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STUDY OF CARGO MANAGEMENT SYSTEM OF THE MILITARY SEALIFT COMMAND--ETC(U)

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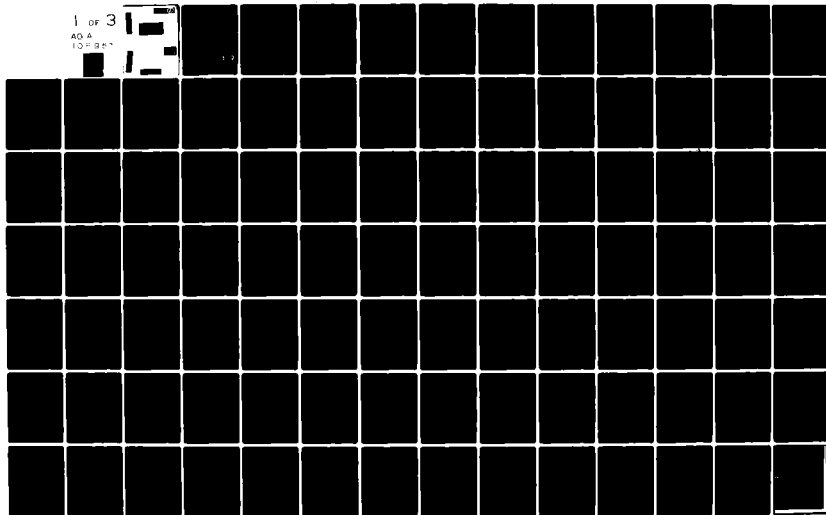
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MILITARY SEALIFT COMMAND

Performed for
Office of Naval Research
Contract No. N00014-79-C-0851

By
E. G. Frankel Inc.

January 1980

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By
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Boston, MA 02215

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February 25, 1980

Mr. J. Brogan
Deputy Executive Director
Military Sealift Command
Department of the Navy
4228 Wisconsin Avenue
Washington, D.C. 20390

Dear Mr. Brogan,

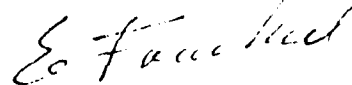
I have great pleasure in submitting to you our report on "MSC Cargo Management System Requirements". We greatly enjoyed performing this evaluation study for MSC and appreciate the help and cooperation provided us in the performance of this project.

We feel that there is a need for the development of a modern Cargo Management System and would appreciate your consideration of our unique experience and capability in designing and installing such a system at the MSC.

With best regards.

Sincerely,

E. G. FRANKEL INC.
E. G. F. INTERNATIONAL



Ernst G. Frankel
President

EGF:sm
Enc.

24 OCT 1980

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I. INTRODUCTION

This study is designed to provide an objective evaluation of the cargo management system of the 'Military Sealift Command' (MSC) of the U.S. Navy. The study was based on detailed field evaluations at MSC headquarters as well as the two area commands, and benefited by the close cooperation and advice of many officers and staff of MSC.

The purpose of this study was to determine the requirements for improvements of the cargo management system. The staff of MSC was continually kept informed of the findings as they evolved and approaches developed for the resolution of existing or potential problems. Suggestions and recommendations presented in this report were discussed with potentially affected staff members, and the general conclusion of the study was presented to MSC headquarters' staff during a briefing before the end of December. Comments and criticisms obtained in these meetings were considered and included in this report where appropriate. We greatly appreciate the productive responses and comments obtained, which greatly added to the value and implementability of the study results.

II. EXECUTIVE SUMMARY

Between August 1979 and January 1980 E. G. Frankel Inc. conducted a study of the Military Sealift Command's cargo management system. The study was concerned with the problems of cargo management confronting the area commands as well as those of the headquarters. The results of the study are completely described in the following section and are summarized below.

II.1 Summary of Recommendations

1. A formalized cost accounting system should be introduced as an adjunct to the existing stewardship accounting system.
2. The forecasting techniques behind the force plan and price setting exercise should be refined.
3. The routing and scheduling procedures used for the MSC controlled fleet should be overhauled.
4. The administration of the CALSTAT system should be rationalized. In the process, clear standards for currentness and level of detail really required should be established.
5. The diverse sources of information supplying the MSC system should be integrated and within two years a modern data base management system installed.
6. A booking system of limited complexity be implemented at each major area command. These should be initially integrated into the command information system of COMSC and finally into the DBMS recommended in 5 above.

II.2 Discussion of Recommendations

II.2.1 Implement a Formal Cost Accounting System

A major conclusion of the study is that MSC's management is not adequately supported by the cost information presented to it. This is particularly true in the area of controlled ship management.

It is a known economic principal that to optimize any process, resources should be expended until their marginal cost equals the marginal gain resulting from their use. As is a common characteristic of any stewardship accounting system, that of MSC is only capable of producing average costs. These averages are presented at a very high level of aggregation. While describing, in some sense accurately what did happen, they are of relatively little value in suggesting what should happen, i.e. for planning purposes.

Their use in planning can at best only result in decisions where average costs equal average returns. It is a clear economic principal that in industries with favorable economies of scale, this regime leads to excess capacity and an unnecessarily large overall systems cost.

While no accounting system can truly present marginal costs and benefits of decisions to decision makers, a formal cost accounting system is structured to provide information in a format closely approaching the ideal.

The important principle behind such an accounting system is to charge costs (and revenues) in such a way that their connection with actual decisions is clear. The first step in such a process is the establishment of profit and cost centers. These are organizational groups which

1. are engaged internally in the same activity

2. are managed internally by a single individual or group
3. internally have costs and revenues determined by decisions made within the group
4. are reasonably small.

Costs and revenues are then booked to these centers allowing the exact origin of organizational success or failure to be determined. Usually operational cost centers are not responsible for the prices of goods and services they procure but only for the amount. Likewise procurement cost centers have great control over cost, but relatively little over actual volumes used. Hence such a system produces both volume and price variances of operating results are produced.

The volume variance is used to assist those making operational decisions, and is based on the actual volume priced at a standard price (usually that in the budget) and the price variance is used to assist those in a procurement function and is calculated using the budgeted volume reported at the actual cost.

In situations where the system is servicing a varying unpredictable demand, a "flexible" budget is used to calculate the variances (rather than the budget used for financial planning). This flexible budget is really a set of budgets each applicable to a given level of system utilization.

While cost accounting systems are relatively standardized (some available as canned programs), their implementation is a major undertaking and their operation usually imposes a large burden in terms of the accurate coding of invoices. Hence it may be desirable to investigate modifications to the existing stewardship system which would allow it to produce cost information more closely approaching the marginal cost ideal.

Most of these ideas have to do with greater segregation of accounting data and the construction of more descriptive matrices of the service provided other than the "ton mile" now used throughout the system. One approach is to split the MSC system into a few typical services. For example

- 1) U.S. Europe container
 - a. inbound
 - b. outbound
- 2) U.S. Europe break bulk
 - a. inbound
 - b. outbound
- 3) U.S. Far East container
 - a. inbound
 - b. outbound
- 4) Tricoast
- 5) Other

Costs and revenues are then tracked within those areas per ton shipped.

In any case it is necessary that the emphasis placed on "ton miles" be removed as few costs and no revenues are explained by the ton mile concept. For example, as little cargo is available in Hawaii for shipment to the Far East, the true burdened cost to ship cargo from Long Beach to Hawaii on an MSC controlled ship is very nearly the same as from Long Beach to Pusan. In addition the commercial charges for carriage between Long Beach and Hawaii may exceed those between Long Beach and Pusan. Thus, for the Tricoast Service, any presentation of cost of revenue data based on ton-mileage will and does lead to some misallocation of the MSC controlled fleet.

II.2.2 Improve Forecasting Techniques

The next recommendation of the study is that the volume forecasting techniques should be refined as used to prepare the annual force plan, budget, and to assist in the determination of MSC's price schedule for interservice billing. Before the recommendations concerning these forecasts are discussed, it should be pointed out that the quality of those at MSC exceeds those available to private industry. This is primarily because of the limited number of large shippers using MSC and the spirit of cooperation and care which surrounds MSC's planning activities. However, the accuracy of MSC's forecast is more critical to its operations than that of a private company.

A private shipping company has considerable latitude to control its unit costs in response to varying demand. Vessels can be layed up, chartered, etc. Thus the effects of fluctuating volumes on operating results are diluted. Additionally, FMC regulation require rates to exceed the fully burdened cost of providing the service, and rates can be adjusted frequently. All these factors give commercial liner service much flexibility in limiting their losses when volume forecasts are incorrect.

In MSC's case both unit costs and unit revenues are firmly set at the beginning of a period and any deviation of actual volumes can have immediate effects on operating results. The impact depends on the difference between unit costs and unit revenues. If this were zero on a route by route basis, then the forecast's accuracy would be moot as the system would break even no matter what volumes were shipped in it.

However, this is not the case as the ton mile methodology used to determine user charges produces cross subsidization. Additionally of routes within the system,

the programmed losses and profits of the system cast noticeable discrepancies between unit costs and revenues. As a direct result, forecasts not only of total system use but also of volumes on all routes where costs are not in line with billed revenues must be correct for the system to perform as planned.

A 5% error in the forecast makes an impact on MSC operating results that no possible operational action can correct. This situation first underlines the importance of a cost accounting system to support the stewardship. If the difference between superb management and less effective performance is a 25 million dollar loss as opposed to a 30 million dollar loss, no one (including the managers themselves) can evaluate the quality of their management decisions. However, the maintenance of such a pricing system is required by the DOD's decision to absorb uncertainty in marine freight rates in MSC - the agency best suited to procure marine freight. For this system to work well, forecasts must be as reliable as possible, and in an effectively usable form.

The current forecasting method consists of appraising the services of future volumes and then of challenging items thought incorrect. This is felt to be a productive procedure which can be shown to provide a strong historical base for the forecast. After the completion of the above, a computer program should sift through the entire forecast and calculate the sensitivity of MSC's operating results to poor estimation of volumes on each route. The program should then print out all flows whose variances have the largest effect - focusing attention on ensuring these to be as accurate as possible.

As a parallel independent effort MSC should work out, using market research and demand forecasting techniques,

what military agency processes or developments are generating the demands. How might they change. It should then adopt a zero base budgeting methodology and construct a budget using its mission statement and the configuration armed forces deployment to estimate logistics demands. When this is done, the forecasts should then be reconciled.

II.2.3 Routing and Scheduling

Much of MSC's system presents no scheduling problem. Notably in the areas of RoRo ship operation by the Atlantic Command and commercial container utilization, MSC has little or no difficulties in the scheduling area. However, in many other areas of the operation, in particular that of the Tricoast Service, the current tools and information available for scheduling represent costly shortcomings in MSC's system and should be extensively revised. The scheduling is deficient in the following respects:

1. The schedule's current goal of optimizing individual voyage results does not necessarily lead to the fulfillment of MSC's mission at minimum cost to the government.
2. The cost and revenue data used in the scheduling exercise does not present an accurate economic description of MSC's operating environment.
3. Cargo prospectus for inbound cargo are insufficient to provide substantial guidance in schedule construction.
4. Insufficient attention is paid to the attractiveness of the schedule to shippers and on its influence of cargo offered MSC.

The current system consists of taking a general proposed schedule and then deriving a schedule by the optimization of the financial results of individual voyages using the PROFORMA computer program as the evaluational tool. This evaluation consists of the comparison of different routings and schedules as variation upon a baseline voyage. The fleet schedule is never directly addressed, but only that of particular vessels. The bulk of the work expended on scheduling a vessel is done when arrangements are being made for its outbound voyage. As a result of the timing of this work,

it is unlikely that any lengthy consideration of the system-wide influence of one voyage on another is possible.

The personnel at the Pacific area command are making substantial efforts to improve this situation and our recommendations are intended to help and support these efforts.

The basic thread of our recommendation is that the voyage by voyage PROFORMA approach is applicable to a tramping operation only. As the Tricoast and other services offered by MSC are not by their nature tramp but scheduled liner operations, schedules should not be evaluated on a voyage basis at all. They should be considered on a system wide basis. All liner companies make the schedules with this philosophy.

There have been numerous attempts to pose shipping schedules as technical operations research problems. To our knowledge all of these attempts have been abandoned except those utilizing linear programming. This is the only methodology with any proven track record. Its success is largely confined to oil and bulk minerals transportation, organizations where savings in transport costs can be realized by the shipper of the goods - the oil or minerals company itself. In the liner area savings from improved scheduling are not easily passed on to shippers and they thus have little interest in modifying their plans for the convenience of the ship operator. As a result, most liner operations are scheduled on a relatively high level in the organization by consideration of service requirements, and schedules of feeder ships, trains, and trucking times from major geographical sources of cargo, and fuel costs. Once sailings are advertised, little leeway is possible because

of the difficulties in changing paperwork.

In MSC's case it is recommended that the use of linear programming be studied as a scheduling tool to replace proforma. This should be done as an experimental real time application on the area command level, rather than via the formalized feasibility study and subsequent procurement method.

This hands-on approach will lead to a more rapid evaluation of the concept and will lead to immediate improvements in the schedule as the model construction will call attention to systematic interactions. The linear programming approach has the desirable feature that while data requirements can be large they follow straight forwardly from the model's structure.

One of the first conclusions will be that the current practice of using MSC's interservice billing rates to evaluate proposed alternatives leads to non-optimal routing of vessels. The true gain to the Government by shipping cargo on these vessels is the cost foregone by not using commercial tonnage. The use of interservice billing rates causes MSC's tonnage to be deployed on longer voyages where the paper gains appears greater, but may in many cases be smaller.

The last recommendation is that more explicit consideration be made of the affect of the schedule on the generation of return cargo and its estimation to sufficient accuracy coupled with its use to improve scheduling. Currently this is an area relatively undeveloped. This is in contrast with commercial practice where it is the most developed.

II.2.4 Rationalization of CALSTAT Administration

Very few features of the MSC management system are as controversial as CALSTAT. The system undeniably works. It accepts input and writes reports daily. These reports are neat and reasonably understandable. However, none of the MSC staff interviewed expressed true satisfaction with the system. Suggestions offered for improvement never pinpointed specific flaws and were frequently contradictory. One person complained that the output was not current enough and suggested that commercial container sailings be added to the system - as if tripling the systems throughput would improve its promptness.

In the contractor's opinion the CALSTAT system could be made to work well. We feel the fundamental problem is that it is used in a data processing environment not well matching the technology used to implement it.

The system is basically a batch processing one, intended to update files from cards and to print reports from these files. The system is expected to accept input from all over the world and to produce accurate timely reports which are distributed all over the world. The system, in a few words, represents a batch processing system used in a time sharing environment. It is felt that the frequency and timing of the jobs making up the CALSTAT system is not in keeping with the volume and timing of input information.

An additional problem is that the system is too detailed and far more input transactions are required to describe MSC's operational situation than the minimum.

A further criticism of the system is that the output routines do not process information sufficiently and do not provide information in formats dictated by the user's requirements. For example, while the system presents off hire

information on a voyage by voyage basis, this information is not presented in the same format as the MSC charters for vessels. Thus it requires much manual manipulation where none would be required if the format of the CALSTAT output were more directed towards the user's needs.

The first step in the improvement of the CALSTAT system is to put the system into more proper perspective as an information tool. It should be considered a tool to support one or two people whose job is to know personally the positions, status, and schedules of the fleet and who perform a troubleshooting function when problems with arrangements arise. In a commercial environment these personnel are called vessel operators and it is one of the more active positions in a steamship companies management. These people should review daily the status of the fleet and should be responsible for maintaining the schedule section of the CALSTAT system.

The next step is to review the coding procedures used with the specific goal of reducing the volume of transactions entering the system. The goal should be to reduce the daily number of transactions for inport status file maintenance to between 50 and 100. The input of these transactions should be revised to eliminate the lag associated with the punching and verification of input cards. This could be done with a small microcomputer (e.g. the Datapoint machine at the Pacific Command) connected to the main computer at Bailey's Cross Roads with a data link. A second alternative would merely be to give extreme priority to CALSTAT transactions when they are input to the computer.

The last goal is to reduce the number of sources of data available to the Bailey's Cross Roads computer. Currently input comes directly via command data link from the major continental United States commands, via

autodin from the major foreign commands and from the Gulf commands. Thus, in principle, the system must process six different batches of transactions arriving continually during the day Washington time. Additionally, when a vessel calls at ports without an MSC office, it too sends information.

The system could easily be revised routing the overseas commands transactions to the Continental area command level to the vessel operators first mentioned. At this level the information would first have immediate use without the data processing delays resulting from the batching of transactions described above. When sorted out at this level, the information would then be sent by command data link to the main processing in Washington.

II.2.5 Data Base Integration and Data Base Management System Implementation

The organization of MSC's management system is too complicated, including more files and computer programs than are required to service MSC's needs, producing more reports than really required, while not providing understandable information of a general nature, nor providing the capability of answering specific questions promptly without unleashing a torrent of unneeded information.

This situation arose as MSC's computer capabilities grew via the progressive implementation of applications. This is a typical way by which EDP systems develop until they reach a point where redundant runs, and quasi duplicate reports, raise costs and organizational problems sufficiently to induce management to reorganize and more completely integrate the system - usually around the data base management system concept.

It is the consultant's recommendation that a feasibility study of the reorganization of MSC's EDP system in the form of a modern data base management system be made. A thorough study is required as the process of implementing such a system while maintaining the necessary continuity of ongoing business records can be complicated and expensive. Additionally, if poorly done, the conversion can result in a period where there are no records at all. In MSC's particular case, some thought has historically been devoted towards keeping data processing organized and it is not felt that any insurmountable problems will arise.

The first step in such a conversion is to consolidate files and above all to rationalize sources of input documents to facilitate the substitution of online entry for the current punched card data entry used. MSC's EDP system now had too many files containing nearly the same information for online data entry to work out well. The principal

problem here is to ensure that all files in the system contain consistent information.

The next step is to completely study the management information needs of the organization and insure that all information requires is, in fact, collected in its primal form. With a data base management system, detailed consideration of who gets what information is not so important as such systems can produce a large variety of reports easily on request, provided the information is there in its primal form to begin with.

A third step is to improve the dependability of data transmission within the system. All MSC personnel concerned with the existing system complained that missing and duplicate blocks of data were common place, and that cleaning up problems of this nature consumed significant amounts of clerical effort. This, of course, would improve the situation even if no DBMs implementation were attempted.

The last step is to install the system and to phase out most of the existing reports whose function would then be better served by the data base management system.

II.2.6 Cargo Booking System Implementation

The area in which great improvement is possible in MSC's cargo management system with relatively small expenditure of resources is in cargo booking. This is an area where MSC routinely handles a very large volume of paperwork and, in fact, adequately administers the expenditure of many millions of dollars. Most of the personnel involved are well experienced.

The principal difficulties with the system are:

1. By today's standards it is wasteful of manpower because of the large volume of records kept on paper.
2. The system's capacity is set by the number of people available and could not quickly be expanded to adequately meet a large volume of emergency shipments.
3. The system, while interfaced with the MILSTAMP and Unit Level Billing systems, is not truly well integrated with them. As a result, the records of the area commands on paper are frequently superior to the above computer centered information systems.
4. This causes much clerical effort to be expended making up for deficiencies in these systems.

It is the consultant's recommendation that this area of MSC's operations be automated to free the competent people in it from many burdensome clerical functions - allowing much more attention to be placed on more pressing issues. Additionally, effective automation of this function would put MSC in a position to cope well with any increase in transaction volume resulting from the changing world situation, within a minimum of time.

Work done on this line should center on a distributed data processing system with local records being maintained

on minicomputers interfaced with the main MSC computer which would continue to do unit level billing and other tasks as now. From a technical point of view such system development is straightforward and few problems, if any, should be expected.

III. SYSTEM OVERVIEW

III.1 Introduction

Responsibility for the Department of Defense Logistics System is divided between three commands - 1) the Military Sealift Command managing sealift activities, 2) the Military Airlift Command managing airlift capabilities, and 3) the Military Terminal Management Command with land transportation. MTMC is further responsible for consignment, documentation, and the provision of freight forwarding and customs brokerage services for the system. Because MTMC is responsible for the custom's brokerage function, a substantial portion of MSC's interaction with its clients is not direct but through MTMC.

The operation of MSC's activities is most clearly divided between two areas - break bulk (primarily vehicle) shipping and container shipping. In the break bulk area MSC's operations closely resemble those of a conventional steam ship company operating break bulk tonnage.

In the container area this is not so clear. The combined operation of MTMC and MSC very closely resemble those of any firm offering international combined freight forwarding, customs brokerage, and transportation services. However, the division of responsibility for the operations between the two groups creates a situation having no good analog at all in commercial practice.

MSC's role in container operation in a physical sense is confined to carrier selection, release of cargo to the carrier, occasionally arrangements for pickup, financial areas such as invoice verification and payment, and a procurement system designed to obtain the best possible commercial terms for the government's shipping acquisition.

III.2 Responsibilities for Cargo Management

MSC's mission is concisely described in its official mission statement which is shown in Table III.1. In a general way the mission statement makes MSC in charge of procuring and routing ocean transportation, but excludes it from documentation preparation, cargo tracking, stevedoring, and terminal operation - these being the responsibilities of MTMC.

Using Table III.1 as a base, it is possible to establish a more detailed description of MSC's functions in cargo management and planning within the confines of the military transportation system. The table additionally shows the division of this responsibility between area commands and headquarters. Additionally it shows the responsibilities of headquarters personnel for different areas of the operation.

The organization shows a clear allocation of nearly all operational functions to the area command level with the headquarters serving all major planning, procurement, system organization, and liaison functions.

One aspect of this is that the area commands have considerable flexibility to set up policies and procedures to suit their particular operating requirements. It does, however, mean that there will be relatively less standardization of policies complicating the acquisition of reliable data by headquarters.

TABLE III.1
MSC FUNCTIONS IN CARGO MANAGEMENT

Procurement	- 1. Charters commercial ships 2. Contracts for movement on scheduled ocean carriers 3. Contracts for systems movement such as supply of Guantanamo
Rate Setting	- Established rates for ocean lift via competitive procurement and negotiations
Booking	- Books ocean cargo on commercial and government owned ships
Billing	- Bills service for ocean lists
Disbursements	- Pays ocean carriers*
Operations and Control-	Operates MSC vessels** - Controls chartered ships

* Other MSC Disbursement Functions such as charter hire payment and payment of invoices for operations of owned vessels beyond scope of study.

**Felt only scheduling and allocation of tonnage within scope.

There are a number of other or implied functions performed by MSC such as clearance of inbound cargo, accountability and financial integration of cargo accounts, and similar functions.

TABLE III.2

DIVISION OF RESPONSIBILITY BETWEEN AREA COMMANDS AND HEAD-
QUARTERS

	<u>Area Command Function</u>	<u>Headquarters Function</u>
<u>BOOKING</u>		
Tender Cargo for Booking (Inbound only)	X	
Book Cargo	X	
Arrange Drayage	X	
Establishment of Procedures		X
<u>BILLING</u>		
Bill Shippers for Services		X
Collect Receivables		X
Establish Billing Rate		X
Publish and Distribute Rate Guide and Procedures		X
<u>DISBURSEMENTS</u>		
Very Invoices	X	
Pay ocean carriers	X	
Supervision of		X
<u>SCHEDULE CONTROL SHIPPING</u>		
Construct Schedule	X	
Review Schedule		X
Review Employment of Ships by Area Command		X
CALSTAT		X
<u>EQUIPMENT CONTROL</u>		
<u>ACCOUNTING</u>		
Account for Cash	X	

TABLE III.2

(continued)

	Area Command Function	Headquarters Function
Supervise Disbursements		X
Administer Accounting System		X
<u>MANAGEMENT INFORMATION</u>		
System Design		X
System Operation	X	X
Advise of Inefficiency		X
<u>INTERAGENCY LIAISON</u>		
MTMC and Shipper Services		X
MILSTAMP		X
<u>SYSTEM MANAGEMENT</u>		
Determine Staffing		X
Travel Budget		X
<u>CONTRACTOR EVALUATION AND LIAISON</u>		
Break Bulk	X	X
Container	X	X
<u>BUDGET</u>		
Area Command	X	
Overall System		X
Container		
Break Bulk		

III.3 Methods of Management

The management methods to which the MSC system is amenable are very different from those of commercial systems. This is because commercial systems are decentralized with clean boundaries between organizational units. Additionally, while both military and commercial transportation activities are concerned with the movement of goods, commercial activities are centered around commerce and military around supply.

The commercial characteristic of commercial shipping emphasizes the contractual obligations between the shipper, the consignee, the shipping company itself, insurance companies, bank, and other organizations which all may have an interest in a single shipping transaction. The obligations created by these contracts have been explored and expanded in many thousands of many years of commercial, technical, and legal activities carried on in all countries of the world. There is little freedom available to make differing arrangements as the potential legal exposure is too large.

In the commercial field, the fundamental contract for all transactions is a bill of lading. This together with its attachments such as an insurance policy completely describes each shipping transaction.

As a bill of lading determines who can have possession of goods and is frequently used as collateral for loans or for moving funds in international commerce, it is seldom incorrect. As it is a contract wherein damages can be imposed for non performance, it can be relied upon to coordinate all of the parties involved in the transaction.

The principal function of a bill of lading is to control the possession of goods as they pass between a buyer and a seller or shipper and consignee. Additionally, it provides a format to administer the customs process and to regulate commerce. None of these activities have any

significance to the military. As a result, the military has no reason to retain the commercial bill of lading approach. Additionally because the contractual terms of a bill of lading generally favor the carrier, the government has obtained terms and prices more desirable than those available to it otherwise by substituting the system shipping and rate agreements. In this system the clearance order (rather than the bill of lading) is the fundamental unit.

Because the government is really the only party to movements in the military system, it must solve for itself all of the problems that numerous parties working in their own self interest and in the format of a well developed institutional and legal framework have solved before. This places a higher level of performance and required standard of performance at all levels. Additionally it removes the divergence of interests that serve to remove errors from the commercial system. A bank must know accurately when goods are loaded on a particular ship as this is when it pays obligations made through it.

On the other hand it leaves a much larger area available to approach from a technical systems approach without "interference" of binding commercial precedents. Systems analysis and computer programs can and are used as a direct substitute for the legal litigation and statutory regulation that formed the commercial system.

As such, the DOD's cargo management system has already reached a greater scope and volume than any commercial system. The ability of such a system to function is clearly dependent on the technology available to support it.

It is only recently that computer and communications technology has reached a point where a hardware and software system adequately supporting such a complete logistical system could even be attempted. Prior to these technological

developments, the decentralization accomplished with a bill of lading was necessary to accomplish anything in an organized way.

With the adoption of the MILSTAMP system, the die was cast to approach military transportation as a complete system with the concurrent commitment to keep everything organized under one roof. MSC's administrative situation can only be understood in the context of the organizations adaptation to this system.

The principal component of this system is the MILSTAMP documentation system. This system together with the support it receives from the auto din message routing system is the Department of Defense's substitute for the bill of lading centered system used commercially. These systems are the principal means of routine business interaction of MSC with its clients the shipper services, and its vendors, the shipping companies.

Table III.3 shows the general activities of the MSC management in both the area commands and headquarters. Additionally it shows the type of FORMAL support offered for the activity by MSC;s administrative system.

There are six basic areas which have been extensively developed. They are

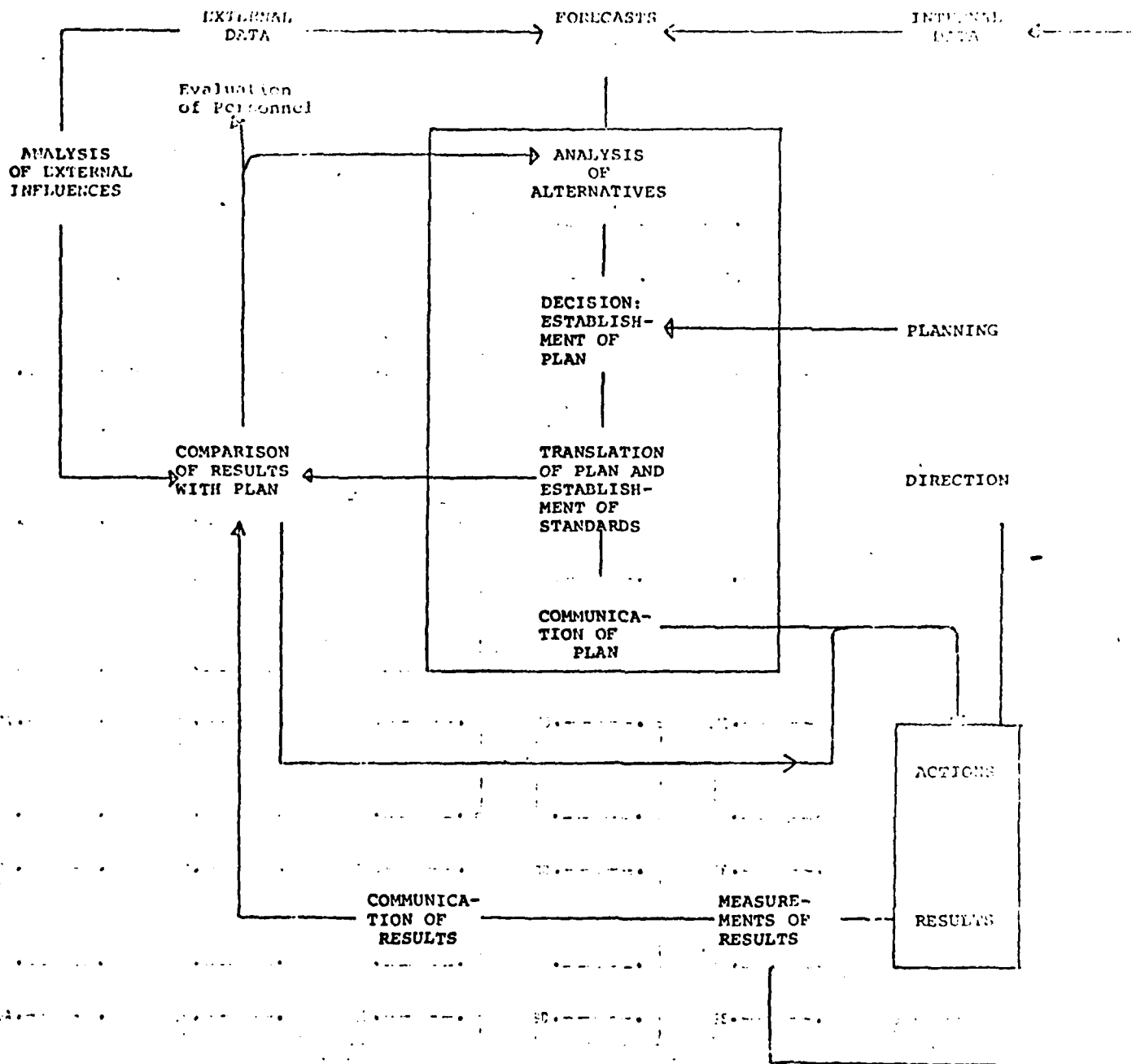
1. Unit Level Billing - Billing and Traffic Records
2. CALSTAT - Vessel operational performance and schedule publication
3. PROFORMA - Voyage profitability evaluation
4. FORCEPLAN construction
5. Rate publication
6. Accounting record processing and budget preparation

Of these systems, PROFORMA is really only a management tool and cannot be thought of as an integrated system.

Figure III.1 shows a format to describe most administrative systems. It represents a feedback oriented

TABLE III.3 CARGO MANAGEMENT ACTIVITIES AT MSC

Management Activity	Type of Formal System Support	Degree of Integration with MILSTAMP
I. <u>System Management</u>	See <u>Management Information below</u>	
II. Capacity Adjustment	a. Force Plan System b. Historical Traffic Records processed from Unit Level Billing System	a. Large b. Large
III. Procurement of Shipping Capacity	No Formal Dedicated Support	
IV. Rate Setting and Publication	RFP Rate System	Small
V. Routing and Scheduling	a. CALSTAT b. PROFORMA	a. Small b. Small
VI. Booking	a. Manual File Maintenance in area commands b. MILSTAMP Itself	a. Very Large b. Complete
VII. Invoice Verification	a. FINIS (Pacific) b. Atlantic Commands Developments	a. Very Large b. Very Large
VIII. Accounts Receivable	Unit Level Billing	Very Large
IX. Management Information	Summarization of Accounts Payable Records, MILSTAMP Manifest Records, and Unit Level Billing Records	Very Large



GENERALIZED MANAGEMENT SYSTEM FOR ANY FUNCTION

system with most constructive action coming from the comparison of measured results with planned results. In commercial practice the planned results are most frequently the operations financial results but sometimes are other measures of performance such as market share, or technical utilization of assets.

Figure III.2 places these administrative systems on this general diagram to illustrate what functions MSC is actually performing in a routine systematic way.

It is clear that the strong points of MSC are in the formalized planning area and on the other end of the spectrum in the detailed measurement of results. For example the results of the force plan exercise give to MSC a forecast of what it is expected to do which is superior to that available to any shipping company with the possible exception of integrated oil and mining companies.

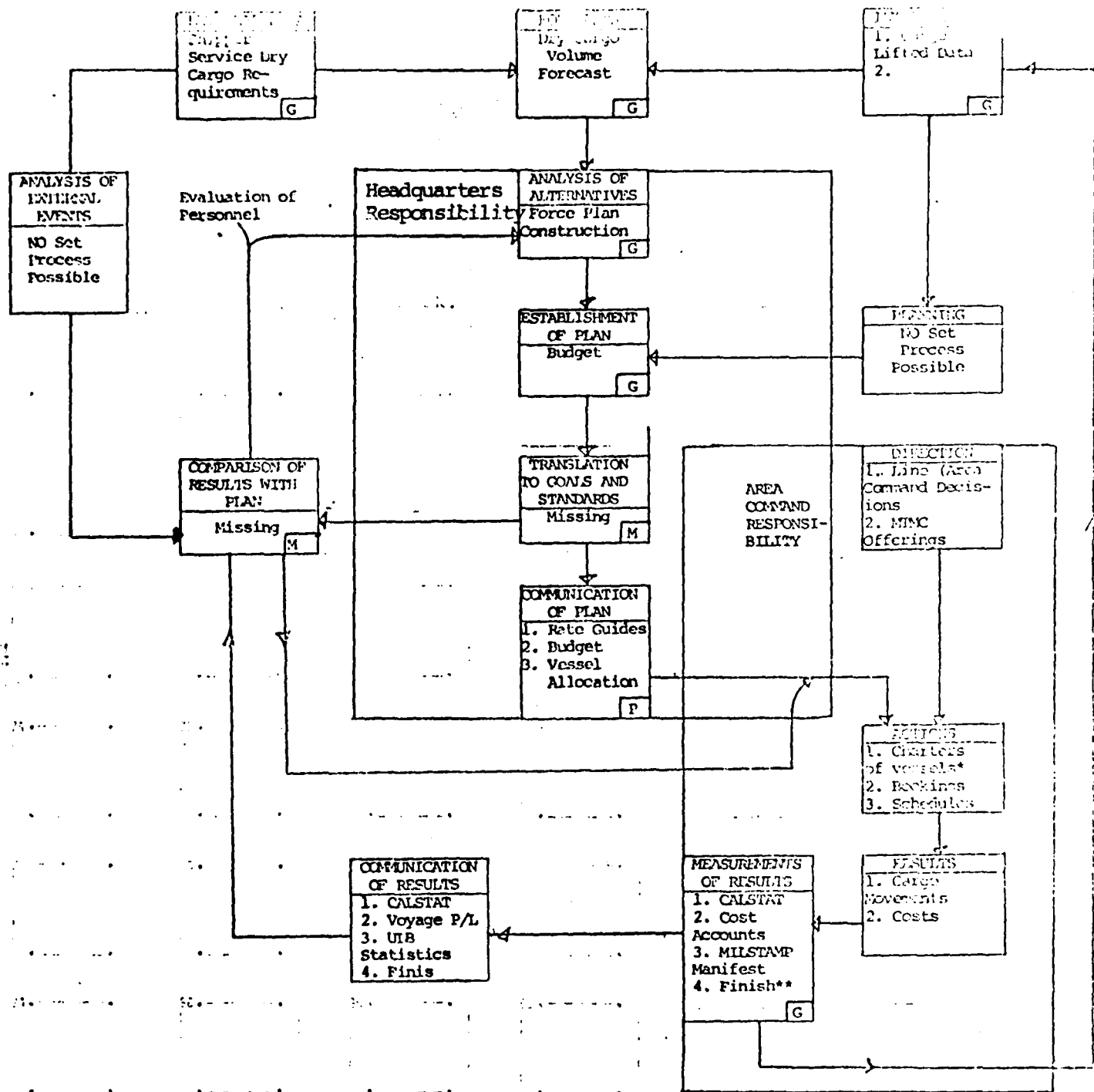
Likewise, the detailed measurement of shipping activities possible through the processing of unit level billing and MTMC manifest is a process well beyond the capabilities of most shipping companies.

