

Providing Visibility of the True Cost of Marine Corps Maintenance

The Marine Corps Total Support Cost (TSC) Module

By

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Abstract

Marine Corps Logistics Command has developed a suite of decision support capabilities to assist in the analysis of materiel life cycle management activities. The Marine Corps Equipment Readiness Information Tool (MERIT) with its Total Support Cost (TSC) module plays a key role in helping the Marine Corps Logistics Command determine affordable readiness. In its graphical and tabular presentation forms, TSC displays cost and cost metrics of Marine Corps weapon and logistics systems to provide reliable investment advice to senior Marine Corps leadership. The purpose of the analysis metrics is to monitor the health of systems in terms of maintenance parts and labor costs and identify systems that are reaching the end of their effective lifecycle. The module will provide input to decision of whether to overhaul or replace a system. The web address for Merit is <https://merit.matcom.usmc.mil/merit/dispatch/show.login>.

An initial paper was written in 2005 as the first version of the TSC module was being completed. In the three years since then, Version 2.0 was completed. This paper will explain the additional capability.

I. Introduction.

The Total Life Cycle Management (TLCM) of military weapon systems is a difficult endeavor. As legacy systems age, their maintenance downtime often increases. Increased downtime means more maintenance effort, more cost, lower readiness, and less capability. Inherently, we know these things to be true. But without a means to accurately measure and assess them, the way forward is typically settled by anecdotal evidence and/or the theory of the squeaky wheel. We need analysis based on reliable data to make the best decision.

Marine Corps Logistics Command (LOGCOM) is developing a decision support capability, with internet-based tools, to assist in the analysis required to make sound investment decisions. The Marine Corps Equipment Readiness Information Tool (MERIT), the first of these tools is now equipped with a Total Support Cost (TSC) module to help us determine affordable readiness.

II. Background.

In May 2003, the Marine Corps Logistics Command (LOGCOM) was established with the mission of providing "worldwide, integrated logistics/supply chain and distribution management; depot level maintenance management; and strategic prepositioning capability in support of the operating forces and other supported units to maximize their readiness and sustainability and to support enterprise and program level Total Life Cycle Management". LOGCOM's Logistics Capabilities Center (LCC), in consonance with the Life Cycle Management Initiative (LCMI), continues to energize the advancement of Marine Corps Logistics Decision Support Capabilities.

The LCMI team supports Marine Corps' move toward a single materiel readiness capability - MERIT. This "one watch" for materiel readiness will allow us to move from reactive to proactive total life cycle systems management. Some of the challenges associated with achieving that "one watch" for materiel readiness have been: visibility and reporting of materiel readiness and cost data and information, lack of standardization, and lack of supply and maintenance integration.

III. Tools.

A. Marine Corps Equipment Readiness Information Tool (MERIT).

MERIT is an award-winning, web-enabled tool that graphically depicts current readiness postures. MERIT displays and detailed supply and maintenance information using emerging data visualization techniques. It displays the Materiel Readiness (MR), Maintenance Readiness, (R), and Supply Readiness (S) ratings for Marine Corps readiness reportable equipment by unit. MERIT gathers current and historical data from Marine Corps systems and will be able to import data from planned future Marine Corps logistics systems.

Integrating the working data produced by disparate supply and maintenance systems and incorporating additional information from accounting and finance systems, MERIT transforms data into valuable information. A unique graphical user interface derived from a commercial stock market tracking system provides a dynamic adaptable view of equipment readiness by commodity, functional area, and organization. An automatic graphics generator feature provides customized information for current and historical readiness and is ideal for weapons systems trend analysis and developing readiness related briefing charts at all levels within the Marine Corps. From the context of current readiness, MERIT enables the user to quickly drill down to underlying maintenance and supply chain problems to include individual parts on order, and parts location in each area of the supply chain. By drastically reducing the readiness information data gathering effort, MERIT enables users to proactively solve and prevent readiness problems.

MERIT has over 3000 users including Marine Corps System Command Program Managers, HQMC Watch Officers, Commanders, Logisticians, Supply and Maintenance Marines from the Operating Forces, Readiness and Status of Resources and Training Systems (SORTS) clerks, encompassing Marines from the rank of Private to General. DLA is using it to improve support to the Marines in Global War on Terrorism (GWOT). The bottom line is that MERIT is the tool moving the Marine Corps toward a "single watch" materiel readiness capability.

