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

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OF THE
MILITARY SEALIFT COMMAND

Performed for
Office of Naval Research
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By
E. G. Frankel Inc.

January 1980

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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

E G Frankel

Ernst G. Frankel
President

EGF:sm
Enc.

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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 <u>per ton</u> 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 then 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 loses 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 <u>Rationalization of CALSTAT Administration</u>

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 prsented 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 stop 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 todays 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 tontinue 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 MSCs 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 HEADQUARTERS

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

TABLE III.2

(continued)

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

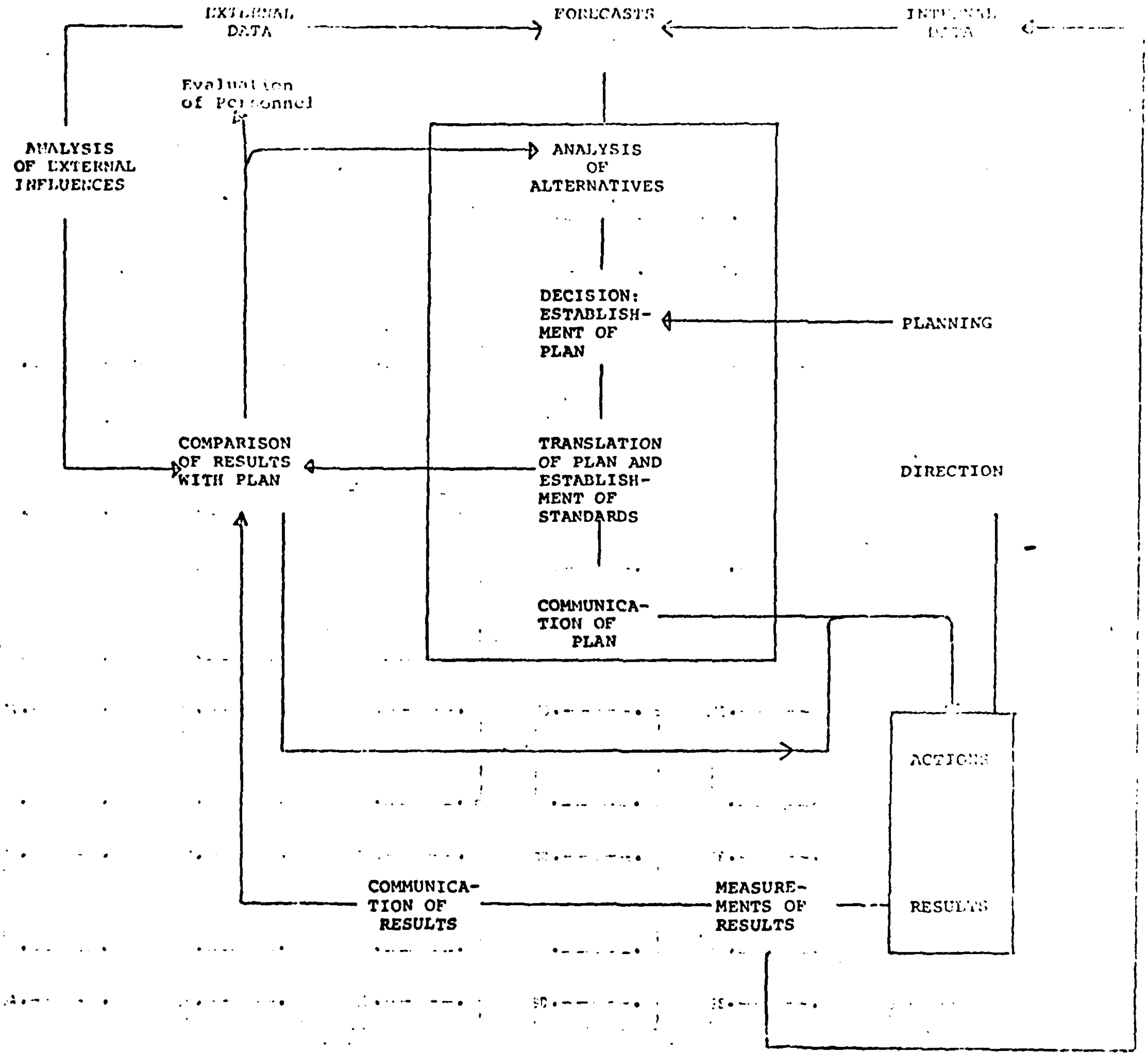
1. Unit Level Billing - Billing and Traffic Records
2. CALSTAT - Vessel operational performance and schedule publication
3. PROFORMA - Voyage profitability evaluation
4. FORCEPLAN construction
5. Rate publication
6. Accounting record processing and budget preparation

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. System Management	See Management Information below	
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.

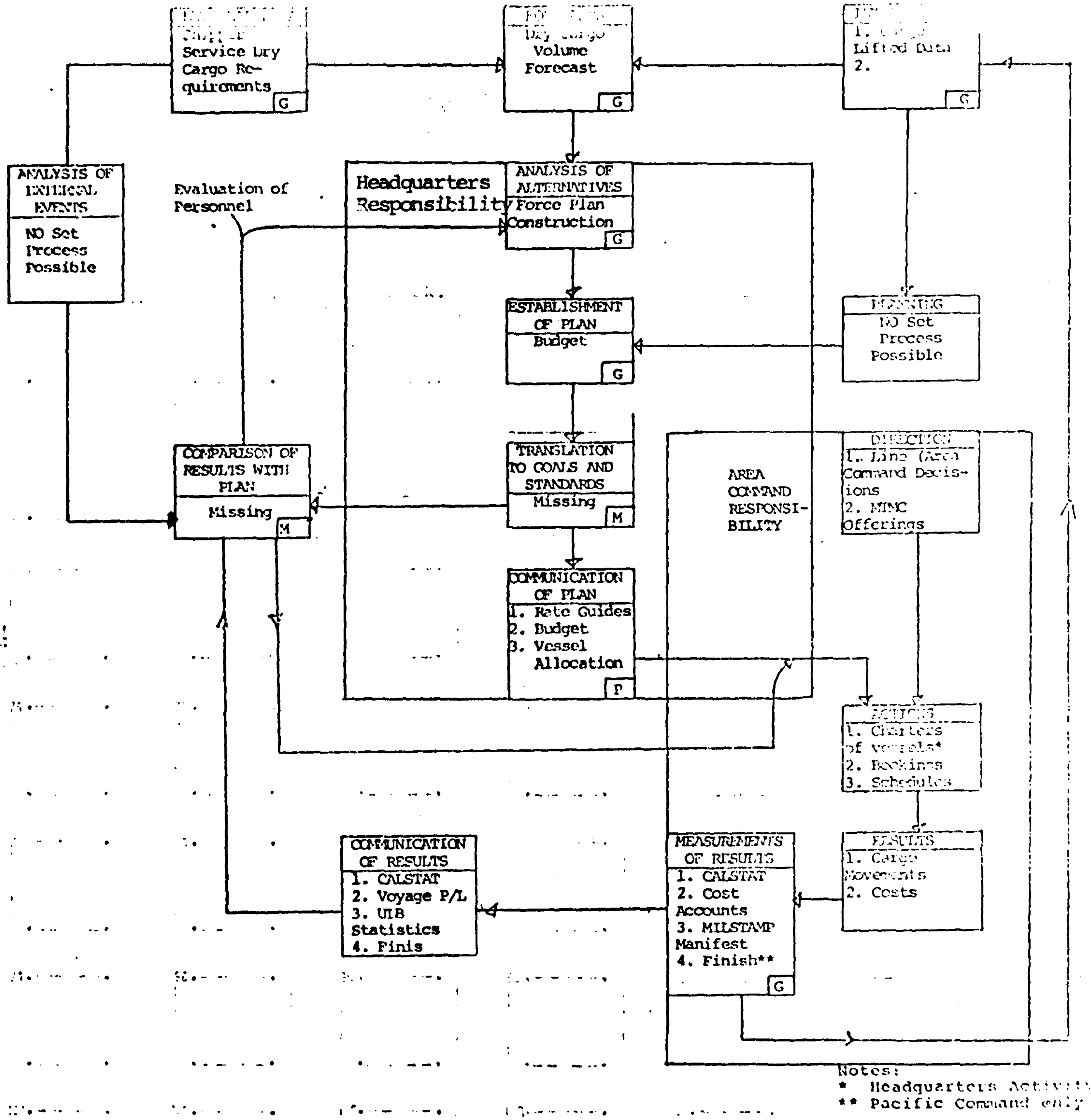
Likewise, the detailed measurement of shipping activities possible through the processing of unit level billing and MTMC manifest is a process well beyond the capabilities of most shipping companies.

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.



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 susceptable 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) offshout 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 Ⓐ is required, the optimal solution is to run the system at the configuration reflected by total cost Ⓒ rather than total cost Ⓓ even though the cost per ton mile for Ⓐ (i.e. Ⓕ) is greater than for the thought optimum Ⓑ (i.e. Ⓠ).

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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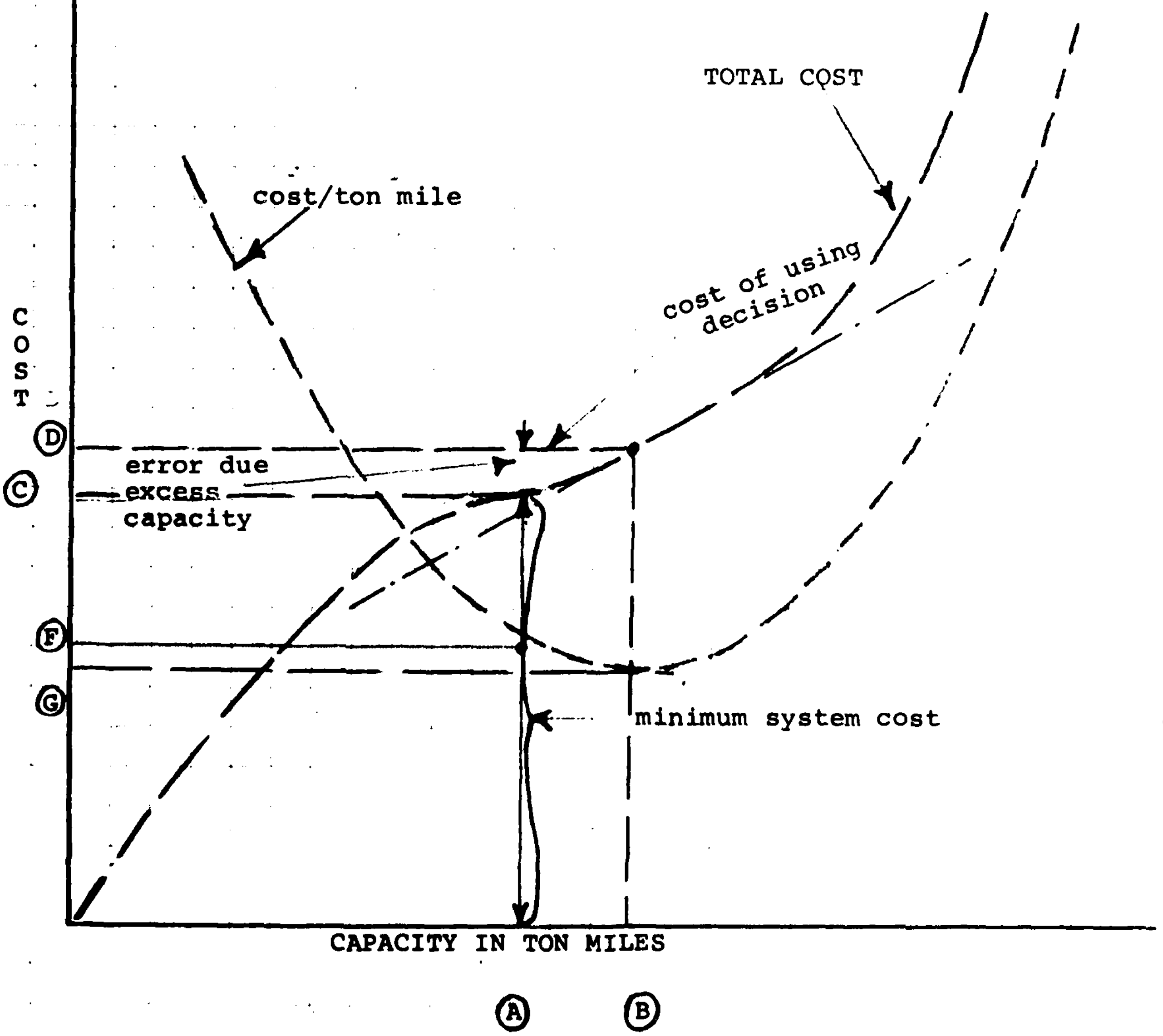

FIGURE IV.1-1
COST VERSUS CAPACITY

words the cost per day for a vessel is more meaningful in determining tis 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 truely 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
Existing Contract Forms				
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
Alternative Contract Forms				
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
Alternative Contract Form				
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.2.1-2

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 specificly 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

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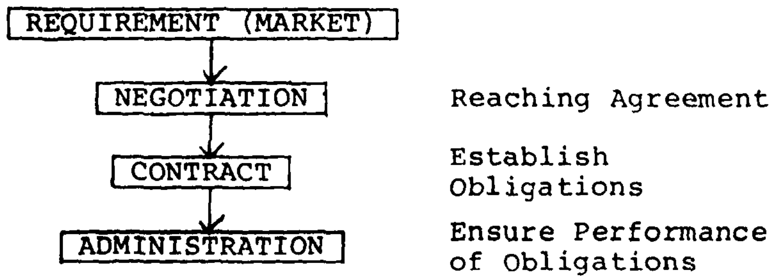
*In some ways, it also resembles the project cargo negotiated rates offered by all conferences.

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 GENERAL TERMS OF "RATE AGREEMENT FOR CONTAINER CARRIAGE"

	Contract Item	Section	Provision	Responsibility Government	Carrier
	Basic Payment Terms				
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	
	Positioning Containers on Inbound and Outbound Legs				
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 of 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
	Container Detention - 3 free days allowed				
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	
	Frustrated Cargo				
18.	Stuffing time allowed	I.27	48 hours min		
	Low Rated Carrier Capacity Reservation				
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	
	Failure of cargo to arrive on time				
22.	Information to calculate liquidated damages	I.34			X

TABLE IV.3-2

GENERAL TERMS "SHIPPING CONTRACT"

Contract Item		Section	Provision	Responsibility Government	Responsibility Carrier
	Level of Service				
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		X	
	Basic Payment Terms				
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	
	Positioning of containers on inbound and outbound legs				
8.	Notice of type (& reefer temp.) and place for spotting vans	I.5	2 days	X	
9.	Notice to pickup container	I.5		X	
10.	Pickup by carrier	I.5	1 day stuffed 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/dry >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	Responsibility 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
	Frustrated Cargo				
26.	Stuffing time allowed	I.5	> 48 hours		
27.	Information to calculate Fuel Oil Allowance	I.5			X

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 enforcibility 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

Item	Rate Agreement	Shipping Contract
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

Information	Type of Info	Use	Source	Time to Proceed
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 containe	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 sailin

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.

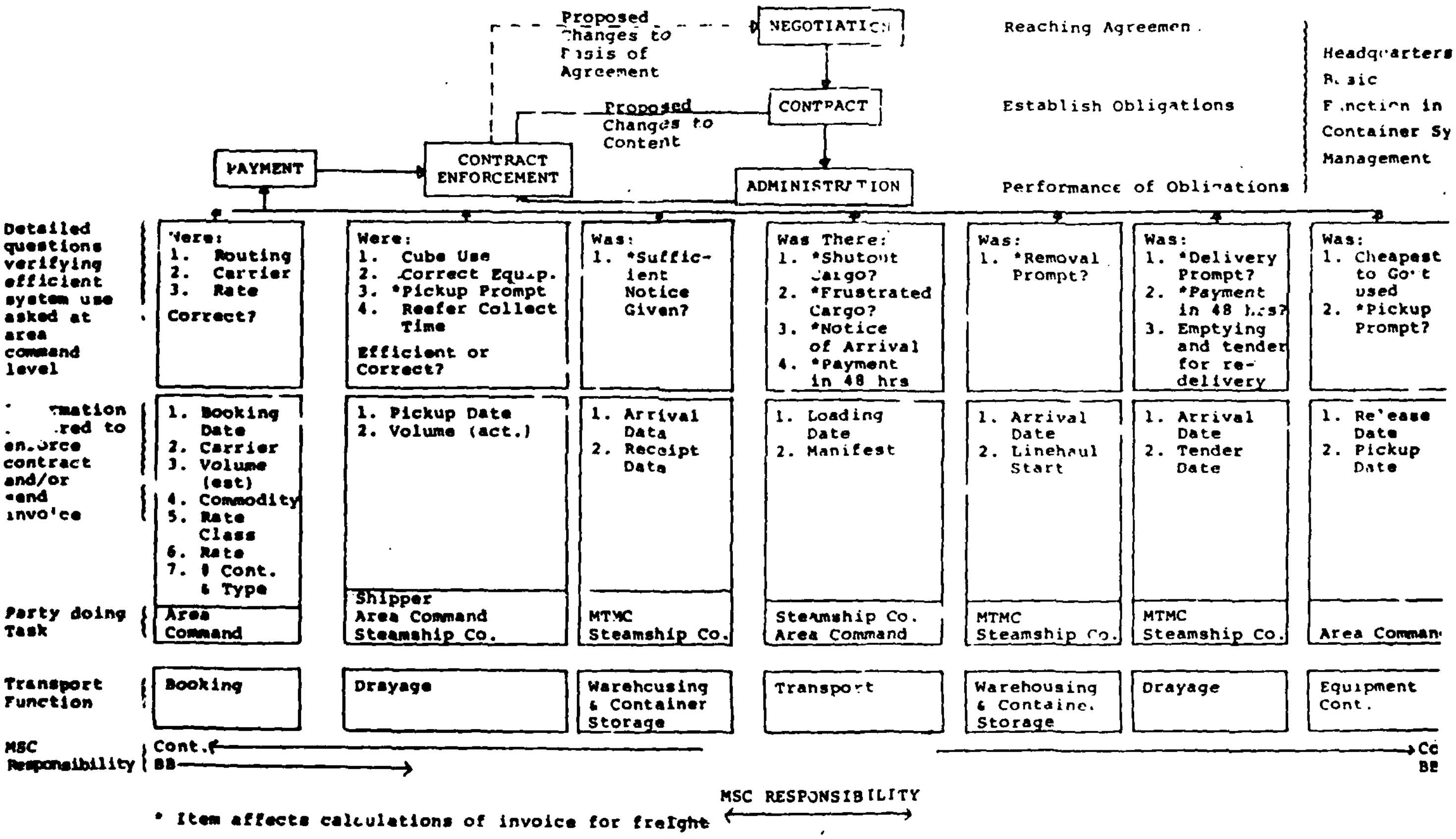
The exact format of the system is not described. It could be decentralized with the transportation officer in

TABLE IV.3-6

ADDITIONAL INFORMATION REQUIRED

	Type of Info	Use	Source	Time to Proceed
25. Did empty miss sailing	Info	I	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 informated 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 Rastenura 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 calcelled, 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 disasterous 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 readible, 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 <u>CALSTAT System Overview</u>

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 give 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

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

SS ARANEFR PNKW NAC412 C464 LANT 13,264 13,064

TERM/CHTN 8 OPERATOR LSLX DATES MIN 73/09/27 MAX 84/09/27 REDEL AREA CONUS

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

PORT NORDENHAM (UF6) ARRIVE 78/03/10 0100Z DEPART 78/03/15 0230Z PORT TIME 5 DAYS 1 HRS 30 MIN

THIS PASSAGE MILES 4481 TIME 11 DAYS 9 HRS 30 MIN AVG SPD 16.4K DIR SPD 19.0 FUEL USED 4,807 (BBL/MI) 1.073

REMARKS D/L LOAD COMM 4 CONT 39 M/T 1340 DSCG COMM 4 CONT 113 M/T 7689

FUEL (BBLS) ON ARRIVAL 2,193 TAKEN 12,025 COST(BBL) 13.87 TOTAL COST 166,784.75 DEPARTURE 14,952 USED THIS PORT 266

SHIP STATUS WHILE IN PORT-

DATE/TIME	START	STOP	CAT	STATUS	HRS	MIN	GANGS L	GANGS D	REMARKS
78/03/10	0200	0700	NCO	SHIFT	5	0			40 NM
78/03/10	0700	0750	NCO	PPRAC		50			
78/03/10	0750	1400	DIS	NORML	6	10		1	
78/03/10	1400	2400	DIS	NORML	10	0		2	
78/03/11	0000	0600	DIS	NORML	6	0		2	
78/03/11	0600	1400	DIS	NORML	8	0		3	
78/03/11	1400	2200	DIS	NORML	8	0		2	
78/03/11	2200	2230	NCO	PPRAC		30			
78/03/11	2230	2400	NCO	BUNKR	1	30			
78/03/12	0000	0600	NCO	BUNKR	6	0			
78/03/12	0600	1800	DIS	NORML	12	0		3	
78/03/12	1800	2400	DIS	NORML	6	0		2	
78/03/13	0000	0600	NCO	PPRAC	6	0			
78/03/13	0600	2200	DIS	NORML	16	0		3	
78/03/13	2200	2400	DIS	NORML	2	0		1	
78/03/14	0000	0600	DIS	NORML	6	0		1	
78/03/14	0600	1200	DIS	NORML	6	0		2	
78/03/14	1200	2135	D/L	NORML	9	35		2	
78/03/14	2135	2400	NCO	PPRAC	2	25			
78/03/15	0000	0015	NCO	AWDEP		15			
78/03/15	0015	0330	NCO	SHIFT	3	15			40 NM

STATUS SUMMARY

CAT	STATUS	DAYS	HRS	MIN	PER CENT
DIS	NORML	3	14	10	70.9
D/L	NORML	0	9	35	7.9
NCO	AWDEP	0	0	15	.2
NCO	BUNKR	0	7	30	6.2
NCO	PPRAC	0	9	45	8.0
NCO	SHIFT	0	8	15	6.8
TOTAL		5	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 N00014-79-C-0851

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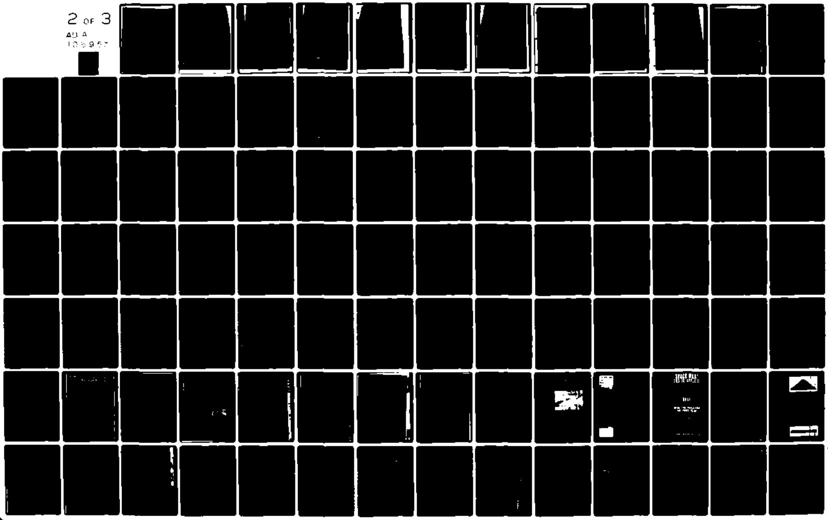