Finally, the CALSTAT system, while not being prompt enough, is a system approaching that which many steamship companies would like to implement and have been unable to.

The weak point of the system is that communication of plans to the operating theaters, and the communication operating results backup for comparison with planned results.

Figure III.2 attempts to evaluate MSC's success in each category as being Good (G), Poor (P), and Missing (M). This type of ranking could not, of course, be more subjective but nevertheless is a good starting point for change and improvement.

It also must be noted that these are rankings of the systems performance, not of individuals or even sections.



Notes:
 * Headquarters Activity
 ** Pacific Command only

MSC CARGO MANAGEMENT SYSTEM

Some areas where MSC is notably deficient are husbanded by competent interested personnel who are trying hard to overcome their problems.

In any case from this point of view, an area which should yield large improvement is in attacking these middle level planning and communications problems which we see as creating operational problems at the area command level and a problem of applicability of the planning done at the headquarters level with the true needs of the area commands for guidance and support.

We see our initial recommendation of a thorough cost accounting system as a means of directly attacking these problems without interfering with the existing direct lines of command and control.

IV. SYSTEM DETAILS

After our overall discussion of the MSC cargo management system, the manner in which it addresses the various components of MSC's mission will now be discussed.

We will consider first the more general activities of MSC management - such as 'system management' and proceed progressively towards more programmed activities such as container booking. The goal of each discussion is to briefly discuss the nature of the function, then to address how well it is supported by MSC's existing cargo management system and finally to provide some constructive ideas for improvement.

IV.1 System Management

The process of overall system management is, of course, in reality an unlimited one. In general, it is a questioning of existing practices to determine areas where improvement is possible and cost effective. In a descriptive sense the questions to be asked are:

1. Where can costs be reduced?
2. If the cost reductions involve changes in services, will clients agree?
3. In what areas can the marketing base of the organization be expanded or solidified?
4. Where did the system not meet the expectations of its clients and why?
5. Can additional services be offered. Can they be billed to defray their cost?
6. Is there a balance within the organization between short and long range planning?
7. Is experimentation and innovation supported?

Table IV.1-1 shows our understanding of how MSC has limited these open-ended questions to ones susceptible to more concrete action.

In considering the information required to go about this type of management, it is useful to consider the psychological origins of this type of activity. It seems to stem from

1. Deviation from planned performance
2. Curiosity (perhaps deviation from idealized performance)
3. Query from outside (deviation from advertised or expected performance)
4. Query from below (deviation of performance from common sense)
5. Observation

TABLE IV.1-1
PROCESS: SYSTEM MANAGEMENT

Functions Involved

1. Locate inefficiencies
2. Review and improve procedures
3. Liaison with MTMC and shipper services
4. Determine staffing and travel budget
5. Budgeting and accounting

Goals of Functions

1. Locate inefficiencies
 - a. Understand global functioning of system to provide baseline
 - b. Track operational activities
 - c. Pinpoint symptoms of trouble and locate precise problem
2. Review and improve procedures
 - a. Treat problem found above as problem to eliminated through improved methods
 - b. Devise and implement new methods
 - c. Ensure problem solved
 - d. Utilize modern technology and techniques to best advantage with MSC
3. Liaison with MTMC and shipper services
 - a. When inefficiency in system caused by other agency, inform responsible people to how to improve
 - b. Provide feedback of actual financial and operating results of others operating policies
 - c. Receive same from other agencies
4. Determine staffing and travel budget
 - a. Evaluate number and skill of people required to operate MSC
 - b. Ensure personnel and tasks properly matched
 - c. Ensure travel at optimum level for organizational efficiency

TABLE IV.1-1

(continued)

5. Budgeting and Accounting

- a. Support function 1.a (locating inefficiency)
by ensuring information in budgets and
accounts is plausible when compared to
real situation
- b. Separate volume and other exogenous effects
from those of operational management

6. Experience from outside fields
7. Environmental pressures
8. Rewards for innovation

The first three of these areas are somewhat amenable to objective treatment by information systems. The fifth, observation, is measured by the knowledge that system managers have of actual practice. While difficult to describe in detail, the signs of the observation function being properly performed are message traffic being read by high level managers, travel to operational areas by all levels of management, etc. From below, it is easy to observe when the observation function is done poorly - as when this insures instructions by the management do not seem to make sense or achieve a real purpose as seen by those whose job it is to carry out the instructions.

Most good operating management is a synthesis of imagination and planning combined with a clear definition of an operation's goals. From the point of view of providing an environment conducive to good management, the first principle is not to stifle ideas until they are understood and evaluated. The second is to place the emphasis on achievement or on the usefulness of ideas, the third is to indicate to managers areas where their attention is most likely to be rewarded with results.

It is this third area where routine management information systems are of the greatest potential benefit. This focusing is most easily accomplished when there exist proper metrics to adequately describe normal system operation. Information provided is presented in terms of those metrics to force management's decision to indicated problem areas.

MSC has three principal systems which provide it with hard information concerning its performance in the field. These are:

1. CALSTAT
2. Unit Level Billing (and MILSTAMP) offshoot reports
3. Sealift Voyage Analysis and Accounting System

CALSTAT provides hard factual information concerning operations of MSC controlled vessels. Its principal task is an accounting for the time of MSC controlled vessels and for the bunkers they burn.

The Unit Level Billing System (by which is meant all 20 series computer programs, their input, and output) provides a variety of reports concerning traffic volumes.

The Sealift Voyage Analysis (program 050) provides management with statements of profit and loss for historically completed voyages.

Additionally the Pacific command is installing the FINIS system which will provide it with some inhouse information system capability.

Nearly all responsibility for input into the systems and for clarification of omissions and error lies at the area command level, while the operation of the system, printing and distribution of reports and system maintenance (i.e. changes to programs) lies in Washington.

The three systems are detail-centered systems and do a good job of capturing the details of operational, cargo, and financial behavior of the system. The sum of the individual records are above average in quality of business records and much effort is expended in an effort to maintain well organized correct records.

Where the system begins to have troubles is in the communication of the physical results to management.

These troubles become more severe when an attempt is made to compare these results to the planned operating results.

The first problem in the communication of results is that insufficient attention has been paid to communicating the results in ways which are meaningful to decision makers. In essence nearly all reports generated by these systems are just file dumps consisting of printing all records with a heading at the top and with a few textual substitutions if the codes cannot be understood well. Additionally there are a few simple averages and sums by category made.

The first of these systems, CALSTAT, does not provide any information easily used for system management. It produces a detailed accounting for the vessel's time and bunkers, but produces no usable summary of what actually happened and no indication of exceptional or noteworthy occurrences. As a result, the information it provides is usable only if the user basically knows what he is looking for and has the time and patience to look through the report.

In order for the information available from this program to be improved, standards to evaluate data it presents must be established. At present, the only operational standards available are those coming from vessel charter parties. However, it is desirable to establish standards for the promptness of vessel arrival, time between vessel arrival and the beginning of cargo operations, number of gangs provided, delays caused by poor arrangements for the delivery of cargo to the terminal, etc.

With these incorporated into the system to locate exceptional conditions, the CALSTAT system could be used to focus managerial attention on specific areas of

difficulty within MSC.

The second source of information available for system management is the Unit Level Billing System and the MILSTAMP Documentation System. From a market research point of view this system presents a wealth of information that is potentially of great use in system management. However, again, its use is hampered by the volume of material and its presentation in reports.

The problem here is similar to that of the CALSTAT reports. Information is insufficiently processed with the intention of determining what, if anything, could be done to improve the situation. For example reports made from the Unit Level Billing information gives the utilization (based on volume) of all containers shipped and average utilization by specific shippers. However, due to a lack of operational standards to interpret the raw data collected in this report, its usefulness is severely compromised. For example, the program labels nearly all containers loaded to their weight limit (as opposed to cube limit) as being underutilized - which is of course untrue. Second, the report does not present data in a format suitable for the generation of ideas on how to improve utilization. It could, for example, print out histograms of the utilization of individual containers by stuffing activity. This would perhaps lead to ideas on how to issue better guidelines for equipment.

The accounting system is the third area where information is provided for general system management. In general, most of the accounting work done at MSC is quite good and satisfies the general goal of stewardship accounting of accurately portraying the financial condition of the organization. However, for a variety of

reasons it does not give adequate information to adequately aid in the system management function.

The first is that detailed level reports are based, to too large an extent, on average accruals, charges, and revenues. This leads to an inexact matching of costs against revenue on an operational level.

Second, these reports place too much emphasis on rather arbitrary measures of performance such as "vessel utilization" and "cost per ton mile" as indications of the level of performance.

It is an economic fact that the use of ratio tests (most bang for the buck, cost per ton mile, unit profit) can lead to misallocation of resource as they imply that the optimal lies where the slope of the ton mile cost function is the least rather than where the value of total cost for a given needed capacity is the least. This is illustrated by Figure IV.1-1 in a general mathematical sense. In this graph if capacity (A) is required, the optimal solution is to run the system at the configuration reflected by total cost (C) rather than total cost (D) even though the cost per ton mile for (A) (i.e. (E)) is greater than for the thought optimum (B) (i.e. (C)).

This difficulty could be eliminated if management attention was directed towards either the total cost for a given capacity level or at marginal costs. As MSC does not operate in a competitive environment where its prices are competitively set, the marginal approach will not be as useful as the total cost.

In a practical sense the recommendation is that the accounting system be changed to provide only total costs broken down by mechanism generating them (bunkers, charter hire, stevedoring expenses, etc.). In other

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JOB _____
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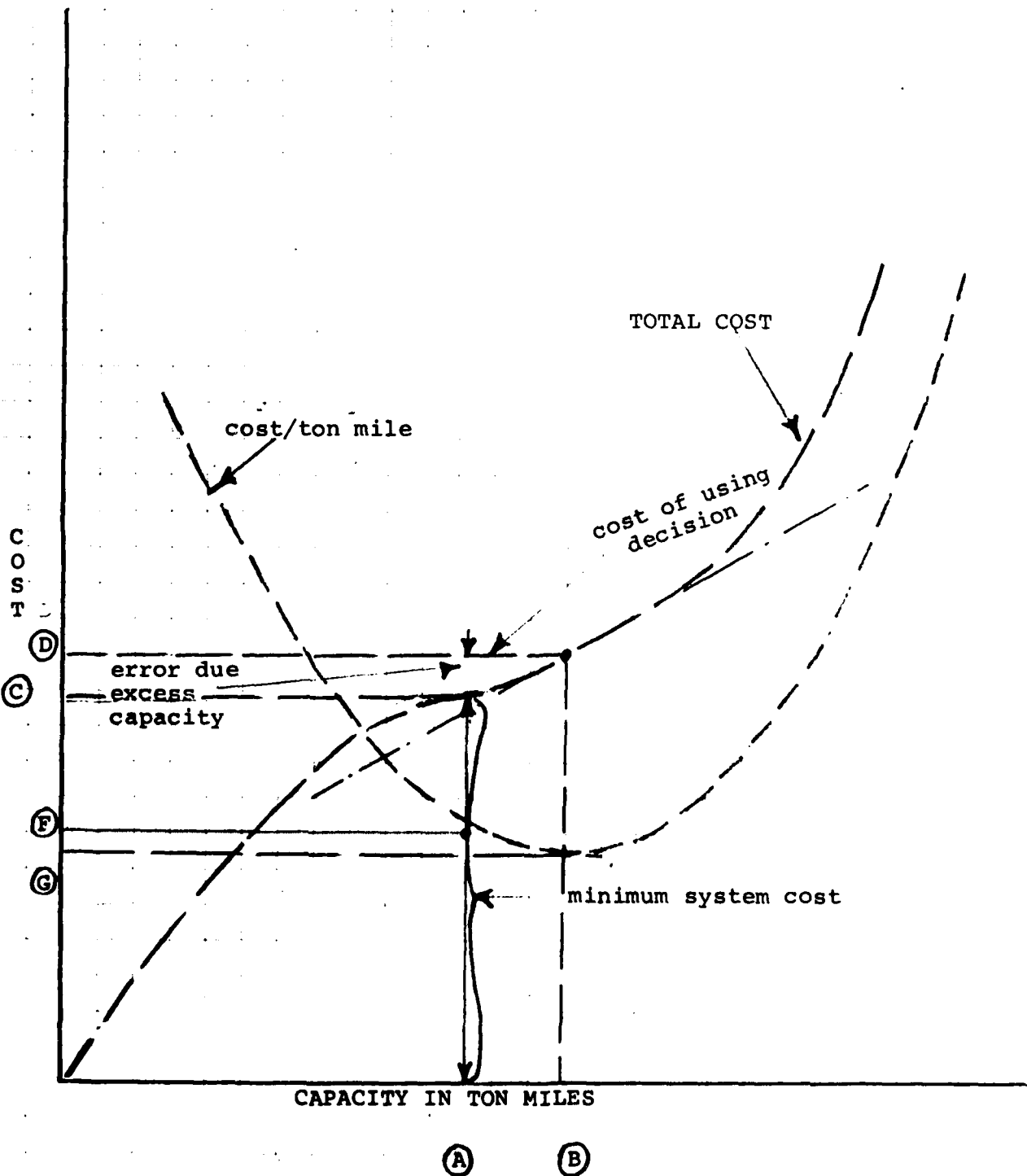


FIGURE IV.1-1
 COST VERSUS CAPACITY

words the cost per day for a vessel is more meaningful in determining its economic usefulness than the cost per ton mile it can produce when fully utilized.

Another area where MSC accounting places incorrect emphasis is on the utilization of vessels. First utilization in this system is incorrectly calculated because:

1. Vessels in ROS (having a utilization of 0%) do not show up in reports as being poorly utilized.
2. The measure of utilization used is the bale cubic of vessels. For properly selected vessels it is the percentage of deadweight used. That is their true utilization. When a break bulk vessel is used to carry vehicles (being perhaps economically well selected but not technically suited), the proper measure would be utilization of deck area.

Second, the utilization of vessels has no necessary connection with the maximization of MSC's system wide results. This means that the least productive assets (for example the Mirfak or maybe the Bromstrom) should be underutilized in order to raise the utilization of the more productive ones - for example, the Comet or Meteor.

While the above is very general, a specific recommendation is that the utilization of vessels not even be calculated, as in an operational sense, it only has meaning if more cargo could be booked for a voyage via management intervention.

In terms of improvement, specific recommendations are difficult to make because the implementation of truly adequate systems in this area is difficult and sometimes costly. The general goal is to inform management when the system performance is at variance with plans, to provide area commands with plans not dependent

on a particular cargo throughput (as this is outside MSC control), and to better allocate costs to particular decisions. The accounting discipline that is intended to do this is that of 'cost accounting' and it is our recommendation that the implementation of such a system be studied with the very serious intention of its implementation. The specific details of this are discussed later in this report.

IV.2 Container Shipping Capacity Adjustment

Container capacity adjustment is again somewhat a misnomer, as MSC makes no specific commitments to tender cargo and hence really has no capacity to adjust. What is meant here is a more careful consideration of the allocation of container cargo between types of contracts and is directly analogous to the market 'channel' analysis used to determine how consumer goods should be sold.

Currently MSC uses two main 'channels' to acquire capacity--the rate agreement and the shipping contract with two other forms used less frequently. There are numerous other arrangements possible, some of which are shown in Table IV.2-1.

This type of market research function is now partially performed by the '3' section in headquarters. The process for conducting this type of activity is shown in Table IV.2-2. This kind of activity is an expansion of the current headquarters function involving the preparation of the force plan. It does not involve an increase in information volume than currently used in the force plan preparation.

This type of evaluation of how to organize procurement activities could be expected to bring about some economies.

For example, the Naval Bases at Rota, Spain and in Guantanamo, Cuba would seem to have similar requirements for shipping. Would not significant organization and rate economies be obtained if Rota was serviced with a shipping contract. To our knowledge two companies regularly call at Cadiz (the port for Rota) - Prudential Lines and Farrel Lines (formerly American Export). Prudential Lines operates LASH vessels on the route which cannot enter the port and all cargo must be handled in barges. LASH

TABLE IV.2-1
EXISTING AND POSSIBLE CONTRACT FORMS FOR CONTAINER CARRIAGE

	Operational Labor Required to Use (Manhours)	Operational Labor (Skill Level)	Management Skill To Setup or Use Extensively	Probable Cost
<u>Existing Contract Forms</u>				
1. Commercial Bill of Lading	Large	Large	Medium	Above
2. Government Bill of Lading	Large	Large	Large	Less
3. Rate Agreement	Large	Low	Done Already	Lower Still
4. Shipping Contract	Medium	Low	Already Done	Lowest
<u>Alternative Contract Forms</u>				
5. Contract of affreightment (commercial format)	Less than medium	Low	Small	?
6. Block chartering of slot space	Medium	Low	Small	?
7. Simplification of existing agreements	Medium	Low	Small	?
8. Fixed fee contract to freight forwarder for system management	None	None	Small	Larger
9. Increased use of government owned containers	Medium	Low	Medium	?
10. Active government use of container pools	Medium	Higher	Medium	?
11. Change government terms or purchase to CIF port of destination	Less than Medium	Low	Small	?
12. 1000 Additional ideas by others				

TABLE IV.2-2

PROCESS: CONTAINER SHIPPING CAPACITY ADJUSTMENT

Headquarters Functions Involved

1. Estimation of cargo flows for inhouse evaluation
2. Development of alternative contractual arrangements for inhouse evaluation
3. Inhouse evaluation
4. Allocation of forecast demands between rate agreement, shipping contract, common carrier, and other arrangements
5. Procurement of capacity elsewhere covered

Goals of Functions

1. Estimation of cargo flows for inhouse evaluation
 - a. Establish volume and its stability sufficient to get and obtain innovative ideas for its improvement
 - b. Provide volume information to operators sufficient to allow informed bids when requested
2. Development of alternative contractual agreements
 - a. Systematically evaluate technical and financial aspects of existing arrangements
 - b. Evaluation influence of operating environment on results from contracts
 - c. Development of other candidate contractual forms
3. Inhouse Evaluation
 - a. Preliminary optimization and evaluation of each contract
3. Allocation of forecast demand between modes
 - a. System optimization dividing transportation pie between types of contracts. This is be direct preparation for RFP.
5. Procurement
 - a. Release of RFP and evaluation of results

vessels thus would be only used for very large shipments in the break bulk mode. Hence Farrel Lines would receive all of the cargo.

First in the current environment why use the current booking procedure when one carrier in principal can get the cargo anyway? Second, if a shipping contract were used, there would be more competition in the rate setting as Prudential Lines, seeing the increased volume and ability to deliver cargo in the barges directly to the naval base, clearly could submit a competitive bid.

IV.2.1 Break Bulk Shipping Capacity Adjustment

The current method used for break bulk shipping capacity adjustment is to analyze requirements as received unilaterally from the respective services in terms of measurement tons (40 cubic feet), by area of origin and destination, class of cargo, and program. Trend analysis (and shipper services) are first used to validate the requirement. The major information used in this analysis are:

1. Shipper Services Annual FY Reports of MSC Ocean Transport Req. Cargo
2. Measurement Ton Mile (MT) Development of Shipper Service Annual Req.
3. Cargo Operations, Budget Vs Actual Analysis
4. Monthly Ship Activity Report
5. Summary of Chartered Ships
6. Container and Off Hire Files
7. Weekly Schedule of Cargo Ships
8. Ship Characteristics Record
9. Various other Mgt. Reports.

MSC reviews requirements as submitted and apparent discrepancies such as omissions or significant variations from recent experience are resolved by formal or informal action devised with concurrence of the appropriate service.

MSC receives requirement and provides (or procures) transportation space in accordance with policies and proceeds. Each military service is responsible for determination of CONUS outbound, inbound, intercoastal, and coastal outbound requirements. The availability and planned utilization of nucleus and berth shipping is evaluated and changes in contractual arrangements, if any, are studied to assure satisfaction

of requirements by route, cargo class, and mode. All remaining break bulk cargo after allocations to nucleus and berth shipping is assigned to time charter ship with the reservation, the GAA shipping may be planned in the event that there are requirements clearly in excess of nucleus, berth, and charter capabilities. Techniques used include examination of MTs, MTMs, as well as their ratios and miles/MT, by route, cargo class, and mode. This then leads to the Cargo Operating Force Plan which is designed to provide decision information showing probably magnitude and character of onward MSC dry cargo workload and proposed manner of accomplishment.

The method used to develop the cargo force plan consists of planning the amount of cargo by class to be lifted by the various shipping modes, nucleus, charter, GAA, mill van, shipping contract, shipping agreement, berth term. etc. by correlating requirements with recent experience and adjusting for known and predicted variations caused by cargo trends, policy, and availability of shipping. The results are presented in the MSC Force Memorandum, which is primarily a forecast of the character and composition of ships necessary for performance of MSC mission as determined from review and analysis of shipper service cargo requirements as discussed above plus the needs of contingency plans and sealift capability.

The current method of developing Break Bulk Shipping Capacity Adjustments serves primarily to determine budget and contracting requirements. The main purpose of the capacity adjustment approach appears to be to provide financial information and hence budget (and deficit) forecasts. Little attempt is made in this approach to assist in the operational planning or in the

determination of how alternative operational plans would affect the budget requirements. The planning horizon is too short for effective, for any but short term, chartering decisions, and the information provided is too detailed for effective operational planning. It consists largely of using large files of detailed information with sometimes questionable accuracy. The plans developed for both Atlantic and Pacific services use the same approach, though Atlantic services, with significantly fewer port calls, constitute a different planning problem from Pacific services which are subject to many more and more varied requirements. In fact it appears that the Area Commands are not really involved in capacity planning in a meaningful sense.

General cargo capacity adjustment is made in a number of different ways. Currently MSC uses several 'channels' to acquire capacity: time charter, rate agreement, shipping contract, and General Agency agreement with other forms used less frequently. There are many other arrangements which could be used to attain cargo capacity adjustments, some of which are shown in Table IV.2-1.

The evaluation of alternative contractual arrangements is now generally performed by Section 3 in headquarters. The process is described in Table IV.2-2 which depicts an expansion of the current headquarters function involving the preparation of the force plan. The information required for this approach is the same as currently used in force plan preparation. The proposed approach can be expected to provide economies in capacity adjustments and improvements in demand responsiveness.

TABLE IV.2.1-1
Existing and Possible Contract Forms for
Break Bulk Carriage

Existing Used Contract Forms	Operational Labor Required to Use (Manhours)	Operational Labor (Skill Level)	Management Skill to Set Up and Use Extensively	Probable Cost
1. Government Bill of Lading	Large	Large	Medium	Fair
2. Rate Agreement	Large	Low	Already Done	Less
3. General Agency Agreement	Medium	Low	Already Done	Less
4. Time Charter	Medium	Low	Already Done	Less
5. Shipping Contract	Medium	Low	Already Done	Lowest
6. Shipping Agreements	Medium	Low	Already Done	Lowest
<u>Alternative Contract Form</u>				
7. Voyage Charter	Medium	Low	Small	?
8. Contract of Affreightment (Commercial Format)	Less than Medium	Low	Small	?
9. Block Space Chartering	Medium	Low	Small	?
10. Fixed Fee Contract to Freight Forwarder for Systems Management	None	None	Small	Larger
11. Commercial Bill of Lading	Large	Large	Medium	Fair
12. Change of Government Terms of Procurement to CIF port of destination basis	Medium	Low	Small	?

TABLE IV.2.1.1-2

Process: Break Bulk Shipping Capacity Adjustment

Headquarters Functions Involved

1. Estimation of cargo flows for inhouse evaluation from information obtained from services and other shippers
2. Review and adjustment of capacity demand estimate by discussion with services and other shippers
3. Evaluation of availability and planned utilization of nucleus and berth shipping
4. Study of changes in contractual arrangements, if any
5. Inhouse evaluation of capacity adjustment requirement
6. Allocation of remaining break bulk cargo to time charter ships, and GAA ships or other contractual arrangements where requirements clearly in excess of nucleus, berth, and charter capabilities
7. Procurement of added capacity

Goals of Functions

1. Estimation of cargo flows for inhouse evaluation
 - a. Review forecasted cargo flows for stability and balance
 - b. Compare with recent capacity allocations
2. Review and adjustment of capacity demand
 - a. Resolution of discrepancies and omissions introduced by shippers stated demand
 - b. Improvement in capacity and budget planning
3. Evaluation of availability and planned utilization of nucleus and berth shipping

TABLE IV.2.1-2
(continued)

- a. Estimate of capacity adjustment requirements
- 4. Study of changes in contractual arrangements
 - a. Systematically evaluate technical and financial aspects of existing arrangements
 - b. Evaluation of influence of requirements on results from alternative contracts
 - c. Development of other contractual arrangements
- 5. Inhouse evaluation of capacity adjustment requirements
 - a. Preliminary cost and operational evaluation of different contractual arrangements
 - b. Review of relative effectiveness or optimization in contracting to meet capacity adjustments
- 6. Allocation of remaining cargo
 - a. Division of cargo demand between types of contracts
- 7. Procurement of added capacity
 - a. Release of RFP and evaluation of results

IV.2.2 Improvements Possible in Capacity Adjustment

The key to imaginative and productive use of the capacity adjustment process is to improve the quality of the forecasts available to MSC's management. The basic forecasts available were described in Section III.2.1 and III.2.2.

The three main possible purposes behind forecast generation are:

1. Scheduling existing resources
2. Acquiring additional resources
3. Determining what type of resources are required
4. Budgetary estimation of operating results.

Of these the principal use of the forecast is number four - Budgeting. A second major use of the forecast is number two ensuring the adequacy of break bulk shipping resources.

The methodology of the creation of the cargo forecast and resulting force plan is premised on the idea that MSC is to meet a demand for transportation placed on it by the shipping services. From this point of view it is each service's responsibility to plan their future shipments and make these requirements known to MSC. It is MSC's job to organize and sum up all these requests and to plan a systematic strategy to meet these total requirements.

The procedure used is heavily dependent on the past years shipments as the next years plan basically consists of modifications of past history. There is little alternative to the past history approach, when the expectation of planners is to produce detailed route by route forecast, as only past history of operations will provide a sufficiently large data base to accomplish this task.

However, one result of this approach is that sufficient attention cannot be given to areas where

MSC's operating environment has changed significantly causing extrapolations to be inadequate for planning. It is on these areas where more attention should be placed.

To the extent the forecast is used for budgetary purposes (i.e. the container operation), it is only routes where costs differ from revenues where the accuracy of MSC's forecasts matters. That is to say when freights charged shippers approximate charges from shipping companies, errors in volume estimation have no impact on financial results. On routes where there is a large variance between cost and revenue, a volume variance will have a big impact on financial results. To single these out, a computer program should specifically label these routes and additional attention should be given to ensure that the volume estimates on these routes only.

On the break bulk operation, it is our feeling that the procedure of zero base budgeting should be adopted in addition to the present procedure, the allocation of vessels starts from scratch and more detailed scrutiny is given to how and which vessels should be deployed to meet the posited demand. This exercise should try to estimate demand for logistics from major troop deployments, world events, etc. The goal here is to keep the problem computationally simple to allow more thought to be devoted to which vessels best suit demand. This effort should be made in parallel with the current force plan exercise and when both forecasts are prepared, they should be reconciled.

Another characteristic of the current forecasting technique is that no use is made of operations research technology available for forecasting. Modern forecasting technology works and has helped many enterprises improve their planning. Unless the fundamental premise of MSC's

forecasting (that the shippers provide transportation requirements) is changed, the principal use of such techniques would be more accurate filtering of these supplied forecasts for errors and the ability to prepare more and better documented "challenges" to supplied numbers.

Our recommendation is that an exponentially weighted average forecasting technique be tried on larger routes. This method is quite simple and could be integrated nicely into the method Mr. Dickell now used to prepare the force plan. To use this method, the data must be aggregated more closely by the mechanism generating the demand (e.g. New Cumberland shipments and their historical destinations sorted out separately) and the technique applied to the individual but still large flow. See Appendix 2.

The general goal of all these recommendations is to first mechanically sift through the data to locate errors and second, to make the forecasting exercise more oriented to make facts from figures.

IV.3 Container Shipping Procurement

The term 'procurement' is a bit misleading when describing the MSC container operation. In fact the principal areas of bargaining are the terms and rates at which a service will be provided without any mention or commitment to particular volumes. Hence, actual procurement is accomplished by the issuance of a shipping order which is a contract to a carrier - under terms negotiated in the procurement bargaining process.

Container capacity procurement is now confined to two contractual arrangements: 1) The Rate Agreement, and 2) The Shipping Contract.

The Rate Agreement leaves the carrier realistically (but not technically or legally) in the status of a common carrier. While the government is obligated to book cargo on the low rated carrier, in practice, scheduling considerations and maximum allowable market share on major routes allow the government considerable freedom in the routing of most shipments. The carrier is free to reject cargo subject only to the low rated carrier obligation. The rate agreement also summarizes a table of charges by each carrier. It thus differs significantly from commercial practice where each carrier would quote rates from the conference tariff and, at least on paper, all rates would be identical.

The shipping contract is analogous to the commercial contract of affreightment.* It commits the government to ship all cargo over a specific route and likewise commits the carrier to accept all cargo tendered by the government. As the rate at which cargo is carried is agreed when the contract is signed, the government is

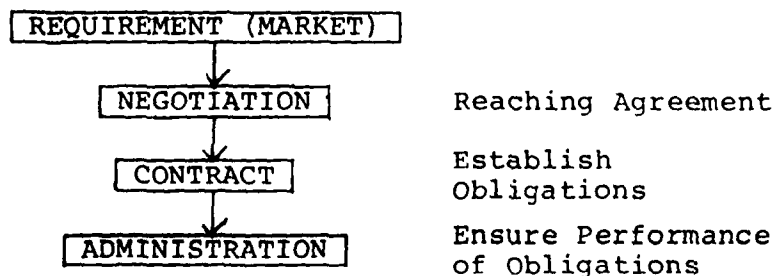
* In some ways, it also resembles the project cargo negotiated rates offered by all conferences.

in the position of knowing the cost of a service only by estimating the volumes flowing over the route. This is not the case with rate agreements, as the allocation of cargo between low, medium, and high rated carriers is not known, during the planning cycle at MSC.

Another difference between the contracts is thought to be their treatment by the Federal Maritime Commission. General Order 29 issued by the Commission late in 1972 states that military cargo bids must at least cover a carriers' "fully distributed costs" or they would be disapproved. While both types of contracts are explicitly subject to the scrutiny of the FMC, the type of scrutiny may not be the same in each case. Additionally the method of calculation of "fully distributed costs" may not be the same in each case.

More firms can bid on shipping contracts as there is no commitment to become common carrier. The notable features of each type of contract are shown in Tables IV.3-1 and IV.3-2.

In clearly understanding the function of headquarters, it is useful to distinguish the process of bargaining from that of actual exchange and transportation. From this point of view the bargaining function is made up of the three functions shown below.



This is clearly contrasted with the process of exchange which is the coordination and accomplishment of

TABLE IV.3-1-1 GENERAL TERMS OF "RATE AGREEMENT FOR CONTAINER CARRIAGE"

Contract Item	Section	Provision	Responsibility	
			Government	Carrier
<u>Basic Payment Terms</u>				
1. Invoice for Basic Charges Tendered (Basic Freight/Initial Line Haul)	I.4	Cargo Pickup or Delivery to Term		X
2. Initial Invoice Paid	I.4	Arrival Ves. + 48 Hours	X	
3. Payment of Remaining Charges	I.4	Delivery cargo + 48 Hours	X	
<u>Positioning Containers on Inbound and Outbound Legs</u>				
4. Shipping Documents			X	
5. Notice of Type (& Reefer Temp) and Place for Spotting Van	I.6	2 days	X	
6. Pickup of Container by Carrier	I.6	1 day if stuffed 3 days if empty		X
7. Beginning Linehaul	I.6	2 days dry cargo 1 day reefer		X
8. Provision container receipt data	I.6	8 hours after receipt		X
9. Provision of container loading data	I.6	8 hours after loading		X
10. List or containers loaded but NOT booked and reverse	I.6	8 hours after loading		X
11. Reefers to be precooled to proper temp	I.6	Yes or No		X
12. Notice of arrival of vessel	I.6	2 days		X

TABLE IV.3-1 (continued)

Contract Item	Section	Provision	Responsibility	
			Government	Carrier
<u>Container Detention - 3 free days allowed</u>				
13. Provide date and time of vessel arrival	I.6			X
14. Notice to release container for linehaul	I.7	Time runs from discharge to Rel.	X	
15. Notice of linehaul start	I.7			
16. Tender container for delivery at consignee	I.7			X
17. Tender empty container for redelivery	I.7		X	
<u>Frustrated Cargo</u>				
18. Stuffing time allowed	I.27	48 hours min		
<u>Low Rated Carrier Capacity Reservation</u>				
19. Low rated carrier capacity reservation	I.33	48 hours		
20. Advice to MSC of space reserved	I.33			X
21. Release of unrequired space	I.33	2 weeks	X	
<u>Failure of cargo to arrive on time</u>				
22. Information to calculate liquidated damages	I.34			X

TABLE IV.3-2
GENERAL TERMS "SHIPPING CONTRACT"

Contract Item		Section	Provision	Responsibility	
Level of Service				Government	Carrier
1.	Frequency of sailings	I.1.	<14 days		X
2.	Transit time	I.1	<9 days		X
3.	Additional tonnage added if requested	I.1		X	
4.	Shipping Documents	I.2			
<u>Basic Payment Terms</u>					
5.	Invoice for basic charges tendered (Basic Freight/Initial Drayage)	I.4	Cargo pickup of delivery to term		X
6.	Initial invoice paid	I.4	Arrival + 48 hours	X	
7.	Payment of remaining charges	I.4	Delivery cargo + 48 hours	X	
<u>Positioning of containers on inbound and outbound legs</u>					
8.	Notice of type (& reefer temp.) and place for spotting vans	I.5	2 days	X	
9.	Notice to pickup container	I.5	1 day stuffed	X	
10.	Pickup by carrier	I.5	3 days empty		X
11.	List of containers booked but not loaded and loaded but not booked	I.5			X
12.	Notice of arrival of vessel	I.5	>48 hours		X
13.	Reefers to be precooled to proper temp	I.5	yes or No		X

TABLE IV.3-2
GENERAL TERMS "SHIPPING CONTRACT"
(continued)

Contract Item	Section	Provision	Responsibility	
			Government	Carrier
14. Notice to deliver container	I.5		X	
15a. Delivery container in port area	I.5	>36 hrs/dry >24 hrs/reefer		X
15b. Delivery container in port area	I.5	>72 hrs/dr. >24 hrs/reefer		X
15c. Commence linehaul to outside port area	I.5	>48 hrs, dry >24 hrs/reefer		X
<u>Container Detention - 3 free days allowed</u>				
16. Notice of date and time of arrival	I.5			X
17. Release of container for linehaul	I.5	Time runs from	X	
18. Notice of commence linehaul	I.5			
19. Tender container to consignee	I.5		X	
20. Tender empty container for redelivery	I.5		X	
-- Guantanamo Free Time	I.5	10 days space between vessels		
22. Did empty miss return sailing	I.5			X
<u>Overweight Containers</u>				
23. Calculation of freight if carrier limits weight	I.5	Based on cargo measurement		X

TABLE IV.3-2
GENERAL TERMS "SHIPPING CONTRACT"
(continued)

Contract Item	Section	Provision	Responsibility	
			Government	Carrier
24. Notice on limitation of weight	I.5			X
25. Payment of costs for removal	I.5	Responsibility of government if in error		X
<u>Frustrated Cargo</u>				
26. Stuffing time allowed	I.5	> 48 hours		
27. Information to calculate	I.5			X
<u>Fuel Oil Allowance</u>				

the mechanical labor of physical delivery.

We now plan to explore the requirements of the headquarters for information from the point of view of adequately accomplishing the bargaining process. Additionally we plan to emphasize the guidance required to supervise transactions between members of the exchange function. These transactions can be outside the traditional concerns and contractual boundaries of any single enterprise. When the contents of the container agreements signed by MSC are reviewed, it is worthy to note that most of the text addresses the mechanics of the interface between government and contractor.

The basic process involved in bargaining for the procurement of container capacity is described in Table IV.3-3. The process is split into six basic functions, all of which are components of the three element bargaining process. The table also shows what the basic goals of the process are from the government's point of view.

The negotiation of the rate agreement serves two general functions. The first is, of course, to establish a contract to bind the parties and the second is to establish a clear definition of what the parties are bidding to provide when rates are submitted for evaluation.

In the process of rate solicitation, the two contractual channels differ as shown in Table IV.3-4. The two agreements further differ in that the rate agreement is a statement of rates charged, whereas the shipping contract represents a real competitive bid with an actual "victor".

The remainder of the functions performed are clear enough from the table. The one point that should be developed is the enforceability of the agreement. The items required to verify contractor compliance and to calculate fees are shown in Table IV.3-5 for the container rate agreement.

