



DoD 4151.18-H

DEPOT MAINTENANCE CAPACITY AND UTILIZATION MEASUREMENT HANDBOOK

March 10, 2007
Incorporating Change 1, August 31, 2018

Office of the Under Secretary of Defense for
Acquisition and Sustainment



DEPUTY UNDER SECRETARY OF DEFENSE FOR
LOGISTICS AND MATERIEL READINESS
3500 DEFENSE PENTAGON
WASHINGTON, DC 20301-3500

March 10, 2007

FOREWORD

This Handbook is issued under the authority of DoD Directive 4151.18, "Maintenance of Military Materiel," March 31, 2004. Its purpose is to provide updated guidance for a common methodology to measure and provide visibility of the capacity and utilization of DoD organic activities that perform depot-level maintenance of military materiel.

DoD 4151.18-H, "Depot Maintenance Capacity and Utilization Measurement Handbook," January 1997, and Deputy Under Secretary of Defense for Logistics and Materiel Readiness Memorandum, "Depot Maintenance Capacity and Utilization Measurement," October 4, 2001, are hereby canceled.

This Handbook applies to the Office of the Secretary of Defense, the Military Departments, and the Defense Agencies (hereafter referred to collectively as the "DoD Components").

This Handbook is effective immediately and is mandatory for use by all the DoD Components. The Heads of the DoD Components may issue supplementary instructions when necessary to provide for unique requirements within their respective Components.

Send recommended changes to the Handbook through the appropriate channels to:

Office of the Deputy Under Secretary of Defense for Logistics and Materiel Readiness
Assistant Deputy Under Secretary of Defense for Materiel Readiness and Maintenance
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3500 Defense Pentagon
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This Handbook is cleared for public release. This Handbook is available on the Directives Division Website at <http://www.esd.whs.mil/DD/>.

SUMMARY OF CHANGE 1. This change reassigns the office of primary responsibility for this Handbook to the Under Secretary of Defense for Acquisition and Sustainment in accordance with the July 13, 2018 Deputy Secretary of Defense Memorandum (Reference (a)).

A handwritten signature in cursive that reads "Jack Bell". Below the signature, the name "Jack Bell" is printed in a simple, sans-serif font.

Deputy Under Secretary of Defense
(Logistics and Materiel Readiness)

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REFERENCES

- (a) Deputy Secretary of Defense Memorandum, “Establishment of the Office of the Under Secretary of Defense for Research and Engineering and the Office of the Under Secretary of Defense for Acquisition and Sustainment,” July 13, 2018
- (b) DoD Directive 4151.18, “Maintenance of Military Materiel,” March 31, 2004
- (c) DoD Instruction 4151.20, “Depot Maintenance Core Capabilities Determination Process,” January 5, 2007
- (d) Section 2466 of title 10, United States Code
- (e) Report to Congress on Distribution of DoD Depot Maintenance Workload, published annually by the Deputy Under Secretary of Defense for Logistics and Materiel Readiness¹
- (f) DoD 8910.1-M, “DoD Procedures for Management of Information Requirements,” June 30, 1998
- (g) Section 2464 of title 10, United States Code

¹ Copies may be obtained via the Internet at: <http://www.acq.osd.mil/log/mppr/reports.htm>

AL1. ABBREVIATIONS AND ACRONYMS

AL1.1.	APH	Annual Paid Hours
AL1.2.	APU	Auxiliary Power Unit
AL1.3.	DLH	Direct Labor Hours
AL1.4.	FYDP	Future Years Defense Program
AL1.5.	GSE	Ground Support Equipment
AL1.6.	MD	Man-day
AL1.7.	MILCON	Military Construction
AL1.8.	NAVSEA	Naval Sea Systems Command
AL1.9.	PSC	Production Shop Category
AL1.10.	TMDE	Test, Measurement and Diagnostic Equipment
AL1.11	VSTOL	Vertical/Short Take-Off and Landing
AL1.12	WBS	Work Breakdown Structure

C1. CHAPTER 1

APPLICABILITY AND SCOPE

C1.1. PURPOSE AND APPLICATION

C1.1.1. Reissuance and Purpose. This Handbook provides updated guidance for measurement of the capacity and utilization of DoD organic activities that perform depot-level maintenance of military materiel.

C1.1.2. Applicability. This Handbook is to be used by all activities and organizations of the DoD Components responsible for the determination and reporting of capacity and utilization information for organic activities that perform depot maintenance. The techniques in this Handbook are applicable to:

C1.1.2.1. Depot-level maintenance performed in covered and uncovered spaces located at, or within, facilities which constitute an enduring plant capacity. The commander who exercises operational control over such spaces will report the capacity and utilization for them.

C1.1.2.2. Depot-level maintenance accomplished by personnel deploying, or detached, from a depot maintenance activity to an off-site installation (e.g., depot field teams, field-site detachments). Capacity for depot field teams, etc., will be reported by the applicable commander of the field team personnel rather than the commander of the host location.

C1.1.3. Scope and Responsibilities

C1.1.3.1. In addition to prescribing calculation methodologies, this Handbook further establishes and outlines reporting criteria for the DoD Components. Such reporting is prescribed to monitor and support the establishment and retention of essential depot maintenance capability as outlined in DoD Directive 4151.18 (Reference (b)).

C1.1.3.2. Organic depot maintenance activities and physical capacities established or retained within the DoD Components are to be kept to the minimum necessary to ensure a ready, controlled source of technical competence and resources to meet military requirements of Reference (b). These activities, then, are to remain in place to provide logistical support for war, emergency, and contingency actions, and are to operate in peacetime in a cost-effective manner.

C1.1.3.3. DoD Components will establish and document the specific qualifications for personnel who will be assigned responsibility for measuring depot maintenance capacity and utilization. Commanders of organizations or activities responsible for measuring depot maintenance capacity and utilization will ensure that only qualified personnel are assigned to perform such duties.

C1.2. INDEXES AND COMPUTATIONS

C1.2.1. This Handbook provides a methodology to calculate depot maintenance capacity and utilization. Direct Labor Hours (DLH) are established as the basic unit of measure for capacity, enabling evaluation of capacity, and utilization data for organizations, activities, and production shops producing varying product mixes. Expressing capacity in DLH provides an indication of relative size and levels of utilization. Also, shop-level data expressed in DLH can be aggregated to develop higher-level indicators.

C1.2.2. Indexes are defined as composite numbers used to characterize different sets of data. Accordingly, indexes determined according to this Handbook are general indicators rather than precise measures. As index data are aggregated, the significance of the data may decrease. While the indexes are important considerations in making workloading or capital investment decisions, such decisions must be made as a result of a thorough, detailed analysis of the workloads, facilities, and resources involved.