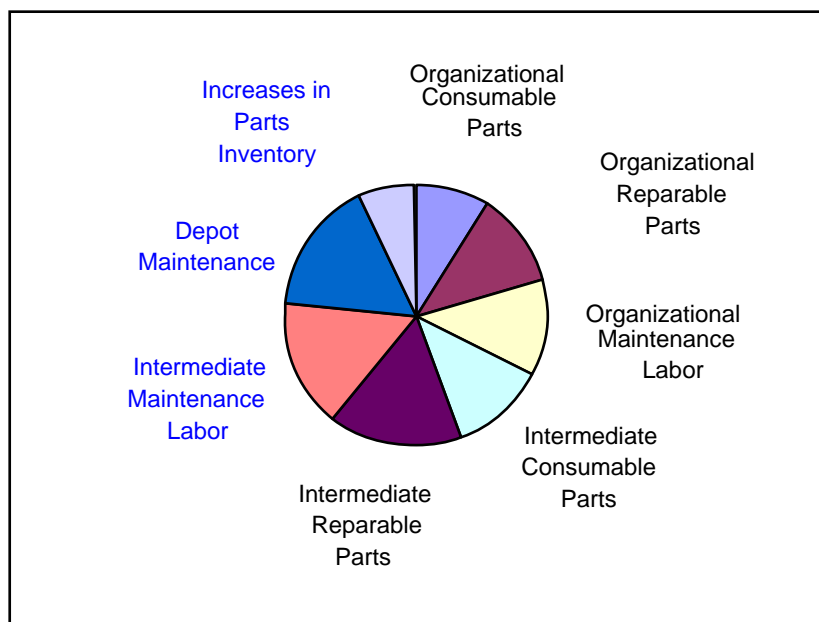
B. Total Support Cost (TSC) Module.

TSC provides the Marine Corps an additional critical piece to the TLCM puzzle. Whereas MERIT describes the operational

availability of a fleet of systems, TSC tracks the effort, in dollars, required to keep that system available - the sustainment cost of a weapon system. As an integrated TLMCM decision support capability, the TSC application draws maintenance cost data from the transactional systems' historical records. TSC displays support costs in tabular and graphic presentations, sorted by weapons system and organization, and provides comparative metrics to enable TLMCM decisions. The graphical display used to depict TSC data employs multiple dimensions. Weapons systems are displayed as squares, with size, placement, and colors of individual squares reflecting various measures. The display is customizable by users to ensure data is shown in a manner to best allow interpretation.

TSC data consisted of the cost of parts and labor for all echelons of maintenance other than depot in Version 1.0. In Version 2.0, the cost of repairing Secondary Repairables (SECREPS) that were repaired in isolation from the end item and depot maintenance has been added (see Figure 1). Also, the number of end items tracked has grown from 136 to 514. Readiness costing does not include the operation of a system (e.g., fuel and ammunition). The mission of capturing the cost of operating a fleet of systems is that of the Visibility and Management of Operating and Support Cost (VAMOSOC) database, found at www.usmcmvamosc.com, which is maintained by joint Navy-Marine Corps efforts.

FIGURE 1: TSC VERSION 2.0 COST ELEMENTS
(NEW OR REVISED Elements in Blue) (Proportions not to Scale)



TSC data is displayed for optimal visual analysis in graphical and tabular forms to allow analysts to not only determine the costs of maintaining a system, but also understand whether those costs are increasing or decreasing with causative factors detailed. To enable this, metrics have been created to portray different approaches of comparing the weapon system to itself historically, to its extended family of similar equipment, and to all the equipment in the Marine Corps inventory that is contained within TSC.

The purpose of the analysis metrics as defined is to identify systems that are reaching the end of their effective lifecycle and identify a possible course of action (i.e., replacement, enhancement, or overhaul). In the past, the United States faced a well-funded, technologically advanced opponent that regularly updated its equipment, thus pushing the Marine Corps to update its equipment on a similar schedule. Under the current operational conditions, Marine Corps equipment is being maintained in the inventory much longer in terms of miles driven or hours operated. Extended sustainment activities require accurate measures to determine when systems are no longer logistically or economically supportable. The TSC capability provides decision makers with the current and detailed data required to accurately determine and predict the return on Investment (ROI) for a weapons system in cases of overhaul or replacement. The three metrics that are applied in the determination of an actionable life cycle management issue are: 1) Total Annual Support Cost, 2) the Year-over-Year Cost Ratio, and 3) the Replacement Value.

Total Annual Support Cost is the annual (i.e., twelve trailing months (TTM)) cost to support a fleet of equipment (see Figure 3). Each square represents a Principle End Item identified by a Marine Corps Table of Authorized Materiel Control Number (TAMCN). The larger the square size, the higher the support costs are during the year. At a glance, one can see which weapon systems are consuming the most resources by the size of the square.