TABLE IV.3-3

PROCESS: CONTAINER SHIPPING PROCUREMENT CONTRACT -
RATE AGREEMENT

Headquarters Functions Involved

1. Negotiation of Rate Agreement
2. Solicitation of Rates Tendered
3. Evaluation of Contractor Contract Performance
4. Evaluation of MSC (and other service) contract Performance and Utilization of Services Provided
5. Supervision of Disbursements
6. Preparation of Budgets

Goals of Functions

1. Negotiation of Rate Agreement
 - a. Establish contractual relation with carrier more favorable than if he was used as common carrier
 - b. Establish procedure for transfer of cargo and cargo documentation between carrier and government reflecting the above
 - c. Standardize services covered to place bids on common basis
 - d. Inform contracting carriers what they are bidding on
 - e. Establish contractual definition of services clear enough to verify carrier performance
2. Solicitation of Rates
 - a. Obtain rates offered
 - b. Verify ability of contractor to perform
 - c. Ensure compliance with FMC
 - d. Publish rate guides and ensure distribution
3. Evaluation of Contractor Performance
 - a. Ensure contractor in compliance with rate agreement
 - b. Evaluation of "enforcibility" of provisions

TABLE IV.3-3 (continued)

4. Evaluation of MSC Contract Performance
 - a. Indicate areas where improved MSC performance results in savings to government
 - b. Evaluation of "enforcibility" of agreement
5. Supervision of Disbursements
 - a. Ensure payment and invoicing terms of contract complied with
 - b. Ensure system to ensure services billed for are in fact provided functions
6. Preparation of the Budget
 - a. Provide basis for Department of Defense budgetary and NIF planning
 - b. Provide basis for evaluating MSC performance.

TABLE IV.3-4
TIME BETWEEN NEGOTIATIONS OF FINANCIAL AND
TECHNICAL ELEMENTS OF CONTRACTS

<u>Item</u>	<u>Rate Agreement</u>	<u>Shipping Contract</u>
Contract "boiler plate"	Annually	Term of contract typically 2 years
Rates	Every 6 months	Term of contract
Bunker adjustment	Monthly	Monthly

TABLE IV.3-5
INFORMATION REQUIRED TO ENFORCE CONTAINER RATE AGREEMENT

<u>Information</u>	<u>Type of Info</u>	<u>Use</u>	<u>Source</u>	<u>Time to Proceed</u>
1. Notice to carrier to send container	Time	P	MSC	
2. Arrival of container at stuffing facility	Time	PI	MSC/carrier	>2 days
3. Notice to carrier to remove container	Time	PI	MSC	
4. Removal of container from stuffing facility	Time	PI	MSC/carrier	<1 day stuffed <3 days empty
Arrival of container at terminal	Time	PI	Carrier	<8 hours
6. Loading of container on vessel	Time	PI	Carrier	<8 hours
7. Arrival of vessel	Time	PI	Carrier	
8. Unloading container	Time	PI	Carrier	
9. Release of container for linehaul	Time	PI	MSC	
10. Beginning of linehaul	Time	PI	Carrier	<2 days dry cargo <1 day reefer
11. Arrival of container at consignee	Time	PI	MSC/Carrier	
12. Release of empty for return	Time	PI	MSC	
13. Pickup empty	Time	PI	MSC/carrier	
14. Size and type of container place wanted	Info	P	MSC	
15. Temperature of Reefers	Info	P	MSC	
16. Nature of contents	Info	I	MSC	
17. Shipping documents	Info	P	MSC	Prior sailing

TABLE IV.3-5
(continued)

Information	Type of Info	Use	Source	Time to Proceed
18. Accounting for reserved space	Info	Good faith damages	Carrier	
19. Release of reserved space	Info	P	MSC	>2 weeks
20. Allocation of cargo between carriers	Info	Good faith	MSC	Quarterly
-- Initial invoice	Info	Pay bill	Carrier	
22. Initial payment	Money	Pay bill	MSC	2 days
23. Final invoice	Info	Pay bill	Carrier	
24. Final payment	Money	Pay bill	MSC	2 days

P = Process required to handle cargo

I = Invoice Calculation for each container lifted

Additional information required for the shipping contract is shown in Table IV.3-6. This information is largely specific to the trade route of the sample agreement (Norfolk to Guantanamo) and is not due to the intrinsic nature of this type of agreement.

Items labeled with a "P" on these tables are procedurally required to handle freight and those labeled "I" are used to calculate the invoice for each container moved. Those labeled "MSC" are known initially to MSC and those labeled "Carrier" are known initially to the carrier.

Especially for the shipping contract, this seems to be a very complicated structure with much information required to document invoices for relatively small but numerous charges.

Figure IV.3-1 shows an idea plan for the flow of information required to support both the implementation of the container agreements at the area command level and the procurement function at the headquarters level.

Across the bottom of the figure are the seven functional areas describing the physical movement of the cargo and manual labor required to do so. Above this are the parties involved with the actual performance of the tasks. Above this is the information required in the provisions of rate agreement and shipping contract. Above this is the types of questions which should be operationally asked at the area command level. It should be noted that they can all be answered to the information below them required by the rate agreement. Thus the lower section of the diagram describes an information system which should now be functioning at the operational level. Without this system, verification of invoices for payment is not possible.

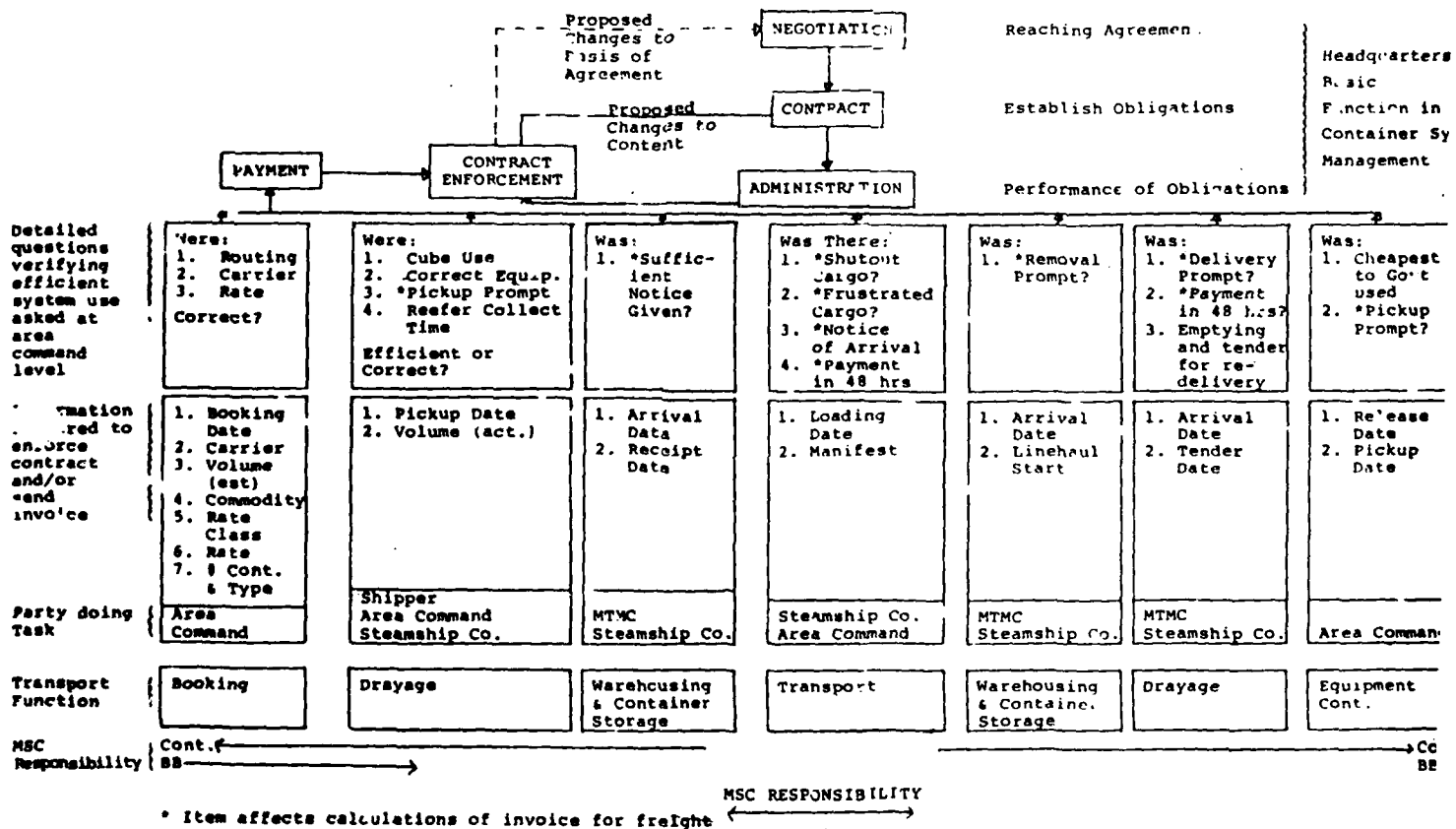
The exact format of the system is not described. It could be decentralized with the transportation officer in

TABLE IV.3-6

ADDITIONAL INFORMATION REQUIRED

	Type of Info	Use	Source	Time to Proceed
25. Did empty miss sailing	Info	+	Carrier	
26. Reason for miss	Info		MSC	
27. Notice of limitation	Info		Carrier	
28. Weight loaded	Info		MSC	
29. Costs incurred	Info	I		
30. Frequency of sailings	Ing	Contract	MSC	
31. Transit time	Info	Cancellation	MSC	

FIGURE II.3 FLOW OF INFORMATION REQUIRED TONNAGE-PROCUREMENT FUNCTION



say Cadiz, Spain, signing invoices stating they are correct and submitting them for payment. It could be centralized with MILSTAMP and CALSTAT providing required information.

Following this the information should be systematically summarized in a form necessary to administer the agreement at a headquarters level. This includes insuring that the location of funds in various bank accounts administered by MSC is current, providing assurance that contractors are meeting their agreements.

The "payment" function shown on the diagram is an area command function and requires, as has been stated, information on all seven physical functions.

Both the payment and administration functions then provide information to the contract enforcement function. This is not intended to be an argumentative function, but a thoughtful, critical, and introspective one that should yield ideas for improving the entire process through contract modification.

The approach outlined above is not necessary to going through the motions of administering the system, but it is an absolute requirement to the informed achievement of MSC's goals through systematic management.

MSC does, to some extent, receive information in a form usable to manage the system. However, there are some clear gaps. MSC headquarters does not have, for example, a good knowledge of dangerous cargo shipped in its system. Likewise it has a poor understanding of the quality of reefer service provided. Are old labels always removed from containers? Has this caused the thawing of frozen meat and the freezing of vegetables? Are reefer containers provided for MSC cargo well maintained? Is the mix of manual and auto defrost types provided representative of operator's fleet mix or is MSC being

provided old equipment just because it has difficulty intentionally not booking cargo without good documentation of poor performance? Are these troubles confined to specific carriers?

There are other areas where the system could possibly be improved by informed questioning. One is the seemingly arbitrarily enforced division between break bulk and containerized cargo. The structure of the overall MSC system treats LASH capacity as break bulk. Hence a different rate is paid if cargo is loaded into containers and subsequently into barges than if directly loaded into barges. Direct barge use will always be more than container because the freight is based on the total internal cube of the barge, whereas when the cargo is shipped in containers loaded in a barge, freight is computed on the sum of the internal cubes of the containers which will be less than the internal cube of the barge. This puts the LASH system at a bad disadvantage. On some routes, such as between Norfolk and Rota, Spain, very little cargo is carried on the LASH services available when it seems ideally suited to the supply of a naval base.

The solicitation of rates and their publication has not been, to date, thoroughly explored. It seems, however, that there are some pathologies in the current methodology.

First, the low rated carrier on inbound legs is not now required to reserve capacity as on the outbound. This could conceivably cause a situation where MSC was unable to exploit a low inbound rate because of a lack of equipment.

For example, between U.S. West Coast and Korea outbound SeaLand is the low rated carrier with a rate of \$26.00, but inbound has a rate of \$60.00. While PFEL had a rate of \$28.60 in both directions, this would cause SeaLand to have more containers in Korea than PFEL and

possibly limit MSC's ability to book cargo at the lower rate because of a lack of equipment.

IV.4 Routing and Scheduling

Routing is the determination of a vessel's ports of call and their order. Scheduling is the determination of specific dates for ports of call and their publication for all concerned. The routing and scheduling of vessels is one of the most critical areas to success in steam ship operation. For tramp operators routing determines which charters can be accepted, and hence the vessel's income. For liner operators routing is of minor importance, but scheduling determines what cargo is offered, the length of port calls, number of cargo restows, etc.

Considering the criticality of this area to a company's success, there have been numerous, some very sophisticated attempts to attack this problem using systems analysis techniques. Most of these efforts have not been successful and have been abandoned.

In the liner area, a major reason for this is the degree of integration of the vessel's schedule with those of trains and trucks and the difficulties created for shippers and their banks if bills of lading must be reissued. As a result companies providing an undependable service are not blessed with any 'brand loyalty' by their customers. This is particularly true when the erratic schedule is for the economic convenience of the steam ship company and, because of conference and RMC rules, cost reductions are not easily passed on to the shippers. It is important to understand that once a schedule is published (for commercial operators) or bookings made (for MSC), revisions made in the promised schedule on the basis of a technical optimization technique will be perceived as unreliable service by shippers. Additionally many important factors in liner shipping cannot be built easily into mathematical models and accurate ones are either difficult or impossible to solve. This is not to

say that there have been or will be no successes, but only that there have been many failures.

Tanker and other tramp operators tend not to perform scheduling functions as these are largely performed by vessel charterers.

In the field of integrated bulk transport, efforts have met with very good success, especially when the technique of liner programming is used. These models are used by nearly all oil companies quite effectively. The characteristics of all linear programs used in this fashion is they treat the entire upstream (production as opposed to downstream-sales and marketing) operation. Production of refineries is changed in response to transportation schedules, as well as the reverse. Also these operations have sufficient inventory holding capacities to allow optimal solutions to be used. They are large and allow linear programming's non-integer solutions to be interpreted plausibly - an oil company's planner's decision when the model says to send 18.3 tankers to Rastenburg is to send 18 or 19. For smaller operations, the model might have said send .3 vessels to Bremerhaven - a harder decision. Finally overall responsibility for the operations logistic and storage costs rests with the department using the model.

In MSC, the functions of routing and schedule construction are confined to the break bulk operation and are performed by the area commands. The Atlantic and Pacific area commands basically establish the routes and schedules for ships under their control. These are then modified by the Far East and European commands to maximize the backhaul utilization of the vessels. The resulting schedules are then published by the headquarters unit using the CALSTAT system.

The Pacific command is more deeply concerned with

routing than the Atlantic command. This is because the ships of the Atlantic command routinely serve fewer ports and can more easily be placed on a repetitive route.

For cargo moving commercially (the complete container operation and some break bulk), vessel schedules are set by the commercial operators and MSC is uninvolved.

MSC provides two basic tools to facilitate routing and scheduling. These are PROFORMA and CALSTAT. Additionally MTMC supplies information required to start scheduling and routing processes in the form of clearance orders for break bulk cargo.

In principal MSC lacks sufficient information to do its work well because of procedures used to book backhaul cargo. Basically the success of any operation in shipping is dependent on its ability to maximize the utilization of tonnage on underutilized voyage legs. For MSC these are frequently inbound legs. MSC receives very poor information on cargo prospectus inbound to the U.S. and hence must do most of its planning blindly for return trips.

This is the area where improvement in the situation may be most easily obtained. In view of the visibility and size of the continental U.S. area command, much effort and study has historically been expended on their problems; however, relatively little seems to have been done of those on the Far East or Europe.

Additionally most liner operations serving the U.S. are more likely to cube out on the inbound leg and also charge higher freights. Hence MSC activities to obtain more cargo on controlled inbound would meet fewer stumbling blocks as government cargo is less desirable cargo commercially than outbound.

In any case the scheduling process is as follows. Both area commands have idea schedules for the deployment of vessels in the long term. These schedules correspond roughly to the activities planned in the force plan. This establishes a general pattern of MSC ship arrivals and departures which we shall call the rough schedule.

When a vessel is completing its current voyage and approaching the U.S., the offerings of MTMC are evaluated and a proforma schedule made to service these break bulk offerings. A rough profit and loss statement is made (generally without a good idea of return cargo), and adjustments to the route are made, ports are added or cancelled, or a request is made to MTMC to solicit more cargo. A schedule is then made based on the route and the physical characteristics of the vessel - principally its speed and cargo handling requirements. This is then published using CALSTAT. The vessel is then loaded and makes her outbound crossing. On arrival the port area command takes over the scheduling, trying to do its best to fill the vessel up for the return leg.

The process, while functioning, has many drawbacks, most of which were noted at the area commands. The first is, as has been said before, that the quality of information concerning what cargo must be lifted is poor. Second, little or no idea of what backhaul cargo is available. Third, while there is a (probably good) attempt to optimize a single voyage, the real goal is to carry the most cargo at minimum cost on a system basis. While individual voyage results may be key to this, they need not be. Good results on one voyage may merely cause disastrous ones on the next - leaving system performance unchanged.

IV.4.1 Proforma

The PROFORMA computer program in many ways is a visionary thing for MSC. It probably is one of the best computer programs in MSC's inventory. It very successfully utilizes a number of files within MSC's ADP system as a data base - making them available in a comprehensible fashion to decision makers. It forces attention on the economics of cargo management. Finally considering the lack of good cargo prospectis', it is conceivable that it is the best approach possible.

The primary goal of PROFORMA is to assess prospective voyages of MSC controlled vessels in terms of cost, time, and cargo moved. This is to assist management decision making in the acquisition and utilization of shipping. The system, in fact, consists of three programs - the first, a voyage simulation; the second, a fuel analysis program; and, the third, a commercial cost program to assess the cost of commercial shipment where possible.

The program accepts a proforma voyage, allows variations to the port and schedule, calculates the economics of the base voyage, and its variations. The input and output to the program is concise and convenient. While the output could be more readable, no user voiced any dissatisfaction.

There is little point in discussing the details of the programs, as they are competently made and any possible improvements are marginal.

There are, however, many areas where the program's computational base is based on the wrong philosophy and could mislead decision makers.

The first is that voyages are analyzed and evaluated principally in terms of their voyage profit (or loss).

This is calculated on the basis of MSC billing rates to the shipping services. As there is no necessary relation between the cost, the government would be charged commercially and at these rates, the program will tend to cause decision makers to increase MSC's paper profits - rather than minimize the government's out of pocket cost for transportation. Thus our first recommendation is that the program calculate profit and loss using commercial rates (when possible) and that the program use MSC billing rates only when commercial tariffs (even foreign) are unavailable. Second, any voyage accounting made subsequent to the voyage be made using primarily commercial prices. Without this the system is inconsistent and asks managers to do the least cost action with the knowledge they will look better when the voyage accounting is done if they did not. Another useful addition to the PROFORMA system is to build fuel curves into the model. This is required as results of model are now independent of speed.

In spite of all the good points of the PROFORMA system and the immediate possibilities for its improvement, it is our recommendation that it be radically overhauled or phased out in favor of other scheduling methods more appropriate to MSC's needs.

The fundamental premise to this conclusion is that the method does not address any of the fundamental factors which determine MSC's actual operating results. The only exceptions to this are vessel hire and fuel costs which the PROFORMA system accounts for in some detail. Table IV.4.1-1 gives some very important factors in determining vessel schedules which are not considered by PROFORMA.

The fundamental deficiency in the whole scheduling process is that the area commands making the schedules have every poor and basically disorganized information

TABLE IV.4.1-1 Desirable Improvements in Vessel
Scheduling Not Easily Possible With
PROFORMA

- Costs and revenues calculated on system wide basis.
- Vessel arrivals more closely integrated with terminal inventories and large consignment arrivals
- More thought given to affect of schedule on cargo offered
- More effective use made of commercial tonnage to carry cargo where MSC's marginal cost is more than the commercial freight
- Freer routing of vessels - schedules maintained by fleet not by vessel
- More use made of vessel stow plans made to route vessels for minimum stowage costs
- Better matching of cargo booked to capabilities of vessels
- Bunkering requirements better integrated into schedule.

concerning the cargoes that are available to MSC. The first step in the improvement of the scheduling process is to obtain a more accurate and better organized picture of the day to day cargo lift tasks the system is expected to accomplish. In particular a large deficiency exists in data on cargo availability in the out ports. Currently a report of foreign cargo availability is furnished by MTMC. A desirable improvement in the process would be for the local MSC office to verify this forecast, including areas where its information does not correctly evaluate the amount of cargo and the time it is available in the port.

When this is available, it is possible that an experienced man could produce a well organized, nearly optimum, vessel schedule for each area command without the use of computer assist on a weekly basis.

A second stage in the process could be to install some type of optimization routine to generate vessel schedules. This cannot be done without improvements in cargo offering information outlined above. There is also a large probability that the resulting method will not prove really useful as was previously discussed. However, the exercise of constructing such models frequently leads to much self discovery within an organization which is very useful even if the resulting product is not.

Should this method of approach be adopted, it is recommended that initial attempts utilize linear programming. Such models can be simply understood, yield solutions which are easily converted to operating instructions, and have data requirements more easily satisfied than other operations research approaches. Finally as extremely well developed linear programming

packages are common place, MSC can be certain the
computer solution portion works and the lion's share
of effort can be put into model construction, verification,
and interpretation of the model's response.

IV.4.2 CALSTAT System Overview

The CALSTAT system became operational in 1978 as a means of keeping track of the status of vessels in MSC's controlled fleet. It is a distributed system with data input coming from area commands by a variety of means - Autodin, PSYCOR, telex, and mail. The output of the system is primarily of use to the headquarters and serves a very real function of keeping headquarters personnel abreast with happenings in the field.

It must, in principal, however, be of less use to the area commands because

1. It does not currently provide information quickly enough to have a real time effect on ship operations
2. Since all information comes initially from the area commands anyway, it can't tell them very much they don't know to begin with.

It does however perform the clerical and typing function of maintaining schedule records and printing various reports at the area commands. Additionally in the few instances where operational decisions of one area command effect the operations of the others, it additionally serves a coordinating function to the extent the reports are prompt.

The express purpose of CALSTAT concerned with dry cargo operations are:

1. to identify and record dry cargo availability
2. to provide the itinerary of dry cargo vessels
3. to provide the status of dry cargo vessels
4. to provide projected ship arrivals by port
5. to provide miles steamed and fuel burned.

The system generates eight basic reports:

1. Dry Cargo Ship Voyage Report

2. Dry Cargo Ship Schedule
3. Dry Cargo Ship Arrival Report
4. Dry Cargo Departure and Port Status Report
5. Dry Cargo End of Voyage Report (similar to 1)
6. Port Time Report
7. Cargo Handling Performance Report
8. Input Data Edit Error Reports - these reports are shown in Figures
9. Option Declaration Listing

They are shown in Figures IV.4.2-1 to IV.4.2-9.

The uses of the CALSTAT system fall into five general areas; 1) Charter Administration, 2) Cargo Operations, 3) Vessel Schedule Publishing, 4) Bunker Administration, and 5) Evaluation of Operations and Operating Personnel. Table IV.4.2-1 shows specific questions that are repeatedly asked to perform work in the above areas.

At least in very large measure, all of the information required to answer these questions is there in files maintained by CALSTAT. From the point of view of headquarters function, it is probably in large measure there timely enough. CALSTAT successfully measures the results in MSC's fleet.

It is however very hard to use this information. First in communication of results much superfluous information is presented. Among these are the vessel's call letters, MSC number, MarAd design. Second, the system attempts to be too accurate. In a voyage of 34 days, minutes have no real significance. The categories used are too fine and serve more to present a picture of what happened rather than answer specific questions. Moreover they are not mutually exclusive; for example, the category NCO Bunker means (or should mean) that

25 APR 78

SHIP IDENTIFICATION	I.R.C.S.	U.I.C.	DESIGN	ADMIN	DMT	CAP-(M/Y)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
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83						
84						
85						
86						
87						
88						
89						
90						

SS	ADJEF	PMB	AA(412	C464	LANT	13,264	13,964
----	-------	-----	--------	------	------	--------	--------

[illegible]

VOYAGE NO 029	START DATE 78/02/01	END DATE 78/03/26	LENGTH OF VOYAGE	34 DAYS
---------------	---------------------	-------------------	------------------	---------

PCRY AGENCY	(JF6)	ARRIVE 76/03/10 0100Z	DEPART 76/03/15 0230Z	PCRY TIME	ELAYS	1 MRS 30 MIN

TIME	MILES	TIME	WPS	MIN	AUG	SPD	DIA	SPD	FUEL USED	(ELL/M)	L.OBS	
		4481	9	40	41N	AVG	3PD	16.4K	19.0	FUEL USED	4.007 (ELL/M)	1.073

[illegible]

FUEL (BELS) CN ARRIVAL 3,193 TAKEN 12,025 COST(BEL) 13.87 TOTAL COST 166,786.75 DEPARTURE 14,952 USED THIS PORT 266

SHIP	STATUS WHILE IN PORT-	RATE/TIME STARY STOP	CAT STATUS	MRS ALLG	GAMES	REMARKS
------	-----------------------	----------------------	------------	----------	-------	---------

4C 25

2

3

ACQ 5015

2E/C3/10 0259 0573

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•
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•
•
•
•

Abstract

87

STATE SUPPLY CAT STATE DAVIS LHS 411 PER CENT

IS	1.0KML	9	14	10	79.9
IS	1.0KML	9	14	10	79.9

7.95	0.935	7.95
7.95	0.935	7.95

	CO	UNDER	CO	BUNKS	
6.2	0	0	7	30	6.2
15	0	0	7	30	15
2.2	0	0	7	30	2.2

CC	PPRAC	0	9	45	0.7	0.3
CC	PPRAC	0	9	45	0.7	0.3

CC	SWIFT	0	0	15	6.9

TOTAL	\$ 1.30
-------	---------

FIGURE IV.4.2-1

DRY CARGO VOYAGE REPORT

AD-A105 957

FRANKEL (E G) INC BOSTON MA

F/G 15/5

STUDY OF CARGO MANAGEMENT SYSTEM OF THE MILITARY SEALIFT COMMAN--ETC(U)

JAN 80 E G FRANKEL

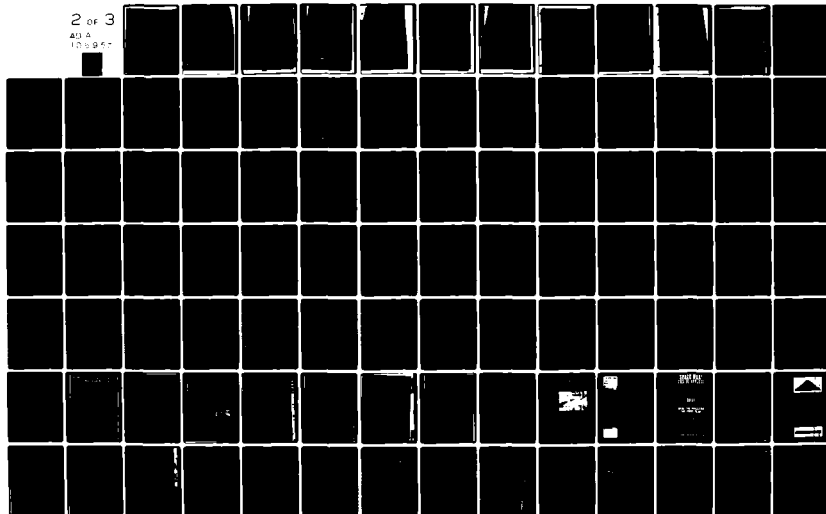
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NL

UNCLASSIFIED

2 OF 3

AD A
105957



CALSTAT VOYAGE REPORT
25 APR 78

COMSCINST 4610.32B
22 September 1978

SHIP IDENTIFICATION I.R.C.S. L.I.C. DESIGN ADMIN DMT CAP-(M/T)
SS ARANGER ANKN AUG 412 C464 LANY 13.264 13.064

TERP/CHIR 2 OPERATOR USLX DATES MIN 78/09/27 MAX 84/09/27 REBEL AREA CONUS

VOYAGE NO 025 START DATE 78/02/21 ENL DATE 78/03/26 LENGTH OF VOYAGE 34 DAYS

PORT SPORT POT (IN4) ARRIVE 78/03/24 1030Z DEPART 78/04/02 1500Z PORT TIME 9 DAYS 4 HRS 30 MIN

THIS PASSAGE MILLS 4175 TIME 9 DAYS 8 HRS 0 MIN AVG SPD 18.7K DIR SPD 19.0 FUEL USED 4,000 (BBL/WIL) 1.165

REPAIRS DIS LOAD CORN COAT M/T JSCG COMM 4 CONT 30 M/T 1340

FUEL (SELS) CN ARRIVAL 10084 TAKEN 3 COST(BEL) 00 TOTAL COST 00 DEPARTURE 9:252 USED THIS PORT 032

SHIP STATUS WHILE IN PORT- CAT STATUS HRS MIN GAMES REMARKS

DATE/TIME	START	STOP	CAT	STATUS	HRS	MIN	GAMES	REMARKS
78/03/24	0030	1000	NCO	SHIFT	4	30	0	ANCHORED AT 0600-1000 FCG
78/03/24	1030	1137	NCO	SHIFT	1	37	0	
78/03/24	1137	1700	NCO	OTHER	5	23	0	COAST GUARD INSP
78/03/24	1700	2400	NCO	PPRAC	7	0	0	SATURDAY
78/03/25	0030	2400	NCO	PPRAC	24	0	0	SUNDAY - HOLIDAY
78/03/26	0030	2400	NCO	PPRAC	24	0	0	

STATUS SUMMARY CAT STATUS DAYS HRS MIN PER CENT

NCO OTHER	0	5	23	8.1
NCO PPRAC	2	7	0	32.7
NCO SHIFT	0	0	7	9.2

TOTAL 2 14 30

FIGURE IV.4.2-1
(continued)

REPORT 000000-RL
PAGE 10

CALSTAT VOYAGE REPORT

25 APR 78

SHIP IDENTIFICATION I.R.C.S. U.I.C. DESIGN ADMIN UMT CAP-(M/T)

SS ARANGER KNRN BA0412 C464 LANT 13,264 13,004

TEMP/CHTR. & OPERATOR USLX DATES MIN 78/09/27 MAX 84/08/27 REDEL AREA IGONUS

VOYAGE NO 025 START DATE 78/02/21 END DATE 78/03/26 LENGTH OF VOYAGE 34 DAYS

VOYAGE SUMMARY SS ARANGER VOYAGE NC. 025

TIME AT SEA	30 DAYS 17 HRS 30 MIN	60.3%	FUEL	AT START 8,613	USED IN PORT 1,118	MILES STEAMED	84,440
TIME IN PORT	33 DAYS 6 HRS 30 MIN	39.0%	TAKEN	12,025	PER DAY PORT 84	CONTRACT SPEED	21.0
TOTAL	34 DAYS 0 HRS 0 MIN		AT END	9,850	USED AT SEA 9,678	AVERAGE SPEED	17.3
			USED	10,793	PER DAY SEA 466	BBL'S PER MILE	1.117

FIGURE IV.4.2-1
(continued)

COMSCINST 4610.32B
22 September 1978

MILITARY SEALIFT COMMAND
HEADQUARTERS

REPORT NO. 2601304
RUN DATE 10 MAY 1979
AS OF 14 MAY 79
PAGE 30

DRY CARGO SHIP SCHEDULE
USNS - PART I

SHIP IDENTIFICATION	LINE NO	PORTS OF CALL	ARR	DEP	CARGO LOAD COMM	CARGO LOAD M/T	CARGO LOAD COMM	CARGO LOAD M/T	REMARKS
USNS BLAND C3ST MSC (17.5) CALSTAT VOY RCS	010	OAKLAND NSC	3/25A	12/31E					US 060017
USNS BROCKTON C4 MSC (15.0) CALSTAT VOY RCS	013	OAKLAND NSC	10/20A	6/08E		110			US 117113
USNS CANTON C3ST MSC (17.7) CALSTAT VOY 018	050	ROTA	5/09E	5/10A		584	563		DIS
	070	ISKEANDERUM	5/16E	5/20E		466	967		DIS
	073	PORT SAID	5/21E	5/22E					T4A
	076	SUEZ	5/22E	5/22E					T4A
	080	AQUABA	5/23E	5/25E		684	1643		DIS
	090	JIDDA	5/27E	5/29E		84	1995		DIS
	105	BAHIRAN	6/04E	6/06E		64	1104		DIS
	115	HOEDEIDA	6/11E	6/13E		86	4892		DIS
	120	SUEZ	6/22E	6/23E					T4A
	125	PORT SAID	6/23E	6/23E					T4A
	160	NORFOLK NSC	7/10E	7/13E					DIS
USNS MATCOB C4ST MSC (20.8) CALSTAT VOY 016	090	CHARLESTON	5/04A	5/05A	3	66	3	3266	L/D
	110	NEW ORLEANS	5/08A	5/12E			348A	1428	DIS
USNS MATCOB C4ST MSC (20.8) CALSTAT VOY 020	010	NEW ORLEANS	5/08A	5/12E					
	020	RAYONE PCT	5/14A	5/16E					
	040	BRIMENHAYN	5/27E	5/29E		3		55	DIS
	060	CHARLESTON	6/10E	6/15E					
USNS MATCOB C4ST MSC (12.7) CALSTAT VOY 018	100	MATARAMI	5/13A	5/14A		4		11	DIS
	110	CALLAO	5/16E	5/16E		4		16	DIS
	120	GUAYAGUIL	5/19E	5/21E		4		772	DIS
	130	BAHUA	5/24E	5/26E		4		306	DIS
	145	CRISTOBAL	5/26E	5/26E					T4A
	150	GUANTANAMO	5/28E	5/29E					
	155	ROSVELT RD	6/01E	6/02E					
	160	RAYONE PCT	6/07E	6/09E		4		5	DIS
USNS MATCOB C4ST MSC (11.5) CALSTAT VOY 015	010	SPRING PCT	5/12A	5/14A		995			
	031	ROSVELT RD	5/17E	5/18E		384		1752	DIS
	041	GUANTANAMO	5/22E	5/23E		386		1774	DIS
	051	CRISTOBAL	5/25E	5/26E		343		1409	DIS
	060	CHARLESTON	5/30E	5/31E					DIS

FIGURE IV.4.2-2 DRY CARGO SHIP SCHEDULE

17 MAY 70

RECEIVED BY THE DIRECTOR

[illegible]

FIGURE IV.4.2-3
DRY CARGO ARRIVAL REPORT

CALSTAT DEPARTURE AND STATUS REPORT

(DISCREPANCY ILLUSTRATION - SEE APPENDIX L PARA 3B (4))

REMARKS

SHIP NAME U I C VOY LNE PORT NAME CDE ARR-L DEP-L REMARKS
LAKELAND NAO423 046 010 CP KENNEDY IRI 770401 770406 LING
DATE TIME ENKRS NILES & TKN COST
ARR 770401 1245 00116 00190 DISCREPANCY
DEP 770406 1700 00495 00375 1680

DAY HR MN
PORT TIME S 4 15
STATUS TIME S 4 15
DIFFERENCE 0 0 0 -

CAT CODE DATE START STOP HR MN GANG REMARKS

SHIP NAME U I C VOY LNE PORT NAME CDE ARR-L DEP-L REMARKS

ADMCALLGRN NAO415 027 010 BAYONE NOT IGC 770402 770404 LOG

DATE TIME ENKRS NILES & TKN COST
ARR 770402 1906 21379 03568
DEP 770405 0523 26830 05535 1850

DAY HR MN
PORT TIME 2 10 17
STATUS TIME 2 9 54
DIFFERENCE 0 0 23

NCO SHIFT 770402 1406 1624 02 18
NCO PPRAC 770402 1624 2400 07 36
NCO PPRAC 770403 0000 0800 08 00
DIS XORNIL 770403 0800 2100 13 00
NCO PPRAC 770403 2100 2400 03 00
NCO PPRAC 770404 0000 0800 08 00
L/D XORNIL 770404 0800 1800 10 00
NCO ANDEP 770404 1800 2300 05 00
NCO SHIFT 770404 2300 2400 01 00

FIGURE IV.4.2-4
DEPARTURE AND PORT STATUS REPORT

CALSTAT PORT TIME REPORT
FOR MONTH OF FEB 1978

24 MAR 78

PART 1: NUCLEAR SUBS

SHIP NAME	INCB	AVAIL R/1/A	PORT TIME	SEA TIME
USS BLAND: SCOTLER STIS	BBN	20	0 14 50.0X	14 50.0X
USS BOGGS: RVT LEONARD C	MLVA	0	20 0 .0X	0 10X
USS CARRY	MJZF	20	0 7 25.0X	21 75.0X
USS METER	MBIJ	20	0 10 35.7X	10 64.0X
USS MINTA	MZAR	20	0 9 32.1X	19 67.0X
USS TOWLE: BRZ JUNG 2	MBTY	20	0 6 21.4X	22 70.0X
SEVAS NUCLEAR		160	20 66 32.0X	94 67.0X

