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TECHNICAL REPORT

Funding Ammunition Ports

Edward G. Keating • Daniel Sommerhauser

Prepared for the United States Army

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Preface

This technical report documents a RAND Arroyo Center study entitled “Funding of Ammunition Ports.” The objective of this research project was to assist the Army in determining how best to fund the ammunition ports Military Ocean Terminal Concord (MOTCO) and Military Ocean Terminal Sunny Point (MOTSU). How to fund these ports is nested within a broader question of how the Department of Defense should fund its infrastructure, e.g., using working capital funds versus appropriated budgets.

This research should be of interest to those involved in Department of Defense installation and financial management. It was sponsored by the Army’s Surface Deployment and Distribution Command (SDDC) and was conducted in RAND Arroyo Center’s Military Logistics Program. RAND Arroyo Center, part of the RAND Corporation, is the United States Army’s federally funded research and development center for policy studies and analyses.

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Summary

The U.S. Army's Surface Deployment and Distribution Command (SDDC) asked RAND Arroyo Center to assess the mechanisms by which SDDC funds its two ammunition ports, Military Ocean Terminal Concord (MOTCO) and Military Ocean Terminal Sunny Point (MOTSU). With a legacy of different histories, the two ports currently have different funding approaches and accounting systems. With both now managed by SDDC, consolidation to a single approach would seem desirable. The central question of this research inquiry is what the most appropriate financial structure would be.

MOTSU currently has an arrangement in which Army appropriations are expected to fund 76 percent of the port's base operating and support (BASOPS) expenditures. The rest of BASOPS is funded by the Transportation Working Capital Fund (TWCF) with revenue generated from prices charged TWCF customers, e.g., the military services that want to ship ammunition into or out of the country. The TWCF additionally pays for contracted stevedore services at both MOTCO and MOTSU. At MOTCO, Army appropriations fund virtually all BASOPS costs; there is no 76-24 BASOPS cost division as seen at MOTSU. In total, we estimate that in recent years the TWCF has funded about 60 percent of MOTSU annual outlays versus about 30 percent of MOTCO annual outlays.¹

To assess the desirability of changing one or both ports' financial arrangements, the RAND Arroyo Center study team interviewed subject matter experts at SDDC and Transportation Command (TRANSCOM), Scott Air Force Base, Illinois; at Army Materiel Command headquarters at the Redstone Arsenal, Alabama; as well as at both MOTSU and MOTCO. We reviewed the literature on working capital fund pricing policies and also reviewed Department of Defense (DoD) financial regulations. We analyzed the ports' recent workload and cost data and then briefed interim results to SDDC leaders and received extensive and valuable feedback from SDDC and port personnel.

MOTCO's and MOTSU's Workload and Finances

In recent years, MOTSU has consistently handled more workload than MOTCO has, but MOTCO's trend is up. MOTSU is in considerably better physical condition than MOTCO is.

MOTSU has had higher annual outlays than MOTCO, but MOTSU's outlays per measurement ton have been consistently lower than MOTCO's. There appear to be economies of

¹ Annual outlays, as we use the term, excludes one-time appropriations such as military construction projects. However, we include both cargo movement costs, such as stevedores, as well as the costs of managing and operating the ports.

scale in port operation, so putting more workload into a port reduces outlays per measurement ton.

Prospective Port Funding Arrangements

We set forth criteria to evaluate prospective port funding arrangements.

One criterion we espouse is *non-distortion*, i.e., the chosen funding mechanism should encourage efficient usage of the ports. Efficiency, in this context, means that ports are used if and only if the marginal benefit to the DoD of using the ports exceeds the marginal costs of doing so.

A second criterion we espouse is *funding stability*. If the DoD has a long-run need for the capability to load and unload ships carrying ammunition, it creates a difficult management challenge if funding for these ports varies sharply over time.

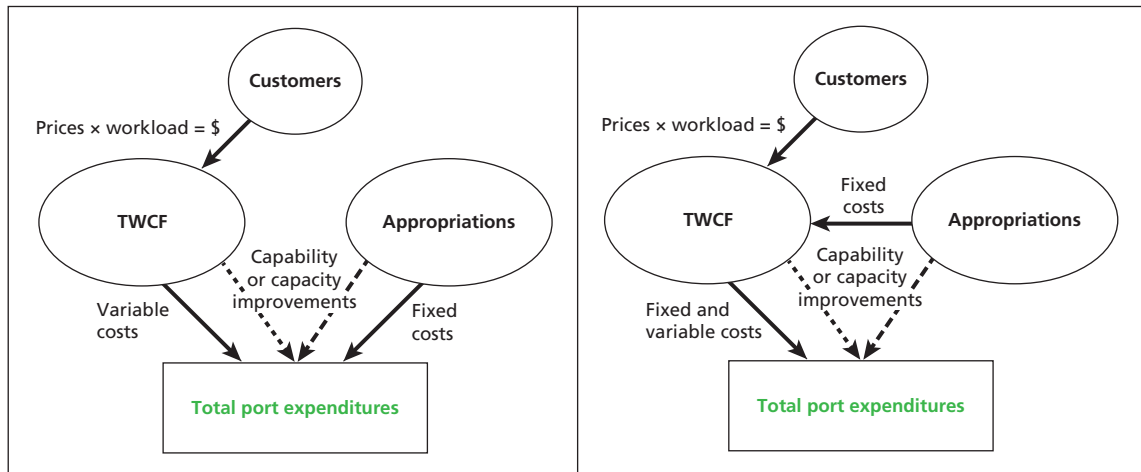
Another criterion espoused by experts we interviewed is *simplicity*, i.e., the chosen funding mechanism should use existing (or easily obtained) financial data to the maximum extent possible to minimize recurring and one-time accounting and other management costs. Consolidating the ports on a single funding approach would intrinsically increase simplicity.

An additional criterion one could consider is *fairness*. We were told that roughly 20 percent of MOTSU's and MOTCO's workload in recent years has come from the Air Force and the Marine Corps. To the extent that Army appropriations provide more of the ports' funding, the Air Force and the Marine Corps benefit at the expense of the Army, though this may not be a concern to the DoD or taxpayers.

Figure S.1 presents two variations of an ammunition port funding policy that we feel rate highly with respect to the asserted criteria.

We think that expenditures used to maintain a port's existing capabilities and capacities should be funded by appropriation. The majority of these expenditures are fixed costs, i.e., they do not vary with the port's annual output level. It would be desirable for the budgetary process

Figure S.1
Two Proposed Variations of Ports' Financial Structure



to explicitly acknowledge the fixed, output-invariant costs associated with having ammunition port capabilities available. Paying for such costs through appropriation makes clear the DoD's fundamental decision on the level of ammunition port capability and capacity it wishes to fund. Reliance on price-generated revenue obscures the fundamental decision with the related, but different, decision of how much workload to put through a given port in a year. Since ammunition ports most centrally exist for infrequent, high-intensity deployments, the level of annual workload may be poorly correlated with the underlying requirement.

As opposed to fixed costs, variable costs are those that vary with a port's annual workload level. We think that variable costs should be funded by customers through revenue from TWCF prices. We further recommend that capacity and capability improvements be funded by whoever demands the improvement, e.g., the TWCF, operating commands.

Although the precise division of fixed costs, variable costs, and capacity/capability improvements has some grey areas, we show that most ammunition port costs in MOTSU's accounting data can be logically inserted into one of these categories.

Our two funding policy variations differ in that the variation on the left of Figure S.1 has appropriations directly pay for fixed costs, whereas in the variation on the right of Figure S.1, appropriations would 100 percent reimburse the TWCF that would actually make the fixed cost expenditures. Under the latter variation, the port's management would have more discretion and flexibility but less chain-of-command oversight.

A strength of either proposed variation is that customers, through TWCF prices, would face marginal costs when deciding how much workload to put through a port. Efficiency is enhanced when customers make decisions based on marginal, not average, costs. Funding would be more stable than under arrangements with higher TWCF prices. Current MOTSU financial data can be used to implement either variation. Increased reliance on appropriations could benefit other military services, but at the expense of the Army.

The ports' current funding arrangements do not perform badly against our stated criteria. In that the TWCF pays for more fixed costs at MOTSU than at MOTCO, there is more behavior distortion from excessive prices at MOTSU. However, there is little evidence at observed price levels that ammunition-shipping customers respond to prices, i.e., ports' locations and capabilities are more important than their prices in customer decisionmaking. We were told that military services choose which port to use on the basis of geography, ship and port availability, and port capability, with TWCF prices being of little importance. Of course, at some price level, customers' ammunition port decisions would be altered.

The current funding arrangements rate less well against the funding stability criterion. When workload changes, revenue from customers likely changes more than costs. A fairness concern with the current funding arrangements is that MOTCO's greater reliance on appropriations benefits other services more than MOTSU's current arrangement.

Our data analyses suggest that TWCF expenditures at MOTSU have exceeded the port's variable cost levels in recent years, i.e., under our policy variations, appropriations would be responsible for more funding at MOTSU and the TWCF responsible for less than has been the case.

Conclusions

Table S.1 summarizes our evaluations of how different prospective ammunition port funding arrangements rate with respect to the criteria we developed. We color cells to encapsulate our evaluation, with dark green being most favorable and yellow most concerning. (We do not rate any cells so adversely as to color them red.)

With the exception of complete reliance on working capital funding, we believe that a range of ammunition port funding approaches could work acceptably well for MOTCO and MOTSU. The key mitigating characteristic for ammunition ports is the apparently limited price elasticity of demand for the ports' services. When customers have greater demand elasticity, e.g., they can repair items themselves rather than sending them to government depots, pricing decisions and hence the chosen funding approach are of greater importance.

Table S.1
A Summary of Evaluations of Alternative Policies for Funding Ammunition Ports

Prospective Funding Approach	Nondistortion?	Funding Stability?	Simplicity?	Fairness?	Comment
Appropriation	Free issue can be abused though a behavior distortion seems unlikely for ammunition ports	Stability is dependent on political decisions	Canonical approach to governmental finance	Tenants, non-host customers can free-ride	Probably an acceptable approach for ammunition ports given apparent inelasticity of demand, though there would need to be a mechanism to fund unanticipated variable costs
Current MOTCO	Stevadore costs are appropriately included in TWCF prices	MOTCO funding has been argued to be inadequate	MOTCO has both appropriation and working capital fund accounting	Comparatively greater reliance on appropriations benefits other services	MOTCO has historically been underfunded, but this underfunding is a separate issue from its financial structure
Our Proposed Variations	Customers pay the marginal costs generated by their workload	Would the political process routinely fund ports' considerable fixed costs?	We illustrate how it could be implemented with MOTSU's current financial data	Other services cover their marginal costs, but do not pay any fixed costs	The choice between our two proposed variations depends on one's view of the management discretion versus oversight tradeoff
Current MOTSU	Customers' prices include a proration of largely fixed BASOPS costs	MOTSU has been adroit at harvesting additional funding opportunities	Current financial system provides more descriptive data than MOTCO's but BASOPS reimbursement is hard to identify	Non-Army customers pay for some of MOTSU's fixed costs	The 76 percent BASOPS reimbursement is a historical artifact with no apparent basis relative to any other specific BASOPS reimbursement proportion
Working Capital Fund	Working capital fund prices include fixed costs, discouraging workload	Potentially volatile if workload varies while prices are fixed	Needs revenue-oriented accounting different from traditional governmental accounting	All costs are allocated across customers in proportion to workload	This approach seems inappropriate as ammunition ports primarily exist to fulfill wartime mobilization requirements

NOTE: Dark green denotes most favorable, yellow denotes least favorable.