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SHIP IDENTIFICATION I.R.C.S. U.I.C. DESIGN ADMIN DWT CAP-(M/T)

SS ARANGER KNKW NAO412 C464 LANT 13,264 13,064

TERM/CHTR 8 OPERATOR USLX DATES MIN 78/09/27 MAX 84/09/27 REDEL AREA CONUS

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

PORT SPORT POT (1N4) ARRIVE 78/03/24 1030Z DEPART 78/04/02 1500Z PORT TIME 9 DAYS 4 HRS 30 MIN

THIS PASSAGE MILES 4179 TIME 9 DAYS 8 HRS 0 MIN AVG SPD 18.7K DIR SPD 19.0 FUEL USED 4,868 (BBL/MIL) 1.165

REMARKS DIS LOAD COMM CONT M/T USCG COMM 4 CONT 39 M/T 1340

FUEL (BBLS) ON ARRIVAL 10,084 TAKEN 0 COST(BBL) .00 TOTAL COST .00 DEPARTURE 9,252 USED THIS PORT 832

SHIP STATUS WHILE IN PORT-	DATE/TIME START	STOP	CAT STATUS	HRS MIN	GANGS L D	REMARKS
	78/03/24 0030	1000	NCO SHIFT	4 30		ANCHORED AT 0600-1000 FCG
	78/03/24 1010	1137	NCO SHIFT	1 37		
	78/03/24 1137	1700	NCO OTHER	5 23		COAST GUARD INSP
	78/03/24 1700	2400	NCO PPRAC	7 0		
	78/03/25 0000	2400	NCO PPRAC	24 0		SATURDAY
	78/03/26 0000	2400	NCO PPRAC	24 0		SUNDAY - HOLIDAY

STATUS SUMMARY	CAT STATUS	DAYS	HRS	MIN	PER CENT
	NCO OTHER	0	5	23	8.1
	NCO PPRAC	2	7	0	82.7
	NCO SHIFT	0	6	7	9.2
	TOTAL	2	18	30	

FIGURE IV.4.2-1
(continued)

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CALSTAT VOYAGE REPORT

25 APR 78

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SHIP IDENTIFICATION	I.R.C.S.	U.I.C.	DESIGN	ADMIN	DWT	CAP-(M/T)
SS ARANGER	KNKW	NAU412	C464	LANT	13,264	13,064

TEAM/CHTR 8 OPERATOR USLX DATES MIN 78/09/27 MAX 84/09/27 REDEL AREA CONUS

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

VOYAGE SUMMARY SS ARANGER VOYAGE NO. 025

TIME AT SEA	20 DAYS 17 HRS 30 MIN	60.9%	FUEL	AT START 8,613	USED IN PORT 1,118	MILES STEAMED	8,660
TIME IN PORT	13 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 9,675	AVERAGE SPEED	17.3
				USED 10,793	PER DAY SEA 466	BBLS PER MILE	1.117

FIGURE IV.4.2-1
(continued)

MILITARY SEALIFT COMMAND
HEADQUARTERS

REPORT NO. [illegible]
RUN DATE [illegible] MAY 1978
AS OF 1[illegible] MAY 78
PAGE NO. [illegible]

DRY CARGO SHIP SCHEDULE
USNS - PART I

SHIP IDENTIFICATION	LINE NO	PORTS OF CALL	ARR	DEP	CARGO COMM	LOAD M/T	CARGO COMM	DISCH M/T	REMARKS
USNS BLAND	010	OAKLND NSC	3/25A	12/31E					ROS [illegible]
C3[illegible] MSC (17,5)									
CALSTAT VOY ROS									
USNS [illegible]	013	OAKLND NSC	10/20A	6/08E		110			ROS 11[illegible]
C4 MSC (15,0)									
CALSTAT VOY ROS									
USNS [illegible]	050	ROTA	5/09E	5/10A			684	563	DIS
C3ST MSC (17,7)	070	ISKENDERUM	5/16E	5/20E			466	967	DIS
CALSTAT VOY 019	073	PORT SAID	5/21E	5/22E					THA
	076	SUEZ	5/22E	5/22E					THA
	080	AQUABA	5/23E	5/25E			684	643	DIS
	090	JIDDA	5/27E	5/29E			84	1995	DIS
	105	DHAHRAN	6/04E	6/06E			64	1104	DIS
	115	HODEIDA	6/11E	6/13E			86	4892	DIS
	120	SUEZ	6/22E	6/23E					THA
	125	PORT SAID	6/23E	6/23E					THA
	160	NORFLK NSC	7/10E	7/13E					DIS
USNS [illegible]	090	CHARLESTON	5/04A	5/05A	3	66	3	3266	L/D
C4ST MSC (20,0)	110	N ORLEANSA	5/08A	5/12E			3A8A	1428	DIS
CALSTAT VOY 019									
USNS METEOR	010	N ORLEANSA	5/08A	5/12E					
C4ST MSC (20,0)	020	BAYONE MOT	5/14A	5/16E					
CALSTAT VOY 020	040	BREMERHAVN	5/27E	5/29E			3	55	DIS
	060	CHARLESTON	6/10E	6/15E					
USNS [illegible]	100	MATARANI	5/13A	5/14A			4	11	DIS
[illegible] C (12,0)	110	CALLAO	5/16E	5/16E			4	16	DIS
CALSTAT VOY 018	120	GUAYAGUILL	5/19E	5/21E			4	[illegible]72	DIS
	130	BALBOA	5/24E	5/26E			4	30[illegible]	DIS
	145	CRISTOBAL	5/26E	5/26E					THA
	150	GUANTANAMO	5/28E	5/29E					
	155	ROSVELT RD	6/01E	6/02E					
	160	BAYONE MOT	6/07E	6/09E			4	5	DIS
USNS [illegible]	0[illegible]	[illegible] MOT	5/12A	5/14A		995			[illegible]
[illegible] MSC (14,5)	031	ROSVELT RD	5/17E	5/18E			384	[illegible]	DIS
CALSTAT VOY 01[illegible]	041	GUANTANAMO	5/22E	5/23E			386	[illegible]94	DIS
	051	CRISTOBAL	5/25E	5/26E			343	1459	DIS
	0[illegible]	CHARLESTON	5/30E	5/31E					DIS

FIGURE IV.4.2-2 DRY CARGO SHIP SCHEDULE

C A L S T A T

PROJECTED SHIP ARRIVALS

17 MAY 78

RPT D001 [illegible]
PAGE 2
AS OF 16 MAY 78

PROJECTED SHIP ARRIVALS IN CONSCFE -

PORT NAME	ETA		SHIP NAME	VOY	EST CARG LDG CON	EST CARG LDG CON	EST CARG LDG M/T	CARGO TO DISCHRG CON	CARGO TO DISCHRG CON	CARGO TO DISCHRG M/T
YOKOSUKA	780517	SS	ACHARGER	010						
YOKOUANHHAT	780517	SS	ACHARGER	010	3460		1000	0359		1117
NSD GUAM	780517	SS	PMOON	009	346		800	683	29	2330
PUSAN	780524	SS	ACHARGER	010				4386		1024
SUBIC BAY	780528	SS	PMOON	009				683	12	1027
NAHA OKI	780528	SS	ACHARGER	010				0346		528
CHINHAE	780528	SS	ARELIANCE	007						
NAHA OKI	780529	SS	PMOON	009				6014	8	1288
CHILUNG	780530	SS	ACHARGER	010				56		297
SUBIC BAY	780602	SS	ACHARGER	010				3865		1398
PUSAN	780605	SS	PMOON	009				683		1020
NSD GUAM	780607	SS	ACHARGER	010				386		230
YOKOSUKA	780609	SS	PMOON	009				68	1	570
YOKOUANHHAT	780611	SS	PMOON	009				683		209
TENGAN OKI	780618	SS	ARELIANCE	007						
NSD GUAM	780618	SS	PCONTENDER	011				68		138
YOKOUANHHAT	780619	SS	ACORSAIR	010				863		239
SUBIC BAY	780610	SS	PCONTENDER	011				6A		199
CHINHAE	780621	SS	ARELIANCE	007						
PUSAN	780625	SS	ACORSAIR	010				0364		890
NAHA OKI	780628	SS	PCONTENDER	011				6		249
NAHA OKI	780627	SS	ACORSAIR	010				86		19
PUSAN	780629	SS	PCONTENDER	011				68		1048
SUBIC BAY	780630	SS	TCOLUMBIA	014						
SUBIC BAY	780705	SS	ACORSAIR	010				36		849
YOKOSUKA	780705	SS	PCONTENDER	011				6		179
PUSAN	780708	SS	TCOLUMBIA	014						
NSD GUAM	780709	SS	ACORSAIR	010				38		128
YOKOUANHHAT	780709	SS	PCONTENDER	011				6		238
NSD GUAM	780718	SS	TCOLUMBIA	014						
YOKOUANHHAT	780719	SS	PCRUSADER	011						
PUSAN	780720	SS	PCRUSADER	011						
SUBIC BAY	780731	SS	PCRUSADER	011						
NSD GUAM	780806	SS	PCRUSADER	011						
YOKOUANHHAT	780812	SS	ACHAMPION	010						
PUSAN	780816	SS	ACHAMPION	010						
NAHA OKI	780828	SS	ACHAMPION	010						
SUBIC BAY	780829	SS	ACHAMPION	010						
NSD GUAM	780905	SS	ACHAMPION	010						

FIGURE IV.4.2-3
DRY CARGO ARRIVAL REPORT

CALSTAT DEPARTURE AND STATUS REPORT

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

SHIP NAME	U I C	VOY	LNE	PORT NAME	CDE	ARR-L	DEP-L	REMARKS
LAKELAND	NA0423	046	010	CP KENNEDY	1RI	770401	770406	LDG

	DATE	TIME	BNKRS	MILES	B TKN	COST
					DISCREPANCY	
ARR	770401	1245	00116	00190		
DEP	770406	1700	00495		00375	1680

	DAY	HR	MN
PORT TIME	5	4	15
STATUS TIME	5	4	15
DIFFERENCE	0	0	0

CAT	CODE	DATE	START	STOP	HR	MN	GANG	R E M A R K S
NCO	PPRAC	770401	0745	0900	01	15		
NCO	BUNKR	770401	0900	1700	08	00		
NCO	PPRAC	770401	1700	2400	07	00		
NCO	PPRAC	770402	0000	2400	24	00		
NCO	PPRAC	770403	0000	2400	24	00		
NCO	PPRAC	770404	0000	2400	24	00		
NCO	PPRAC	770405	0000	0800	08	00		
NCO	ANDEP	770406	0800	1200	04	00		

SHIP NAME	U I C	VOY	LNE	PORT NAME	CDE	ARR-L	DEP-L	REMARKS
ADMCALLGHN	NA0415	027	010	BAYONE MOT	1GC	770402	770404	LDG

	DATE	TIME	BNKRS	MILES	B 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

CAT	CODE	DATE	START	STOP	HR	MN	GANG	REMARKS
NCO	SHIFT	770402	1406	1624	02	18		
NCO	PPRAC	770402	1624	2400	07	36		
NCO	PPRAC	770403	0000	0800	08	00		
DIS	NORML	770403	0800	2100	13	00		
NCO	PPRAC	770403	2100	2400	03	00		
NCO	PPRAC	770404	0000	0800	08	00		
L/D	NORML	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

REPORT 000140R1
PAGE 1

24 MAR 78

PART I NUCLEUS SHIPS

SHIP NAME	IRCS	AVAIL	R/I/A	PORT TIME		SEA TIME	
USNS BLAND, SCHUYLER OTIS	NHRR	28	0	14	50.0%	14	50.0%
USNS BOSTROM, PVT LEONARD C	NLUA	0	28	0	.0%	0	.0%
USNS CAREY	NJZP	28	0	7	25.0%	21	75.0%
USNS METEOR	NBIU	28	0	10	35.7%	18	64.3%
USNS MIRFAK	NZAE	28	0	9	32.1%	19	67.9%
USNS TOWLE, PVT JOHN R	NSTY	28	0	6	21.4%	22	78.6%
TOTAL NUCLEUS		140	28	46	32.8%	94	67.2%

FIGURE IV.4.2-5
PORT TIME REPORT

C A L S T A T   RPT 000130-R1
                                                     PAGE 1

LOCATION AND STATUS
10 MAY 78   AS OF 09 MAY 78

SHIP	UIC	VOY	LOCATION	NEXT PORT	E.T.A.	IN PORT STATUS		
ACADNVCTRY	NA4313	001	AT SEA	BARBADOS I	780507			
ACHALLNGER	NA0407	013	AT SEA	ROTA	780513			
ACHAMPION	NA0441	017	AT SEA	NSD GUAM	780513			
ACHARGER	NA0408	010	AT SEA	YOKOHAMMAT	780521			
ACHIEFTAIN	NA0409	011	AT SEA	P HUENEMEN	780514			
ACORSAIR	NA0410	010	AT SEA	MOBILE ALA	780513			
ACOURIER	NA0442	016	BAYONE MOT	ARGENTIA	780512	LDG	NORML	780509 1400
ADMCALLGHN	NA0415	044	AT SEA	BAYONE MOT	780510			
ARACER	NA0411	009	AT SEA	BREMERHAVN	780510			
ARANGER	NA0412	027	SPORT MOT	NORDENHAM	780521	LDG	NORML	780509 0800
ARELIANCE	NA0413	007	TENGAN OKI	CHINHAE	780526	LDG	NORML	780509 1630
BLAND	N01897	ROS	OAKLND NSC					
BROSTROM	N08493	ROS	OAKLND NSC					
CANAVERAL	NA0418	040	ELUTHERA I	G TURK IS	780512			
COMET	N01932	018	AT SEA	ROTA	780509			
GREENPORT	NA0419	ROS	MOBILE ALA					
GREENWAVE	NA0421	ROS	N ORLEANSA					
GRENSPRNGS	NA0420	ROS	MOBILE ALA					
INAGUACLOD	NA4444	007	CP KENNEDY			DIS	NORML	780510 0915
LAKELAND	NA0423	074	CP KENNEDY	G BAHAMA I	780513	NCO	OTHER	780510 0000
METEOR	N01938	020	N ORLEANSA	BAYONE MOT	780515			
MIRFAK	N01934	018	VALPARAISO	MATARANI	780513			
OTRAVELLER	NA0446	027	ST NAZAIRE	NORFLK NSC	780522			
PCOMMANDER	NA0447	009	AT SEA	NORFLK NSC	780510			
PCONTENDEN	NA0431	011	AT SEA	S DIEGO NS	780514			

FIGURE IV.4.2-6
LOCATION AND STATUS REPORT

```
                                         C A L S T A T                                                  REPORT  080070R2
                                ERROR AND MAINTENANCE LISTING                                           PAGE    1
                                          10 MAY 78                                                     AS OF 09 MAY 78
ERRORS  RECEIVED FROM   080000

INPUT TRANSACTION                                                                      ERROR CODES
INDR              001 180000DK01 78130          CALSTAT                                01
INDR             2001 180000DK02 78130          CALSTAT                                01
ACE CALSTAT  78130 BN72                                                                04 05 06 08
SABADMCALLGHNNA0415JFINCORPRACT8050610002400                                  043      41
SABADMCALLGHNNA0415JFINCOAVDEP78050913001565                                  093      41
ACP CALSTAT 09 MAY 78 BN-07                                                            04 05 06 08
ACGCALSTAT    10 MAY BN 05                                                             04 05 06 08
BBLACADMVCTRYNA431300103OCP378050 7A780508A1506        30            D/L               02
BBLACADMVCTRYNA4313001050 1R178051 4E7805 16E150          6        30DIS               02
BBLACADMVCTRYNA4313001040CN278051 0A780510E150                                         02
SALACOURIER   NA0442GA3NCQRPRAC78042510062100                                 043      41
SALACOURIER   NA04421P2NCOSHIFT78050309081224                                 043      41
ACLCALSTAT    78130                                             ACLCALSTAT 78130       04 05 06 08
AALINAGUACLODNA44440070780511A780515E                                                  07
BALINAGUACLODNA44440080101R1780510A780511E100                                          05
BALINAGUACLODNA44440080301R1780515E780516E100                                          05
BALINAGUACLODNA44440080200C857805 13E780513E100                                        05
CALINAGUACLODNA444400801015 1ARR78051012000034001080                                   05 26
ACM CALSTAT 78128 MAY BN 02                                                            04 05 06 08
ACMCALSTAT 78129 MAY BN 03                                                             04 05 06 08
SANTCOLUMBIA NA0440PMINCQSHIFT7804071324161 8                                 043      41
ACPCALSTAT    78130                                                                    04 05 06 08
SAPPCONTENDERNA04314EINCOADMIN78050900000800  SCHEDULE                        093      41
```

FIGURE IV.4.2-7
ERROR LISTING

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C A L S T A T
ERROR AND MAINTENANCE LISTING
13 APR 78

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PAGE 4
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LINE	PORT	ARRIVAL	DEPART	SPD	CARGO LOADED COMM	CON	M/T	CARGO DISCHARGE COMM	CON	M/T	REMARKS
080	2B1	780409A	780411A	16.0				0		3050 A	DIS

VIC	VOY	SHIP NAME	I R C S	T/S	START	COMPLT	POL CAR
N01932	018	USNS COMET	NJZP	1	780410A	780615E	

LINE	PORT	ARRIVAL	DEPART	SPD	CARGO LOADED COMM	CON	M/T	CARGO DISCHARGE COMM	CON	M/T	REMARKS
005	2B1	780409A	780411A	16.0							LDG
010	2DC	780412E	780414E	16.0				368	18	760 A	DIS
020	16C	780418E	780421E	16.0							
030	1N4	780422E	780425E	16.0							
050	RJ2	780507E	780508E	16.0							
060	LD9	780510E	780511E	16.0							
070	LO1	780512E	780513E	16.0							
080	PE1	780515E	780516E	16.0							
090	PP1	780517E	780518E	16.0							
100	PG1	780520E	780521E	16.0							
110	PF3	780522E	780524E	16.0							

VIC	VOY	SHIP NAME	I R C S	T/S	START	COMPLT	POL CAR
N01934	017	USNS MIRFAK	NZAE	1	771212A	780305A	

LINE	PORT	ARRIVAL	DEPART	SPD	CARGO LOADED COMM	CON	M/T	CARGO DISCHARGE COMM	CON	M/T	REMARKS
010	16C	771126A	771212A	12.0							REPAIRS
020	165	771212A	771219A	12.0	4		1480 A				LDG
040	FB1	780109A	780113A	12.0				4		666 A	DIS
050	FC1	780117A	780118A	12.0	4		47 A	4		27 A	L/D
060	FE3	780119A	780121A	12.0				4		32 A	DIS
065	EE3	780131A	780202A	12.0						47 A	DIS
070	EEB	780205A	780206A	12.0				4		314 A	DIS
080	ED1	780209A	780209A	11.0				4		22 A	DIS
090	EC1	780212A	780214A	12.0				4		191 A	DIS
100	BA1	780217A	780217A	12.0							TRA
110	BB1	780218A	780218A	12.0							TRA
120	CR4	780220A	780221A	12.0				4		9 A	DIS
130	CR6	780221A	780223A	11.5				4		219 A	DIS
140	165	780301A	780319A	12.0				4		45 A	DIS

VIC	VOY	SHIP NAME	I R C S	T/S	START	COMPLT	POL CAR
N01934	018	USNS MIRFAK	NZAE	1	780306A	780531E	

LINE	PORT	ARRIVAL	DEPART	SPD	CARGO LOADED COMM	CON	M/T	CARGO DISCHARGE COMM	CON	M/T	REMARKS
020	165	780301A	780319A	12.0	46		1276 A				LDG
030	CR4	780326A	780327A	11.0				4		112 A	DIS

FIGURE IV.4.2-7
(continued)

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PAGE 1

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.H.I.P. NAME	I.R.C.S.	OPER	TERMS	TYPE	SPD	COMM-DTE	MIN-DATE	MAX-DATE	DEC-DATE	REC-DATE	REC-AREA
SS AMERICAN CHARGER	KGTR	USLX	8	001	22.0	71/08/19	78/08/18	84/08/18	78/07/19		CONUS
SS AMERICAN CHIEFTAIN	KJKA	USLX	6	001	22.0	71/08/20	78/08/19	84/08/19	78/07/20		CONUS
MS LAKELAND	KPOU	AMCC	8	001	10.0	73/08/08	78/08/07	81/08/07	78/06/07		CAXMIAMI
SS PIONEER CONTENDER	KPEC	USLX	8	001	22.0	71/08/18	78/08/17	84/08/17	78/07/18		CONUS
SS SAN ANTONIO	KICJ	THCO	U	002	15.0	69/06/15	78/09/01	79/09/01	78/05/15	79/09/17	WK
MS STAR TEEN	KOZF	SERI	8	001	10.0	73/08/10	78/08/02	81/08/09	78/06/10		LSECCULE

RECORDS ON FILE 080010S1 56

RECORDS ON RPT 080020R1 6

SAUPB = 01125, ACTIVITY = = 07, , REPORT CODE = 73, RECORD COUNT = 000020

FIGURE IV.4.2-8
OPTION DECLARATION LISTING

CALSTAT
CARGO HANDLING PERFORMANCE REPORT
17 MAY 78

REPORT 080150-R1
PAGE 89

PART A - DETAILED BY PORT - APR 78

PORT MIDWAY IS (XJ1) SHIP PCONTENDER ARR= 780418 1654 DEP= 780420 0042 COMM LDD= 69 CUMM DSC= 6

CARGO OPERATIONS

DATE	FROM	TO	NO. GANGS	TOTAL TIME DDD HH MM	GANG HOURS	M/T LOADED	M/T DISCHGD	M/T TOTAL	M/T PER GNG HR
780418	0900	1200	2	3	6				
780418	1300	1630	2	3 30	7				
780418	1730	2300	2	5 30	11				
780419	0000	0430	2	4 30	9				
780419	0700	1030	1	3 30	3				
				20	36	1768	1	1769	49

NCO D 11H 48M PORT TIME 1D 7H 48M

PART A - DETAILED BY PORT - APR 78

PORT MIDWAY IS (XJ1) SHIP PCONTRACTR ARR= 780405 1718 DEP= 780406 2036 COMM LDD= 6 CUMM DSC= 68A1

CARGO OPERATIONS

DATE	FROM	TO	NO. GANGS	TOTAL TIME DDD HH MM	GANG HOURS	M/T LOADED	M/T DISCHGD	M/T TOTAL	M/T PER GNG HR
780405	0830	1630	2	8	16				
780405	1800	2400	2	6	12				
780406	0000	0384	2	3 44	7				
				17 44	35	14	705	719	40

NCO D 9H 34M PORT TIME 1D 3H 18M

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

PORT MIDWAY IS (XJ1)

MONTH	SHIP	M/T LOADED	M/T DSCHGD	M/T TOTAL	GANG HRS	M/T GNG HR
APR 78	PCONTENDER	1768	1	1769	36	49
APR 78	PCONTRACTR	14	705	719	35	20
		1782	706	2488	71	35

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 enought 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 gneerating 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