FIGURE IV.4.2-5
PORT TIME REPORT

C A L I F O R N I A
PORT 800100-01

LOCATION AND STATUS
10 MAY 78
AS OF 09 MAY 78
NEXT PORT S.T.A.C. IN PORT STATUS

SHIP	UIC	VBY	LOCATION	STATUS	PORT	STATUS
ACADWCTBY	MA0333	001	AT SEA	BARBADOS	1	780509
ACHALLENGER	MA0407	013	AT SEA	ROYA		780513
ACHAMPION	MA0441	017	AT SEA	MSO GUAM		780513
ACHARGER	MA0400	010	AT SEA	YOKOHAMA	780521	
ACHIEFTAIN	MA0400	011	AT SEA	P HUENHLEN	780514	
ACORSAIR	MA0410	010	AT SEA	MOBILE ALA		780513
ACOURIER	MA0442	010	DAYONE NOT ARGENTIA	780512	LDC	NORML 780509 1000
ADMALLEN	MA0415	040	AT SEA	DAYONE NOT	780510	
ARACER	MA0411	009	AT SEA	BREMERMAN	780510	
ARANGER	MA0412	027	SPORT NOT	NORSEMAN	780521	LDC NORML 780509 0900
ARELIANCE	MA0413	007	TENGAN OKI CHINMAE	780526	LDC	NORML 780509 1030
BLAND	MA0197	R05	OAKLAND NSC			
BROSTROM	MA0493	R05	OAKLAND NSC			
CAMAVERAL	MA0410	040	ELUTHERA I 6 TURK IS	780512		
COMET	MA0132	010	AT SEA	ROYA		780509
GREENPORT	MA0419	R05	MOBILE ALA			
GREENWAY	MA0421	R05	N ORLEANS			
GREENSPRINGS	MA0420	R05	MOBILE ALA			
INAGUACLOD	MA0444	007	CP KENNEDY			PIS NORML 780510 0915
LAKELAND	MA0423	074	CP KENNEDY 6 BAHAMA I	780513	NCO	OTHER 780510 0000
METEOR	MA0138	020	N ORLEANS	DAYONE NOT	780515	
MINPAK	MA0134	010	VALPARAISO	MATARAMI	780513	
OTMAVELER	MA0440	027	ST MAZARE	NORFLK NSC	780522	
PCUMHANGER	MA0447	009	AT SEA	NORFLK NSC	780510	
PCUNTERDEN	MA0431	011	AT SEA	S DIEGO NS	780514	

FIGURE IV.4.2-6
LOCATION AND STATUS REPORT

COMSCINST 4610.32B
22 September 1978

REPORT 080708Z
PAGE 1
AS OF 09 MAY 78

C A L S T A Y
ERROR AND MAINTENANCE LISTING
10 MAY 78

INPUT TRANSACTION	ERROR CODES
INMR 001 18000001 70130	01
INMR 001 18000002 70130	01
ACB CALSTAT 78130 0072	04 05 06 08
SABADNCALLGNNH0015JF1NCDPRAC78050618002400	41
SABADNCALLGNNH0015JF1NCDPRAC78050618001505	41
ACP CALSTAT 09 MAY 78 00-07	04 05 06 08
ACB CALSTAT 10 MAY 00 05	04 05 06 08
BBLACADNVCTRYMA313001030CP3780507A780508A1506	02
BBLACADNVCTRYMA313001030CP3780507A780508A1506	02
BBLACADNVCTRYMA313001030CP3780507A780508A1506	02
SALACOURIEN MA044823NCDPRAC78042810042190	41
SALACOURIEN MA044823NCDPRAC78042810042190	41
ACB CALSTAT 78130	04 05 06 08
AALINAGUACLODMA44400780811A780515E	07
BALINAGUACLODMA44400801031780519A780511E100	05
BALINAGUACLODMA444008036121780519E780516E100	05
BALINAGUACLODMA444008080805780513E780513E100	05
CALINAGUACLODMA444008010101A78051012000034001080	05 26
ACB CALSTAT 78128 MAY 02	04 05 06 08
ACM CALSTAT 78129 MAY 03	04 05 06 08
SAMTCOLUMBIA MA0440PM1NCDPRAC78040713E41618	41
ACB CALSTAT 78130	04 05 06 08
SAPPCONTENDERNMA031E1NCDADHINT8050900000800 SCHEDULE	41

FIGURE IV.4.2-7
ERROR LISTING

REPORT 080708Z

REPORT 0007083
PAGE 4
AS OF 11 APR 78

C A L S Y A Y
GENERAL AND MAINTENANCE LISTING
13 APR 78

LINE PORT ARRIVAL DEPART SPD CARGO LOADED CARGO DISCHARGE REMARKS
COMM COM M/T COMM COM M/T
000 201 780009A 780011A 10.0 0 3050 A D15

UIC VOY SHIP NAME I M C S T/S START COMPLY POL CAR

M01932 018 USNS COMET NJ2P 1 780410A 780515Z

LINE PORT ARRIVAL DEPART SPD CARGO LOADED CARGO DISCHARGE REMARKS
COMM COM M/T COMM COM M/T
005 201 780009A 780011A 10.0 368 18 760 A D15
010 201 780012B 780014B 10.0
020 100 780013C 780015C 10.0
030 100 780022E 780025E 10.0
040 100 780027E 780030E 10.0
050 100 780031E 780034E 10.0
060 100 780035E 780038E 10.0
070 100 780042E 780045E 10.0
080 100 780046E 780049E 10.0
090 100 780053E 780056E 10.0
100 100 780060E 780063E 10.0
110 100 780066E 780069E 10.0

UIC VOY SHIP NAME I M C S T/S START COMPLY POL CAR

M01936 017 USNS MIRFAK NZAE 1 771212A 780305A

LINE PORT ARRIVAL DEPART SPD CARGO LOADED CARGO DISCHARGE REMARKS
COMM COM M/T COMM COM M/T
010 100 771126A 771212A 12.0 REPAIRS
020 100 771212A 771219A 12.0 656 A D15
030 100 780109A 780113A 12.0 27 A L/D
040 100 780117A 780118A 12.0 47 A 32 A D15
050 100 780119A 780121A 12.0 47 A D15
060 100 780131A 780204A 12.0 314 A D15
070 100 780205A 780209A 12.0 22 A D15
080 100 780209A 780209A 11.0 101 A D15
090 100 780212A 780214A 12.0 TRA
100 100 780217A 780217A 12.0 9 A D15
110 100 780218A 780219A 12.0 210 A D15
120 100 780220A 780221A 12.0 45 A D15
130 100 780221A 780223A 11.5
140 100 780301A 780319A 12.0

UIC VOY SHIP NAME I M C S T/S START COMPLY POL CAR

M01934 018 USNS MIRFAK NZAE 1 780306A 780531E

LINE PORT ARRIVAL DEPART SPD CARGO LOADED CARGO DISCHARGE REMARKS
COMM COM M/T COMM COM M/T
020 100 780301A 780319A 12.0 1276 A
030 100 780326A 780327A 11.0 112 A D15

FIGURE IV.4.2-7
(continued)

COMSCINST 4610.328
22 September 1978

C A L S T A T
OPTION DECLARATION LISTING
25 APR 78

THE FOLLOWING OPTIONS MUST BE DECLARED DURING MAY 1978 THRU JUL 1978 -
S. M. J. P. NAME I. R. C. S. OPEN TERMS TYPE SPD COMBUTE MIN-DATE MAX-DATE DEC-DATE REP-DATE REC-AREA

SS AMERICAN CHARGER	AGTR	USLX	0	001	22.0	71/08/14	78/08/18	84/08/18	78/07/19	CONUS
SS AMERICAN CHIEFTAIN	BJA	USLX	0	001	22.0	71/08/20	78/08/19	84/08/19	78/07/20	CONUS
PS LAMBLAND	APOL	ANCC	0	001	30.0	73/08/08	78/08/07	81/08/07	78/06/07	ARMY
SS PICKER CONTENDER	WEC	USLX	0	001	22.0	71/08/10	78/08/17	84/08/17	78/07/18	CONUS
SS SAN ANTONIO	KICJ	TMCO	U	002	15.0	69/06/15	78/09/01	79/05/15	79/09/17	WA
PS STAR TECH	MOZF	SERI	0	001	10.0	73/08/10	78/08/02	81/08/09	78/06/10	USCG

RECORDS ON FILE 0001011 56

RECORDS ON FILE 00020M1 6

NAME - 01125, ACTIVITY - 01, REPORT CODE - 73, RECORD COUNTY - 000020

FIGURE IV.4.2-8
OPTION DECLARATION LISTING

CALSTAT
CARGO HANDLING PERFORMANCE REPORT
17 MAY 78

COMSCINST 4610.32B
22 September 1978

PART A - DETAILED BY PORT - APR 78
PORT MIDWAY IS (AJJ) SHIP PCONTENDER ARR- 780418 1634 DEP- 780420 0942 COMM LDD- 89 CUMM DSC- 5

CARGO OPERATIONS

DATE	FROM TO	NO. SACS	TOTAL TIME	SANG	DDO	MM	HH	MM	MO	NO.	LOADED	DISCHGD	TOTAL	M/T	PER	PORT TIME
780418	0900 1200	2	3	30	7											
780418	1300 1630	2	3	30	7											
780418	1730 2100	2	3	30	11											
780419	0600 0630	2	4	30	9											
780419	0700 1030	1	3	30	3											

PART A - DETAILED BY PORT - APR 78

PORT MIDWAY IS (AJJ) SHIP PCONTRACTR ARR- 780405 1710 DEP- 780406 2036 COMM LDD- 8 CUMM DSC- 68A1

CARGO OPERATIONS

DATE	FROM TO	NO. SACS	TOTAL TIME	SANG	DDO	MM	HH	MM	MO	NO.	LOADED	DISCHGD	TOTAL	M/T	PER	PORT TIME
780405	0830 1030	2	2	0	16											
780405	1600 2000	2	4	0	12											
780406	0000 0300	2	3	44	7											

PART B - SUMMARY BY PORT - APR 78 THRU JUN 78

PORT	MIDWAY IS (AJJ)	SHIP	LOADED	DISCHGD	TOTAL	SANG	MM	HH	MM	MO	NO.	LOADED	DISCHGD	TOTAL	M/T	PER
APR 78	PCONTENDER		1768	1	1769	36						36			49	
APR 78	PCONTRACTR		1782	706	2488	71						35			20	

MAY 78 DATA NOT AVAILABLE

FIGURE IV.4.2-9
CARGO HANDLING PERFORMANCE REPORT

TABLE IV.4.2-1 Use of CALSTAT Information

I. Charter Administration

1. Did the vessel break down - are funds due under the offhire clauses in the vessel's charter?
2. Did the ship's cargo handling gear work - again are funds due under the offhire clause?
3. If requested, was the vessel able to meet her chartered speed - what funds were due under the speed clause?
4. Did the owner direct the ship for his private business (such as drydocking) - was the vessel offhire during this time, how much fuel was burned for the owner's account.

II. Cargo Operations

1. Did the vessel leave cargo behind and why?
2. Was the vessel delayed because cargo was not there?
3. Are there any conditions on the vessel which require schedule or other management changes to deal with (e.g. draft too large to enter a port)?
4. Were cargoes loaded intelligently or was there avoidable double handling?
5. Was the loading plan correct or was it necessary to open every hatch to find cargo not properly indicated on the plan?

III. Vessel Schedule Publishing

IV. Bunker Administration

1. Were bunkers stemmed in a reasonable way?

TABLE IV.4.2-1 (continued)

V. Evaluation of Operations and Operating Personnel

1. Were efficient voyage orders given?
 - a. Was the vessel told to speed up and then slow down?
 - b. Did it steam full speed, arrive early, then anchor?
 - c. Did the master know his initial port of call on sailing?
 - d. Was the vessel diverted - were the reasons for this good?
2. Were arrangements properly made?
 - a. Did the vessel wait at berth on arrival?
 - b. Did enough gangs come?
 - c. Were decisions to work or not work on nights and holidays defensible?
 - d. Did gang production meet the historical average of the port?
 - e. Did errors in arrangements delay the ship?

cargo operations were stopped by bunkering the vessel - hopefully a rare occurrence. But if it is port practice not to work between 0000 and 0600, then bunkerings at this time should be practiced - but it should be NCO PPR even though the vessel took bunkers.

When it comes to using the CALSTAT information to meet the administrative functions shown in the Table IV.2.2-1, the output is really of little value.

The reason for this is clear. There are no standards built in the CALSTAT system and it gives no indications of the variance of performing from these standards. Without these standards to filter the CALSTAT output, the effect of the system is to flood the headquarters with interesting, largely correct, needed information - but with no provision to get the most out of it. The light of CALSTAT is so bright the user is blinded.

The reports in CALSTAT should all be restructured to more clearly present what the operating people need to know. This work should be accompanied by the construction of operating standards whose variances are to be measured.

In part, these standards already exist. Vessel charters provide very concrete descriptions of vessel performance which many times are not met.

The CALSTAT should immediately be reprogrammed to indicate areas where chartered vessels do not meet charter party conditions. Easily accomplished portions of this are - having the "Prepare CALSTAT Voyage Report" program clearly labeled in the left hand margin with "*" all voyages or legs of voyages where

1. the vessel's actual speed was less than the directed speed
2. delays were reported because of difficulties with the ship's gear

3. off hire times in a day exceed 12 hours
4. voyage where off hire money calculated by charter provisions is due MSC
5. other conditions.

In filtering the remainder the task is more difficult because no real standards exist at MSC. The lack of standards comes basically because the vessel's schedule is not now seen as an operational plan for things to happen. It is seen as a forecast of what will happen. Additionally, while historical records of cargo handling productivity exist, to build these standards into CALSTAT is probably a very large job.

As an alternative, it is proposed that CALSTAT have a program added to it to establish from the proposed schedule standards of performance required to accomplish voyage according to plan - subject of course to maximums established by reality. These standards will then be used to filter the voyage data and indicate areas where either the plan was based on erroneous expectations or that actual performance was poor.

The above task will improve the quality of the output. The next task is to improve its currentness. The largest complaint concerning the system was that its output was not current enough to be really useful. The five major reasons why the output is not current are shown below:

1. Input to the system comes from too many sources to be efficiently used by a batch processing computer system
2. The volume of input to the system is too large
3. Input processing is not prioritized properly
4. No one person or group has sufficient control to organize input and corrections to guarantee

correct output in appropriate time frames.

5. The documentation for the system is poor
6. Input to the system is designed for ease of programming and keypunching rather than ease and accurateness of data entry.

Table IV.4.2-2 gives the originators of the vast majority of information in the CALSTAT system. The information enters the system via the process shown in Figure IV.4.2-10.

Basically subordinate commands and personnel submit reports to the area commands who subsequently forward the information to the computer facility in which generates error listings and submits them back to the area command generating the data for correction.

Because of time differences and reasonable work practices, the time between the recording of a transaction with an office lacking a direct connection with the Washington computer cannot possibly be less than 2 days. Transactions occurring late in the week will take at least 4 days. Should a transaction be bad, it will require at least one day for notification of its rejection to reach the originating area command and at least one more day and probably 2 to make the input correction card. Thus a transaction is at least between 2 and 4 days old if it is correct, and between 7 and 11 days old if it was initially wrong.

The above represents the operation possible in practice substantially greater delays are likely. Depending on the volume of errors and their type, the reports of the system probably don't make very much sense until nearly all bad input is eliminated and corrected. Thus the system cannot produce reports which are less than two weeks old.

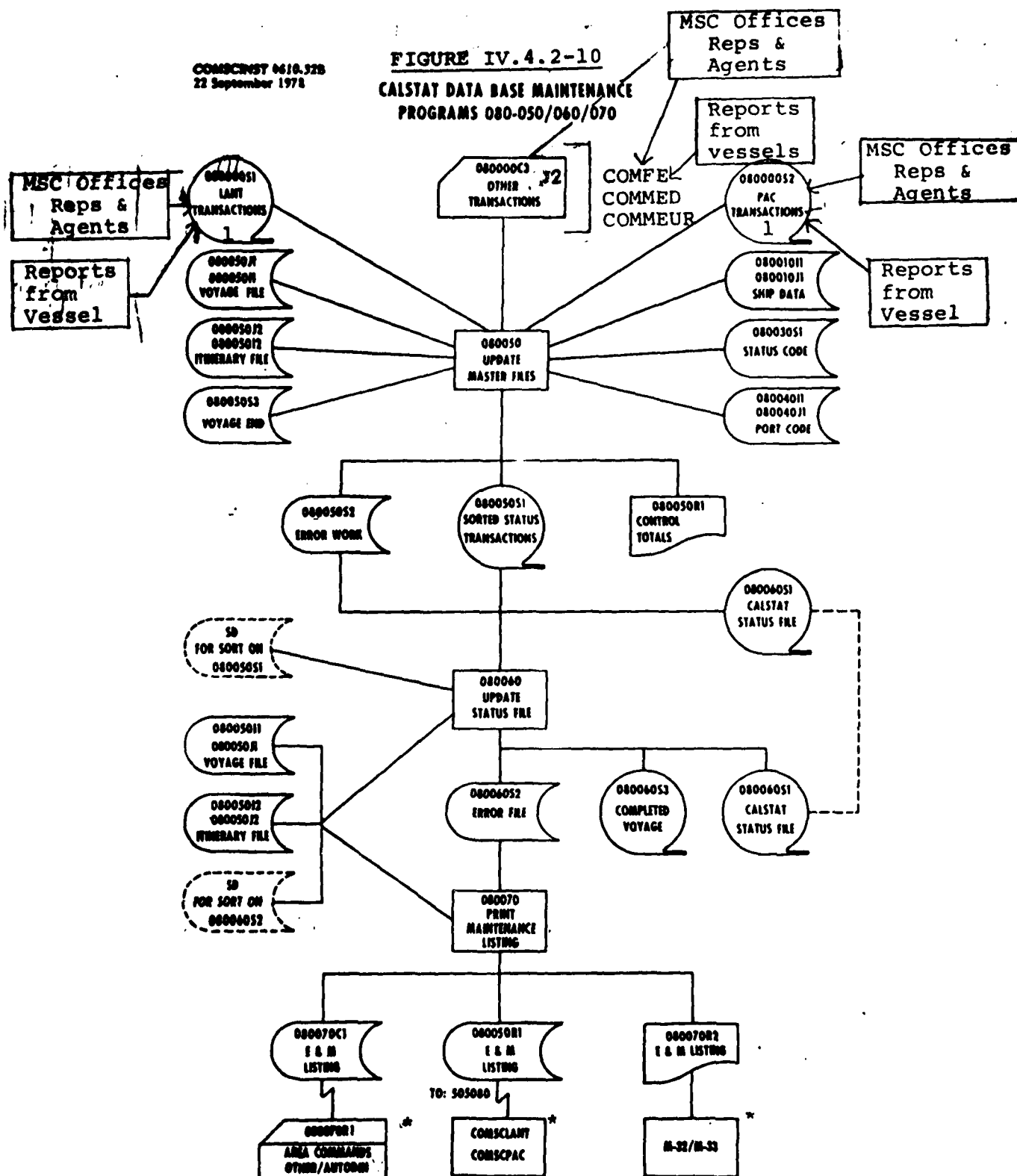
The most obvious improvement is to install micro

TABLE IV.4.2-2 Origin of Information in CALSTAT

- I. Ship Data
 - 1. Charters
 - 2. Specifications
- II. Voyage and Itinerary Data
 - 1. Sailing and Diversion Orders
- III. Ship Location Data
 - 1. Primary - ship movement messages
 - 2. Secondary - MSC offices
 - MSC reps.
 - MSC agents
- IV. Ship Status Data
 - 1. Primary - MSC Representative at port level
 - 2. Secondary - Vessel's Master
- V. Tankship Documents - Inapplicable
- VI. Dry Cargo Documents
 - 1. Shipping Order
 - 2. Manifest
- VII. POL Documents - Inapplicable

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FIGURE IV.4.2-10
CALSTAT DATA BASE MAINTENANCE
PROGRAMS 080-050/060/070



- 1 Command Data Link
- 2 Autodin
- 3 Corrections of reported errors are input as ordinary transactions above.

computers at most of the locations providing input to CALSTAT. These computers should be programmed to perform the same editing functions now done at the facility in Washington. The system would then be able to produce reports about one week more current than now.

The next difficulty with CALSTAT is that the volume of transactions is needlessly large. Table IV.4.2-3 gives information on the number of transactions occurring in the system. The two most numerous transactions are those required to make the in port status report and those required for the itinerary report.

The largest volume of transaction reductions will come from reducing the level of detail in the report and in simplifying the coding system. A reasonable proposal is to normally require one card per vessel giving hours cargo was worked, number of gangs, and production. More emphasis should be placed on the comments field.

As the in port status report itself will almost never be available in MSC's offices before the vessel has left, it should place its emphasis on data collection for planning and on collecting any off hire money due MSC because of problems with ship's gear or delays caused by repairs. For these and most other operational problems, the use of the comments field will make the situation clearer than rather broad codes.

A revised coding system is shown in Table IV.4.2-4. The new category code simply tells what the vessel is doing, i.e. waiting berth, working cargo, not working cargo, and waiting to sail. The new status code should be only "normal" or "abnormal" and is intended only to call attention to the comments field. The comments field should contain all important information. For comparison, the current system is shown in Table IV. 4.2-5. The affect of adopting this record format

TABLE IV.4.2-3 Volume of Data Required for CALSTAT Reports

- I. Dry Cargo Voyage Report
 - 1. Estimated start and finish date
 - 2. Actual start and finish dates or revised estimated
- II. Dry Cargo Itinerary Report
 - 1. One card for each port of itinerary
- III. Arrival/Departure
 - 1. One card for each arrival
 - 2. One card for each departure
- IV. Ship In Port Status
 - 1. One card for each status from arrival to departure
- V. End of Voyage
 - 1. One card signifying end of voyage

TABLE IV.4.2-4

Suggested Category and Status Codes for the CALSTAT System

<u>Category</u>	<u>Status</u>	<u>Comment</u>
At Sea	Normal	} Used to explain what happened
Waiting Berth	Abnormal	
Working Cargo		
Waiting to Sail		

TABLE IV.4.2-5 Current CALSTAT Category and Status Codes

<u>Category</u>	<u>Status</u>	<u>Comments</u>
Discharging	Port Security	
Loading	Cargo Handling	Infrequently
Loading/Discharging	Ship Deficiency	used
Discharging/Loading	Terminal Deficiency	
No Cargo Operations	Weather	
Floating Storage	Awaiting Cargo	
Maintenance	Labor Problems	
	Awaiting Pilot	
	Awaiting Assignment	
	Awaiting Tow	
	Awaiting Weather	
	Bunkering	
	Overhaul	
	Ship Repair	
	Ship Upkeep	
	Logistics	
	Port Practice	
	Port Security	
	Shifting	

will be to reduce the volume of transactions by about 75%.

The next area where transactions can be reduced in volume is by simplifying the input data for the schedule maintenance section of CALSTAT. The attacking of this problem is closely linked to the improvement in the overall format of data input to the system. Basically all input to the system is designed to simplify the programming of the system and the job of keypunching the data. As a result of this the volume of input characters is many times what is really required to provide all information, all of the remaining information only serves to simplify programming. The best way to eliminate this redundant data input is again to install a micro computer device to accept input in as simple human oriented fashion possible and to have it generate the card images required by the CALSTAT program.

As currently available hardware is quite sophisticated, the editing routines that could be added to these front end micro processors would prevent any bad input from reaching the computer in Washington. The approach will

- 1) eliminate completely any paper coding sheets
- 2) eliminate all keypunching
- 3) eliminate all transaction rejections now occurring.

While the study did not encompass any consideration of the autodin or command data links, it is thought that any system producing 8 level or perhaps 5 level punched paper tape could input data via these channels to the computer in Washington with no changes in existing hardware. Table IV.4.2-6 gives an implementable hardware selection and cost for such front end processors.

TABLE IV.4.2-6 Front End System Development Costs -
Paper Tape Interface between Autodin
and Command Data Link

1. Micro Computer	
Horizon Micro Computer 32K Memory	
1 Double Density Floppy Disk	\$2049.00
2. ADM 3ACRT Terminal	849.00
3. ASR43 Teletype Machine with 8	
level tape perforator	<u>1000.00</u>
 Total Hardware Cost per Installation	 \$3898.00
Software Development and Installation	<u>\$10000.00</u>
(includes travel and field work with	
area command)	
Total Cost Prototype CALSTAT Front End	\$13898.00
 Cost follow on installations	 \$3898.00

The software development cost could be kept down to a total of \$10,000 if its development was well managed. It is our basic recommendation that a pilot front end micro processor be developed and installed at a major area command. As the Atlantic command currently seems to have the greatest difficulty with CALSTAT system use, the installation should initially be there.

IV.5 Booking and Cargo Documentation

MSC contracts with commercial carriers and with itself to carry specific shipments by making bookings. Container bookings are nearly always made with commercial carriers and break bulk bookings primarily with MSC.

For an individual shipment, the booking process starts with an offering (issued by MTMC) and ends with a clearance order. The clearance order is the actual contract between the carrier and the government for transportation services and is somewhat analogous to a bill of lading. Table IV.5-1 shows the component tasks of the booking process. Figure IV.5-1 shows the overall role of the booking evolution in the overall clearance order process for government cargo.

While each individual transaction is usually simple and straightforward, the volume of transactions makes booking a very large and complicated job. Responsibility for booking is held by the Pacific and Atlantic area commands. Each command has a manual system to perform the clerical work. There is little uniformity between them.

Figures IV.5-2 to IV.5-4 give flow diagrams for the booking procedures used in the Pacific area command for Government Bill of Lading (mostly domestic) cargo, international carrier, and international break bulk movements respectively. Figures IV.5-5 to IV.5-7 give the same for the Atlantic command. Appendix 3 gives samples of the documenting paperwork for each unit.

While resembling each other superficially, the two procedures differ greatly in the operational involvement of the shipping company itself. In the procedure used by the Pacific command, the booking staff elects and assigns specific consignments to carriers. They are

TABLE IV.5-1

- Receive offering
- Arrange for transportation with carrier or MSC
- Confirm booking to MTMC with clearance order
- Confirm booking to carrier with clearance order
- Maintain advanced header file in unit level
booking system
- Maintain internal records in MSC area command

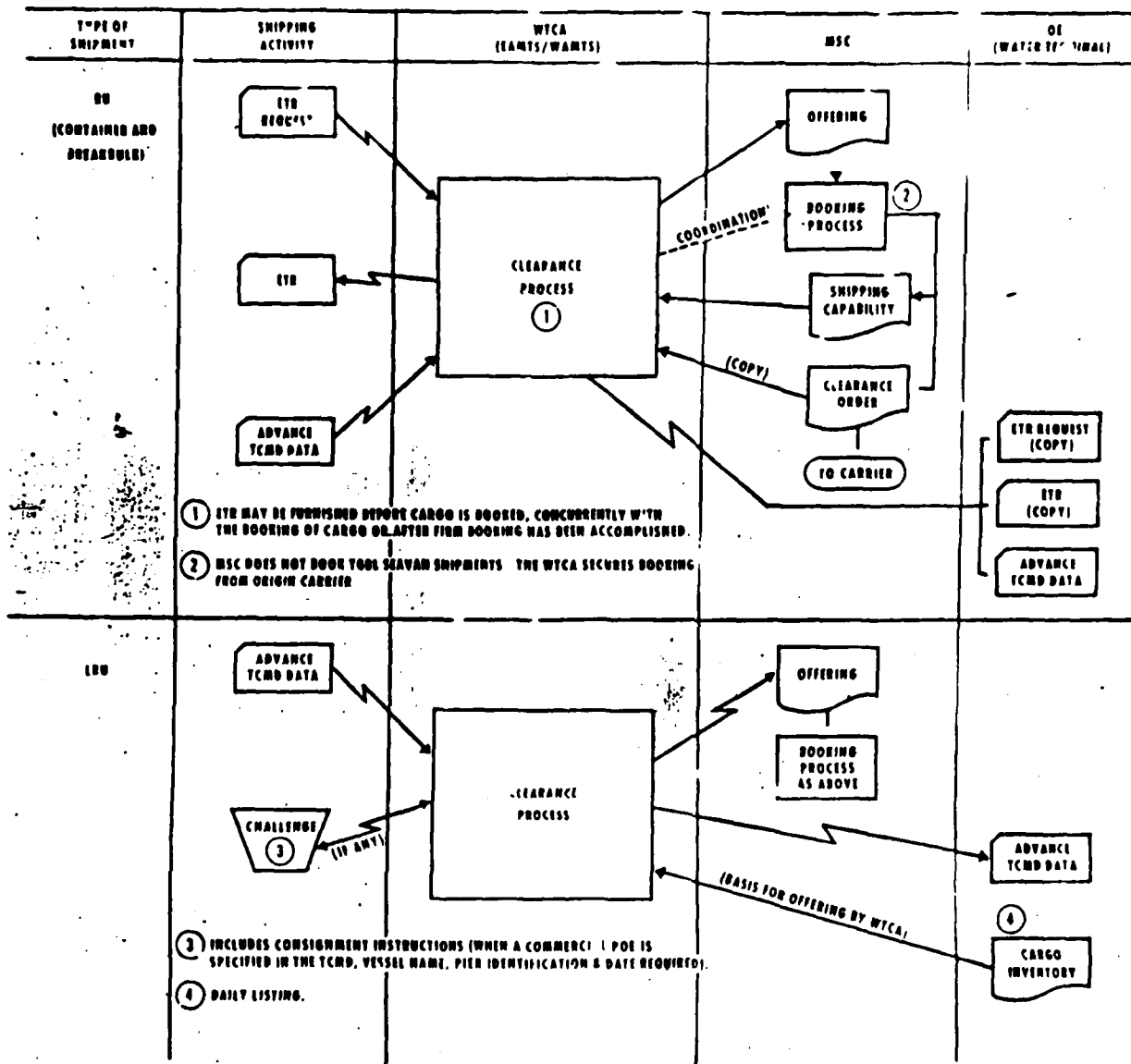


FIGURE IV.5-1

SURFACE EXPORT CLEARANCE OF DOD CARGO

FIGURE IV.5-2 Container Booking - Pacific Command
GBL Shipments

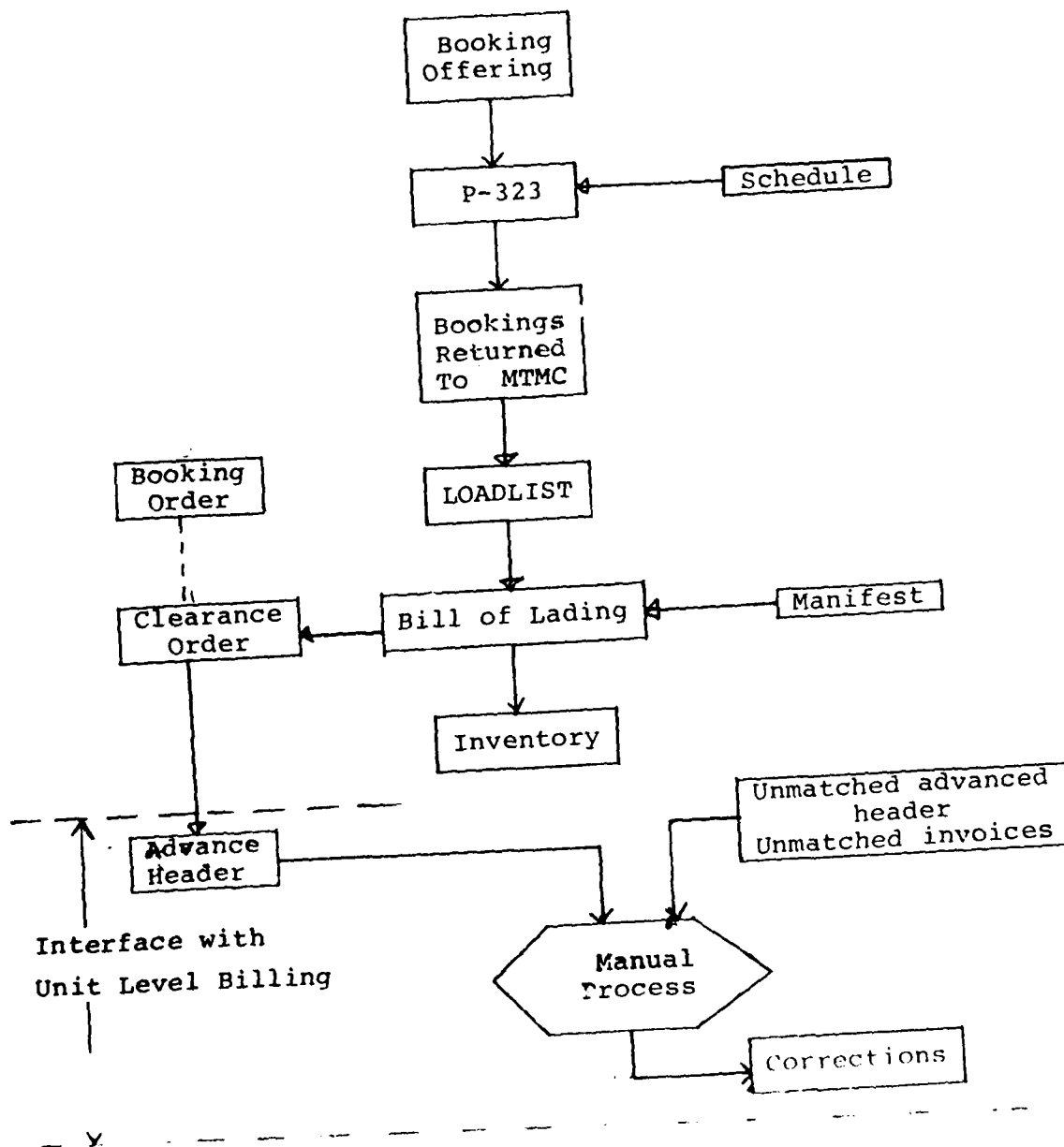


FIGURE IV.5-3 Container Booking International Shipments

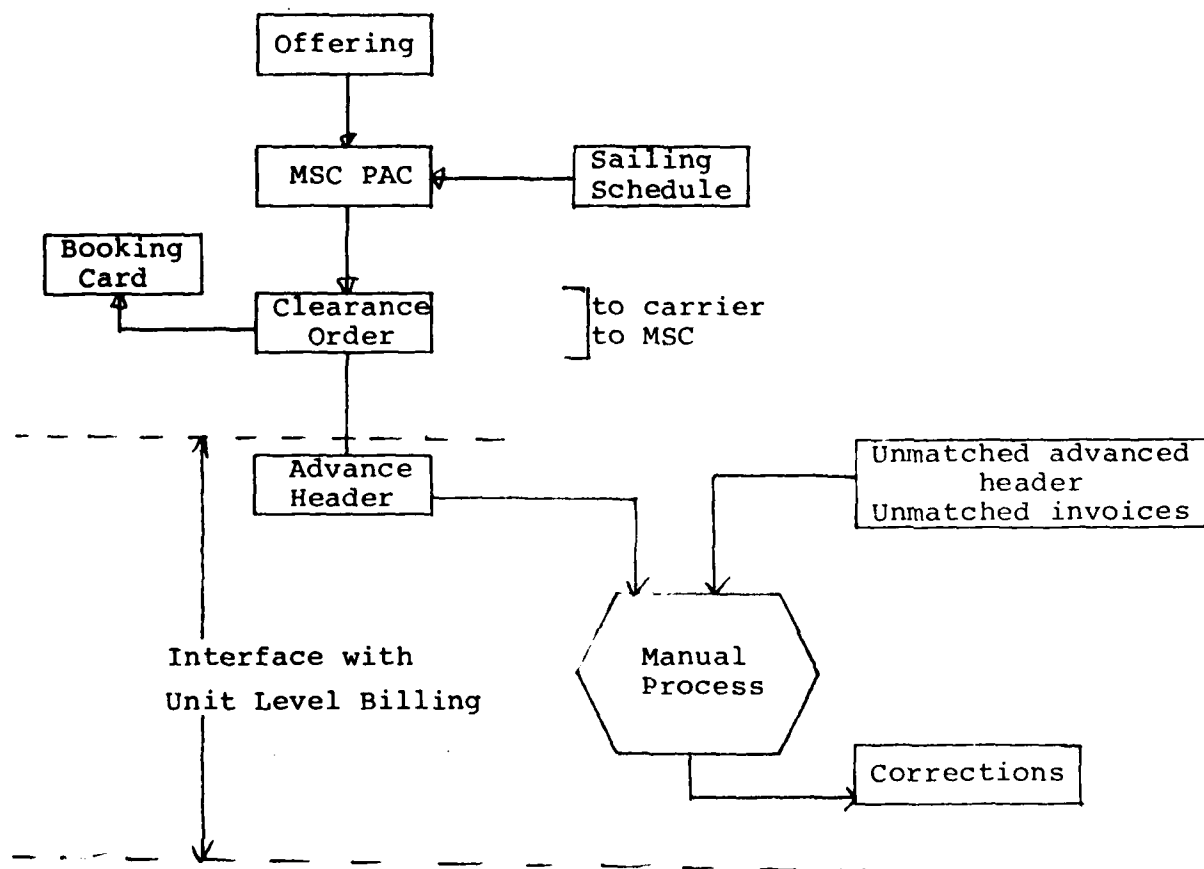
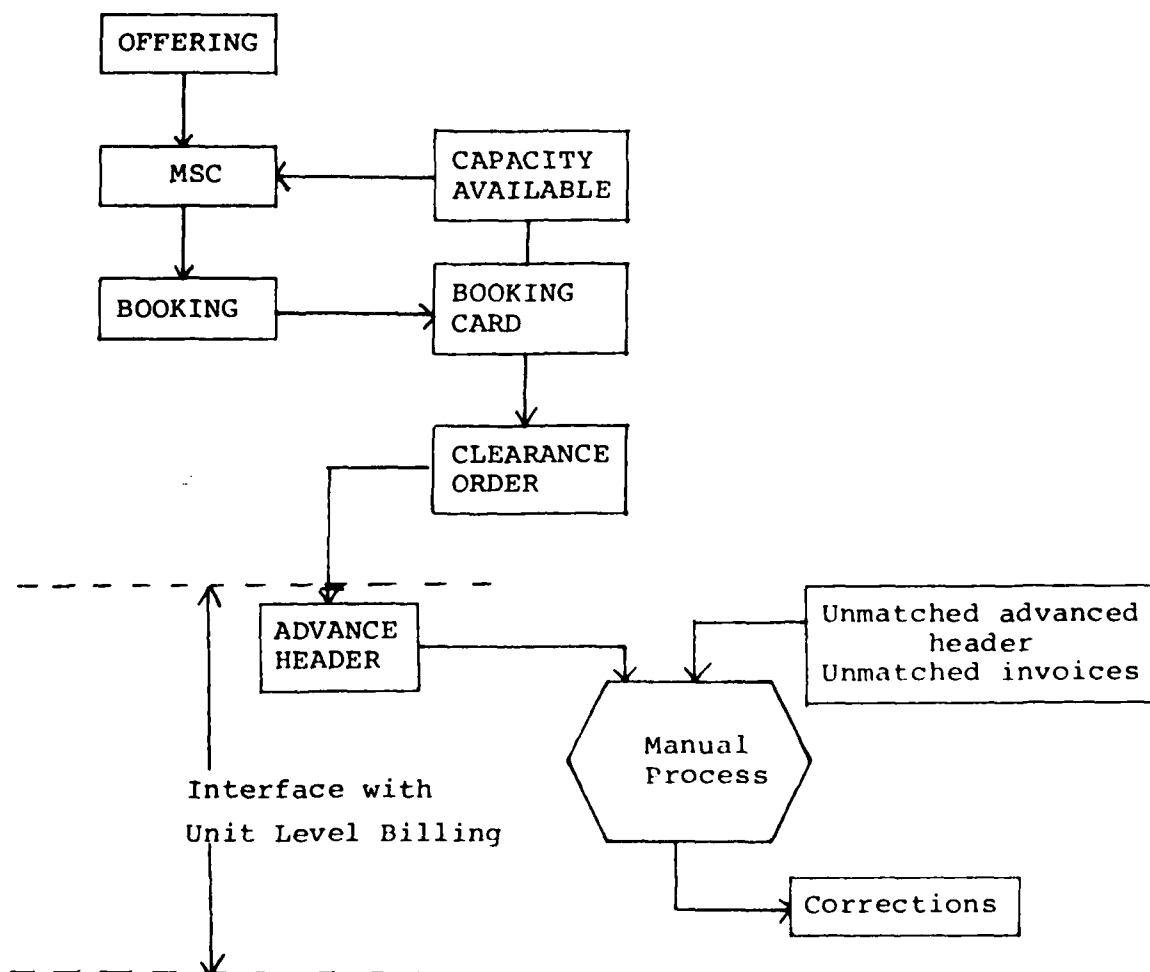


FIGURE IV.5-4 Container Booking - Break Bulk



Note: Planning horizon about 4 weeks.