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The research team and Arthur Gebbia enjoyed a visit to MOTSU on January 5–6, 2011, and the assistance there of Jose Caldero, Colonel Joseph Calisto, Steven Kerr, and Donald Parker. Donald Parker and John Vollmer joined us in visiting Lieutenant Colonel Christopher Hart and his colleagues at MOTCO on January 12–13, 2011.

Karen Skoog of Air Mobility Command; Pamela Robertson of the Anniston Army Depot; Susan Carlson, Anita Coleman, and Cedric Jasmin of Army Headquarters G-4; Gregory Bodorf, Dina Crowley, Susan Goodyear, and Kenneth Holderfield of the Army Materiel Command; and Patrick Davis and Lauri Pierson of Transportation Command (TRANSCOM) provided useful insights.

An earlier version of this research was briefed to Major General Kevin Leonard of SDDC on April 4, 2011.

We received helpful reviews of an earlier version of this report from our RAND colleague Ellen M. Pint and from R. Derek Trunkey of the Congressional Budget Office.

We also appreciate the assistance of RAND colleagues Sarah Bana, Rick Eden, Kenneth Girardini, Mike Hix, and Patrice Lester. Rick Eden and Kenneth Girardini provided extensive suggestions that improved the document considerably. Terri Perkins, Nikki Shacklett, and Benson Wong helped prepare the document. Patricia Bedrosian edited it.

While this paper was being finalized, Mike Hix passed away. The authors extend their condolences to the Hix family.

Of course, remaining errors are solely the authors' responsibility.

Abbreviations

ADP	Automated Data Processing
ARA	Airlift Readiness Account
BASOPS	Base Operating and Support
CPP	Capital Procurement Program
DBOF	Defense Business Operations Fund (now Defense Working Capital Fund)
DoD	Department of Defense
DWCF	Defense Working Capital Fund
FY	Fiscal Year
IMC	Industrial Mobilization Capacity
IMCOM	Installation Management Command
MCA	Military Construction, Army
MOTCO	Military Ocean Terminal Concord
MOTSU	Military Ocean Terminal Sunny Point
NEW	Net Explosive Weight
NWSC	Naval Weapon Station Concord (now MOTCO)
O&M	operations and maintenance
OCO	Overseas Contingency Operation
OPA	Other Procurement, Army
PBD	Program Budget Decision
PUIC	Project Unique Identification Code
RIC	Reserve Industrial Capacity
ROS	Reduced Operating Status
SDDC	Surface Deployment and Distribution Command
TRANSCOM	Transportation Command
TWCF	Transportation Working Capital Fund

Introduction

The United States Army's Surface Deployment and Distribution Command (SDDC) asked the RAND Corporation to assess the mechanisms by which SDDC funds its two ammunition ports, Military Ocean Terminal Concord (MOTCO), northeast of Oakland, California; and Military Ocean Terminal Sunny Point (MOTSU), southwest of Wilmington, North Carolina. With a legacy of different histories (e.g., before October 1, 2008, what is now MOTCO was the Navy's Naval Weapon Station Concord, NWSC), the ports are currently funded in different manners. In that the ports are now both overseen by SDDC and have essentially the same missions albeit on different coasts, it seems eminently reasonable to transition the ports onto the same financial structure. The central question of this research inquiry is what the most appropriate financial structure would be.

In the broadest sense, there are two alternatives (as well as additional alternatives generated by hybridization of the two basic approaches).

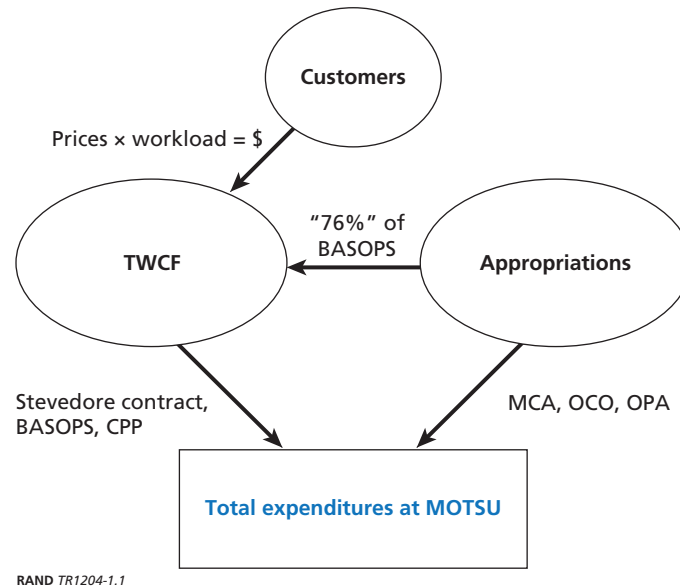
The first alternative we term *appropriation*. Under this approach, the standard Department of Defense (DoD) and Army budgetary process would appropriate funds to pay to operate, maintain, and, if desired, upgrade the ports. The ports would then provide ammunition-handling services to Army and other DoD customers as needed without charging those customers for the services provided.

The second alternative we term *working capital fund*. Under this approach, the ports would sell their services to customers—e.g., the military services that want to ship ammunition into or out of the country—and would use the resultant revenue to entirely fund their operations. Customers would have to pay the ports for their services. Without direct appropriations to the ports, customers' prices would have to be high enough to fully fund the ports' costs based on the workload provided by customers.

Neither port currently uses a pure version of either approach, but MOTSU has a greater relative emphasis on working capital funding than MOTCO does. Figure 1.1 depicts how funding flows at MOTSU. The Transportation Working Capital Fund (TWCF) charges MOTSU customers prices for services rendered. Additionally, the Army's appropriated budget reimburses the TWCF for 76 percent of MOTSU's base operating and support (BASOPS) expenditures.¹ The TWCF pays for all MOTSU BASOPS expenses up front with an appropriated reimbursement following behind it. (However, we have put 76 percent in quotations in Figure 1.1, as we were told that the appropriated budget does not always completely fulfill

¹ BASOPS expenditures maintain buildings, provide security, and otherwise pay for "housekeeping" on military installations. However, they do not pay for direct mission functions, e.g., the port experts who handle transportation logistics. In that mission expertise as well as BASOPS is needed to operate an ammunition port, we view BASOPS as just a subset of the fixed, "open the door" costs of having a viable ammunition port.

Figure 1.1
MOTSU's Financial Structure



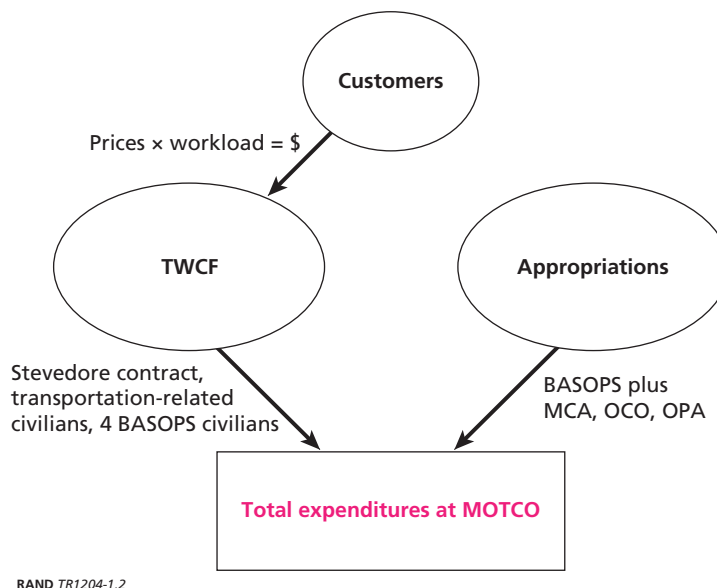
this obligation, resulting in the TWCF bearing more than 24 percent of MOTSU's BASOPS costs.) The TWCF also pays for contracted stevedores who load and unload ships and for Capital Procurement Program (CPP) projects at MOTSU. Both ports pay a service contractor to provide unionized stevedores who work at the ports while ships are being loaded and unloaded but then leave to provide stevedoring services elsewhere when the ammunition ports do not host ships (which is the vast majority of the time—even the busier MOTSU might host ships for a few days per month, on average).

Ultimately, all “regular” outlays (e.g., BASOPS, the stevedore contract) at MOTSU go through the TWCF. However, netting out the BASOPS reimbursement, one finds the port to be partially funded by the TWCF and the revenue it derives from MOTSU customers and partially funded by appropriations. Unlike the BASOPS reimbursement, additional direct appropriations of funding to MOTSU such as Military Construction, Army (MCA), Overseas Contingency Operation (OCO), and Other Procurement, Army (OPA) do not flow through the TWCF.

MOTSU's 76-24 BASOPS funding division extends beyond institutional memory, i.e., at least back to the 1990s. We found no persuasive justification for appropriations paying for 76 percent of MOTSU BASOPS relative to any other specific percentage. We are not aware of other DoD locations that use a 76 percent BASOPS reimbursement arrangement like MOTSU's.

MOTCO does not have a BASOPS reimbursement. Instead, as depicted in Figure 1.2, appropriated funds pay for BASOPS as well as MCA, OCO, and OPA. However, there are TWCF expenditures at MOTCO—most notably for stevedore services—as well as funding 25 government-employed civilians, most of whom are in transportation-related positions, but four of whom are in BASOPS-related positions. As at MOTSU, the TWCF generates revenue to pay for its MOTCO obligations through prices charged to MOTCO customers for workload handled.

Figure 1.2
MOTCO's Financial Structure



We estimate that in recent years, the TWCF has funded about 60 percent of MOTSU annual outlays versus about 30 percent of MOTCO annual outlays.²

To assess the desirability of changing one or both ports' financial arrangements, the RAND study team interviewed subject matter experts at SDDC and Transportation Command (TRANSCOM) at Scott Air Force Base, Illinois; at Army Materiel Command headquarters at the Redstone Arsenal, Alabama; as well as at both MOTSU and MOTCO. We reviewed the literature on working capital fund pricing policies and also reviewed DoD financial regulations. We analyzed the ports' recent workload and cost data, then briefed interim results to SDDC leaders and received extensive and valuable feedback from SDDC and port personnel.

We have come to favor an appropriation-working capital fund hybrid funding approach for the ports, in which appropriations would pay for the ports' output-invariant or fixed costs and customers would pay for the ports' marginal or incremental costs through TWCF prices. This result echoes Hirshleifer's (1956) seminal work on transfer pricing where it was found to be optimal for different divisions of a company to charge one another marginal costs for goods and services provided across divisions. Likewise, Rogerson (1995) argued for marginal cost pricing in Air Force repair and maintenance. Yet, relative to other DoD contexts such as depot-level maintenance, we do not think the specifics of the ports' financial arrangements are especially important. The reason for this flexibility is that it is unclear whether ports' prices have a large, or even any, effect on customers' decisions to move ammunition through the ports at least in the recently observed range of these prices. Prices are very important when customers have choices, e.g., whether or not to buy a good or service and from whom. Demand for ammunition ports' services appears to be highly inelastic, putting it in a context in which pricing decisions are comparatively unimportant. Port prices can be too high (too much reli-

² Annual outlays, as we use the term, excludes one-time appropriations such as military construction projects. However, we include both cargo movement costs, such as stevedores, as well as the costs of managing and operating the ports.

ance on TWCF funding relative to the most efficient case) or too low (too much reliance on appropriations) without causing large-scale changes in customer behavior. However, excessive reliance on price-generated revenue may increase the ports' funding volatility and hence challenges faced by the ports' managers.

The remainder of this report is structured as follows: Chapter Two provides more information on the ports' cost and workload histories. Chapter Three presents criteria by which to evaluate funding arrangements, two possible port funding variations that rate well with respect to those criteria, as well as an illustration of their financial consequences for MOTSU. (Current MOTCO financial data were not amenable to the same illustration.) Chapter Four presents conclusions. We additionally provide an appendix with an overview of defense working capital fund issues.