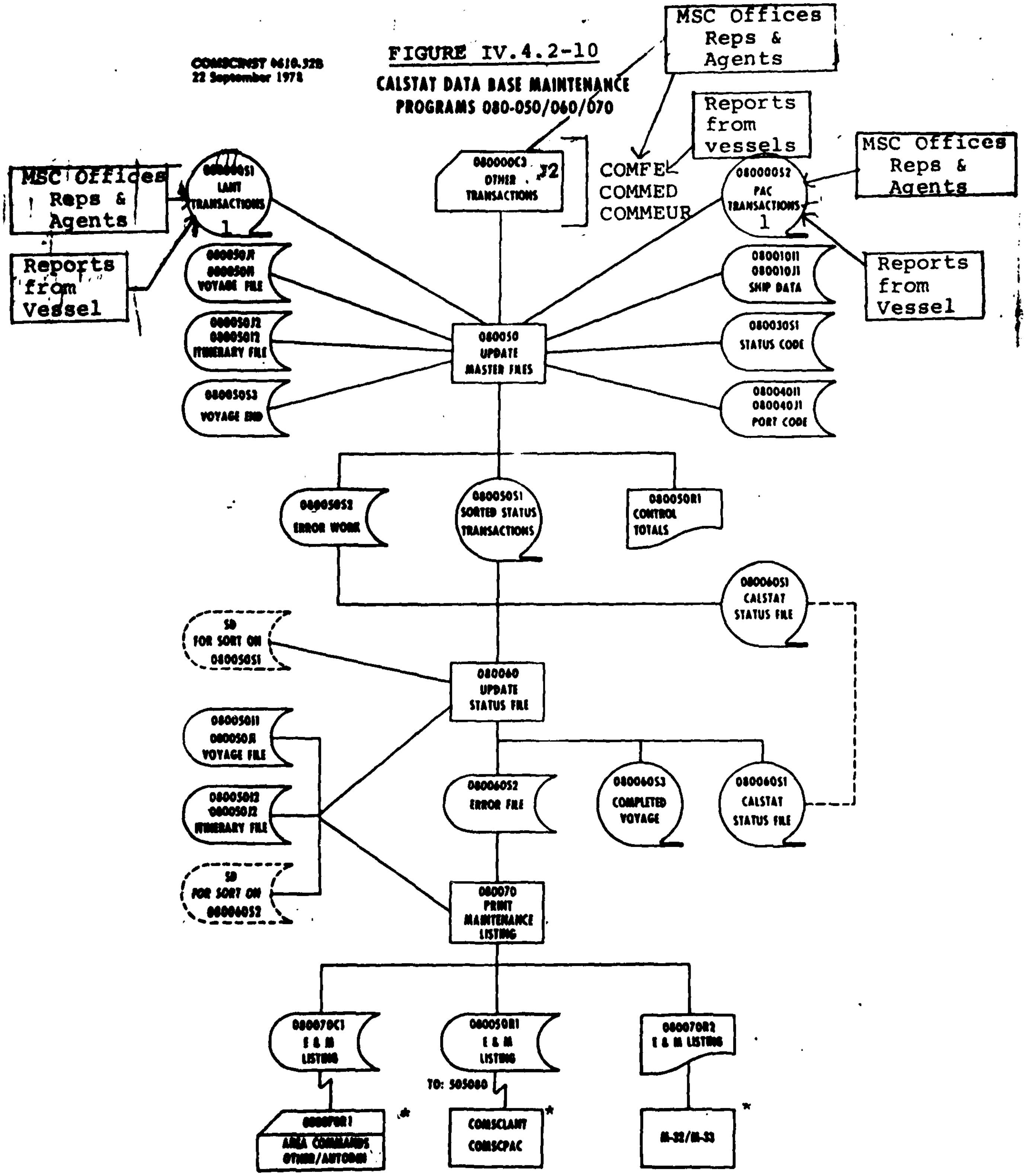
V. Tankship Documents - Inapplicable

VI. Dry Cargo Documents
   1. Shipping Order
   2. Manifest

VII. POL Documents - Inapplicable

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 donw 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 reasonably 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

Category	Status	Comment
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

Category	Status	Comments
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 trasnaction 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	1000.00
Total Hardware Cost per Installation	$3898.00
Software Development and Installation (includes travel and field work with area command)	$10000.00
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

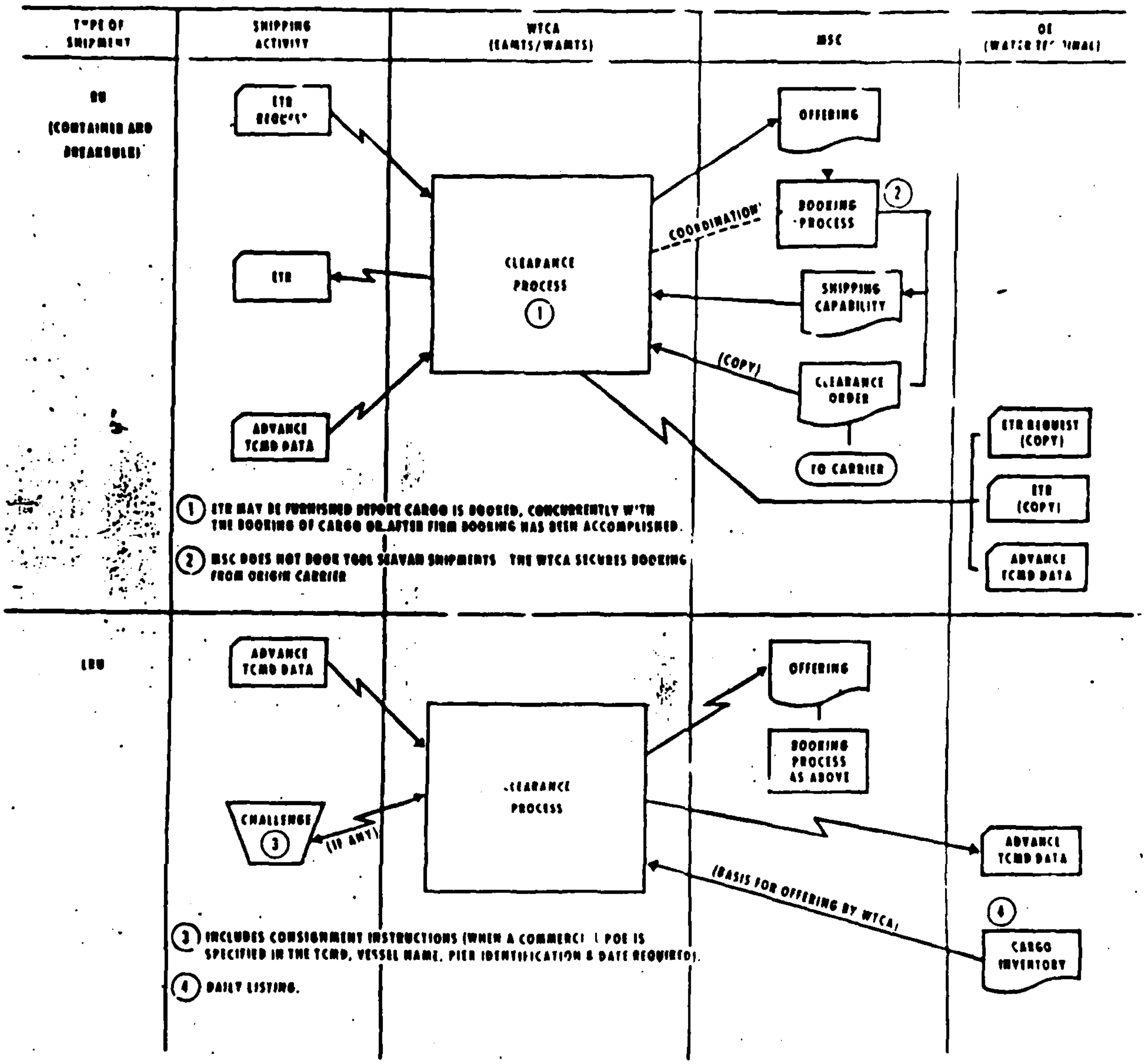


FIGURE IV.5-1

SURFACE EXPORT CLEARANCE OF DOD CARGO

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

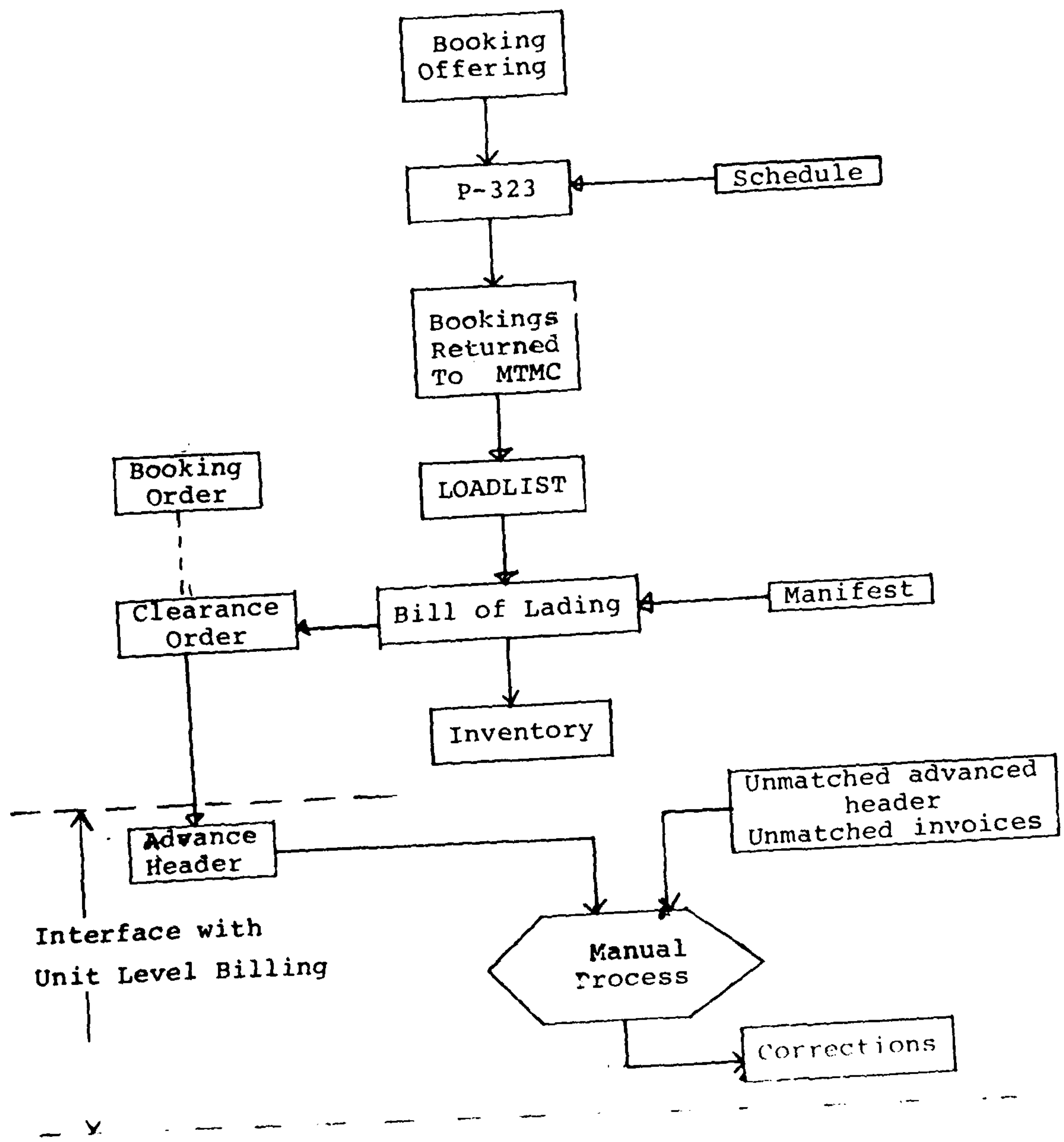


FIGURE IV.5-3 Container Booking International Shipments

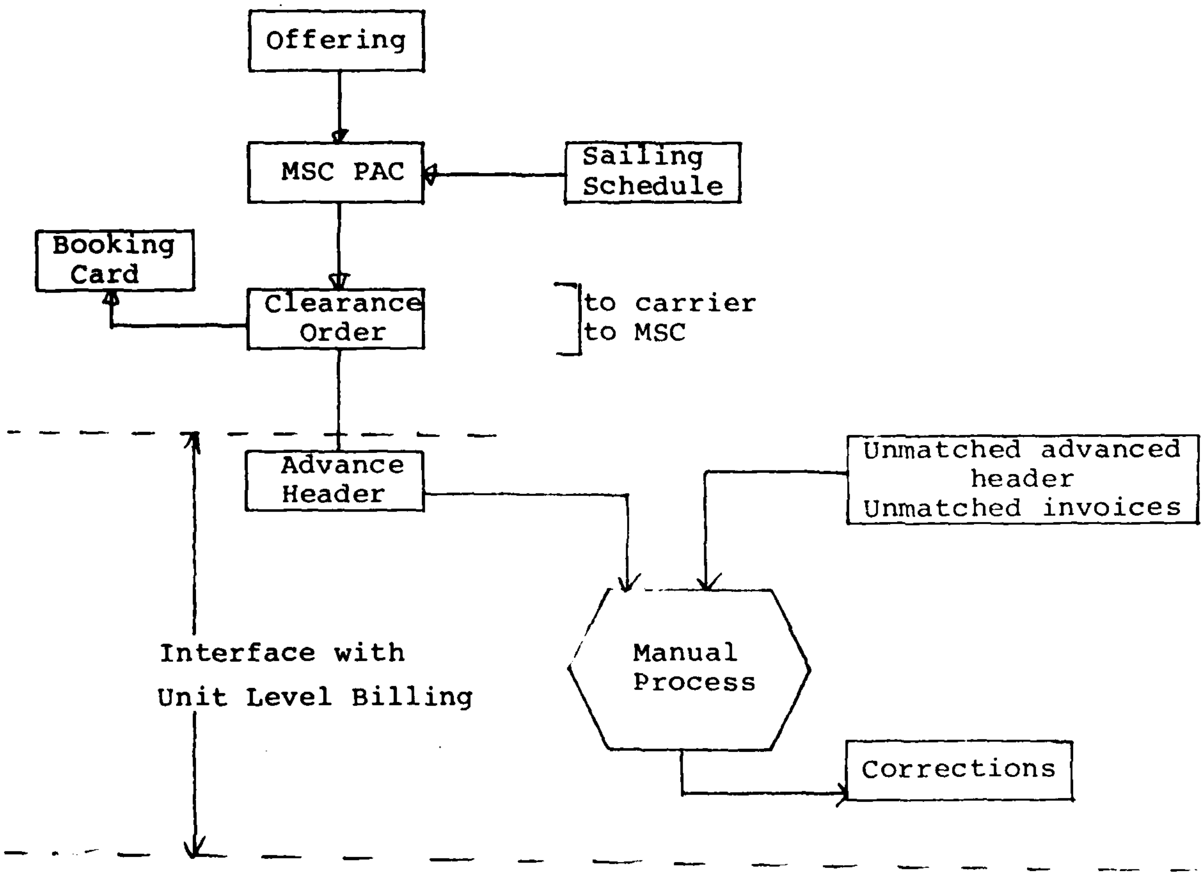
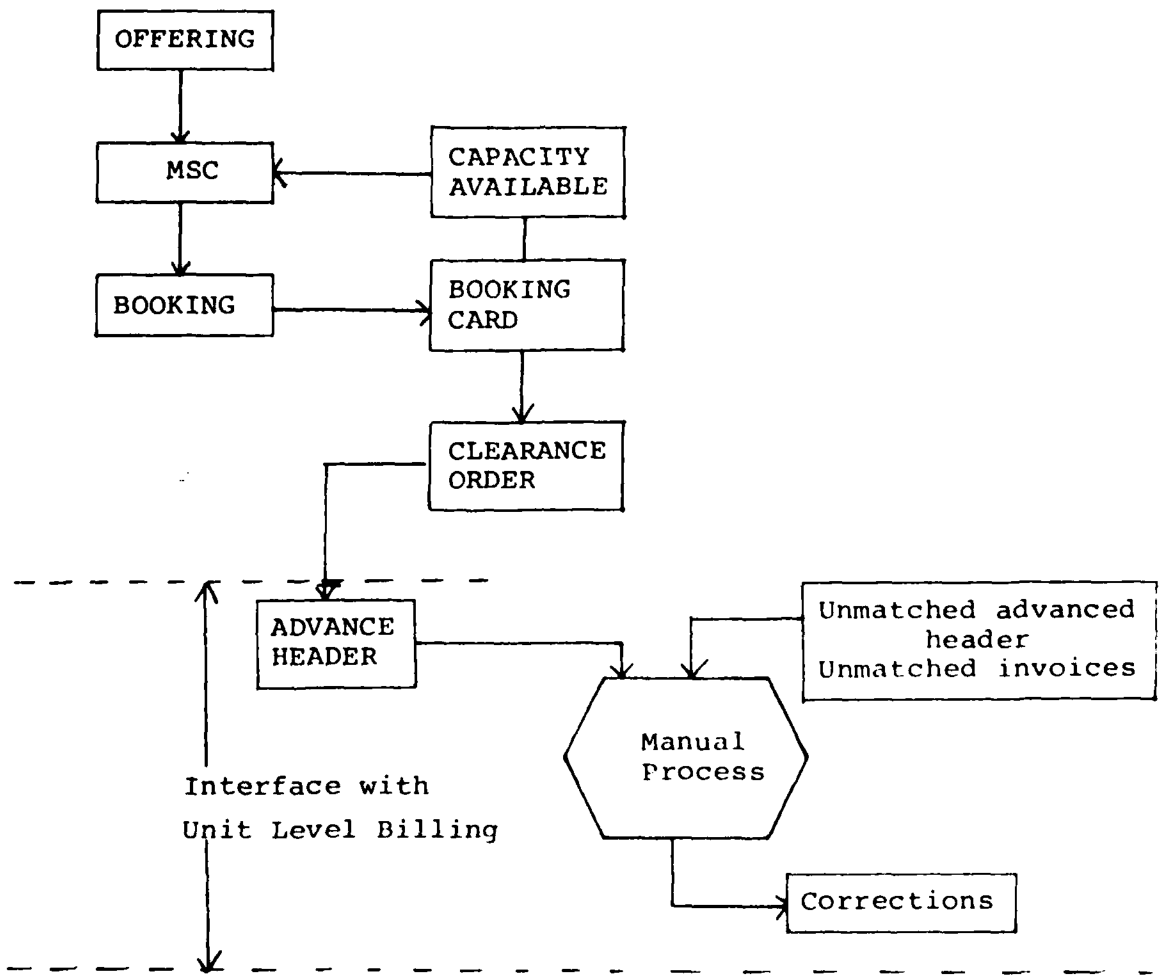


FIGURE IV.5-4 Container Booking - Break Bulk



Note: Planning horizon about 4 weeks.

