SE required to support the system.

9.4.3.2. Identify the adequacy and need of developmental SE proposed by the contractor.

9.4.3.3. Select the developmental SE for depot level requirements.

9.4.3.4. Identify any required SE for SE.

9.5. Validation of SE requirements and the method by which the ES decides to satisfy the requirement must be communicated to affected activities. If the decision is to manufacture instead of procure the item from a contractor, copies of SE documentation must be made available to the implementing agency and the maintenance organization responsible for manufacturing the item.

9.6. The support decision creates the need to assign source codes (and appropriate maintenance/recoverability codes) to SE. The source code PE is assigned to items identified for procurement (both government furnished equipment (GFE) and contractor furnished equipment (CFE)). SE to be manufactured is assigned a MD series source code or the K series code for support items contained in kits.

10. Relationship to System Engineer. The ES will obtain support from the system engineer during provisioning activities, especially when determining the proper maintenance posture for fielding a new item or system. The engineer and ES must validate that item or system's maintenance plan through RCM analysis.

11. Relationship to Depot Maintenance Activities:

11.1. Preproduction planning experience is required to correlate repair and parts usage for the new equipment being procured. Preproduction planning is necessary to establish initial shop repair cycle time, and to evaluate the availability and adequacy of existing SE and facilities. Production personnel participation promotes early facility and production planning, and the development of manpower requirements for the establishment of a repair capability. This effort should be consistent with pre-established target dates for system and equipment support programs.

11.2. The provisioning parts list (PPL), formerly called the recoverable item breakdown (RIB), is used by the ES to document SMR codes and the demand rates/ overhaul percent. It is the source document for the range and replacement rates of parts and material to be established in initial material standards. Care must be taken to assure that design changes and their effect on the initial maintenance decisions are considered in the material standards to prevent deficiencies in parts support. The results (material, derivation of material standards, master repair lists, and the coordination of changes between the SSM/IMS and the TRC) must be accurately maintained as long as the item must be repaired. The API subsystem, D200F, has been developed to record and continually update the initial maintenance decisions through the programmed life of the equipment. Accurate file maintenance by the ES is critical to ensure parts support since buy decisions are based on API data. The indentures show weapon system relationships in a top-to-bottom structure.

11.3. In addition to assuring the availability of the updated range and rate of parts to support repair, the ES from the ALC assigned management responsibility (TO 00-25-115, *Logistics/Maintenance Engineering Management Assignments*) must ensure the TRC is provided the list of SE required to

support the repair program. This data must be provided in time to permit the TRC to requisition and position material and equipment to meet scheduled repair requirements. Continuity in all systems and equipment acquisition activities is required to assure the TRCs are provided all required support (spares, repair parts, SE TOs, training, etc.) for establishment of organic repair capability.

12. Relationship to Production Management:

12.1. The functions and responsibilities of the ES can't be accomplished without the help of the production management specialist. Manufacturing workloads and repair scheduling must be planned and programmed on a timely basis. At the time of SMR coding, the ES will require the help of the production specialists in determining and establishing the capabilities of the maintenance shops to overhaul or manufacture items. Depot level manufacturing capabilities, such as numerically controlled (NC) equipment, will be taken into consideration in order to reduce the support costs to the Air Force. Prime candidates of parts to be manufactured by depot level maintenance NC equipment are insurance type items which have limited and infrequent usage and are complex in nature. Advance knowledge of items coded for overhaul or manufacture allows the production management specialist to anticipate and plan manufacturing workloads and attendant raw material requirements.

12.2. Integration of the ES's decisions during the acquisition processes with production management is essential when relating to reparability coding. When identifying items for depot repair, the ES places the responsibility to immediately plan and project for expected repair workloads on production management through the IMS.

12.3. The availability of an organic repair capability in time to support the initial deployment of a system or equipment is not always feasible because of design problems, or delays in delivery of SE, TOs, etc. Through participation in the design, development, and production processes, the ES should be aware of potential delays and initiate action to alert production management of these problems. Such delays could indicate the need for interim contractor support or accelerated planning action. The maintenance program should include the use of contractor support where necessary to achieve or sustain an operational capability. Contractor support programs for new items will be based on the projected maintenance/overhaul factors and the expected operational program.

12.4. At the time of initial repair projections, the ES is responsible for furnishing production management with an up-to-date list of source coded range and rate of parts selected to support anticipated repair workload.

12.5. The ES is also responsible for providing to production management the list of applicable tools, test equipment, and TOs procured to support the repair program. Continuity and follow up from acquisition activities into production management is not only vital for timely establishment of organic repair capability, but for early establishment of maintenance contracts. The source coded range and rate of parts established in provisioning and updated because of design changes is the source document for material requirements lists for contractor maintenance. The maintenance and overhaul replacement rates determine the quantity of spare/repair parts requisitioned by or provided to the contractor to support the repair schedule. The accuracy of these factors determines the effectiveness of support for contract maintenance.

13. Relationship to Using Activity Base Capabilities and Facilities. The operation of Air Force systems and equipment requires a proficient maintenance organization. Maintenance cannot fulfill its obligations when requirements such as spare/repair parts, TOs, and test equipment are not available. Because of

design characteristics and complexity of repair, the scope of maintenance which can be accomplished at the organizational and intermediate levels is controlled by the degree of technical skills required, cost of peculiar SE, and spare/repair parts support. Early identification of these influencing factors is essential to a successful maintenance program. It is important that using activity personnel participate in all facets of the acquisition process, particularly in the level of repair decisions, and identifying methods (SMR coding) of supporting the repair program.

14. Demand and Overhaul Rates. For those items that are to be made available in the supply system, the ES must project and assign the demand and overhaul rates necessary to compute initial requirements. These factors establish the baseline for the initial requirements computation and identify projected maintenance actions that will affect supply. They also portray these maintenance actions into common language and format that logistics systems can use.

14.1. Care must be taken in the development of demand and overhaul rates. The accuracy of these factors is reflected in excesses or shortages during the initial operational and maintenance support periods. In effect, the demand and overhaul rates predict the total quantitative procurement, asset distribution, dollars spent for spares and repair parts support, and integrity of the maintenance program. Significant changes to failure rates, including SPD/contractor provided data must be coordinated with the end article IMS or SSM so impacts can be assessed by management. No changes will be made to contractor furnished data by the ES if they were developed as part of a R&M program under LSA unless there is a change in mission or maintenance concept after the factors were developed. Such changes require the approval of the SSM. Data justifying significant changes should be maintained in the item/equipment history file.

NOTE: Demand rates and overhaul percents are not required on items source coded as "insurance" items. Initial requirements for these types of items are based on quantities recommended by the ES.

14.2. The following demand and overhaul rates were developed for use in determining initial requirements and providing input data for various logistics systems such as D200F (API), D041, and D062.

- 14.2.1. Total organizational intermediate maintenance demand rate (TOIMDR) (maintenance replacement rate I (MRR I)).
- 14.2.2. Overhaul replacement rate (ORR).
- 14.2.3. Condemnation below depot (CBD).
- 14.2.4. Program depot maintenance (PDM) job-routed (JR) condemnation percent.
- 14.2.5. Engine overhaul JR condemnation percent.
- 14.2.6. Management of items subject to repair (MISTR) JR condemnation percent.
- 14.2.7. PDM non-job-routed (NJR) program percent.
- 14.2.8. Engine overhaul NJR program percent.
- 14.2.9. MISTR NJR program percent.
- 14.2.10. PDM NJR replacement percent.
- 14.2.11. Engine overhaul NJR replacement percent.
- 14.2.12. MISTR NJR replacement percent.

14.2.13. Depot replacement percent for economic order quantity (EOQ) items.

14.2.14. EOQ condemnation percent.

14.2.15. Not reparable this station (NRTS) percent.

14.2.16. Condemnation at depot (CAD).

NOTE: Rates are not required/assigned on every item coded for procurement. The rates assigned depend upon the authorized level of repair and are used for the item being rated and its relationship to the next higher assembly.

14.3. The frequency of maintenance actions and resultant demands on the supply system are proportional to the operational program and the reliability designed into the equipment. This relationship is exhibited in the factoring methodology.

14.4. There are nine types of programs used in the computation of initial requirements. These programs are divided into two categories: organizational intermediate maintenance (OIM) and depot level maintenance (DLM). The OIM programs generate requirements at the base level (also referred to as the field level). These demands upon supply are made at the base level. The DLM programs depict repair, overhaul, or modifications that will be accomplished at the depot level. These demands upon supply are made at depot level.

14.4.1. There are six types of OIM programs:

14.4.1.1. Hours.

14.4.1.2. Inventory months (equipment months).

14.4.1.3. Drone recoveries.

14.4.1.4. 1000 rounds of ammunition.

