STRATEGY RESEARCH PROJECT

AN EVALUATION OF U.S. COAST GUARD SHORE FACILITY READINESS MEASURES

BY

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ABSTRACT

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The intent of this Strategy Research Project is to argue that the Coast Guard should revise its current and proposed shore facility condition readiness measures. I will show that the metrics of Plant Replacement Value (PRV); Deferred Maintenance Backlog; and Facility Condition Index (FCI), provide a sound analytical basis from which to calculate an overall shore facility readiness measure called the Condition Level Rating (C-Rating). The C-Rating translates engineering condition into a metric that apprises Coast Guard senior leadership of the impacts the facility has on the ability to execute missions in accordance with standards. The C-Rating also supports the planning, programming and budgeting of Coast Guard infrastructure investments. In addition, I will show that the Facility Condition Assessment (FCA) provides the instrumental engineering foundation for the generation of the facility condition and readiness metrics. To support my conclusions, I will compare the Coast Guard shore facility condition measures with those used by the Department of Defense as well as other industry benchmarks.

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AN EVALUATION OF U. S. COAST GUARD SHORE FACILITY READINESS MEASURES

MILITARY READINESS: A NATIONAL ISSUE

Military readiness was an important issue in the recent presidential election. Readiness is usually defined by the numbers and qualifications of personnel, training standards, equipment, and weapons systems necessary to implement the requirements of our National Security Strategy (NSS) and National Military Strategy (NMS). Military infrastructure is also an important factor in the readiness equation for it provides the means to directly execute our NSS and NMS through power projection platforms, as well as indirectly through the multitude of supporting facilities managed by the armed services. This is indeed a national issue as evidenced by the fact that our new Commander in Chief has already focused on military readiness and infrastructure just weeks into his administration.

President Bush, in his first policy speech on the military since taking office, emphasized his concern over the aging and deteriorated condition of infrastructure.[1] The budget challenges of the 21st century with increasing fixed costs and decreasing discretionary funds for re-capitalization and transformation, places additional importance on the sound management of our infrastructure. Savings from reduced fixed costs will be essential for the continuation of our modernization programs. As such, additional rounds of Base Realignment and Closures (BRAC) will be inevitable as well as significant improvements in the way we plan; invest; use; and dispose of real property throughout the military.[2] In recognition of these needs, the U. S. Coast Guard has embarked upon initiatives to develop a Readiness Management System (RMS) and to improve overall capital asset management. It is the confluence of readiness management and capital asset management that is the focus of shore facility condition readiness.

The purpose of this research paper is to argue that the Coast Guard should revise its current and proposed shore facility condition readiness measures. I will show that the metrics of Plant Replacement Value (PRV); Deferred Maintenance Backlog; Facility Condition Index (FCI); and Condition Rating (C-rating), taken together provide a sound analytical basis for Coast Guard senior leaders to make informed infrastructure investment decisions. I will also show that Facility Condition Assessments (FCA) provides the instrumental engineering foundation for the generation of readiness metrics. To do this, I will first review the relevancy of shore facility readiness measurement to our national interests and establish the link to Coast Guard strategic planning efforts. Next I will provide a brief overview of Coast Guard shore facility measurement efforts to date to establish the context for evaluation. Finally, I will compare the adequacy of

Coast Guard shore facility condition measures with those used by the Department of Defense as well as other industry benchmarks, and derive my conclusions for the way forward from the research. Adequacy is defined as accurate, sustainable and meaningful information that has a sound engineering basis. In the end I will show that the Coast Guard's ongoing effort to develop shore facility readiness measures should be revised to best support both our national and service strategy and remain competitive with other agencies for scarce federal resources.

FACILITY CONDITION READINESS LINK TO STRATEGY

The 3 core objectives of the most current NSS issued in 1999 by former President Clinton are to enhance America' security; to bolster America's prosperity; and to promote democracy and human rights abroad. To accomplish these objectives, he highlighted the preservation and enhancement of the readiness of the armed forces as an essential tool to carry out the strategy.[3] With respect to the first objectives (Enhance America's Security), three components characterize the strategy: shaping the international environment, responding to crises and threats, and preparing for an uncertain future.[4] All three of these components have a direct relationship to the readiness of the armed forces and compete for the same resources in the budget process. Without significant increases in the top-line budget, for every dollar that is committed to transformation to position the armed forces for an uncertain future, there is one less dollar to support current shaping and responding operations. As a result, we must balance our abilities to shape and respond to issues today, with our need to modernize to support long term readiness and develop unparalleled capabilities for the future.[5] In recognition of the budget realities, the NSS calls for Congress to enact Defense Reform Initiative legislation to free up resources through a Revolution in Business Affairs (RBA). The key elements of the RBA include the following: "This effort includes competitive sourcing, acquisition, reform, transformation of logistics, and elimination of excess infrastructure through two additional base realignment and closure rounds."[6]

Within this framework it is clear that the military will face increasing pressure to create internal savings to fund the competing priorities of the NSS, and the disposal of excess military infrastructure is a vital source of discretionary resource dollars. Although there are a number of factors to be considered in a BRAC or excess facility disposal process, facility condition readiness is an important tool for decision-makers to evaluate the costs and benefits of such actions. A clear understanding of how well a facility supports readiness today, as well as into the future, is paramount in the determination to BRAC, excess or demolish infrastructure. The NMS also highlights the same linkage between scarce resources and excess infrastructure.

