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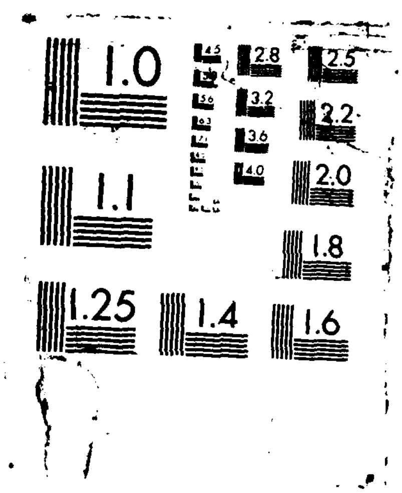
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NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

CONTRACTING ISSUES ASSOCIATED WITH REDUCTION OF REPAIR TURNAROUND TIME WITHIN THE CONTRACT DEPOT MAINTENANCE (CDM) PROGRAM

by

Roger Ellsworth Petty

December 1987

Thesis Advisors: Raymond W. Smith
Alan W. McMasters

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This thesis examines the key contracting issues that have caused Repair Turnaround Time (RTAT) of Depot Level Repairables (DLR's) under the Contractor Depot Maintenance (CDM) program to be excessive. Many of the DLR's repaired by commercial depots under this program exceed the Naval Supply System Command's goal of 60 days for items managed by the Navy Ships Part Control Center (SPCC) and 45 days for items managed by the Aviation Supply Office (ASO). SPCC, ASO and four commercial depots were visited to gather RTAT data on DLR's and identify potential improvements in the CDM program that would reduce RTAT. An analysis of the policies and procedures used by SPCC and ASO in requirements determination as well as the effects of the repair workload forecast on the CDM process was also conducted. Recommendations are made to reduce RTAT through the contractual vehicle utilized and enhanced demand forecasting.

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Contracting Issues Associated With Reduction of Repair Turnaround Time Within the Contract Depot Maintenance (CDM) Program

by

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ABSTRACT

This thesis examines the key contracting issues that have caused Repair Turnaround Time (RTAT) of Depot Level Repairables (DLR's) under the Contractor Depot Maintenance (CDM) program to be excessive. Many of the DLR's repaired by commercial depots under this program exceed the Naval Supply System Command's goal of 60 days for items managed by the Navy Ships Part Control Center (SPCC) and 45 days for items managed by the Aviation Supply Office (ASO). SPCC, ASO and four commercial depots were visited to gather RTAT data on DLR's and identify potential improvements in the CDM program that would reduce RTAT. An analysis of the policies and procedures used by SPCC and ASO in requirements determination as well as the effects of the repair workload forecast on the CDM process was also conducted. Recommendations are made to reduce RTAT through the contractual vehicle utilized and enhanced demand forecasting.

TABLE OF CONTENTS

I. INTRODUCTION

A. BACKGROUND

This thesis examines the contracting issues associated with Depot Level Repairable (DLR) maintenance performed by commercial sources of repair. Specifically, the research explores the methodologies being utilized by Navy activities to improve Repair Turnaround Time (RTAT) of these commercial sources.

In broad terms, RTAT is the time period between the time of component failure and the return of that component to a ready for issue (RFI) condition. The non-availability of this component necessitates the procurement of additional assets to insure availability during the period of turn-around time. This investment is known as "pipeline." Whenever RTAT is protracted, additional investment in pipeline assets is required.

During late 1985 the Naval Supply Systems Command (NAVSUP) established the reduction of RTAT as a priority project in the NAVSUP Strategic Plan [Ref. 1]. This action resulted from the adverse impact that protracted RTAT was having on the budgetary (stratification) investment figure utilized in Program Objective Memorandum (POM) development. In general, it was felt that reduction of RTAT at ASO and

SPCC to 45 and 60 days, respectivly, would result in a $100 million reduction in pipeline investment [Ref. 2].

B. OBJECTIVES OF RESEARCH

The main objectives of this research effort are to:

1. Provide a brief overview of the Contract Depot Repair cycle.
2. Review the issues impacting Contract Depot Repair Turnaround Times.
3. Examine the impact that current contract vehicles are having on RTAT with a view toward presenting recommendations that will assist in the overall reduction of Contract Depot RTAT.