14.4.1.5. Aircraft sorties.

14.4.1.6. Squadron months.

14.4.2. There are three types of DLM programs:

14.4.2.1. PDM.

14.4.2.2. Engine overhaul.

14.4.2.3. MISTR.

14.4.3. The program applicable to a particular end item is identified by an initial requirements determination programming checklist. The programming checklist (PCL) can identify eight of the nine programs. The exception is the MISTR program. This program must be developed by the IMS or ES according to AFMCR 57-27, *Initial Requirements Determination*.

14.5. The TOIMDR represents the rate at which OIM activities are expected to place a recurring demand upon base supply in relation to a given OIM program. The replacement of the item must further create a demand on supply for that item. The demand on supply or meantime between demand (MTBD) criteria exclude maintenance actions such as overhaul removals and other nondemand failures, which are not part of the TOIMDR. The derivation of a total OIM demand rate must encompass such factors as the ratio of demands to failures, demands to maintenance actions, and operating hours to flying hours (utilization factor).

14.5.1. To develop the TOIMDR for an item with a quantity per assembly (QPA) of one or a quantity per end item (QPEI) of one and a single next higher assembly (NHA) or end item, estimate the time the item will experience between failure removals which places a demand on base supply (MTBD) and divide into the appropriate operating program unit. This figure represents the rate at which a single installed item will fail requiring removal and replacement at base level. The estimate must include considerations for:

- 14.5.1.1. Design performance limitations.
- 14.5.1.2. M&R analysis data.
- 14.5.1.3. Similar or like item comparison and usage data.
- 14.5.1.4. Contractor and vendor estimates.
- 14.5.1.5. Mandatory removal intervals.
- 14.5.1.6. Replacement due to repair of NHA.
- 14.5.1.7. Test data and experience.
- 14.5.1.8. Operational environment.
- 14.5.1.9. Safety analysis data.

14.5.2. If the applicable program is in program units of 100 hours (H), develop the rates by dividing 100 by the estimated MTBD. For example, when the MTBD is estimated at 1000 hours, the rates are as follows:

<u>100 hours (program unit)</u>	0.1000 maintenance
1000 hours (MTBD)	replacement rates

expressed as 0.1000
failure removals per
100 hours of program.

14.5.3. If the applicable program is in program units of inventory month or squadron month (M), develop the rates by dividing one by the MTBD. For example, when the MTBD is estimated at 5 months, the rates are as follows:

<u>1 month (program unit)</u>	0.2000 maintenance
5 months (MTBD)	replacement rates

expressed as 0.2000
failure removals per
1 month of program.

14.5.4. If the applicable program is in program units of 1000 rounds of ammunition expended (R), develop the rates by dividing 1000 by the MTBD. For example, it is estimated that the item will require replacement of a single application every 5000 rounds, the rates are as follows:

<u>1000 rounds (program unit)</u>	0.2000 maintenance
5000 rounds (MTBD)	replacement rates

expressed as 0.2000
failure removals per
1000 expended.

14.5.5. The program to which the rates are applied must be in program units compatible with the rates. In computing gross removals for the initial requirements support period, the rates may be applied to aggregate end article/recoverable item programs as shown below:

25000 hours (programs) 250 program units of
100 hours (program unit) 100 hours each;
250 units x 0.1000
(MTBD) = 25 each.

The conversion from total operating hours of 100-hour increments will be accomplished during preparation of the PCL and is shown here only for the purpose of clarity.

14.5.6. To develop the TOIMDR for multiple QPAs or multiple QPEIs within a single NHA or end item, determine the rate of each single application and divide the sum of the single rates by the total number of single applications. For example, the MTBD is estimated at 400 hours for the 1st application, 1800 hours for the 2nd application and 2300 hours for the 3rd application. The OIM demand rates and the TOIMDR are computed as follows:

1st Application OIM Demand Rate

OIM demand rate = 100 hours
(program unit) ÷ 400 hours (MTBD) = 0.2500

2nd Application

OIM demand rate = 100 hours
(program unit) ÷ 1800 hours (MTBD) = 0.0555

3rd Application

OIM demand rate = 100 hours
(program unit) ÷ 2300 hours (MTBD) = 0.0435

Total OIM Demand Rate 0.3490

To compute the TOIMDR, use total OIM demand rate (0.3490) ÷ total number of single applications (3) = 0.1163 TOIMDR (average failure removals per QPA or QPEI per 100 hours of the program).

14.5.7. To develop the rate for multiple QPAs or QPEIs for multiple NHAs or end items, perform the following:

- 14.5.7.1. **Step 1.** Multiply the QPA or QPEI of the items times the number of NHAs installed.
- 14.5.7.2. **Step 2.** Determine the rate within a single NHA or end item and multiply that figure times the results of step 1.
- 14.5.7.3. **Step 3.** Total the results and divide by the sum of all installed QPAs or QPEIs. For example: The F105 has two gyros, five actuators, and ten pumps. Bearing "XX" is used (QPA)

five times on each gyro, four times on each actuator, and three times on each pump. Establish an average total OIM demand rate as follows:

Table 1. Average Total OIM Demand Rate

Bearing	QPA	X	Installed	=	QPA	X	OIM	=	Demand Rate
Gyro	5	X	2	=	10	X	0.250	=	2.50
Actuator	4	X	5	=	20	X	0.500	=	10.00
Pump	3	X	10	=	<u>30</u>	X	0.400	=	<u>12.00</u>
					60				24.50

Demand rate 24.50 divided by the installed QPA of 60 = average TOIMDR of 0.4083. This is expressed as 0.4083 failure removals per QPA per operating program increment.

14.5.8. Total OIM Demand Rate. This rate is expressed as a five-position number (that is, 0.5000) with the decimal point always being between the first and second positions. TOIMDRs are not required for items authorized for depot use only. The initial requirements for recoverable items authorized for depot use only are computed from the JR and NJR rates. The initial requirements for EOQ items authorized for depot use only are computed from the depot replacement percent and EOQ condemnation percent. EOQ items authorized for base use will have an OIM demand rate.

NOTE: Conversion tables for transposing anticipated MTBD to its compatible TOIMDR are in AFMCM 57-4, Recoverable Consumption Item Requirements System. Maximum use should be made of these tables to eliminate rates interpolation through mathematical process.

14.5.9. ORR. The ORR represents the replacement rate of a spare or repair part in the overhaul of the NHA. The maintenance decision for the item being factored or for its next higher assembly determines the need for the assignment of an overhaul replacement rate. This relationship also determines if the overhaul replacement rate is used to compute an initial requirement or to determine asset distribution. The following rules apply in the assignment of ORRs:

14.5.9.1. Subassemblies and bits and pieces for items with a D or L in the fourth position of the SMR code require an overhaul replacement/rate.

14.5.9.2. Subassemblies and bits and pieces for items with an F in the fourth position of the SMR code will not require an overhaul replacement rate. It is imperative that indenture integrity be maintained to ensure proper parts projected and that initial computations are based upon the projected maintenance program of the next higher assembly.

NOTE: References are provided in [Attachment 2](#) and [Attachment 3](#) for federal supply groups (FSG) 53 and 59 respectively.

14.5.10. CBD. The rate is assigned to items with an O or F in the fourth position of the SMR code. It represents that portion of the failed items removed and processed for base level which is condemned at that level due to wear out or economical repair limitations. The entry for items with an O or F in the fourth position of the SMR code is used during the initial requirements computation and is vital to the accuracy of the initial procurement quantities. A base condemnation rate of 100 is always applied to items with a B or Z in the fourth position of the SMR code. The CBD rate is

expressed as a two-position number (that is, .10) with the decimal to the left). 100 percent CBD will be expressed as .99.

14.5.11. NRTS Percent. The base NRTS percent represents that portion of the estimated reparable generations which their repair shops are unable to repair and therefore are processed to a TRC. During initial provisioning, this applies only to items with D or L in the fourth position of the SMR code. The use of this factor and the technician's ability to accurately use it is important for determining the initial requirements. This factor, in conjunction with one or more of the other factors, will assist in providing such information as percent base processed/repared, percent depot processed/repared, estimated quantities of depot condemnations, estimated reparable generations, and the overhaul recovery percent. An NRTS percent is not required for items with an O or F in the fourth position of the SMR code. These items are planned 100 percent field level repair. The NRTS factor must be portrayed on the provisioning document as a three-position number with the decimal point always between the first and second position (that is, 0.25).

14.5.12. CAD. This is the ratio of reparables condemned in relation to the attempted repairs during depot level repair of the item. It does not include the condemnations of the item during the repair of a higher assembly.

14.5.13. The PDM NJR Repair Percent. This factor is used to divide the PDM overhaul program into a JR and NJR program. It represents that portion of item removals during depot repair of the end item which is turned into supply for shipment to another facility.

14.5.14. The Engine Overhaul NJR Repair Percent. This factor is used to divide the engine overhaul program into JR and NJR programs. It represents that portion of item removals during depot repair of the NHA or end item which is turned into supply for shipment to another repair facility.