C1.2.3. A single shift, 40-hour workweek is established as the standard for computing baseline capacity for activities and organizations performing depot maintenance. The execution of funded workload may necessitate additional shifts and/or hours per workweek that exceed this standard for some organizations, activities, or production shops.

C1.2.4. The production shop categories defined in Appendix 5 of this Handbook have been aligned with the work breakdown structure (WBS) prescribed for determining Core capability requirements (DoD Instruction 4151.20 (Reference (c))). This enables depot maintenance capacity and utilization to be measured and evaluated in the structural context used by the DoD Components to compute Core capability requirements and articulate funded workload.

C2. CHAPTER 2

STANDARD FACTORS

C2.1 COMPARABLE BASE

An objective of this Handbook is to provide methodologies for calculation of comparable data. Consequently, it is necessary that the DoD Components use similar factors as the basis of calculations. The Standard Factors identified in section C2.2. shall be used by the DoD Components to ensure comparable data are developed.

C2.2. CALCULATION FACTORS

C2.2.1. Annual Paid Hours (APH). For determining annual productive hours, the annual paid DLH will be 2,080 per work position.

C2.2.2. Annual Productive Hours. For capacity and utilization index calculations, the annual productive hours will be 1,615 DLH per work position. The calculation of 1,615 DLH annual productive hours is derived by using the following formula:

$$(2,080 \text{ APHs} - 80 \text{ hrs Holidays} - 274 \text{ hrs Leave} - 111 \text{ hrs Indirect}) = 1,615 \text{ Annual Productive Hours}$$

C2.2.3. Availability Factor. The percentage of a work year that work positions can be used to accomplish direct productive work is known as the availability factor, and it is expressed in decimal form. This factor includes reductions for facility and equipment non-availability for reasons such as calibration, maintenance, or repairs of real property and shop equipment, utility failure, adverse weather, and equipment installation or rearrangement. For depot capacity and utilization index calculations, the availability factor will be 0.95.

C2.3. BOTTLENECKS

Capacity for identified bottlenecks should also be calculated on a one-shift basis. In managing depot shop operations, the DoD Components shall attempt to eliminate bottlenecks using continuous process improvement techniques and/or standard industrial engineering procedures. Where this is not possible, bottlenecks, whether operated on a single- or multi-shift basis, should be used as pacing factors for structuring and workloading all affected shops.

C3. CHAPTER 3

CAPACITY MEASUREMENT

C3.1. APPLICABILITY

C3.1.1. The capacity for all covered and uncovered spaces at all locations other than Naval shipyards in which depot maintenance is being performed, including maintenance performed by depot field teams, will be computed using the technique described in C3.2. for all production shops that perform direct work, using the production shop categories defined in Appendix 5.

C3.1.2. The indexes described in C3.3. through C3.6. will be determined for each applicable production shop category for all activities that perform depot maintenance.

C3.1.3. Naval shipyard capacity will be computed as described in C3.8.

C3.2. BASELINE CAPACITY INDEX

C3.2.1. The Baseline Capacity Index indicates the amount of capacity, expressed in DLH, that a product shop or activity can effectively employ annually on a single shift, 40-hour week basis while producing the product mix that the production shop or activity is designed to accommodate. Individual shop-level Baseline Capacity Indexes are calculated and then combined to determine the Baseline Capacity Index of the various production shop categories and an entire activity.

C3.2.2. The following steps outline procedures for calculating the Baseline Capacity Index, to include Shipyard Output Shops (see C3.8.3.2.). The steps are illustrated in the Capacity Index Determination Flowchart at Appendix 2. The formula for Baseline Capacity Index is:

$$\frac{((\text{work positions}) \times (\text{availability factor}) \times (\text{annual productive hours}))}{(0.95)} + \frac{(\text{Depot Field Team DLH})}{(1,615)}$$

C3.2.2.1. Step One. Obtain detailed shop layouts that identify the function of each shop, its boundaries, and its equipment and/or workbench locations. Verify and update the layouts to reflect the current product mix. If product mix changes are expected to result in shop reconfiguration(s) during the fiscal year, drawings should be obtained for each specific configuration. In cases where a shop has a fluctuating multi-commodity product mix, it may not be practical to address every possible product mix and a representative shop layout may be used.

C3.2.2.2. Step Two. Determine and identify on the layouts the number of work stations and the work positions in each station. Calculate the number of work positions for each work station. To obtain the number of work positions in the shop, add the totals for the work stations within the shop. Work positions will be identified by the following rationale:

C3.2.2.2.1. If only one person would operate the equipment and/or process, the work station will include the equipment and/or process and be recorded as one work position. Examples are: a work station of several pieces of robotic equipment operated by one person; a work station of several pieces of computer-aided manufacturing equipment operated by one person; and a tire recapping machine operated by one person. In these instances, although the number of pieces of equipment varies from example to example, there is only one work position because in each case, the work position is operated by one person.

C3.2.2.2.2. If the work station is designed to be operated by more than one person, one work position will be recorded for each person. Examples are engine test cells and radar ranges that are operated by more than one person. In each case, the number of work positions is the maximum number of people by which the work station is designed to be operated.

C3.2.2.2.3. If, under design conditions, a piece of equipment would only be infrequently used, or would support more than one work station, it will not be counted as an individual work position, but will be included in a designated work station and labeled support equipment. Examples are machine shop support equipment, such as lathes and drill presses that support multiple work stations.

C3.2.2.2.4. If an equipment and/or process is designed to be frequently but not continuously used, it should be included as part of a related work position.

C3.2.2.2.5. For the stall and/or work bay and/or aircraft dock situation, determine the optimum number of people who can effectively work during each phase of the process cycle. The weighted average over the cycle will equal the work position quantity of the work station. It is recognized that a stall, work bay, or aircraft dock may be reconfigured during the year to accommodate variations in product mix. When this condition exists, the number of work positions for each configuration should be multiplied by the estimated percent of time during the year that the specific configuration will be in place. An analysis of the product mix and process variations may be necessary to determine this value based on experience and knowledge of the processes involved.

C3.2.2.2.6. Bulk processing work stations, such as plating, chemical cleaning, and heat treating shops, can be regarded as one work station. The work position count of these stations is the number of persons necessary to effectively staff the entire work station.

C3.2.2.2.7. If a position is designed to be staffed continuously, but is currently vacant because of reduced workload quantity, it shall be counted as a work position.