The NMS echoes the themes of shaping, responding and preparing now for an uncertain future in accordance with the NSS. It identifies the need to exploit the Revolution in Military Affairs (RMA) to create a stabilized investment program for the modernization of our forces. It also points to the harsh realities of the budget environment and the need to grow from within to maintain our military superiority as follows:

> It also requires a fundamental reengineering of our infrastructure and streamlining of our support structures through the RBA to realize the cost efficiencies necessary to recapitalize the force. Though difficult to accomplish, such tasks are essential to reaching new levels of joint warfighting effectiveness.[7]

Clearly, improved infrastructure management is a critical enabler for the readiness of the armed forces and the execution of our national strategy. While the executive branch has focused on the policy aspects of the readiness equation, the legislative branch has enacted a law that addresses, among other things, the measurement portion.

Congress has weighed in on the issues of strategic planning, performance and accountability at the agency level of the Federal Government. The Government Performance and Results Act (GPRA) of 1993 highlights the need to improve the efficiency, effectiveness and internal management practices of federal agencies.[8] The overarching principle of the Act is to instill greater confidence in government through systematic accountability of federal agencies to achieve program results. The Act requires agencies to develop strategic plans with outcome-related goals and objectives for operations and major functions. Key elements of this process are the development of performance plans and measures to access actual progress towards attainment of the goals and an annual reporting procedure to publish agency results.[9] Thus, GPRA provided a foundation for the measurement aspect of Coast Guard strategic planning efforts and the readiness management initiative. The Coast Guard's Strategic Plan defines agency goals and objectives, while its Readiness Management System measures performance across the spectrum of operations and programs.

The Coast Guard Strategic Plan defines readiness as " the ability of Coast Guard systems to execute mission requirements in accordance with standards. Readiness is measured by comparing current capabilities with required capabilities through the lens of standards."[10] The planning architecture provides an integration of external and internal influences though the Family of Plans as depicted in figure 1. The correlation of the various plans insures focus and alignment and facilitates communication up and down the chain of command.[11] The Strategic

Plan defines 5 goals with corresponding objectives, measures and strategies that characterize the Coast Guard's reason for existence and the focus of all organizational effort. These goals are as follows:

- Maritime Safety
- Maritime Security
- Protection of Natural Resources
- Maritime Mobility
- National Defense[12]

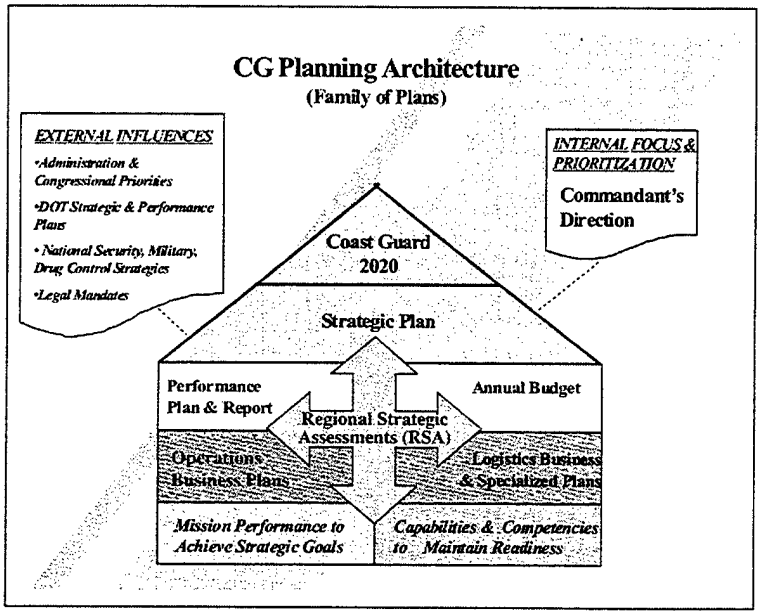

FIGURE - 1 COAST GUARD FAMILY OF PLANS[13]

The enabling mechanism to achieve these goals is through the Coast Guard Logistics Doctrine. Logistics is defined as "all the activities associated with acquiring, sustaining, and retiring the components of capability: people, information, and systems."[14] The purpose of Coast Guard Logistics is to "put the right capability in the right place at the right time and at the right cost."[15] Shore facilities are critical inputs to the logistics doctrine through the systems component of capability and support all five operating goals. Therefore, facility condition readiness is an important measure for senior leadership to evaluate in the ongoing development of a service-wide Readiness Management system (RMS).