FIGURE IV.5-5 Container Booking - Atlantic Command

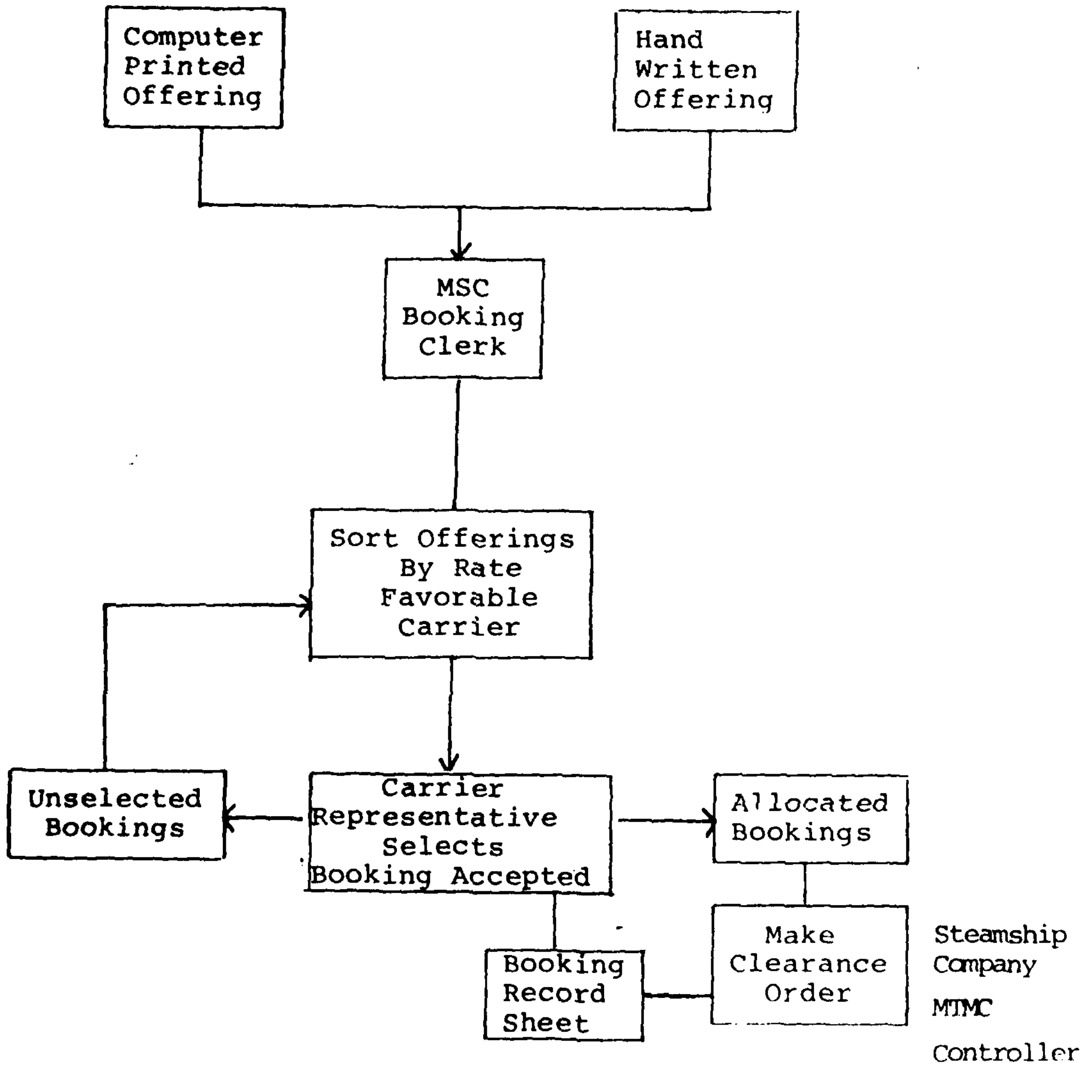
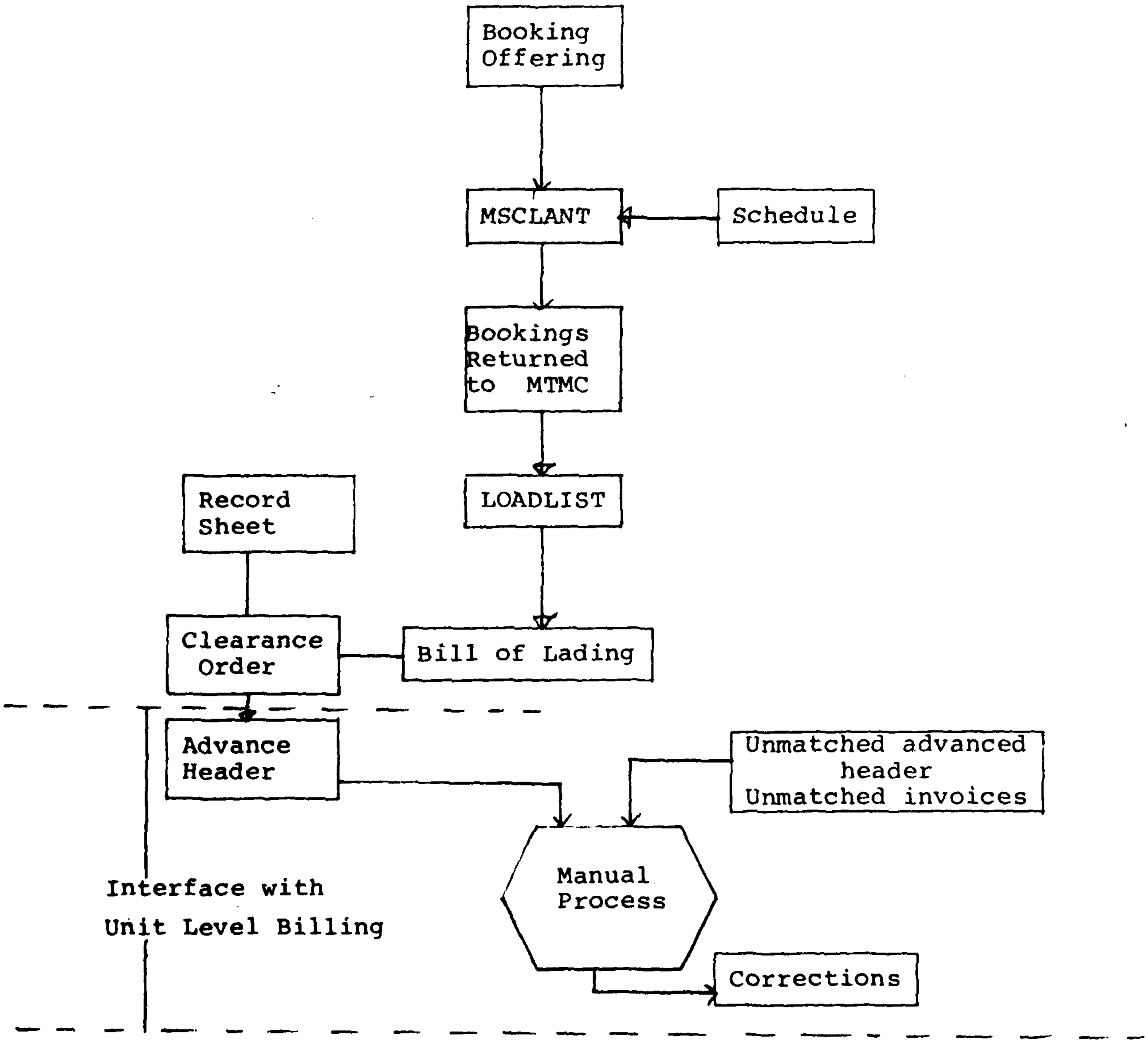
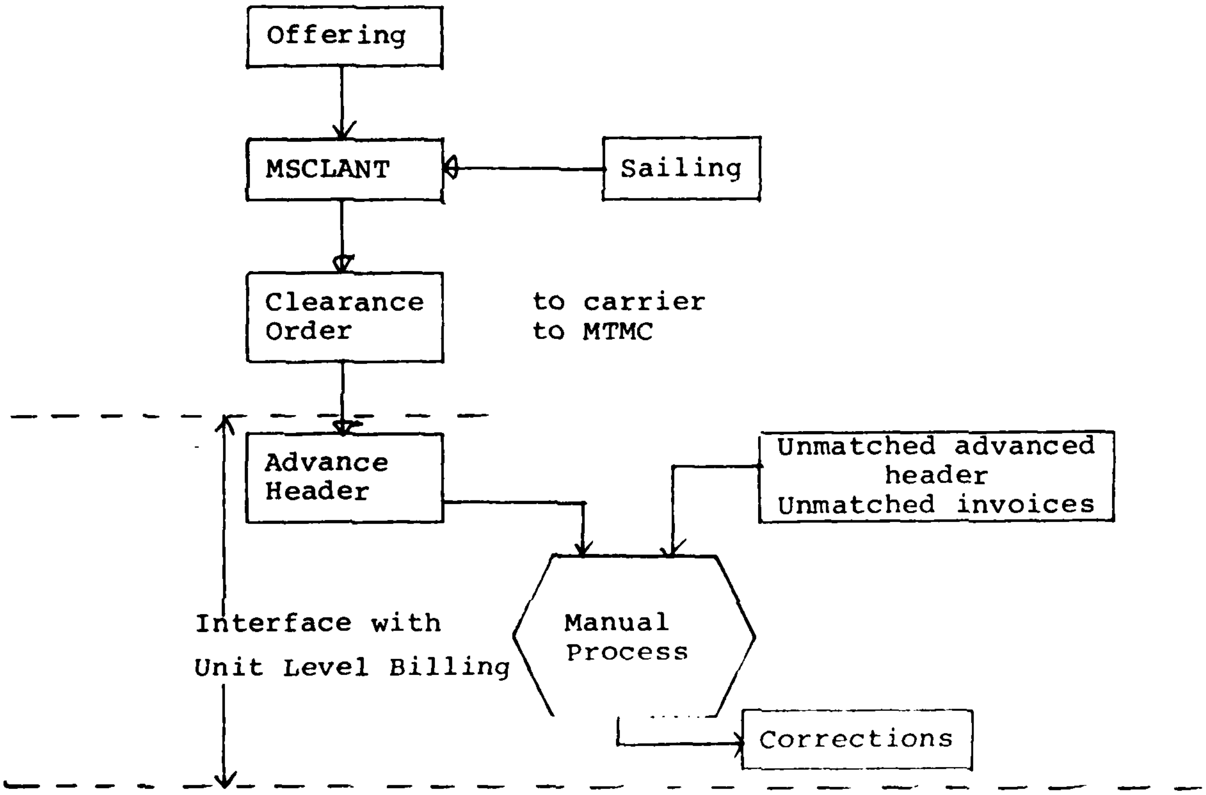


FIGURE IV.5-6 Container Booking - GBL Shipments Atlantic Command



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 truely 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 gree 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 stabile 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

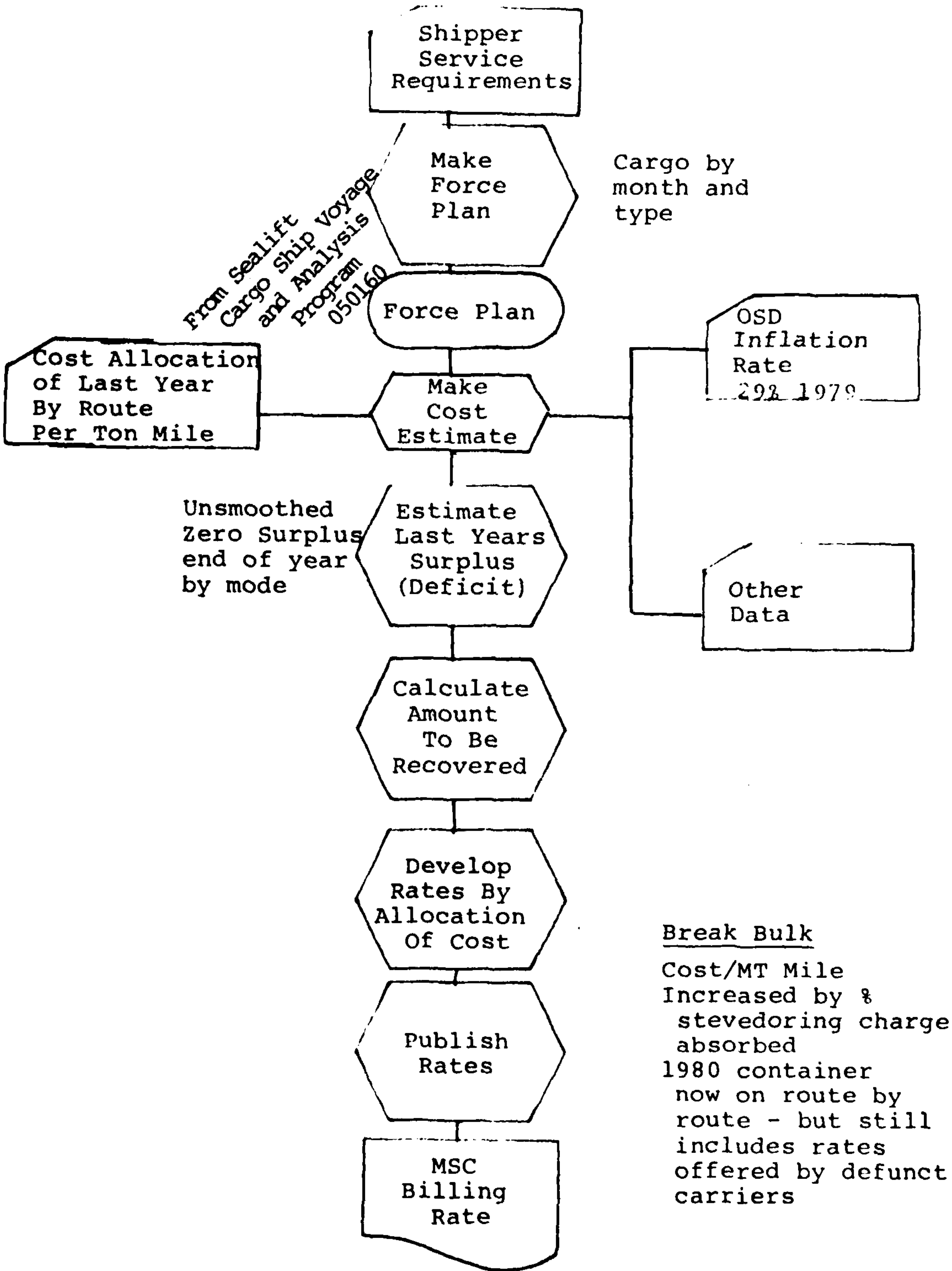


FIGURE IV.6-1 Establishment of Interservice Billing Rate

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 or 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 fiels 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 is receivables for the Pacific command runs in the vicinity of 28 million dollars, the Oakland

TABLE IV.7-1

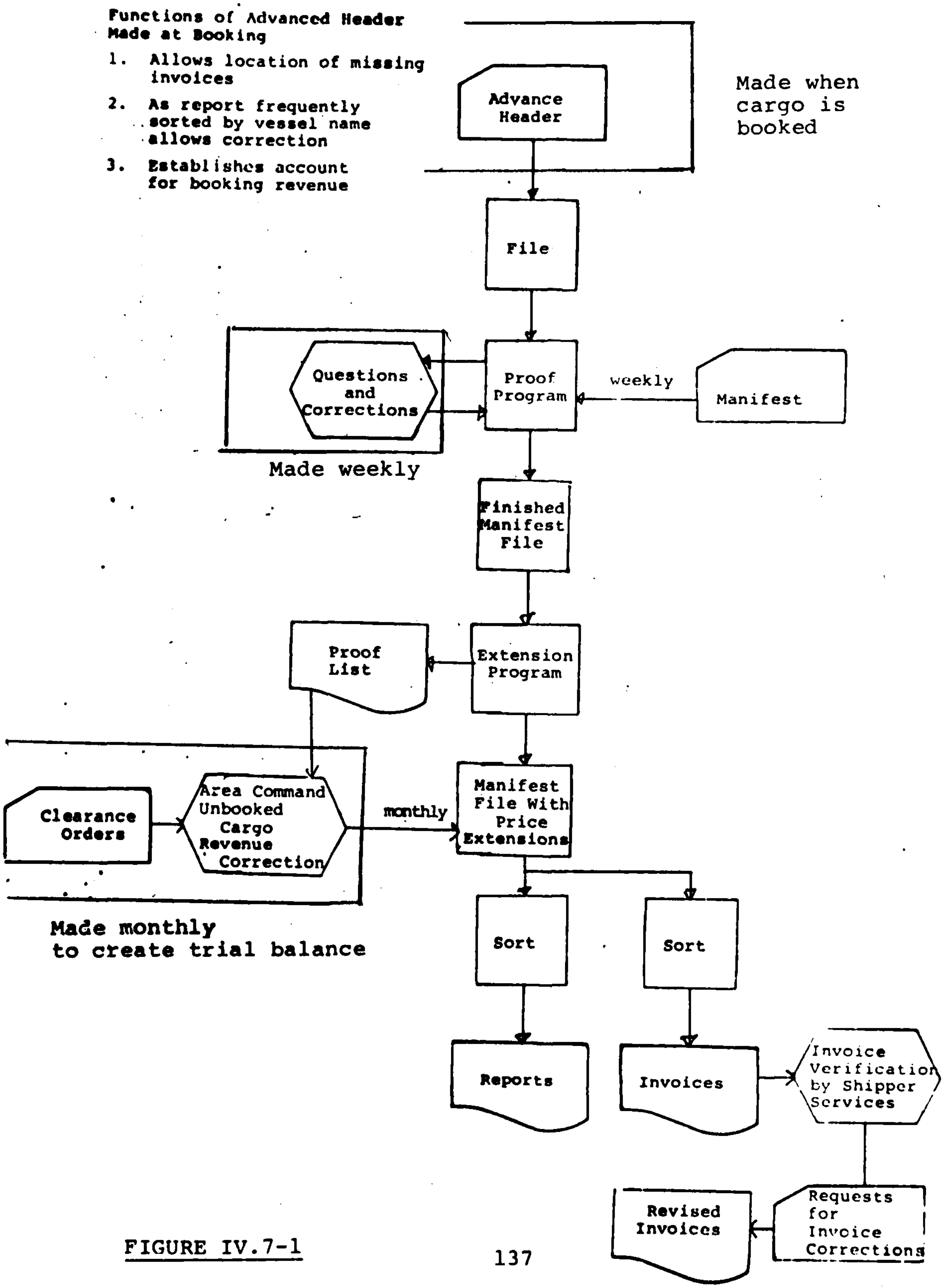
Process: Unit Level Billing

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
Advance Header
Made when cargo is booked
File
Questions and Corrections
Proof Program
weekly
Manifest
Made weekly
Finished Manifest File
Proof List
Extension Program
Clearance Orders
Area Command Unbooked Cargo Revenue Correction
monthly
Manifest File With Price Extensions
Made monthly to create trial balance
Sort
Sort
Reports
Invoices
Invoice Verification by Shipper Services
Revised Invoices
Requests for Invoice Corrections

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%.

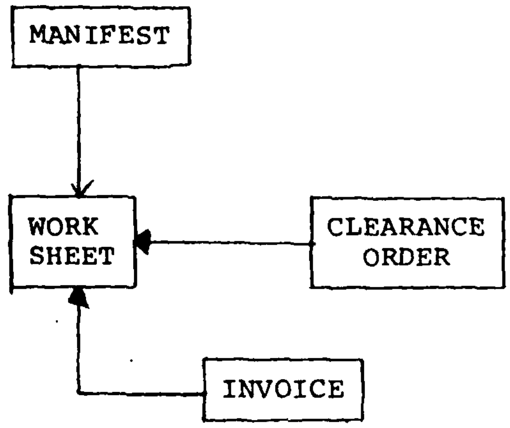
IV.7.1 <u>Invoice Verification</u>

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

PRELIMINARY F[illegible]SE ESTIMATE/WORKSHEET
FIND MSCPAC [illegible]/22 (9-78)

FIGURE IV.7.2-2

	VOYAGE DOC. NO.	NIF NO.	PAYEE NO.	CARRIER BILL NO.	CHECK NO.	DATE PAID	SHIPPING ORDER NO.	CONTRACT BBA
1-2	3-6	7-14	15-18	19-24	25-31	32-37		
NN	4531		5659	502689			448-68/79	

SAIL DATE	LOADING PORT	POE	DISCHARGE PORT	POD	ROUTE INDEX ZONE	TERM	COMMODITY	CMDY	TYPE SERV	UNIT MEAS	EXCEPT CLEAN	CONTAINERIZED SHIPMENTS 1 ORIG CODE	U... CO...
		38-40		41-43		44		45 46	47 48	49	50	51-54	55-
9Ø9							Bunker fuel		34				
9Ø921		3DS		LA1		W	Cargo NOS (2)	6Ø	Ø2	4	1		
"		"		"		"	Dray (2) Z-1	"	24	"	"		
							S/C 9.5%						
9Ø921		3DS		SA3		W	Reefer (9)	1Ø	Ø2	4	1		
							Tectrol		29				
9Ø921		3DS		SA3		W	Dray (1) Z.3	1Ø	24	4	1		
							S/C 9.5%						
9Ø921		3DS		SA3		W	Dray (4) Z.2	1Ø	Ø24	4	1		
							S/C 9.5%						
9Ø921		3DS		SA3		W	Cargo NOS (58)	6Ø	Ø2	4	1		
"		"		"		"	Dray (34) Z-1	"	24	"	"		
							S/C 9.5%						

17 4

RE IV.7.2-2

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

CMDY	TYPE SERV	UNIT MEAS	EXCEPT CLEN	CONTAINERIZED SHIPMENTS I ORIG CODE	U DEST CODE	CONTENTS	VAN M/TON	RATE	COST
45 46	47 48	49	50	51-54	55-58	59-64			65-73
	34						66332.19 ~~[illegible].89~~	8.10	53,730.11 54,001.81
60	02	4	1			56	104.90	77.00	8,077.30
S	24	S	S				104.90	.70	73.43
							104.90	.07	(7.34)
10	02	4	1			246	385.47	94.00	36,234.18
	29						5	261.00	1,305.00
10	24	4	1				42.83	1.65	70.67
							42.83	.16	(6.85)
10	024	4	1				171.32	1.37	234.71
							171.32	.13	(22.27)
60	02	4	1			2451	3026.65	38.45	116,374.69
S	24	S	S				1767.85	.70	1,237.50
							1767.85	.07	(123.75)

JC 11/10/79

PRELIMINARY ' SE ESTIMATE/WORKSHEET
IIND MSCPAC 7. 0/22 (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 N
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	UNIT MEAS	EXCEPT CLEN	CONTAINERIZED SHIPMENTS I ORIG CODE	U DEST CODE
		38-40		41-43		44		45 46	47 48	49	50	51-54	55-
90921		302		UL3		W	Cargo Nos (1)	60	02	4	1		
"		"		"		"	Dray (1) Z-1	"	24	"	"		
							S/C 9.5%						
90921		301		UME		W	Reefer (1)	10	02	4	1		
							Tectrd		29				
90921		301		UME		W	Cargo Nos (24)	60	02	4	1		
"		"		"		"	Dray (11) Z-1	"	24	"	"		
							S/C 9.5%						
90921		301		UME		W	Dray (1) Z-2	60	24	4	1		
							S/C 9.5%						

FIGURE IV.7.2-2 (continued)

DATE PAID	SHIPPING ORDER NO.	CONTRACT BBA NO.	CA NO.	SHIP	OPERATION	EST
32-37						

MODITY	CMDY	TYPE SERV	UNIT MEAS	EXCEPT CLEN	CONTAINERIZED SHIPMENTS I ORIG CODE	U DEST CODE	CONTENTS	VAN M/TON	RATE	COST
	45 46	47 48	49	50	51-54	55-58	59-64			65-73
Nos (1)	60	02	4	1			37	60.03	27.90	1,674.84
(1) Z-1	(	24	(	(				60.03	.70	42.02
.5%								60.03	.07	(4.20)
(1)	10	02	4	1			25	42.83	82.00	3,512.06
		29						1	261.00	261.00
Nos (24)	60	02	4	1			1077	1372.50	27.90	38,292.75
								600.30	PAB	420.21
(11) Z-1	(	24	(	(				660.33	.70	462.23
								600.30	[illegible]	[illegible]
5%								660.33	.07	(46.23)
(1) Z-2	60	24	4	1				60.03	1.05	63.03
.5%								60.03	.10	(6.00)

PRELIMINARY E[illegible] ESTIMATE/WORKSHEET
[illegible]IND MSCPAC 7[illegible] 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 [illegible]
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		UNIT	MEAS	EXCEPT	CLEN	CONTAINERIZED SHIPMENTS 1 ORIG CODE	U DEST CODE
		38-40		41-43		44		45	46	47	48	49		50		51-54	55-[illegible]
910921		3DS		UME		W	Vehicle (2)	86		02		4		1			
910921		3HZ		SA3		W	Reefer (4)	10		02		4		1			
							Cargo Nos (3)	60									
							Dray (2) Z-1			24							
							S/C 9.5%										
910921		3H2		SA3		W	Dray (1) Z-2	60		24		4		1			
							S/C 9.5%										
910921		3H2		UME		W	Reefer (1)	10		02		4		1			

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.7.2-2 (continued)

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

CMDY	TYPE SERV	UNIT MEAS	EXCEPT	CLEN	CONTAINERIZED SHIPMENTS 1 ORIG CODE	CONTAINERIZED SHIPMENTS U DEST CODE	CONTENTS	VAN M/TON	RATE	COST
45 46	47 48	49	50		51-54	55-58	59-64			65-73
36	02	4	1				38 73	38.00 72.63	PAB 63.50	2,413.00 4,612.01
10	02	4	1				131	171.32	94.00	16,104.08
60							103	157.35	38.45	6,050.11
	24							104.90	.95	99.66
								104.90	.09	(9.44)
60	24	4	1					52.45	1.95	102.28
								52.45	.19	(9.97)
10	02	4	1				36	42.83	82.00	3,512.06

PRELIMIKARY F E ESTIMATE/WORKSHEET
IIND MSC AC 7.../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
·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	UNIT MEAS	EXCEPT / CLEN	CONTAINERIZED SHIPMENTS ORIG CODE	U... CODE
		38-40		41-43		44		45 46	47 48	49	50	51-54	55-
9Ø921		3HS		UME		W	Cargo Nos (13)	6Ø	Ø2	4	1		
~		~		~		~	Dray (11) Z-1	~	24	~	~		
							S/C 9.5%						
9Ø921		4DS		SA3		W	Cargo Nos (2)	6Ø	Ø2	4	1		
				UL3		W	Cargo Nos (1)	6Ø	Ø2	4	1		
				UME			Cargo Nos (5)						
				~			Dray (3) Z-1		24				
							S/C 9.5%						
							Total S/C 9.5%						

RE IV.7.2-2 (continued)

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

	CMDY	TYPE SERV	UNIT	MEAS	EXCEPT	CLEN	CONTAINERIZED SHIPMENTS 1 ORIG CODE	U DEST CODE	CONTENTS	VAN M/TON	RATE	COST
	45 46	47 48	49		50		51-54	55-58	59-64			65-73
(13)	6φ	φ2	4		1				475	772.81	27.9φ	21,561.4φ
2-1		24								652.75	.95	62φ.11
										652.75	.09	(58.75)
(2)	6φ	φ2	4		1				66	1φ4.9φ	38.45	4,φ33.41
(1)	6φ	φ2	4		1				42	6φ.φ3	27.9φ	1,674.84
(5)									238	292.57	27.9φ	8,162.7φ
2-1		24								18φ.φ9	.86	154.88
6										18φ.φ9	.φ8	(14.41)
95%												[illegible] .3φ9.91
												$328,913.96

$326,3[illegible]

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 providors 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**

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

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 inhibiter
      - 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. Biese, 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

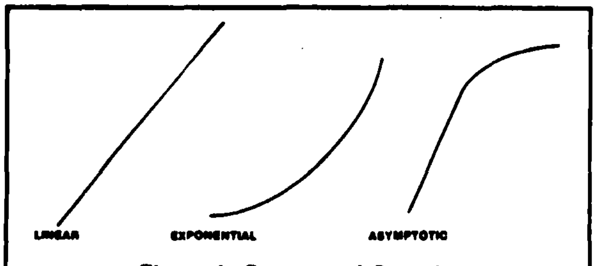


Figure 1. Patterns of Growth

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).