FIGURE IV.5-5 Container Booking - Atlantic Command

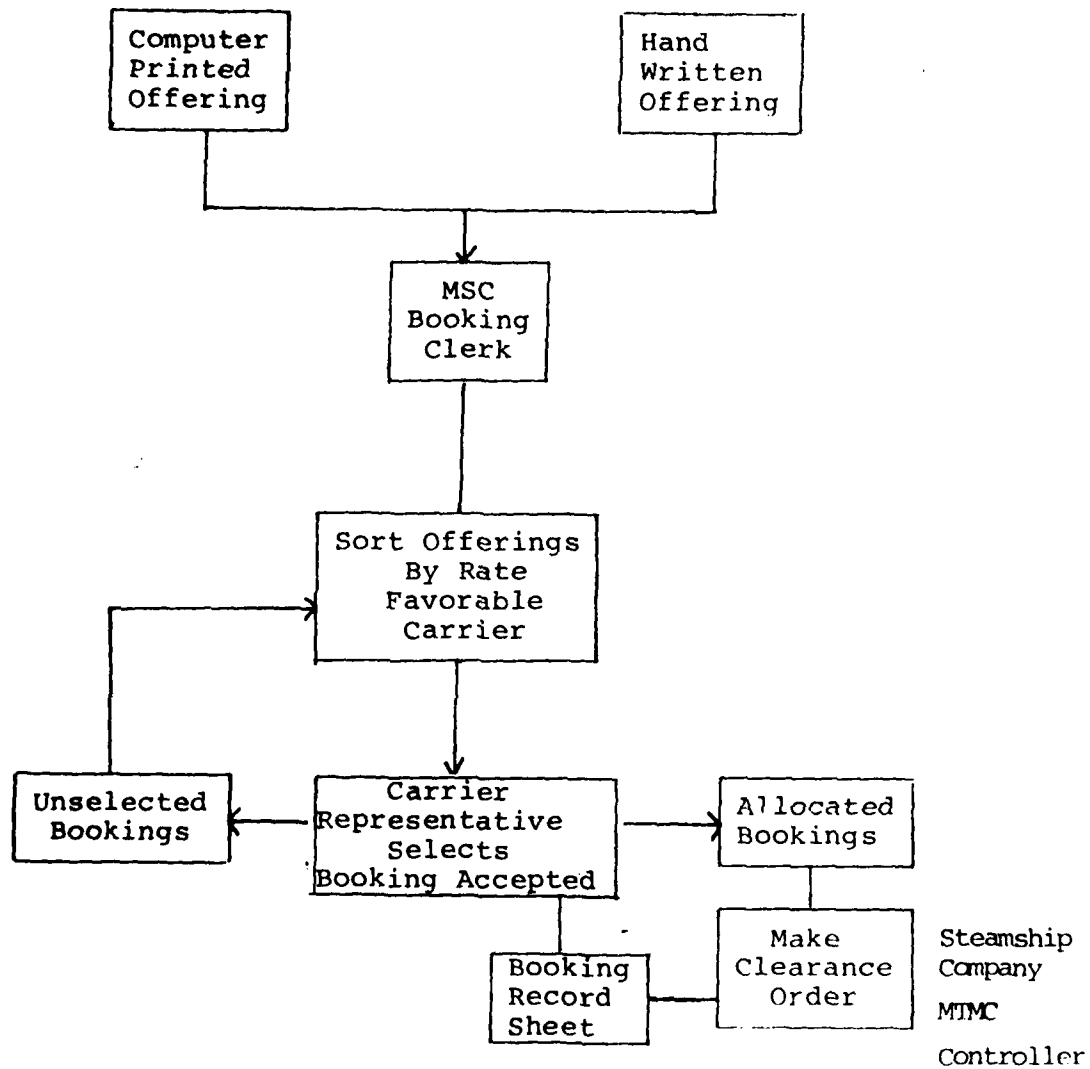
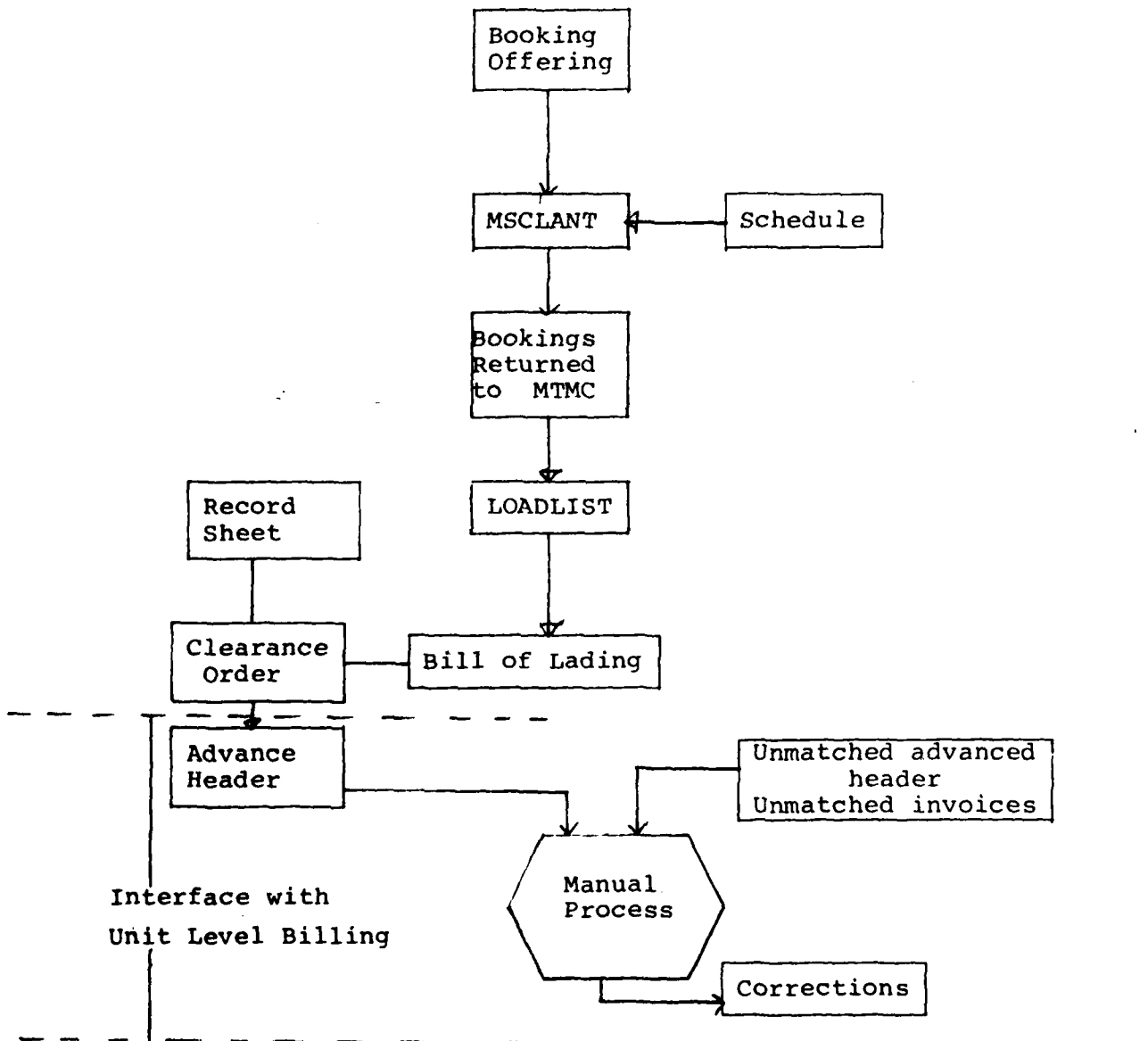
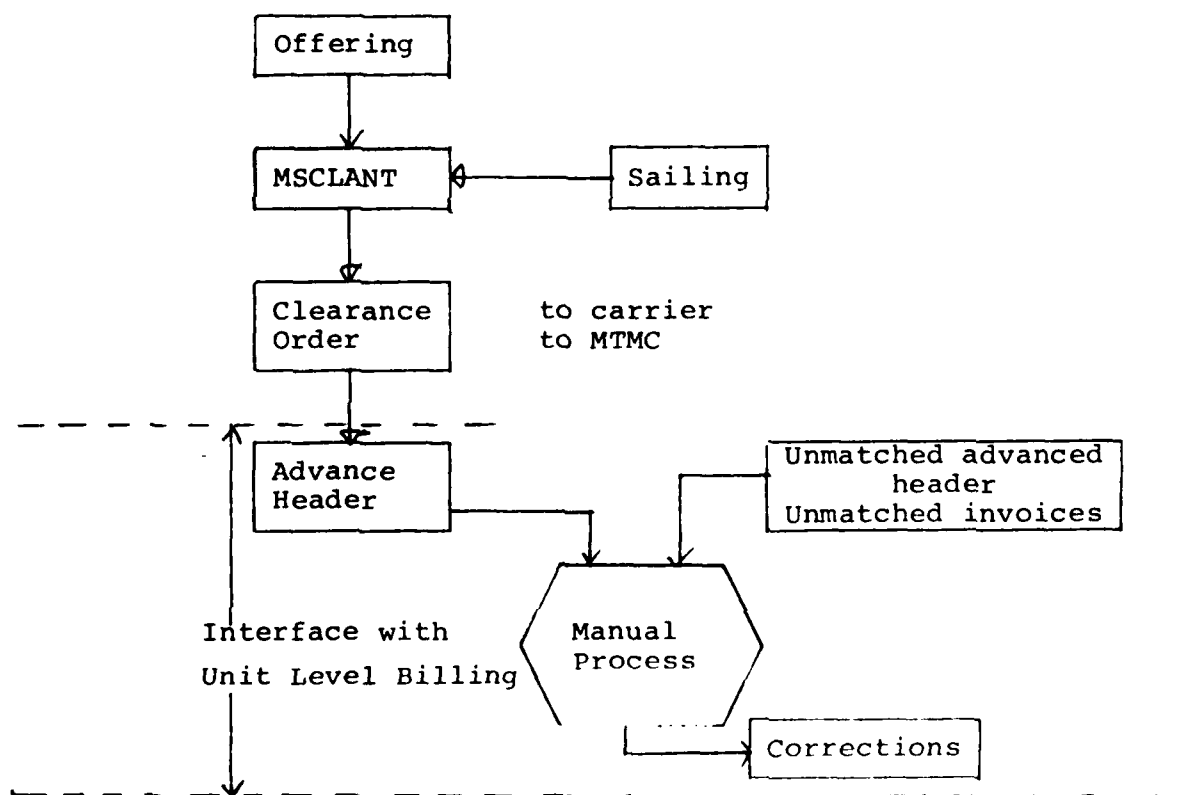


FIGURE IV.5-6 Container Booking - GBL Shipments
Atlantic Command



Note: Few shipments are sent in this way.

FIGURE IV.5-7 Container Booking International Shipments - Atlantic Command



governed in this assignment by vessel schedules, rates offered, and statutory constraints on the maximum market share carried by the low rated carrier. With some limits on its flexibility, the carrier can reject any particular offering.

The Atlantic command's procedure, on the other hand, offers a group of boxes to the low rated carrier. From this group, the carrier selects those boxes it wishes to carry. The culls from this selection are then offered the second rated carrier, etc.

It is not clear which method, if either, results in the lowest cost to the Government. The Pacific's procedure seems more businesslike, whereas the Atlantic's procedure seems at first glance somewhat sloppy.

The Atlantic's procedure gives the low rated carrier the opportunity to select exactly which cargoes it does carry. For purely technical reasons, the low rated carrier should select the heaviest and lightest cargo, leaving the middle range for his competition. This strategy will allow him better use military cargo to balance out the mix of commercially available. This ability, particularly to acquire heavy boxes, expands the low rated carrier's ability to book non-military commercial cargo. This is due to the naval architecture of container ships.

As the cargo offered the second rated carrier is the culls of the first, this second rated carrier will receive a mix of cargo less desirable to sail his vessels in a full and down condition. The third is worse still.

This selection process should create a situation where there is a greater disparity in rates between high and low rated carriers on the East Coast than West. The low rated carrier bidding to obtain the advantage of the possibility of expanded commercial sales, and the high rated carrier reacting to decreased commercial sales.

Whether or not this situation exists factually should be investigated. If so, a study should be made as to which method of cargo allocation is least costly to the Government. On the basis of these studies, the booking procedures in both the Atlantic and Pacific commands should be made uniform as it is not possible that they both be equally effective.

The second area where the area commands differ is in the way block bookings are made. Both commands accept block bookings which are, in effect, reservations of space on a particular voyage made before the exact discharge port is known. The Pacific command frequently books cargo for Korea with the exact ports of discharge to be nominated when the cargo is tendered to the carrier.

The Atlantic command is faced with a slightly more complicated situation in that for many inland destinations in Germany, both Bremerhaven and Rotterdam, are interchangeable from all technical points of view as ports of discharge from the vessel. The Atlantic command therefore developed the practice of booking cargo to the inland destination in Germany without specifying the port of discharge, this in theory being left to the discretion of the steam ship company.

This procedure creates problems when the shipment is, in fact, made because the shipper must nominate a specific port of discharge to make the TCMD. Since the clearance order for block booked cargo does not give its port of discharge, the carrier will unload it at the incorrect port should his commercial considerations dictate. This creates substantial customs and documentation problems, sometimes delaying shipments for up to a week.

Discussions surrounding block booking have no clear end. Clearly it is a practice that raises MSC's cost for the convenience of another service. The common sense value of the convenience is small, as the justification of wanting to send something 4,000 miles without knowing where it is going should be large indeed. No private commercial shipments ever are made with such arrangements. However, if the cost of eliminating

block booking is more than the cost of the occasional confusion resulting, then the practice should be continued.

There are a few points that should be raised. First, MSC should not absorb any of the cost of misrouted cargo. It is unlikely that the shippers utilizing block booking actually know its cost, and only they are in a position to estimate the utility of the practice to the DOD. Without a bill being rendered by MSC to them, no one has the factual cost data required to evaluate the procedure.

Second, the relative lack of cooperativeness of carriers (if literal compliance with contracts is uncooperative) reveals a flaw in MSC bidding and overall procurement procedure for container services. The procedure for booking cargo gives the cargo to the carrier offering the service at least cost to the government. Carriers incurring extra charges or going out of their way to provide good service are not preferred and no objective records are kept by MSC to support such performance. Thus, there is no reason for a carrier to do anything but exactly fulfill the contract. The carrier of 'misrouted' block booked cargo could easily eliminate the problem by not unloading cargo at Rotterdam which is documented for Bremerhaven. There is, however, no reason for the carrier to absorb extra costs for the benefit of MSC and hence they don't.

Great improvement is possible in the area of the administration of cargo bookings. The current system, while being adequate to today's current limited needs, could not deal well with any substantial increase in traffic volume. Additionally, the extreme emphasis that the system puts on manual recordkeeping is wasteful of manpower and exposes MSC to needlessly high operating

costs. The two largest defects of the current system are first that it can routinely furnish no information concerning the quality of transportation furnished MSC and it is not truly integrated with MILSTAMP and the unit level billing system. A substantial portion of the clerical effort required for cargo booking is spent correcting errors in the information available to the unit level billing system.

Considering the relatively small cost and straightforward development, it is recommended that an automated booking system be developed. The system should be a distributed one - resident on a micro or mini computer located at each area command. These systems should then periodically dump their files to MSC's computer to maintain the unit level billing system and other pre-existing business software.

Table IV.5-2 gives the major goal that such an implementation should have.

TABLE IV.5-2 Goals of Booking System

- Make all bookings at major area commands in an automated fashion at least cost to Government subject to pertinent constraints
- Ensure accurate commodity description on GBL shipments
- Maintain records of all other booking transactions
- Ensure optimum selection of van type and size
- Be able to accommodate a five-fold increase in activity in a two-month period with no decrease in system effectiveness
- Continually monitor quality of transportation services provided the DOD and general level of excellence of system operation. As part of this, establish system norms for satisfactory performance.
- Improve contract administration document reconciliation procedures
- Provide suitable data base for management inquiries and system evaluation
- Provide comparative information between commercial and MSC controlled tonnage utilization for specific lifts
- Provide information on cargo/container capacity location for DOD contingency planning.

IV.6 Interservice Billing Rates

In a free market economy, the most important pieces of information required to manage and plan operations are the prices of goods, materials, and services required to accomplish a given goal. Any type of cost benefit analysis, rate of return calculation is not possible if both the costs and benefits are realistically understood in monetary format. Prices set by the market are the invisible hand which guides the free enterprise economy and vastly simplifies planning.

In this type of economy any form of price control or other intervention has the tendency to cause uneconomic allocations of resources. This causes greater real cost to be incurred for the accomplishment of a task than would be made in an environment without regulation of the prices.

Because of the complicated structure of freight rates under which all users of marine transportation obtain such service, it is a wise, organizational decision for the DOD, to have MSC cope with commercial payments and to offer a simplified pricing system to its clients. This reduces overwhelmingly administrative cost of procuring marine transportation for the Defense Department.

However, because the tariffs charged by MSC are, of necessity, simplifications of those it pays commercially, they are good examples of the price controls described above. They will inevitably cause logistics decisions to be made which are not the same ones which would have been made had the decision maker known the true costs involved. The most obvious example of this within MSC's system lies in the intercoastal shipment of goods to and from Hawaii. In this trade commercial invoices are based on the hundred weight with a certain minimum charge per container. Follow-on containers of the same shipment have the minimum charge waived. As such, there is no economic gain to the Government

to utilize the cube of the containers above the level naturally following from the cargo's weight. MSC, however, based all of its invoices on the cargo's volume without consideration of its weight. This information will cause shippers to expend funds stuffing containers to minimize the use of cube to a level beyond that which is reasonable from the carrier's tariff. These expenditures are wasted as they bring no benefit to the Government - even though they seem efficient on paper.

The interface of cargo management with MSC's pricing policy are large. In cases like the above when the pricing structure does not cause the proper action by shippers, then there must be explicit management intervention by MSC if the Government is to pay the lowest cost for ocean transportation. This intervention may be made more difficult when the situation arises that although the Government pays less by a certain treatment of cargo, the shipper is in fact charged more. The need for this type of management involvement clearly decreases when the price structure more clearly dictates the actual costs of various actions by shippers.

The stated goal of MSC rate setting apparatus is to annually recover the cost of shipping goods from the client services. To do this, MSC establishes billing rates based on cost and volume forecasts, publishes these rates 2 years in advance, and then collects its revenues using these rates in conjunction with the unit level billing system. A more general statement of the goals of the rate setting function is shown in Table IX.6-1.

Figure IV.6-1 shows the general methodology used at MSC to formulate MSC's prices charged to shippers. The prices charged affect cargo operations management in the following ways:

TABLE IV.6-1 Process: Interservice Billing Rate Setting

Headquarters Functions Involves

1. Establish services for which invoices rendered
2. Establish geographical base to calculate invoices
3. Establish cost of providing service
4. Forecast volume in system
5. Establish prices
6. Investigate sensitivity to changes in environment
7. Publish tariff

Goals of Function

1. Establish services for which invoices rendered
 - a. Delineate to shippers areas where MSC wishes their decisions to be influenced by transportation costs
 - b. Determine areas where subsidization of high cost services by low ones is contrary to policy
 - c. Establish metric to determine how much of MSC's resources are consumed by shipper
 - d. Determine level of effort expended in writing bills and detail in same
 - e. Determine format of cost information available to management
2. Establish geographical base for invoices
 - a. Determine the extent to which shippers have an interest in routing cargo
 - b. Determine the apparent reasonableness of rates - the narrower the description of geography, the more commercial pressures affect a given route, the less reasonable it seems

TABLE IV.6-1 (continued)

- c. Determine cross substitution of routes
- 3. Establish cost of providing service
 - a. Provide objective justification of rates
 - b. Ensure that selected prices lead to satisfactory financial results
- 4. Forecast volume in system
 - a. Establish unit costs for transportation
 - a. Indicate areas where
- 5. Establish prices
 - a. Ensure that provision of service gives no long run gain or loss to NIF
 - b. Present services continuous stable prices for planning - i.e. absorb uncertainty in transportation costs at MSC level
 - c. Rationalize prices for internal military use
- 6. Investigate sensitivity of system to changes in environment
 - a. Clarify magnitude of risk taken in price setting
 - b. Question assumptions and adequacy of information used in pricing process
- 7. Publish prices
 - a. Make cost of transportation known to users

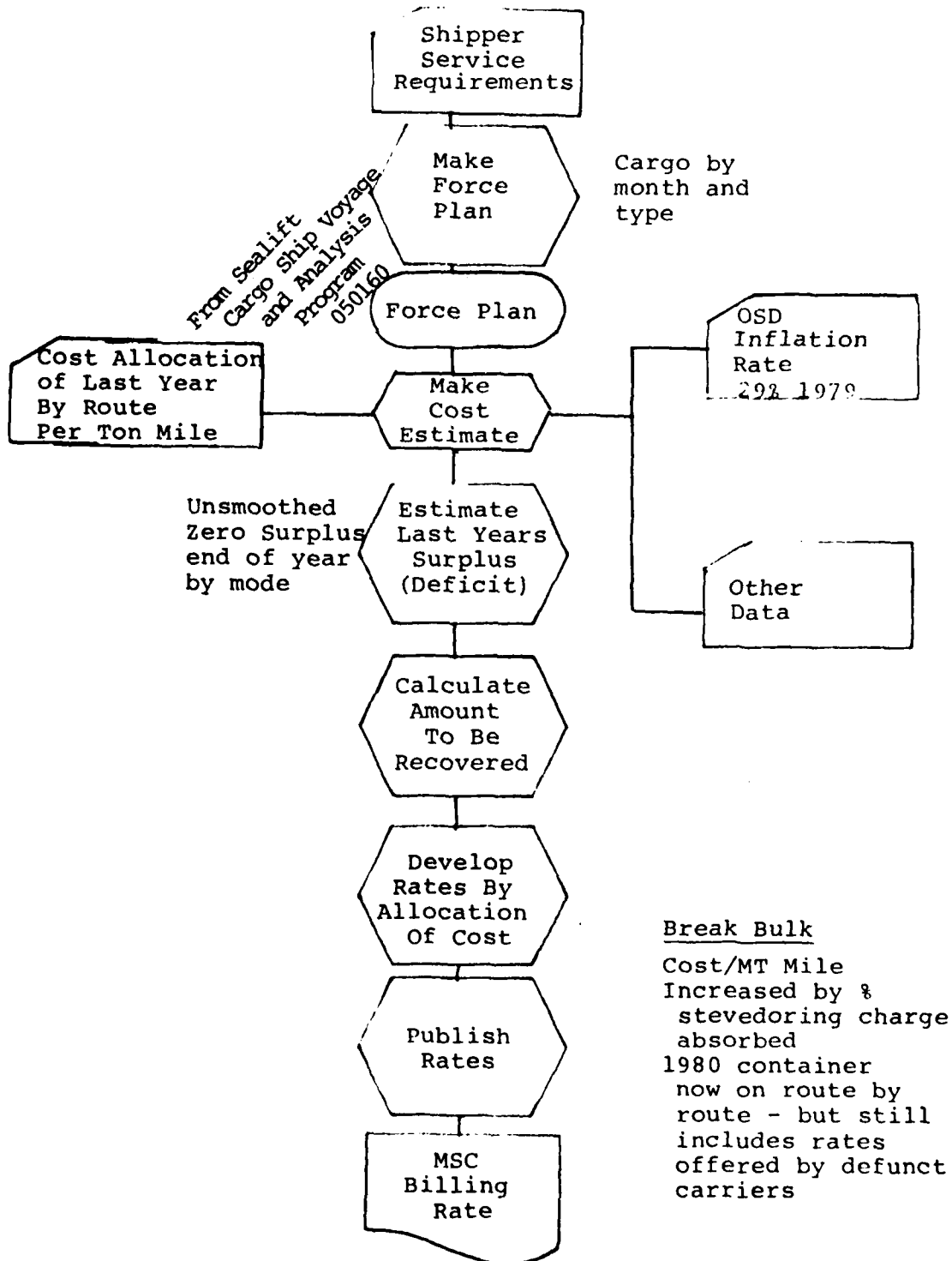


FIGURE IV.6-1 Establishment of Interservice Billing Rate

1. Prices are the best vehicle to ensure users of services use them optimally. Areas where prices are not used as a management tool will have to have explicit management intervention to ensure proper management decisions.
2. Because of the emphasis the process of setting the freight rate puts on breaking even at specific volumes, substantial amounts of management effort is required to make projections of volumes shipped. The accuracy of these forecasts is the most important single thing which affects MSC's operating results.

Concerning the second item, it is a matter somewhat unrelated to cargo management, how MSC adjusts its balance with the Navy Industrial Fund. However the current method of adjusting freight rates causes alternate periods of profits and losses which dispell any hope of understanding what is occurring in MSC's operations from its books. Additionally it places a large burden on the accuracy of volume forecasts. These forecasts have not been up to the standard required and have themselves caused unpredictable fluctuations in results. The minimum requirement to continue the current policies of pricing is to improve these forecasts. This is discussed elsewhere in the report.

The fundamental objection to the pricing policies of MSC is that their stated goal of recovering the cost of the service from shippers is too narrow, and is unimaginatively formulated and implemented. For those reasons, MSC fails to obtain any benefit from prices as a problem solving device.

Appendix I gives a very well thought out example of how a utility's prices were set to manage the demand

for water as well as recover the utility's operating cost. An approach resembling this in intent should be tried at MSC. The first step in this procedure should be the establishment of additional goals of the pricing policy.

The next step is to revise the structure of MSC's tariffs to allow the new billing procedure to address these issues. The intention here is to create a few simple modifications to the tariff which could be part of a revised Worldwide Cargo Transportation Costs Guide (Fam 55-5) and put in the hands of the users of the service. Unless this is done, the exercise will not have any real results in improving MSC's operational performance.

The last step is to test the new tariff through its use, first at one medium volume facility and then at a high volume facility prior to its system wide introduction. This will smooth out any problems and locate any pathologies in the tariff itself.

While this approach may involve a bit of liaison work with MTMC, it has the potential of solving a large number of problems within the system with a very small expenditure of resources.

IV.7 Unit Level Billing and Invoice Verification

The Unit Level Billing System is a comprehensive computer system designed to process manifest tapes furnished by MTMC into invoices for transportation to shipping services. Additionally the system deals with error corrections, etc. The unit level billing system is currently one of the keystones of MSC's management information systems, as most of the reports available to MSC's management either come directly from it or are printed from fields maintained by it.

The system itself is run by the controller's section of MSC and is largely beyond the scope of this study. The system by itself seemingly works well but is handicapped by discrepancies in the source documentation (MTMC manifest tapes) used as its primary data base.

The system's interfaces with MSC's cargo management system are extensive and making these interfaces go as smoothly as possible should be a goal of any work done on cargo management at MSC. In particular any work done on automated cargo booking could easily be broadened sufficiently to vastly decrease the amount of clerical time required to rectify errors in the manifest tapes.

Table IV.7-1 gives the functions and general goals of the unit level billing system. The general operation of the system is shown in Figure IV.7-1. The figure shows the three areas where the unit level billing system routinely interfaces with MSC's cargo booking system.

An improved automated cargo booking system well interfaced with the unit level billing system will improve the performance of the unit level billing system. Currently the float in receivables for the Pacific command runs in the vicinity of 28 million dollars, the Oakland

TABLE IV.7-1

Process: Unit Level Billing

Headquarters Functions Involved

1. Determine monthly services rendered to shippers
2. Invoice charges
3. Clarify objections to invoice (if any)

Goals of Function

1. Determine monthly services rendered
 - a. Create sum of all known individual shipments for extension to invoice
 - b. Correct any errors known prior to issuing invoices
 - c. Obtain estimate of last weeks invoices due (as billing and accounting period coincide)
 - d. Obtain sum of all special services, per diem (now detention, etc.)
 - e. Determine if major unbilled charges exist and find, if so
2. Invoice charges
 - a. Provide to paying agency charges that it is expected to pay
3. Clarify objections to invoice
 - a. Provide support and justification to protested charges and correct when they are incorrect

**Functions of Advanced Header
Made at Booking**

1. Allows location of missing invoices
2. As report frequently sorted by vessel name allows correction
3. Establishes account for booking revenue

Made when
cargo is
booked

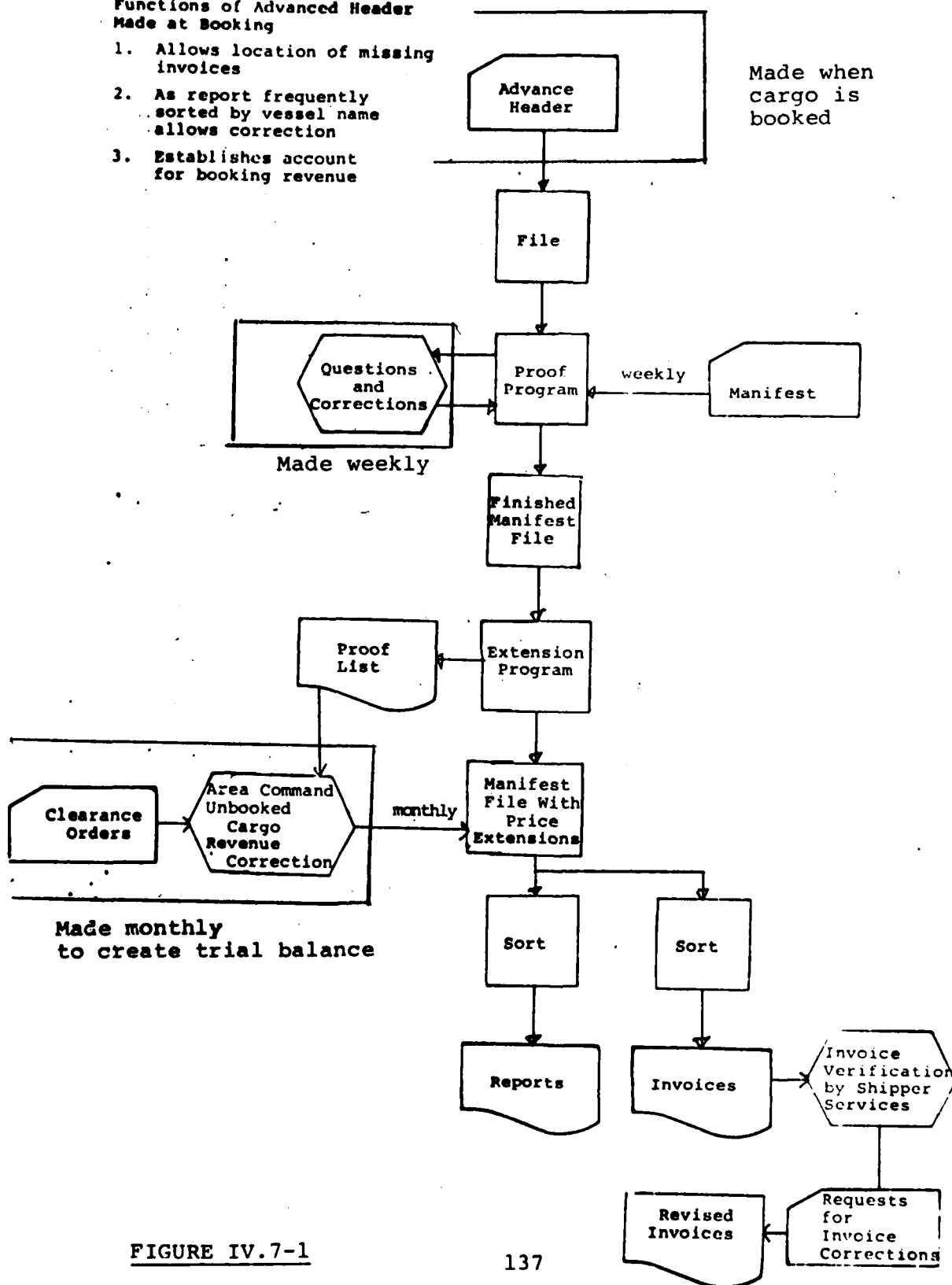


FIGURE IV.7-1

office being responsible for about 12 million. While much of this float just stems from a large volume, a substantial portion comes from difficulties in locating the proper party to send the invoices to. The three basic reasons why the unit level billing system cannot on occasions issue bills are:

1. no advanced header in the system for a ship voyage
2. transmission errors in submission of manifest tapes via autodin
3. multiple consignments per container
4. incorrect TAC codes on the ATCMD

All four problems could be remedied using an automated booking system. A reasonable target from the installation of such a booking system is the reduction of float due unbillable revenue by 50%.