The RMS initiative is an effort to develop a common framework for managing and measuring readiness across the spectrum of programs and missions.[16] It draws upon the

performance based management requirements of GPRA to establish a link between resources and results as described in the Strategic Plan.[17] It also requires a methodology to measure readiness through the application of standards, which is not insignificant. Although some requirements or missions lead to a direct or immediate correlation with results (i.e. flight hours to lives saved), in other areas the correlation is more complex or may take a much longer period of time.[18] Such is the case for many, if not most, of the Coast Guard's shore facilities. While the correlation between the condition of a pier and capability of a small boat station to execute missions is clear, it is much more difficult to conceptualize the impact a decision to delay the repaving of a parking lot for Coast Guard Office building has on readiness.[19] The challenge is to develop a set of metrics for shore infrastructure condition that have sound engineering basis and are relevant for both direct and indirect association with readiness.

Why is this important? Aside from the national policy as well as legal mandates, the Commandant of the Coast Guard has determined that its concentration on short-term success has had a negative impact on the preparations for the future.[20] In other words, future readiness is being compromised in order to sustain current readiness beyond what our resources can support. From a logistical perspective, the Coast Guard does not have the funds available to maintain its aging shore facility infrastructure along with all of its operational deepwater assets (vessels and aircraft which operate in excess of 50 nautical miles from the shore), while at the same time sustaining operations at current levels. The implication of this reality is that facility maintenance and repair dollars will continue to be diverted to support operations unless decision-makers are provided with a clear understanding of the costs of such actions. This problem is not isolated the Coast Guard. Throughout the federal government agencies are struggling with this very issue as documented in a recent study by the National Research Council.

In 1998 the National Research Council (NRC) issued a study, Stewardship of Federal Facilities, A Proactive Strategy for Managing the Nation's Public Assets, that found throughout the federal government, facilities are deteriorating and maintenance continues to be under funded. The study also found there is a lack of appreciation of the relationship between federal facilities and agency missions in strategic planning and budgeting. The NRC found that the lack of adequate maintenance investment over time shortens the service life of a facility.[21] The study also detailed the difficulty Facilities Managers have in advocating for increased maintenance and repair (M&R) budgets in a constrained resource environment due to the time delay in consequences of inaction. Findings 5 and 6 of the study speak to this important point:

> Finding 5. Maintenance and repair expenditures generally have less visible or less measurable benefits than other operating programs. Facilities program managers have found it difficult to make compelling arguments to justify these expenditures to public officials, senior agency members, and budgeting staff.
>
> Finding 6. Budgetary pressures on federal agency managers encourage them to divert potential maintenance and repair funds to support current operations, to meet new legislative requirements, or to pay for operating new facilities coming on line.[22]

This is the essence of the challenge in a facility condition readiness system; to communicate the importance of facilities maintenance and repair investment to future readiness in competition for scarce resources that support operations. The key to success is through the use of appropriate measures that relate facility condition directly to readiness. In the next section, I will review the Coast Guard's efforts to date in facility measurement as a stepping off point to develop recommendations for the future.

COAST GUARD MEASUREMENT DEVELOPMENT: THE PAST IS PROLOGUE

The measurement of the condition of the shore plant is not a new concept in the Coast Guard. In 1983 the first formal attempt to quantify the shore plant was implemented through the promulgation of the Facility Adequacy Scoring Technique (FAST). The purpose of this instruction was to provide a standardized engineering evaluation system to assess the physical and functional adequacy of the shore plant.[23] The basic elements of FAST consisted of an inspection checklist with adequacy standards for different types of buildings and building systems that produced an overall score for the facility, which could be related theoretically to readiness. Although this system did provide an indication of plant condition in a relative sense, the subjective nature of the standards caused it to be inadequate as an overall measure of plant condition and the variability in scoring prevented a meaningful link to readiness.

However, a brief review of FAST is instructive to guide the way forward as to what works, as well as what doesn't work in the development of a facilities condition readiness system. FAST did attempt to relate an engineering assessment to generate a metric on facility condition. In this respect FAST was on the right track but inadequate in the execution. An engineering based Facilities Condition Assessment (FCA) is the basic foundation of any facility condition readiness system. The problem with FAST was that the assessment standards were overly broad and allowed wide variability between inspectors or evaluators. Consequently, consistency in evaluation could not be sustained at a single facility, let alone across the entire Coast Guard. This provides the second valuable lesson from FAST; a condition readiness system must be designed in such a way to insure accuracy and consistency between inspectors

and types of facilities. Simply put, the system needs to insure that regardless of whom or where the assessment is done, similar facilities with similar conditions will receive similar evaluations. The ongoing Coast Guard Readiness Measurement Initiative relies on an automated and standardized approaches in effort to address these vary issues.