14.5.15. The MISTR NJR Repair Percent. This factor is used to divide the MISTR program into a JR and NJR program. It represents that portion of item removals during depot level repair of the NHA which is turned into supply for shipment to another repair facility.

14.5.16. The PDM NJR Replacement Percent. When NJR items are removed during depot level repair, a replacement item is needed from supply. The PDM NJR replacement percent is the ratio of the PDM NJR replacements to the PDM NJR program.

14.5.17. The Engine Overhaul NJR Replacement Percent. When NJR items are removed during depot level repair, a replacement item is needed from supply. The engine overhaul NJR replacement percent is the ratio of engine overhaul NJR replacements to the engine overhaul NJR program.

14.5.18. The MISTR NJR Replacement Percent. When NJR items are removed during depot level repair, a replacement item is needed from supply. The MISTR NJR replacement percent is the ratio of MISTR NJR replacements to the MISTR NJR programs.

14.5.19. Depot Replacement Percent. This percent is used for expense (EOQ) items. It is the number of replaced repair parts divided by the program of the NHA or the end item.

14.5.20. Normally, it will not be necessary to factor end items of equipment because the quantity procured is specified on the contract and initial spare requirements are not computed. However, there are cases when systems are procured for integration into other systems. In effect, this would make them subsystem or components and would therefore require factoring to provide input into

various maintenance and logistics system (API-D200). ESs should be aware of this requirement and ensure, when necessary, these factors are assigned and provided to the required systems.

15. Operational Reliability:

15.1. Attempts to forecast initial spare operational requirements against the engineered reliability value, meantime between failures (MTBF), consistently results in underpredicting initial requirements. Because of this, the term MTBD was developed and is used as the base line for developing initial maintenance and overhaul rates. However, the MTBD for the majority of items does evolve from the MTBF value. The disparity between the two figures is brought about by the inability of the reliability engineer to take into consideration, or to quantify, such parameters as operational environment, maintenance learning curve, or the ratio of operating hours to flying hours. ESs responsible for establishing and maintaining demand and overhaul rates must understand and consider these varying differences and at what point in time they occur.

15.2. **Figure 1.** is a schematic diagram of the theoretical steps in converting the design (engineered) reliability value to an MTBD. The purpose is to explain the difference between the two values and provide a logical and progressive approach to documenting the conversion process. The left column shows the principle factors, with an arrow pointing to the equivalent formula in the center column. There are four K factors provided leading from the MTBF to the MTBD. These are:

15.2.1. K1 - The ratio of the specified MTBD to the minimum acceptable MTBF. This ratio should be identified in that portion of the end item contract outlining reliability requirements.

15.2.2. K2 - This recognizes the differences between failures which are contractor responsibility and measurable in the test environment as opposed to those failures occurring in the operating environment which creates a demand on the supply system. (This distinction in kinds of failure is shown in the right column.)

15.2.3. K3 - Ratio of operating hours to flying hours. Operational reliability and demand interval of aeronautical items are normally based on flying hours. Design reliability is calculated and tested on the basis of actual hardware operating hours rather than flying hours.

15.2.4. K4 - Ratio of demands (removals) to failures. Not all failures generate a remove and replace action and a demand for a spare. In some instances, the item may be removed, repaired, and reinstalled without requiring a like item from supply, or in certain instances, a failure can only be repaired by extensive shop repair time. Design of the item, location in higher assembly, and test concept influence this ratio. These factors may be one (1.00) or greater or less than one. The latter is expressed as a decimal fraction, for example, formula:

$$\text{MTBD} = \text{Design MTBF}$$

$$K^1 \times K^2 \times K^3 \times K^4$$

16. Factoring Piece Parts:

16.1. Demand and overhaul rates assigned at the piece part level will not be developed by the application of K factors. Any attempt to underrate the MTBF of the individual piece part would become so detailed and repetitious that the prediction would become too costly in terms of time and effort. The most logical method of developing demand and overhaul rates at the piece part level is to compare the items under review with the demand history of like or similar items. Depending on the degree of sim-

ilarity of equipment and application, the comparison method can be the quickest and most accurate means of predicting demand rates. The comparison method also permits the development and application of standard rates. A study of demand and overhaul rates assignments by individual ALCs resulted in the formation of standard factor lists (**Attachment 2** and **Attachment 3**) for electronic components (for example, resistors and capacitors) and selected hardware items (for example, nuts, bolts, washers). To achieve maximum benefit from the utilization of these tables the following procedures will apply.

16.2. Standard maintenance and overhaul replacement rates for FSG 53 and 59 items, IMC coded for DLA management, are mechanically assigned based on the rates assigned to items listed in the standard rates in **Attachment 2** and **Attachment 3**. Rate assignments for FSG 53 and 59 items not identified in **Attachment 2** and **Attachment 3** are according to procedures outlined in preceding paragraphs. Proposed changes or additions to the standard factors must be submitted to HQ AFMC/LGIM.

17. Economic Considerations in Maintenance Coding. For programs where a formal RLA or LSA has not been accomplished, the economic analysis methods outlined below will be used to supplement the technical and operational considerations which can and do affect maintenance decisions. Design of the item, flight safety, mission success, or established maintenance policy are primary considerations. As such, the use of this analysis may be precluded. If noneconomic considerations do not dictate the decision, or only dictate a partial decision, this guidance applies.

17.1. Data Requirements. There are four categories of data required to perform the economic analysis prescribed here:

17.1.1. Data From Provisioning Documents:

17.1.1.1. Item Cost. The projected cost of the item under analysis should be available on the provisioning documentation. Normally, these costs are justifiable estimates by the contractor; however, the ES/IMS/SSM should challenge the estimate in those instances where historical data and experience indicate differences. If the contractor cannot or will not justify the estimate and/or make an appropriate adjustment, the ES will provide a more realistic price which will be used to update the provisioning document and alert the administrative contracting office (ACO) that the estimated price has been challenged.

17.1.1.2. Cost of Subassemblies/Bit and Piece. Costs for items of this type are normally available on the provisioning documentation. If not or historical data and experience indicate different costs estimates, the ES/IMS/SSM should challenge the contractor to justify or adjust estimates accordingly. If the contractor does not justify or adjust challenged estimates, the ES will provide a more reasonable estimate to be used to update the provisioning document and alert the ACO of a contractor price challenge.

17.1.1.3. QPEI. The QPEI portrayed on the provisioning document is used in the economic analysis.

17.1.2. Data from Initial Requirements Determination Programming Checklist:

17.1.2.1. Life Expectancy. The period of time (in years) the end article will remain in the inventory.

17.1.2.2. Procurement Quantity. The total number of end items programmed for entry into the

inventory.

17.1.2.3. Usage Rate. The time one end item will be used in a 1-month period. For multiyear procurement contracts, the usage rate is the average flying hour program divided by the average inventory.

17.1.3. Developmental SE Data:

17.1.3.1. Intermediate SE Acquisition Costs. The cost to develop and acquire SE; that is, ATE to support the item under analysis at one repair activity.

17.1.3.2. TRC SE Acquisition Cost. The cost to develop and acquire SE to support the item under analysis at a TRC.

NOTE: If the SE is multifunctional (used in the repair of more than one assembly within the end item), the economic evaluation must be conducted on an aggregate item basis. Under these conditions, the economic analysis worksheets would reflect the total spares costs for all items associated with the same piece of SE. Using this approach, all items under analysis would receive the same maintenance code. In cases where software costs are involved, they must be included in the analysis.

17.1.3.3. SE Maintenance Cost. The cost to maintain a piece of peculiar SE over its operation life. Unless otherwise known, the yearly cost is estimated at 10 percent of acquisition cost.

NOTE: Evaluate if equipment already in the Air Force inventory will fulfill requirements.

17.1.4. Technical Projections:

17.1.4.1. MTBD represents that portion of time an item will remain in operation before its removal will create a demand on supply. The MTBD is a derivative of the meantime between maintenance, type 1 (MTBM-1) and is to be developed according to AFMCM 57-4 and **paragraph 14.** and **paragraph 15.** of this instruction.

17.1.4.2. Condemnation rate represents that portion of the failed items processed for repair or overhaul that will be condemned due to wear-out or excessive damage.

17.1.4.3. Average repair time represents the projected time in hours required by maintenance to return a failed item to a serviceable condition.

17.1.4.4. Average material cost per repair action represents the average cost of the material required to accomplish repair.

17.1.4.5. Total number projected failures represents the total number of item failures requiring maintenance action to return to a serviceable condition. The failure need not necessarily create a demand on supply. The total number of projected failures represents all applications within the end article, over the life of the item.

17.2. Application of Method. These procedures were developed under the premise that support costs which most influence an economic repair decision are SE, spares and repair parts, tools and labor.