MOTCO's and MOTSU's Workload and Finances

In this chapter, we present data provided to RAND by SDDC on the two ports' historical workload and finances. The chapter provides contextual information before we discuss alternative financial arrangements for the ports in Chapter Three.

Ports' Workload

Ammunition port workload is calibrated using both Net Explosive Weight (NEW) and “measurement tons.” NEW is a stock concept—how much ammunition can be safely located at a port at a point in time. Measurement tons is a flow concept—how much ammunition a port handles over a period of time, such as one year. Interestingly, an ammunition measurement ton is not a measure of weight. Instead, it is a measure of volume equal to 40 cubic feet. The NEW of a measurement ton would vary based on how compactly the ammunition is packed and whether the ammunition is heavily encased in metal or is largely explosive material.

MOTSU's current maximum allowable NEW is 44.2 million pounds and MOTCO's is 18.8 million pounds. This difference is caused by a greater distance at MOTSU between wharves where ammunition-laden ships dock and inhabited areas. As one might expect, given the ports' mission, personnel at both ports are extremely cognizant of ammunition-handling safety issues and risks.

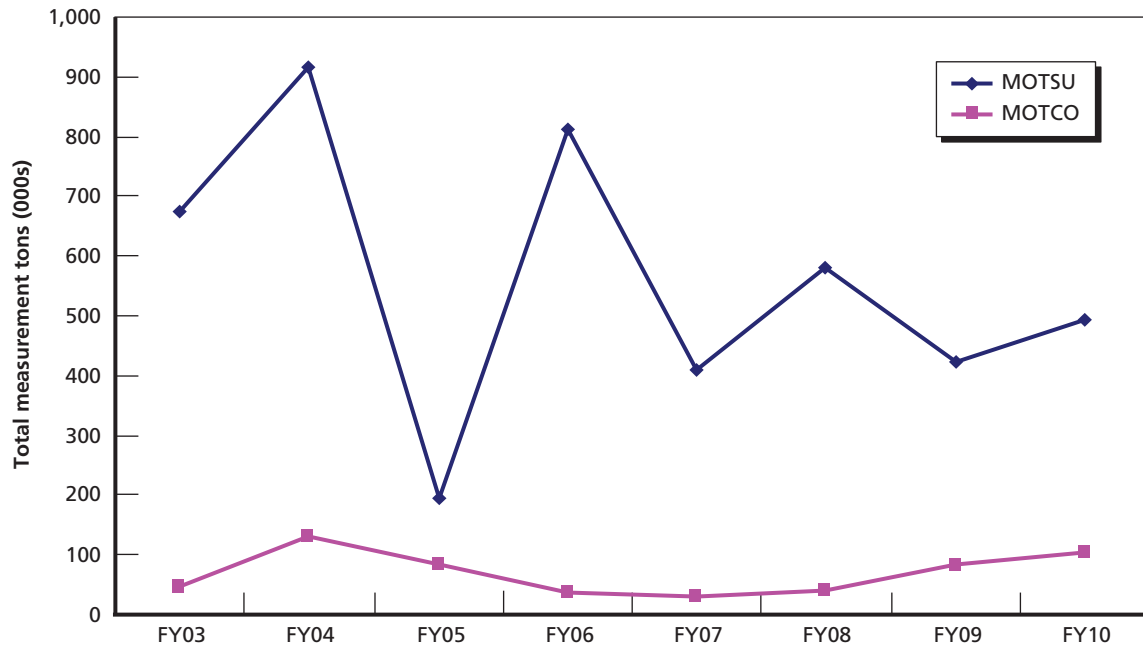
A port can occasionally approach or hit its NEW while, in general, being highly underutilized. Both ports have low overall utilization rates, hosting at most two or three ships per month. But, of course, if a ship carries a sizable amount of ammunition, the port's NEW may be a binding constraint during the period of the ship's visit to the port.

Figure 2.1 shows total measurement tons of ammunition handled by the two ports annually between fiscal year 2003 (FY03) and FY10. MOTSU has consistently handled more workload than MOTCO has, but MOTCO's trend is up in recent years.

The ratio of MOTSU measurement tons to MOTCO measurement tons has varied widely between 2.3 in FY05 and 22.7 in FY06. The ratio of MOTSU workload to MOTCO workload was 4.7 in FY10. MOTSU's closer proximity to recent military operations in the Middle East is one reason for the cross-port workload differentials.

Along with handling more workload than MOTCO, MOTSU is in considerably better physical condition. With a legacy of years of neglect by the Navy, MOTCO would require hundreds of millions of dollars in maintenance, upgrades, and repairs to approach the current conditions of MOTSU's cranes, equipment, facilities, railroad track, roads, and wharves.

Figure 2.1
MOTSU's and MOTCO's Measurement Tons, by Fiscal Year



RAND TR1204-2.1

MOTCO leadership has plans for many such upgrades, but future funding levels are, of course, uncertain.

In our interviews, we found frequent conflation of MOTCO's less-desirable physical condition and its not receiving 24 percent of its BASOPS funding from the TWCF, unlike MOTSU. There is obviously an element of truth to this linkage in that if MOTCO had received additional BASOPS funding over the years, it would doubtlessly be in better condition. But the much greater contributor to MOTCO's problems has been a dearth of high-dollar appropriations such as MCA. The paucity of capital improvements over many years is unrelated to the structure of MOTCO's annual funding.

Ports' Finances

In this section, we first discuss financial regulations that concern the ports then provide data on the ports' finances in recent years.

Relevant Financial Regulations

MOTSU and MOTCO have very different histories that have direct bearing on their current financial statuses. Whereas MOTSU has been an Army installation since its founding in the mid-1950s, the Army took possession of MOTCO only on October 1, 2008, as a result of the 2005 Base Realignment and Closure process.

Symptomatic of the low level of funding the Navy provided to NWSC, the installation was placed in Reduced Operating Status (ROS) in 1999.¹ Our review of the December 6, 1999, Program Budget Decision (PBD) 410 suggests that putting NWSC into ROS status was based on premises that have not held.² PBD 410 noted “the central [General Officer Steering Committee] recommendation placed NWSC [now MOTCO] in a Reduced Operating Status (ROS) with plans to use NWSC for an annual two-week military exercise operation to maintain wartime readiness” (p. 13) and, implicitly, having the port otherwise be idle.

PBD 410 also noted “for NWSC, the only identified workload is 25 thousand measurement tons per year (equal to one quarter of a ship)” (p. 15). However, in no fiscal year between FY03 and FY10 was MOTCO measurement tonnage as low as 25,000. The FY08–FY10 totals were 41,261, 83,966, and 104,589, respectively. Experts suggested that MOTCO’s workload in future years is scheduled to be akin to its 2010 level.

The fact that the preponderance of MOTCO’s BASOPS expenditures is not run through the TWCF relates directly to its ROS status. Program Budget Decision 410, December 6, 1999, changed the financing of MOTCO “from [working capital fund] to direct funding since it is being placed into a reduced operating status” (p. 16).

The baseline presumption in defense working capital funds (DWCFs) is that prices are based on full cost recovery, including fixed costs, variable costs, and offsets for past losses or profit.³ However, that same regulation’s Section D, “Mobilization/Surge Costs and War Reserve Material,” sub-section 7, “Reserve Industrial Capacity (RIC),” exempts the ammunition ports from the DWCF full cost recovery policy noting that SDDC “shall plan for and maintain a Reserve Industrial Capacity (RIC) to transport personnel resources, material and other elements required to satisfy a mobilization requirement. The SDDC will also plan and program with the Army for 100 percent of the operating cost at Military Ocean Terminal, Concord (MOTCO). The Military Ocean Terminal, Sunny Point (MOTSU) RIC and the operating costs at MOTCO are a mobilization requirement funded by appropriated funds from the DoD Component having management responsibility for this activity” (pp. 9–18). So there is no regulatory imperative for either port to fully recover its costs through customer-generated revenue.

Ports’ Financial Data

The ports have different financial arrangements. Regular outlays, excluding capital investments, at MOTSU flow through the TWCF. As a result, we see MOTSU financial data displayed in the cost categories the TWCF uses. MOTCO’s arrangement is more complex with some financial data in the TWCF format, but the majority of outlays using appropriation

¹ United States Department of Defense (2010b), the DoD’s Joint Publication 1-02, defines ROS as applying to Military Sealift Command ships withdrawn from full operating status because of decreased operational requirements. “A ship in reduced operating status is crewed for a level of ship maintenance and possible future operational requirements, with crew size predetermined contractually. The condition of readiness in terms of calendar days required to attain full operating status is designated by the numeral following the acronym ROS (e.g., ROS-5).”

An obvious question is what it means to put a port, rather than a ship, into ROS. MOTCO has been kept open and operating, albeit at fairly low levels. So this case is not directly analogous to a ship being put into mothballs awaiting future use or scrapping.

² United States Department of Defense (1999).

³ See United States Department of Defense (2010a), Section F.

expense categories that have no clear linkage to the TWCF categories. Table 2.1 shows the ports' FY10 expenditure data. We ignore depreciation. TWCF accounting includes depreciation, but these are not current-year cash outlays but instead represent echoes of past expenditures. (Depreciation does enter into TWCF pricing determination, however.)

The TWCF categories in Table 2.1 divide into more granular subcategories. We exploit this granularity in Chapter Three, assigning specific subcategories as being fixed or variable costs. We use MOTSU data for that exploration. MOTSU's TWCF accounting data were more useful and informative for us than MOTCO's appropriation data.

The appropriated majority of MOTCO's spending causes problems in Chapter Three. Although we label TWCF expenditure subcategories as fixed or variable, we have no way to comparably bifurcate the MOTCO appropriation categories.

Table 2.1 tabulates the ports' expenditures, not the TWCF revenue that each port generated. In this study, we did not have any direct visibility over the revenue that each port generated for the TWCF. Table 2.1 does not show the appropriated funds BASOPS contribution at MOTSU.

Table 2.1
MOTSU and MOTCO FY10 Expenditures (Millions of FY10 Dollars)

Category	Accounting Approach	MOTSU	MOTCO
Military labor	TWCF	0.1	
Civilian labor	TWCF	21.3	2.8
Travel	TWCF	0.3	0.6
Material, equipment, and supplies	TWCF	2.5	0.1
Other transportation	TWCF	0.1	0.1
Other purchases	TWCF	14.6	0.4
Stevedore contracts	TWCF	8.9	4.9
Environmental services	Appropriation		0.4
Engineering	Appropriation		1.0
Sustainment, restoration, and modernization	Appropriation		8.9
Fire and emergency services	Appropriation		3.3
Security services	Appropriation		5.7 ^a
Utilities/municipal services	Appropriation		1.0
Total		47.8	29.1

^aSDDC financial experts told us that of the \$10 million in engineering, fire and emergency services, and security services expenditures at MOTCO in FY10, \$5.7 million was for civilian labor. This civilian labor expenditure is separate from the TWCF's \$2.8 million civilian labor expenditure at MOTCO.

As shown in Figure 2.2, MOTSU has consistently had higher outlays than MOTCO. Outlays at MOTSU were 4.2, 2.7, 2.6, 1.8, and 1.6 times larger than MOTCO's in FY06–FY10, respectively.

The outlays in Figure 2.2 exclude MCA, OCO, OPA, and CPP expenditures. Table 2.2 enumerates the two ports' military construction projects back to FY97. FY06 was the only year between 2000 and 2010 in which NWSC/MOTCO received military construction obligational authority. Table 2.2's data come from United States Department of Defense, Office of the Under Secretary of Defense (Comptroller) (2009 and earlier years).