COAST GUARD MEASUREMENT INITIATIVE: THE FUTURE

In support of the Strategic Plan and the Readiness Management Initiative, in 2000 the Systems Directorate at CG Headquarters established the Shore Facility Capital Asset Management (SFCAM) initiative and the Systems Measurement Implementation Team (SMIT). The goal of the former is to transform the management philosophy from a decentralized facilities engineering/project execution based approach to a holistic capital asset management approach that considers shore infrastructure as a corporate strategic resource.[24] The goal of the latter is to provide an overarching information management and measurement tool to aid in strategy, policy, and investment/resource allocation decisions.[25] The SFCAM Mission is "to provide sustainable shore infrastructure that enables Coast Guard mission readiness".[26] From a measurement perspective, SFCAM will align asset measures with those developed under the SMIT to facilitate compatibility with the Readiness Management Initiative. The SFCAM objective with respect to asset measures is as follows:

> Develop asset measures which enable responsible stewardship of shore facility assets, and identify potential impacts of alternative decisions: Measures will provide information that not only illustrates the cost of a given decision but also the cost of not doing something such as deferred maintenance.[27]

In June of 2000, the SMIT submitted its final report detailing the recommendations for a common set of measures/metrics across the scope of responsibilities of the Systems Directorate, which includes: ships, boats, aircraft, motor vehicles, aids to navigation and shore facilities. The team adopted a framework of 4 dimensions applicable to all Systems; Performance; Availability; Human Factors; and Resource Management. A synopsis of the framework is shown in Figure 2. In concert with the overall Readiness Management Initiative, the Systems measures will output through an automated system that will produce a color-coded dashboard display to indicate the appropriate readiness of the system. The colors green, yellow and red define conditions that either meet or exceed the standard; that is in danger of not meeting the standard; or fails to meet the standard. The intent is to provide an easy to read graphical representation of current readiness, as well as trend analysis, to provide an indication of future readiness.[28] Each of the four dimensions of measurement is broken down into

separate indexes that are averaged to arrive at an overall score for the dimension. The overall measure of a facility or installation is called the Shore Facility Index (SFI) and is the average of the four dimensions.[29]

Systems Measurement Framework Synopsis

Program	System Category	Performance	Availability	Human Factors	Resource Management
Vessels	1. **Ships** (all vessels over 65')	Fleet Readiness Days	% Operating Time Free of C3/C4 CASREPs	Cutter Equip Mishaps	AFC-45 Budget Model; CASREP Exp; Maint Backlog
	Standards Ranges				
	2. **Boats** (all vessels up to 65')	Scheduled Depot Maint Cycle Time	Operational Hours per Maintenance Hour	Boat Equip Mishaps	Maintenance Expenditures
	Standards Ranges				
Aircraft	3. **Fixed Wing** (HU25, HC130)	% Planned Monthly Flight Hours Flown	Availability Index	Unit-level Exp Index; Unit-level Maint Loading Index; Class A-D mishap rates	Total Stock Position; Direct Maintenance Costs
	Standards Ranges	90-95% <90%			
	4. **Rotary Wing** (HH60, HH65)	% Planned Monthly Flight Hours Flown	Availability Index	Unit-level Exp Index; Unit-level Maint Loading Index; Class A-D mishap rates	Total Stock Position; Direct Maintenance Costs
	Standards Ranges				
Shore	5. **Facilities** (non-moving structures: bldgs, piers, etc)	Size, distance, CASREPs	Days Mission Ready	Number of Mishaps	Acquisition, Maint & Projected Maint costs
	Standards Ranges	≥ 0.8 < 0.8	≥ 0.8 < 0.8	≥ 0.8 < 0.8	≥ 0.8 < 0.8
C4I	6. **Radio Navigation Systems** (DGPS, LORAN)	Radionavigation Signal Performance (Signal on-air)	Radionavigation Equipment Availability (Equipment Mission Capable)		Systems Resources (Labor & Funds) required per radionav system
	Standards Ranges	<95%			
	7. **Communication Systems**	Customer Survey	Availability Index	Cost of Operator & Maint training; # of mishaps	Total operating & support cost
	Standards Ranges				
	8. **Information Systems** (SWIII COE, MS Email)	Customer Survey, Flexibility Index	System Availability	Cost of Operator & Support training	COE Total Cost Ownership
	Standards Ranges				
	9. **Command and Control (C2) Decision Support Systems (DSS)** (SCCS, C2PC, VTS, etc)	DSS Performance (measure being developed)	DSS Equipment Availability (Equipment Mission Capable)		System Resources (Labor & Funds) required per DSS
	Standards Ranges				

Definitions:

- **Green** = meets or exceeds "standard"
- **Yellow** = in danger of NOT meeting "standard"
- **Red** = Fails to meet "standard"

Performance
Ability of assets/ systems to continually meet operational requirements

Availability
Time (ratio [%] of planned vs. actual) asset/system is mission capable

Human Factors
Pertains to human elements of systems and interfaces between the human being, the machine, facilities, and the associated software

Resource Management
Actual life cycle cost vs. expected or budgeted life cycle costs

FIGURE – 2 RMS FRAMEWORK[30]

Once the SFI is calculated, it is compared to the standards to arrive at the color-coded rating. The overall rating would then be displayed in the appropriate color on the dashboard display in the Readiness Management System (RMS).[31]. The requirement to develop and measure common dimensions of performance for vastly different systems sub-optimizes the needs of each of the programs. In other words, commonality drives the selection of dimensions

and measures developed to fit the categories, instead of the importance of a dimension to a particular system. Another problem with this approach is that the graphical output, while it may be easy to understand for internal decision-makers, is not consistent with the terminology used by DOD (i.e. Condition Level Ratings: C-1, C-2, etc.) and then understood by Congress to gain support for additional resources. The SMIT most certainly had a very difficult job in attempting to strike a balance between the readiness measurement needs of six very different types of systems. With respect to facility condition, the resultant measures are inadequate.