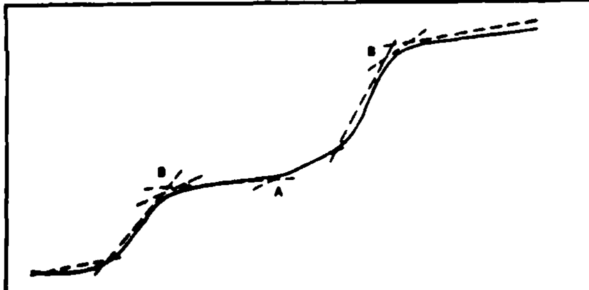


Figure 2. Representative Compound Growth. This could be approximated only by multiple short period linear curves.

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 affect 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

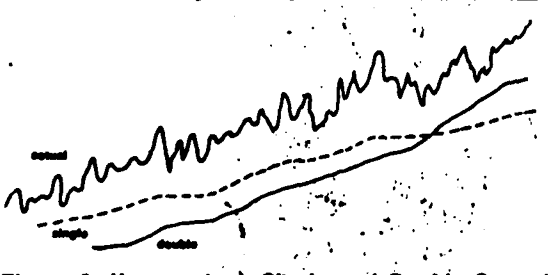


Figure 3. Unsmoothed, Single and Double Smooth Data (Redrawn after Westlake)

"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 affect 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.

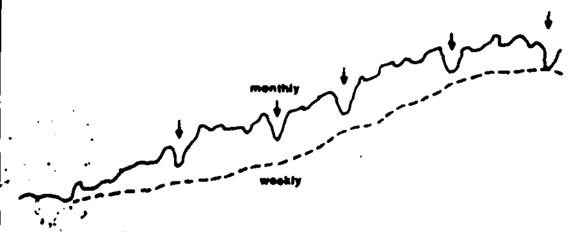


Figure 4. Effects of Loss of Periodic Data by Smoothing with Weekly Moving Average and Monthly Moving Average. (Redrawn after Westlake)

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 (II) 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**

REFERENCES

Alonso, J.R.F.; *Simple Suite of Programs. A Software Handbook of Statistical Techniques.* Sterling Swift, Manchaca, Texas, 1978

Brown, R.G.; *Smoothing, Forecasting and Prediction of Discrete Time Series.* Prentice-Hall, Englewood Cliffs, New Jersey, 1963

Westland, G. (Ed.); *Management and Cost Control Techniques for the Clinical Laboratory.* University Park Press, 1977

Wheelwright, S.C., and Makridakis; *Forecasting Methods for Management* John Wiley and Sons, New York, 1973

Wolfe, H.D.; *Business Forecasting Methods.* Holt, Rhinehart & Winston, New York, 1966

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 (Pertec) drives through Tarbell controllers.

PROGRAM LISTING

```
100 'FORCAST: A program to predict future test volume given sufficient
     data on past performance; based on the article by George Westlake
     in: MANAGEMENT AND COST CONTROL TECHNIQUES FOR THE CLINICAL LAB.;
     University Park Press,1977

110 'Programmed in Microsoft Basic for the CP/M operating system.
     All comments should be directed to:  Lee P. Biese,MD
                                           RFD 1,Murray Hill Road
                                           Hill, NH 03243

120 'NOTE: you must have at least one dummy 'xxxxxxx.DAT' file on the
     disc to prevent a file-not-found error. The data files should be
     created with this program itself to load correctly.

130 CLEAR 1000                                    'Get some string space
140 SIZE=52                                       'Dim to No. of periods
150 DIM P(SIZE),V(SIZE)
160 DIM S1(SIZE),S2(SIZE),D(SIZE)
170 PRINT CHR$(26)                                'Clear ADM screen

180 PRINT"PROJECTION OF FUTURE LABORATORY TEST VOLUME/REVENUE"
190 PRINT"  You are dimentioned to no more than "SIZE"periods."
200 PRINT"------------------------------------------------------"
210 PRINT:PRINT

220 PRINT"THE DATA FILES AVAILABLE FOR THIS PROGRAM ARE:":PRINT
230 FILES "*.DAT"
240 PRINT:PRINT
250 PRINT"ENTER A FILENAME (WITHOUT .DAT EXTENTION) TO USE A FILE";:
    PRINT" FROM THE"
260 PRINT"     LIST ABOVE or CARRAGE RETURN TO START A NEW FILE OF DATA"
270 PRINT:PRINT
280 PRINT"OLD FILE NAME  ?  ";
290 LINEINPUT X$
300 IF X$="" THEN PRINT:LINEINPUT"NEW FILE NAME (8 CHARS)  ? ";X$:
          X$=X$+".DAT":B=1:GOTO 410

310 '--------------- User wants an old file, get it

320 X$=X$+".DAT"
330 OPEN "I",#1,X$
340 INPUT #1,N,A0,A9
350 FOR I=1 TO N:
        INPUT #1,V(I):
        NEXT:
        CLOSE

360 '--------------- Data entry and review

370 PRINT
380 INPUT"DO YOU WANT TO ADD TO THE CURRENT DATA  ";Q$
390 IF LEFT$(Q$,1)="Y" THEN B=N+1:
    PRINT:GOTO 460                                'B=Start of new data
400 PRINT:GOTO 620                                'No, use old data

                   Start a new data file

410 A0=2E+10:A9=2E+10                             'init. hi/lo counters
420 B=1                                           'we are not adding data
430 PRINT"BEGIN ENTERING YOUR DATA NOW"
440 PRINT"PERIODS MAY BE:  WEEKLY,MONTHLY,YEARLY OR ANY OTHER INTERVAL."
450 PRINT"     RESULTS WILL BE IN TERMS OF THE SAME PERIODS."
460 PRINT:PRINT"IF YOU MAKE AN ERROR ENTER 999, "!
470      PRINT"TO END DATA ENTRY USE 000":PRINT
480 FOR I=B TO 2E+10                              'cont. till told to stop
490     IF I/20=INT(I/20) THEN PRINT:PRINT        'But remind the user
500     PRINT "PERIOD";I;"= ";
510     INPUT V(I)
520            IF V(I)=999 THEN PRINT:PRINT"REDO ";:GOTO 500
530            IF V(I)=0 THEN N=I-1:GOTO 590
540            IF V(I)>=A0 THEN 560
550              A0=V(I)                          'get lowest value A0
560            IF V(I)<=A9 THEN 580
570              A9=V(I)                          'and highest A9
580     NEXT
590     PRINT:PRINT

600 PRINT"  ".             *** DATA ENTRY COMPLETE ***":PRINT

610 '---------- User may want to check the old data

620 INPUT"DO YOU WANT TO REVIEW THE DATA FOR ERRORS  ";Q$
630 IF LEFT$(Q$,1)<>"Y" THEN 880
640 PRINT:PRINT

650 FOR I=1 TO N                                  'Yes,print it out
660     PRINT USING "###";I;
670     PRINT"> "V(I),
680     NEXT
690 PRINT:PRINT:INPUT"CORRECT";A$
700 IF LEFT$(Q$,1)<>"N" THEN 750
710 PRINT:INPUT"CHANGE WHICH VALUE ";I
720 INPUT"WHAT IS THE CORRECT VALUE  ";Z
730 V(I)=Z:GOTO 640

740 '---------- Save the final version of the data

750 PRINT CHR$(26):PRINT"SAVING ""X$"" ON THE DISC.....":PRINT
760 OPEN "O",#1,X$
770     PRINT #1,N,A0,A9
780     FOR I=1 TO N
790         PRINT #1,V(I)
800         NEXT
810         CLOSE

820 '::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

830 'Calculations. Note: the calculations given are for three-period
840 'exponential smoothing. If simple smoothing is desired substitute
850 'the following or add as a subprogram:

          S1(P+1)=(V(P)+V(P-1)+V(P-2)....+V(P-N))/N
          S2(P+1)=(S1(P+1)+S1(P)+S1(P-1))/3
                D=((2*S1(P+1))-S2(P+1))+((2/N-1))*(S1(P+1)-S2(P+1)))

860 'Where V=volume, P=period, S1=first smoothing, S2=second smoothing
     and D=double smoothing.

870 '::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

880 PRINT:INPUT"SMOOTHING FACTOR DESIRED (0-1)      ";F:PRINT
890 IF F>1 THEN PRINT:GOTO 880

900 '---------- Calculations. Note: with 3-period smoothing
                S1,S2 are invalid for the first period and
                D for the first two periods.

910 S1(1)=V(1):S2(1)=V(1)                         'initialize
920 FOR P=2 TO N
930     S1(P)=S1(P-1)+(F*(V(P-1)-S1(P-1)))        '1st. smoothing
940     S2(P)=S2(P-1)+(F*(S1(P)-S2(P-1)))         '2nd. smoothing

                 now double-smooth with factor F
```

```
950     B(P-1)=(((2*S1(P))-S2(P))+((F/(1-F))*(S1(P)-S2(P))))
960     NEXT

970 '--------------- Tabular printout of data.

        In the cp/m system a 'PRINT' command is directed to the
        assigned console (CRT) and an 'LPRINT' is sent to the LST
        device (printer)

980 INPUT"WHAT IS THE TITLE OF YOUR DATA";G1$

990 PRINT"ADJUST YOUR PAPER, TURN ON THE PRINTER and then hit 'RETURN'"
1000 INPUT"                   READY ??          ";Q$
1010 LPRINT
1020 LPRINT SPC(4);"EXPONENTIAL SMOOTHING OF LABORATORY TEST  VOLUME"
1030 LPRINT SPC(15);"    USING A FACTOR OF ";F
1040 LPRINT
1050 LPRINT G1$
1060 LPRINT STRING$(LEN(G1$),"=");LPRINT
1070 LPRINT"PERIOD","VOLUME","1ST. SM.","2ND. SM.","DOUBLE"
1080 LPRINT" (P)"," (V)"," (S1)"," (S2)"," (B)"
1090 LPRINT STRING$(64,"-")
1100 J=1
1110 FOR K=1 TO N
1120     LPRINT " ";K,V(K),
1130     IF K=1 THEN LPRINT SPC(2);CHR$(45);CHR$(45),SPC(2);CHR$(45);
         CHR$(45), SPC(2);CHR$(45);CHR$(45);J=J+1:GOTO 1170
1140     LPRINT INT((S1(K)+.5)),INT((S2(K)+.5)),
1150     IF J<3 THEN LPRINT SPC(2);CHR$(45);CHR$(45);J=J+1:GOTO 1170
1160     LPRINT INT((B(J-1)+.5));J=J+1
1170     NEXT
1180 LPRINT STRING$(64,"-")
1190 FOR I=1 TO 6:LPRINT:NEXT                      'eject paper
1200 '--------------- define graph parameters

1210 WIDE=120:HEIGHT=54:                           ' 14"x11" paper
1220 WIDTH 130
1230 SCALE=INT((A9-A0)/HEIGHT)                     'vertical interval
1240 PLACE=INT(WIDE/N)                             'horizontal tabs
1250 PRINT CHR$(26)
1260 PRINT"SET UP THE PARAMETERS FOR GRAPHIC OUTPUT"
1270 PRINT STRING$(40,45):PRINT
1280 PRINT"YOUR DATA RANGES FROM ";A0;"to";A9;"or";A9-A0 "UNITS IN ALL"
1290 PRINT
1300 INPUT"SELECT AN EVEN RANGE FOR THE GRAPH: LOWEST VALUE  ";AL
1310 INPUT"                                    HIGHEST  ";AH:PRINT
1320 PRINT"THE GRAPH WOULD BE";HEIGHT;" DIVISIONS HIGH or";
1330 PRINT INT((AH-AL)/HEIGHT);" UNITS/DIV.":PRINT
1340 PRINT
1350 INPUT"SELECT AN EVEN NUMBER OF UNITS/DIV (CAN'T BE LOWER)   ";I1
1360       IF I1=0 THEN I1=INT((AH-AL)/HEIGHT):GOTO 1380
1370       IF I1<INT((AH-AL)/HEIGHT) THEN PRINT:PRINT"WON'T FIT,";:
           PRINT "MUST BE >";:GOTO 1330
1380 PRINT CHR$(26):PRINT STRING$(72,45):PRINT
1390 PRINT"     YOUR GRAPH WILL RUN FROM "AL"to"AH" ON THE VERTICAL AXIS"
1400 PRINT"     WITH EACH DIVISION =";I1;"UNITS":PRINT
1410 PRINT"     THE HORIZONTAL RANGE IS FROM ZERO TO"WIDE"AND YOU";
           :PRINT" HAVE"N"POINTS"
1420 PRINT"     WITH EACH DIVISION =";PLACE;"UNIT";:IF PLACE >1 THEN
           PRINT"S" ELSE PRINT
1430 PRINT:PRINT STRING$(72,45):PRINT:INPUT "CORRECT  ";Q$
1440 IF LEFT$(Q$,1)="N" THEN PRINT CHR$(26);
     PRINT"BEGIN GRAPH DEFINITION AGAIN":FOR I=1 TO 5:
     PRINT CHR$(7);:FOR J=1 TO 100:NEXT J,I:PRINT:GOTO 1280

1450 '---------- Now print the graph

1460 X=2' Start counter and print only alternate margin values

1470 PRINT:INPUT"ADJUST PRINTER AND HIT RETURN TO START ";Q$

1480 FOR I=AH TO AL STEP -I1
1490     IF X/2=INT(X/2) THEN LPRINT USING "####";I;
         ELSE GOTO 1510
1500     LPRINT "-|";:GOTO 1520
1510     LPRINT TAB(5)"|";

1520     X=X+1                                  'counter for graph vert.
1530     IF X=8 THEN LPRINT TAB(15) G1$;                 'our graph title
1540     IF X=9 THEN LPRINT TAB(20)"SMOOTHING FACTOR = ";F;
1550     FOR P=1 TO N-1'

         'activate next 3 lines for plotting the unsmoothed data also

1560 '       IF V(P) <= I-(I1/2) THEN 1530
1570 '       IF V(P) >  I+(I1/2) THEN 1530
1580 '       LPRINT TAB(PLACE*P);"o";
1590         IF P<3 THEN 1630                   'first 2 B's invalid
1600         IF B(P) <= I-(I1/2) THEN 1630
1610         IF B(P) >  I+(I1/2) THEN 1630
1620         LPRINT TAB(PLACE*P);"x";
1630         NEXT: LPRINT

1640     NEXT I

1650 '---------- Now print a horizontal legend for the graph

1660 LPRINT SPC(5);
1670 IF PLACE=1 THEN LPRINT (WIDE,"-"):FOR I=1 TO WIDE STEP 5:
       LPRINT I:NEXT:GOTO 1800
1680 FOR I=1 TO (WIDE/PLACE)-3
1690     LPRINT "|-";
1700     IF PLACE=4 THEN LPRINT "--";
1710     IF PLACE=3 THEN LPRINT "-";
1720     NEXT: LPRINT

1730 '    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 OC NV ";
1770     NEXT
1780     LPRINT
1790     LPRINT TAB(20)"1976"; TAB(60)"1977"; TAB(95)"1978"

1800 FOR I=1 TO 5:LPRINT:NEXT                     'eject the paper
1810 END


 RUN #1  CREATING THE DATA FILE


 RUN

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


 THE DATA FILES AVAILABLE FOR THIS PROGRAM ARE:

 DUMMY   .DAT
```

```
ENTER A FILENAME (WITHOUT .DAT EXTENTION) TO USE A FILE FROM THE
    LIST ABOVE or CARRAGE RETURN TO START A NEW FILE OF DATA

OLD FILE NAME  ?

NEW FILE NAME (8 CHARS)  ? 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 =     ? 895

              ......  etc

PERIOD 36 =    ? 1939
PERIOD 37 =    ? 000

             *** DATA ENTRY COMPLETE ***

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 #2 USING OLD DATA FILES

RUN

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

THE DATA FILES AVAILABLE FOR THIS PROGRAM ARE:

DUMMY   .DAT  PROFILE .DAT
ENTER A FILENAME (WITHOUT .DAT EXTENTION) TO USE A FILE FROM THE
    LIST ABOVE or CARRAGE 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>  895
  6>  1012     7>  1095     8>  1024     9>  937     10>  949
 11>  1109    12>  1100    13>  877     14>  994     15>  913
 16>  1064    17>  961     18>  847     19>  1003    20>  864
 21>  1279    22>  1361    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 54  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 36 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
===============================
```

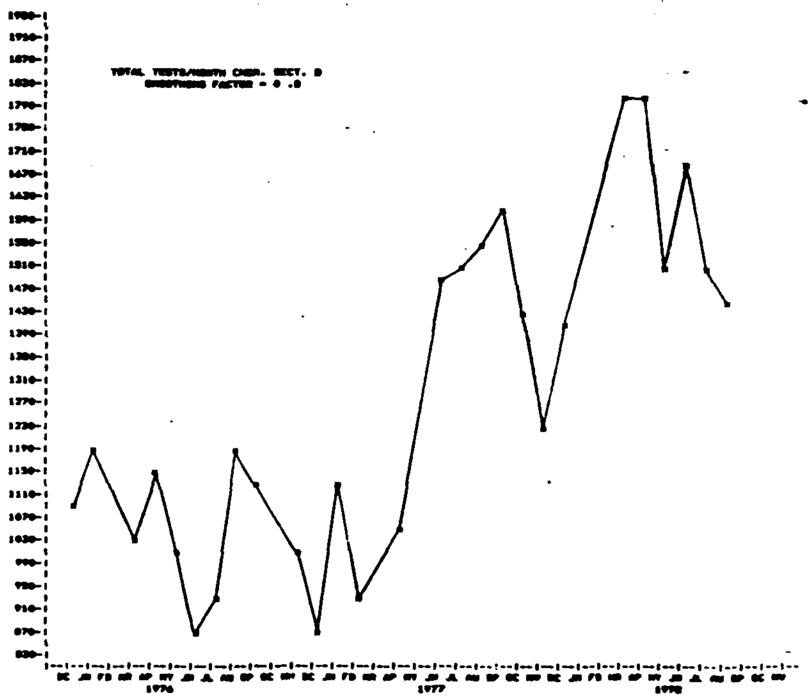
PERIOD (P)	VOLUME (V)	1ST. SM. (S1)	2ND. SM. (S2)	DOUBLE (D)
1	994	--	--	--
2	1000	994	994	--
3	1049	999	998	1004
4	1129	1039	1031	1080
5	895	1111	1095	1191
6	1012	938	970	781
7	1095	997	992	1025
8	1024	1075	1059	1159
9	937	1034	1039	1010
10	949	956	973	874
11	1109	950	955	928
12	1100	1077	1053	1200
13	877	1095	1087	1138
14	994	921	954	754
15	913	979	974	1005
16	1064	926	936	878
17	961	1036	1016	1137
18	847	976	984	936
19	1003	873	895	761
20	864	977	961	1059
21	1279	887	901	813
22	1361	1201	1141	1500
23	1442	1329	1291	1517
24	1520	1419	1394	1547
25	1440	1500	1479	1606
26	1316	1452	1457	1425
27	1398	1343	1366	1229
28	1767	1387	1383	1408
29	1858	1691	1629	1999
30	1797	1825	1786	2020
31	1800	1803	1799	1819
32	1614	1801	1800	1802
33	1699	1651	1681	1502
34	1579	1689	1688	1698
35	1520	1601	1618	1514
36	1939	1536	1553	1454

A7

EXPONENTIAL SMOOTHING OF LABORATORY TEST VOLUME
USING A FACTOR OF 0 .1

TOTAL TESTS/MONTH CHEM. SECT. B

PERIOD (P)	VOLUME (V)	1ST. SM. (S1)	2ND. SM. (S2)	DOUBLE (D)
1	994	--	--	--
2	1000	994	994	--
3	1049	995	994	995
4	1129	1000	995	1006
5	895	1013	996	1031
6	1012	1001	997	1006
7	1095	1002	997	1008
8	1024	1012	999	1026
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
16	1064	995	1003	986
17	961	1002	1003	1001
18	847	998	1002	993
19	1003	983	1000	963
20	864	985	999	969
21	1279	973	996	947
22	1361	1003	997	1011
23	1442	1039	1001	1081
24	1520	1079	1009	1150
25	1440	1123	1020	1230
26	1316	1155	1034	1290
27	1398	1171	1048	1309
28	1767.	1194	1062	1340
29	1850	1251	1081	1440
30	1797	1312	1104	1543
31	1800	1360	1130	1617
32	1614	1404	1157	1679
33	1699	1425	1184	1693
34	1579	1453	1211	1721
35	1520	1465	1236	1720
36	1939	1471	1260	1705



APPENDIX 2

Rate-Setting and Billing for Small Utilities

BY STEPI N 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.

Illustration by David Bastille

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 captial 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 statistically significant i ease at any one meter might indi a leak or some other problem wi ater use. Finally, customers who qu ion the billing procedures can be sho n exactly how their consumption com es with that of others in the town

How Much Per allon?

Let's begin by l oking at the technique used to est sh rates. This is basically a one-ti program, but it might be used aga hould use patterns of water use chang n the near future. The town has a go idea of what revenues it needs to erate the system, and knows the total amount of water pumped from the wells. From government surveys, we c n also determine how much water a t pical 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 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 cutoff 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

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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-

CIRCLE 27

CIRCLE 28

THIS PA...
FROM ...

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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 pro... 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 primative hardware available for microprocesssor 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 Microsoft 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.

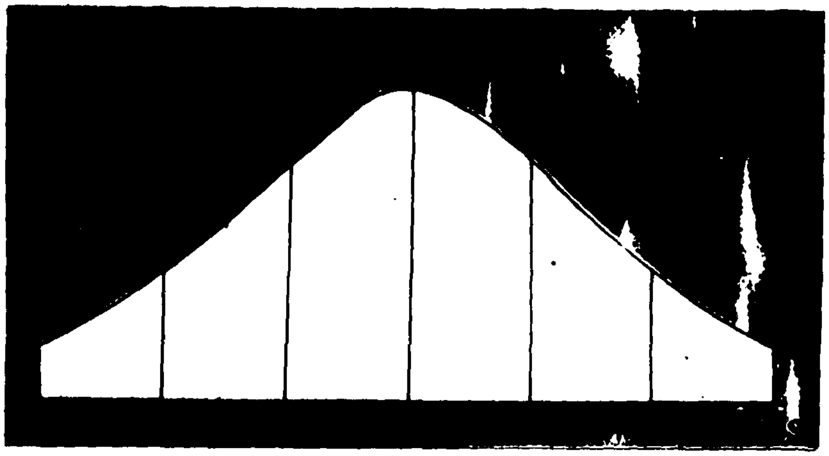
In building a sample population, however, we must know more than just the average. We must know if all the elements of our population should be close to the average, or if they should be scattered widely. Perhaps a large number just below the average should be balanced by a few who are far above it. 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 access 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 accessed. Thus, PEEK and POKE commands in BASIC will activate one of the strobe lines.