There are plans for a \$98 million (then-year dollars) pier replacement at MOTCO in 2016.

As shown in Figure 2.3, MOTSU's outlays per measurement ton have been consistently lower than MOTCO's. Put differently, MOTCO's outlay level has not been as small a percentage of MOTSU's outlay level as MOTCO's workload has been as a percentage of MOTSU's workload.

There appear to be economies of scale in port operation, so putting more workload into a port reduces outlays per measurement ton. Figure 2.4 plots the ports' FY06–FY10 measurement ton levels on the horizontal axis with the ports' outlays per measurement ton levels on the vertical axis. The busier MOTSU has had considerably lower costs per measurement ton.

Not surprisingly, in light of how its funding arrangements are structured, the TWCF (as shown in Figure 2.5) has funded a greater percentage of total outlays at MOTSU than at MOTCO with the TWCF share centered on 60 percent at MOTSU versus 30 percent at MOTCO (including both cargo movement and port management costs). However, Figure 2.5 excludes MCA, OCO, and OPA appropriations as well as TWCF-funded CPP projects to isolate and compare "regular" outlays between the two ammunition ports.

Figure 2.2
MOTSU's and MOTCO's Annual Outlays, FY06–FY10 (Millions of FY10 Dollars)

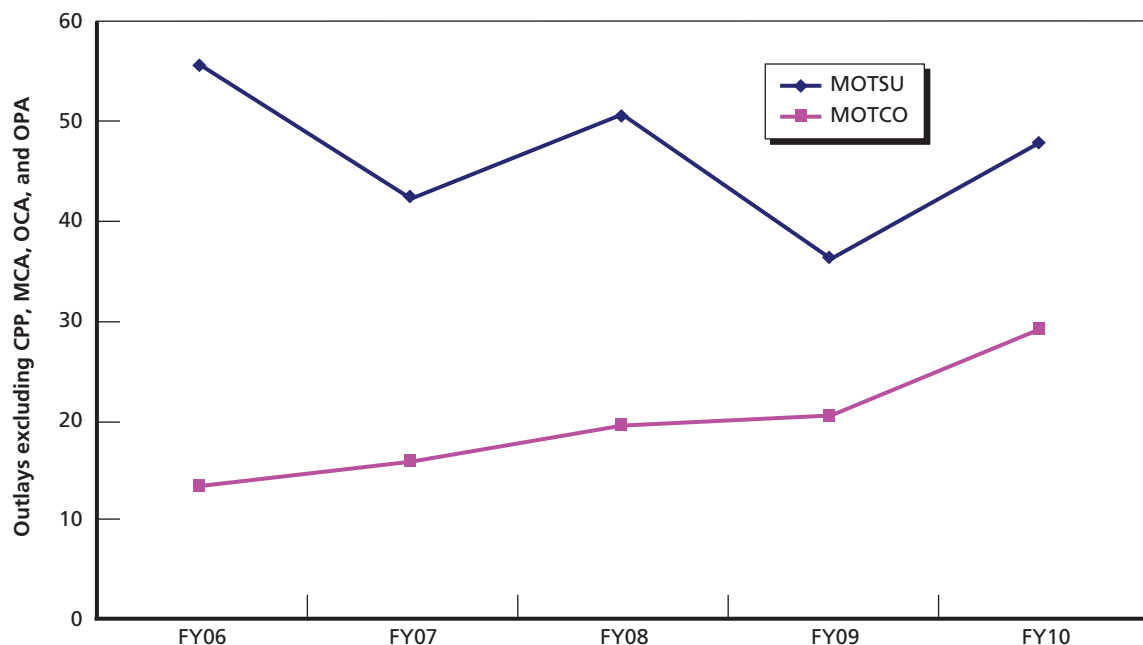


Table 2.2
Ammunition Ports' Military Construction Total Obligational Authority as Enacted (Millions of Then-Year Dollars)

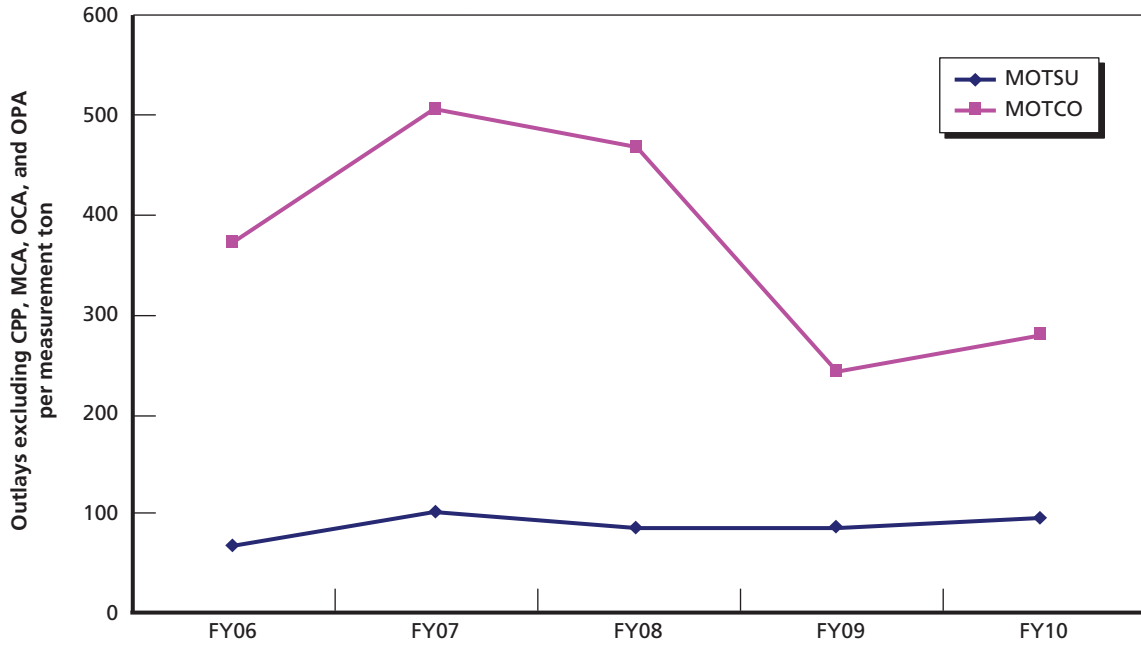
Fiscal Year	Port	Project	Cost
1997	NWSC (MOTCO)	Ammunition pier	27
1998	NWSC (MOTCO)	Ordnance support facility	23
1999			
2000	MOTSU	Ammunition surveillance facility	3.8
2001	MOTSU	Railroad equipment maintenance facility	2.3
2002	MOTSU	Deployment staging area	1.977
	MOTSU	Fire station	2.719
	MOTSU	Open storage area	2.027
	MOTSU	Road improvements and truck pad	4.548
2003			
2004			
2005			
2006	NWSC (MOTCO)	Pier security upgrade	8.6
	NWSC (MOTCO)	Upgrade outload facilities	3.25
2007	MOTSU	Center wharf expansion	46
2008			
2009			
2010	MOTSU	Lightning protection system	25
	MOTSU	Towers	3.9

In a literal sense, as noted, the TWCF makes all the outlays at MOTSU. But Figure 2.5's display estimates the TWCF's net share of outlays at both ports, adjusting for the BASOPS reimbursement provided to the TWCF at MOTSU.

Running outlays through the TWCF and, more generally, the larger role of the TWCF at MOTSU has had advantages for that port. There are fewer "color of money" constraints, i.e., specifications as to where and how funding is to be spent. MOTSU has had access to BASOPS payments from the TWCF, i.e., the stipulation that the TWCF pay 24 percent of MOTSU's BASOPS costs. It has also allowed the port to compete for additional TRANSCOM funding such as CPP funding.

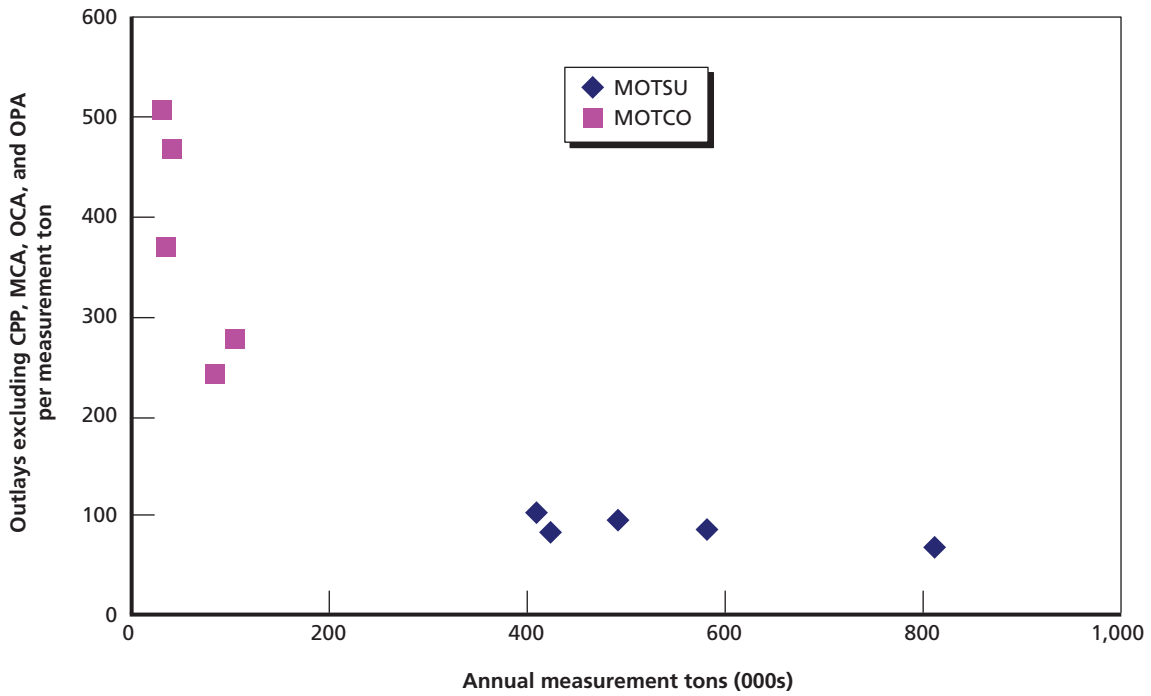
But there are other explanations for MOTSU's superior condition. In our visit, we saw that MOTSU has had stable, highly experienced management. As noted, MOTSU is also closer than MOTCO to, and more utilized in supporting, the two recent wars in the Middle East, enhancing its profile and the perception of its importance. Perhaps abetted by this relative proximity, MOTSU has had extraordinary success in competing for disparate funding sources. Recent projects at MOTSU have been funded by, for instance, the Combating Terrorism Readiness Initiatives Fund, the MCA budget, OCO funding, and the OPA budget. Garnering these funds was unrelated to MOTSU being in the TWCF.