To provide a more meaningful representation of facility condition readiness, I will show the SMIT should concentrate on the measurement of; Facility Condition Assessments (FCA); Deferred Maintenance Backlog, Plant replacement value (PRV); Facility Condition Index; and a Condition Level (C-Rating). The methodology I will follow in developing recommendations for Facility Condition Assessments, as well as the other measures noted, is to identify the appropriate industry standard if one exists; discuss the current or proposed Coast Guard practice if applicable; compare with the Department of Defense practices; and provide a specific recommendation for the measure.[32]

FACILITY CONDITION ASSESSMENTS (FCA)

As indicated in the discussion on FAST, the foundation of any facilities condition readiness system starts with an aggressive Facility Condition Assessment (FCA) program. This is because all of the other metrics are derived from the output of the FCA. Its accuracy is therefore vital to the success of the program. FCA has a sound engineering basis and is widely used as an industry standard. The National Research Council (NRC) has issued several of the pre-eminent publications on the maintenance of public and federal buildings. In Committing to the Cost of Ownership; Maintenance and Repair of Public Buildings, the NRC stresses that a formalized comprehensive condition assessment program is a vital management tool to protect buildings from wastage.[33] Other key features of the program include the use of technically qualified and trained personnel and standardization of the inspections and diagnostic analysis.[34] Done correctly, the assessment will validate the shore facility inventory, which will update/validate the plant replacement value (PRV), and provide a comprehensive list of deferred maintenance needs for the facility. Assessments must be completed on regularly scheduled intervals in order to evaluate trends. Consequently, the NRC recommends a maximum three-year inspection schedule.[35]

The Coast Guard currently conducts facility assessments through a biennial inspection program. Trained engineers use regionally standardized inspection checklists. The outputs of

the inspections are up to date PRV and deferred maintenance backlog items. Aside from the lack of a single Coast Guard inspection standard, a problem with the current the practice is that the biennial inspections are often low priority on the regional Civil Engineering Unit's work list. Design and execution of current year projects take precedence over identifying future work. As a result, often times the biennials slip one, two, three years or more. As an example, the last biennial inspection at Air Station Cape Cod (the second largest shore facility in the Coast Guard) was 1991. There is no measure to report on the performance of the Civil Engineering Units in relation to the percentage of inspections completed. The SMIT did not address FCA in their report.

In evaluation of the Coast Guard's methodology to address shore facility condition readiness, a comparison with the Department of Defense (DOD) is appropriate due to the similarities of the armed services and of military facilities. The four armed services of DOD are collectively responsible for management and maintenance of more real property than any other single entity in the world.[36] Despite the fact that the Army, Navy, Air Force and Marines all fall under the auspices of DOD, there is no common method used by these services to rate or assess facility condition.[37] With over 320,000 buildings and a total PRV of over $500 billion, DOD's real property assets dwarf those of the Coast Guard, however, the processes and procedures employed by the services to manage these facilities provide useful benchmarks to assess the Coast Guard's efforts.

The U. S. Army has the largest real property holdings among the DOD military services. To manage these assets, the Army conducts condition assessments through a program called the Installation Status Report (ISR) system. Unlike the Coast Guard and the industry benchmark where the purpose of the assessment is to document deficiencies, the ISR evaluates the condition of facilities against published standards.[38] The Army developed detailed standard booklets for each type of facility to allow a trained inspector to classify the condition into one of three color-coded categories (green, yellow amber). The ISR doctrine is rather rigid in that the overall rating for a facility cannot exceed that of its worst component. There is no allowance to average component ratings to arrive at an overall facility rating. This practice can tend to skew the ratings.[39] The ISR format separates infrastructure into 5 broad areas: Mission Facilities; Mobility Facilities; Housing; Community Facilities; and Installation Support.[40] These major areas are subdivided down to facility category groups and evaluated on quantitative and qualitative aspects using the color-coded standards.[41]

The U. S. Air Force manages the second largest real property account within DOD and uses a tool called the Facility Investment Metric (FIM) system to rate their facilities' deficiencies

with respect to their impact on mission areas. The mission areas include Primary Mission; Mission Support; Base Support; and Community Support. Minor construction and repair projects are included in the FIM. The Air Force uses four general mission areas to classify real property facilities and a three tiered rating system (critical, degraded, minimal) to assess the impact of the specific facility deficiencies (as opposed to the whole facility itself) on mission performance. The three ratings are defined only in very general terms. The FIM is therefore a project rating system and not a facility condition rating system.[42]