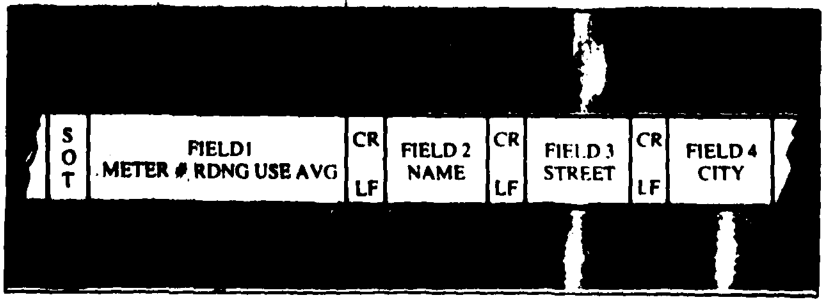
Two flip-flops are added to latch these strobes. Accessing memory location D10N or D20N causes the corresponding latch to be set. Accessing DOFF causes the corresponding latch to be set. Accessing DOFF resets both latches. The latched outputs drive small relays which actually control the current to the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

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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 CONVERSATION
TARGET CONSUMPTION : 909091  GALLONS PER MONTH
REVENUE SHOULD FALL BETWEEN $ 300  AND $ 327.273

A POPULATION OF 100  ELEMENTS HAS BEEN CREATED
 TOTAL USAGE : 1.08794E+06 GALLONS PER MONTH
MEAN USAGE : 10875.4
STANDARD DEVIATION : 4405.22
A : .227003   K : .227003
PREDICTED CONSUMPTION : 1.04269E+06        REVENUES : $ 277.26
A : .267945   K : .294082
PREDICTED CONSUMPTION : 1.02285E+06        REVENUES : $ 314.57
A : .267945   K : .428157
PREDICTED CONSUMPTION : 999198             REVENUES : $ 317.67
A : .267945   K : 1.05959
PREDICTED CONSUMPTION : 910416             REVENUES : $ 282.73
A : .310193   K : 1.06909
PREDICTED CONSUMPTION : 891894             REVENUES : $ 308.24
RECOMMENDED RATE SCHEDULE
LESS THAN 6470.14 GALLONS - $ 2.00674
 6470 TO 10873  ADD $ .310193  PER 1000 GALLONS
 13673 TO 19480  ADD $ 1.37042  PER 1000 GALLONS
 19280 TO 19680  ADD $ 2.4307  PER 1000 GALLONS
MORE THAN 24090 ADD $ 3.49097 PER 1000 GALLONS
```

This routine finds a rate scale which should cause total water consumption to be reduced to the target level while insuring that revenues will be adequate to operate the water works. A Monte Carlo model creates a user population based on the population characteristic of the town and U.S. Department of Commerce statistics on residential water consumption. Bills are calculated using a proposed rate scale. The probable effect of increased bills is then computed and a new total consumption and total revenue are calculated. If either consumption or revenue do not meet the set criteria, the rate schedule is adjusted and the bill/effect/bill/test procedure is repeated.

A similar technique can be applied to marketing or production problems, but the user should be careful. This interactive technique may not converge on a solution when two variables are adjusted independently as in this program. It is important to have some insight into the problem and design a correction (i.e., change in rate schedule) compatible with its effect (i.e., change in consumption). The equation used here cannot be considered general, but are designed to insure convergence to a reasonable solution.

Listing

```
1 PRINT"ESTIMATION OF RATE SCHEDULE TO ENCOURAGE WATER CONVERSATION"
2 REM WRITTEN BY STEPHEN P. SMITH
3 REM             STATE COLLEGE, PA
4 REM MICROSOFT BASIC
5 P=100
10 DIM U(P),U1(P),V(P),B(P),B1(P)
11 DIM D(6),UU(6),UL(6),N(6)
12 MINREV=825*P/275
13 MAXREV=900*P/275
14 TARGET=2500*P/275
15 PRINT"TARGET CONSUMPTION :"TARGET*1000" GALLONS PER MONTH"
16 PRINT"REVENUE SHOULD FALL BETWEEN $"MINREV" AND $"MAXREV
17 PRINT
19 GOSUB 200: REM CREATE A MODEL POPULATION
20 S=S2:M=M2
22 A=1/S:K=A
24 PRINT"A :"A,"K :"K
25 GOSUB 460: REM BILL AT CURRENT USAGE
30 GOSUB 700: REM FIND EFFECT OF HIGHER BILLS
35 GOSUB 460: REM PREDICT NEW BILLS
36 PRINT"PREDICTED CONSUMPTION :"UT*1000,"REVENUES : $"INT(BT*100)/100
40 D=1
42 FOR I=1 TO P:U(I)=U1(I):NEXT
45 KE=K:UE=UT
48 REM ADJUST K FACTOR TO MEET TARGET
50 K=K+ABS((K-KL)/(UT-UL))*(UT-TARGET)
52 KL=KE:UL=UE
54 IF UT>TARGET THEN D=0
55 IF UT<0.95*TARGET THEN D=0
58 REM IF REVENUE TOO LOW, RAISE A FACTOR
63 IF BT<MINREV THEN A=A*MAXREV/BT:D=0
68 REM IF REVENUE TOO HIGH, LOWER A FACTOR
73 IF BT>MAXREV THEN A=A*MINREV/BT:D=0
83 IF NOT D GOTO 24
84 REM
85 REM ****************************************
90 PRINT"RECOMENDED RATE SCHEDULE"
100 PRINT"LESS THAN"(M-S)*1000"GALLONS - $"A*(M-S)
110 FOR I=0 TO 2
120 PRINT INT((M+(I-1)*S)*100)*10"TO"INT((M+I*S)*100)*10" ADD $"A+I*K;
121 PRINT " PER 1000 GALLONS"
130 NEXT
140 PRINT"MORE THAN"INT((M+2*S)*100)*10"ADD $"A+3*K"PER 1000 GALLONS"
103 STOP
104 REM
105 REM ****************************************
200 REM MODEL SUBROUTINE
210 REM DATA TABLES HOLD PERCENT OF POPULATION WITH N PERSONS/FAMILY
214 REM FOLLOWED BY UPPER AND LOWER DAILY USE PER PERSON
220 DATA 3,30,10[illegible],13,40,120,33,40,140,83,40,130,97,30,130,100,40,120
230 FOR I=1 TO 6:READ D(I),UL(I),UU(I):NEXT
240 FOR I=1 TO P
250 [illegible]
260 FOR J=1 TO 6
270 IF R>D(J) THEN NEXT J
275 REM SET FAMILY SIZE
280 [illegible]
290 [illegible]
300 REM SET USE [illegible] HOUSEHOLD
310 [illegible]*30/1000*J
315 REM COMBINE TOTAL
320 T=T+U(I)
330 [illegible]
340 NEXT I
350 REM [illegible] (AVERAGE)
360 [illegible]
370 REM STANDARD DEVIATION
380 [illegible]/(P-1))
390 PRINT"A POPULATION OF"P" ELEMENTS HAS BEEN CREATED"
400 PRINT" TOTAL USAGE :"T*1000"GALLONS PER MONTH"
410 PRINT"MEAN USAGE :"M2*1000
415 PRINT"STANDARD DEVIATION :"S2*1000
420 RETURN
430 REM
440 REM ****************************************
460 REM BILLING SUBROUTINE
462 REM CALCULATE BILL FOR EACH METER BASED ON PROPOSED SCHEDULE
470 BT=0:UT=0
480 FOR I=1 TO P
490 B(I)=A*(M-S)
495 UT=UT+U(I)
500 S1=INT((U(I)-M)/S)+2
520 IF S1<=0 GOTO 610
525 S2=-1
530 IF S1>4 THEN S1=4
550 U1=U(I)-M+S
560 S1=S1-1
565 S2=S2+1
570 IF S1=0 THEN B(I)=B(I)+U1*(A+S2*K):GOTO 610
580 B(I)=B(I)+S*(A+S2*K)
590 U1=U1-S
600 GOTO 560
610 BT=BT+B(I)
612 NEXT I
620 RETURN
630 REM
640 REM ****************************************
700 REM EFFECT SUBROUTINE
702 REM EFFECT OF HIGHER BILL HAS THREE FACTORS
710 M=M:S2=S
720 FOR I=1 TO P
760 U1(I)=U(I)
765 B1(I)=B(I)
768 REM 1ST FACTOR IS INCREASE IN BILL
769 REM CURRENT BILL IS 3 DOLLARS PER MONTH
770 DB=B(I)-3
775 IF DB<=0 GOTO 830: REM LOWER BILL WON'T RAISE CONSUMPTION
778 REM 2ND FACTOR IS POTENTIAL FOR DECREASE
780 DU=U(I)/V(I)-UL(V(I))*30/1000
790 REM 3RD FACTOR IS RANDOM AND SCALING
800 DF=(1+RND(3))*.5
810 DU=DU*DB*DF
820 U(I)=U(I)-DU
824 TEST=UL(V(I))*30/1000*V(I)
825 IF U(I)<TEST THEN PRINT"*";U(I):TEST
830 NEXT I
840 RETURN
```

Program 2 – Billing Routine

Run

```
DATE? "SEPTEMBER 30,1978
AUTO ENTRY? YES
METER # 23456
READING? 346789
METER # 23473
READING? 235654
******************
STATISTICAL DATA FOR TOWN,  SEPTEMBER 30,1978
TOTAL  2198  MEAN  1099  STD DEV  0
******************
CHANGE OF USER OR ADDRESS
METER #? 0
IS TAPE 2 SET TO RECORD HEADER? YES
DATE BILLS DUE? "OCTOBER 31, 1978
INPUT TAPE ON DRIVE ONE
OUTPUT TAPE ON DRIVE TWO
READY? YES

TOWN WATER SERVICE
PARSLEY, VA 23421
SEPTEMBER 30,1978

                    STEPHEN P. SMITH
                    106 EAST CLEARVIEW
                    STATE COLLEGE, PA 16801

FOR METER 23456 READING 345678 TO 346789
PLEASE REMIT $2.00 ON OR BEFORE OCTOBER 31, 1979

THIS BILL WAS PREPARED BY COMPUTER
OUT ERRORS MAY BE REPORTED TO A PERSON AT 665-5090.
ASK LOWER RATES FOR CAREFULL USERS

TOWN WATER SERVICE
PARSLEY, VA 23421
SEPTEMBER 30,1978

                    STEPHEN P. SMITH
                    106 EAST CLEARVIEW
                    STATE COLLEGE, PA 16801

FOR METER 23473 READING 234567 TO 235654
PLEASE REMIT $2.00 ON OR BEFORE OCTOBER 31, 1978

THIS BILL WAS PREPARED BY COMPUTER
OUT ERRORS MAY BE REPORTED TO A PERSON AT 665-5090.
ASK LOWER RATES FOR CAREFULL USERS

BILLING COMPLETE FOR 2 METERS
NEW METERS MAY BE ADDED TO SYSTEM
IS OUTPUT TAPE READY ON DRIVE TWO? NO
```

This program computes and prints the bills for over 200 residential and commercial water meters. All data are contained in a single sequential file on audio cassettes. The file is updated by making a new copy.

The program begins by reading the entire file. Next, the operator is prompted to enter the new meter readings. A check insures that the data are at least reasonable. When all new readings are entered, the operator may store address changes for use when the updated file is written. The updates occur as the file is read again, this time record by record. With each read, a fee is calculated, a bill is printed, and a new record is written. Finally, the operator may add new meters to the updated file.

The program is a good example of top down design. Although it relies on Ohio Scientific's implementation of audio tape to operate, modification to suit other hardware should be easy. Note also how the extended variable names permitted by Microsoft's interpreter make the code more readable.

Listing

```
10 REM MODEL UTILITY BILLING PROGRAM
12 REM MICROSOFT BASIC AND OSI 430 TAPE I/O
14 REM
16 PO=275: REM NUMBER OF METERS IN SYSTEM
40 DIM M(PO),R(PO),R1(PO),U(PO),U1(PO),A(PO)
50 DIM N$(10),R$(10),A$(10),S$(10),C$(10)
60 CR$=CHR$(13): REM CARRIAGE RETURN
55 STX$=CHR$(2): REM START OF TEXT
63 FF$=CHR$(12): REM FORM FEED
65 LF$=CHR$(10): REM LINE FEED
70 D1ON=64256: REM STROBE FOR DRIVE ONE ON
83 D2ON=64460: REM STROBE FOR DRIVE TWO ON
90 DOFF=64263: REM STROBE FOR BOTH DRIVES OFF
100 FRACTION=.25: REM POSSIBLE CHANGE AT ONE METER IN ONE MONTH
110 TAPE=64259: REM TAPE PORT (FB03 STATUS REG,FB05 I/O PORT).
140 INPUT"DATE";DATE$
150 GOSUB 310: REM READ TAPE FOR LAST MONTH'S DATA
160 INPUT"AUTO ENTRY";A$
170 IF A$="YES" THEN GOSUB 1210:GOTO 185: REM METER # GENERATED AUTOMA
180 GOSUB 1270: REM OPERATOR ENTERS METER NUMBERS
185 GOSUB 1610: REM STATISTICS
190 GOSUB 1710: REM CHANGE OF ADDRESS
200 GOSUB 2010: REM WRITE HEADER
210 GOSUB 2410: REM DO BILLS
220 PRINT"BILLING COMPLETE FOR"PO"METERS"
230 GOSUB 2810: REM ADD NEW METERS
240 END
290 REM************************
300 REM
310 REM READ TAPE
320 INPUT"NUMBER OF RECORDS ON TAPE";PO
330 PRINT"SET DRIVE 1 TO PLAYBACK"
340 INPUT "READY";A$
350 FOR I=1 TO PO
360 GOSUB 510: REM GET A RECORD
370 M(I)=METER
380 R(I)=READING
390 U(I)=USAGE
400 A(I)=AVERAGE
410 NEXT
440 RETURN
490 REM************************
500 REM
510 REM READ A RECORD
520 X=PEEK(D1ON): REM START DRIVE ONE
530 GOSUB 910: REM GET CHARS
540 IF CHAR$<>STX$ GOTO 530
550 REM FOUND START OF RECORD
560 GOSUB 810: REM GET LINE
570 METER$=LINE$
580 GOSUB 810: REM GET LINE
590 NAME$=LINE$
600 GOSUB 810: REM GET LINE
610 STREET$=LINE$
620 GOSUB 810: REM GET LINE
630 CITY$=LINE$
640 X=PEEK(DOFF): REM TAPE OFF
650 REM DECODE METERS
660 LINE$=METER$
670 GOSUB 1010:REM GET NUMBER
675 METER=NUMBER
680 GOSUB 1010: REM GET NUMBER
690 READING=NUMBER
700 GOSUB 1010: REM GET NUMBER
710 USAGE=NUMBER
720 GOSUB 1010: REM GETNUMBER
730 AVERAGE=NUMBER
740 RETURN
790 REM************************
800 REM
810 REM GETLINE
815 LINE$=""
820 GOSUB 910: REM GET CHAR$
830 IF CHAR$=CR$ THEN RETURN
840 IF ASC(CHAR$)>31 THEN LINE$=LINE$+CHAR$
850 GOTO 820
890 REM************************
900 REM
910 REM GET CHARACTER IN CHAR$
920 WAIT TAPE,128,128: REM TEST STATUS REGISTER
930 X=PEEK(TAPE+2)
940 CHAR$=CHR$(X): REM DATA STORED AS ASCII CHARACTERS
950 RETURN
990 REM************************
1000 REM
1010 REM GET NUMBER FROM LEFT SIDE OF STRING LINE$
1020 L=LEN(LINE$)
1030 NUM$=""
1040 FOR I=1 TO L
1050 CHAR$=MID$(LINE$,I,1)
1060 IF CHAR$=" " GOTO 1090
1070 NUM$=NUM$+CHAR$
1080 NEXT
1090 NUMBER=VAL(NUM$)
1100 LINE$=RIGHT$(LINE$,L-I)
1110 RETURN
1115 REM************************
1200 REM
1210 REM  ENTER METER NUMBERS AUTOMATICALLY
```

A16

Listing 2 continued

```
1420 R1(I)=1
1430 FOR I=1 TO PO
1440 METER=P(I)
1450 PRINT"METER #"METER
1460 GOSUB 1550: REM INPUT READING ETC.
1462 NEXT
1464 RETURN
1465 REM************************
1468 REM
1475 REM OPERATOR ENTERS METER NUMBERS
1490 INPUT"METER #";METER
1500 IF METER=0 THEN RETURN
1510 FOR I=1 TO PO
1520 IF METER=M(I) THEN GOSUB 1550: GOTO 1490
1530 NEXT
1540 PRINT"INVALID METER NUMBER, TYPE 0 TO RETURN":GOTO 1490
1545 REM************************
1550 REM
1552 REM INPUT READING ETC
1560 INPUT"READING";READING
1565 USAGE=READING-R(I)
1575 DELTA=ABS(USAGE-U(I))
1580 AVERAGE=A(I)
1585 IF DELTA<FRACTION*USAGE OR DELTA<FRACTION*AVERAGE GOTO 1500
1590 PRINT"CURRENT USAGE"USAGE"IS OUT OF PROBABLE RANGE"
1600 PRINT"LAST USAGE="U(I);"LAST READING"R(I);"AVERAGE USAGE="A(I)
1610 INPUT"WAS READING IN ERROR";A$
1620 IF A$="YES" GOTO 1590: REM GET CORRECTED READING
1500 REM UPDATE RECORD WITH CORRECT READING
1510 U1(I)=U(I):U(I)=USAGE
1520 R1(I)=R(I):R(I)=READING
1530 A(I)=(USAGE+AVERAGE*3)/4: REM RUNNING WEIGHTED AVERAGE
1540 RETURN
1590 REM************************
1600 REM
1610 REM STATISTICS
1620 SQ=0:T=0
1630 FOR I=1 TO PO
1640 T=T+U(I): REM TOTAL USAGE FOR TOWN
1650 SQ=SQ+U(I)*U(I)
1660 NEXT
1670 M=T/PO: REM MEAN USAGE AT ALL METERS
1680 S=SQR((SQ-PO*M*M)/(PO-1)): REM STANDARD DEVIATION
1682 PRINT"****************"
1684 PRINT"STATISTICAL DATA FOR TOWN,";DATE$
1685 PRINT"TOTAL "T" MEAN "M" STD DEV "S
1686 PRINT"****************"
1690 RETURN
1699 REM************************
1700 REM
1710 PRINT"RANGE OF USER OR ADDRESS"
1720 FOR I=1 TO 10
1725 GOSUB 1920: REM INITIALIZE METER
1730 IF METER=0 GOTO 1900
1740 M2(I)=METER
1760 R2(I)=READING
1770 N$(I)=NAME$
1780 S$(I)=STREET$
1790 C$(I)=CITY$
1800 NEXT
1810 PRINT"STORAGE EXHAUSTED *** PROGRAM ERROR #12
1820 RETURN
1890 REM************************
1900 REM
1910 REM INITIALIZE METER
1920 INPUT"METER #";METER
1930 IF METER=0 THEN RETURN
1940 INPUT"READING";READING
1950 USAGE=
1960 AVERAGE=12000
1970 INPUT"NAME";NAME$
1980 INPUT"STREET";STREET$
1990 INPUT"CITY";CITY$
1995 GOTO 1920
1999 REM************************
2000 REM
2010 REM WRITE A RECORD
2040 FOR I=1 TO 1000:NEXT: REM RECORD A BLANK LEADER
2050 CHAR$=SOT$:GOSUB 3410: REM PUT CHARS
2060 LINE$=STR$(METER)+STR$(READING)+STR$(USAGE)+STR$(AVERAGE)
2065 GOSUB 3310: REM PUT LINE
2070 LINE$=NAME$: GOSUB 3310: REM PUT LINE
2080 LINE$=STREET$: GOSUB 3310: REM PUT LINE
2090 LINE$=CITY$: GOSUB 3310: REM PUT LINE
2100 LINE$="": GOSUB 3310: REM PUT LINE
2110 FOR I=1 TO 1000:NEXT: REM TRAILING BLANK TAPE
2120 REPEAT(BOFF): REM ALL DRIVES OFF
2130 RETURN
2190 REM************************
2200 REM
2210 REM WRITE HEADER
2220 INPUT"IS TAPE 2 SET TO RECORD HEADER";A$
2230 IF A$="NO" GOTO 2220
2240 REPEAT(320N): REM DRIVE TWO ON
2250 FOR I=1 TO 1000:NEXT: REM LEADER
2260 LINE$="RECORDS UPDATED ON "+DATE$+" FOR "+STR$(PO)+" EXISTING "
2265 GOSUB 3310: REM PUT LINE
2270 LINE$="TOTAL USAGE LAST PERIOD WAS "+STR$(T)+" GALLONS"
2275 GOSUB 3310: REM PUT LINE
2280 LINE$="MEAN USAGE LAST PERIOD "+STR$(M)
2285 GOSUB 3310: REM PUT LINE
2290 LINE$="STANDARD DEVI    N "+STR$(S)
2295 GOSUB 3310: REM PUT    NE
2300 LINE$="TOTAL BILLING $"+TB
2305 GOSUB 3310: REM PUT LINE
2310 LINE$="": GOSUB 3310: REM PUT LINE
2390 REM************************
2400 REM
2410 REM DU...
2420 PRINT"INPUT TAPE ON DRIVE ONE"
2430 PRINT"OUTPUT TAPE ON DRIVE TWO"
2440 INPUT"READY";A$
2450 FOR I1=1 TO PO
2460 GOSUB 3101: REM READ A RECORD
2470 GOSUB 3210: REM ENTER CHANGES
2472 GOSUB 3010: REM FIND FEE
2474 GOSUB 3510: REM DOLLARS AND CENTS
2475 TB=TB+AMOUNT
2480 READING=R(I1)
2490 USAGE=U(I1)
2500 AVERAGE=A(I1)
2505 REM
2506 REM PRINT BILL
2510 PRINT FF$: REM FORM FEED
2520 PRINT"TOWN WATER SERVICE"
2530 PRINT"PARKSLEY, VA 23421"
2540 PRINT DATE$
2550 PRINT:PRINT
2560 PRINT TAB(20);NAME$
2570 PRINT TAB(20);STREET$
2580 PRINT TAB(20);CITY$
2590 PRINT:PRINT
2600 PRINT "FOR METER"METER"READING"R1(I1) "TO"R(I1)
2610 PRINT"PLEASE REMIT $"AMOUNT$" ON OR BEFORE "DUE$
2620 PRINT:PRINT
2630 GOSUB 2910: REM COMMENTS
2640 GOSUB 2010: REM WRITE A RECORD ON TAPE
2650 NEXT I1
2670 RETURN
2690 REM************************
2800 REM
2810 PRINT"NEW METERS MAY BE ADDED TO SYSTEM"
2820 INPUT"IS  OUTPUT TAPE READY ON DRIVE TWO";A$
2830 IF A$="NO" THEN RETURN
2840 GOSUB 1920: REM INITIALIZE METER
2850 IF METER=0 THEN RETURN
2860 GOSUB 2010: REM WRITE A RECORD
2870 GOTO 2830
2890 REM************************
2900 REM
2910 REM COMMENTS
2920 REM THIS ROUTINE CAN ADD A MESSAGE ON EVERY BILL
2925 REM
2930 PRINT"THIS BILL WAS PREPARED BY COMPUTER"
2940 PRINT"BUT ERRORS MAY BE REPORTED TO A PERSON AT 665-5090."
2945 REM
2950 REM IT CAN ALSO ADD MESSAGES TO SPECIFIC BILLS
2955 REM
2963 IF AMOUNT<3 THEN PRINT"NEW LOWER RATES FOR CAREFULL USERS"
2979 RETURN
2990 REM************************
3000 REM
3010 REM FIND AMOUNT
3020 IF KNOWN GOTO 3070
3030 DIM LEVEL(5),RATE(5)
3040 DATA 8000,2,12000,3,16000,4,20000,5,24000,6
3050 FOR I1=1 TO 5:READ LEVEL(I1),RATE(I1):NEXT I1
3060 KNOWN=1
3070 AMOUNT=RATE(1): REM MINIMUM BILL
3080 IF USAGE<LEVEL(1) THEN RETURN
3090 FOR I2=2 TO 5
3100 IF USAGE<LEVEL(I2) THEN AMOUNT=AMOUNT+(USAGE-LEVEL(I2-1))*RATE(I2)
3105 IF USAGE<LEVEL(I2) THEN RETURN
3110 AMOUNT=AMOUNT+(LEVEL(I2)-LEVEL(I2-1))*RATE(I2)
3120 NEXT I2
3130 AMOUNT=AMOUNT+(USAGE-LEVEL(5))*RATE(5)
3140 RETURN
3190 REM************************
3200 REM
3210 REM ENTER CHANGES
3220 FOR I1=1 TO 10
3230 IF METER<>M2(I1) GOTO 3280
3240 NAME$=N$(I1)
3250 STREET$=S$(I1)
3260 CITY$=C$(I1)
3270 GOTO 3290
3280 NEXT I1
3290 RETURN
3299 REM************************
3300 REM
3310 REM PUT LINE
3320 L=LEN(LINE$)
3330 FOR I2=1 TO L
3340 CHAR$=MID$(LINE$,I2,1)
3350 GOSUB 3410: REM PUT CHARS
3360 NEXT I2
3370 CHAR$=CR$: GOSUB 3410: REM PUT CHARS
3380 CHAR$=LF$: GOSUB 3410: REM PUT CHARS
3390 RETURN
3399 REM************************
3400 REM
3410 REM PUT CHARS
3420 WAIT TAPE,128,128
3430 POKE TAPE+2,ASC(CHAR$)
3440 RETURN
3490 REM************************
3500 REM
3510 REM FORMAT AMOUNT AS DOLLARS AND CENTS IN AMOUNT$
3520 X1=AMOUNT
3525 IF X1<1 THEN X0$="0"
3530 X1=INT(X1*100+0.5)/100
3540 X0$="":X$=""
3550 IF X1=0 GOTO 3650
3630 X1$=STR$(X1)
3635 X2=LEN(X1$)
3640 X2=X2-1
3645 X1$=MID$(X1$,2,X2)
3650 FOR I=1 TO X2
3655 X3=I
3660 X2$=MID$(X1$,I,1)
3665 IF X2$="." THEN 3685
3670 NEXT I
3675 X$=".00"
3685 IF X3=(X2-1) THEN X$="0"
3690 AMOUNT$=X0$+X1$+X$
3700 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: SPONSOR DOD AAC	VOYAGE DOC. NUMBER	WTCA CONT. NO.	SVC / TYPE	POE: / POD	REMARKS MTMC	NET CONTENTS: 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 ~~2L2~~	OAK UL8	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 C62LBL		V	1M2	OAK UME			
8	S/1	082-1601 4161	AAFES C62LBL		V	1M2	OAK UME			
9	L/5	081-0223 4161	NSC OAK N00228		V	1L2	OAK UME	UM4		
10	L/2	079-0343 4098	NSC OAK N00228		V	1L2	OAK UME			
11	L/9	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	MB4-258 75-1545	NRSO EA N00250		V	KL2	OAK UME	MIN-BRIDGE		

MTW FORM 3830 PREVIOUS EDITION IS OBSOLETE

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REMARKS BY ITEM NO.