17.2.1. AFMC Form 26, **Economic Analysis.** The formulas and procedures identified in **Figure 1.** provide a simplified technique for developing the individual cost categories. If the ES is aware of other relevant support costs, they will be identified in the column marked "OTHER" on the AFMC Form 26. A repair decision, particularly the initial decision, may change as more data is obtained. The chances for change increase as the cost projections for various alternatives draw

closer together. The sensitivity of the economic analysis can be determined by the following tolerances:

50-100% difference = High confidence in decision.

20-50% difference = Moderate confidence in decision.

Less than 20% difference = Low confidence in decision.

17.2.2. Initial Maintenance Decision. The equipment data required to conduct this analysis is normally made available prior to and during initial provisioning. It is not recommended that the ES wait until the provisioning conference to do the analysis but progressively accumulate and formulate cost figures. This will reduce the time required at the provisioning conference to complete the analysis. Before using this method on stock numbered items, it's important that ESs consider the maintenance decisions already established. If the previous decision was to "discard at failure," it may now be cost effective to establish a repair capability for all applications. However, the economical analysis should include the total support costs for all applications. For stock numbered items maintained by other services, repair considerations must include the possibility of using interservice maintenance contracts.

17.2.3. Maintenance Recording. The conditions that affect or control initial maintenance decisions are dynamic and may require the Air Force to revise maintenance workloads as changes occur. As in initial maintenance decision, conditions that produce the need for change may dictate that economics take a secondary role in the decision process. For example, operational requirements may limit the amount of SE authorized at the intermediate maintenance level. Alternatives are to discard or return the reparable to the depot for repair, or an item that normally would be discarded at failure must be coded for repair because a manufacturer is not available to produce a new item. However, the majority of changes to establish maintenance programs can and should be accomplished in an economic environment. These procedures can be used in developing and identifying the support costs associated with changing maintenance codes. When making an analysis of this type, source data should be from historical files.

17.2.4. Documenting Maintenance Alternative. AFMC Form 26 was developed to aid the ES in analyzing support costs. It also serves as formal documentation and summary of the analysis. It must be retained as part of the item history life.

17.3. Split Level Repair. The method outlined in this instruction will result in a repair decision that will be either to discard or totally repair at either the field or TRC levels. If the maintenance tasks necessary for repair of an item in different failure modes vary greatly and require different resources, the repair of the item can be split between the base and TRC. The economic advantages of splitting the repair of an item between base and TRC can be evaluated by conducting the analysis described on a maintenance tasks basis. If the results indicate different decisions (base or TRC repair) for the individual maintenance tasks on the same item, the assignment of a split-level maintenance code would be appropriate.

17.4. Guidelines for Completing AFMC Form 26 ([Attachment 2](#)):

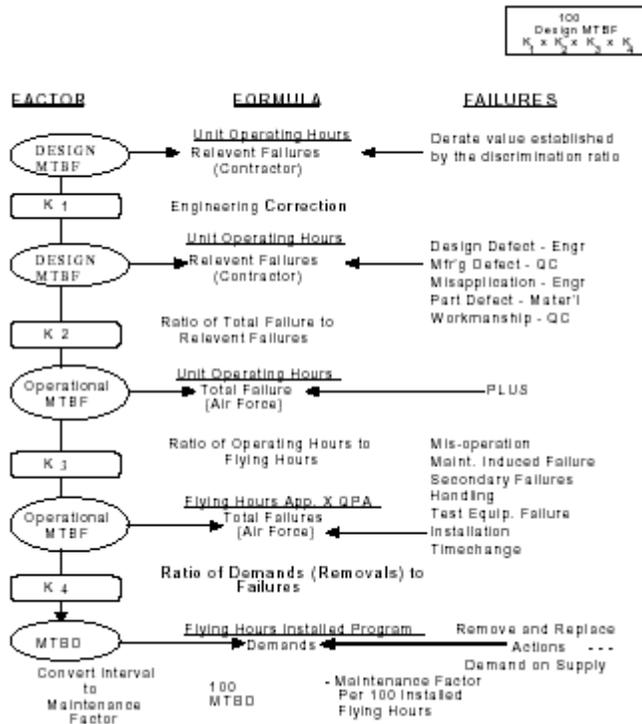
17.4.1. **Step 1.** Collect all input data using the following sources:

17.4.1.1. MTBM - Contractor, Historical Files.

17.4.1.2. MTBD - AFMCM 57-4 and [paragraph 15.1](#) of this instruction.

- 17.4.1.3. MTTR (Depot) - Contractor/D041/DO56C (AFMCM 57-4).
- 17.4.1.4. MTTR (Intermediate) - Contractor/ D041/ DO56C.
- 17.4.1.5. Condemnation Percent - Contractor/ D041/ DO56C
- 17.4.1.6. Life Expectancy - Contractor/Life Cycle Historical Data.
- 17.4.1.7. Average Monthly Usage - User/D056C, Historical Files.
- 17.4.1.8. QPEI - Contract, Historical Files.
- 17.4.1.9. Number of End Items - Contract, Historical File.
- 17.4.2. **Step 2.** Substitute data values from step 1 in formula on AFMC Form 26.
- 17.4.3. **Step 3.** Fill in cost data on AFMC Form 26.

Figure 1. Conversion Factors - Design MTBF to Maintenance



WILLIAM J. KOHLER, JR, Col, USAF
Deputy Director of Logistics

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****Abbreviations and Acronyms***

ACO—Administrative Contracting Office
AFMC—Air Force Materiel Command
ALC—Air Logistics Center
API—Applications/Programs Indenture
ATE—Automatic Test Equipment
CAD—Condemnation at Depot
CBD—Condemnation Below Depot
CCB—Configuration Control Board
CDR—Critical Design Review
CFE—Contractor Furnished Equipment
DC—Direct Current
DLA—Defense Logistics Agency
DLM—Depot Level Maintenance
DSC—Depot Support Concept
EDFP—Engineering Data for Provisioning
EMD—Engineering and Manufacturing Development
EOQ—Economic Order Quantity
ERRC—Expendability, Recoverability Reparability, Category
ES—Equipment Specialist
FSG—Federal Supply Group
GFAE—Government Furnished Aerospace Equipment
GFE—Government Furnished Equipment
GFP—Government Furnished Property
IMC—Item Management Code
IMS—Inventory Management Specialist
IPB—Illustrated Parts Breakdown
ISSL—Initial Spares Support List
JR—Job-Routed
LSA—Logistics Support Analysis

LSAR—Logistics Support Analysis Record
MISTR—Management of Items Subject to Repair
MMAC—Materiel Management Aggregation Code
MRL—Maintenance Repair Level
MTBD—Meantime Between Demand
MTBF—Meantime Between Failures
MTBM—Meantime Between Maintenance
NC—Numerically Controlled
NHA—Next Higher Assembly
NJR—Non-Job-Routed
NRTS—Not Repairable This Station
OIM—Organizational Intermediate Maintenance
ORR—Overhaul Replacement Rate
PAD—Program Action Directive
PCL—Programming Checklist
PDM—Program Depot Maintenance
PMD—Program Management Directive
PMP—Program Management Plan
PPL—Provisioning Parts List
PTD—Provisioning Technical Documentation
QPA—Quantity Per Assembly
QPEI—Quantity Per End Item
R&M—Reliability and Maintainability
RCM—Reliability Centered Maintenance
RFP—Request for Proposal
RIB—Recoverable Item Breakdown
RLA—Repair Level Analysis
RSP—Readiness Spares Package
SE—Support Equipment
SMR—Source, Maintenance and Recoverability
SPD—System Program Director
SPRAM—Special Purpose Recoverables Authorized to Maintenance