Based upon the discussion of the problems with the current facility assessments and review of the effectiveness of Army and Air Force assessments, the Coast Guard should revise its Facility Condition Assessment program to include the following:

- Identify the FCA as a priority program among all Civil Engineering Units.
- Implement an annual measurement requirement for Civil Engineering Units to report on their performance in conducting scheduled FCA.
- Categorize and track FCA and all measures by facility type similar to the Air Force process. Recommend categories of Operations: Operations Support; Base Support; Community Support; and Housing. This will facilitate segregation of readiness measures and evaluation by mission impact.
- Implement a comprehensive standardized inspections guide for Coast Guard wide use.
- Require the FCA to include a validation of the Shore Facility Inventory, which will update the facility PRV.
- Retain the existing 2 year (biennial) inspection schedule.

DEFERRED MAINTENANCE BACKLOG

The second of the five RMS categories is the Deferred Maintenance Backlog. This is a measure of unfunded non-recurring shore facility maintenance and repair requirements. The fact that a deferred maintenance backlog exists represents a physical and financial liability for a building.[43] The Coast Guard maintains a deferred maintenance backlog for all its facilities. The backlog includes preliminary cost estimates based upon a general scope of the problem and the recommended correction. An area of concern is the validity of the backlog. Two problems are encountered. Occasionally the backlog is overstated due to superceded or completed projects not being removed, or the backlog is underestimated due to the failure to conduct facility condition assessments and document needed maintenance actions in a timely manner. The Systems Measurement Implementation Team recommended this measure be retained and used in concert with plant replacement value to generate a facility condition index.[44]

All of the services maintain backlogs of deferred maintenance and there is nothing remarkable or noteworthy about any of their efforts. As with the Coast Guard, accuracy of the backlog is a concern and a challenge for the services.[45]

With respect to Deferred maintenance Backlog, the Coast Guard should adopt the following to fix its quality problem:

- Improve the accuracy of the backlog through comprehensive and timely facility condition assessments.

PLANT REPLACEMENT VALUE (PRV)

The third RMS category that I will now review is Plant Replacement Value (PRV). This is a measure of the current cost to replace buildings, structures, utilities, etc. PRV encompasses the entirety of physical or real property assets of the shore plant with exception of land value, which is excluded. In and of itself, PRV is not a measure of condition, but it is a measure of value. Used in a ratio with deferred maintenance backlog, it generates a metric called the Facility Condition Index (FCI), which is a measure of condition and readiness. The National Research Council (NRC) recommended that current replacement value (identical to PRV) should be used as the principle measurement tool for the level of maintenance and repair investment in order to optimize service life.[46] In an effort to provide an M&R funding guideline that is sufficiently sensitive to building characteristics and financial conditions (geographic cost differences), the NRC proposed that the appropriate funding level should be on average between 2 and 4% of current replacement value.[47]

The Coast Guard uses PRV as one the primary measures for management and evaluation of the shore plant. PRV is calculated from the shore facility inventory database, which applies geographic, and facility type cost factors to arrive at the replacement cost for all facilities. The cost factors are updated on an annual basis. Regional Civil Engineering Units are responsible to maintain the accuracy of PRV for all facilities in their respective service areas. Similar to the problems with FCA, update of PRV is a low priority in comparison to the execution of current year contracts. PRV and deferred maintenance backlog are used for internal funds distribution and to calculate FCI, which is described in more detail later in the paper. The Systems Measurement Implementation Team recommended continued use of PRV in the calculation of FCI, which is described as the leading facilities measure.[48]

All the DOD services use PRV in the management of their facilities, primarily as a budgetary tool.[49] For example, The Navy and Marine Corps uses PRV to advocate for levels of maintenance and repair funding that meet the industry standard of 2-4% of PRV.[50] The Air

Force uses PRV to gauge the adequacy of its preventive maintenance program, which is targeted at 1% of PRV.[51] The Air Force also uses PRV in conjunction with the Facility Investment Metric (FIM) System to generate a measure called Facility Investment Index (FII) at for each facility where projects are identified. FII is the ratio of project costs to the PRV in the facilities where they will be accomplished.[52] The GAO has criticized the use of PRV to justify budget requests because the metric is valued based and not needs based. Another concern is that the standard cost factors are too general and not representative of the differences between individual buildings.[53] My experience leads me to believe that the GAO is simply off the mark. Maintenance and repair is largely a predictive science and industry standards recognize this fact. Typical of a government bureaucracy, the GAO would rather have the services provide detailed cost estimates on projects that have yet to be designed in order to more closely identify the funding need. The magnitude of infrastructure coupled with the tremendous backlog of project needs makes this a virtual impossibility. The result is that the GAO's focus solely on the budgetary needs aspect doesn't adequately take into account the fact that the correlation between resources and results for facility maintenance can often take years to develop. Consequently, sustained investment based upon an industry standard metric is a prudent course of action.