C. RESEARCH QUESTIONS

The primary research question was as follows:

What are the key contracting issues and what methodologies might be utilized to reduce Repair Turnaround Time within the Contract Depot Maintenance program?

The subsidiary questions were as follows:

1. What is Contract Depot Maintenance and how has it been utilized on Navy repairable components?
2. What are the principal contracting variables or factors which affect Repair Turnaround Time?
3. What are the critical areas where improvements can be made within the contracting process to facilitate Repair Turnaround Time reductions?

D. RESEARCH METHODOLOGY

The topic of this thesis evolved from a comprehensive study of current literature that stressed the need for the Navy to more effectively manage depot level repairables. Unfortunately, this literature did not address the specific issue of how to reduce repair turnaround time within the Contract Depot Maintenance (CDM) program. As a consequence, a more complete understanding of the program and repair cycle had to be obtained through personal and telephonic interviews. Information was collected from the following:

1. Navy Supply Systems Command's Contracting Management Division.
2. Technical and contracting personnel at the Ships Parts Control Center (SPCC) and Aviation Supply Office (ASO).
3. Directors of Contracting and Production at the geographically selected facilities identified below.
   - Varian Associates, Inc., Microwave Tube Division
   - Hughes Aircraft Co., Ground Systems Group
   - Western Division GTE Government Systems Corp.
   - AiResearch Mfg. Company of CA.
   - Kaiser Electronics

E. ORGANIZATION OF THE STUDY

Chapter II describes the Contract Depot Maintenance cycle. A brief explanation of key segments of the depot repair cycle is given to provide the reader with an understanding of the complexities involved. Chapter III discusses causative factors which have contributed to excessive RTAT at contract depots. Chapter IV presents the results of a modified case study designed to underscore the RTAT benefits being derived by ASO and SPCC in current repair agreements. An executive summary of the problem is provided in Chapter V along with conclusions and recommendations that will assist the ICPs reduction of Contract Depot Repair Turnaround Time.

II. CONTRACT DEPOT MAINTENANCE

A. CHAPTER OVERVIEW

This chapter introduces the reader to the process utilized in determining the quantities of assets to be repaired by Contract Depot Maintenance (CDM) and the steps involved in contractor repair. A detailed description of contractor repair activities is provided to highlight the various elements contained within the RTAT time measurement.

B. BACKGROUND

Government managers are responsible for obtaining items needed to support the Military Departments missions in the most cost-effective and timely manner. Program managers choose to repair rather than buy new parts in support of weapon systems whenever possible due to the significance of the savings obtainable both in time and money. The repairs of these parts will be effected by either government (organic) or contractor repair depots to sustain a maintenance mobilization base capable of expansion within a limited timeframe.

DoD policies relating to depot maintenance are contained in two separate documents. The first, Office of Management and Budget (OMB) Circular No. A-76, states that DoD should rely on the private sector except when there is some compelling reason to retain in-house capability. A-76 realizes that agencies need to consider economy and mobilization readiness when deciding between organic and commercial sources.

DoD Directive (DoDD) 4151.1, "Use of Contractor and Government Resources for Maintenance of Material," prescribes that at least 30 percent of "mission-essential" maintenance should be contracted out in support of the mobilization base goal. The directive further states that maintenance not considered "mission-essential" should be contracted out.

The rational for requiring both organic and contractor facilities was best expressed by the Office of the Assistant Secretary of Defense for Installations and Logistics. In summary, the rational is that [Ref. 3:p. 2]:

> Organic sources offer (1) the advantage of a controlled source of competence dedicated to maintaining in a state of readiness military weapons and equipment which will be used in direct support of our military forces in reaction to any contingency, (2) the assurance of a capability to sustain that equipment in an initial surge, and (3) provide a base for expansion.
>
> Contractor sources provide a broader maintenance support base capable of greater expansion in wartime. However, because there is normally a time lag between identifying a need for commercial maintenance support and the ability of commercial sources to respond, it is important that some part of mission-essential work be assigned to contractors in peacetime along with non-mission-essential workloads.

The following table summarizes the major reasons currently being cited for the distribution of mission-essential workloads to commercial sources of repair.