C3.2.2.2.8. If a work station is designed to be manned continually, but one or more work positions are intermittently vacant because personnel are deployed, or detached, from a depot maintenance activity to an off-site installation (e.g., depot field teams, field-site detachments), but an enduring plant capacity remains at the depot maintenance activity, then the work position count for these stations is the number of persons normally assigned to the work station.

C3.2.2.2.9. For uncovered areas in which depot maintenance is routinely performed year round on a parked vehicle, such as an aircraft parking apron, the number of work positions is calculated in the same manner as in paragraph C3.2.2.2.5. For uncovered areas in which equipment has been permanently installed, the number of work positions will be determined based on the criteria in paragraphs C3.2.2.2.1. through C3.2.2.2.7.

C3.2.2.2.10. It is recognized that a shop may be reconfigured during the year to accommodate variations in product mix. When this condition exists, the number of work positions for each configuration should be multiplied by the estimated percent of time during the year that the specific configuration will be in place. An analysis of the product mix and process variations may be necessary to determine this value based on experience and knowledge of the processes involved. The resulting products for the different configurations should be added together to arrive at the annual weighted work position count for that shop.

C3.2.2.2.11. Record the number of work positions. When identifying work positions for a future fiscal year, the impact of projected work position changes resulting from programmed Military Construction (MILCON) projects, shop reconfigurations, divestitures, changes in product mix, etc., must be taken into account.

C3.2.2.3. Step Three. Multiply the result of Step Two by the Availability Factor (0.95).

C3.2.2.4. Step Four. Multiply the product of Step Three by the applicable annual productive hour rate (1,615 DLH).

C3.2.2.5. Step Five. Record the resultant baseline shop capacity index.

C3.2.2.6. Step Six. Allocate the shop's baseline capacity index to the appropriate production shop category (PSC) (see Appendix 5). Multiple PSCs may be applicable to a single shop. In such cases the shop capacity will be prorated to applicable PSCs, based upon the product mix.

C3.2.2.7. Step Seven. The baseline capacity index for depot-level maintenance accomplished by depot field teams, field-site detachments, etc. – where no associated enduring plant capacity exists (or remains) at the depot maintenance activity – equals the amount of direct labor hours expended or projected to be expended. Allocate the baseline capacity index for such depot field teams to the appropriate PSC. Multiple PSCs may be applicable to such capacity. In such cases the capacity will be prorated to applicable PSCs, based upon the product mix.

C3.2.2.8. Step Eight. Add the resultant capacity indexes for the various production shop categories to compile the baseline capacity index for an entire activity.

C3.3. UTILIZED CAPACITY INDEX

The Utilized Capacity Index is an indicator of the capacity, expressed in DLH, required by a shop or activity to support funded depot maintenance workload requirements. It is equal to the total number of DLH required for a shop or activity to execute funded workload requirements on an annual basis. This index may include capacity used to perform core sustaining workload, as well as non-core sustaining workload. Non-core sustaining workload satisfies the requirements of 10 United States Code (U.S.C.) 2466 (Reference (d)), best value analyses, and last source of repair.

C3.4. CORE CAPACITY INDEX

The Core Capacity Index is an indicator of the capacity, expressed in DLH, that is available within a shop or activity to support the Core capability requirements derived using the approved DoD Core Methodology as described in Reference (c), and allocated to that activity. This includes Core capacity that is held in reserve, as described in section C3.5.

C3.5. RESERVE CAPACITY INDEX

The Reserve Capacity Index, which is a subset of the Core Capacity Index, is an indicator of the Core Capacity, expressed in DLH, that is retained to support the projected requirements of the Joint Chiefs of Staff contingency scenarios; but is not utilized under normal conditions. Reserve capacity should be specifically identified at the shop level. Specific rationale for retention of reserve capacity shall be developed by the activity concerned and approved by the respective DoD Component.

C3.6. UTILIZED CORE CAPACITY INDEX

The Utilized Core Capacity Index is an indicator of the capacity, expressed in DLH, that is required by a shop or activity to support the funded core-sustaining workload assigned to that activity.

C3.7. CAPACITY INDEXES RELATIONSHIPS

A pictorial portrayal of the relationship of the capacity indexes is contained in Appendix 3.

C3.8. NAVAL SHIPYARD CAPACITY INDEXES

C3.8.1. Overview. The preponderance of ship depot maintenance is accomplished on major ship overhauls that require dry docking, as these overhauls have the largest work packages. The

best measurement of a shipyard's overall capacity is a combination of Dry Dock Throughput (to capture all ship work), and Output Shop capacity (to capture the Repairable and Non-ship work).

C3.8.2. Dry Dock Throughput Index

C3.8.2.1. The Dry Dock Throughput Index represents the capacity of a shipyard to perform ship depot maintenance work when every operational dry dock is utilized fully with the largest ship type possible. This index is calculated as follows:

C3.8.2.1.1 Step One. For each operational dry dock in the shipyard, identify the class of ship and type of overhaul with the largest workload that can normally be performed in that dry dock (e.g., CVN docking planning incremental availability loaded into carrier dry docks).

C3.8.2.1.2. Step Two. Determine the maximum number of overhauls of the ship class selected in Step One that can be completed annually in the dry dock. ASSUME: (a) the dry dock will be continually utilized for that type of overhaul; (b) as soon as the dry dock phase of one overhaul is complete, that ship is undocked and the next ship is docked; and (d) dry dock work commences on the second ship while the first ship's overhaul is completed at the pier. Thus, for example, if a 688 class submarine Depot Modernization Period typically requires 7 months in dry dock; then the shipyard could complete $12/7 = 1.7$ submarine overhauls per year using one dry dock.

C3.8.2.1.3 Step Three. Compute the total workload associated with the throughput capacity of each dry dock. The total workload represents all the work executed during an overhaul, including the dry dock, pier side, and shop work. For example, assume a 688 class submarine overhaul typically requires 141,000 total direct labor man-days (MD). The typical workload per overhaul [expressed in MD] is multiplied by the maximum overhauls per year (e.g., 1.7); thus yielding 239,000 MD for that dry dock. This total is then multiplied by 8 [the hours in a standard work day] to get 1,912,000 DLHs; which is the dry dock's throughput workload capacity.

C3.8.2.1.4. Step Four. Sum the dry dock throughput workload capacity for each dry dock at the shipyard. This total is defined as the Dry Dock Throughput Index.

C3.8.2.2. For reporting and evaluation purposes, the Dry Dock Throughput Index will be attributed to the relevant production shop categories as defined in Appendix 5.

C3.8.3. Output Shop Capacity

C3.8.3.1. The Output Shop Capacity Index is defined as repairable work not related to the ships being overhauled in the shipyard. This work is assigned by customers other than the Fleet and Naval Sea Systems Command (NAVSEA) (e.g., Naval Inventory Control Point, Space and Naval Warfare Systems Command) and primarily is in support of the Navy Supply System.