SRD—Standard Reporting Designators

SSM—System Support Manager

TO—Technical Order

TOIMDR—Total Organizational Intermediate Maintenance Demand Rate

TRC—Technology Repair Center

Attachment 2

SAMPLE AFMC FORM 26

Figure A2.1. Sample AFMC Form 26

ECONOMIC ANALYSIS						
PART NUMBER 84596-090		END ITEM APPLICATION Receiver, Radio		MANUFACTURER'S CODE 11201		
QPE 2		STOCK NUMBER ---		ESTIMATED COST 750		
TECHNICAL PROJECTIONS			ALLOCATED SE COST (Acquisition)			
MTBD HOURS 2300	CONDEMNATION % 2%	CNRTS %	INTERMEDIATE 7000	HOURLY RATE	DEPOT 9000	HOURLY RATE
MEAN TIME TO REPAIR (MTTR)			PROGRAMMING DATA			
FIELD 2 Hrs		DEPOT 2.5 Hrs		END ARTICLE LIFE EXPECTANCY 10 Years		
AVERAGE MATERIAL COST PER REPAIR ACTION 37.00			AVERAGE MONTH UTILIZATION RATE 200 Hrs			
			NUMBER OF END ITEMS 65			
COST DATA (Use formula at bottom to compute)						
SUPPORT ELEMENTS		DISCARD AT FAILURE	INTERMEDIATE REPAIR		TRC REPAIR	
PROJECTED SPARES		1,017,000	20,340		20,340	
MATERIAL			66,600		66,600	
SB			23,100		9,000	
LABOR			32,400		45,000	
OTHER						
TOTAL		\$1,017,000.00	\$142,440.00		\$140,940.00	
FORMULAS						
EST TOTAL DEMANDS PER APPLICATION = $\frac{\text{PER YEAR UTILIZATION RATE} \times \text{QPE} \times \text{END ITEMS PROCURED} \times \text{LIFE EXPECTANCY}}{\text{MTBD}}$						
PROJECTED SPARES (Intermediate)						
COST FOR DISCARD AT FAILURE = EST TOTAL DEMANDS PER APPLICATION \times EST TOTAL NO. NRTS \times FIELD CONDEMNATION RATE \times QPE \times ITEM COST						
COST DURING REPAIR = EST TOTAL DEMANDS PER APPLICATION \times EST TOTAL NO. CONDEMNED \times REPAIR RATE \times QPE \times ITEM COST						
PROJECTED SPARES (Depot)						
COST FOR DISCARD AT FAILURE = EST TOTAL NO. DEPOT PROCESSED \times DEPOT CONDEMNATION RATE \times QPE \times ITEM COST						
MATERIAL COSTS TOTAL NUMBER PROJECTED FAILURES \times AVERAGE MATERIAL COST PER REPAIR ACTION						
LABOR COSTS TOTAL NUMBER PROJECTED FAILURES \times AVERAGE REPAIR TIME \times HOURLY WAGE RATE						
INTERMEDIATE SE COST ACQUISITION COST						
$\frac{\text{PER BASE}}{\text{NUMBER OF ITEMS SUPPORTED}} \times \text{NUMBER OF BASES REQUIRING SE} \times \text{END ARTICLE LIFE EXPECTANCY}$						
DEPOT SE COSTS						
$\frac{\text{SE ACQUISITION COST}}{\text{NUMBER OF DIFFERENT ITEMS SUPPORTED}} \times \text{END ARTICLE LIFE EXPECTANCY}$						
EQUIPMENT SPECIALIST Jane Doe			OFFICE SYMBOL LAPR		DATE 10/Jul/95	

Attachment 3

**STANDARD MAINTENANCE REPLACEMENT RATE I (MRR I) AND OVERHAUL
REPLACEMENT RATE (ORR) FOR FSG 53 ITEMS**

Table A3.1. MRR I/ORR (53 Items)

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5305	Screws, assembled washer	0.0060	0.01
5305	Screws, cap, hexagon head	0.0060	0.01
5305	Screws, cap, socket, head	0.0060	0.01
5305	Screws, close tolerance	0.0090	0.02
5305	Screws, externally relieved body	0.0060	0.00
5305	Screws, eye	0.0020	0.01
5305	Screws, instrument	0.0090	0.01
5305	Screws, machine	0.0060	0.02
5305	Screws, panel fastener	0.0060	0.05
5305	Screws, self-locking	0.0200	0.07
5305	Screws, shoulder	0.0060	0.01
5305	Screws, tapping, thread cutting	0.0020	0.01
5305	Screws, tapping, thread forming	0.0020	0.01
5305	Screws, wood	0.0020	0.01
5305	Setscrews	0.0090	0.01
5305	Thumbscrews	0.0060	0.01
5305	Screws, adjustable	0.0200	0.05
5305	Screws, flat	0.0060	0.01
5306	Bolts, assembled washer	0.0060	0.02
5306	Bolts, clevis	0.0060	0.02
5306	Bolts, close tolerance	0.0090	0.02
5306	Bolts, drive shank	0.0060	0.02
5306	Bolts, eccentric head	0.0060	0.02
5306	Bolts, externally relieved body	0.0060	0.02
5306	Bolts, eye	0.0090	0.02
5306	Bolts, fillister head	0.0060	0.02
5306	Bolts, hanger	0.0020	0.02
5306	Bolts, hex head	0.0060	0.02

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5306	Bolts, hook	0.0020	0.02
5306	Bolts, internal wrenching	0.0060	0.02
5306	Bolts, internally relieved body	0.0060	0.02
5306	Bolts, key head	0.0020	0.02
5306	Bolts, lag	0.0020	0.02
5306	Bolts, machine	0.0060	0.02
5306	Bolts, ring	0.0020	0.02
5306	Bolts, self-locking	0.0200	0.02
5306	Bolts, shear	0.0090	0.02
5306	Bolts, shoulder	0.0060	0.02
5306	Bolts, sliding handle	0.0020	0.02
5306	Bolts, square neck	0.0060	0.02
5306	Bolts, tee-head	0.0020	0.02
5306	Bolts, toggle	0.0020	0.02
5306	Bolts, U	0.0060	0.02
5307	Studs, continuous thread	0.0020	0.03
5307	Studs, extension	0.0020	0.02
5307	Studs, locked in	0.0090	0.03
5307	Studs, plain	0.0060	0.03
5307	Studs, recessed	0.0060	0.03
5307	Studs, recessed and stepped	0.0060	0.03
5307	Studs, self-locking	0.0200	0.03
5307	Studs, shouldered	0.0060	0.03
5307	Studs, shouldered and stepped	0.0060	0.03
5307	Studs, stepped	0.0060	0.03
5307	Studs, tapping, thread forming	0.0020	0.03
5307	Studs, welding	0.0020	0.03
5310	Nuts, concave, hexagon	0.0090	0.01
5310	Nuts, concave, square	0.0090	0.01
5310	Nuts, eye	0.0060	0.01
5310	Nuts, hexagon, jam	0.0020	0.01

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5310	Nuts, plain	0.0090	0.04
5310	Nuts, plain, barrel	0.0090	0.04
5310	Nuts, plain, blind rivet	0.0020	0.04
5310	Nuts, plain, cap	0.0140	0.04
5310	Nuts, plain, castellated, hexagon	0.0090	0.04
5310	Nuts, castellated, octagon	0.0090	0.04
5310	Nuts, plain, clinch	0.0090	0.04
5310	Nuts, plain, cone seat, hexagon	0.0090	0.04
5310	Nuts, plain, dodecagon	0.0090	0.04
5310	Nuts, plain, double ball set, hexagon	0.0140	0.04
5310	Nuts, plain, extended washer, double hexagon	0.0090	0.04
5310	Nuts, plain, extended washer, hexagon	0.0090	0.04
5310	Nuts, plain, extended washer, square	0.0090	0.04
5310	Nuts, plain, hexagon	0.0090	0.04
5310	Nuts, plain, internal wrenching	0.0090	0.04
5310	Nuts, plain, knurled	0.0140	0.04
5310	Nuts, plain, octagon	0.0090	0.04
5310	Nuts, plain, plate	0.0090	0.04
5310	Nuts, plain, rectangular	0.0090	0.04
5310	Nuts, plain, round	0.0090	0.04
5310	Nuts, plain, single base set, hexagon	0.0140	0.04
5310	Nuts, plain, slotted, hexagon	0.0090	0.04
5310	Nuts, plain, slotted, octagon	0.0090	0.04
5310	Nuts, plain, spline	0.0090	0.04
5310	Nuts, plain, square	0.0090	0.04
5310	Nuts, plain, tubular	0.0090	0.04
5310	Nuts, plain, welding	0.0090	0.04
5310	Nuts, plain, wing	0.0090	0.04
5310	Nuts, self-locking, assembled washer	0.0200	0.04
5310	Nuts, self-locking, barrel	0.0200	0.07
5310	Nuts, self-locking, blind rivet	0.0200	0.07
5310	Nuts, self-locking, cap	0.0250	0.07
5310	Nuts, self-locking, castellated, hexagon	0.0200	0.07