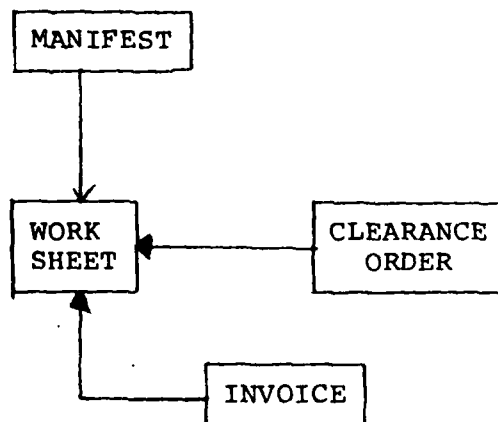
IV.7.1 Invoice Verification

Related to the unit level billing is the process of carrier invoice verification. This represents a large volume for containerized traffic. In fact, a single clearance order makes two sets of invoices. One for the basic freight and a second for overseas linehaul, drayage, and miscellaneous charges. The second invoices represent about 12% of the basic freight.

As the basic freight invoice is very simple, and can be verified only by the knowledge that the goods were in fact put on the vessel, the second invoice requires more research to ensure its accuracy. Figure IV.7.2-2 gives a sample worksheet used for invoice verification at the Pacific command.

Currently the Pacific command is experimenting with the generation of this worksheet as part of the development of the finis system. Another approach would be to develop such a worksheet from our automated booking system which would have the similar information in it.

In any case the automated generation of the worksheet should be implemented at the Atlantic command.



Oversea's linehaul and drayage run 12% of basic freight.

FIGURE IV.7.2-1 INVOICE VERIFICATION PROCEDURE

RE IV.7.2-2

SHIPPING ORDER NO.	CONTRACT BBA NO.	CA NO.	SHIP	DATE	EST
448-68/79		9864	Exchange	29	

C M D Y	TYPE SERV		U N I T	M E A S U R E M E N T	E X C L E P T	CONTAINERIZED SHIPMENTS		CONTENTS	VAN M/TON	RATE	COST
	I O R I G C O D E	U D E S T C O D E									
5	46	47	48	49	50	51-54	55-58	59-64			65-73
		34							66,332.19 ~~66,244.89~~	8.1¢	53,734.17 ~~54,001.81~~
	6¢	¢2	4	1				56	1¢4.9¢	77.¢¢	8,¢77.3¢
	5	24	5	5					1¢4.9¢	.7¢	73.43
									1¢4.9¢	.¢7	(734)
	1¢	¢2	4	1				246	385.47	94.¢¢	36,234.18
		29							5	2¢1.¢¢	1,3¢5.¢¢
	1¢	24	4	1					42.83	1.65	7¢.¢7
									42.83	.16	(6.85)
	1¢	¢24	4	1					171.32	1.37	231.71
									171.32	.43	(22.27)
	6¢	¢2	4	1				2451	3¢26.65	38.45	116,374.69
	5	24	5	5					1767.85	.7¢	1,237.50
									1767.85	.¢7	(12375)

Je- 11/10/79

PRELIMINARY SE ESTIMATE/WORKSHEET
 IIND MSC PAC 7-3/22 (9-78)

FIGURE IV.7.2-2 (continued)

	VOYAGE DOC. NO.	NIF NO.	PAYEE NO.	CARRIER BILL NO.	CHECK NO.	DATE PAID	SHIPPING ORDER NO.	CONTRACT SSA NO.	
1-2	3-6	7-14	15-18	19-24	25-31	32-37			
NN									

SAIL DATE	LOADING PORT	POE	DISCHARGE PORT	POD	ROUTE INDEX ZONE	T E R M	COMMODITY	C M D Y	TYPE SERV	U N I T	E X C E P T	CONTAINERIZED SHIPMENTS			
												1. ORIG CODE	U S B E I C O D E		
		38-40		41-43		44		45	46	47	48	49	50	51-54	55-58
7φ921		3D2		UL3			W Cargo Nos ①	6φ	φ2	4	1				
⋮		⋮		⋮			⋮ Dray (1) Z-1	⋮	24	⋮	⋮				
							S/C 9.5%								
142 9φ921		3D1		UME			W Reefer ①	1φ	φ2	4	1				
							Refrd		29						
91φ921		3D1		UME			W Cargo Nos ②	6φ	φ2	4	1				
⋮		⋮		⋮			⋮ Dray (11) Z-1	⋮	24	⋮	⋮				
							S/C 9.5%								
9φ921		3D1		UME			W Dray (1) Z-2	6φ	24	4	1				
							S/C 9.5%								

FIGURE IV.7.2-2 (continued)

DATE PAID		SHIPPING ORDER NO.		CONTRACT BBA NO.		CA NO.		SHIP		EST	
32-37											
COMMODITY	C M D Y	TYPE SERV	UN A I S T	EX C L E P N T	CONTAINERIZED SHIPMENTS		CONTENTS	VAN M/TON	RATE	COST	
					1 ORIG CODE	2 DEST CODE					
	45	46	47	48	49	50	51-54	55-58	59-64	65-73	
Nos ①	6	0	2	4	1		37	60.03	27.90	1,674.84	
(1) Z-1	1	24	1	1			60.03	.70		42.02	
5%							60.03	.07		(4.20)	
①	1	0	2	4	1		25	42.83	82.00	3,512.00	
		29						1	261.00	261.00	
Nos ②	6	0	2	4	1		1077	137.25	27.90	38,292.75	
(1) Z-1	1	24	1	1			60.03	.70		42.02	
5%							60.03	.07		(4.20)	
(1) Z-2	6	0	2	4	1		60.03	1.05		63.03	
5%							60.03	.10		(6.00)	

22 (9-78)

FIGURE IV.7.2-2 (continued)

	VOYAGE DOC. NO.	NIF NO.	PAYEE NO.	CARRIER BILL NO.	CHECK NO.	DATE PAID	SHIPPING ORDER NO.	CONTRACT BBA 1
1-2	3-6	7-14	15-18	19-24	25-31	32-37		
NN								

SAIL DATE	LOADING PORT	POE	DISCHARGE PORT	POD	ROUTE INDEX ZONE	TERM	COMMODITY	CMDY	TYPE SERV	UNASIST	EXCEPT	CONTAINERIZED SHIPMENTS			
												1 ORIG CODE	U DE CODE		
		38-40		41-43		44		45	46	47	48	49	50	51-54	55-1
94921		3DS		UME		W	Vehicle ②	86	φ2	4	1				
94921		3H2		SA3		W	Reefer ④	1φ	φ2	4	1				
{	{	{	{	{	{	{	Cargo Nos ③	6φ							
							Dray (2) Z-1		24						
							S/C 9.5%								
94921		3H2		SA3		W	Dray (1) Z-2	6φ	24	4	1				
							S/C 9.5%								
94921		3H2		UME		W	Reefer ①	1φ	φ2	4	1				

7.2-2 (continued)

3 of 1

SHIPPING ORDER NO.	CONTRACT BBA NO.	CA NO.	SHIP

C N O Y	TYPE SERV	M E A S U R E M E N T	E X C L U S I O N	CONTAINERIZED SHIPMENTS		CONTENTS	VAN M/TON	RATE	COST
				I ORIG CODE	U DEST CODE				
5	46	47	48	49	50	51-54	55-58	59-64	65-73
86	02	4	1			38 73	38.00 72.63	PAB 63.50	2713.44 4,612.41
10	02	4	1			131	171.32	94.00	16,104.08
60	02	4	1			103	157.35	38.45	6,050.11
	24						104.90	95	99.66
							104.90	09	(9.44)
60	24	02	4	1			52.45	1.95	102.28
							52.45	19	(9.97)
10	02	4	1			36	42.83	82.40	3,512.46

RE IV.7.2-2 (continued)

7 of 4

PAID	SHIPPING ORDER NO.	CONTRACT BBA NO.	CA NO.	SHIP	OPERATION	EST.
37						

	C M D Y	TYPE SERV	U N E A I S T	E X C L E P N T	CONTAINERIZED SHIPMENTS		CONTENTS	VAN M/TON	RATE	COST			
					I ORIG CODE	U DEST CODE							
	45	46	47	48	49	50	51-54	55-58	59-64		65-73		
(13)	6	6	2	4	1				4.75	712.81	27.90	21,561.40	
2-1			24						652.75	95		620.11	
									652.75	.89		(58.75)	
(2)	6	6	2	4	1				66	104.90	38.45	4,033.41	
(7)	6	6	2	4	1				42	60.03	27.90	1,674.84	
(5)									238	292.57	27.90	8,162.70	
2-1			24						180.09	.86		154.88	
6									180.09	.08		(14.40)	
95%												349.20	
												\$328,913.96	

\$326,381.66

V. ACCOUNTING SYSTEM

A description of management information requirements and availability would be incomplete without some idea of what are the capabilities of the accounting system of the organization. As with all organizations, MSC's accounting system is one of the principal providers of information within the organization.

While developed from the point of view of stewardship accounting, the system does not appear to provide sufficient operational information to provide the maximum assistance to the MSC staff.

This is a common characteristic of stewardship accounting systems as their goal is the objective reporting of an organization's financial condition to outsiders. These outsiders may be stockholders, regulatory agencies, or in MSC's case, the Navy Industrial Fund and the Department of Defense. Stewardship accounting systems also have the goal of prevention of unauthorized use of organizational assets.

Stewardship accounting procedures, being organized towards describing the organization to outsiders, frequently do not support management sufficiently and often organizations have separate cost accounting systems to fill this gap. The principal problem with a stewardship accounting system is its results are highly dependent on factors beyond the control of individuals in the organization.

With the exception of procurement oriented positions, managers have little control over the prices of items they use, but only on the physical amount. By using the prices actually paid rather than prices it was planned to pay, the manager cannot always know if he is effective as the fluctuations in factor prices many times are in excess of the maximum impact a manager can have if he does a superb job.

Secondly, the stewardship accounting system is blind to increases in physical volume of production. And a situation that was satisfactory at one level of production may be very poor if actual production differs significantly from planned.

Thirdly, in a stewardship accounting system accounts are determined by the nature of the expense. In a cost accounting system several factors determine the account structure. They are

1. nature of the expense
2. who is responsible for the expense
3. decision determining level of expense
4. direction of response
5. whether a cost is fixed or variable.

Setting up accounts in a cost accounting system is a very precise job which determines how satisfactory the system is. The goal is of course to try to ensure that only particular decisions of one decision maker affect the balance in an account. The assumption being that when this is true, the decision maker is much better able to determine the results of his decisions.

Table V-1' gives rough comparison between the two approaches.

Additionally, emphasis is put on incremental revenues and costs rather than on gross revenues and costs.

Because of the system's emphasis of cost accounting on variable output, it has an item known as a flexible budget. Basically this is really a set of fixed budgets for a given set of production volumes - each of which reflects the costs that are reasonably necessary to attain a given level of production. Additionally there is a planning budget for use by the

TABLE-V-1 Comparison of "Stewardship" and "Cost" Accounting System

<u>Item</u>	<u>Stewardship</u> <u>Accounting</u>	<u>Cost</u> <u>Accounting</u>
<u>Reporting Period</u>	Oriented toward requirements of outsiders for information	As required without physical inventories
<u>Timing of Cost</u>	Against income	Immaterial as value of goods usually standard not actual
<u>Classification of Costs</u>	By nature	By nature but also by forces generating expense and direction of response of cost
<u>Inventory Accounts</u>	Based on physical inventory	Based on records
<u>Budgetary Control</u>	a. Expenses collected by nature of expenses b. Budgets simple - basically target for each account	a. Expenses collected by nature but also by organizational unit b. Budgets complicated and intended to be somewhat divorced from volumes

steward ship accounting system which is the one point on the flexible budget which is thought most likely.

The planning budget need not agree with the flexible budget. For example when volume changes there will be a discrepancy with the planned budget as the firm is now operating in a different environment, while there ideally is no variance from the flexible budget unless the manager's performance is at variance with the plan.

Cost accounting is based on a 'standard' cost which is in fact the planned cost for each factor used in production. When results differ from the plan, there are two types of variances - quantity variable, and price variance.

The quantity variance is obtained by taking the 'standard' cost of a factor of production and charging an account for the actual amount consumed times its standard cost and crediting it with the planned amount times the standard cost. The result is the amount the physical resources used to accomplish a task differ from the planned - measured in monetary terms (but independent in price fluctuations). The price variance is the actual amount of the asset used times its actual cost minus the amount used times its standard cost. This indicates how much the operating results were affected by price changes.

This approach is very important to evaluation of decisions made in such areas as fuel consumption. As fuel prices apparently will go up steadily even very successful programs to manage bunker costs result in increased fuel charges (albeit much less than they would have been). The quantity variance from a cost accounting system is probably the only way to ascertain the combined effects of speed reductions, engineering improvements, and

decreased fuel quality on bunker costs in a way which is useful in evaluating the costs of obtaining improvements.

It is clear that from this sophisticated point of view MSC has no cost accounting system. As a direct result managers do not receive information in formats that are easy to digest and present their affect on MSC in a way they can understand. This is in reality the typical situation in many (or most) marine organizations. While being an area where real improvements is possible, it is not an area where MSC's performance is beneath the general industry level.

The last item is perhaps the most important as it means that MSC operating management frequently is making decisions with poor quality information. At MSC the only systemitized routinely available information comes from either the unit level billing system or from the accounting system. Since MSC is a huge organization, it is only possible to use the volume of information in the accounting system on an exceptional basis. Since the norm at MSC is supposed to be break even, the only exceptions really plausible are profits and losses.

As the prices are set by general average costs of system operation, decisions made on financial operating results are blind. For example, nearly everyone at MSC is of the opinion that the Ro-Ro operation with the Admiral Callahan to Europe is an efficient, well run "money making" operation, whereas the tricoast break bulk operation is a "loser". As a result, management attention is focused away from the Callahan to the break bulk.

Yet the largest single and also most easily approached area where MSC can save money is in the bunkers for the Callahan. Between 1 and 3 million dollars in expenses can

be saved annually on this vessel and yet only surface attempts have been made to economically operate the gas turbine powered vessel. Table V-2 shows all the areas that a commercial operator approached to reduce bunker charges in a fleet of gas turbine powered container vessels - prior to repowering them with diesels as a commercial operation could not pay the fuel bill. The only reason why this has not occurred at MSC is that all financial results from the Admiral Callahan show voyage profits.

The basic reason why the voyages are profitable is not that the vessel is efficient (considering its large fuel rate) but because the price used to determine its voyage revenue is artificially high. This is because it is based on an average of MSC's cost per ton mile to ship break bulk cargo in its entire fleet. As the Tricoast vessels operate on very long routes, they are responsible for a large fraction of the total ton miles produced by MSC's break bulk fleet. These vessels are quite costly to operate because of their small size and long times in port. The Callahan, being an excellent efficient ship from the point of view of cargo handling, incurs no such charges.

When the tariff is calculated, a large fraction of the charges due to the technical inefficiency of the Tricoast vessels is added to the freight the Callahan earns. It is this addition that is partially responsible for the profits that MSC earns on this route. Yet because this artificial profit exists, the pressure on management to reduce the Callahan's fuel bill is substantially reduced.

TABLE V-2

Steps taken to improve operating results of gas turbine powered containerhips:

1. new port side propeller (larger diameter and developed area ratio)
2. single shaft operation
3. improved scheduling utilizing technical characteristics of gas turbine to set schedule (best speed one engine full power other shut down)
4. installation Marisat (ensure vessel actually making speed needed for schedule)
5. bunker bonus (\$1000/voyage) if bunker conservation goals met (could double captain's income)
6. decrease distillate fuel quality used
 - a. distillate service fuel MGT-4
 - b. installation of MGT-2 stating system
7. burn heavy oil (not distilled)
 - a. installation RFO system
 - onboard washing fuel
 - varandium inhibitor
 - onboard fuel analysis capability mass
8. elimination of excess ballast sailing at minimum draft
9. purchase of water in lieu of using evaporator (allows boiler to be shut down)
10. installation of exhaust gas boiler
11. substitution of medium speed diesel for gas turbine

Fuel economies of about 25-30% were obtained prior to gross surgery of reengining. Reengining will halve fuel bill for vessel.

APPENDIX 1

FORECAST: Volume Projection for the Small Business

By Leo P. Blese, M.D.

The prediction of future volume is an important management tool for business. A multinational corporation may employ a staff of analysts and programmers to predict future sales to the highest degree of accuracy possible, but in small businesses forecasting is no less important.

For the manufacturer, the projected volume governs the procurement of raw materials and parts, personnel requirements, and perhaps capital expenditures, to mention only a few areas.

For the retailer, projection is needed to anticipate changes in necessary stocks, as well as cash flow and staffing. Even the purely service-oriented business can make good use of volume projections.

The traditional method of making projections consists of displaying past performance as a large graph behind the president's desk. The analysis and subsequent projection is then made by taking an "eyeball guesstimate." Depending upon the nature of the past data and upon the experience and acumen of the estimator, the guess may offer varying degrees of accuracy.

The problem is that the basic underlying trend upon which the projection is based is often hidden in a background of statistical noise generated by seasonal, as well as apparently random, variations. The mathematical analysis of time-series trends is a set of tools to reduce this noise much in the same way that electronic signal averaging is used to extract a given signal from its background noise.

The analysis of trends has no inherent unit and it makes no difference if we are talking about projecting gross sales in dollars or actual items sold. The material in this article is based on the author's experience in anticipating future test volume in a large clinical laboratory setting, but it is just as applicable to the anticipated sales of a widget manufacturer. The numbers are purely that: the number of things that happen at a given time. The algorithm used is one method of smoothing the data to recover the underlying trend. You could just as easily plug in building permits, town populations, or even your golf score over the years; only the titles on the printout change.

PATTERNS OF GROWTH

Growth occurs in one, or a combination, of three basic patterns (Figure 1). In LINEAR growth, the rate is constant

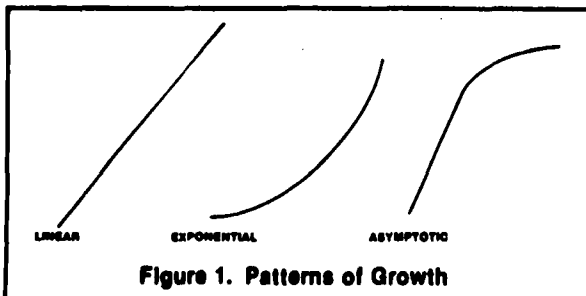


Figure 1. Patterns of Growth

and presents no analytical problems, since it can easily be projected visually. Unfortunately, linear growth is rarely sustained except for short periods of time and under special circumstances. The usual methods of volume projection often assume linear growth, but when the noise due to volume fluctuations is suppressed by various smoothing techniques,

it can be readily shown that growth was linear over only a short period of time and any projections based on this would be very misleading.

In EXPONENTIAL growth, the rate is constantly increasing. This represents, for example, the desirable situation when every satisfied customer brings in three new customers. Unfortunately for business, this pattern is also rarely sustained for very long.

ASYMPTOTIC decline is another common pattern in which growth starts out briskly (perhaps in a linear manner), but the rate of growth slows gradually, even though the total volume keeps increasing, as the market becomes saturated. This represents the situation where "almost everyone's got one." Identification of this type of pattern would be important, for example, to determine at what point further increases in sales would no longer make it worthwhile to continue manufacturing the product.

SIGMOID growth represents the real world. Sigmoid, or "S"-shaped growth is actually composed of parts of the other three types of growth. It is the most common representation because it reflects the external events that influence growth. A new product is introduced and its rapid acceptance produces a period of exponential growth in a hungry market (Figure 2).

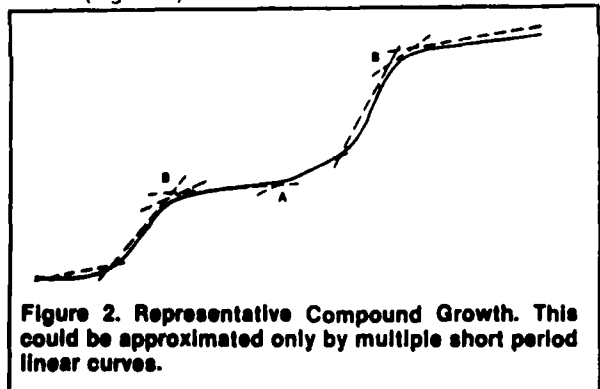


Figure 2. Representative Compound Growth. This could be approximated only by multiple short period linear curves.

At point A, the curve changes direction (called an inflection point); the period of rapid growth is over and the product then enjoys a steady period of linear acceptance. At point B the curve again changes and the product enters a period of asymptotic decline in new sales. Point B may represent market saturation or external events such as product obsolescence owing to new technology, overpricing, the introduction of competition, and so on.

Asymptotic curves are ones that keep increasing at an ever smaller rate so that they approach, but never get to, 100%; they are asymptotic because of Barnum's rule that there is always someone out there who needs/wants one.

Actual growth curves are often a combination of a series of these different patterns. High inflation rates may change linear growth into asymptotic decline only to approach linear growth once again as interest rates come down.

Microcomputer mainframe sales is an excellent example in which the full sigmoid curve completed itself in just three years with the introduction of the chips and saturation of the hobby market, but is now (slowly) repeating that same sigmoid curve with the acceptance of the microcomputer by the small business community.

It is this type of compound curve that is the most difficult to appreciate visually and the most difficult one to project over long periods of time, precisely because the analyst cannot predict the occurrences of outside stimuli and their effect on volume. Unfortunately, no computer program can do that. You could have had huge amounts of sales data for 1950 and never predicted the results of the advent of the transistor nor the effects of Japanese competition a decade later. Time-series forecasting can, however, go a long way towards reducing the errors in deciding where you are probably going by looking at where you have been.

SMOOTHING TECHNIQUES

A fairly typical pattern of sales is shown in Figure 3. The underlying growth trend is obscured by week to week fluctuations. About all we can say for the period shown is that

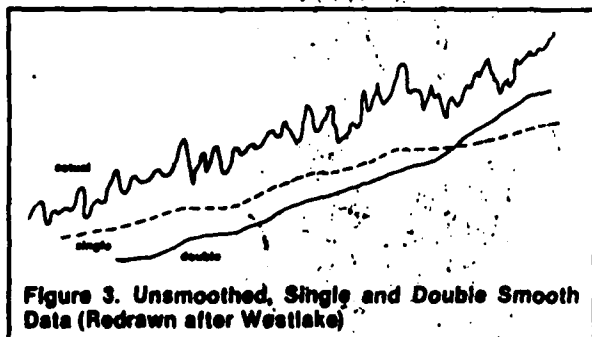


Figure 3. Unsmoothed, Single and Double Smooth Data (Redrawn after Westlake)

"sales are up" — not a very satisfactory way of deciding how many units we should make/buy for the coming period. There may also be significant seasonal trends hidden in here, which will be discussed later.

The simplest technique to reduce random fluctuations would be to compress the units of volume used. If the unit volumes were great enough, we could plot thousands sold instead of hundreds sold, effectively rounding off the data. It may very well be, however, that such a crude attempt at smoothing would be worthless, since we can't plan on the basis of thousands of units because the components are too expensive. It is at this point that the appropriate mathematical techniques can be helpful.

MOVING AVERAGES

In all the mathematical techniques of smoothing, we use some variation to take the average between two successive periods and weight (i.e., adjust) this difference in some manner so that it can be applied to the next following period. The difference between methods lies in how we derive this adjustment and how heavily we apply it. As will be shown later, we can adjust to the point where our data is no longer significant because it no longer provides the information we need.

The moving average is the least destructive of the smoothing techniques. It is found by taking the simple average of some number of past periods and using that as the prediction for the average of the next period. (Note that this is not the same as "simple averaging" because it is reapplied with each new period or group of periods and hence the average is continually changing.)

We can, for example, take the sales data per month for the past six months, average it, and use this average as the prediction for the next month. In this specific case:

$$\text{predicted ave. July sales} = \frac{\text{actual sales Jan-June}}{6}$$

To smooth the curve over many periods, we simply keep repeating the process for as long as we have data; the average sales for Feb.-July becomes the predicted sales for August,

etc. Three important factors are at work here: 1) the degree of smoothing depends upon the number of periods chosen, and 2) the periods before that have no effect on the smoothed curve. At the same time, 3) the ability to predict change is inversely proportional to the number of periods chosen.

To put it another way: For any given year, the closer we select the data intervals (monthly, biweekly, weekly) the:

1. smoother the curve is,
2. less able the curve is to predict short-term changes, and
3. greater the curve is in predicting long-term (e.g., yearly) trends
4. predictions for, say, August are based on actual sales for Feb.-July and are not influenced by actual sales in January, no matter how high or low they were.

The effect of using different numbers of periods for calculating the moving average is shown in Figure 4 where using monthly data over a period of five years shows a definite seasonal pattern that is eliminated by using weekly sales data.

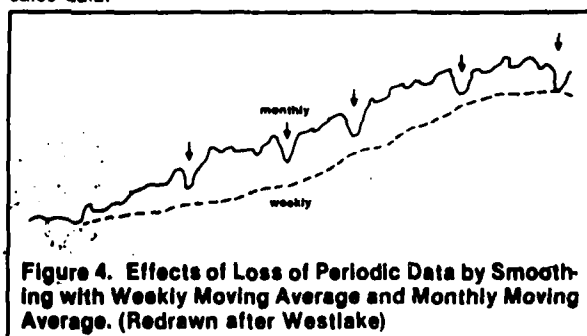


Figure 4. Effects of Loss of Periodic Data by Smoothing with Weekly Moving Average and Monthly Moving Average. (Redrawn after Westlake)

Greater smoothing can be obtained by repeating the process a second or even a third time on the previously smoothed data, but other techniques are usually more appropriate. In addition, we can increase the ability to show changes in trends (inflection points) by adding the difference between the first and second smoothing . . . back to the first smoothing; a process called "double moving averaging."

Consider the curves in Figure 3: the smoothed curve (moving average) lags behind the actual data by a period of three months because we needed the first three months to get the first moving average. If we now perform a second smoothing by taking a moving average of the moving average, this new curve would lag the first curve by an additional three months.

Now if we took the difference between the first moving average and the second moving average and added it back to the first, some of the lag is erased. The first smoothing is unaffected, but the changes (inflection points) which were largely suppressed by the second smoothing are enhanced! The formulas for doing this are given as remark statements in the program that follows.

EXPONENTIAL SMOOTHING

In this method we take the difference between the actual volume for a given period and the predicted volume for the same period and add a fixed portion (weighting factor) to the forecast for the following period. In this manner we continually correct the curve on the basis of past experience. This could be viewed as a kind of "self-correction" forecast which "learns" by its own past experience. The percentage of difference (weight) remains the same, but unlike the moving average, the correction applied to each period is influenced by all the previous points in the database.

The weighting factor can be anything between 0 and 1. The smaller the value, the greater the smoothing effect. This is subject to the same limitations discussed above, i.e., the smaller

the weight factor, the greater the smoothing and the less subject the curve is to short-term changes. In general, weighting factors of about .2-.3 give good results, but several should be tried. As in the moving average, we can apply the process a second or third time. Double exponential smoothing is performed similarly to double moving averaging, and is probably the best smoothing procedure available for general use. This is the method used in the program to follow.

A glance at the program calculations will serve to convince you that double exponential smoothing of a monthly five-year sales record (60 points) is an excellent reason in itself for owning a micro, since doing it by hand would result in the forecasting period being over by the time the calculations were done. A few additional titles and form feeds and you can have the annual report done in less than five minutes.

LINEAR REGRESSION

This is a method often mentioned for projecting future volume; it is brought up here only to condemn it. As we have seen, actual growth is very rarely linear except for small periods of time (months) and very serious errors can occur when attempting to use this method unless very elaborate statistical tests are used to evaluate the "fit" of the derived formula to the observed curve.

SEASONAL ADJUSTMENT

As was mentioned above, the purpose of smoothing techniques is to minimize the effects of noise fluctuation and show the underlying growth trends. This smoothing affects not only the pseudo-random variations in volume, but seasonal (periodic) variations as well. In many instances it is desirable to preserve this seasonal information in order to refine further the projection process. There are many mathematical techniques for recovering periodic information, but their various merits will not be discussed here. Fortunately, one of the most easily understood and easiest to apply, called seasonal indexing, is quite satisfactory for our purposes.

A Seasonal Index is constructed by first performing a single moving average as described above, usually a 12-month moving average, since we want to use the least destructive smoothing procedure and so preserve the maximum seasonal information. The unadjusted index for each period is then the actual volume divided by the predicted volume:

$$\text{raw index } P + 1 = \frac{\text{actual volume period } P}{\text{predicted volume period } P}$$

Next we find the medial average for the year by discarding the highest and lowest raw indexes and averaging the remaining values. The "adjusted" seasonal index is then each raw index minus the average index, and this can be used as a factor to multiply the projected volume for each period. Further refinements include various weighting techniques. The reader is encouraged to consult the references listed. Seasonal indexing has not been incorporated in the program presented.

ABOUT THE PROGRAM

The program is written in Microsoft BASIC 4.1 running under the CP/M operating system. The program is interactive with a floppy disk drive; old data may be called up and added to at any time or viewed and then corrected, since this is considered essential in a business environment. The program is reasonably fast, so that multiple trial runs with different smoothing factors can be accomplished; it takes about five minutes for a complete run with a 300 cps printer. Some error traps have been programmed, but no effort was made to make these complete.

The graphic output is modified from the author's generalized program module GRAPH; for the display of non-formula X-Y data. The horizontal and vertical axis has been changed

with volumes and periods adapted for this specific purpose. The volumes are in equal increments declared during the run.

For biweekly or weekly data, only about 105 periods can be printed on 14" wide paper, while 36 monthly periods print out at intervals of three spaces each. The vertical (column) axis is limited to about 52 lines, and you must set the interval (I) within this to avoid running off the paper.

This section is presented as an example only. The reader must furnish his own subroutines for significant changes for data outside these ranges. □ **Program follows**

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ABOUT THE AUTHOR

Leo P. Biese is a physician, pathologist and currently director of an independent laboratory in New England.

His hardware consists of two mainframes based on the 8080 processor with 64 and 48K memory, ADM-3a and SSM video terminals, and a DECwriter printer, all running with three 8" floppy (Perc) drives through Tarbell controllers.

CIRCLE INQUIRY NO. 11

INTERFACE AGE 63

das
Wes

**Plant
Nursery**

```

1400 X=2 Start counter and print only alternate margin volumes
1470 PRINT:INPUT "ADJUST PRINTER AND HIT RETURN TO START :P00
1400 FOR I=AM TO AL STEP -11
1490 IF X/2=INT(X/2) THEN LPRINT USING "0000":I1
ELSE GOTO 1510
LPRINT "-1":1680 TO 1520
LPRINT TAB(5):"-1"
1520 X=X+1
1530 IF X=0 THEN LPRINT TAB(15) 0101
1540 IF X=9 THEN LPRINT TAB(30):SMOOTHING FACTOR = 0:IF1
1550 FOR P=1 TO M-1
'counter for graph vert.
'marg slash title
activate next 3 lines for plotting the unsmoothed data also
1540 IF V(P) <= I-(11/2) THEN 1530
1570 IF V(P) > I+(11/2) THEN 1530
1580 LPRINT TAB(PLACECP):"-0"
1590 IF P<3 THEN 1430
1600 IF B(P) <= I-(11/2) THEN 1430
1610 IF B(P) > I+(11/2) THEN 1430
1620 LPRINT TAB(PLACECP):"-M"
1630 NEXT: LPRINT
1640 NEXT I
'first 2 B's invalid
Now print a horizontal legend for the graph
1650 LPRINT SPC(5);
1670 IF PLACE=1 THEN LPRINT (WIDE,"-"):FOR I=1 TO WIDE STEP 5:
LPRINT I:NEXT:GOTO 1690
1680 FOR I=1 TO (WIDE/PLACE)-3
LPRINT ": ";
1690 IF PLACE=4 THEN LPRINT "----"
1700 IF PLACE=3 THEN LPRINT "-.-."
1720 NEXT: LPRINT
the above prints the bottom margin only, the values
must be provided by the user. The following is for
a specific use.
1740 LPRINT SPC(7)
1750 FOR I=1 TO 3
1760 LPRINT:DC JN FB MR AP MY JN JL AU SP QC NW "I
NEXT
1770 LPRINT
1790 LPRINT TAB(20):1976:I TAB(60):1977:I TAB(95):1978
1800 FOR I=1 TO 5:LPRINT:NEXT
1810 ENB
'eject the paper
RUN #1 CREATING THE DATA FILE
RUN
PROJECTION OF FUTURE LABORATORY TEST VOLUME/REVENUE
You are disallowed to no more than 52 periods.
THE DATA FILES AVAILABLE FOR THIS PROGRAM ARE:
DUMMY .DAT

```

ENTER A FILENAME (WITHOUT .DAT EXTENSION) TO USE A FILE FROM THE LIST ABOVE OR CARRIAGE RETURN TO START A NEW FILE OF DATA

OLD FILE NAME ?

NEW FILE NAME (0 CHAR) ? PROFILE

BEGIN ENTERING YOUR DATA NOW

PERIODS MAY BE: WEEKLY, MONTHLY, YEARLY OR ANY OTHER INTERVAL.

RESULTS WILL BE IN TERMS OF THE SAME PERIODS.

IF YOU MAKE AN ERROR ENTER 999. TO END DATA ENTRY USE 000

PERIOD 1 = ? 994

PERIOD 2 = ? 1000

PERIOD 3 = ? 1049

PERIOD 4 = ? 1129

PERIOD 5 = ? 893

..... etc

PERIOD 34 = ? 1939

PERIOD 37 = ? 000

000 DATA ENTRY COMPLETE 000

DO YOU WANT TO REVIEW THE DATA FOR ERRORS ? N

SMOOTHING FACTOR DESIRED (0-1) ? .8

WHAT IS THE TITLE OF YOUR DATA? TOTAL TESTS/MONTH CHEM. SECT. B
ADJUST YOUR PAPER, TURN ON THE PRINTER and then hit 'RETURN'

READY ?

RUN 02 USING OLD DATA FILES

RUN

PROJECTION OF FUTURE LABORATORY TEST VOLUME/REVENUE
You are disallowed to no more than 52 periods.

THE DATA FILES AVAILABLE FOR THIS PROGRAM ARE:

DUMMY .DAT PROFILE .DAT

ENTER A FILENAME (WITHOUT .DAT EXTENSION) TO USE A FILE FROM THE LIST ABOVE OR CARRIAGE RETURN TO START A NEW FILE OF DATA

OLD FILE NAME ? PROFILE

DO YOU WANT TO ADD TO THE CURRENT DATA ? NO

DO YOU WANT TO REVIEW THE DATA FOR ERRORS ? YES

1> 994	2> 1000	3> 1049	4> 1129	5> 893
6> 1012	7> 1093	8> 1024	9> 917	10> 949
11> 1109	12> 1100	13> 977	14> 994	15> 913
16> 1044	17> 941	18> 847	19> 1003	20> 844
21> 1279	22> 1341	23> 1442	24> 1520	25> 1440
26> 1316	27> 1398	28> 1767	29> 1858	30> 1797
31> 1800	32> 1614	33> 1699	34> 1579	35> 1520
36> 1939				

CORRECT? YES

SET UP THE PARAMETERS FOR GRAPHIC OUTPUT

YOUR DATA RANGES FROM 847 to 1939 or 1092 UNITS IN ALL

SELECT AN EVEN RANGE FOR THE GRAPH: LOWEST VALUE ? 830
HIGHEST ? 1950

THE GRAPH WOULD BE 34 DIVISIONS HIGH or 20 UNITS/DIV.