C3.8.3.2. Output Shop capacity is to be calculated in accordance with the methodology outlined in C3.2.2. for the following Output Shop types:

C3.8.3.2.1. Electronics

C3.8.3.2.2. Machine Shop (Inside): non-ship portion

C3.8.3.2.3. Foundry

C3.8.3.2.4. Forge

C3.8.3.2.5. Repairable Work Centers

C3.8.3.3. Output Shop capacity and utilization will be attributed for reporting and evaluation purposes to the relevant production shop categories as defined in Appendix 5.

C4. CHAPTER 4UTILIZATION INDICATORSC4.1. PURPOSE

Utilization Indicators can assist in oversight of depot maintenance by providing management with potentially useful information about the relationship among capacity indexes for a depot or shop. The minimum set of Utilization Indicators that should be monitored is described below.

C4.2. FUNDED OPERATIONS UTILIZATION INDICATOR

The Funded Operations Utilization Indicator, expressed as a percentage, provides an indication of the degree of alignment between the capacity required to support funded workload and the Baseline Capacity of a shop or activity. The formula for the Funded Operations Utilization Indicator is:

$$\frac{\text{Utilized Capacity Index}}{\text{Baseline Capacity Index}} \times 100 = \text{ _____\%}$$

C4.3. CORE CAPABILITY ATTAINMENT INDICATOR

The Core Capability Attainment Indicator, expressed as a percentage, provides an indication of the degree of alignment between capacity available to perform core-sustaining workload and the core capability requirements of a shop or activity. The formula for the Core Capability Attainment Indicator is:

$$\frac{\text{Core Capacity Index}}{\text{Core Capacity Requirement}} \times 100 = \text{ _____\%}$$

C4.4. CORE CAPACITY UTILIZATION INDICATOR

The Core Capacity Utilization Indicator, expressed as a percentage, provides an indication of the degree of alignment between the capacity utilized in support of funded core-sustaining workload and the capacity available to support core capability requirements of a shop or activity. The formula for the Core Capacity Utilization Indicator is:

$$\frac{\text{Utilized Core Capacity Index} + \textit{Reserve Capacity Index}^2}{\text{Core Capacity Index}} \times 100 = \text{ _____\%}$$

² For activities that have set aside Reserve Capacity, the Reserve Capacity Index is included in the formula as shown in italics.

C5. CHAPTER 5

INFORMATION REQUIREMENTS

C5.1. RECORDS. The DoD Components shall identify the level and location for retention of records regarding capacity and utilization data. As a minimum, the following records should be maintained for review and validation of capacity and utilization determination:

C5.1.1. Shop drawings for each shop configuration designating work positions, work station locations, and support equipment. However, shop drawings are not required for depot-level maintenance accomplished by personnel deploying, or detached, from a depot maintenance activity to an off-site installation where no enduring plant capacity exists (e.g., depot field teams, field-site detachments).

C5.1.2. Capacity Index calculations, including activity-level capacity index data sorted by production shop category.

C5.1.3. Identification of reserve capacity by activity and production shop category, along with supporting justification.

C5.1.4. Identification of bottlenecks by activity and shop, along with identification of the impacted production shop categories.

C5.1.5. Utilization Indicator calculations by activity and production shop category.

C5.1.6. Documentation reflecting independent review of the shop drawings and capacity index calculations noted in paragraphs C5.1.2. and C5.1.3.

C5.1.6.1. The following specific elements will be verified by independent review: accuracy of drawings for each shop; work position count for each shop; the calculation used to arrive at the Baseline Capacity Index data for each shop; identification of production shop category(ies) for each shop; and roll-up of shop Baseline Capacity Index data to the production shop category and activity total.

C5.1.6.2. Independent reviews may be conducted, at the DoD Component's discretion, by qualified personnel from organic organizations other than the activities being reviewed, higher headquarters, Service audit agencies, or private consultants.

C5.1.6.3. Independent reviews should be conducted biennially, or whenever substantial changes in the product mix and/or shop configurations occur.

C5.2. REPORTING REQUIREMENTS

C5.2.1. Each activity performing depot maintenance workloads that are included in the "Federal Work" category in the annual *Report to Congress on Distribution of DoD Depot*

Maintenance Workloads (Reference (e)) is required to determine the capacity and utilization data using this Handbook and report this data to the respective DoD Component.

C5.2.2. Each DoD Component shall maintain, in a central location, the data reported under this section. Capacity data reporting systems shall be designed to provide an audit trail from the data reported by each activity to the respective shop capacity records and data.

C5.2.3. Each DoD Component shall submit reports in electronic format, as prescribed below, to the Deputy Under Secretary of Defense for Logistics and Materiel Readiness, Attention: Assistant Deputy Under Secretary of Defense for Materiel Readiness and Maintenance Policy. The transmittal memorandum for each report shall identify a point of contact for issues and questions relating to the data being reported.

C5.2.4. Each DoD Component shall submit an annual report within 6 months after the end of each fiscal year containing depot maintenance capacity and utilization summary data, as portrayed in Appendix 4, for all activities meeting the criterion of C5.2.1. This annual DoD internal reporting requirement has been assigned Report Control Symbol DD-A&T(A)2008 in accordance with DoD 8910.1-M (Reference (f)).

C5.2.4.1. The as-of date for data will be September 30 for each fiscal year reported. Data for the planning years should reflect the impact of projected capacity changes resulting from programmed MILCON projects, shop reconfigurations, divestitures, changes in product mix, and other related factors.

C5.2.4.2. Each report shall also include a narrative explanation of significant changes, developments, information, or trends portrayed in the report.

C5.2.5. Each DoD Component shall biennially submit a report within 3 months after submission of the biennial Core computation as prescribed in Reference (c) containing the information prescribed below.

C5.2.5.1. Bottlenecks. For each occurrence, provide: the name of the activity (or installation), the specific shop, the impacted production shop category(ies), and a brief explanation of what actions (if any) are being taken (or contemplated) to eliminate the bottleneck.

C5.2.5.2. Reserve Capacity. For each occurrence, provide: the name of the activity (or installation), the specific shop, the relevant production shop category, the magnitude of the Reserve Capacity (expressed in DLH), and a brief explanation of the reason for setting aside the capacity.

C5.2.5.3. Core Capability Deficiencies. For each occurrence where Core capacity and/or Core sustaining workload is insufficient to support Core capability requirements, provide: the name of the activity (or installation), the relevant production shop category, the magnitude of the deficiency (expressed in DLH), and a brief explanation of the reason for the deficiency and what actions (if any) are being taken (or contemplated) to eliminate the deficiency.