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5310	Nuts, self-locking, castellated, octagon	0.0200	0.07
5310	Nuts, self-locking, clinch	0.0250	0.07
5310	Nuts, self-locking, cone seat, hexagon	0.0200	0.07
5310	Nuts, self-locking, double ball seat, hexagon	0.0200	0.07
5310	Nuts, self-locking, double hexagon	0.0200	0.07
5310	Nuts, self-locking, extended washer, double hexagon	0.0200	0.07
5310	Nuts, self-locking, extended washer, hexagon	0.0200	0.07
5310	Nuts, self-locking, extended washer, square	0.0200	0.07
5310	Nuts, self-locking, gang channel	0.0400	0.07
5310	Nuts, self-locking, hexagon	0.0200	0.07
5310	Nuts, self-locking, internal wrenching	0.0200	0.07
5310	Nuts, self-locking, knurled	0.0200	0.01
5310	Nuts, self-locking, single ball seat, hexagon	0.0200	0.07
5310	Nuts, self-locking, slotted, hexagon	0.0200	0.07
5310	Nuts, self-locking, slotted, octagon	0.0200	0.07
5310	Nuts, self-locking, spline	0.0200	0.07
5310	Nuts, self-locking, square	0.0200	0.07
5310	Nuts, self-locking, welding	0.0200	0.07
5310	Nuts, self-locking, plate	0.0200	0.07
5310	Nuts, self-locking, round, except bearing	0.0200	0.17
5310	Nuts, self-locking, wing	0.0250	0.01
5310	Nuts, sheet spring	0.0090	0.01
5310	Nuts, sleeve	0.0090	0.01
5310	Nuts, stamped	0.0090	0.01
5310	Nuts, Tinnerman	0.0090	0.01
5310	Nuts assemblies, retainer plate	0.0140	0.01
5310	Nut assemblies, retainer ring	0.0140	0.01
5310	Nut assemblies, self-locking, gang angle	0.0400	0.07
5310	Nut assemblies, self-locking, gang channel	0.0400	0.07
5310	Nut spaces, plate	0.0900	0.01
5310	Nut strips	0.0140	0.01
5310	Push on nuts	0.0400	0.02
5310	Recessed washers	0.0060	0.02

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5310	Rivet	0.0250	0.07
5310	Slotted nuts	0.0090	0.01
5310	Spanner nuts	0.0400	0.01
5310	Washers, bevel	0.0090	0.01
5310	Washers, C	0.0090	0.01
5310	Washers, concave	0.0060	0.01
5310	Washers, convex	0.0060	0.01
5310	Washers, countersunk lock	0.0200	0.03
5310	Washers, external lock	0.0200	0.03
5310	Washers, finishing	0.0060	0.01
5310	Washers, flanged cup	0.0060	0.03
5310	Washers, flanged dish	0.0060	0.03
5310	Washers, flat	0.0060	0.01
5310	Washers, internal lock	0.0200	0.03
5310	Washers, key	0.0090	0.01
5310	Washers, keyway	0.0090	0.01
5315	Key machine	0.0020	0.01
5315	Key, woodruff	0.0040	0.02
5315	Nails	0.0020	0.02
5315	Pins, cotter	0.1000	0.02
5315	Pins, drive	0.0400	0.03
5315	Pins, grooved, headed	0.0400	0.03
5315	Pins, headless	0.0700	0.03
5315	Pins, lock	0.0020	0.03
5315	Pins, retaining	0.0400	0.03
5315	Pins, shoulder headless	0.0400	0.03
5315	Pins, shoulder headed	0.0400	0.03
5315	Pins, straight headed	0.0400	0.02
5315	Pins, straight headless	0.0400	0.02
5315	Pins, straight threaded	0.0020	0.02
5315	Pins, tapered plain	0.0400	0.00
5315	Pins, tapered threaded	0.0040	0.00

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5315	Pins, toggle, eye collar	0.0090	0.03
5315	Pins, toggle headed	0.0090	0.03
5315	Tacks	0.0020	0.03
5315	Pins, grooved, headless	0.0040	0.03
5315	Pin, spring	0.0090	0.02
5315	Plates, door kick	0.0060	0.02
5315	Plates, door push	0.0060	0.02
5315	Plates, mending	0.0040	0.20
5315	Plates, resilient mount	0.0040	0.20
5315	Plugs, expansion	0.0040	0.20
5315	Plugs, fusible	0.0060	0.05
5315	Plugs, protective, dust and moisture seal	0.0090	0.20
5315	Plug, assemblies, sealing	0.0060	0.05
5315	Plungers, quick release	0.0060	0.05
5315	Pockets, stake	0.0020	0.01
5315	Points, glazer	0.0060	0.02
5315	Pokers	0.0020	0.01
5315	Poles, sash	0.0060	0.02
5315	Post, electrical and mechanical equipment	0.0090	0.05
5315	Pulleys, sash	0.0020	0.01
5315	receptacles, friction catch stud	0.0400	0.20
5315	Receptacles, quick release pins	0.0400	0.20
5315	Retainers, assembled nut	0.0090	0.05
5315	Retainers, nut and bolt	0.0060	0.02
5315	Rings, door flush	0.0020	0.01
5315	Rods, grooved, headless	0.0400	0.20
5315	Rods, straight, headless	0.0400	0.20
5315	Rod ends, externally threaded	0.0400	0.20
5315	Rod ends, internally threaded	0.0400	0.20
5315	Saddles, pipe covering protection	0.0060	0.02
5320	Caps, rivet	0.0060	0.02
5320	Collars, pin-rivet, grooved	0.0060	0.02

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5320	Collars, pin-rivet, threaded	0.0060	0.02
5320	Pin-rivets, dowel	0.0060	0.02
5320	Pin rivets, grooved	0.0060	0.02
5320	Rivets, blind	0.0090	0.02
5320	Rivets, solid	0.0090	0.01
5320	Rivets, split	0.0060	0.02
5320	Rivets, structural	0.0090	0.02
5320	Rivets, tubular	0.0060	0.02
5325	Caps, snap fastener	0.0090	0.02
5325	Chains, interlocking slide fastener	0.0090	0.02
5325	Clinch plates, snap fastener	0.0090	0.02
5325	Clinch plates, turn button fastener	0.0200	0.10
5325	Cowling fastener, aircraft	0.0200	0.10
5325	Ejector springs, turn lock fastener	0.0200	0.10
5325	Ejector spring assemblies, turn lock fastener	0.0200	0.10
5325	Eyelets, metallic	0.0090	0.02
5325	Eyelets, nonmetallic	0.0090	0.02
5325	Eyelets, turn lock fastener	0.0090	0.02
5325	Fasteners, positive lock	0.0090	0.02
5325	Fasteners, slide interlocking	0.0090	0.02
5325	Fasteners, snap	0.0090	0.02
5325	Fasteners, snap slide	0.0090	0.02
5325	Fasteners, spring tension, trim	0.0200	0.02
5325	Fasteners, turn button	0.0200	0.02
5325	Fastener assemblies, turn lock	0.0200	0.02
5325	Grommets, metallic	0.0060	0.02
5325	Grommets, plastic	0.0090	0.02
5325	Grommets, rubber	0.0200	0.04
5325	Latches, snap slide fastener	0.0090	0.02
5325	Latch guides, snap slide fastener	0.0090	0.02
5325	Locksprings, turn lock fastener	0.0200	0.02
5325	Posts, snap fastener	0.0090	0.02

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5325	Post, snap slide fastener	0.0090	0.02
5325	Receptacles, positive lock	0.0200	0.03
5325	Receptacles, turn lock fastener	0.0200	0.03
5325	Retainer, turn lock fastener ejector spring	0.0200	0.02
5325	Sliders and pulls, interlocking slide fastener	0.0200	0.02
5325	Sockets, push button fastener	0.0090	0.02
5325	Sockets, snap fastener	0.0090	0.02
5325	Sockets, turn button fastener	0.0200	0.02
5325	Stops, interlocking slide fastener	0.0090	0.02
5325	Studs, lock pin fasteners	0.0090	0.01
5325	Studs, push button fasteners	0.0090	0.01
5325	Studs, snap fasteners	0.0090	0.01
5325	Studs, snap slide fastener	0.0090	0.01
5325	Studs, turn button fastener	0.0200	0.01
5325	Studs, turn lock fastener	0.0200	0.01
5325	Stud assemblies turn lock fastener	0.0200	0.01
5325	Supports, snap fastener	0.0090	0.01
5325	Studs, positive lock	0.0090	0.01
5330	Bibb Washers	0.0140	0.05
5330	Disks, solid, plain	0.0060	0.02
5330	Gaskets	0.0200	0.38
5330	Gasket and preformed packing assortments, except specially designed	0.0140	0.38
5330	Gasket and performed packing sets, except specially designed	0.0140	0.38
5330	Gasket and seal sets, except specially designed	0.0140	0.38
5330	Gasket and shim sets, except specially designed	0.0140	0.38
5330	Gasket assortments, except specially designed	0.0140	0.38
5330	Glands, packing	0.0060	0.20
5330	Grease seals, except specially designed	0.0060	0.20
5330	Leathers check valve	0.0140	0.38
5330	Leathers hydraulic packing	0.0140	0.38
5330	Lock on seals	0.0140	0.38