Figure 2.3
MOTSU's and MOTCO's Outlays per Measurement Ton, FY06–FY10 (FY10 Dollars)



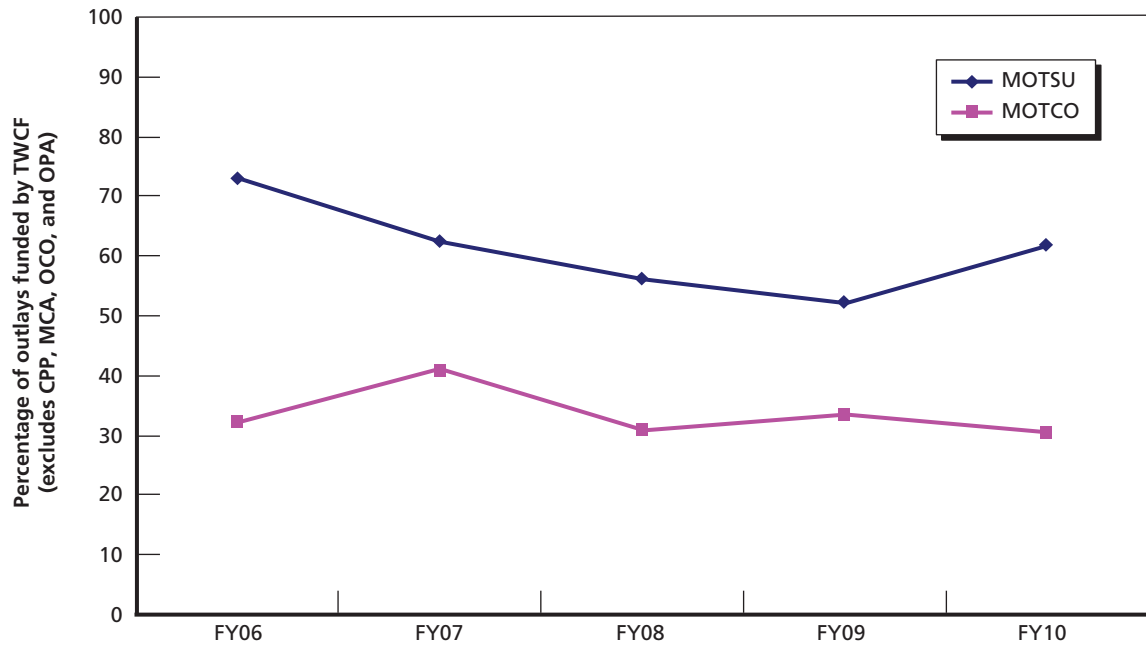
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Figure 2.4
Ammunition Ports' Measurement Tons and Outlays per Measurement Ton (FY10 Dollars)



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Figure 2.5
MOTSU's and MOTCO's TWCF Percentages of Annual Outlays, FY06–FY10



Prospective Port Funding Arrangements

We begin this chapter by setting forth criteria to evaluate prospective port funding arrangements. We developed two complementary variations for how MOTSU and MOTCO might be funded that rate well against the evaluative criteria. We also evaluate the ports' current arrangements against the same criteria and then illustrate what MOTSU funding might look like under our proposed variations. (Appropriation financial data challenges did not allow parallel illustration for MOTCO.) We conclude the chapter by discussing concerns we heard about our proposed variations.

Criteria for Evaluating Funding Arrangements

Here we set forth criteria to evaluate prospective port funding arrangements (appropriation, working capital fund, some hybridization thereof).

One criterion we espouse is *non-distortion*, i.e., the chosen funding mechanism should encourage efficient use of the ports. In this context, efficiency means that ports are used if and only if the benefit to the DoD of using the ports exceeds the marginal costs of doing so. We would not want a prospective customer to avoid using a port (e.g., switch to a different port) on the grounds of price if that price is set in excess of the port's marginal cost of handling the customer's workload. Non-distortion implies that customers pay the marginal costs of putting workload through a port but no more than those marginal costs. Most obviously, marginal costs include the costs of contracted stevedores, since no stevedores would be hired if there were no workload shipped through the ports. Customers currently, and quite correctly in our view, pay for stevedores at both ports through working capital fund prices. But there are other categories of costs that also figure to increase when ports are used more, including costs of supplies, some types of maintenance, and personnel overtime. Customers should face all of these incremental costs, but no fixed costs, in their prices of using ammunition ports.

Either insufficient or excessive working capital fund prices can be problematic. If prices for goods and services are too low, as with free issue of spare parts, customers do not have the appropriate incentive to conserve resources. It may be easier for the customer—but more costly to the DoD—to throw away a broken part than to have it repaired. This phenomenon could occur in an appropriation-only environment where there is no incremental cost to a new part seen by a customer.

In the current DoD working capital fund environment, excessive pricing is probably the more common problem. In particular, average cost pricing in which fixed, not just marginal, costs are included in prices can be deleterious. Brauner et al. (2000), for instance, discusses

the situation in the mid-late 1990s where the Army's depot maintenance system was highly underused but customers such as Forces Command nevertheless had strong incentive to minimize the amount of workload they provided to the depots. The appendix provides more discussion of defense working capital fund pricing issues.

A second criterion we espouse is *funding stability*. In particular, if the DoD has a long-run need for the capability to load and unload ships carrying ammunition, it is not helpful to sharply vary funding for such ports. As noted at the end of Chapter Two, MOTSU has been adroit at making good use of episodic influxes of funding. But it is challenging for port managers to accommodate funding variability while capability requirements are unchanged.

Any governmental organization faces variance in the level of funding availability over time. But funding variability can be amplified in a working capital fund environment. The total costs of operating MOTCO, for instance, would not be three times as large if nine ships used the port in a year rather than three. However, working capital fund-generated revenue would be three times as large absent a change in prices. Indeed, working capital fund prices are adjusted inversely to expected workload levels for this reason. But to help customers formulate their budgets, prices are generally set two to three years in advance based on forecasts of workload. Unanticipated workload therefore generates unexpected revenue, whereas unexpected loss of workload implies loss of anticipated revenue.

Of course, funding stability cannot offset funding inadequacy. MOTCO's funding has been relatively stable but arguably at an inadequate level.

Ultimately, the fixed costs of ammunition port capabilities and capacities¹ need to be borne by someone. They can be borne by port customers through prices that vary inversely with workload provided to the ports. Or they can more directly be funded through appropriation. We favor the latter approach because reliance on price-generated revenue introduces additional volatility. Further, paying for such costs through appropriation makes clear the DoD's fundamental decision on the level of ammunition port capability and capacity it wishes to fund. Reliance on price-generated revenue obfuscates the fundamental decision with the related, but different, decision of how much workload to put through a given port in a year. Since ammunition ports most centrally exist for infrequent, high-intensity deployments, the level of annual workload may be poorly correlated with the underlying requirement.

Another criterion espoused by experts we interviewed is *simplicity*, i.e., the chosen funding mechanism should use existing (or easily obtained) financial data to the maximum extent possible to minimize recurring and one-time accounting and other management costs. Consolidating the ports on a single funding approach would intrinsically increase simplicity. Also, the algorithm to determine what is included in customer prices should be (reasonably) easily explained and justified. In the illustration we present below, we ran into ambiguous cases, e.g., what fraction of ports' personnel overtime costs are caused by additional workload from ships in port?²

It may not be worth collecting additional data to more accurately tie overtime to specific ships' visits, though it could be done. The costs of developing more precise pricing may exceed

¹ We use the term *capabilities* to refer to functions that can be safely performed at a port. The term *capacities* refers to the volume of business a port can accommodate.

² Expert judgment provided to us by interviewees led us to decide not to include any personnel overtime in estimated marginal costs and, hence, customer prices. Interviewees told us that much of the ports' overtime pay is caused by undermanning, not by ships' visits.

the benefits of doing so. We found that ambiguous cases constitute only a small minority of expenditures.

As mentioned above, MOTSU's TWCF data proved to be more useful to us for analysis purposes. Data that are more informative may be worth paying a cost in reduced simplicity.

An additional criterion one could consider is *fairness*. We were told that roughly 80 percent of the ports' workload in recent years has been provided by Army customers. The Navy has its own (smaller) ammunition ports so it largely does not use MOTSU or MOTCO. But the Air Force and the Marine Corps provide workload to MOTSU and MOTCO. To the extent that Army appropriations provide more of the ports' funding and working capital fund-generated revenue provides less, the Air Force and the Marines Corps benefit at the expense of the Army.

From a DoD or taxpayer perspective, it is not a valid argument against an otherwise desirable funding approach that it favors one military service over another. There may also be possible bureaucratic compromises, e.g., keep ports' working capital fund prices low enough to cover only marginal costs but ask the Air Force and the Marine Corps to provide some part of the ports' appropriated funding. This approach would be analogous to Metzger's (1994) proposal for internal service funds to have price equal to the variable cost of the service applied to actual use plus a measure of fixed costs based on long-run average utilization.

Fairness concerns may be of greater importance in other DoD contexts. It could be argued that it is not fair to private sector competitors if governmental providers (such as MOTCO and MOTSU) charged only marginal costs for services whereas private firms must have pricing arrangements that fully cover their costs. But because of the risk of explosion, no nonmilitary ports can handle large amounts of ammunition. The same would not be true of, for instance, many types of maintenance activities where private sector maintenance is possible. But public policy decisions imply that at least a portion of such work must be done by government-operated depots.³

Funding Policy Variations

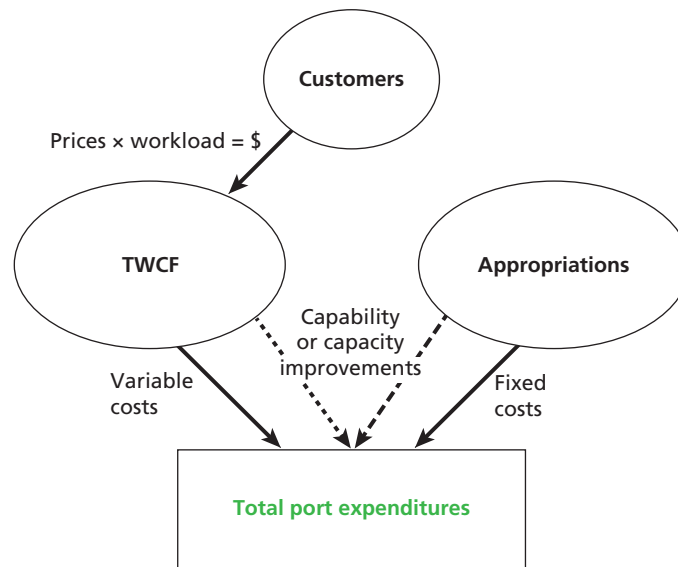
In this section, we develop and evaluate two ammunition port funding policy variations that we feel rate highly with respect to the previous section's criteria. Figure 3.1 sketches one proposed funding variation for the ammunition ports.

In that costs to maintain a port's existing capabilities and capacities will be incurred irrespective of a port's workload, we think that these costs should be funded by appropriation. These are fixed costs for "turning on the lights." These fixed costs would be borne even if a port served no ammunition-bearing ships in a given year. It would be desirable for the budgetary process to explicitly acknowledge the fixed, output-invariant costs associated with having ammunition port capabilities available.

Fixed costs need not be identical across different installations with different missions and characteristics. For example, experts we interviewed argued that an ammunition port needs patrol vessels intrinsic to its mission, irrespective of its workload. The costs of maintaining and operating patrol vessels are therefore fixed. Note, however, that most other Army installations lack ports or water proximity. So although the costs of maintaining and operating patrol ves-

³ See, for instance, United States Congressional Budget Office (1995) and Warren (2000) for a discussion of these issues.

Figure 3.1
Proposed Ports' Financial Structure



RAND TR1204-3.1

sels are reasonable and necessary fixed costs at MOTSU and MOTCO, one would likely not find such costs at, for instance, Fort Hood. “Fixed cost” is not a synonym for “every Army base has one.”

By contrast, we think that expenditures directly related to a port’s volume of business should be funded by the customers through revenue from TWCF prices. Such workload-driven expenditures are variable costs. These are costs that would be zero if the port were open but handled no workload.

We think that capability or capacity improvements should be funded by whoever demands the improvement, e.g., the TWCF, operating commands. These would be investments intended to allow a port to perform a function that it cannot currently perform or to increase the volume of business it can handle. Safety improvements would also fall in this category. The first time a port purchased a patrol vessel (as distinct from maintaining existing patrol vessels) was a capability or capacity improvement.