SELECT AN EVEN NUMBER OF UNITS/DIV (CAN'T BE LOWER) ? 20

YOUR GRAPH WILL RUN FROM 830 to 1950 ON THE VERTICAL AXIS
WITH EACH DIVISION = 20 UNITS

THE HORIZONTAL RANGE IS FROM ZERO TO 120 AND YOU HAVE 34 POINTS
WITH EACH DIVISION = 3 UNITS

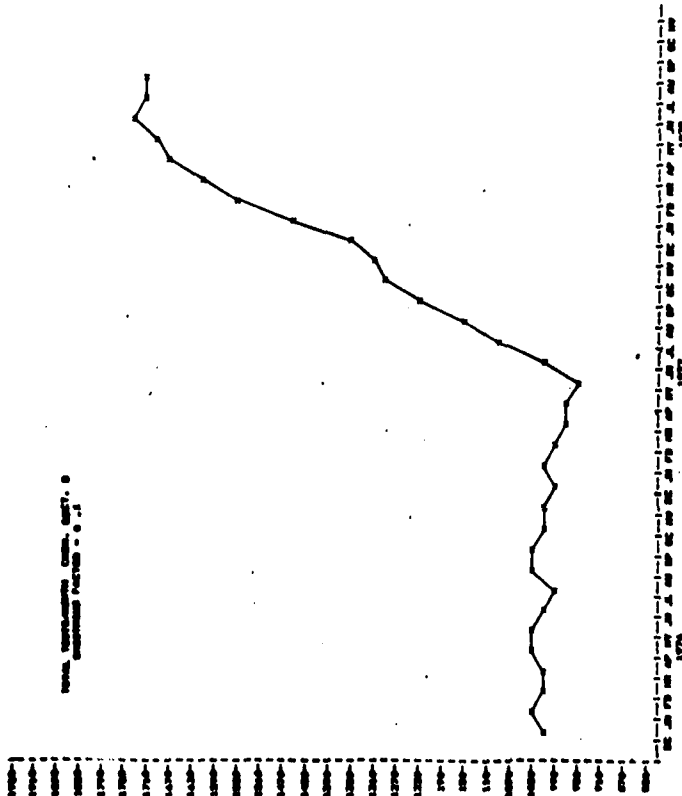
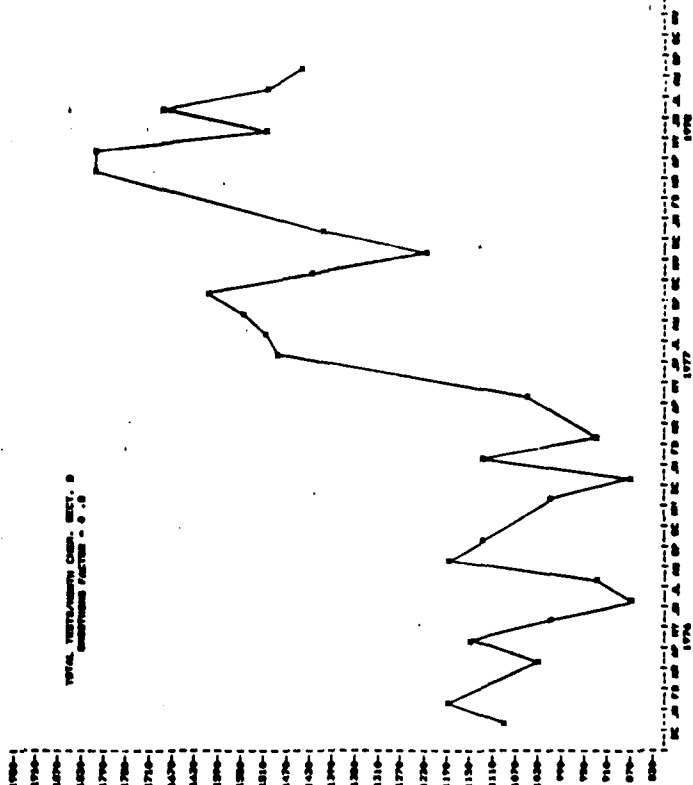
CORRECT ? YES

EXPONENTIAL SMOOTHING OF LABORATORY TEST VOLUME
USING A FACTOR OF 0.8

TOTAL TESTS/MONTH CHEM. SECT. B

PERIOD (P)	VOLUME (V)	1ST. SM. (S1)	2ND. SM. (S2)	DOUBLE (D)
1	994	994	994	—
2	1000	994	998	1004
3	1049	1039	1031	1080
4	1129	1111	1095	1191
5	893	938	970	781
6	1012	997	992	1023
7	1093	1075	1059	1159
8	1024	1034	1039	1010
9	917	954	973	874
10	949	950	953	928
11	1109	1077	1053	1200
12	1100	1095	1087	1138
13	877	921	954	754
14	994	979	974	1005
15	913	926	936	878
16	1044	1034	1014	1137
17	941	974	984	934
18	847	873	893	741
19	1003	977	961	1059
20	844	887	901	813
21	1279	1201	1141	1300
22	1341	1329	1291	1517
23	1442	1419	1394	1547
24	1520	1500	1479	1604
25	1440	1452	1457	1425
26	1316	1343	1344	1229
27	1398	1367	1383	1408
28	1747	1671	1629	1999
29	1858	1825	1784	2020
30	1797	1803	1799	1817
31	1800	1801	1800	1802
32	1614	1651	1681	1502
33	1699	1689	1688	1698
34	1579	1520	1514	1314
35	1520	1534	1533	1454
36	1939			

14	1044	995	1003	904
17	941	1002	1003	1001
18	947	998	1002	992
19	1043	993	1000	942
20	944	995	997	949
21	1279	972	995	947
22	1341	1003	997	1011
23	1442	1039	1001	1001
24	1320	1079	1009	1158
25	1440	1123	1020	1228
26	1316	1155	1034	1290
27	1398	1171	1048	1309
28	1767	1194	1042	1340
29	1850	1231	1081	1440
30	1797	1312	1104	1543
31	1800	1340	1120	1617
32	1614	1404	1137	1679
33	1499	1425	1184	1693
34	1579	1453	1211	1721
35	1320	1445	1234	1720
36	1939	1471	1240	1705



EXPONENTIAL SMOOTHING OF LABORATORY TEST VOLUME
USING A FACTOR OF 0.1

TOTAL TESTS/MONTH CHEM. SECT. B

PERIOD (P)	VOLUME (U)	1ST. SM. (S1)	2ND. SM. (S2)	DOUBLE (D)
1	994	994	994	994
2	1000	994	994	994
3	1049	995	994	995
4	1129	1000	995	1004
5	895	1013	994	1031
6	1012	1001	997	1004
7	1095	1002	997	1008
8	1024	1012	999	1024
9	937	1013	1000	1027
10	949	1005	1001	1010
11	1109	1000	1001	998
12	1100	1011	1002	1020
13	877	1019	1003	1037
14	994	1005	1004	1007
15	913	1004	1004	1005

APPENDIX 2

Rate-Setting and Billing for Small Utilities

BY STEPHEN P. SMITH

This article presents the development and implementation of a package which includes billing and record keeping routines for a small utility, in this case a town water system. We'll see how the computer assists in establishing water rates, how it maintains records, prepares the bills and provides statistical data to monitor the distribution of the water. The modest hardware requirement can be imitated using almost any microcomputer. The BASIC software, with the possible exception of audio tape utilities, can be used directly on any system with an 8K interpreter.

The water system in question is operated by the town of Parksley, Virginia. Parksley has a population of about a thousand people and a prosperous business section servicing the surrounding rural area. Water is drawn from several deep wells and pumped to a tower for storage. Gravity feeds water from the tower to business and residential customers. Although a large portion of the system was built using Federal money, it is now maintained from fees and town property taxes.

Historically, these fees have been a flat \$9-per household per quarter. The result was that Parksley used almost twice as much water per capita as did similar towns with metered systems. Households that conserved water subsidized the water wasters, and there was no incentive to repair leaks. Also, the system's total capacity was nearly reached, while the need for new connections was steadily increasing. As an alternative to expensive capital improvements, the town elected to install water meters, charge customers by the gallon, and hope that consumption would be forced down.

This conversion presents two problems. The first is to determine a rate schedule that will achieve an adequate income. The current solution is to set the minimum rate at the existing \$9 per



quarter, but with the addition of a computer it will be possible to further reward conservation-minded households without jeopardizing the solvency of the system. The second problem is the actual preparation of the bills. Meters must always be read by hand, but manual preparation of bills has proved to be time consuming, costly and error prone. The task is ideal for automation, but people tend to fear that impersonal and inflexible billing, characteristic of large utilities, will result. This is an area where the intimacy and personal control possible with a microcomputer will prove to be a convincing factor.

In addition to solving these problems, automation will provide a bonus. With all the meter readings in its memory, the computer can do a fairly thorough statistical analysis. Consequently, the town can see the average use for residential and business customers, along with the deviations from month to month. The town will have a good idea what range of use can be expected at various times of the year. A statisti-

cally significant increase at any one meter might indicate a leak or some other problem with water use. Finally, customers who question the billing procedures can be shown exactly how their consumption compares with that of others in the town.

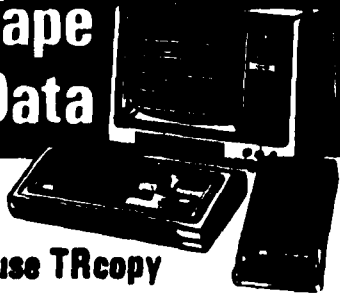
How Much Per Gallon?

Let's begin by looking at the technique used to establish rates. This is basically a one-time program, but it might be used again should use patterns of water use change in the near future. The town has a good idea of what revenues it needs to operate the system, and knows the total amount of water pumped from the wells. From government surveys, we can also determine how much water a typical household should use and how the price of water would affect that use. What we need is a model, a set of equations that will accept this data and find the optimum rate scale.

The model developed here is the Monte Carlo type—that is, it generates its own random population based on

Illustration by David Bastille

See and Copy Tape Data



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TRcopy is a cassette tape copying system that lets you SEE what your computer is reading.

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MAKE BACKUPS FOR YOUR PROGRAMS

Now you can make backup copies of your valuable programs. Many times a cassette that you make will load better than one that is mass produced. The original can then be kept as a backup in case the copy is damaged.

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If you are in the software business you can use TRcopy to make tested copies of your programs for sales distribution. TRcopy produces machine language tapes that are more efficient than those produced by the assembler file.

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With TRcopy you can experiment with the volume and level controls and you can SEE what the computer is reading—even if your computer will not read the data through normal read instructions! In this way it is possible to read and copy faulty tapes by adjusting the volume control until you SEE that the data is input properly.

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given statistics, then tries various rate schedules and compares their effects. We don't really know how many people live in each house in Parksley or how much water they use. We do know, however, what percentage of households (on a regional average) have 1, 2, 3, . . . people and we know the normal range of water use for a household of any given size. We also know, from data published by the U.S. Department of Commerce, how a change in a water bill will effect consumption. We can't predict the behavior of individuals, but we can be fairly certain about the average effect over a population the size of Parksley's.

Our procedure, therefore, is to generate a random population whose water use pattern matches that expected for a town of 1000 persons. Next, we bill them according to a specific schedule and see what the effect will be on their consumption. Bills are then generated for the new consumption and we determine if the revenues and total water use meet our goals. If not, the schedule is adjusted; a new consumption is calculated; and the entire process is repeated. After several iterations, the procedure produces a table of rates consistent with good water management and fiscal need.

The first step is to generate the population. The computer does this using the BASIC random number function. The first set of numbers assigns the size of each household. About 3% of the possible random numbers will assign one person to a house; 50% will assign four persons. The percentages are provided to the program in data statements. The same statements contain the normal range of use per person in households of each given size. A second series of random numbers will be used to select a specific rate of consumption within this range. Different random number generators will pick different populations, and none may be exactly like that found in Parksley. Provided that our statistics are good, however, each will produce almost identical results in our billing model. These results demonstrate the power of the Monte Carlo technique.

The next step is to prepare a bill for each water user we have created. For Parksley, a five-level schedule has been selected with the hope that it will produce enough flexibility to control waste without overly confusing the customers. (The local electric power co-op also uses a five-tier schedule.) The cut-off for each level is a function of use and is determined by the program. The

approximately 100 customers whose use is lower than one standard deviation below the mean (see the accompanying box on normal distributions) pay only the minimum connection fee. Consumption within each standard deviation above that is billed at a successively higher rate, until the 10% of the customers whose water use is more than two standard deviations above the mean are paying the highest rate. Within each level, the price per 1000 gallons is determined by an equation of the form $C1 + N * C2$. N is the number of the price level (from 0 to 4). As we will see, this formula allows the rate schedule to be corrected for either low revenue or high consumption.

**Many businesses,
including small
utilities, often must
vary rates by use.
Computers can
simplify calculations
needed to insure
equitable rates.**

Finally, we can use the bills we have just generated to determine what the new water use patterns will be. Information provided in data statements allows our program to calculate the consumption each household should reach within a few billing cycles. The billing algorithm is run once again and the resulting revenue is compared with that needed to run the system. If too little money is brought in, constant C1 in the rate is increased. If too much money (say a 10% surplus) is generated, C1 is reduced, lowering prices across the board. If the new total consumption is too high, constant C2 is raised, increasing prices for heavy users. The program now returns to the original consumption data and calculates bills using the new schedule. Once again the effect of the bills consumption is found and the rate schedule is revised accordingly. The procedure is repeated over and over, until both fiscal and conservation criteria are met.

CIRCLE 26

Does This Apply to My Business

This type of trade-off analysis should be familiar to most business people. If your prices are high, you make a good profit on each sale, but expect few sales. If your prices are low, you get more sales, but less profit on each. The optimum is the point at which total profit is the greatest. Although the town only needs to break even, the problem is similar. A rate schedule too highly weighted for conservation might reduce revenue below that needed to run the system. A schedule weighted too lightly might allow use to exceed the system's total capacity. Finally, if the overall rate structure is too high, the citizens may revolt and vote out the town officers at the next election.

This Monte Carlo model can be adapted for any small business enterprise. Market surveys will supply data on how customers will react to various price levels. Often the Federal government or industry groups will have already published this work. A good manager will know how his costs will vary with production or purchase levels, sales volume, warehousing, taxes on inventory and changes in the need for personnel and equipment. Given this data, a computer model will be able to select the optimum price for a product, predict demand and even show how altering price structure could change your share of the market (perhaps lowering current profits, but providing an even larger return in the future).

The Billing Program

The rate schedule generated with the Monte Carlo model becomes one of the inputs to the billing routine. The other inputs are the meter readings and a historical data file. This file includes last month's readings and certain statistical data for each meter. The new readings are entered at a terminal by the town secretary. All that is needed from the software is a simple prompting routine and some checks for obvious errors. The historical data must come from mass storage; and it's here that microcomputers most often fail to perform adequately for business applications.

Without good system utilities, it is very difficult to build disk or tape files that will cover any situation. Because we are limiting our computer system to this single task; however, we can handle the chore with an inexpensive audio tape recorder and a little BASIC software.

Having established that tape will be used, we must now determine what in-

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CIRCLE 27

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CIRCLE 28

formation is needed on the file. Certainly the last meter reading must be included. To help track changes in consumption, the last month's water use and the average use at this meter will appear. Additional statistical parameters such as standard deviation may also prove helpful in predicting use patterns. Each record on the tape will be identified by a unique meter number, and also by the name and address of the person receiving the bill. Reading and updating this tape involves a trade off. Reading the entire tape before doing any processing requires a lot of memory. This method is often the only alternative with the primitive hardware available for microprocessor systems. Adding a little special purpose hardware, however, we can provide our program with control of the tape recorder motor and allow it to read the file one record at a time. Unfortunately, if each record is read and processed individually, the operator will spend a great deal of time waiting for the relatively slow audio tape to enter its data.

The procedure which has proven most advantageous in this application involves software motor control and two readings of the tape which extract needed data without the operator being present. The tape is first read before any new data are entered. The system stores the meter number, the previous reading and the last monthly consumption. The other data are ignored. About 6000 words of memory are required for this array. As the operator enters new readings, the billing routine calculates the number of gallons used and compares it with the figure for the previous

month. Unusual changes are flagged so that the operator may check for input errors or make notes to examine the meter location for problems.

When all the new readings have been entered, the mean and standard deviation of water use for the entire town are calculated. These figures are used to measure progress toward the consumption goal and to assist in future rate calculations. They may also be used to tell individual users how their consumption compares to that of their neighbors. (Think of the effect of receiving a bill telling you you're using more water than 97% of your neighbors!)

The second reading of the tape takes place automatically. A single record is read and all the data are retained in memory. The computer now prints the bill for this customer, addressing it as shown on the data tape. The operator can store a list of customer name and address changes before the process starts. The list is keyed to meter numbers and corrects the tape as the bill writing proceeds. As each bill is printed, a new tape is written. This tape becomes the input file for the next month's billing procedure.

Because a relatively slow audio tape is used for storage and a very slow KSR-35 teletype is used for printing, this billing procedure is a lengthy process. The system has proven exceptionally reliable, however and can be run unattended. The operator keys in the new readings on the day they are collected, sets up the tapes and then leaves. The computer runs overnight, preparing bills and making a new tape.

Hardware

I'm sure that most data processing managers would be horrified at the prospect of using such equipment to do their work. From the standpoint of cost effectiveness, however, I doubt that they can match it.

The hardware consists of an Ohio Scientific Challenger II with 12K words of user memory and 8K Micro-soft BASIC in ROM, a used KSR-35 Teletype terminal, two Kansas City standard audio cassette recorders and some relays for motor control. The entire package costs less than \$1500. Additions like disk drives and a high speed printer would be nice, but they are clearly not necessary and may contribute to the user's fear of the computer.

Overcoming this fear is one of the most important functions of the personal computer. Many potential business applications users have no experience with data processing, and out of ignorance, distrust the computer. The Parksley water billing system shows what can be done to encourage new users. The same hardware could just as easily perform inventory or general ledger operations. Alternately, any other hardware configuration (for example, your personal system) could do this job. The key to success is the development of software geared directly to the user's application. With this power available, a business person faced with paying tens of thousands of dollars for a general purpose minicomputer will be very interested in a custom tailored micro costing much, much less.

The Normal Distribution

Operation of the Monte Carlo model relies not on knowing about a specific group of people, but on the fact that we can know how people behave in general. They are described to the computer in terms of statistics. For example, 50% of all households have four people, and the average daily water use is 120 gallons per person.

In building a sample population, however, we must know more than just the average. We must know if all the elements of our population should be close to the average, or if they should be scattered widely. Perhaps a large number just below the average should be balanced by a few who are far above

it. This kind of information is supplied by a statistical distribution.

The distribution most commonly used is called simply the normal distribution. It characterizes almost any type of measurement, from test scores to the value of resistors to the water use of a community. Theoretically, the normal distribution appears as the bell-shaped curve shown in Figure 1. The majority of the population will be grouped at the center, near the average or mean. As you leave the center in either direction you find fewer and fewer samples.

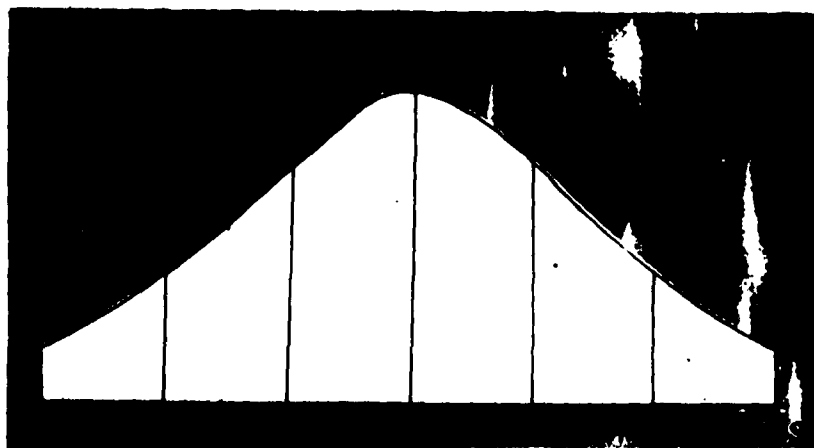
Just how closely the samples group around the mean is called the central tendency. In a normal distribution, the

measure of central tendency is called the standard deviation: 68% of a normal population falls within one standard deviation of the mean, 34% above and 34% below. Another 28% lie between one and two standard deviations, and most of the remaining 14% lie between two and three. In each case, half are above and half are below the mean.

Suppose we know, for example, that the mean test grade in a class of 50 pupils was 85% and that the standard deviation was 5%. We can be fairly certain that 17 of the grades fell between 85 and 90, and that 17 more were between 80 and 85. It is unlikely, although not impossible, that more than

one pupil scored better than 95. We can also predict how many grades fell between any two limits. All these calculations are taken from the mean, standard deviation and the mathematical definition of the normal distribution.

The mean and standard deviation are calculated from real data such as census surveys or (in other applications) samples of a product. Often only these statistical parameters, and not the original data, are available. Using tables or equations that describe the distribution, however, we can create a new model population that will behave in approximately the same manner as the original. Thus, we can determine how a town will behave without ever meeting its inhabitants.



M is the mean or average. S is the standard deviation. The height of the curve represents the probability of finding element of the population with the given value.

Controlling Audio Tape From BASIC

The relatively low speed of the audio tape used for mass storage in the water billing system makes manual control of the tape drives impractical. If an operator were required to turn the recorders on and off for each record, any savings which might be realized through automation would quickly be lost. It is necessary, therefore, to provide computer control. Fortunately most quality cassette recorders have a remote on/off capability. Our software only needs ac-

cess to the switch.

The Ohio Scientific 430 I/O board which provides the audio tape port in this system has several unused output lines which can perform the switch function. High order address lines are decoded to activate the board. The three low order address lines are demultiplexed with the Read/Write line to produce 16 lines which strobe (go briefly from the zero to one level) when the correct memory location is ac-

cessed. Thus, PEEK and POKE commands in BASIC will activate one of the strobe lines.

Two flip-flops are added to latch these strobes. Accessing memory location D10N or D20N causes the corresponding latch to be set. Accessing DOFF causes the corresponding latch to be set. Accessing DOFF resets both latches. The latched outputs drive small relays which actually control the current to the tape recorders.

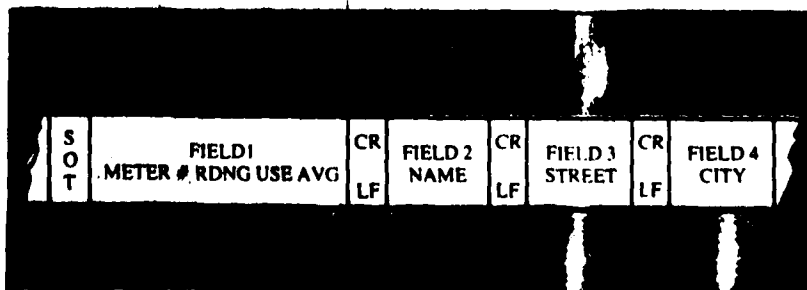
File Structure

Producing a computer system for a specific application such as water billing requires more than choosing a computer and writing some BASIC software. Careful consideration must be given to the format in which data are stored. You, as the system analyst, must decide which data to save, the number of digits to present, the units to use, and whether to store numeric values as strings of ASCII characters, as binary numbers or in BASIC floating point representation. In many cases you must make a trade off between an efficient file structure and the amount of money you're willing to invest in mass storage devices for your system.

Data for the water billing system are stored in a single tape file. The file contains a series of records. Each record begins with an SOT (start of text) character and contains four fields of data. (See Figure 2.) The fields are

separated by a carriage return and line feed. Because data are accessed sequentially (one character at a time) and because special characters are used as delimiters, the data fields may be of variable length. Only necessary characters are included, producing the shortest records. This method is of considerable importance when slow mass storage such as audio tape is used.

The first of the four data fields contains four numeric values separated by commas. These values are all integers and will fit nicely in the six significant figure accuracy of the Microsoft BASIC. The first value is the meter number and serves to identify the record. The second is the last meter reading (gallons*10); the third is the previous usage (gallons); and the last is the



Sequential file holds meter reading and name and address of owner.

weighted average of all previous uses. This field is read as a string of characters and then converted to numeric form. Using direct binary integers would save file space, but a special routine would be required to convert the numbers to BASIC floating point representation. BASIC already has a

function VAL(X), to convert from string notation.

The other three fields remain as character data. Field 2 contains the name of the person receiving the bill. Fields 3 and 4 contain the street and city/state/ZIP addresses respectively. If random access files had been used

(e.g., on floppy disk), the name and address data might have been stored separately from the meter data, allowing each file to be updated independently. The use of sequential access, however, dictated the combined format as most effective. The file structure had to be designed around hardware selection.

Program 1 - Setting the Rate Schedule

Run

ESTIMATION OF RATE SCHEDULE TO ENCOURAGE WATER CONSERVATION
TARGET CONSUMPTION = 10000 GALLONS PER MONTH
REVENUE SHOULD FALL BETWEEN \$ 300 AND \$ 307.25

```

* POPULATION OF 100 ELEMENTS HAS BEEN CREATED
TOTAL REVENUE = 1.06754E+06 GALLONS PER MONTH
REVENUE = 10675.4
STANDARD DEVIATION = 4403.22
* REVENUE = 1.22700E+06
PREDICTED CONSUMPTION = 1.04261E+06 REVENUE = $ 277.24
* REVENUE = 1.23400E+06
PREDICTED CONSUMPTION = 1.02285E+06 REVENUE = $ 314.57
* REVENUE = 1.24100E+06
PREDICTED CONSUMPTION = 999199 REVENUE = $ 317.67
* REVENUE = 1.24800E+06
PREDICTED CONSUMPTION = 910416 REVENUE = $ 287.73
* REVENUE = 1.25500E+06
PREDICTED CONSUMPTION = 891854 REVENUE = $ 308.24
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PREDICTED CONSUMPTION = 873292 REVENUE = $ 328.74
* REVENUE = 1.26900E+06
PREDICTED CONSUMPTION = 854730 REVENUE = $ 349.24
* REVENUE = 1.27600E+06
PREDICTED CONSUMPTION = 836168 REVENUE = $ 369.74
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PREDICTED CONSUMPTION = 817606 REVENUE = $ 390.24
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PREDICTED CONSUMPTION = 799044 REVENUE = $ 410.74
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PREDICTED CONSUMPTION = 780482 REVENUE = $ 431.24
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PREDICTED CONSUMPTION = 743358 REVENUE = $ 472.24
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PREDICTED CONSUMPTION = 724796 REVENUE = $ 492.74
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PREDICTED CONSUMPTION = 0 REVENUE = $ 3916.24
* REVENUE = 2.49400E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 3936.74
* REVENUE = 2.50100E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 3957.24
* REVENUE = 2.50800E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 3977.74
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* REVENUE = 2.80900E+06
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* REVENUE = 2.81600E+06
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* REVENUE = 2.82300E+06
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* REVENUE = 2.83000E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 4920.74
* REVENUE = 2.83700E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 4941.24
* REVENUE = 2.84400E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 4961.74
* REVENUE = 2.85100E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 4982.24
* REVENUE = 2.85800E+06
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PREDICTED CONSUMPTION = 0 REVENUE = $ 5043.74
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* REVENUE = 2.90000E+06
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* REVENUE = 2.92800E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 5207.74
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* REVENUE = 2.94200E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 5248.74
* REVENUE = 2.94900E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 5269.24
* REVENUE = 2.95600E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 5289.74
* REVENUE = 2.96300E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 5310.24
* REVENUE = 2.97000E+06
PREDICTED CONSUMPTION = 0 REVENUE = $ 5330.74
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PREDICTED CONSUMPTION = 0 REVENUE = $ 5351.24
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PREDICTED CONSUMPTION = 0 REVENUE = $ 5371.74
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PREDICTED CONSUMPTION = 0 REVENUE = $ 5843.24
* REVENUE = 3.15200E+06
```