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5330	Oil seals, except specially designed	0.0060	0.20
5330	Packing, preformed	0.1000	0.34
5330	Packing, retainer ring	0.0140	0.50
5330	Packing assemblies	0.0140	0.50
5330	Packing assortments, preformed, except specially designed	0.1000	0.50
5330	Packing rings	0.0140	0.50
5330	Packing with retainers, except specially designed	0.0140	0.50
5330	Pipe flange gaskets	0.0200	0.50
5330	Preformed packing assemblies, except specially designed	0.0140	0.50
5330	Retainers, packing	0.0140	0.50
5330	Ring gaskets	0.0140	0.38
5330	Seals, plain	0.0060	0.38
5330	Seals, plain encased	0.0060	0.38
5330	Seal rings, metal	0.0090	0.38
5330	Sealing rings	0.0090	0.20
5330	Sleeves, seal, coupler	0.0060	0.20
5335	Metal Screening	Bulk items not subject to maintenance factoring	
5340	Adapters, resilient mount	0.0090	0.20
5340	Anchor plates, steel strapping	0.0060	0.02
5340	Bands, retaining	0.0090	0.20
5340	Brackets, angle	0.0060	0.03
5340	Brackets, handrail	0.0020	0.03
5340	Brackets, shelf	0.0020	0.03
5340	Brackets, track sliding door	0.0060	0.03
5340	Bumpers, luggage	0.0060	0.03
5340	Bumpers, plastic	0.0060	0.03
5340	Bumpers, rubber	0.0090	0.02
5340	Buttons door	0.0060	0.03
5340	Buttons, plug	0.0060	0.03
5340	Casters, rigid	0.0200	0.03

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5340	Casters, swivel	0.0200	0.03
5340	Catches, clamping	0.0060	0.20
5340	Catches, elbow	0.0020	0.03
5340	Catches, friction	0.0060	0.03
5340	Chains, transom	0.0020	0.03
5340	Clamps, I-beam gripping	0.0060	0.03
5340	Clamps, instrument mounting	0.0400	0.03
5340	Clamps, lid and body, luggage	0.0060	0.03
5340	Clamps, loop	0.0090	0.01
5340	Clamps, rim clenching	0.0200	0.03
5340	Clamps, tray, luggage	0.0200	0.03
5340	Claws, flush catch	0.0060	0.03
5340	Clevises, rod end	0.0400	0.20
5340	Clips, retaining	0.0090	0.20
5340	Clips, split tubular	0.0090	0.20
5340	Clips, spring tension	0.0090	0.03
5340	Clips, steel beam flange	0.0060	0.03
5340	Closers, door	0.0060	0.03
5340	Connectors, rod end	0.0200	0.20
5340	Control, rods	0.0400	0.20
5340	Corners, case	0.0060	0.01
5340	Couplings clamp grooved	0.0400	0.20
5340	Coupling halves, clamp grooved	0.0400	0.20
5340	Cups, furniture	0.0060	0.03
5340	Cups, suction	0.0090	0.03
5340	Dogs, door closer	0.0060	0.03
5340	Doorknobs	0.0020	0.07
5340	Doorstops	0.0060	0.01
5340	Escutcheon plates	0.0090	0.03
5340	Eyes padlock	0.0060	0.03
5340	Eye hooks	0.0090	0.07
5340	Fairlead halves, tubular	0.0060	0.03
5340	Fasteners, casement	0.0060	0.03

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5340	Fasteners, flarelock	0.0060	0.03
5340	Ferrules, grooved clamp coupling	0.0060	0.03
5340	Frames, rigid caster	0.0200	0.20
5340	Frames, swivel caster	0.0200	0.20
5340	Glides, furniture	0.0020	0.07
5340	Grips, handle	0.0020	0.01
5340	Handles, bail	0.0060	0.03
5340	Handles, bow	0.0060	0.03
5340	Handles, extension, wood	0.0020	0.01
5340	Handles, hook	0.0020	0.01
5340	Handles, luggage	0.0020	0.01
5340	Handles, recess	0.0020	0.01
5340	Handle caps, luggage	0.0020	0.01
5340	Hangers, screen and storm sash	0.0020	0.01
5340	Hangers, sliding door	0.0200	0.20
5340	Hinges butt	0.0090	0.07
5340	Hinges, strap	0.0200	0.02
5340	Hinges, tee	0.0020	0.01
5340	Holdes, door	0.0020	0.01
5340	Holdes, key	0.0020	0.01
5340	Hooks, coat and hat	0.0020	0.01
5340	Hooks, door	0.0020	0.01
5340	Hooks, hammock	0.0020	0.01
5340	Hooks, mailbag rack	0.0020	0.01
5340	Hooks, screw	0.0060	0.03
5340	Hooks, support	0.0090	0.07
5340	Hooks and eves, door	0.0060	0.03
5340	Inserts, screw thread	0.0400	0.20
5340	Keepers, slide	0.0090	0.07
5340	Key blanks	0.0060	0.03
5340	Key chains and reel	0.0060	0.03
5340	Latches, mortise	0.0200	0.07
5340	Latches, thumb	0.0060	0.03

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5340	Latch sets, mortise	0.0400	0.01
5340	Latch sets, rim	0.0400	0.07
5340	Lifts, sash	0.0060	0.03
5340	Locks, flush	0.0090	0.03
5340	Locks, luggage	0.0060	0.03
5340	Locks, rim	0.0200	0.07
5340	Locks sets, mortise	0.0060	0.03
5340	Lock sets, rim	0.0400	0.03
5340	Mounts, resilient	0.0400	0.20
5340	Pads, shock mount	0.0400	0.20
5340	Padlocks	0.0020	0.01
5340	Patches, mechanical, flexible surface	0.0400	0.20
5340	Patches, mechanical, rigid surface	0.0400	0.20
5340	Pins, quick release	0.0400	0.20
5340	Plates, clip retainer	0.0090	0.03
5340	Seals, metallic	0.0400	0.07
5340	Seals, self-locking	0.0200	0.07
5340	Shields, expansion	0.0090	0.03
5340	Shields, stovepipe	0.0060	0.03
5340	Shields, termite	0.0060	0.03
5340	Snap hooks	0.0400	0.07
5340	Spring hooks, cremation urn	0.0060	0.01
5340	Staples, hasp	0.0060	0.01
5340	Stays, folding	0.0060	0.01
5340	Stays, sliding	0.0060	0.20
5340	Straps, line supporting	0.0400	0.20
5340	Straps, retaining	0.0400	0.20
5340	Studs, friction catch	0.0400	0.20
5340	Supports, pipe, chair	0.0090	0.03
5340	Supports, pipe, hook	0.0090	0.03
5340	Supports, pipe seat	0.0090	0.03
5340	Tie-rods, tensioning, threaded end	0.0400	0.20
5340	Timber rings	0.0020	0.01

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5340	Tips, furniture leg	0.0060	0.07
5340	Tracks, sliding door	0.0400	0.07
5340	Supports, pipe saddle	0.0090	0.03
5340	Turnbuckles	0.0400	0.07
5340	Turnbuckle assemblies	0.0400	0.20
5340	Turnbuckle bodies	0.0400	0.20
5340	Delay lines		0.13
5355	Adjusters, meter pointer	0.0200	0.05
5355	Bushing-shafts, panel	0.0090	0.05
5355	Couplings, insulated, bushing-shaft	0.0090	0.05
5355	Covers, dial, multiapplication	0.0200	0.05
5355	Cursors, indicator	0.0090	0.05
5355	Dials, control	0.0200	0.05
5355	Dials, scale	0.0200	0.05
5355	Dial-knob locks, electronic component	0.0400	0.05
5355	Extension shafts, except specially designed	0.0090	0.05
5355	Masks, dial, multiapplication	0.0200	0.05
5355	Pointers, dial	0.0140	0.05
5355	Shaft locks, electronic component	0.0090	0.05
5355	Shutters, dial, multiapplication	0.0400	0.05
5355	Stops, dial	0.0200	0.05
5355	Windows, dial	0.0090	0.05
5360	Engine, valve springs	0.0060	0.01
5360	Initial tension extension springs	0.0060	0.01
5360	Initial tension springs	0.0090	0.01
5360	Springs, body support	0.0060	0.01
5360	Springs, cap, distributor	0.0020	0.01
5360	Springs, contract, ignition	0.0020	0.01
5360	Springs, cowling fastener	0.0020	0.01
5360	Springs, door, adjustable	0.0020	0.01
5360	Springs, earth moving and excavating equipment	0.0020	0.01