AP1. APPENDIX 1

DEFINITIONS

AP1.1. Annual Paid Hours. The annual work hours per worker, including holidays, for a single shift, 40-hour work week for which an employee is paid.

AP1.2. Annual Productive Hours. That portion of the annual paid hours per production worker that remains for direct application to the job after subtraction of holidays, leave, training, and other recognized indirect hours.

AP1.3. Availability Factor. The percentage of a single-shift work year that work positions can be used to accomplish direct productive work. This factor may include reductions for facility and/or equipment non-availability such as calibration and/or maintenance and/or repairs of real property and shop equipment, utility failure, unscheduled facility closures, and equipment installation and/or rearrangement.

AP1.4. Bottleneck. A process in a production flow that restricts the ability to achieve full, single-shift utilization of other processes either preceding or following the bottleneck.

AP1.5. Core. The depot maintenance capability (including personnel, equipment, and facilities) maintained by the Department of Defense at Government-owned, Government-operated facilities as the ready and controlled source of technical competence and resources necessary to ensure effective and timely response to a mobilization, national defense contingency situations, and other emergency requirements. Depot maintenance for the designated weapon systems and other military equipment is the primary workload assigned to DoD depots to support core depot maintenance capabilities.

AP1.6. Core Capability Requirement. The depot maintenance capability, expressed in DLH, which must be provided by Government personnel, equipment, and facilities in compliance with 10 U.S.C. 2464 (Reference (g)). This capability requirement is reflected in block H of the approved DoD Core methodology described in Reference (c).

AP1.7. Core Sustaining Workload. Workload, expressed in DLH, that is assigned to a DoD depot maintenance activity during peacetime in order to maintain core capability for specified weapon systems, end items, and components. Core-sustaining workload ensures technical competence in peacetime while preserving the surge capacity and reconstitution capabilities necessary to fully support the strategic and contingency plans prepared by the Chairman of the Joint Chiefs of Staff. This workload is reflected in block K of the approved DoD Core methodology described in Reference (c).

AP1.8. Depot Maintenance. The processes of materiel maintenance or repair involving the overhaul, upgrading, rebuilding, testing, inspection, and reclamation (as necessary) of weapons systems, equipment end items, parts, components, assemblies, and subassemblies. Depot maintenance also includes all aspects of software maintenance, the installation of parts or

components for modifications, and technical assistance to intermediate maintenance organizations, operational units and other activities. Depot maintenance is typically accomplished in fixed shops, shipyards and other shore-based facilities, or by field teams, using more extensive shop facilities, equipment, and personnel of higher technical skill than are available at lower echelons of maintenance.

AP1.9. Depot Maintenance Activity. An industrial-type facility established to perform depot-level maintenance on ships, aircraft, weapon systems, equipment, and components.

AP1.10. Direct Labor Hours. Work performed solely for the benefit of a single job order. It is only incurred during the period of time that benefits accrue solely to that specific job order.

AP1.11. Direct Production Worker. A non-supervisory worker whose labor hours are normally charged to specific production work.

AP1.12. Enduring Plant Capacity. Maintenance shops that are located at, or within, facilities which are dedicated to performing depot-level maintenance and under the operational control of the commander of the personnel performing the depot maintenance.

AP1.13. General Shop Support. General shop support includes functions such as management supervision, engineering, production control, clerical functions, plant maintenance, central or general storage, quality assurance, materials testing, etc. This includes covered and uncovered areas that are used for offices, cafeterias, libraries, supervisors' work space, shop parts storage areas, main aisles, wash and dressing areas, dispatching facilities, inspection facilities, etc.

AP1.14. Index. A composite number used to characterize different sets of data. An index determined in accordance with this Handbook is a general indicator rather than a precise measure. Consequently, as index data are aggregated, their significance may decrease.

AP1.15. Indirect Labor Hours. All work performed that is not classified as direct.

AP1.16. Last Source of Repair. A DoD activity designated to perform a specific type of work because there are no other sources available for the type of work concerned.

AP1.17. Product Mix. A combination of heterogeneous workloads usually related to major systems, subsystems, components, stock classes, or items.

AP1.18. Production Shop Category. A grouping of shop capacities in terms of the types of weapons systems, equipment, or commodities that are repaired or otherwise supported.

AP1.19. Shop. A work center, functional work group, or resource group that contains one or more work stations that perform depot maintenance work.

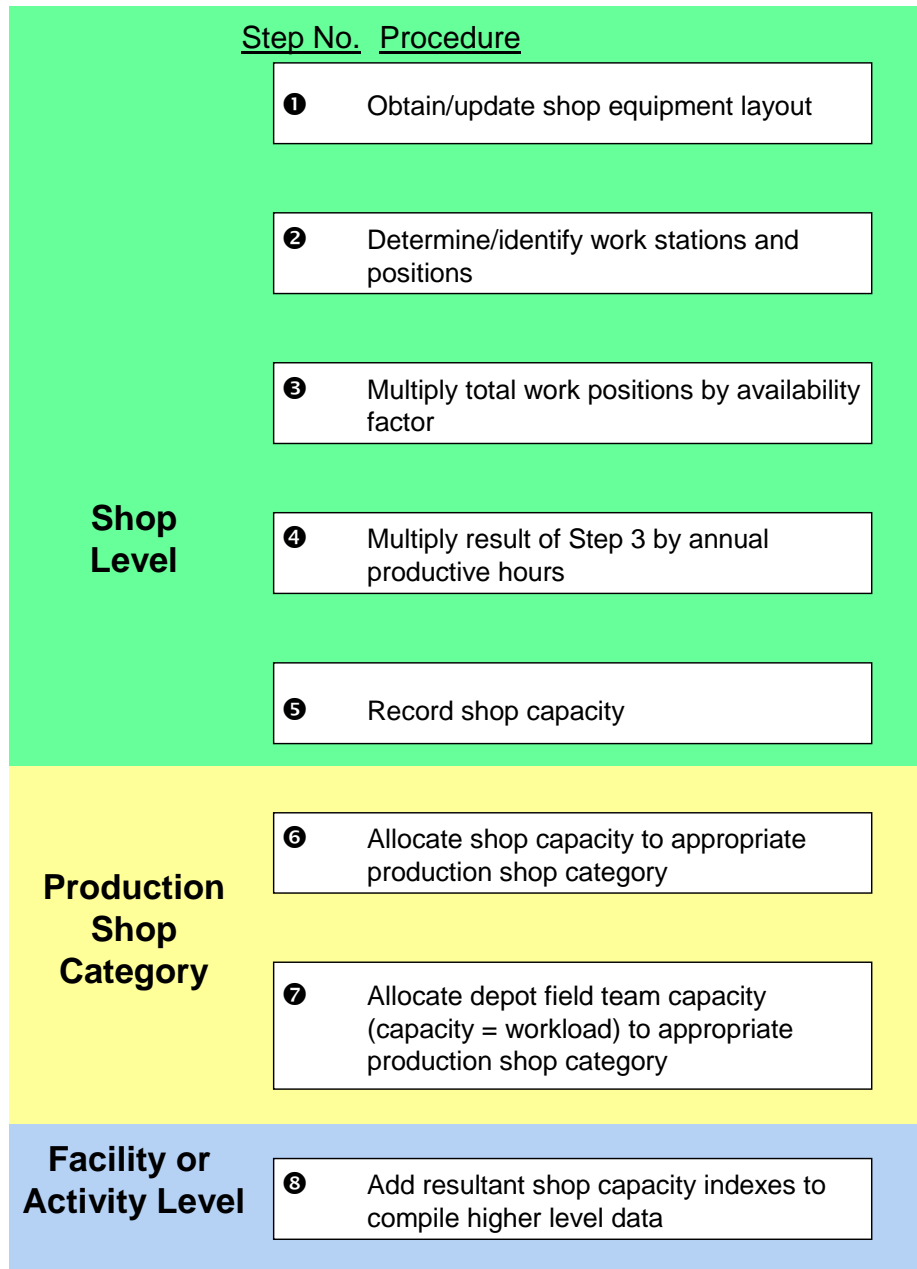
AP1.20. Workload. Peacetime maintenance support, expressed in DLH, by year (past years are actual DLH produced; current and future years are DLH projected to be produced), inclusive of funding from all sources (i.e., Operations and Maintenance, Procurement, and Research Development Testing and Evaluation appropriations, working capital fund, and reimbursables such as other Services and Foreign Military Sales).