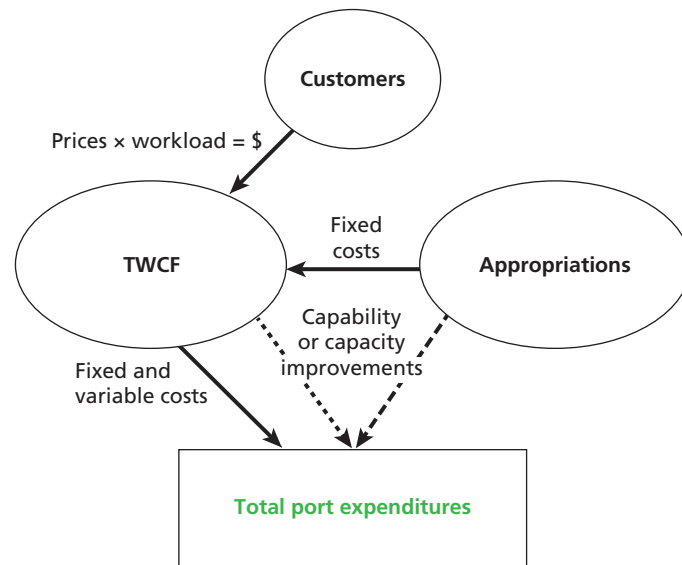
In Figure 3.1, we have made the capability or capacity improvement line from appropriations thicker because we suspect that the majority of spending to upgrade port capabilities will have to come from appropriations. TWCF prices are unlikely to accommodate large-scale capital expenditures.

Figure 3.2 presents a complementary variation. In this variation, appropriations again fully pay for fixed costs, but they do so by transfer into the TWCF. This would be akin to the current MOTSU arrangement but with 100 percent fixed cost reimbursement rather than 76 percent BASOPS reimbursement.

The desirability of Figure 3.2’s variation relative to Figure 3.1’s variation comes down to an assessment of the net desirability of giving a port’s management more discretion and flexibility, but less chain-of-command oversight, than with appropriated funding.

Note that variable costs and capability or capacity improvement expenditures are handled identically between Figures 3.1 and 3.2. Variable costs are paid for by the TWCF; capability

Figure 3.2
Proposed Ports' Financial Structure with Installation
Management in the TWCF



RAND TR1204-3.2

or capacity improvements come from appropriations (primarily) and the TWCF (secondarily). The only difference between Figures 3.1 and 3.2 is whether fixed costs first flow into the TWCF (Figure 3.2) or not (Figure 3.1).

A strength of either Figure 3.1's variation or Figure 3.2's variation is that the customer, through TWCF prices, faces marginal costs when deciding how much workload to put through a port. Therefore, other expenses, such as the sunk costs related to mobilization requirements and other high-level wartime capacity decisions, do not affect TWCF prices and, hence, customers' decisionmaking. If high-level decisions about ports' capacities and capabilities do not change the ports' marginal costs, customers' decisionmaking should not be altered. Optimal customer decisionmaking is based on consideration of marginal costs, not average or full costs.

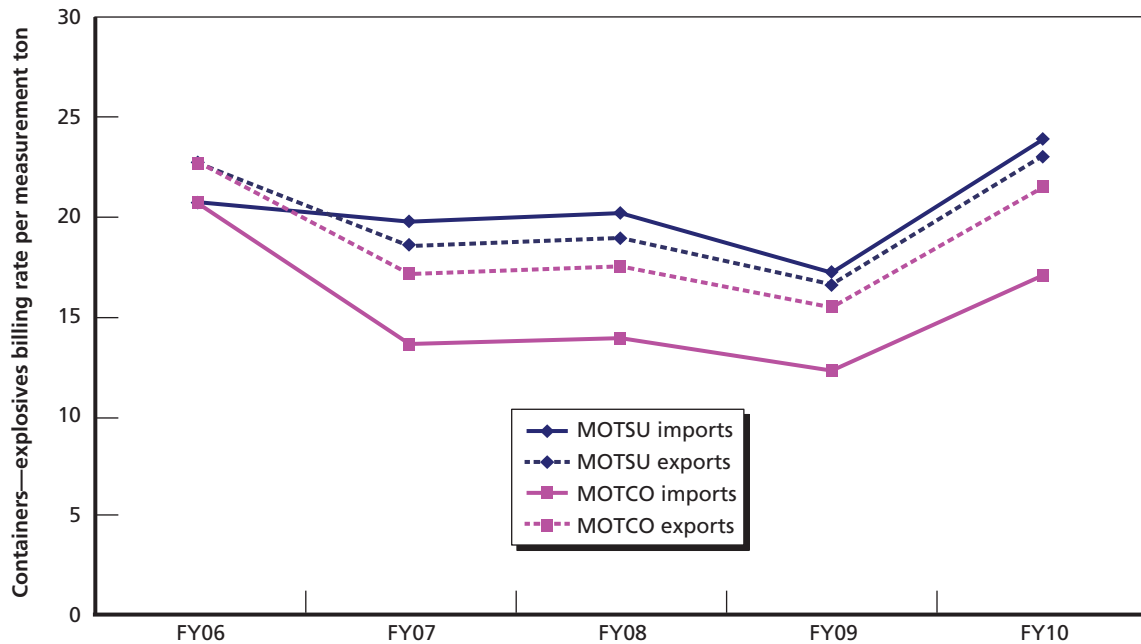
We also hypothesize that customers' prices (i.e., marginal costs) under either Figure 3.1's or Figure 3.2's variation would likely be more stable than under an average cost pricing regime. Under an average cost pricing regime, diminution in workload can cause large-scale price increases, even with constant marginal costs. Average costs increase with reduced workload in the presence of fixed costs.

Comparison to Current Funding Approaches

The ports' current funding arrangements do not perform badly against the same evaluation criteria, but we feel that either the Figure 3.1 or 3.2 variation would be preferable.

In that TWCF prices cover more costs at MOTSU than at MOTCO, there is more potential behavior distortion at MOTSU. However, we have found little recent evidence that ammunition-shipping customers respond to prices. In recent years, as shown in Figure 3.3,

Figure 3.3
Ports' Containerized Explosives Billing Rates per Measurement Ton, FY06–FY10 (FY10 Dollars)



RAND TR1204-3.3

MOTSU's prices for shipping ammunition have generally exceeded MOTCO's, but the preponderance of workload has nevertheless gone through MOTSU.

Figure 3.3 shows that MOTSU's prices have generally exceeded MOTCO's in recent years. Yet Figure 2.1 showed that MOTSU has consistently handled more workload. So we conclude that ammunition-shipping customers do not have much price elasticity of demand, i.e., ports' locations and capabilities are more important than their prices in customer decision-making. On the other hand, United States General Accounting Office (1997a) suggested that MOTSU won some work away from what was then NWSC by bidding lower for that work. We have not found more current examples of ammunition port price responsiveness.

We were told that military services choose which port to use based on geography (both of the ammunition's origin and destination), ship and port availability, and port capability, with TWCF prices being of little importance, at least in the recently observed range of prices.⁴

Current arrangements, especially at MOTSU, have less funding stability than would be true under Figures 3.1 or 3.2 variations. Currently, if workload changes at either port, revenue will change more than costs will, i.e., additional customers will more than cover their marginal costs whereas losing customers will generate port losses.

Preserving current funding arrangements at the ports may be simpler than any reform to the extent that SDDC and port personnel have adapted to current approaches. But there could be recurring accounting cost savings at SDDC if the ports employ the same financial arrangement. We find that MOTSU's current financial system is more informative which is why, in

⁴ At some larger price differential, customers might find it worthwhile to choose a less geographically proximate, but lower-priced, port. But the price differences shown in Figure 3.3 have not been sufficient to cause this outcome.

the next section, we use MOTSU, but not MOTCO, financial data to illustrate the potential consequences of implementing either the Figure 3.1 or the Figure 3.2 variation.

MOTCO's greater current reliance on Army appropriations benefits other military services more than MOTSU's current arrangement does.

Illustration of a Figure 3.1 or Figure 3.2 Funding Variation

We next illustrate the potential consequences of implementing either the Figure 3.1 or Figure 3.2 funding variation. Of central interest was how we might use existing MOTSU financial data to compare the fixed costs associated with maintaining current port capabilities and capacities with the variable costs associated with putting workload through the port.

Large fixed costs might include civilian labor, facility maintenance, automated data processing, security guard services, training, and utilities. The logic is that these classes of expenditure would largely occur even if a port handled no workload but was still being maintained in operational condition.

Large variable costs might include stevedore contracting, supplies and materials (including fuel and lashing gear), rental of equipment/vehicle leases, and equipment maintenance. Our instinct was to count civilian overtime pay as a variable cost, but interviewees told us that much of the ports' overtime pay is caused by undermanning, not ships' visits.

There are undoubtedly gray areas. Some equipment maintenance might need to occur even if a port handled no workload. Utility costs might be increased during ships' visits. One could undertake more granular examination of which types of expenditures belong in which categories. Heretofore, we have assigned each expenditure class to (at most) one category. One could alternatively assign them on a percentage basis, e.g., 90 percent of facility maintenance is fixed, 10 percent is variable.

Table 3.1 lists MOTSU's largest FY10 expenditure classes that we count as fixed.⁵

The vast preponderance of MOTSU fixed costs are for government-employed civilian and military labor and facility maintenance and repair, neither of which, we believe, would be much altered by different annual workload levels at MOTSU.

Table 3.2 lists MOTSU's largest FY10 expenditure classes that we count as variable.

Stevedore costs are the largest variable cost, but there are also a number of sizable supply and maintenance expenditure classes. Although we decided to count facility maintenance costs as fixed (Table 3.1) and equipment maintenance costs as variable (Table 3.2), reality is probably more nuanced. Workload puts stress on facilities, and some equipment maintenance would be required even if there were no workload.

Additional recorded expenses are enumerated in Table 3.3 that we have not considered. We do not know what some expenditures were for. We also exclude depreciation, since it is not a current-year cash outlay. We also exclude CPP program expenditures, which we consider to be associated with capability or capacity improvements (as are various appropriations such as MCA, which are not enumerated here).

⁵ We were unable to undertake similar analysis for MOTCO because the appropriated majority of MOTCO's spending shown in Table 2.1 is not put into expenditure classes amenable to fixed versus variable delineation in the historical financial data we received.

Table 3.1
MOTSU FY10 Expenditures We Count as Fixed

Expenditure Class	FY10 Outlay Dollar Total
Labor	21,372,087
Facility maintenance and repair	12,392,581
Conference travel	52,224
Automated Data Processing supplies—commercial	31,238
Entitlements	28,398
Information Systems Support Activity requirements—Army	26,972
Non-ADP training—commercial	24,554
Other fixed costs	30,872
Fixed cost total	33,958,926

Table 3.2
MOTSU FY10 Expenditures We Count as Variable

Expenditure Class	FY10 Outlay Dollar Total
Stevedore costs	8,851,929
All other supplies—others	1,241,707
Non-ADP equipment maintenance	1,065,175
Non-ADP equipment purchases	854,691
Leased passenger vehicles—General Services Administration	521,486
Fuel defense supply center—Petroleum, Oil, and Lubricants	354,314
Operational travel	163,985
Train travel	80,063
Demurrage—railcar	72,000
Transportation of cargo	45,996
Lashing gear—Defense Logistics Agency	31,724
Rentals (buildings and land, excluding GSA)	15,250
Other variable costs	14,107
Variable cost total	13,312,426

Table 3.3
MOTSU FY10 Expenditures We Do Not Categorize

Expenditure Class	FY10 Outlay Dollar Total	Reason for Exclusion
Other contractual services	354,527	Purpose unclear to us
Miscellaneous services and expenses	11,505	
Funded depreciation—materiel handling equipment	597,165	Depreciation, not a cash outlay
Funded depreciation—non-ADP	458,458	
Funded depreciation—minor construction	408,767	
Funded depreciation—ADP and telecommunications	330,000	
Funded depreciation—software development	45,191	
CPP—equipment Army manager	146,315	CPP
CPP—equipment local purchase	33,597	
Total noncategorized expenditures	2,385,524	

Putting aside Table 3.3's expenditures, we estimate that about 28 percent of MOTSU FY10 outlays were variable and 72 percent were fixed. By contrast, as shown in Figure 3.4, we estimate that the TWCF paid about 62 percent of MOTSU's outlays in FY10. "Outlays" includes both cargo movement costs and the costs of managing and operating the ports.