TABLE 1

MAJOR REASONS WHY CONTRACT DEPOT MAINTENANCE IS PERFORMED IN COMMERCIAL FACILITIES [Ref. 3:p. 6]

1. Depot Level Repairables which are similar in design to or which are modified versions of commercially operated Depot Level Repairables are most often maintained by contract sources.

2. Organic support capability does not exist and the investment to establish such support would be excessive in relation to the volume and/or frequency of workload requirements.

3. To provide interim support for new items until maintenance requirements are stabilized and organic capability is established.

4. Systems which are reaching or have reached the end of their mission-essential status are put on contract to free organic capacity for support of new material.

5. Existing contract by another service supporting similar or identical items.

C. REPAIR SOURCE SELECTION

Depot planning begins early in weapon system acquisition to ensure that adequate capability and capacity are available to support failed DLRs throughout their service life. The Hardware Systems Commands (HSC's) are responsible for evaluating and certifying designated overhaul points (DOP's) for each repairable item/family [Ref. 4:p. IV-1]. The planners' selection process comprises analyses and decision points wherein the advantages and disadvantages of the three available sources of depot repair--organic, interservice, or contract--can be compared.

A decision tree portraying the logic used in arriving at the DOP choice is contained in the Appendix. This source selection "decision tree" reflects Navy policy that organic facilities should have [Ref. 5:p. 5]:

1. The repair capabilities needed to support front-line weapon systems;
2. Repair capacity to satisfy projected wartime workloads for these systems;
3. Sufficient workload in peacetime to ensure that wartime capacity needs can be met.

As noted in Table 1 the current rational for distributing repairs to commercial depots is not consistent with OMB Circular A-76, which emphasizes comparative costs; DoDD 4151.1, which emphasizes workload percentages; nor the source-selection "decision tree". In the Rand Report, "Depot Maintenance of Aviation Components: Contractor vs. Organic Repair", the authors indicate that the majority of component workload currently accomplished on contract supports front-line weapons, whereas much of that done in organic depots is for older systems. They offer the following observations in explaination of this disparity [Ref. 5:p. 5]:

> Many of these capability deficiencies result because the necessary capital investments, which often entail multi-

million dollar expenditures for just test equipment, have not been funded by the weapon system acquisition programs. Acquisition managers have strong incentives to keep program cost within targets without reducing the number of weapon systems procured. System cost growth is accommodated frequently by reductions in allocations for support capability, including organic depot-level maintenance capability.

D. REQUIREMENTS DETERMINATION

The Navy utilizes several of its Uniform Inventory Control Point (UICP) ADP programs to forecast repair requirements. The goal of these programs is to ensure that sufficient materials are in place when and where they are required.

The ICPs rely on information provided by the following four UICP programs to assist them in the determination of repair requirements for DLRs [Ref. 4:p. VIII-2]:

1. Levels Program. Forecasts several key requirements determination elements such as quarterly demand, requisition frequencies, carcass returns, and repair turnaround time. The program also uses this data to compute wholesale requirement levels such as procurement reorder point, procurement order quantity, repair reorder point, and repair quantity.
2. Supply Demand Review. Recommends DLR buys in response to attrition loses. The SDR program provides (1) a comparison of assets to inventory requirements; (2) an expedite action when requirements exceed assets; (3) a termination recommendation when assets exceed

requirements; and (4) a redistribution order when a stock point is below its allocation.

3. Cyclic Repairables Management (B08) Program. In many ways, B08 can be likened to the Supply Demand Review (SDR) application. As SDR compares assets to requirements for the procurement problem, B08 compares assets to requirements for the repair problem. The program provides item managers with information about how many DLRs to repair and at what time repairs will be needed.

4. Stratification Program. Compares forecast requirements to forecast asset levels to project future procurement and repair requirements for budget purposes.

Utilizing the output from these programs the IMs notify the HSCs, PMs, and DOPs of future repair requirement projections on a periodic basis so that timely adjustments can be made in existing depot capacity and capabilities.

Since repair requirements determination typically takes place in a cyclic environment, only those requirements above and beyond those previously provided to DOPs by the ICP's are identified as new requirements.

E. CONTRACTOR REPAIR ACTIVITIES

The CDM repair process appears to be best described in terms of six major functions; (1) material receipt;

(2) inspection; (3) determination of repair agreement coverage; (4) scheduling; (5) rework; and (6) Government acceptance. Figure 2.1 illustrates the relationships which exist between the phases of the CDM process.