AP1.21. Work Position. A designated amount of space and equipment that is occupied by a single direct production worker to accomplish assigned tasks on a full-time basis. A work position may include more than one location if the worker moves to other locations to accomplish the assigned tasks.

AP1.22. Work Station. The lowest order of equipment and/or process location that requires separate analysis of work flow and function during the capacity index calculation. It will consist of one or more work positions as determined by the criteria in Step 2 of the capacity index calculation in this Handbook.

AP2. APPENDIX 2

CAPACITY INDEX DETERMINATION FLOWCHART³



³ Refer to section C3.2. for a thorough explanation of the procedures contained in each step shown.

AP3. APPENDIX 3

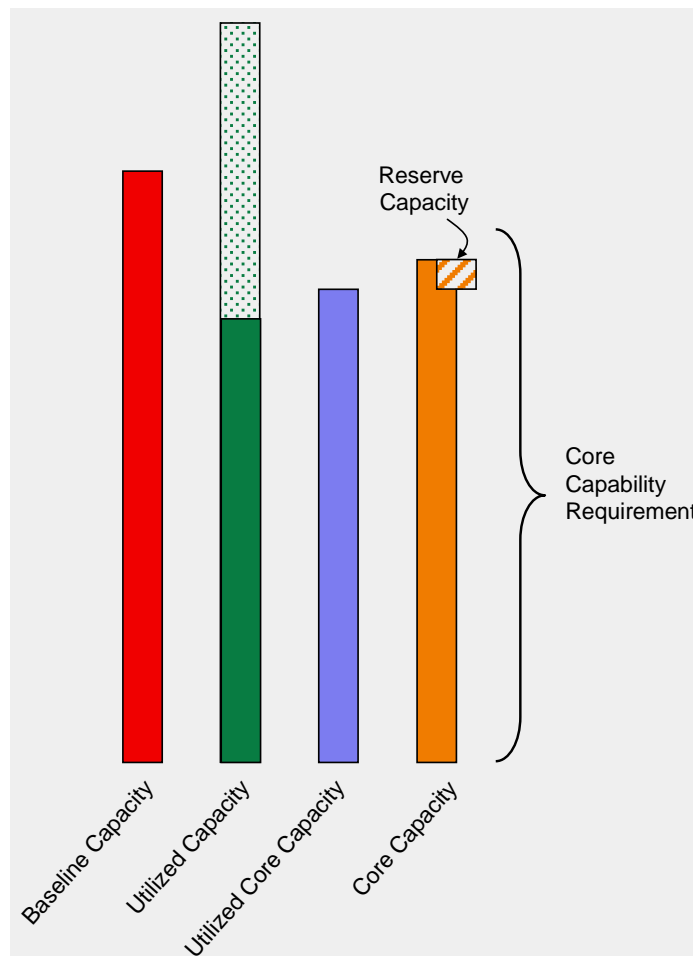
CAPACITY INDEXES RELATIONSHIPS⁴

AP3.1. The relationship among Capacity Indexes is as follows:

- Utilized Capacity can be less than, equal to, or greater than, Baseline Capacity
- Core Capacity can be less than, or equal to, the Core Capability Requirement
- Utilized Core Capacity can be less than, or equal to, Core Capacity
- Reserve Capacity (when applicable) is included as a subset of Core Capacity

AP3.2. These relationships are portrayed in Figure AP3.F1.

Figure AP3.F1. Capacity Indexes Relationships



⁴ Refer to sections C3.2. through C3.6. for an explanation of the contents of each of these indexes.

AP4. APPENDIX 4

DEPOT MAINTENANCE CAPACITY AND UTILIZATION SUMMARY DATA

Activity (or Location) _____	DoD Fiscal Years				
	Past Actual	Current Year	Plan Year 1	Plan Year 2	Plan Year 3
Utilized Capacity Index (DLH)					
Baseline Capacity Index (DLH)					
Funded Operations Utilization Indicator (%)					
NOTE: Baseline capacity data for the planning years should reflect the impact of projected capacity changes resulting from funded MILCON projects, shop reconfigurations, divestitures, changes in product mix, etc.					