Indeed, as shown in Figure 3.5, for all five years we analyzed, we estimate that the TWCF-funded percentage of MOTSU outlays was greater than the share we estimate was variable. If TWCF prices covered only variable costs in accord with the Figures 3.1 and 3.2 variations, we estimate that the TWCF would pay less at MOTSU and appropriations would pay more than has historically been the case.

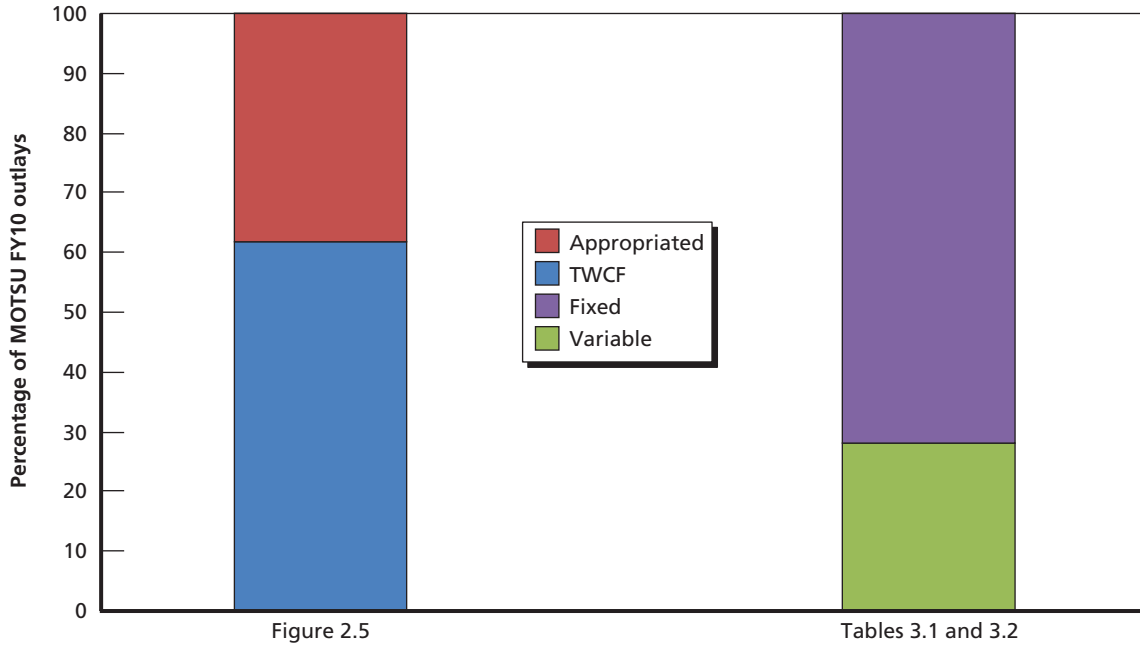
Concerns with Our Proposed Variations

In soliciting expert comments on an earlier version of this report, the RAND research team received a number of thoughtful concerns about the variations presented in Figures 3.1 and 3.2. Here we present and discuss some of those concerns.

Appropriated Fixed Cost Funding from IMCOM Would Be Inadequate

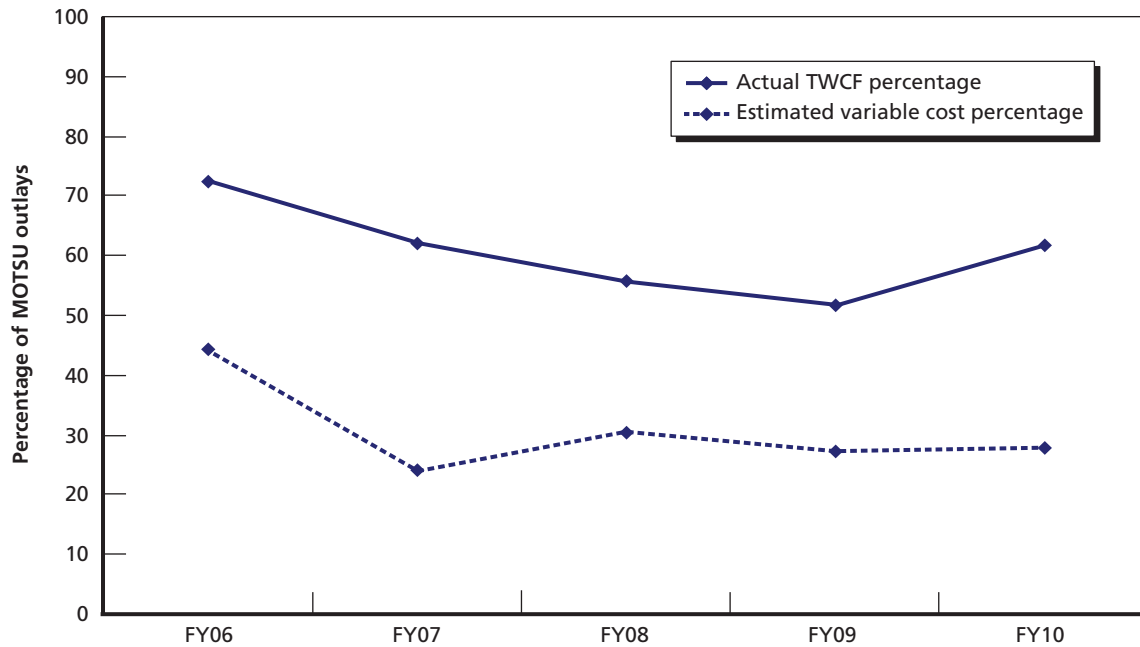
Our interviews revealed that there is widespread concern in the ammunition port community about the ports someday falling under the purview of the Army's Installation Management Command (IMCOM). The concern is that IMCOM will fund only a bare-bones basic package of installation services, leaving the ports unable to fulfill their missions at IMCOM-provided appropriated funding levels.

Figure 3.4
An Analysis of MOTSU FY10 Outlays



RAND TR1204-3.4

Figure 3.5
MOTSU TWCF Percentages of Outlays and Estimated Variable Cost Percentages, by Fiscal Year



RAND TR1204-3.5

Both our fixed cost appropriation proposal and the ports falling under IMCOM would imply that appropriations, not TWCF revenue, would pay ports' fixed or "turn on the lights" costs. However, there is no per se reason that appropriation levels need to be inadequate or that appropriated fixed cost funding implies IMCOM oversight. As noted above, we do not believe that appropriating fixed costs should imply that every Army installation gets the same package of capabilities. Ammunition ports' manifest need for patrol vessels is just one example of how their appropriation needs differ from other Army installations' needs.

The magnitude of IMCOM's assessments of the funding required to maintain installations' necessary capabilities and capacities is a separate issue from the desirability of appropriations versus working capital funding.

Interviewees also told us that IMCOM will not fund "mission-related" expenditures, instead passing them on to customers. We assume that any facility on an Army installation ultimately contributes to mission fulfillment, directly or indirectly. We instead believe that expenditures should be categorized as fixed or output-invariant versus variable or varying with workload levels. We believe that appropriations should fund the former.

A Fixed/Variable Cost Dichotomy Would Require Additional Costly Accounting Effort

We purposely used accounting categories already available in MOTSU financial data to illustrate a fixed/variable cost delineation. Hence, if agreement could be made on how to divide expenditure classes into the categories, the marginal accounting cost could be fairly minimal.

No accounting category division would be devoid of ambiguity. For instance, Air Mobility Command Instruction 65-602, December 23, 2009, lays out its rules for allocating costs to TWCF tenants: "If a TWCF activity occupies between 10 percent to 90 percent of a joint use . . . facility, the cost of a mutually beneficial project . . . is prorated between TWCF and [operations and maintenance (O&M)] funds based on the number of personnel assigned to the facility. However, there may be circumstances where the square footage of the facility floor space is more appropriate to use in determining the prorated split between TWCF and O&M rather than the number of assigned personnel" (p. 42). So although our proposal requires determination of how expenditure classes are to be assigned, the same is true of any other effort to divide costs between different customers or funding sources. We do not think that ambiguous cases constitute a large percentage of port spending.

We do not favor large-scale increases in accounting expenditures. Although there would likely be one-time accounting costs associated with putting MOTCO financial data into the Tables 3.1 through 3.3 expenditure classes currently provided only for MOTSU, there would be recurring management cost savings from having the two ports on the same accounting system. We found MOTSU's TWCF-driven accounting structure to be more informative and useful, so we would propose consolidation to that accounting system.

The TWCF Would Not Have the Funding to Pay for the Capability or Capacity Improvements It Desires

Army financial experts we interviewed suggested that the TWCF is likely to desire port capability or capacity improvements it cannot pay for, so appropriated funds would have to fund these improvements.

On some level, this is not a problematic result, i.e., it implies that TWCF rates are kept low, discouraging distortionary adaptations to excessive prices. It is hardly surprising that the

TWCF has a reputation for large-scale demands if it has historically not been asked to pay for them.

The Proposed Variations Would Hurt the Army but Benefit Other Services

As noted, the Army has been MOTSU's and MOTCO's largest customer in recent years, but the Air Force and the Marine Corps have also provided workload to the ports. Therefore, lower TWCF prices caused by increased Army appropriations to the ammunition ports would end up benefiting the Air Force and the Marine Corps, rather than solely being an intra-Army funds transfer. However, from the broader perspective of the DoD or the taxpayer, this outcome would not be undesirable.

Conclusions

Table 4.1 summarizes our evaluations of how different prospective ammunition port funding arrangements rate with respect to the criteria we developed. We color cells to encapsulate our evaluation with dark green being most favorable and yellow most concerning. (We do not rate any cells so adversely as to color them red.)

We rate the Figure 3.1–3.2 variations most highly. But perhaps the most interesting finding is that we believe, with the exception of complete reliance on working capital funding, any of these approaches could work acceptably well for these ammunition ports. The key mitigating characteristic for ammunition ports is the apparently limited elasticity of demand for the ports' services. Ammunition is shipped into and out of the United States based on geopolitical needs, such as military operations abroad or returns from engagement abroad. These decisions are quite appropriately made with little to no consideration for how many dollars per measurement ton the required movement would cost. With inelastic demand, pricing errors (e.g., building fixed costs into prices discouraging customer workload) figure to rarely have large consequences. When customers have greater demand elasticity, e.g., they can repair items themselves rather than sending them to government depots, pricing decisions and hence the chosen funding approach are of greater importance.