1. Material Receipt

DLRs which fail in usage are given a condition code of "F"[1] and are processed for return to the supply system in accordance with the Master Repairable Item List (MRIL) for repair. The MRIL contains a listing of all DLRs, their designated overhaul points (DOP) or designated supply points (DSP), and instructions or procedures for turn-in and shipment.

Within the MRIL those repairables which are in short supply and assigned to commercial DOPs are normally coded for direct shipment to contractors' facilities. On the other hand, those items in long supply are normally coded for shipment to a DSP which will retain the defective asset until the appropriate ICP determines that estimated quarterly overhauls (regenerations) will be insufficient to support forecasted demand. At that point the ICP orders additional carcasses to be sent to the DOP for repair.

2. Inspection

Upon receipt of the carcass the contractor will establish a material control document to use in material

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1Condition code "F" is assigned to a failed DLR that is unserviceable and deemed to be repairable.

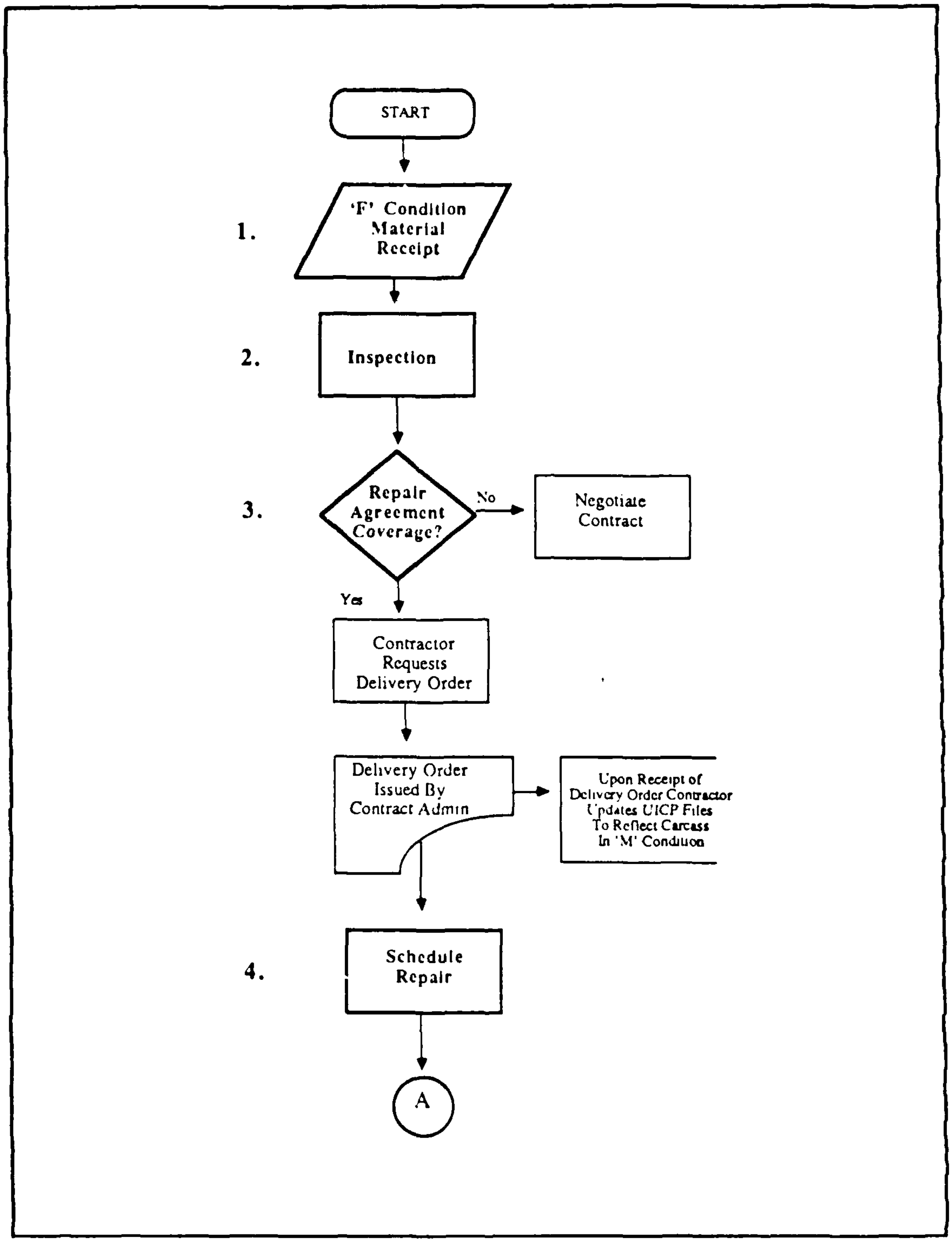

Figure 2.1.