Accordingly, the Coast Guard should continue to use PRV as a primary measure for both budgeting and condition readiness measurement in accordance with the following stipulations:

- The accuracy of PRV must be maintained and should be validated at each Biennial Inspection.
- PRV should be used externally along with Condition Level Ratings to advocate increased for increased budgets with Congress and the Administration.
- PRV should be used on a macro level as an internal indicator of funding adequacy. The value of PRV as a measure of funding adequacy is in a trend analysis over a period of years as opposed to an individual year's evaluation.
- PRV should continue to be used as the denominator in a ratio with deferred maintenance backlog to calculate the Facility Condition Index.

FACILITY CONDITION INDEX (FCI)

The fourth RMS category is a function of the second and third categories. As previously noted, the Facility Condition Index (FCI) is the ratio of the deferred maintenance backlog to the PRV of a facility or installation. In a study by the National Association of College and University

Business Officers (NACUBO) called Managing the Facilities Portfolio, a Practical Approach to Institutional Facility Renewal and Deferred Maintenance, a facilities portfolio management mode is proposed which includes the use of FCI as a principle measure. The model recommends use of the FCI as a means to estimate and prioritize the backlog of deferred maintenance for both short and long-term requirements.[54] The funding model presents several algorithms to develop deferred maintenance reduction budgets based upon desired FCI or desired backlog level.[55] Lastly, the model recommends a measurement and reporting program based upon trend analysis of deferred maintenance backlog and FCI as well as several other minor metrics (i.e. gross square footage, age, type of use, etc.).[56]

The Coast Guard currently uses FCI as the leading measure of facility condition. While there are no service-wide standards to judge a particular value of FCI, its primary value is currently in comparison of conditions between units. As the value of the FCI ratio increases, it is an indicator that the facility condition is declining. The Systems Measurement Implementation Team recommended retaining FCI as a measure for facility condition and established ranges of FCI values to correspond to color-coded graphical display (green, yellow and amber) to represent readiness condition ratings. Although the Report identifies FCI as the leading measure for facility condition, it is an input to only two of the fifteen indexes used to generate the overall Shore Facility Index and is weighted equally with all other indexes.[57] The impact of this approach is that FCI is marginalized in comparison with other indexes that have little to do with facility condition (i.e. distance to mission area index, size index, mission ready index, etc.).

As discussed in the PRV section, the Air Force metric called the Facility Investment Index (FII) is similar but has a narrower focus than the FCI. Where as FCI is an index of all deficiencies relative to the plant value, FII is an index of specific project costs to the plant value. Since the FII excludes all deficiencies not related to the specific project identified, it is of limited usefulness as a condition readiness measure because it doesn't give a complete or accurate picture of the overall conditions. It is beneficial as a project evaluation tool and the important point to be gleaned in this discussion is that the methodology is the same as FCI and that there is a DOD similar basis for this approach. The common goal is to generate an index that normalizes costs based upon plant value. The FCI method is more suitable to achieve the Coast Guard's desired end state.

The Coast Guard should continue to use FCI as the primary facility condition in accordance with the following recommendations:

- FCI should be calculated for all facilities with the values translated into a condition rating similar to the NACUBO model and the proposed Coast Guard model. The specifics of the condition rating will be discussed in the following section.
- The FCI should be tracked, collated and capable of roll-up by facility type as recommended in the FCA section.
- As the leading measure of facility condition, FCI should be weighted far more heavily than any of the other 15 measures proposed by the Systems Measurement Implementation Team. An appropriate weighting factor would be 50% for FCI and 50% for the total of the remaining measures.

CONDITION LEVEL RATING (C-RATING)

While the first four RMS measures discussed above provide a sound engineering basis to evaluate facility condition, alone they do not provide a measure of readiness. The Condition Level Rating is the overall readiness measure for shore facilities. It is a translation of the facility condition into a metric that apprises leadership of the impact on the "ability of Coast Guard systems to execute mission requirements in accordance with standards".[58] The leading measure for facility condition is FCI, and the NACUBO study provides a basis for this translation of engineering data into a readiness indicator. NACUBO calculates the FCI in the same way as the Coast Guard, but has the added benefit of assigning condition ratings based upon discrete ranges in the value of FCI. Condition ratings are specified as good, fair or poor.[59]

The Coast Guard currently does not currently have a condition rating system in use. However, the Systems Measurement Implementation Team recommended the adoption of a total of eleven measures for shore facilities that are divided into four categories, normalized on a 1.0 scale and averaged into an overall Shore Facility Index (SFI) rating. The SFI scale is divided into three ranges to indicate readiness condition. Each SFI range corresponds to a color-coded graphical display of green, amber or red. A green rating denotes that the facility meets or exceeds the standard. A red rating denotes that the facility does not the standard, and a yellow rating indicates the facility is in danger of not meeting the standard.