DATE FROM MSC:	POD: JAPAN	DATE TO MSC: 085
	BROOKS	

REMARKS MTMC	NET CONTENTS WEIGHT	NET CONTENTS CUBE	AVAIL DATE	SIZE NO. BKED	ETD / ETA	VESSEL:	REMARKS: MSC	RELEASE DATE INITIAL	SHIPPER CONSIGNEE
7			4/10						DR PEPPER M95162
11			4/15						CHIPMAN WHSE M95160
14			3/27						N62649
14			3/27						N62649
			3/26						WHSE 803 CT5511
			3/26						WHSE 803 CT5505
4			3/26						ALAMEDA N62649
			4/16						BLDG 432 N65950
			4/16						BLDG 432 N6595[illegible]
			3/29						COCA COLA N62649
IN-BRIDGE			4/2						EATHA[illegible]

ATTACHMENT

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 boo[king]. Freight will be based upon the cargo actually loaded and entered on the cargo manifest, bill of lading as appropriate.

FROM: Comscpac

TO: United States Lines

☐ USNS ☐ TC ☐ VC ☐ GAA Container ☒ SHIP[PER] MST

CARGO				LOADING							
CAT. NO.	DATE BOOKED	DESCRIPTION	NR Vans/ ~~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

Page 1 of 2

of cargo as available at the time of booking. ding as appropriate.	ORDER NO. 180-19/79
United States Lines	SHIP NAME: American Astronaut V-71E — VOYAGE NO.: P-4105 AGENT

☐ CAA — CONTAINER ~~SHIPPING CONTRACT~~/AGREEMENT ☒ MST C-9867-RI-23/24/28A (W2) ☐ BILL OF LADING

AL/ NO.	EDOB	RLD	GOV ACC	CAR ACC	OTHER	DISCHARGE PORT	ETA	INLAND DESTINATION	RRD	GOV ACC	CAR ACC	OTHER
	2/28			X		Balboa (BA1)	3/6	Maddenlye			X	
	..			..		..	..				..	
	..			..		..	..				..	
	..			..		Rotterdam (JG1)	4/1	Grossauheim			..	
	..			..		..	..	Zweibruecken			..	
	..			..		Felixstowe (HA8)	4/2	Braintree			..	
	..			..		..	..				..	
	..			..		Bremerhaven (JF1)	4/3				..	
	..			..		..	..	Bitburg			..	
	..			..		..	..	Germersheim			..	
	..			..		..	..				..	
	..			..		..	..	Kaiserslautern			..	
	..			..		..	..				..	

(Column group headings: …NG (loading side, left) and DISCHARGING (right).)

…TICULARS

ATTACHMENT IX

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CONT. .ER LIST

VESSEL/VOYAGE: LARK 77W — RECEIPT LIST: ( ) — CARRIER: UNITED STATES LINES, INC.

SAILING DATE: 9/22/79 — TIME: 0122 — FINAL LIFT LIST: (✓) — LOADING PORT: OAKLAND

MSC PAC NUMBER: 4513 — DISCHARGE PORT: Honolulu

FINAL LIFT LIST TRANSMITTED ON DATE: — TIME: — BY: B.B. — TOTAL NUMBER OF CONTAINERS LIFTED: 24

FB-1

SIZE	CONTAINER PREFIX	CONTAINER NUMBER	TRANSPORTATION CONTROL NUMBER	SEAL NUMBER	CONSIGNEE	PCS	WEIGHT	CUBE	RECEIVED
40	USLU	4092643 ✓ ✓	U62P4E 4513 Y017 LK2	0049890	N00604	30	13237	1933	9/14
✓	✓	4209004 ✓ ✓	✓ ✓ Y020 ✓	0049885	M00318	511	7782	1322	✓
✓	SSIU	221342 ✓ ✓	✓ ✓ Y021 ✓	0049897	N00604	25	9490	1913	✓
✓	USLU	4156476 ✓ ✓	✓ ✓ Y019 ✓	0049883	✓	46	14385	1684	✓
✓	✓	4231522 ✓ ✓	✓ ✓ V015 ✓	49844	M00318	582	38138	1910	9/11
✓	CTIU	434554 ✓ ✓	✓ ✓ V016 ✓	0049882	N00604	64	15806	1714	9/13
✓	USLU	4219635 ✓ ✓	✓ ✓ V023 ✓	0049907	M00318	348	13576	1856	9/14
✓	✓	4111677 ✓ ✓	✓ ✓ V018 ✓	0049887	N00604	66	26788	1861	9/18
✓	CTIU	442441 ✓ ✓	✓ ✓ V022 ✓	0049898	✓	22	13286	1881	9/18
✓	USLU	4138045 ✓ ✓	N00228 4499 V281 LK2	578347	N65938	436	21700	2280	9/14
✓	✓	4202592 ✓ ✓	B52WAK 4513 Y081 KK2	57461	N/A	1	37304	1600	9/14
✓	✓	4014656 ✓ ✓	N00228 4499 V282 LK2	5781619	N65938	302	15262	2292	9/21
✓	✓	4173473 ✓ ✓	✓ 4513 V023 ✓	578528	✓	1296	23328	2329	9/20
✓	✓	4227137 ✓ ✓	✓ ✓ V027 ✓	5781608	✓	727	19178	2313	✓

Sent from Shipping Company

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CONTAINER BOOKING RECORD 12ND MSCPAC 4610/30A (REV. 1-76)

FORM III

EXP NO.	PORT: Oak/[illegible] NO. VANS	SVC	DATE CONFIRMED	SHIPPER	PORT: Oak/Sub[illegible] EXP NO.	NO. VANS	SVC	DATE CONFIRMED	SHIPPER	PORT: Oak/Sub EXP NO.	NO. VANS	SVC	DATE CONFIRMED	SHIPPER	BOOKED TOTALS PORT	VANS
1	X	KK	026	A. Vial Karl Dragon Co	017 8	2	KK	017	Mail	052 3	2	MK	052	Tracy		
0 11	60	K	030	A. 403	034		KK	03[illegible]	Meso A[illegible]	053	3	1K	053	NSC		
032 1	2	MK	033	M. Bay	030 15	2	1K	030	A 803	058 4	1	1K	058	MC[illegible] (P)		
033 1	2	KK	036	D. P&G	031 6	1	KK	031	D. Kellogg							
033 5	5	KK	036	Dermma M. Cat	033 3	2	MK	033	M. Bay							120
037 2	1	KK	038	D. Carnation	036 4	6	1K	036	NSC							
038 1	2	KK	038	D. Del Monte		2	KK									
040 1	1	KK	040	D. Colgate	038 1	4	KK	038	D. Del Monte							
043 3	2	KK	040	D. [illegible] Foods	039 6	20	1K	039	MOTHA							
					046 1	2	MK	046	Tracy							
	TO [illegible] Port cancelled Rebooked				046 3	1	KK	046	NAF Gallo							
					046 5	5	2K	046	Alameda NSC						POD	ETA
	Oak/[illegible]				046 6	1	1K	046	NSC						[illegible]	3/2
R 037-1	2	KK	046	NSC [illegible]	057 2	5	KK	051	G. STKN						[illegible]	3/13
					051 8	1	MK	051	Tracy					Pioneer	[illegible]	3/20
					052 2	5	KK	052	G. STKN						[illegible]	3/21

SHIP: CLFM[illegible] | VOY: 10[illegible] | PACKING NO.: P4087 | LOADING PORTS/ETD: [illegible] 2/25 OAK 3/2 [illegible] 2/23 | VANS OFFERED: 120 | [illegible] 3/27

ATTACHMENT III

CONTAINER BOOKING RECORD (REEFER) 12ND MSCPAC 4610/30 (REV. 12-75) LDG. PORT

DISCHG PORT Bus

EXP. NO.	COMMAND	COMMODITY	FR	CH	POD	VENDOR	REMARKS
O-6	WT4MO		(1-20)			Oscar Myers	LA
Q-17	Sum308	eggs		(1-40)	4/15	Williamson	LA
Q-40	"	Lettuce		(1-40)	"		LA (Tect)
Q-41	"	"		(1-40)	"		LA (Tect)
~~R-24~~		Puts	1-40		4/20		OAK } CANC 3/15 BJ
~~R-25~~	"	"	1-40		"		OAK }
~~R-26~~	"	"	1-40		"		OAK }
~~R-27~~	"	"	1-40		"		OAK }
R-74	"	Puts		(1-40)	4/18		OAK
R-75	"	"		(1-40)	"		OAK
R-76	"	celery carrots		(1-40)	"		LA (Tect)
R-78	"	Citrus		(1-40)	4/21		LA
R-80	"	tomatoes		(1-20)			OAK (Tect)

OFFERINGS	5 x 20 24-40	2 x 20 6 x 40	LDG	ETD	C/O	DISCHARGE PORTS ETA		
							Hg 4/20	
SHIP	VOY	PAC	SP	4/3	4/1	4/17	4/19	4/21
PR McKinley	79	4158	OAK	4/5	4/3	Yoko	Hbc	Bus

FORM IV

ATTACHMENT VIII

FORM V

1978

	1-2 SEP	3-9 Sep	10-16 Sep	17-23 Sep	24-31 Sep
APL	58,373 31	66,415 32	74,356 32	77,990 31	86,166 (31)
SCND	93,325 50	102,079 50	112,953 49	125,002 49	134,974 (49)
SSCO	30,252 16	31,571 15	37,755 16	42,736 17	47582 (17)
USLX	∅ ∅	∅	∅	∅	∅
MTSN	4692 3	5960 3	5960 3	6833 3	6936 (3)
TOTALS:	186,646	206,025	231,524	252,561	275658
	9271	19379	25499	21037	23,097

ATTACHMENT IV

Pacific Command Documentation - Break Bulk Shipments

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 N00014-79-C-0851
UNCLASSIFIED NL

3 OF 3
AD A
105957

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

FORM I

WORKSHEET
MTW-ITX-1, 1 APR 77

BREAKBULK CARGO OFFERINGS MSCPAC

DATE OFFERED 14 MARCH 1979
POE MOTBA

POD CODE	ULT DEST CODE	M/T	DESCRIPTION/WEIGHT - CUBE	DATE AVAIL	DATE BKD	OPERATOR/SHIP/ETD VOYAGE NUMBER	CUT OFF DATE	LOAD PORT	TERMS CARR
YOKOSUKA UM4		M/W	AMMO, SMALL ARMS W/O EXPLOSIVE BULLETS, DOT CLASS C, CG-CLASS 2'; 1 SD (13 BXS) CARTRIDGE 12GA SHOTGUN 00 BUCKSHOT, 3120 RDS 650# 17cu. NET EXPL WT = 15.475204		3/14 EB	USNS BLAND P-4165. ETD / MOTBA / 4/3 ETA / YOKOS / 5/2 " SUB / 5/18	3/30	MOTSN	1-1
SUBIC SA3		M/W	1 BX CRIMPS, 22 CAL SHORT BLANKS, 400 RDS 115# 14cu. NET EXPL WT = .013 #						

ATTACHMENT X

MTW FORM 114

SHIP REPAIR/AVAILABILITY STATUS

DATE: 7/07/75

COVERING PERIOD: THRU:

SHIP	EST.	AVAIL	AGENT	CARGO CELLS. NOS.	LOADING PORT	DISCH PORT	M/T TON	PORT ROTATION
TRANS- T COLORADO C			GEN	F707? B " C	KAOH "	LB OAK		7/17 - SUB - SALC -
C4-S-82 MAX 7-26-78				" E " F	KLG "	LB OAK		SUB - KAOH.
16K				F6C42C " D	SUB "	LB ALA		KLG - NAHA -
				" E	"	OAK		LB - ALA -
REPAIRS DUE	NEXT	RETURN		US				OAK
				ZIS SHIPS				
AM CHIEFTAIN			TODDS		6/3			
AM CORSAIR			P36		6/27			
AM RACER			TODDS		6/11			
PION CRUSADER			P36		4/12			
PION MAIN			TODDS		4/28			

CLEARANCE ORDER/SHIPPING ORDER **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 boo[king.]
Freight will be based upon the cargo actually loaded and entered on the cargo manifest, bill of lading as appropriate.

FROM: COMSCPAC

TO: LYKES BROS. STEAMSHIP C[O.]

☐ USNS ☐ TC ☐ VC ☐ CAA ☒ SHIP[PER] MST[S] C[...]

CARGO				LOADING							
CAT. NO.	DATE BOOKED	DESCRIPTION	~~WEIGHT/~~ CUBE MTON	INLAND ORIGIN	LOADING PORT	TERMINAL/ PIER NO.	EDOB	ETD [redacted]	GOV ACC	CAR ACC	
11	3/2	CARGO NOS	246		SDIEGO	(3JA)	3/2	3/2		X	
24	"	VEHICLES	1858		"	"	"	"		"	
36	3/1	VEHICLES	400		SFRAN	(3DI)	3/4	3/5		"	

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DISTRIBUTION NITIIICWA – CODE P-5 – COMSCFE
MSCREPSDIEGO – MSCOBUS – MSCOOKI
LYKES, SF.

OTHER PARTICULARS * BT UND[...]

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 c[...]

TYPED NAME OF CONTRACTING OFFICER: R.L. COLGAN

SIGNATURE

Previous editions of this form are obsolete.

File

as available at the time of booking.
appropriate.

ORDER NO.
193-3/79

os. STEAMSHIP Co.

SHIP NAME: TYSON LYKES. V-1 | VOYAGE NO.: P-4141
AGENT

SHIPPING AGREEMENT
☒ MST C-8811-R1-1 A2/3 (F-2) ☐ BILL OF LADING

ATTACHMENT XI

EDOB	ETD	GOV ACC	CAR ACC	OTHER	DISCHARGE PORT	ETA	INLAND DESTINATION	RRD	GOV ACC	CAR ACC	OTHER
3/2	3/2		X		OKINAWA	3/19	(UBF)			X	*
"	"		"		" "	"	"			"	"
3/4	3/5		"		BUSAN	3/25	(UDC)			"	"

RS * BT UNDE SA

show the rates, terms and conditions as stated herein. EB

DATE 3/15/79

m are obsolete. D-18880

VOY NO.	VESSEL	OPR	OFF/ACG	ON B [illegible]			[illegible]	ALLOC	DESTINAT
1516	HAWI MONARCH V-165 BT/GBL/52	MTSN					7/8-10	CONTR POV	HONO
531	MATSONIA V-52 BT/GBL/52	MTSN					7/11-12	CONTR POV	HONO
1515	HAWI ENTERPRISE V-119 BT/GBL/52.	MTSN			7/11-12			CONTR POV	HONO
1497	HAWAIIAN V-259 BT/GBL/52	MTSN		SEA 7/11-12			7/7-8	CONTR POV	HONO
1532	HAWI QUEEN V-161 BT/GBL/52	MTSN					7/15-16	CONTR POV	HONO

OF	ALLOC	DESTINATION		CARGO
7/8-10	CONTR POV	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 POV	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 POV	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) HAWILIWILI (PREV BK
7/7-8	CONTR POV	HONO	7/19	SEA(R)CONT: 2 HONO - 1 PRL SEA(D)CONT: 40 HONO. SEA(B/B): 24 (P) HONO (PREV BKD)
/15-16	CONTR POV	HONO	7/22	OAK(R)CONT: 18 HONO OAK(B/B): 35 (P) HONO

VOY NO.	VESSEL	OPR	OFF/AL…	ON BERTH OTHER	ON BERTH LB	ON BERTH SF	ALLOC	ESTINAT…
-1534	LURLINE V-58 BT/GBL/52	MTSN				7/18-19	CONTR POV	HONO
-1530	HAWAII PROGRESS V-108 BT/GBL/52	MTSN			7/18-19		CONTR POV	HONO
-1533	CALIFORNIAN V-260 BT/GBL/52	MTSN		SEA 7/20-21		7/17-18	CONTR POV	HONO
F-1452	TRANSCHAMPLAIN V-12 BT/GBL/52	MTSN				7/8-9	CONTR POV	GUAM

DATE 9 JULY 75 WEEK ENDING

	ALLOC	DESTINATION		CARGO
-19	CONTR POV	HONO	7/22	OAK(R)CONT: 16 PRL - 3 KAN - 1 HONO OAK(D)CONT: 14 HONO OAK(B/B): 40 (P) HONO
	CONTR POV	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)
-13	CONTR POV	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 POV	GUAM	7/24	OAK(R)CONT: 11 GUAM OAK(D)CONT: 16 GUAM OAK(B/B): 140 (P) GUAM - 1 (P) GUAM (SAIPAN-TI (PREV BKD)

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WORKSHEET
MTW-ITX 1, 1 Sep 76

BREAKBULK CARGO OFFERINGS MSCPAC

POD CODE	ULT DEST CODE	M/T	DESCRIPTION/WEIGHT - CUBE	DATE AVAIL	DATE RLSD	RDD PRI	DATE BKD	OPERATOR VOYAGE
BUSAN	UD6	1	Books					
BUSAN	UD6	17	Elect Equip					
BUSAN	UD6	9	Cable Assy 2 Cr 3165# ea 86 X 60 X 43 1 Cr 2140# 86 X 60 X 34					
BUSAN	UD6	41	1 Vehicle 9600# 220 X 96 X 131					
BUSAN	UD6	26	1 Vehicle 8000# 197 X 96 X 92					
BUSAN	UD6	31	1 Vehicle 4010# 171 X 96 X 121					
BUSAN	UD6	32	1 Vehicle 7800# 194 X 96 X 120					
BUSAN	UD6	28	1 Vehicle 4900# 167 X 96 X 124					
BUSAN	UD6	72	2 Vehicles 9300# ea 195 X 96 X 131					
BUSAN	UD6	130	12 Hawk Loading Vehicles 142 X 74 X 87					

THE ABOVE SHIPMENT IS HAWK MISSILE BATTERY UEX-1
AVAILABLE 17 MARCH - MANDATORY RDD 23 APRIL 1977
CLASSIFIED CONFIDENTIAL

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(2)

AC							DATE OFFERED 2 March 1977
							POE San Diego

RDD PRI	DATE BKD	OPERATOR/SHIP/ETD VOYAGE NUMBER	CUT OFF DATE	LOAD PORT TERMS	TERMS CARR	REMARKS

UEX-1
RIL 1977

2

ARMY-DARS

FORM II

CONTAINER CONTROL SUMMARY

DOD REG 4500 32R

ADDITIONAL REMARKS BY ITEM NO.

ITEM NO.	SIZE / QTY	SPONSOR IDENT.	TRANSPORTATION CONTROL NUMBER: SPONSOR DOD AAC	VOYAGE DOC. NUMBER	WTCA CONT. NO.	SVC / TYPE	POE / POD	REMARKS MTMC	NET CONTENTS: WEIGHT	CUBE
1	1	M0780	W62P7E	4166	V		OAK / VA3	CUNNINGHAM 73 YOLK	1918	339
					V					
					V					
					V					
					V					
					V					
					V					
					V					
					V					
					V					
					V					

MTM FORM 3030 PREVIOUS EDITION IS OBSOLETE

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TIONAL REMARKS BY ITEM NO.

DATE FROM MSC: | POD: VA3 | DATE TO MSC: 061

Aik — Pov

REMARKS MTMC	NET CONTENTS WEIGHT	NET CONTENTS CUBE	AVAIL. DATE	SIZE NO. SKED	ETD / ETA	VESSEL:	REMARKS: MSC	RELEASE DATE INITIAL	SHIPPER CONSIGNEE
CUNNINGHAM 73 YOLK	1918	339	061	1 / POV	4/21 5/26	LLOYD BAKKE VOY-485 CLNR P-02797	NR/GBL 5-1	3/2 EB	[illegible]

ARMY-OAKB, CA.

FORM III

SHIP REPAIR/AVAILABILITY STATUS

DATE: 7/07/75

[illegible]ING PERIOD: THRU:

SHIP	ETL	AVAL	AGENT	CARGO CALL. NOS	LOADING PORT	DISCH PORT	M/H TON	PORT ROTATION
[Am]erican T [C]ammen C			USC	F4057	MWY NAHA	OAK "	136.	7/4-9 PUS - YOKOS -
C4 EY 1-26-80				F3026C " B	GM "	" SEAT		YIKO - GM -
20K				F5054E " F	PUS "	" OAK		PRL - SEAT -
				F1098C " D	YOKS "	SEAT OAK		OAK.
				" G " H	YIKO "	SEAT OAK		
[Gr]een T [L]ake C			BAY/GOTH	F8031E	CHIN VAY	CANC "	1446	7/4-6 KAOH - TEKG -
4-5-83 EY 7-28-75				F4055A F5053A	TEKG CHIN	" "		CHIN - SAS -
16K				F1101A F1101B	SAS KURE	" "		KURE - VAY -
								CANC
[Am]erican T [Al]liance C			USC		SUB "	OAK LB	1951 121	7/11 PRL - OAK -
U S-64a 12-19-75					KAOH "	OAK LB	22 302	LB
21K					KEEL NAHA	LB OAK	22 2109	
					" PUS	LB OAK	162 342.	
[Pi]oneer T [Co]ntractor C			USC	F5052B	VAY CHIN	CANC "	4057	7/13 - PRL - CANC
C4 EY 1-13-80								
22K								

					DUS	OAK	342.	
ONEER INTERACTOR	T C		USC	F5052B	VAY. CHIN	CANC "	4057	7/13 - PRC - CANC
C 4 EY 1-13-80								
22K								

[illegible] 1610-1?