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5360	Springs, flat	0.0140	0.01
5360	Springs, garter, extension	0.0020	0.01
5360	Springs, ground, ignition	0.0020	0.01
5360	Springs, helical	0.0020	0.30
5360	Springs, helical, compression	0.0020	0.30
5360	Springs, helical, extension	0.0020	0.30
5360	Springs, helical, torsion	0.0020	0.30
5360	Springs, mobil crane and crane-shovel	0.0140	0.01
5360	Springs, seat, valve	0.0090	0.01
5360	Spring, spiral	0.0090	0.01
5360	Springs, spiral, torsion	0.0090	0.01
5360	Springs, valve	0.0090	0.01
5360	Springs, volute	0.0090	0.01
5360	Springs, wheeled tractor	0.0060	0.01
5365	Bushings, machine thread	0.0090	0.03
5365	Bushings, rubber	0.0090	0.03
5365	Bushings, tapered	0.0090	0.03
5365	Bushings blanks	0.0090	0.03
5365	Plugs, machine thread	0.0090	0.03
5365	Plugs, machine thread, magnetic	0.0090	0.03
5365	Rings, connecting, round	0.0020	0.07
5365	Rings, dee	0.0020	0.07
5365	Rings, externally threaded	0.0090	0.20
5365	Rings, lock, keyed	0.0020	0.20
5365	Rings, lock serrated	0.0020	0.20
5365	Rings, retaining	0.0060	0.40
5365	Rings, retaining, instrument	0.0060	0.40
5365	Ring sets, retaining, instrument	0.0060	0.40
5365	Shims	0.0090	0.20
5365	Shims, battery terminal post	0.1000	0.40
5365	Shims, brake lining	0.1000	0.40
5365	Shims, retaining washer	0.0090	0.20

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5365	Shims, assortments	0.0090	0.20
5365	Shim sets	0.0020	0.20
5365	Spacer, axle, landing gear	0.1000	0.20
5365	Spacers, plate	0.0020	0.20
5365	Spacers, ring	0.0060	0.20
5365	Spacers, sleeve	0.0020	0.20
5365	Spacers, stepped	0.0060	0.20
5365	Spacers assortments, plate	0.0020	0.20
5365	Spacer sets, plate	0.0020	0.20
5365	Spacer sets, ring	0.0060	0.20

Attachment 4

STANDARD MAINTENANCE REPLACEMENT RATE I (MRR I) AND OVERHAUL REPLACEMENT RATE (ORR) FOR FSG 59 ITEMS

Table A4.1. MRR I/ORR (59 Items)

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5905	Potentiometer	0.0200	0.11
5905	Resistor, adjustable	0.0200	0.11
5905	Resistor, fixed, composition	0.0200	0.04
5905	Resistor, fixed, film	0.0100	0.04
5905	Resistor, fixed, wirewound	0.0100	0.03
5905	Resistor, variable wirewound	0.0100	0.11
5905	Resistor, variable	0.0200	0.07
5905	Rheostat	0.0050	0.11
5910	Capacitor, fixed, electrolytic	0.0050	0.05
5910	Capacitor, fixed, glass dielectric	0.0050	0.05
5910	Capacitor, fixed, mica dielectric	0.0050	0.06
5910	Capacitor, fixed, paper dielectric	0.0050	0.06
5910	Capacitor, fixed, plastic, dielectric	0.0050	0.05
5910	Capacitor, fixed, oil dielectric	0.0050	0.05
5910	Capacitor, fixed, ceramic	0.0050	0.04
5910	Capacitor, variable, air dielectric	0.0080	0.07
5910	Capacitor, variable, ceramic	0.0100	0.07
5910	Capacitor, variable, oil	0.0300	0.07
5915	Filter, audio frequency	0.0070	0.07
5915	Filter, band pass	0.0070	0.08
5915	Filter, band supressor	0.0070	0.07
5915	Filter, DC power	0.0100	0.07
5915	Filter, radio interference	0.0070	0.10
5915	Network, impedance matching	0.0100	0.07
5920	Arrestor, electrical surge	0.0200	0.35
5920	Fuse, cartridge	0.0500	0.90

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5920	Fuse, electrical	0.0200	0.35
5920	Fuse, holder	0.0050	0.05
5925	Circuit breaker	0.0100	0.04
5930	Switch, box	0.0050	0.10
5930	Switch, knife	0.0050	0.10
5930	Switch, limit	0.0400	0.10
5930	Switch, pressure	0.0300	0.10
5930	Switch, rotary	0.0100	0.10
5930	Switch, stepping	0.0100	0.10
5930	Switch, toggle	0.0100	0.02
5930	Switch, thermostatic	0.0300	0.20
5930	Switch, sensitive	0.0300	0.20
5930	Switch, push	0.0100	0.10
5930	Adapter, switch actuator	0.0050	0.08
5935	Connector, electrical, cable guard	0.0100	0.05
5935	Connector, electrical, receptacle	0.0100	0.09
5935	Connector, high voltage	0.0100	0.05
5935	Plug, electrical	0.0100	0.03
5935	Socket, relay & socket, tube, plug-in	0.0060	0.03
5935	Clamp cable, electric	0.0060	0.03
5935	Shield, electric	0.0300	0.55
5935	Key, polarizing	0.0100	0.01
5940	Terminal, board	0.0050	0.02
5940	Terminal, feed thru	0.0050	0.03
5940	Terminal, lug	0.0050	0.01
5940	Terminal, post	0.0050	0.02
5940	Terminal, stud	0.0050	0.02
5940	Clip, electrical	0.0050	0.01
5945	Relay, AC-DC control	0.0100	0.37

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5945	Relay, multipurpose	0.0300	0.55
5945	Relay, thermal	0.0400	0.25
5945	Relay, armature	0.0100	0.12
5945	Relay, motor driven	0.0100	0.05
5945	Relay, solenoid	0.0300	0.13
5945	Solenoid, electrical	0.0400	0.37
5950	Choke, filter	0.0050	0.02
5950	Choke, radio frequency	0.0050	0.01
5950	Coil, deflection yoke	0.0100	0.01
5950	Coil, radio frequency	0.0060	0.15
5950	Reactor	0.0160	0.06
5950	Reactor, saturable	0.0070	0.02
5950	Reactor, transformer	0.0070	0.02
5950	Transformer, audio	0.0050	0.02
5950	Transformer, power fixed (below 1KVA)	0.0160	0.11
5950	Transformer, power, variable (below 1KVA)	0.0200	0.07
5950	Transformer, pulse	0.0050	0.08
5950	Transformer, radio frequency	0.0050	0.11
5950	Transformer, electrical (general)	0.0010	0.08
5960	Base, shield	0.0050	0.02
5960	Base, switch	0.0050	0.02
5960	Base, tube	0.0050	0.02
5960	Tube, electron	0.1000	0.73
5960	Tube, electron power	0.2500	0.73
5960	Shield, electron	0.0050	0.26
5960	Retainer, electron	0.0050	0.02
5961	Pad, transistor	0.0100	0.10
5961	Semiconductor device, diode	0.4000	0.14
5961	Socket, semiconductor device	0.0060	0.02
5961	Socket, tube	0.0060	0.01

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5961	Transistor, low frequency	0.0300	0.26
5961	Transistor, power	0.1000	0.26
5961	Retainer, transistor	0.0060	0.02
5961	Photoelectric cell	0.1000	0.11
5961	Rectifier, semiconductor	0.2500	0.35
5961	Insulator	0.0020	0.01
5962	Core, memory, magnetic	0.0020	0.05
5962	Integrated circuits	0.0100	0.20
5963	Electronic modules	0.0100	0.20
5965	Headsets	0.0200	0.11
5965	Jack assy, tip	0.0100	0.04
5965	Jack, telephone	0.0100	0.02
5965	Loud speaker	0.0200	0.11
5965	Microphone	0.0200	0.20
5970	Bushing, sleeve	0.0050	0.11
5970	Insulator, disk	0.0050	0.11
5970	Insulator, feed thru	0.0050	0.11
5970	Insulator, post	0.0080	0.20
5970	Insulator, standoff	0.0080	0.20
5970	Insulator, washer	0.0080	0.20
5970	Insulator, pin	0.0080	0.20
5970	Insulator, electrical	0.0080	0.20
5975	Clamp, electrical	0.0050	0.03
5977	Brushes, electrical contact	0.0050	1.00
5977	Holder, brush contact	0.0050	0.25
5977	Holder, clip	0.0050	0.25

FSC	Item Name	Std Maint Factor	Overhaul Replacement Percent
5985	Antenna	0.0050	0.08
5985	Attenuator, fixed	0.0050	0.08
5985	Attenuator, variable	0.0100	0.10
5985	Coupler, directional	0.0100	0.10
5985	Dummy load	0.0050	0.05
5985	Waveguide	0.0100	0.10
5985	Waveguide, flexible	0.0300	0.20
5990	Motor, selsyn	0.0060	0.10
5990	Syncho, receiver	0.0060	0.10
5990	Syncho, receiver, transmitter	0.0060	0.10
5990	Syncho, resolver	0.0060	0.10
5990	Syncho, transmitter	0.0060	0.10
5995	Cable assembly, control	0.0050	0.02
5995	Cable assembly, power	0.0050	0.02
5995	Cable assembly, radio frequency	0.0100	0.05
5995	Wiring harness	0.0050	0.01
5999	Contact, electrical	0.0100	0.10
5999	Gasketing material, conductive	0.0080	0.20
5999	Heat sink	0.0060	0.02
5999	Shield, electron tube	0.0080	0.02
5999	Shield, cathode ray tube	0.0080	0.02