The color of the squares in Figure 2 is determined by the Year-over-Year Cost Ratio. As systems age, cost of support tends to increase. The cost ratio is the system's cost for the last TTM divided by the cost of previous 36 months. If the system's cost is less than the previous three-year's average annual cost, its ratio is less than 1 and the square is green. If this year's cost is greater, the ratio is greater than 1 and the square's color is red. The greater the ratio, as compared

to all systems displayed, the darker red the square, providing a quick visual reference of systems exceeding the defined metrics.

FIGURE 2: THE TSC'S ENTERPRISE LEVEL COST MODULE



The third metric is the Replacement Value factor, which the operator can display by color or size of the block. In order to ensure that replacement benefits are normalized across weapons systems families, an algorithm dividing system support cost by its value was created, offering direct comparison between the diverse systems. This algorithm, Replacement Value, consists of the cost of support divided by the fleet's procurement cost. It is expected that as a system ages, its Replacement Value will increase (i.e., the bathtub curve of system's lifecycle cost). The best candidate for replacement would then be the system with the highest support cost to procurement cost ratio because it is more likely that a replacement system would help pay for its acquisition cost with reduced maintenance costs. For example, an existing radar fleet might cost 25% of their purchase price (escalated to current dollars) each year to maintain. If a new

radar fleet was purchased, but cost only 5% of its procurement cost to support, there would be a support cost savings equal to 20% of the original system's cost that would help justify the new procurement. Using the TSC module, analysts look for the systems with the highest and increasing Replacement Values and comparing those system's costs to replacement system acquisition and support costs to identify the best replacement candidates available.

IV. The Analysis and the Solutions.

In combination, the MERIT and TSC tools may be used to perform detailed analysis on the state of USMC equipment. The following are a number of use cases depicting the analysis process.

A. **Case 1 - Falling Readiness and Increasing Cost.** These conditions represent the most common problem experienced and should trigger management intervention. If the data is normalized for operational time periods, the cost of support for multiple years can be compared. As equipment ages, readiness tends to fall as subsystems reach the end of their service life. As subsystems are repaired, the parts and labor consumed drive up the cost and lower the system's readiness. Using the TSC module, the weapons systems experiencing these changes are identified as their metrics go up and their readiness values go down. Once identified, the program manager, using the Part Maps built into TSC, can quickly determine if a relatively few parts are to blame or if the increased failures are widely dispersed among the parts. This begins the process that ultimately determines the best solution to maintain the weapon systems capability.

B. **Case 2 - Low Readiness and Low Cost.** If a system represented by this condition is not being replaced or planned for SLEP, a logical question is why more resources are not being applied toward its support. TSC and MERIT can easily identify these systems, but identifying the true cause is a little harder to uncover. Indications may be that parts are not being replaced on the system, but one does not know if this is due to a lack of parts, maintainers, or training.

Further research is required.

- C. **Case 3 - High Cost and High Readiness.** As a system ages, it will cost more to support as compared to its procurement price. In the past, the Marine Corps Life Cycle managers would assume everything was fine, if a system's readiness was above a designated threshold. However, it was not apparent just how much money and labor was expended to keep the system "combat ready". TSC and MERIT create visibility of those systems, which appear to be okay, but are actually draining valuable resources from the Force Commander. The program manager reviews systems falling into this category for possible replacement by comparing existing system support costs to the cost of acquiring a new system with lower support costs. At a certain point, it will be cost effective to replace an older system with a newer one, whose ownership costs are lower. It should be noted that any increase of functionality would drive the new system's acquisition and support costs higher. Thus, the Marine Corps could end up with a new, but more capable system with the same support costs.

V. Conclusion.

The MERIT and TSC decision support capabilities make the Marine Corps logistics managers aware of potential problems and provide the supporting data for timely and reliable decision-making. The success in developing a "Single Watch" for equipment readiness has positioned the Marine Corps closer to a Total Life Cycle Management decision support capability, at both program and enterprise levels, providing trusted "Investment Advice" based on the most reliable information.

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Mr. Kuusisto holds a BS degree in Chemistry and Masters of Business Administration from the University of ND, Grand Forks, ND. He has held several positions in Operations Research with the US Marine Corps Research and Development Command, renamed the US Marine Corps Systems Command, US Marine Corps Operational Test Activity, the US Marine Corps Materiel Command, and the US Marine Corps Logistics Command. He is currently the Supervising Operations Research Analyst of the Logistics Command's Operations Research Branch.

Mr. Kuusisto is married to the former LaRae Marie Varty of Lakota, ND. They have two children; Jason, 11 and Jeremy, 9.