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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

FORM I 3/5

SEAVAN OFFERING

DATE: 79-050 PCP: 2435 IDENT: CISAAF 050-1306 OFFERED: 79-061

LOADING PORT: NY

DISCHARGE PORT: BREMERHAVEN GER / Giessen

REFERENCE: 1146

CARGO CATEGORY

GENERAL CARGO	POVS/MIL VEH	REEFER	OTHER

NR. CONTR SIZE: SMALL	LARGE	WEIGHT IN LBS	TOTAL M/TN	R S	D	R D D	CA	TP	PRI
3	M2					105			3

REQUEST SEAVANS PICK UP AT: Somerset Paterson N.J.

CONTACT NAME ... TELEPHONE # 201-858-6293

(LHC TO BE PAID BY SHIPPER) SPOT SEAVANS, DATE: 3/22

... COVERS MOVE FROM (ORIGIN) (CARRIER TERM) TO DESTINATION

REQUEST VANS BE DEL IN 1/3 LOTS ON FRI......MON......TUES......

REQUEST CONUS DEPARTURE ON OR ABOUT: 3/31

3-M2

REMARKS:

NIAF

1. S/L - 2/35'
2. USL - 2/20'
3. FAA - 3/20'

EASTMTS REP: | APPROVED BY MSCLANT REP: BH

TO BE COMPLETED BY MSCLANT

VOYAGE NO.	SHIP NAME	BL/SHIPG ORDER NO	OPERATOR/AGENT

TERM/COMM PIER	DELV DATE	CHARTER	FLAG	REGISTRY NO/POL

EDOR	ETA	COMSCLANT REPRESENTATIVE	DATE BOOKED

As received from MTMC

TERM/CONN PIER	DELV DATE	CHARTER	FLAG	REGISTRY NO/POL

ECUR	ETA	COMSCLANT REPRESENTATIVE	DATE BOOKED

As received from MTMC

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ATTACHMENT II

FORM II

SEAVAN OFFERING	PCF NUMBER	IDENT. NUMBER	DATE OFFERED
		T-CX	3/2

LOADING PORT	DISCHARGE PORT/INLAND POINT	REFERENCE NUMBER
NOR NSC	UPPER HEYFORD	0970

CARGO CATEGORY

GEN. CARGO	POV'S	MIL. VEHS.	MILVANS	REEFER	OTHER
✓					(R/L)

VAN SIZE	TOTAL WEIGHT IN LBS	TOTAL MTONS	RSD	RDD	PRI
☐ SMALL ☒ LARGE 1					

SEAVAN PICK UP

CONTACT	TELEPHONE NUMBER	VAN SPOT DATE	CONUS DEPARTURE ON OR ABOUT
PITTS	804-444-3584	3/9	3/-

LHC PAID BY SHIPPER	MOVE COVERED FROM (Origin) (Carrier Term)	TO (Destination)
	NOR NSC	

REQUEST VANS DELIVERED IN 1/3 LOTS ON ☐ FRI ☐ MON ☐ TUES

[illegible]

SCL CARGODIV

5 MAR 79 7:39

NOO189 FL 2

REMARKS

FL-L19

via Feldy

EAMTMTS REP. (Signature)	RECEIVED BY (Signature of MSCLANT Rep)
G.J. 7350	[signature]

TO BE COMPLETED BY MSCLANT

VOYAGE NUMBER	VESSEL NAME	CLEAR/SHIPPING ORDER NO.	OPERATOR/AGENT
4946	Great Republic		

TERM/COMM. PIER	DELIVERY DATE	CHARTER	FLAG	REGISTRY NO./RCL
NIT		W2		#3758

LOAD	ETA	COMSCLANT REPRESENTATIVE	DATE BOOKED
3/18		Carroll Skunkis [illegible]	3/5

MTE (HQ) FORM APR 74 39

BOOKED BY MSC LANT

Via
Felix

EAMTMTS REP. (Signature)	RECEIVED BY (Signature of MSCLANT Rep)
G. J. 7350	[signature]

TO BE COMPLETED BY MSCLANT

VOYAGE NUMBER	VESSEL NAME	CLEAR/SHIPPING ORDER NO.	OPERATOR/AGENT
4946	Great Republic		

TERM/COMM. PIER	DELIVERY DATE	CHARTER	FLAG	REGISTRY NO./RCL
NIT		W2		#3758

EDOB	ETA	COMSCLANT REPRESENTATIVE	DATE BOOKED
3/18		Carol Skunkist Inc	3/5

MTE (HQ) FORM 9 APR 74 39

BOOKED BY MSC LANT

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FORM III

SUMMARY CONTAINERS/BREAK BULK BOOKED

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

AS OF RECORDS 2 MAR 79

ROUTE INDEX

S/S COMPANY	TOTALS	4	5	CONTAINERS 6 Breakbulk	BREAK BULK 6	REMARKS
U.S. LINES	PREVIOUS	18920	102834			
	ADDITIONAL	2878	8570			
	GRAND TOTAL	21798	111404			
		% 55.78	% 33.57	%	%	
SEALAND	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	%	
PRUDENTIAL	PREVIOUS			19		
	ADDITIONAL			0		
	GRAND TOTAL			19		
		%	%	% 0.03	%	
	PREVIOUS					
	ADDITIONAL					
	GRAND TOTAL	%	%	%	%	
	PREVIOUS					
	ADDITIONAL					

		% 44.22	% 16.07	% 57.77	%	
RUDENTIAL	PREVIOUS			19		
	ADDITIONAL			0		
	GRAND TOTAL			19		
		%	%	% 0.03	%	
	PREVIOUS					
	ADDITIONAL					
	GRAND TOTAL	%	%	%	%	
	PREVIOUS					
	ADDITIONAL					
	GRAND TOTAL	%	%	%	%	
REVIOUS TOTALS AS OF	2/23/79	35169	307680	67362		
DDITIONS AS OF	3/2/79	3910	24215	7341		
[illegible] TOTAL AS OF	3/2/79	39079	331895	74703		

R1 4 FORM I (continued) CO

COMPANY	20'	35'	40'	No. OF POVs
USL	BA x 22.37		11 BA 48 59 x 41.85 2469.15	x12.00
SLND	BA x	BA x	BA x	x 12.00
AAA	4 BA 28 32 x 21.94 702.08		BA 1 x 42.39 42.39	24 x12.00 288.00
1	BA x		BA x	x 12.00

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COB

No. OF POV^S	REEFER	BREAK BULK	TOTAL
x 12.00	15 x 27.27 409.05		2878
x 12.00	x		
24 x 12.00 288.00	x 27.08		1032
x 12.00	x		

FORM IV

SMALL (20') FARRELL LINES LARGE (40')

20' 40'	OCEAN 35.91 K 35.91	(P) 20' 40' OCEAN 35.91 PHILA 1.39 2.43 41.29 38.59	20' 40' OCEAN 35.91 DALTO 2.63 .97 37.99 36.83	20' 40' OCEAN 35.91 NORF 1 1.36 .63 37.27 36.54	20' 40' OCEAN 35.91 NORF 2 2.23 1.50 38.14 37.41	(P) 20' 40' OCEAN 35.91 GIRAS 2.69 1.24 38.60 37.15	20' 40' OCEAN 35.91 JAX NO RATE —	OCEAN 35.91 MOREY 1.97 1.31 37.88 37.22	OCEAN 35.91 EXEMPT 3.41 1.58 39.32 37.49	OCEAN 35.91 COMAL 3.41 1.58 39.32 37.49	OCEAN 35.91 BELLE AM 3.41 1.58 39.32 37.49
AUGSBURG 24.MB 19.12B	60.10 B 55.13 B	65.43 B 58.11 B	62.18 B 56.60 B	61.46B 56.26B	63.33B 57.13B	62.79B 56.87B		62.07B 56.44B	63.51 B 57.21 B	63.51 B 57.21 B	63.51 B 57.21 B
BAD KRUEZNACH 1.46 B 15.80B	56.37 B 51.71 B	61.75 B 54.19 B	58.45 B 52.68 B	57.93B 52.34B	59.60B 53.21 B	59.06 B 52.95 B		58.94 B 53.02 B	59.78 B 53.29 B	59.78 B 53.29 B	59.78 B 53.29 B
BERLIN 23.36B 13.10B	59.27 B 49.01 B	64.56 B 51.49 B	61.35 B 49.98 B	60.63B 49.64B	62.50B 49.64B	61.96 B 50.25 B		61.24 B 50.32 B	62.68 B 50.59 B	62.68 B 50.59 B	62.68 B 50.59 B
BITBURG 30.25B 15.33B	56.16 B 51.24 B	61.54 B 53.72 B	58.24 B 52.21 B	57.52B 51.87B	57.39B 52.74B	58.85 B 52.48 B		58.13 B 52.55 B	59.57 B 52.82 B	59.57 B 52.82 B	59.57 B 52.82 B
FRANKFURT 20.98B 15.54B	55.99 B 51.45 B	61.37 B 53.93 B	58.07 B 52.42 B	57.35B 52.08 B	59.22B 52.95B	58.68 B 52.69 B		57.96 B 52.76 B	59.40 B 53.03 B	59.40 B 53.03 B	59.40 B 53.03 B
FULDA 20.98B 16.01B	55.99 B 51.92 B	61.37 B 54.40 B	58.01 B 52.89 B	57.35B 52.55B	59.22B 53.42B	58.68B 53.16 B		57.96 B 53.23 B	59.40 B 53.50 B	59.40 B 53.50 B	59.40 B 53.50 B
GIESSEN 16.21B 12.25B	52.22 B 48.16 B	57.50 B 50.64 B	54.20 B 49.13 B	53.48B 48.79B	55.35B 49.66B	54.81 B 49.40 B		54.09 B 49.47 B	55.53 B 49.74 B	55.53 B 49.74 B	55.53 B 49.74 B
HANN 21.44A 15.42B	57.35 A 51.33 B	62.73 A 53.81 B	59.43 A 52.30 B	58.91 A 51.96B	60.58A 52.83B	60.04A 52.57B		59.32 A 52.64 B	60.76 A 52.91 B	60.76 A 52.91 B	60.76 A 52.91 B
HEILBRONN 25.08B 19.63B	60.99 B 54.99 B	66.37 B 57.42 B	63.07 B 55.91 B	62.35 B 55.57B	64.22 B 56.44 B	63.68 B 56.18 B		62.96 B 56.25 B	64.40 B 56.52 B	64.40 B 56.52 B	64.40 B 56.52 B
BAROBERSTEIN 20.57A 15.04B	56.48 A 50.95 B	61.86 A 53.43 B	58.56 A 51.92 B	57.84A 51.58B	59.71A 52.45B	59.17A 52.19B		58.49 A 52.26 B	59.89 A 52.53 B	59.89 A 52.53 B	59.89 A 52.53
KAISERSLAUTERN 18.83B 14.89B	54.74 B 50.80 B	60.12 B 53.28 B	56.82 B 51.77 B	56.10 B 51.43 B	57.97 B 52.30 B	57.43 B 52.04 B		56.73 B 52.11 B	58.15 B 52.38 B	58.15 B 52.38 B	58.15 52.38
KARLSRUHE 19.91B 15.16B	55.82 B 51.07 B	61.20 B 53.55 B	57.90 B 52.04 B	57.18 B 51.70 B	59.05 B 52.57 B	58.51 B 52.31 B		57.79 B 52.33 B	59.23 B 52.65 B	59.23 B 52.65 B	59.23 52.65
MANNHEIM 19.24B 14.95B	55.15 B 50.86 B	60.53 B 53.34 B	57.23 B 51.83 B	56.51 B 51.49 B	58.38 B 52.36 B	57.84 B 52.10 B		57.12 B 52.17 B	58.56 B 52.44 B	58.56 B 52.44 B	58.56 52.44
MUNICH 25.62B 20.67B	61.53 B 56.58 B	66.91 B 59.06 B	63.61 B 57.55 B	62.89 B 57.21 B	64.76 B 58.08 B	64.22 B 57.82 B		63.50 B 57.89 B	64.94 B 58.16 B	64.94 B 58.16 B	64.94 58.16
NUERNBERG 23.05B4 19.03B	58.96 B 54.94 B	64.34 B 57.42 B	61.04 B 55.91 B	60.32B 55.57 B	62.19 B 56.44 A	61.65 B 56.18 B		60.93 B 56.25 B	62.37 B 56.52 B	62.37 B 56.52 B	62.37 56.52
PIRMASENS 18.38A 14.72A	54.29 A 50.63 A	59.61 A 53.11 A	56.37 A 51.60 A	55.65 A 51.26 A	57.52 A 52.13 A	56.98 A 51.87 A		56.26 A 51.94 A	57.70 A 52.21 A	57.70 A 52.21 A	57.70 52.21

HEILBRONN 25.83 B 19.63 B	60.99 [illegible] 54.91 B	[illegible] 57.42 B	[illegible] 55.71 B	55.57	56.44	56.18		[illegible]	[illegible]	[illegible]	[illegible]
BAUMHOLDER 20.57 A 15.04 B	56.48 A 50.95 B	61.96 A 53.43 B	58.56 A 51.92 [illegible]	57.84 A 51.58 B	59.71 A 52.45 B	59.17 A 52.19 B		58.49 A 52.26 B	57.59 A 52.53 B	57.89 A 52.53 B	59.89 52.53
KAISERSLAUTERN 18.83 B 14.83 B	54.74 B 50.80 B	60.12 B 53.13 B	56.32 B 51.77 B	56.10 B 51.43 B	57.97 B 52.30 B	57.43 B 52.04 B		56.78 B 52.11 B	58.15 B 52.38 B	58.15 B 52.35 B	58.15 52.58
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 51.70 B	59.05 B 52.57 B	58.51 B 52.31 B		58.59 B 52.33 B	59.23 B 52.65 B	59.23 B 52.65 B	59.23 52.65
MANNHEIM 19.24 B 14.95 B	55.15 B 50.96 B	60.53 B 53.34 B	57.13 B 51.53 A	56.51 B 51.49 B	58.37 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 52.44
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	64.76 B 58.03 B	64.22 B 57.82 B		63.50 B 57.89 B	64.94 B 58.16 B	64.94 B 58.16 B	64.94 58.16
NUERNBERG 23.58 B 19.03 B	58.96 B 54.94 B	64.37 B 57.42 B	61.04 B 55.91 B	60.37 B 55.57 B	62.19 B 56.41 A	61.65 B 56.18 B		60.93 B 56.25 B	62.37 B 56.52 B	62.37 B 56.52 B	62.37 56.52
PIRMASENS 18.39 A 14.12 B	54.29 A 50.63 A	59.67 A 53.11 A	56.37 A 51.60 A	55.65 A 51.26 A	57.52 A 52.13 A	56.98 A 51.87 A		56.86 A 51.94 A	57.70 A 52.21 A	57.70 A 52.21 A	57.70 52.21
SCHWEINFURT 22.72 B 17.23 B	58.63 B 53.14 B	64.01 B 55.62 B	60.71 B 54.11 B	59.99 B 53.71 B	61.86 B 54.64 B	61.32 B 54.38 B		60.70 B 54.45 B	62.04 B 54.72 B	62.04 B 54.72 B	62.04 54.72
STUTTGART [illegible]	58.34 B 53.72 B	63.72 B 56.15 B	60.42 B 54.67 B	59.70 B 54.35 B	61.57 B 55.22 B	61.05 B 54.96 A		60.39 B 55.03 B	61.75 B 55.30 B	61.75 B 55.30 B	61.75 55.30
WUERZBURG 21.27 B 16.53 B	57.18 B 52.74 B	62.56 B 55.22 B	59.26 B 53.71 B	58.64 B 53.37 B	60.41 B 54.24 B	59.87 B 53.98 B		59.15 B 54.05 B	60.59 B 54.32 B	60.59 B 54.32 B	60.59 54.32

Reefer

CLEARANCE ORDER/SHIPPING ORDER **FORM V**

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 Freight will be based upon the cargo actually loaded and entered on the cargo manifest, bill of lading as appropriate.

FROM: Consolidated

TO: Sealand

☐ USNS ☐ TC ☐ VC ☐ CAA ☐ S[illegible]

CARGO				LOADING						
CAT. NO.	DATE BOOKED	DESCRIPTION	WEIGHT/CUBE	INLAND ORIGIN	LOADING PORT	TERMINAL/PIER NO.	EDOB	RLD	GOV ACC	CAR ACC
940	3/8	(3-Chill-45° / 2-Freeze-0°)	175	VOT *	Norfolk	FMT	3/19			X
730	[illegible]	(2-Freeze 0° / 1-Chill-45°)	105	[illegible], Pa.	Phila	Pt. Eliz.	3/15			
943	3/8	1-Freeze-0°	35	[illegible]	Balt.	" "	"			
729	"	2-Freeze-0°	70	[illegible]	"	"	"			
936	"	1-Freeze-0°	30	[illegible]	"	"	"			
639	3/6	2-Freeze-0°	63	[illegible]	Boston	"	"			
640	3/13	2-Freeze-0°	60	VOT *	NYK	" "	"			
108	3/1	1-Chill-34°	30	VOT *	Norfolk	FMT	3/17			
001	"	1-Chill-34°	30	VOT *	"	"	"			
002	"	1-Chill-45°	30	VOT *	"	"	"			
003	"	2 Chill-34°	60	VOT *	"	"	"			

A43

DISTRIBUTION

* - Accessorial charges to apply

OTHER PARTICULARS

(1) Freezer ship [illegible]
(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.

ecfer) 2

ATTACHMENT VII

as available at the time of booking. ppropriate.	ORDER NO. 1.P.	
land	SHIP NAME Resource	VOYAGE NO. A-4921
	AGENT	

☐ MST SHIPPING CONTRACT/AGREEMENT CA 4464 R.I.S ☐ BILL OF LADING

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

ARS
ship. phila. 3/9
" " Balt. 3/12
" " Boston 3/9

t show the rates, terms and conditions as stated herein.

	DATE

form are obsolete. B-18650

Atlantic Command - Break Bulk Documentation

FORM I Break Bulk Offering

BREAK BULK OFFERING	PCF NUMBER 7661	IDENT. 7/5 6/14	DATE 2/14
LOADING PORT/TERMINAL Bayonne NJ	DISCHARGE PORT/INLAND DESTINATION Bhn JFI		REFERENCE NUMBER 0134

CARGO CATEGORIES	AMT	LTH	WTH	HGT	L TON PER UNIT	M TON PER UNIT	TOTAL M TONS	RLD	RDD	PRI
GENERAL (Noe)										
H. H. GOODS										
WHEELED VEHICLES UP TO 10,000 LBS										
WHEELED VEHICLES OVER 10,000 LBS	1	16/10	9/7	9/2	15	37				
POV'S										
REFRIGERATED (Temperature required)										
CONEX BOXES										
DECK CARGO										
BOATS										
HAZARDOUS/LABEL										
WEIGHT CARGO										
UNUSUAL SIZE CARGO										
EXPLOSIVES										

REMARKS

12 FEB 79 7: 45

EAMTMTS REPRESENTATIVE (Signature)	RECEIVED BY (Signature)
[signature] X 6279	BH

TO BE COMPLETED BY MSCLANT

VESSEL NAME	VOYAGE NO.	CLEARANCE - SHIPPING NO.	OPERATOR/AGENT
Towle	4994		

REMARKS

a+/MC 2/27

COMSTLANT REPRESENTATIVE (Signature)	DATE

MTE (HQ) FORM 4 APR 74 38

BREAK BULK OFFERING	PCF NUMBER 7445	IDENT. O/H T/S	DATE 2/14
LOADING PORT/TERMINAL Bayonne NJ	DISCHARGE PORT/INLAND DESTINATION JFI Bhvn		REFERENCE NUMBER 0129

CARGO CATEGORIES	AMT	LTH	WTH	HGT	L TON PER UNIT	M TON PER UNIT	TOTAL M TONS	RLD	RDD	PRI
GENERAL (Nos)										
H. H. GOODS										
WHEELED VEHICLES UP TO 10,000 LBS										
WHEELED VEHICLES OVER 10,000 LBS	1	22/1	8/5	8/6	11	41				
POV'S										
REFRIGERATED (Temperature required)										
CONEX BOXES										
DECK CARGO										
BOATS										
HAZARDOUS/LABEL										
WEIGHT CARGO										
UNUSUAL SIZE CARGO										
EXPLOSIVES										

REMARKS

SCL CARGODIV

FEB 79 7: 44

EAMTMTS REPRESENTATIVE (Signature)	RECEIVED BY (Signature)
Macy ... V1279	BH

TO BE COMPLETED BY MSCLANT

VESSEL NAME	VOYAGE NO.	CLEARANCE - SHIPPING NO.	OPERATOR/AGENT
Towle	4994		

REMARKS

wt/MG 2/27

COMSTLANT REPRESENTATIVE (Signature)	DATE

MTE (HQ) FORM 4 APR 74 38

BREAK-BULK OFFERING

DATE: 79-030 POF: 8530 IDENT: S1403A-023-1500 OFFERED: 79-030 | DATE

LOADING PORT: MOTBY | DISCHARGE PORT: KA1--LISBON PORTUGAL | REFERENCE: B635097 | LOAD

MAP | CARGO CODE | COMMODITY NAME | PRI 1 | GE

CARGO EXCEPT ZR OUTSIZE DIMENSIONS

UFC/NMFC	LENGTH	WIDTH	HEIGHT	PIECES	L/TON	M/TON	RDD	RLD
U93340-00 NOT ON UFC-NMFC TABLE								
UTILITY TRKS M151A1	11/01	05/04	04/04	114	122	741	000	
						741	TOTAL	M/TON

NO. SHA | RE | CONT. (LHC | OFFE REQU | REQUI

30L-CARGODIV

2 FEB 79 7:59

DATE(S) DUE AT POE: 2/21

REMARKS: (1) NESS/Elgin/AH 2/22 1530hrs Booking to Corsair cancelled - Cargo NOT ON Hand - Offering held open. Availability Date NOT Yet Determined | REMAR

EAMTMTS REP: X6609 | RCVD BY MSCLANT REP: BH | EAMTM

TO BE COMPLETED BY MSCLANT

VOYAGE NO.	SHIP NAME	CL/SHIPG ORDER NO	OPERATOR/AGENT
~~A-495E~~ A 4994	~~A Corsair~~ USNS Tooele	~~A50~~	

TERM/COMM PIER	DELY DATE	CHARTER	FLAG	REGISTRY NO/RCL
		AH/Ness 3/5		

EDOB	ETA	CONSCLANT REPRESENTATIVE	DATE BOOKED
		Ness/AH 2/16	

(2) Cargo Confirmed as Priority 1. 105 Veh Avail For loading 6 Mar.
~~9 Veh Avail approx 20 mar~~ - AH/NESS 3/1 1600hrs

BOOKED BY MSC LANT & CHANGED

LMED

-8