Table 4.1
A Summary of Evaluations of Alternative Policies for Funding Ammunition Ports

Prospective Funding Approach	Nondistortion?	Funding Stability?	Simplicity?	Fairness?	Comment
Appropriation	Free issue can be abused though a behavior distortion seems unlikely for ammunition ports	Stability is dependent on political decisions	Canonical approach to governmental finance	Tenants, non-host customers can free-ride	Probably an acceptable approach for ammunition ports given apparent inelasticity of demand, though there would need to be a mechanism to fund unanticipated variable costs
Current MOTCO	Stevedore costs are appropriately included in TWCF prices	MOTCO funding has been argued to be inadequate	MOTCO has both appropriation and working capital fund accounting	Comparatively greater reliance on appropriations benefits other services	MOTCO has historically been underfunded, but this underfunding is a separate issue from its financial structure
Our Proposed Variations	Customers pay the marginal costs generated by their workload	Would the political process routinely fund ports' considerable fixed costs?	We illustrate how it could be implemented with MOTSU's current financial data	Other services cover their marginal costs, but do not pay any fixed costs	The choice between our two proposed variations depends on one's view of the management discretion versus oversight tradeoff
Current MOTSU	Customers' prices include a proration of largely fixed BASOPS costs	MOTSU has been adroit at harvesting additional funding opportunities	Current financial system provides more descriptive data than MOTCO's but BASOPS reimbursement is hard to identify	Non-Army customers pay for some of MOTSU's fixed costs	The 76 percent BASOPS reimbursement is a historical artifact with no apparent basis relative to any other specific BASOPS reimbursement proportion
Working Capital Fund	Working capital fund prices include fixed costs, discouraging workload	Potentially volatile if workload varies while prices are fixed	Needs revenue-oriented accounting different from traditional governmental accounting	All costs are allocated across customers in proportion to workload	This approach seems inappropriate as ammunition ports primarily exist to fulfill wartime mobilization requirements

NOTE: Dark green denotes most favorable, yellow denotes least favorable.

An Overview of Defense Working Capital Funds

This appendix provides an overview of DWCFs.

Canonically, a government organization is funded through appropriations. A budget is passed specifying that a certain amount of funding is to be devoted to a project or function, funds are provided, and the project's or function's managers are responsible for achieving what is desired with the funding provided. If desired missions increase or costs are found to be greater than expected, additional appropriations may be needed.

A different approach is to make a governmental organization at least partially dependent on payments from other governmental organizations. A DWCF provider no longer receives full (or perhaps even any) appropriations. Instead, the provider must raise revenues from other organizations by selling goods and services to them. Those revenue-providing organizations must, either directly or indirectly, be receiving appropriations, but the DWCF provider is "downstream" from those appropriations.¹

A DWCF provider is to be "business-like," i.e., it receives revenue from customers by charging prices for goods and services "like a real business."² But, in fact, the analogy is inexact. A governmental DWCF provider is unlikely to be allowed to fail and cease operations the way a real business might. Further, lacking shareholders, profits are not to be generated over the long run.

The DWCF price- or rate-setting process is lengthy. Cost and workload estimates are typically generated two years in advance to help appropriation-dependent customers generate their budgets.³ But if conditions then change (e.g., more or less workload than anticipated, a change in such input costs as energy), the DWCF provider is stuck with an annual "stabilized rate" structure that is fated to generate unintended profits or losses.⁴ Realized profits or losses, although clearly sunk, are then to be rebated or recovered from future customers, but those rebates (for profits) or surcharges (for losses, the more common case) do not affect prices until several years later when they have been worked through the lengthy budget process. Today's customer may benefit from or be penalized by circumstances that affected potentially differ-

¹ Byrnes (1993) provided a description of the DWCF approach, though using the since-replaced terminology "Defense Business Operations Fund" (DBOF).

² Shycoff (1995) provided enthusiastic advocacy of running the DoD's support establishment like a business.

³ United States General Accounting Office (1997b) describes the process for establishing stabilized prices for DWCFs.

⁴ Friend (1995) discusses a Navy aviation example in which unplanned engine work caused losses that resulted in a sharp increase in future stabilized rates. In that example, the Navy requested a "pass-through," i.e., appropriation, from Congress to keep those losses from raising future rates unduly.

ent customers several years ago. Obviously, no business would set prices with such long lags, within-year inflexibility, and intertemporal customer cross-subsidies.

DWCF providers are subject to myriad constraints associated with being part of the government (e.g., considerable frictions in either increasing or decreasing staff levels, inability to close facilities without going through an arduous process). A DWCF provider cannot access private capital markets (e.g., borrow money or issue new equity to increase capacity). So, although DWCF providers have some of the trappings of real businesses, such as prices, they fundamentally are not actual businesses. Keating et al. (2001)'s Appendix A presents a discussion of why DWCF entities cannot be expected to operate "like businesses." Likewise, Hanks (2009) notes the perils of making analogies between the DoD and private sector firms.

At the same time, there can be management advantages to being a DWCF provider rather than a governmental entity directly dependent on appropriations. In particular, the revenue received by a DWCF provider is typically more fungible and flexible than appropriations. A DWCF manager may have more latitude to move spending across categories. Further, DWCF revenue does not have fiscal year affiliation. An appropriated organization faces strong (and sometimes pernicious) "use it or lose it" incentives to spend money before the end of a fiscal year; a DWCF-funded organization does not.⁵ Indeed, DWCF-funded organizations can be good end-of-fiscal-year recipients of appropriated organizations' spending. Managers of DWCF organizations appreciate the flexibility the mechanism provides; few we have talked to would want to instead manage appropriated organizations. Of course, from a congressional and Army leadership perspective, DWCF organizations do not have the same level of oversight seen in appropriated organizations. Managerial flexibility (a desirable characteristic) and reduced oversight (an undesirable characteristic from leadership's and Congress's perspective) in DWCF organizations are, in fact, two sides of the same coin.

The DoD has multiple DWCFs. Each military service has its own DWCF as does the cross-service TRANSCOM. The TWCF is TRANSCOM's DWCF. The TWCF is of central interest to this research because MOTCO and MOTSU receive payments from the TWCF, albeit in different ways (as discussed in Chapter One). In the remainder of this appendix, we highlight other customer-provider relationships in the DoD as sources of analogies.

TWCF as a Base Tenant

TWCF activities are tenants on a number of Air Mobility Command bases (Dover Air Force Base, Travis Air Force Base, to name two). The TWCF does not directly pay for installation-wide services, e.g., security guards at the gate. Instead, the TWCF pays a general and administrative support fee to the host installations as well as paying to maintain designated buildings and ramp space dedicated to the TWCF's mission. DoD Financial Management Regulations note that "only the incremental change in cost attributable to the DWCF activity (incremental

⁵ Wilson (1989), p. 116, lyrically notes "in the days leading up to September 30, the federal government is Cinderella, courted by legions of individuals and organizations eager to get grants and contracts from the unexpended funds still at the disposal of each agency. At midnight on September 30, the government's coach turns into a pumpkin. That is the moment—at the end of the fiscal year—at which every agency, with a few exceptions, must return all unexpended funds to the Treasury Department." DWCF organizations are one of those exceptions. McNab and Melese (2003) also provide a discussion of "use it or lose it."

direct cost) shall be chargeable to the DWCF activity.”⁶ When the TWCF pays these expenses, these costs go into the TWCF’s rate base. Any expenses borne by the TWCF must ultimately translate into higher prices charged to TWCF customers (e.g., commanders who want to ship materiel).

An Air Mobility Command expert told the research team that, over fiscal years 2010–2012, the TWCF is to pay an average of 22 percent of the total base operating support/civil engineering–type costs at those Air Mobility Command installations on which it is a tenant.

The Airlift Readiness Account

The TWCF has an interesting commercial pricing-appropriations hybrid mechanism for passenger and cargo transportation with commercial analogs. DoD customers are charged prices comparable to those assessed by commercial operators, but if these prices are not sufficient to cover TRANSCOM’s operating costs, the Air Force’s Airlift Readiness Account (ARA) is to provide an appropriation supplement.⁷

An argument in favor of this approach is that it does not highly distort incentives. Customers see the same price for transportation as if they had used a commercial provider. Perhaps DoD customers should be paying TRANSCOM’s marginal costs, not this commercial analog price, but certainly this pricing mechanism is far preferable to fully burdened, average cost pricing of TRANSCOM services. Under an average cost pricing regime, many more DoD customers would fly commercially (discouraged from TRANSCOM flight by the commercial price advantage) and TRANSCOM aircraft and crews would be underutilized.

On the other hand, the ARA has been only partially funded in recent years resulting in TWCF losses on this type of service.⁸ These losses must then be recovered through other TWCF business areas or distortionary future pricing surcharges.

The ARA approach is not directly applicable to the MOTCO/MOTSU cases because no commercial ports handle large amounts of ammunition. Therefore, the DoD lacks the commercial pricing benchmark that determines the TWCF’s airlift price and, hence, the required ARA appropriation.

Military Depots

Repair depots in each military service are large-scale users of DWCFs. As noted in Chapter Two, the baseline presumption in DoD financial management regulations is one of full cost recovery in DWCF pricing. This presumption has generally been implemented as average cost pricing, i.e., a depot’s price equals its expected total cost divided by its expected workload. In recent years, this sort of pricing has been quite lucrative for the depots, as they have generally had plenty of workload; it has not been hard to cover their fixed costs with customer revenue. The situation at the depots was much more problematic in the 1990s when workload was down

⁶ United States Department of Defense (2010a), p. 9-23.

⁷ See Air Mobility Command (2009).

⁸ See United States Air Force (2009 and 2010).

and customers had incentives to maneuver to keep workload out of depots that they perceived to be very expensive. The Army's Forces Command, for instance, set up an inter-installation workload redistribution mechanism to minimize the amount of work installations sent to underused Army depots.⁹

We believe that a sizable proportion of these depots' costs would not decrease in proportion to a workload decrease. Kirk et al. (2008) and Boning and Geraghty (2009) present estimates of fixed costs in Navy aviation depots.

In 2011, Army depots were almost entirely funded by working capital fund revenue derived from sales to customers. Some "Indicator 1" appropriations paid for programs for on-post military personnel, e.g., Morale, Welfare, and Recreation.¹⁰ But Indicator 1 appropriations were a tiny fraction of total depot expenditures.

Appropriations were more important to Army depots and arsenals in the past, e.g., a now-dormant program called Industrial Mobilization Capacity (IMC) that appropriated funds to preserve then-unused capacity that would be needed during a contingency.¹¹ Table A.1, assembled from various years' Army Working Capital Fund annual reports, provides annual Army depot and arsenal IMC funding levels back to FY01.

Table A.1
Army Depots and Arsenals Industrial
Mobilization Capacity Funding Levels
(Millions of Then-Year Dollars)

Fiscal Year	IMC Funding Level
2001	66.5
2002	49.5
2003	60.0
2004	113.9
2005	99.6
2006	64.0
2007	0
2008	6.9
2009	0
2010	0
2011	0

⁹ See Brauner et al. (2000).

¹⁰ Defense Finance and Accounting Service–Indianapolis Regulation 37-1, Chapter 15, January 2000, notes "BASOPS cost accounts coded '1' are (with minor exceptions) primarily troop support activities that contribute to the morale and welfare of soldiers (active or retired soldiers who are stationed at, or live in the area serviced by, the installation). Generally, activities defined in these cost accounts do not benefit the mission programs and customers or the tenants and satellites of the installation."

¹¹ See Hix et al. (2003). The same program was also known as Unutilized Plant Capacity. See Department of the Army (2005).

Appropriations may return to Army depots in the future. If repair demands fall in coming years, IMC or something like it may again be needed lest the depots' prices again escalate to the point of encouraging customers to remove workload from the depots. Also, it could be that Army depots will be moved under the Army's IMCOM, which may then use appropriations to pay for base operating and support expenditures at Army depots currently funded through working capital fund revenue.

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