Contractor Repair Activities Flow Chart.

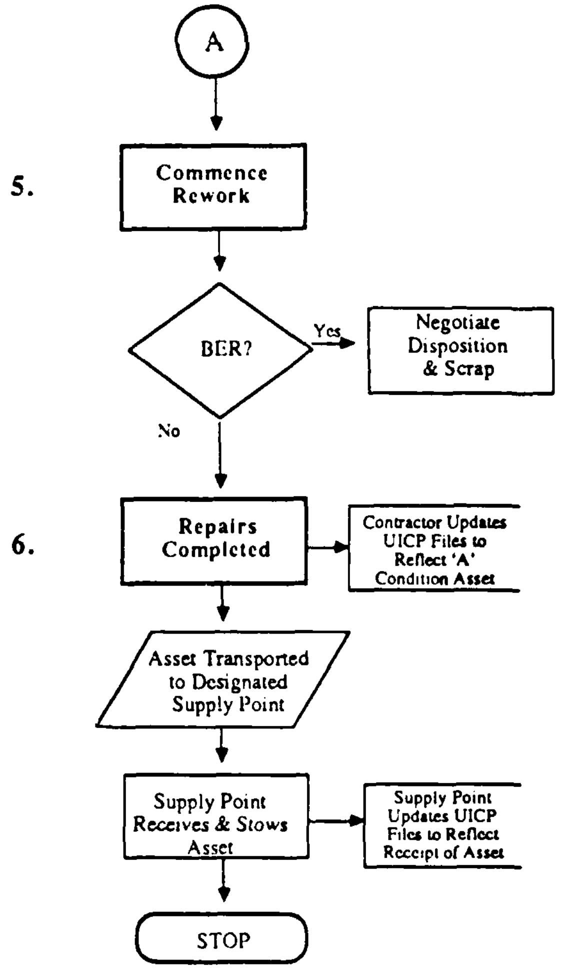

Figure 2.1.

Contractor Repair Activities Flow Chart (continued).

documentation and tracking. The control document also provides the contractor with a vehicle for documenting the physical condition of the carcass upon receipt and recording all actions taken during the repair process.

The next step is an initial inspection. Initial inspections are normally limited to a determination of the carcass's proper identification and physical condition.

Several of the contractors contacted in this investigation maintain a historical record on each of the carcasses received for repair. These records facilitate repair efforts and provide data for trend analysis of asset performance. From this trend analysis adverse trends in reliability or maintainability can be readily detected and engineering changes proposed to reverse the performance shortcoming.

3. Determination of Repair Agreement Coverage

Following this initial inspection the contractor will make a determination regarding the existence of an applicable repair agreement. In most cases a basic ordering agreement (BOA) will have been established to expedite the repair effort. The BOA is a written instrument of understanding between the Government and the contractor which contains appropriate contract terms and conditions. An order under the applicable BOA terms and conditions will represent the actual contract. These orders can be priced retrospectively or they can be priced prospectively.

If it is determined that an Advance Delivery Order (ADO) exists the carcass can be forwarded for repair without additional delay. An ADO is generally established for critical assets, those comprising a small percentage of the total DLR population, which experience high demand. The ADO can be viewed as a form of Requirements Contract, in that carcass receipt represents the Government's placement of an order thereby triggering contractor efforts. The ADO has been designed to affect timely repairs to a specified number of assets during the period of coverage, usually six months.

If, on the other hand, it is determined that the carcass is not covered by an ADO the contractor will contact the Administrative Contracting Officer (ACO) to obtain a delivery order. The delivery order represents the contractor's authorization to commence repair. This authorization can not be given by the ACO until he has determined that the number of carcass repairs being requested by the contractor do not exceed the funding/quantity limitations established in the ICP's delegation of repair program administration.