AP5. APPENDIX 5

PRODUCTION SHOP CATEGORIES⁵

AP5.1. Aircraft

AP5.1.1. Airframes. Covered and uncovered areas associated with processing the airframe under these programs commonly identified as progressive aircraft rework, inspect repair as necessary, maintenance, crash damage repair and/or overhaul, modernization, modification, etc. The work functions include stripping, disassembly, airframe repair, reassemble, systems check, and refinishing. Also includes machine and metal repair; etc., to include Aircraft Structures-- Airframe skin, spars, stiffeners, etc., that make up the skeleton and outer shell of the aircraft--conducted in conjunction with airframe repair. Applies to the following categories:

AP5.1.1.1. Rotary

AP5.1.1.2. Vertical/Short Take-Off and Landing (VSTOL)

AP5.1.1.3. Cargo/Tanker

AP5.1.1.4. Fighter/Attack

AP5.1.1.5. Bomber

AP5.1.1.6. Aircraft – Other. Those areas used to perform productive airframe work that is not included in categories AP5.1.1.1. through AP5.1.1.5.

AP5.1.2. Aircraft Components. Covered and uncovered areas associated with processing aircraft components, as follows:

AP5.1.2.1. Dynamic Components. All aircraft moving components, such as transmissions, propeller shafts, etc., not otherwise classified.

AP5.1.2.2. Hydraulic and/or Pneumatic. Fluid and air pumps and associated plumbing lines and components, air-driven accessories, ram air turbines, fluid driven accessories, etc. (also includes pneudraulics).

AP5.1.2.3. Instruments. Indicators or measurement devices such as pressure, temperature and humidity gages; air speed, direction, and other flight control instruments; etc.

AP5.1.2.4. Landing Gear. Wheels, strut assemblies, tires, brakes, etc.

⁵ The contents of the various PSCs, as described in this Appendix, are illustrative; not mandatory. Capacity should be reported in the category(ies) that correspond to the WBS category(ies) which contain associated funded workload. Refer to sections C1.2.4. and C3.2.2.6. for additional insight.

AP5.1.2.5. Aviation Ordnance. Delivery systems, such as bomb racks, missile racks and launchers, guns, etc.

AP5.1.2.6. Avionics/Electronics. Electronic equipment, such as radar systems, radios, on-board computers, etc.

AP5.1.2.7. Auxiliary Power Units (APU). On-board systems, not powered by aircraft primary sources, used to supply electrical, hydraulic, or air power for short or temporary periods, such as starting, heating crew and passenger compartments, or emergencies.

AP5.1.2.8. Structures/Other. Covered and uncovered areas that are not an integral part of other categories previously prescribed in AP5.1.2.1 through AP5.1.2.7, and that contribute to aircraft repair operations by such work functions as parts cleaning; painting and plating; parachute, ordnance, photographic, leather, and fabric repair. Also includes machine and metal repair to include Aircraft Structures--Airframe skin, spars, stiffeners, etc., that make up the skeleton and outer shell of the aircraft--not included in categories AP5.1.1.1 through AP5.1.1.6. Also includes those areas used to perform aircraft component productive work that are not included in categories AP5.1.2.1. through AP5.1.2.7.

AP5.1.3. Aircraft Engines. Covered and uncovered areas associated with processing aircraft gas turbine engines and engine components in terms of overhaul, low time, complete repair, and major inspection. The work functions include uncanning, disassembly, cleaning, metals examination, examination and evaluation, parts reconditioning, subassembly, final assembly, test and preservation. Includes covered and uncovered areas that are not an integral part of the engine shop, but that contribute to aircraft gas turbine engine repair operations by such work functions as parts cleaning, plating, and machine and metal repair. Includes covered and uncovered areas used with processing aircraft engine blades and vanes.

AP5.2. Ground Vehicles

AP5.2.1. Combat Vehicles. Covered and uncovered areas used for depot maintenance of combat vehicles and their components (less communications-electronics). Work functions include repair, overhaul, rebuild, cleaning, disassembly, reassembly, refinishing, systems check, etc. Also includes covered and uncovered areas that are not an integral part of, but contribute to, combat vehicle equipment repair operation by such work functions as parts cleaning, painting, plating, leather and fabric repair, machine and metal repair, etc.

AP5.2.2. Amphibious Vehicles. Covered and uncovered areas used for depot maintenance of amphibious vehicles and amphibious vehicle components (less communications-electronics). Work functions include repair, overhaul, rebuild, cleaning, disassembly, reassembly, refinishing, systems check, etc. Includes covered and uncovered areas used for depot maintenance of amphibian hull and/or body, frame-installed systems and power train accessories, and components. Also includes accessories and components of internal combustion engines and armament systems. Includes covered and uncovered areas that are not an integral part of, but contribute to, the vehicle repair operations by such work functions as parts cleaning, leather and fabric repair, machine and metal repair, etc.

AP5.2.3. Tactical (Wheeled) Vehicles. Covered and uncovered areas for depot maintenance of tactical automotive vehicles and their components (less communications-electronics). Work functions include repair, overhaul, rebuild, cleaning, disassembly, reassembly, refinishing, systems check, etc. Also includes covered and uncovered areas that are not an integral part of, but contribute to, tactical (wheeled) vehicle equipment repair operation by such work functions as parts cleaning, painting, plating, leather and fabric repair, machine and metal repair, etc.

AP5.2.4. Construction Equipment. Covered and uncovered areas for depot maintenance of construction equipment vehicles and their components (less communications-electronics). Work functions include repair, overhaul, rebuild, cleaning, disassembly, reassembly, refinishing, systems check, etc. Also includes covered and uncovered areas that are not an integral part of, but contribute to, construction equipment repair operations by such work functions as parts cleaning, painting, plating, leather and fabric repair, machine and metal repair, etc.

AP5.3. Sea Ships

AP5.3.1. Aircraft Carriers. Covered and uncovered areas associated with the following: central tool shop, shipfitting, sheet metal, forge and heat treating, welding, inside machining, marine machining, boilermaking, electrical, pipefitting, woodworking, painting and blasting, riggings, foundry, pattern making, and temporary services.

AP5.3.2. Submarines. Covered and uncovered areas associated with the following: central tool shop, shipfitting, sheet metal, forge and heat treating, welding, inside machining, marine machining, boilermaking, electrical, pipefitting, woodworking, painting and blasting, riggings, foundry, pattern making, and temporary services.

AP5.3.3. Surface Combatants/Others. Covered and uncovered areas associated with the following: central tool shop, shipfitting, sheet metal, forge and heat treating, welding, inside machining, marine machining, boilermaking, electrical, pipefitting, woodworking, painting and blasting, riggings, foundry, pattern making, and temporary services.

AP5.4. Communications/Electronic Equipment

AP5.4.1. Radar. Covered and uncovered areas associated with processing radar equipment for overhaul, repair, conversion, and modification that are required in support of fixed, mobile, and portable electronic and communication systems. Radar equipment categories include navigation, search, surveillance, height finding, and identification. Work functions include disassembly, inspection, cleaning, repair, parts reconditioning and or/or replacement, manufacture, calibration, reassembly, test, and alignment.