The Army's Installation Status Report (ISR) takes the ratings derived from the facility inspections and applies a variety of weighting factors to arrive at a Condition Rating or C-Rating as it is known. The C-Ratings range from C-1, which indicates the element or facility meets standards or is capable of supporting all installation requirements, to C-4, which indicates the facility does not meet standards or is incapable of supporting installation requirements. An additional rating of C-5 is used to denote a facility undergoing a major reorganization such as

Base Closure and Realignment. Overall C-Ratings are the composite of the qualitative and quantitative ratings.[60] The key element of this rating system is its wide acceptance and understanding by DOD and Congress.

The Navy Shore Base Readiness Report (BASEREP) System also produces a condition level rating. C-1 indicates the rated element has fully met the demands during the reporting period. C-4 denotes that the rated element has not met vital demands during the period. However, there are no detailed standards to apply against the ratings. Commanders exercise their discretion in evaluating the appropriate condition level of their facilities. The BASEREP is divided into three categories (personnel, facilities, equipment) and rates across twenty-eight mission areas.[61]

The Marines use four rating levels across twenty-four mission areas. Level 1 indicates fully mission capable and level 4 indicates not mission capable. Contrary to the Navy, the Marines provide detailed guidance in the application of the level ratings.[62]

The Coast Guard should adopt the following Condition Rating System:

- The system should employ a Condition Rating C-1 to C-4 similar to that used by the U. S. Army to gain acceptance, understanding and support from DOD and Congress.
- The Condition Rating System should be segregated and capable of roll-up by facility type.
- The Dashboard system recommended by the Systems Measurement Implementation Team should be modified to include four ranges vice three to correspond with the 4 levels of the C-Rating. The three-color dashboard display can be retained, however the ranges will span color intersections.

CONCLUSION

The implementation of a Facility Condition Readiness System requires the integration of sound engineering analysis with mission impact criteria to produce a metric that has broad understanding among those who control or have influence over the resources provided to the Coast Guard. This paper concludes that the Coast Guard should adopt a facility condition readiness measure that is based on a sound engineering foundation and provides meaningful information to both internal and external decision makers. The Facility Condition Assessment provides the engineering basis to achieve this end and is the primary means to generate technical information on facility condition. The engineering measures of Deferred Maintenance Backlog, Plant Replacement Value and Facility Condition Index are all derived from this first vital step. Each of these engineering measures is critical to the determination of an overall

readiness measure. Although the Coast Guard has undertaken an initiative to develop measures that relate facility condition to readiness, their efforts have fallen short.

The Coast Guard Readiness Management Initiative fostered the creation of the Systems Measurement Implementation Team, which produced readiness measures recommendations for all Coast Guard systems. With respect to facility condition readiness measures, the team's recommendations have been sub-optimized by the necessity to adopt common measures also applicable to ships, boats, aircraft and electronics systems. Through comparison with industry standards, DOD services and my own extensive experience in managing and maintaining Coast Guard shore facilities, I've shown that the combination of standard accepted practices for measuring facility condition and reporting readiness provides the optimum solution for internal and external consumption of the information.

The overall readiness measure that ties engineering condition to the readiness of shore facilities is the Condition Level Rating (C-Rating). The Condition Level Rating is a known and understood measure used by all the services in DOD and should be adopted by the Coast Guard. In its quest to develop a Readiness Management System from scratch, the Coast Guard lost sight of a fundamental consideration; the identification, needs and expectations of the target audience. While dashboard displays and colored lights may serve internal leaders well, the index values and snazzy lights will be lost upon those we need the most to deliver the resources to correct the red and yellow light displays. The recommendations I've put forth, combines the benefits of both to speak in the language that's expected.

WORD COUNT = 6581

GLOSSARY

BASREP	Shore Base Readiness Report
BRAC	Base Realignment and Closure
CG	Coast Guard
C-Rating	Condition Level Rating
DOD	Department of Defense
FAST	Facility Adequacy Scoring Technique
FCA	Facility Condition Assessment
FCI	Facility Condition Index
FII	Facility Investment Index
FIM	Facility Investment Metric
GAO	General Accounting Office
GPRA	Government Performance and Results Act
ISR	Installation Status Report
M&R	Maintenance and Repair
NACUBO	National Association of College and University Business Officers
NMS	National Military Strategy
NRC	National Research Council
NSS	National Security Strategy
PRV	Plant Replacement Value
RBA	Revolution in Business Affairs
RMS	Revolution in Military Affairs
RMI	Readiness Management Initiative
RMS	Readiness Management System
SFCAM	Shore Facility Capital Asset Management
SFI	Shore Facility Index
SMIT	Systems Measurement Implementation Team

ENDNOTES

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[32] The author of this paper, CDR Christopher D. Mills, P. E., U. S. Coast Guard, is a technical expert in the field of shore facilities readiness measures by virtue of educational background in Civil Engineering (MSCE from the University of Illinois, BSCE from the United States Coast Guard Academy); registration as a Professional Engineer from the Commonwealth of Virginia; and over eighteen years direct and progressively responsible experience in Coast Guard Civil Engineering, including ten years in facilities management with the last four years as the Facilities Engineer at the Coast Guard's second largest shore facility at Air Station Cape Cod.

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