Run

Listing

```

970 METERS=LINES
980 GOSUB 8101: REM GET LINE
990 MMS=LINES
1000 GOSUB 8101: REM GET LINE
1010 STREET=LINES
1020 GOSUB 8101: REM GET LINE
1030 CITY=LINES
1040 KIPER(OFF): REM TAPE OFF
1050 NEM DECODE METERS
1060 LINES=METERS
1070 GOSUB 1010: REM GET NUMBER
1080 METER=NUMBER
1090 GOSUB 1010: REM GET NUMBER
1100 NEEJIM=NUMBER
1110 GOSUB 1010: REM GET NUMBER
1120 NAME=NUMBER
1130 GOSUB 1010: REM GET NUMBER
1140 AVHAGE=NUMBER
1150 NEM=NEM
1160 NEM=.....
1170 NEM
1180 NEM
1190 NEM
1200 GOSUB 8101: REM GET LINES
1210 LINES=
1220 GOSUB 8101: REM GET LINES
1230 IF CHARACTERS THEN RETURN
1240 IF (SC(CHARACTERS) THEN LINES=LINES+CHARACTERS
1250 GOTO 820
1260 NEM=.....
1270 NEM
1280 NEM
1290 NEM
1300 NEM
1310 NEM
1320 NEM
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2460 GOSUB 3101: REM READ A RECORD
2470 GOSUB 3210: REM ENTER CHANGES
2472 GOSUB 3010: REM FIND FEE
2474 GOSUB 3101: REM DOLLARS AND CENTS
2475 TO 70-AMOUNT
2480 READING=H*(11)
2490 USAGE=U(11)
2500 AVERAGE=M(11)
2503 REM
2504 REM PRINT BILL
2510 PRINT FFS: REM FORM FEED
2520 PRINT "TOWN WATER SERVICE"
2530 PRINT "PARKSLEY, VA 24221"
2540 PRINT DATES
2550 PRINT PRINT
2560 PRINT TAB(30);NAMES
2570 PRINT TAB(30);STREETS
2580 PRINT TAB(30);CITY
2590 PRINT:PRINT
2600 PRINT "FOR METER" METER "READING" R1(11) "TO" R2(11)
2610 PRINT "PLEASE REMIT $" AMOUNTS " ON OR BEFORE " DUES
2620 PRINT " "
2630 GOSUB 2910: REM COMMENTS
2640 GOSUB 3010: REM WRITE A RECORD ON TAPE
2650 NEXT I1
2670 RETURN
2690 REM*****
2900 REM
2910 PRINT "NEW METER MAY BE ADDED TO SYSTEM"
2920 INPUT "IS OUTPUT TAPE READY ON DRIVE TWO?" AS
2930 IF AS="0" THEN RETURN
2940 GOTO 1980: REM INITIALIZE METER
2950 IF METER=0 THEN RETURN
2960 GOSUB 3010: REM WRITE A RECORD
2970 GOTO 2930
2990 REM*****
3000 REM
3010 REM COMMENTS
3020 REM THIS ROUTINE CAN ADD A MESSAGE ON EVERY 87'L
3030 REM
3040 PRINT "THIS BILL WAS PREPARED BY COMPUTER"
3050 PRINT "IT ERRORS MAY BE REPORTED TO A PERSON AT 443-3090."
3055 REM
3090 REM IT CAN ALSO ADD MESSAGES TO SPECIFIC BILLS
3095 REM
3096 IF AMOUNT<3 THEN PRINT "NEW LOWER RATES FOR CAREFUL USERS"
3097 REM
3098 REM*****
3099 REM
3010 REM FIND AMOUNT
3020 IF KNOWN GOTO 3070
3030 DIM LEVEL(3),RATE(3)
3040 DATA 1000,2,1000,3,16000,4,20000,5,24000,6
3050 FOR I=1 TO 3:READ LEVEL(I),RATE(I):NEXT I
3060 KNOWN=I
3070 AMOUNT=MATE(11): REM MINIMUM BILL
3080 IF USAGE<LEVEL(1) THEN RETURN
3090 IF USAGE<LEVEL(1) THEN RETURN
3100 IF USAGE<LEVEL(1) THEN RETURN
3101 IF USAGE<LEVEL(1) THEN RETURN
3102 IF USAGE<LEVEL(1) THEN RETURN
3103 IF USAGE<LEVEL(1) THEN RETURN
3104 IF USAGE<LEVEL(1) THEN RETURN
3105 IF USAGE<LEVEL(1) THEN RETURN
3106 IF USAGE<LEVEL(1) THEN RETURN
3107 IF USAGE<LEVEL(1) THEN RETURN
3108 IF USAGE<LEVEL(1) THEN RETURN
3109 IF USAGE<LEVEL(1) THEN RETURN
3110 IF USAGE<LEVEL(1) THEN RETURN
3111 IF USAGE<LEVEL(1) THEN RETURN
3112 IF USAGE<LEVEL(1) THEN RETURN
3113 IF USAGE<LEVEL(1) THEN RETURN
3114 IF USAGE<LEVEL(1) THEN RETURN
3115 IF USAGE<LEVEL(1) THEN RETURN
3116 IF USAGE<LEVEL(1) THEN RETURN
3117 IF USAGE<LEVEL(1) THEN RETURN
3118 IF USAGE<LEVEL(1) THEN RETURN
3119 IF USAGE<LEVEL(1) THEN RETURN
3120 IF USAGE<LEVEL(1) THEN RETURN
3121 IF USAGE<LEVEL(1) THEN RETURN
3122 IF USAGE<LEVEL(1) THEN RETURN
3123 IF USAGE<LEVEL(1) THEN RETURN
3124 IF USAGE<LEVEL(1) THEN RETURN
3125 IF USAGE<LEVEL(1) THEN RETURN
3126 IF USAGE<LEVEL(1) THEN RETURN
3127 IF USAGE<LEVEL(1) THEN RETURN
3128 IF USAGE<LEVEL(1) THEN RETURN
3129 IF USAGE<LEVEL(1) THEN RETURN
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APPENDIX 3 - Pacific Command Documentation - Container
Shipments

FORM I Container Control Summary
Booking form first filled out by MTMC as offering,
then completed by PAC becoming booking

FORM II Clearance Order
Record of consignments to be shipped on
particular voyage

FORM III Booking Record Card

FORM IV Booking Record Card (Refer)
Basic record of shipments made

FORM V Worksheet Demonstrating Compliance with
rules governing carrier market shares

FORM VI Government Bill of Lading - used primarily
on domestic shipments (i.e. to Hawaii) -
sample obtained.

FORM I

CONTAINER CONTROL SUMMARY

DOD REG 4500 32R

ADDITIONAL REMARKS BY ITEM NO.

ITEM NO.	SIZE QTY	SPONSOR IDENT.	TRANSPORTATION CONTROL NUMBER				POE: POD	REMARKS MTMC	NET CONTENTS	
			SPONSOR DOD AAC	VOYAGE DOC. NUMBER	WTCA CONT. NO.	SVC TYPE			WEIGHT	CUBE
3	S 1	080-0800 3546	MARINE WA M95110		V	3M2	OAK UL3	UL7		
4	S 1	078-0805 3485	MARINE WA M95110		V	3M2 2.52	OAK UL3	UL7		
5	L 1	081-0342 4182	TRACY SW3200		V	L2	OAK UME	UM4		
6	S 1	081-0341 4181	TRACY SW3200		V	L2	OAK UME	UM4		
7	L 2	082-1602 4162	AAFES C62 LBL		V	1M2	OAK UME			
8	S 1	082-1601 4161	AAFES C62 LBL		V	1M2	OAK UME			
9	L 5	081-0223 4161	NSC OAK N00228		V	1L2	OAK UME	UM4		
10	L 2	079-0243 4098	NSC OAK N00228		V	1L2	OAK UME			
11	L 4	079-0340 4097	NSC OAK N00228		V	1L2	OAK UME			
12	S 4	079-0720 4099	NSC OAK N00228		V	L2	OAK UME			
13	L 1	M84-258 75-1545	NRSO EA N00250		V	1L2	OAK UME	MIN-BRIDGE		

NAV FORM 9470

PREVIOUS EDITION IS OBSOLETE

A20

REMARKS BY ITEM NO.

DATE FROM MSC:

POB:

JAPAN

DATE TO

MSC: 085

BROOKS

ATTACHMENT

REMARKS BY ITEM NO.	NET CONTENTS		AVAIL	SIZE NO. BKED	ETD ETA	VESSEL	REMARKS MSC	RELEASE DATE INITIAL	SHIPPER CONSIGNEE
	WEIGHT	CUBE	DATE						
7			4/10						DR PEPPER M95102
7			4/15						CHIPMAN WASE M95102
4			3/27						N62649
4			3/27						N62649
			3/26						WASE 803 CT5511
			3/26						WASE 803 CT5505
4			3/26						ALAMEDA N62649
			4/16						BLDG 432 N65953
			4/16						BLDG 432 N65951
			3/29						COCA EOL-A N62649
WIN - BRIDGE			4/2						EARTH

CLEARANCE ORDER/SHIPPING ORDER

MSC FORM 4612/1 (REV. 3/71) S/N 0104-LF-121-3002

FORM II

This order confirms cargo booking as indicated and reflects the approximate tonnages and details of cargo as available at the time of booking. Freight will be based upon the cargo actually loaded and entered on the cargo manifest, bill of lading as appropriate.

FROM:

Comsepac

TO:

United States Lines

☐ USNS

☐ TC

☐ VC

☐ GAA

Container ☒ SHIP ☒ MST

CARGO				LOADING							
CAT. NO.	DATE BOOK-ED	DESCRIPTION	NR VOLS/WEIGHT/CUBE	INLAND ORIGIN SVC	LOADING PORT	TERMINAL/PIER NO.	EDOB	RLD	GOV ACC	CAR ACC	
1	2/16	Type 2L	2	1M	Oakland	(302)	2/28			X	
1	"	" "	1	2K	"		"			"	
23	"	" "	5	1K	"		"			"	
1	"	" "	1	KM	"		"			"	
1	"	" "	1	1M	"		"			"	
1	"	" "	1	KM	"		"			"	
23	"	" 2S	2	1K	"		"			"	
1	"	" "	3	KK	"		"			"	
1	"	" "	1	KM	"		"			"	
1	"	" "	2	1M	"		"			"	
1	"	" 2L	3	KK	"		"			"	
1	"	" "	1	KM	"		"			"	
23	"	" 2S	24	1K	"		"			"	

DISTRIBUTION

OTHER PARTICULARS

of cargo as available at the time of booking.
ding as appropriate.

ORDER NO.

180-19/79

United States Lines

SHIP NAME
AGENT

American Astronaut V-714

VOYAGE NO.

P-4105

GAA

Container

SHIPPING CONTRACT/AGREEMENT

☒ MST

C-9867-RI-23/24/28A (W2)

☐

BILL OF LADING

LOADING						DISCHARGING						
SHIP NO.	EDOB	RLD	GOV ACC	CAR ACC	REF NO	DISCHARGE PORT	ETA	INLAND DESTINATION	RRD	GOV ACC	CAR ACC	OTHER
	2/28			X		Balboa (BAI)	3/6	Madden Wye			X	
	"			"		"	"				"	
	"			"		"	"				"	
	"			"		Rotterdam (JG)	4/1	Grossauheim			"	
	"			"		"	"	Zweibruecken			"	
	"			"		FELASTOWE (HAS)	4/2	Braintree			"	
	"			"		"	"				"	
	"			"		Bremerhaven (JFI)	4/3				"	
	"			"		"	"	Bitburg			"	
	"			"		"	"	Germerheim			"	
	"			"		"	"				"	
	"			"		"	"	Kaiserslautern			"	
	"			"		"	"				"	

PARTICULARS

ATTACHMENT IX

A21

CONT. JER LIST

VESSELMOYAGE: **CAK 770**
 SAILING DATE: **9/22/79**
 MSL. PAL. NUMBER: **ASB**

CARRIER: UNITED STATES LINES, INC.
 LOADING PORT: **OKLAND**
 DISCHARGE PORT: **Honolulu**

RECEIPT LIST: ☒
 FINAL LIST: ☒

TIME: **0122**

TOTAL NUMBER OF CONTAINERS LIFTED: **24**

BY: **B.B.**

FINAL LIST TRANSMITTED ON DATE: **9/22/79**

DATE	PREFIX	CONTAINER NUMBER	TRANSPORTATION CONTROL NUMBER	SEAL NUMBER	CONSIGNEE	PCS	WEIGHT	CUBE	RECEIVED
40	USU	4092643	✓	✓	✓	✓	✓	✓	✓
✓	✓	4209004	✓	✓	✓	✓	✓	✓	✓
✓	SSU	221342	✓	✓	✓	✓	✓	✓	✓
✓	USU	4156476	✓	✓	✓	✓	✓	✓	✓
✓	✓	4231522	✓	✓	✓	✓	✓	✓	✓
✓	OTM	434554	✓	✓	✓	✓	✓	✓	✓
✓	USU	4219635	✓	✓	✓	✓	✓	✓	✓
✓	✓	4111677	✓	✓	✓	✓	✓	✓	✓
✓	OTM	442441	✓	✓	✓	✓	✓	✓	✓
✓	USU	4138045	✓	✓	✓	✓	✓	✓	✓
✓	✓	4202592	✓	✓	✓	✓	✓	✓	✓
✓	✓	4014656	✓	✓	✓	✓	✓	✓	✓
✓	✓	4173473	✓	✓	✓	✓	✓	✓	✓
✓	✓	4227137	✓	✓	✓	✓	✓	✓	✓

Seal & Final
 Shipped Company

FORM IV

EXP. NO.	COMMAND	COMMUNITY	IR	CH	BOH	DISC. PORT	REMARKS
0-6	Wt 440		(1-20)			LN	
0-17	Sum 306	099		(1-40)	4/15	Wilmington	LN (Tect)
0-40		Le 140		(1-40)		LN	LN (Tect)
0-41				(1-40)		LN	LN (Tect)
R-25		Puls	1-40		4/20		LN (Tect)
R-26			1-40				LN (Tect)
R-74		Puls	1-40		4/18		LN (Tect)
R-75		"	1-40				LN (Tect)
R-76		ce/boy	1-40				LN (Tect)
R-78		ce/fus	1-40		4/21		LN (Tect)
R-90		ten/fus	1-20				LN (Tect)
OFFERINGS	5 x 11	5 x 20	5 x 20	LDG	ETD	C/O	DISCHARGE PORTS ETL
SHIP	Wt 440	VOY	PAC	SP	4/3	4/11	4/17 4/19 4/24
De McKinley	79	458	096	4/5	4/3	Yoko	Bus Bus

A24

ATTACHMENT III

1978

	1-2 SEP	3-9 Sep	10-16 Sep	17-23 Sep	24-31 Sep
APL	58,373 ³¹	66,415 ³²	74,856 ³²	77,990 ³¹	86,166 ⁽³¹⁾
SLND	93,325 ⁵⁰	102,079 ⁵⁰	112,953 ⁴⁹	125,062 ⁴⁹	134,970 ⁽⁴⁹⁾
SSCO	30,252 ¹⁶	31,571 ¹⁵	37,755 ¹⁶	42,736 ¹⁷	47,582 ⁽¹⁷⁾
USLX	5 8	0	8	6	8
MTSN	4692 ³	5960 ³	5960 ³	6833 ³	6936 ⁽³⁾
TOTALS:	186,646 9271	206,025 19379	231,524 25449	252,561 21037	275,658 23,007

ATTACHMENT IV

Pacific Command Documentation - Break
Bulk Shipments

AD-A105 957

FRANKEL (E G) INC BOSTON MA

F/6 15/5

STUDY OF CARGO MANAGEMENT SYSTEM OF THE MILITARY SEALIFT COMMAN--ETC(U)

JAN 80 E G FRANKEL

N00014-79-C-0851

NL

UNCLASSIFIED

3 OF 3

AD-A
105 957



END
DATE
FILMED
11-81
DTIC

FORM I	Break Bulk Offering
FORM II	Break Bulk Offering
FORM III	Vessel Schedules
FORM IV	Clearance Order
FORM V	Activity Record

WORKSHEET MTW/JTX-1, 1 APR 77				BREAKBULK CARGO OFFERINGS MSC PAC		DATE OFFERED 14 MARCH 1979			
POD CODE	ULT CODE	M/T	DESCRIPTION/WEIGHT - CUBE	DATE AVAIL	DATE BKD	OPERATOR/SHIP/ETD VOYAGE NUMBER	CUT OFF DATE	LOAD PORT	TERRAIN CAIR
YOKOSUKA 4474		MID	ARRIVO, Small Arms w/ Explosive Bullets, 007 Cans C, CG-CASST L; 1 SD (13 BX) ANTITANK w/ 1 12 GA SHOTGUN 00 BUCKETSHOT, 3120 RDS 650 # 17cu. NET SHOTGUN - 15. #75209		3/14 GP	USNS BLAND P-4165.	3/30	MO7371	1-1
SAFIC 543		MID	1 BX CLAMP, 22cu SHOT BULLETS, 400 RDS 115 # 14cu. NET SHOT GUN - 013 #			ETD / MOTBA / 4/3 ETA / YOKOS / 5/2 " SUB / 5/18			

ATTACHMENT X

SHIP RETURN/AVAILABILITY DATE:

DATE: 7/07/75

CCRTGZ 77-10:

תשובה :

[illegible]

FORM IV

MSC FORM 4612/1 (REV. 3/71) S/N 0104-LF-121-3002

This order confirms cargo booking as indicated and reflects the approximate tonnages and details of cargo as available at the time of booking. Freight will be based upon the cargo actually loaded and entered on the cargo manifest, bill of lading as appropriate.

FROM:

COMSC PAC

TQ

LYKES BROS. STEAMSHIP CO

☐ USNS

☐ TC☐ VC☐ GAA☒ SHIPMENT
☐ MISTAKE

A33

OTHER PARTICULARS	* BT UNDA
-------------------	-----------

This shipment is to be routed as indicated, and any ocean bill of lading issued to cover the above cargo must show the rates, terms and conditions of the carrier.

TYPED NAME OF CONTRACTING OFFICER

R.L. COLGAN

SIGNATURE

Previous editions of this form are obsolete.

VOY No.	VESSEL	DPR	OFF/ACC	ON B		ALLOC	DESTINATION
				ON B	OFF		
1516	HAWAII MONARCH V-165 BT/GBL/52	MTSN				7/8-10 CONTR FOV	HONO
531	MATSONIA V-52 BT/GBL/52	MTSN				7/11-12 CONTR FOV	HONO
A34							
1515	HAWAII ENTERPRISE V-119 BT/GBL/52.	MTSN			7/11-12	CONTR FOV	HONO
1497	HAWAIIAN V-259 BT/GBL/52	MTSN		SEA 7/11-12		7/7-8 CONTR FOV	HONO
1532	HAWAII QUEEN V-161 BT/GBL/52 (2)	MTSN				7/15-16 CONTR FOV	HONO

BY	ALLOC	DESTINATION	CARGO
7/8-10	CONTR FOV	HONO 7/16	OAK(R)CONT: 2 HONO - 2 KAN - 2 PRL OAK(D)CONT: 9 HONO - 15 HONO (KHAJ) - 1 HONO (JOHNSTON) OAK(B/B): 35 (P) 24 (S) HONO (PREV BKD)
7/11-12	CONTR FOV	HONO 7/16	OAK(R)CONT: 1 PRL - 8 HONO (KHAJ) OAK(D)CONT: 15 HONO OAK(B/B): 42 (P) 86 (S) HONO - 24 (S) HONO (KHAJ) (PREV BKD)
	CONTR FOV	HONO 7/16	LB(R)CONT: 9 PRL - 1 KAN - 2 HONO LB(D)CONT: 25 HONO LB(B/B): 85 (P) HONO - 3 (P) HAWILINILI (PREV BKD)
7/7-8	CONTR FOV	HONO 7/19	SEA(R)CONT: 2 HONO - 1 PRL SEA(D)CONT: 40 HONO SEA(B/B): 24 (P) HONO (PREV BKD)
7/15-16	CONTR FOV	HONO 7/22	OAK(R)CONT: 18 HONO OAK(B/B): 35 (P) HONO

Voy No.	VESSEL	OPR	OFF/ALL	ON BERTH			ALLOC	DESTINAT
				OTHER	LS	SP		
1534	LJRLINE V-58 BT/GBL/52	MTSN				7/18-9	CONTR FOV	HONO
1530	HAWAII PROGRESS V-108 BT/GBL/52	MTSN			7/18-19		CONTR FOV	HONO
1533	CALIFORNIAN V-260 BT/GBL/52	MTSN		SEA 7/20-21		7/17-18	CONTR FOV	HONO
1552	TRANSCAMPAIN V-12 BT/GBL/52	MTSN				7/8-9	CONTR FOV	GUAM

DATE

9 JULY 75

WEEK ENDING

ALLOc	DESTINATION		CARGO
3-9 CONTR FOV	HONO	7/22	OAK(R)CONT: 16 PRL - 3 KAN - 1 HONO OAK(D)CONT: 14 HONO OAK(B/D): 40 (P) HONO
CONTR FOV	HONO	7/23	LB(R)CONT: 1 PRL - 1 KAN - 1 HONO LB(D)CONT: 32 HONO LB(B/B): 90 (P) HONO (PREV BKD)
7-13 CONTR FOV	HONO	7/27	SEA(R)CONT: 5 PRL - 1 HONO SEA(D)CONT: 22 HONO SEA(B/B): 20 (P) HONO (PREV BKD)
9 CONTR FOV	GUAM	7/24	OAK(R)CONT: 11 GUAM OAK(D)CONT: 16 GUAM OAK(B/B): 140 (P) GUAM - 1 (P) GUAM (SAIPAN-13 (PREV BKD)

A35

NEW-ITX 1, 1 Sep 76

BREASBULK CARGO OFFERINGS MSC PAC

[illegible]

DOD REG 4500 32R

<u>OAK</u>	CUNNINGHAM
VM3	73 YOLK

A30

DATE FROM AGO: 10/3 FILE TO: 061

ARMY-ORND, CA.

SHIP REPAIR/MAINTENANCE COSTS

DATE: 7/07/75

REF:

[illegible]

					PUS	DAK	342.	
ONEER	T				UAY	COUC	4057	713-
INSTR-AC-TO-	C		USC	F5052B	CHIN	"		PRL - CANC
CY								
1-13-50								
22K								

AY PIR 000000 1010-10

/ A31

Atlantic Command Documentation -
Container Shipments

FORM I	Offering Computer Generated
FORM II	Offering Manually Prepared
FORM III	Summary of Containers Booked used to ensure compliance with regulations governing market shares of carriers
FORM IV	Booking Records
FORM V	Clearance Order

DATE: 79-080 ESEA VARI OFF FLOWING
PRFR 2435 IDENTI CLEAF-080-1308 OFFERED: 79-061

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13</																																																																																							

NO. FOOTL SIZE:		HEIGHT	:	TOTAL	:	R S D:	R D D:	CA	:	TD	:	FR1
SMALL	LARGE	IN LBS	:	N/TOT	:				:		:	
			:		:				:		:	

3 02 1 1 105 1 3 1
REQUEST DEAVONS PICK UP AT Scrum up Paterson N.J.

1 CONTACT NAME TELEPHONE # 201-858-6293
1 (LHC TO BE PAID BY SHIPPER) SPOT SEAVANS, DATE: 3/27.

RETRUCKING COVERS MOVE FROM (ORIGIN) (CARRIER TERM) TO DESTINATION.
REQUEST VANS BE DEL IN 1/3 LOTS ON FRI.....MON.....TUE.....

1 REQUEST CONUS DEPARTURE OF CR AGENT.....5/3/.....

1962 C.A. 28

2017 11: 25

REMARKS: ① 5/L - 2/35' -
NIAF ② USL - 2/20' -
③ FAA - 3/20' -

! EANTTS REPI ! ! MOVE 5X / SCLANT REPI !

TO BE COMPLETED BY INSULANT

VOYAGE NO. ISHIHARA	COL/SHIP ORDER NO/DIRECTOR/AGENT
---------------------	----------------------------------

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

EDUC	EST	CONSULTANT REPRESENTATIVE	DATE BOOKED
------	-----	---------------------------	-------------

As received from mTMC

TERM/COUNN FIE-		DELY DATE	CHARTER	FLAG	REGISTRY NO/ROL
EDUE	ETA	CONSOLANT REPRESENTATIVE			DATE BOOKED

As received from MTMC

A38

ATTACHMENT II

FORM II

SEAVAN OFFERING		PCF NUMBER	IDENT. NUMBER T-08		DATE OFFERED 3/2
LOADING PORT MOR MSC		DISCHARGE PORT/INLAND POINT LIPPER HAYFORD			REFERENCE NUMBER 0970
CARGO CATEGORY					
GEN. CARGO ☒	POV'S	MIL. VEHs.	MILVANS	REEFER	OTHER (R/L)
VAN SIZE ☐ SMALL ☒ LARGE 1	TOTAL WEIGHT IN LBS	TOTAL MTNS		RSD	RDD PRI
SEAVAN PICK UP					
CONTACT PITTS	TELEPHONE NUMBER 804-44-3584	VAN SPOT DATE 3/9		CONUS DEPARTURE ON OR ABOUT 3/10	
LHC PAID BY SHIPPER		MOVE COVERED			
		FROM (Origin) (Carrier Team) MOR MSC		TO (Destination)	
REQUEST VANS DELIVERED IN 1/3 LOTS ON ☐ FRI ☐ MON ☐ TUES					
USE OF VEHICLES LATER THAN 10:00 AM MUST BE APPROVED BY MSLANT					
SCL CARRIAGE					
51 APR 79 7:35					
1400/89 1-2					
REMARKS FL-419					
Via Felix					
EAMTMS REP. (Signature) G. J. 7350			RECEIVED BY (Signature of MSLANT Rep) BAH		
TO BE COMPLETED BY MSLANT					
VOYAGE NUMBER 4746	VESSEL NAME Great Republic		CLEAR/SHIPPING ORDER NO.		OPERATOR/AGENT
TERM/COMM. PIER NIT	DELIVERY DATE	CHARTER W2	FLAG	REGISTRY NO./RCL #3758	
DOB 3/18	RTA	CONSULTANT REPRESENTATIVE CAROL SKUNKS		DATE BOOKED 3/5	

MTE (HQ) • FORM APR 74 39

BOOKED BY MSLANT

U2
Fein

SEAMTMS REP. (Signature)

G. J. 7350

RECEIVED BY (Signature of MSCLANT Rep)

B.H.

TO BE COMPLETED BY MSCLANT

VOYAGE NUMBER 47146	VESSEL NAME Great Republic	CLEAR/SHIPPING ORDER NO.		OPERATOR/AGENT	
TERM/COMM. P/F/R NIT	DELIVERY DATE	CHARTER W2	FLAG	REGISTRY NO./RCL # 3758	
DOB 3/18	ETA	CONSULTANT REPRESENTATIVE CAROL SKURAKIS		DATE BOOKED 3/5	

MTE (HQ) • FORM APR 74 39

BOOKED BY MSCLANT

A39

FORM III

SUMMARY CONTAINERS/BREAK BULK BOOKS

11th Report 2nd Cycle
Jan / Feb / MAR 79

AS OF RECORD 2 MAR 79

ROUTE INDEX

% COMPANY	TOTALS	4	5	CONTAINERS 6 BULK	BREAK BULK 6	REMARKS
U.S. LINES	PREVIOUS	18920	102834			
	ADDITIONAL	2878	8570			
	GRAND TOTAL	21798	111404			
		% 55.78	% 33.57	%	%	
SEPLAND	PREVIOUS		155311	27470		
	ADDITIONAL		11850	4057		
	GRAND TOTAL		167161	31527		
		%	% 50.36	% 42.20	%	
FAN	PREVIOUS	16249	49535	39873		
	ADDITIONAL	1032	3795	3284		
	GRAND TOTAL	17281	53330	43157		
		% 44.22	% 16.07	% 57.77	%	
AUDENTIAL	PREVIOUS			19		
	ADDITIONAL			0		
	GRAND TOTAL			19		
		%	%	% 0.03	%	
	PREVIOUS					
	ADDITIONAL					
	GRAND TOTAL	%	%	%	%	
	PREVIOUS					
	ADDITIONAL					

		% 44.22	% 16.09	% 57.77	%	
CONFIDENTIAL	PREVIOUS			19		
	ADDITIONAL			0		
	GRAND TOTAL			19		
		%	%	% 0.03	%	
	PREVIOUS					
	ADDITIONAL					
	GRAND TOTAL	%	%	%	%	
	PREVIOUS					
	ADDITIONAL					
	GRAND TOTAL	%	%	%	%	
PREVIOUS TOTALS	2/23/79	35169	307680	67362		
AS OF						
ADDITIONAL	3/2/79	3910	24215	7341		
AS OF						
GRAND TOTAL	3/2/79	39079	331895	74703		
AS OF						

COMPANY	20'	35'	40'	No. OF PV'S
USL	BA <u>X 22.37</u>		11 BA 48 59 <u>X 41.85</u> 2469.15	<u>X 12.00</u>
SLND A41	BA <u>X</u>	BA <u>X</u>	BA <u>X</u>	<u>X 12.00</u>
AAA	4 BA 28 32 <u>X 21.94</u> 702.08		BA 1 <u>X 42.39</u> 42.39	24 <u>X 12.00</u> 288.00
	BA <u>X</u>		BA <u>X</u>	<u>X 12.00</u>

COB

No. OF PUVS	REEFER	BREAK BULK	TOTAL
<u>X 12.00</u>	15 <u>X 27.27</u> 409.05		2878
<u>X 12.00</u>	X		
24 <u>X 12.00</u> 288.00	<u>X 27.08</u>		1032
<u>X 12.00</u>	X		

FORM IV

SMALL (20')

FARRELL LINES

LARGE (40')

	(P)					(P)				
	OLEAN 35.91	OLEAN 35.91	OLEAN 35.91	OLEAN 35.91	OLEAN 35.91	OLEAN 35.91	OLEAN 35.91	OLEAN 35.91	OLEAN 35.91	OLEAN 35.91
	35.91	35.91	35.91	35.91	35.91	35.91	35.91	35.91	35.91	35.91
20' 40'	35.91	35.91	35.91	35.91	35.91	35.91	35.91	35.91	35.91	35.91
11045BURG	61.70 B	65.43 B	62.18 B	61.46 B	63.33 B	62.79 B		62.07 B	63.51 B	63.51 B
24.4 B 18.7 B	55.13 B	58.11 B	56.60 B	56.22 B	57.13 B	56.37 B		56.94 B	57.21 B	57.21 B
KRUEZNACH	56.37 B	61.75 B	58.45 B	57.73 B	59.60 B	59.06 B		58.84 B	59.78 B	59.78 B
1.4 B 15.8 B	51.71 B	54.17 B	52.08 B	52.34 B	53.21 B	52.75 B		53.02 B	53.24 B	53.24 B
BERLIN	59.27 B	64.35 B	61.35 B	60.63 B	62.50 B	61.96 B		61.24 B	62.68 B	62.68 B
13.36 B 13.10 B	49.01 B	51.49 B	49.93 B	49.64 B	49.64 B	50.25 B		50.22 B	50.59 B	50.59 B
BITBURG	56.16 B	61.54 B	58.24 B	57.52 B	59.39 B	58.85 B		58.13 B	59.57 B	59.57 B
20.25 B 15.33 B	51.24 B	53.74 B	52.21 B	51.87 B	52.74 B	52.48 B		52.55 B	52.82 B	52.82 B
FRANKFURT	55.99 B	61.37 B	58.07 B	57.35 B	59.22 B	58.68 B		57.96 B	59.40 B	59.40 B
20.19 B 15.54 B	51.45 B	53.93 B	52.42 B	52.08 B	52.95 B	52.69 B		52.76 B	53.03 B	53.03 B
FULDA	55.99 B	61.37 B	58.07 B	57.35 B	59.22 B	58.68 B		57.96 B	59.40 B	59.40 B
20.19 B 16.01 B	51.45 B	54.40 B	52.89 B	52.55 B	53.42 B	53.16 B		53.23 B	53.50 B	53.50 B
GIESSEN	52.12 B	57.50 B	54.20 B	53.48 B	55.35 B	54.81 B		54.09 B	55.53 B	55.53 B
16.2 B 12.25 B	48.16 B	50.64 B	49.13 B	48.79 B	49.66 B	49.40 B		49.47 B	49.74 B	49.74 B
HANN	57.35 A	62.73 A	59.43 A	58.71 A	60.58 A	60.04 A		59.32 A	60.76 A	60.76 A
21.44 A 15.4 B	51.33 B	53.81 B	52.30 B	51.96 B	52.83 B	52.57 B		52.64 B	52.91 B	52.91 B
HEILBRUNN	64.99 B	66.37 B	63.07 B	62.35 B	64.22 B	63.68 B		62.96 B	64.40 B	64.40 B
25.18 B 19.63 B	54.91 B	57.41 B	55.91 B	55.57 B	56.44 B	56.18 B		56.25 B	56.52 B	56.52 B
HARDEBERG	56.49 A	61.87 A	58.56 A	57.84 A	59.71 A	59.17 A		58.45 A	59.89 A	59.89 A
20.57 A 15.04 B	50.95 B	53.43 B	51.92 B	51.58 B	52.45 B	52.19 B		52.26 B	52.53 B	52.53 B
GRERSLAUTERN	54.24 B	60.12 B	56.32 B	56.10 B	57.97 B	57.43 B		56.71 B	58.15 B	58.15 B
18.93 B 14.91 B	50.80 B	53.13 B	52.77 B	52.43 B	52.30 B	52.04 B		52.11 B	52.38 B	52.38 B
KARLSRUHE	55.82 B	61.20 B	57.90 B	57.18 B	59.05 B	58.51 B		58.79 B	59.23 B	59.23 B
19.91 B 15.16 B	51.07 B	53.55 B	52.04 B	51.70 B	52.57 B	52.31 B		52.38 B	52.65 B	52.65 B
MANNHEIM	55.15 B	60.53 B	57.23 B	56.51 B	58.38 B	57.84 B		57.12 B	58.56 B	58.56 B
19.4 B 14.25 B	50.96 B	53.34 B	52.83 B	52.49 B	52.36 B	52.10 B		52.17 B	52.44 B	52.44 B
MUNICH	61.53 B	66.91 B	63.61 B	62.89 B	64.76 B	64.22 B		63.50 B	64.94 B	64.94 B
25.62 B 20.67 A	56.58 B	59.06 B	57.55 B	57.21 B	58.08 B	57.82 B		57.89 B	58.16 B	58.16 B
MUERBERG	58.96 B	64.34 B	61.04 B	60.32 B	62.19 B	61.65 B		60.93 B	62.37 B	62.37 B
23.58 B 19.03 B	54.94 B	57.42 B	55.91 B	55.57 B	56.44 B	56.18 B		56.25 B	56.52 B	56.52 B
ARMASSEN	54.24 A	59.61 A	56.31 A	55.59 A	57.46 A	56.92 A		56.20 A	57.64 A	57.64 A
18.38 A 14.25 A	50.63 A	53.11 A	51.60 A	51.26 A	52.13 A	51.87 A		51.94 A	52.21 A	52.21 A

HEILBRUNN 25.18 B 19.63 B	58.49 B 59.91 B	58.57 B 57.47 B	55.71 B 55.71 B	55.57 B 56.44 B	56.18 B 56.18 B		58.49 B 58.49 B	59.91 B 59.91 B	59.91 B 59.91 B	59.91 B 59.91 B	59.91 B 59.91 B
BARBERSTEN 20.57 A 15.4 B	56.48 A 50.95 B	61.96 A 53.43 B	58.56 A 51.97 B	57.84 A 51.58 B	59.71 A 52.45 B	59.17 A 52.19 B	58.49 A 52.26 B	59.91 A 52.53 B	59.91 A 52.53 B	59.91 A 52.53 B	59.91 A 52.53 B
GIESSEN 18.93 B 14.91 A	57.74 B 50.81 B	60.12 B 53.13 B	56.32 B 57.77 B	56.10 B 57.43 B	57.97 B 52.30 B	57.47 B 52.04 B	56.74 B 52.11 B	58.15 B 52.38 B	58.15 B 52.38 B	58.15 B 52.38 B	58.15 B 52.38 B
KARLSRUHE 19.91 B 15.16 B	55.82 B 51.07 B	61.20 B 53.55 B	57.90 B 52.04 B	57.18 B 57.70 B	59.05 B 52.57 B	58.51 B 52.31 B	58.49 B 52.33 B	59.23 B 52.65 B	59.23 B 52.65 B	59.23 B 52.65 B	59.23 B 52.65 B
MANNHEIM 19.41 B 14.95 B	55.15 B 50.96 B	60.53 B 53.34 B	57.13 B 57.53 B	56.51 B 57.49 B	59.39 B 52.36 B	57.84 B 52.10 B	57.72 B 52.17 B	58.56 B 52.44 B	58.56 B 52.44 B	58.56 B 52.44 B	58.56 B 52.44 B
MUNICH 25.62 B 20.67 A	61.53 B 56.58 B	66.91 B 59.06 B	63.61 B 57.55 B	62.87 B 57.21 B	64.16 B 58.23 B	64.22 B 57.82 B	63.50 B 57.89 B	64.91 B 58.16 B	64.91 B 58.16 B	64.91 B 58.16 B	64.91 B 58.16 B
NUERNBERG 23.65 B 19.63 B	58.96 B 54.94 B	64.41 B 57.42 B	61.04 B 55.91 B	60.37 B 55.57 B	62.19 B 56.01 A	61.65 B 56.18 B	61.93 B 56.25 B	62.37 B 56.52 B	62.37 B 56.52 B	62.37 B 56.52 B	62.37 B 56.52 B
HRMASSEN 18.39 A 14.16 B	54.29 A 50.63 A	59.67 A 53.11 A	56.37 A 51.60 A	55.65 A 57.26 A	57.52 A 52.13 A	56.45 A 57.87 A	56.22 A 51.94 A	57.20 A 52.31 A	57.20 A 52.21 A	57.20 A 52.21 A	57.20 A 52.21 A
SCHWINGEN 22.72 B 17.23 B	58.13 B 53.14 B	64.01 B 55.62 B	60.71 B 54.11 B	59.95 B 53.71 B	61.86 B 54.64 B	61.32 B 54.38 B	60.80 B 54.45 B	62.44 B 54.71 B	62.04 B 54.72 B	62.04 B 54.72 B	62.04 B 54.72 B
STUTTGART 22.72 B 17.23 B	58.31 B 53.72 B	63.72 B 56.12 B	60.42 B 57.67 B	59.70 B 54.35 B	61.57 B 55.62 B	61.03 B 54.86 A	60.31 B 55.03 B	61.75 B 55.50 B	61.75 B 55.50 B	61.75 B 55.50 B	61.75 B 55.50 B
WUERZBURG 21.27 A 16.53 B	57.18 B 52.74 B	62.56 B 55.22 B	59.16 B 53.71 B	58.44 B 53.37 B	60.41 B 54.24 B	59.87 B 53.94 B	59.25 B 54.05 B	60.57 B 54.34 B	60.57 B 54.34 B	60.57 B 54.34 B	60.57 B 54.34 B

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FROM OFFICIAL RECORDS

CLEARANCE ORDER/SHIPPING ORDER **FORM V**

MSC FORM 4612/1 (REV. 3/71) S/N 0104-LF-121-3002

Reeper

This order confirms cargo booking as indicated and reflects the approximate tonnages and details of cargo as available at the time of Freight will be based upon the cargo actually loaded and entered on the cargo manifest, bill of lading as appropriate.

FROM:

Consolidant

TO:

Sealand

☐ USNS

☐ TC

☐ VC

☐ CAA

☐ SE
MC

CARGO

LOADING

CAT. NO.	DATE BOOK-ED	DESCRIPTION	WEIGHT/ CUBE	INLAND ORIGIN	LOADING PORT	TERMINAL/ PIER NO.	EDOB	RLD	GOV ACC	CAR ACC
2940	2/18	3-Chill - 45°	175	VOT *	Trifolite	FMT	3/19			X
		2-Freeze - 0°	175							
2930	2/18	2-Freeze - 0°	165	Phila., Pa.	Phila	Ph. City	3/15			
		1-Chill - 45°	165							
2943	2/18	1-Freeze - 0°	35	Philadelphia	Phila.	" "	" "			
2929	"	2-Freeze - 0°	70	Philadelphia	"	" "	" "			
2936	"	1-Freeze - 0°	30	Philadelphia	"	" "	" "			
2939	2/18	2-Freeze - 0°	63	Philadelphia	Phila.	" "	" "			
2940	2/13	2-Freeze - 0°	60	VOT *	Trifolite	" "	" "			
2908	2/1	1-Chill - 34°	30	VOT *	Trifolite	FMT	3/17			
2901	"	1-Chill - 34°	30	VOT *	"	"	"			
2902	"	1-Chill - 45°	30	VOT *	"	"	"			
2903	"	2-Chill - 34°	60	VOT *	"	"	"			

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DISTRIBUTION

X - Accrual charges to apply

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OTHER PARTICULARS

(1) Funder ship reg
(2) " " " " " "
(3) " " " " " "

This shipment is to be routed as indicated, and any ocean bill of lading issued to cover the above cargo must show the rates, terms

TYPED NAME OF CONTRACTING OFFICER

SIGNATURE

Previous editions of this form are obsolete.

Refer 2

ATTACHMENT VII

as available at the time of booking. appropriate.	ORDER NO. I.P.
SHIP NAME Kinsale	VOYAGE NO. H-4921
AGENT	

☐ SHIPPING CONTRACT/AGREEMENT
MST *C.H. 4/16/4 R.I.S.* ☐ BILL OF LADING

					DISCHARGING						
EDOB	RLD	GOV ACC	CAR ACC	OTHER	DISCHARGE PORT	ETA	INLAND DESTINATION	RRD	GOV ACC	CAR ACC	OTHER
3/17			X		Baltimore		KCS			X	KM
3/15					Baltimore	(1)	KCS				KM
"					"	(2)	KCS				KM
"					"	(2)	KCS				KM
"					"	(2)	"				KM
"					"	(3)	Philadelphia				KM
"					"		"				KM
3/17					"		KCS				KM
"					"		"				KM
"					"		KCS				KM
"					"		"				KM

ARS
 ship dep. Phila. 3/9
 .. Balt. 3/12
 .. Boston 3/7

show the rates, terms and conditions as stated herein.

DATE

Atlantic Command - Break Bulk Documentation

FORM I Break Bulk Offering

BREAK BULK OFFERING			PCF NUMBER		IDENT.		DATE			
LOADING PORT/TERMINAL <i>Bayonne NJ</i>			DISCHARGE PORT/INLAND DESTINATION <i>BKLN JFI</i>		REFERENCE NUMBER <i>0134</i>					
CARGO CATEGORIES	AMT	LTH	WTH	HGT	L TON PER UNIT	M TON PER UNIT	TOTAL M TONS	RLD	RDD	PRI
GENERAL (No 4)										
M. M. GOODS										
WHEELED VEHICLES UP TO 10,000 LBS										
WHEELED VEHICLES OVER 10,000 LBS	<i>16/10</i>	<i>9/7</i>	<i>9/2</i>	<i>15</i>	<i>37</i>					
POVS										
REFRIGERATED (Temperature required)										
CONEX BOXES										
DECK CARGO										
BOATS										
HAZARDOUS LABEL										
WEIGHT CARGO										
UNUSUAL SIZE CARGO										
EXPLOSIVES IV										
REMARKS <i>15 FEB 79 7:45</i>										
EAMTMTS REPRESENTATIVE (Signature) <i>Murphy</i>						RECEIVED BY (Signature) <i>BH</i>				
TO BE COMPLETED BY MSCLANT										
VESSEL NAME <i>Towle</i>		VOYAGE NO. <i>4994</i>		CLEARANCE - SHIPPING NO.			OPERATOR/AGENT			
REMARKS <i>att/mc 2/27</i>										
CONSTANT REPRESENTATIVE (Signature)								DATE		

TE (HQ) FORM 38 APR 74

BREAK BULK OFFERING			PCF NUMBER 7445		IDENT. O/H T/S		DATE 2/14			
LOADING PORT/TERMINAL Bayonne NJ			DISCHARGE PORT/INLAND DESTINATION JFI Bkun				REFERENCE NUMBER 0129			
CARGO CATEGORIES	AMT	LTH	WTH	HGT	L TON PER UNIT	M TON PER UNIT	TOTAL M TONS	RLD	RDD	PRI
GENERAL (No 4)										
H. H. GOODS										
WHEELED VEHICLES UP TO 10,000 LBS										
WHEELED VEHICLES OVER 10,000 LBS	1	22/1	8/5	8/6	11	4/1				
POVS										
REFRIGERATED (Temperature required)										
CONEX BOXES										
DECK CARGO										
BOATS										
HAZARDOUS LABEL										
WEIGHT CARGO										
UNUSUAL SIZE CARGO										
EXPLOSIVES										
REMARKS BCL CARGO BIV FEB 79 7:44										
SEAMTMS REPRESENTATIVE (Signature) Mary J					RECEIVED BY (Signature) V1279 B/H					
TO BE COMPLETED BY MSC/ANT										
VESSEL NAME Towle		VOYAGE NO. 4994		CLEARANCE - SHIPPING NO.			OPERATOR/AGENT			
REMARKS wt/mc 2/27										
CONSTANT REPRESENTATIVE (Signature)								DATE		

NOTE (HQ) 4 APR 78 38

DATE: 79-030 PCFI 8530 IDENT: S1403A-023-1500 OFFERED: 79-030 DATE

LOADING PORT

MOTBY

DISCHARGE PORT

KAI--LISBON PORTUGAL

REFERENCE: LOAD

B635097

MAP

CARGO

CODE

C O M M O D I T Y

N A M E



CARGO EXCEPT ZR OUTSIDE DIMENSIONS

UFC/NMFC LENGTH WIDTH HEIGHT PIECES L/TON M/TON R/D R/LD NO. S/A

U93340-00

NOT ON

UFC-NMFC TABLE

RE

UTILITY	11/01	05/04	04/04	114	122	741	000	CONT.
TRKS M15/A1						741	TOTAL M/TON	CLAC
								OFFER
								REQUI
304-CARGO DIV								REQUI
2 FEB 79 7: 09								

DATE(S) DUE AT PDEI

REMARKS: ① NESS/C/IN/AH 2/22 1530hrs Booking to
Cargair cancelled - Cargo NOT ON HAND - OFFERING held
open. Availability Date NOT yet Determined

EAMT VS REP: X6609 RCVD BY MSCLANT REP: B/H

TO BE COMPLETED BY MSCLANT

VOYAGE NO. /SHIP NAME ICL/SHIP ORDER NO/OPERATOR/AGENT VOYAG

A-4958 A-Corson A-50 A-4994 USNS TOW/RE

TERM/COMM PIER IDELY DATE CHARTER FLAG IREGISTRY NO/RCL TERM/

EDOB IETA ICONSCLANT REPRESENTATIVE IDATE BOOKED EDOB

NESS/AH 2/16

② Cargo CONFirmed as Priority 1. 105 Vch Avail For loading 6 Mar.
9 Vch Avail approx 20 Mar - AH/NESS 3/1 1600hrs

BOOKED BY MSC LAOT & CHANGED

LMED
-8