AP5.4.2. Radio. Covered and uncovered areas associated with processing radio equipment for overhaul, repair, conversion, and modification that are required in support of fixed, mobile, and portable electronic and communications systems. Categories of equipment include communication, control, navigation, auxiliary, relay, microwave, television, and radiological. Work functions include disassembly, inspection, cleaning, repair, parts reconditioning and/or replacement, manufacture, calibration, reassembly, and test.

AP5.4.3. Wire. Covered and uncovered areas associated with processing wire and communications equipment for overhaul, repair, conversion, rehabilitation, and modification that are required in support of fixed, mobile, and portable electronic and communication systems. Categories of equipment include teletype, facsimile, telephone and telegraph, intercom and public address systems, sound recording and reproduction, and visible and invisible light communication.

AP5.4.4. Electronic Warfare. Covered and uncovered areas associated with processing electronic warfare equipment.

AP5.4.5. Navigational Aids. Covered and uncovered areas associated with processing of navigational aids.

AP5.4.6. Electro-Optics/Night Vision. Covered and uncovered areas associated with processing of electro-optics and night vision equipment.

AP5.4.7. Cryptologic. Covered and uncovered areas associated with processing of cryptology equipment.

AP5.4.8. Computers. Covered and uncovered areas associated with processing of computer equipment

AP5.4.9. Other. Covered and uncovered areas to perform depot maintenance on other types of communications-electronics equipment, including maintenance of Satellite Control and/or Space Sensors. This PSC also includes covered and uncovered areas that are not an integral part of other categories previously prescribed, and that contribute to communications-electronics equipment repair operations by such work functions as painting, plating, cleaning, welding, machine shop operations, metal and woodworking, canvas and upholstery repair, and plastic, graphic arts and other repair efforts, associated with the electronic and communications equipment.

AP5.5. Support Equipment

AP5.5.1. Ground Support Equipment (GSE). Covered and uncovered areas associated with depot maintenance of ground support equipment (except electronics-related GSE, which should be included in category AP5.5.3.) and its accessories and components.

AP5.5.2. Generators. Covered and uncovered areas associated with the depot maintenance of ground generators and their accessories and components.

AP5.5.3. Test Measurement and Diagnostic Equipment (TMDE). Covered and uncovered areas used for depot maintenance of TMDE equipment and their accessories and components, including maintenance of avionics/airborne electronics and ground communications-electronics support equipment.

AP5.5.4. Calibration. Covered and uncovered areas used to perform calibration on all types of equipment.

AP5.5.5. Other. Those areas used to perform productive work on support equipment that is not included in category AP5.5.1. through AP5.5.4. Includes covered and uncovered areas used for depot maintenance of all types of bearings. Includes covered and uncovered areas that are not an integral part of other categories previously prescribed, and that contribute to support equipment repair operations, by such work functions as painting and plating, machine and metal repair, etc.

AP5.6. Ordnance, Weapons, & Missiles

AP5.6.1. Nuclear Weapons. Covered and uncovered areas associated with renovation, modification, repair, inspection, test, assembly, and demilitarization of nuclear weapon materiel.

AP5.6.2. Chemical Weapons. Covered and uncovered areas associated with renovation, modification, repair, inspection, test, assembly and demilitarization of chemical weapons and their components, and associated materiel.

AP5.6.3. Biological Weapons. Covered and uncovered areas associated with renovation, modification, repair, inspection, test, assembly and demilitarization of biological weapons and their components, and associated materiel.

AP5.6.4. Conventional Weapons. Covered and uncovered areas associated with renovation, modification, repair, inspection, test, assembly and demilitarization of all items of conventional ammunition and their components, including bombs, grenades, weapon warheads, rockets, mines, torpedoes, pyrotechnics, fuses, primers, etc. Also includes the repair, overhaul, alignment, installation, checkout and test of weapons systems and integrated systems (e.g., gun mounts, turrets, saluting batteries, and launching pads), and associated target acquisition devices, such as, gun sights, range finders, torpedo directors, telescopic gun sights, periscopes, binoculars, stereo trainers, etc. Excludes aviation ordnance delivery systems, which should be included in category AP5.1.2.5.

AP5.6.5. Explosives. Covered and uncovered areas associated with renovation, modification, repair, inspection, test, assembly and demilitarization of all items of explosives and their components, including pyrotechnics, fuses, primers, etc.

AP5.6.6. Small Arms/Personal Weapons. Covered and uncovered areas associated with modification, repair, inspection, test, assembly, and demilitarization of small arms, including all hand-held weapons, bayonets, their components and associated materiel.

AP5.6.7. Strategic Missiles. Covered and uncovered areas associated with processing the strategic missile frames, motors, guidance systems and components, payload systems, accessories, and launch equipment.

AP5.6.8. Tactical Missiles. Covered and uncovered areas associated with processing tactical missile frames, solid or liquid propellant, major inspection and modification and their components. The work functions include disassembling, cleaning, propellant examination and evaluation, parts reconditioning, subassembly, final assembly, test and calibration.

AP5.6.9. Other. Covered and uncovered areas that are not an integral part of other categories previously prescribed, and that contribute to ordnance, weapons and munitions repair operations by such work functions as painting and plating, and machine and metal repair, etc. Also includes those areas used to perform productive work that are not included in categories AP5.6.1. through AP5.6.8.

AP5.7. Software

AP5.7.1. Weapon System. Covered and uncovered areas used for depot maintenance of weapon system software.

AP5.7.2. Support Equipment. Covered and uncovered areas used for depot maintenance of support equipment software.

AP5.8. Fabrication/Manufacturing

Covered and uncovered areas associated with fabrication and/or manufacturing in support of depot maintenance of the items in categories AP5.1. through AP5.7. and AP5.10. and AP5.11.

AP5.9. Fleet/Field Support

Covered and uncovered areas used for support services not covered within categories AP5.1. through AP5.8. Fleet support includes services such as salvage, preservation & de preservation, work incidental to acceptance and transfer of weapon systems at the depot; customer support provided directly to operating forces, component reclamation and calibration.

AP5.10. Special Interest Items

Covered and uncovered areas used for depot maintenance of items included in the “Special Interest Items” category of the Core Logistics Capability work breakdown structure.

AP5.11. Other

Covered and uncovered areas used for depot maintenance of items not identified in categories AP5.1. through AP5.10. Includes repair of other items in covered and uncovered areas that are not an integral part of categories previously prescribed, and that contribute to repair operations by such work functions as painting and plating, and machine and metal repair. Includes those areas used to perform productive work that are not included in categories AP5.1. through AP5.10.