Those items received but not covered by a BOA or alternative contract vehicle are, by necessity, delayed pending negotiation of an individual repair contract.

The date of the delivery order or determination that an item is covered by an ADO is important because it triggers the contractor's "F" to "M" condition code transfer, indicating that the carcass has entered repair.

4. Scheduling

Two patterns of repair scheduling were noted during this investigation. In the first case, the contractor integrated the carcass directly into his production line. Contractors utilizing this methodology cited the economies obtained by (1) not having to train personnel specifically for rework, (2) not having to establish a separate repair line, or (3) not having to sustain a work force consistently subjected to sporadic tasking. In the second case, contractors choose to undertake repair on a separate line. The primary reasons cited for this methodology dealt with the need to perform entirely different processes in the repair effort.

5. Rework

Upon completion of the rework scheduling process the failed carcass is forwarded to the applicable repair shop and repair efforts commence. When the repair has been completed, the DLR is presented to the government for acceptance. If the shop determines that the carcass is beyond economic repair (BER) the carcass is removed from repair and scheduled for inspection by the Quality Assurance Representative (QAR). If this latter inspection confirms the BER all salvageable parts will be removed and retained for future repairs.

6. Government Acceptance

Upon satisfying himself that the DLR has been fully repaired, the contract administrator or designated government representative will sign off on the DD-250 form signifying acceptance of the repaired DLR. It is at this point that the contractor reports another condition code change to the ICP; this time from "M" to "A" indicating that the DLR is ready for issue. He then prepares the DLR for shipment to a specified supply point.

F. CONTRACT DEPOT RTAT

The preceding description of the CDM process should provide the reader with an understanding of the issues which influence repair turnaround time or RTAT. The Commander, Naval Supply Systems Command defines RTAT as that period of time between [Ref. 6]:

1. Date when an unserviceable item is requested for induction by the depot maintenance activity and is first reported to the Inventory Control Point (ICP) as being in suspended (in work) condition.

   Measurement Point: Date when the Condition Code transfer from unserviceable (repairable) ("F") to suspended (in work) ("M") is Transaction Item Reported (TIR) to the ICP by the DSP, or "In Work Date" (or "Receipt Date", "Delivery Order Date") reported by non-TIR commercial / interservice depot maintenance activities in status reports to the ICP.

2. Date when an item has been restored by a depot maintenance activity to serviceable condition, and is first reported as issuable to the ICP by the DSP.

   Measurement Point: Date when the Condition Code changes from suspended (in work) ("M") to serviceable and issuable ("A") and the information is TIRed by the DSP to the ICP, or "Completion Date" (or "Shipped Date", "DD-250 signature date") reported by non-TIR commercial / interservice depot maintenance activities in status reports to the ICP.

3. Awaiting Parts Time ("G" Condition Code) will be included in the calculation of the RTAT time segment.

The inclusion of awaiting parts time in the calculation of contract depot RTAT differs from similiar calculations occurring within organic depots. While current regulations require organic DOPs to return a DLR which is awaiting parts to its co-located DSP it is not cost effective to require similiar actions by commercial DOPs which are located throughout the country. Additionally, the ICPs do not currently have a timely means to accurately obtain Condition Code changes since commercial repair depots are not all automated reporting activities.

The inclusion of "G" condition time presents a unique obstacle to the accurate measurement of RTAT; for, depending on who is responsible for providing piece parts, this time may represent an excusable delay, which will not be counted in elapsed RTAT, or as a delay which is included.

To maintain effective management control over DLRs in the commercial repair pipeline, the IM's at ASO and SPCC observe RTAT time and compare it to established performance goals. Deviations between the two times form the basis for management actions which are directed at individual item problems and DOP performance in general [Ref. 4:p. XII-3].

Table 2, which follows, is a summary of the goals which NAVSUP provided SPCC and ASO for the reduction of Repair Turnaround Time.

TABLE 2

RTAT REDUCTION GOALS [Ref. 6, 7, 8]

	SPCC		ASO	
	Goal	(Actual)	Goal	(Actual)
Baseline (Mar 85 Strat.)	167 days	(167)	67 days	(67)
Ending FY 1986	137	(142)	56	(61)
Ending FY 1987	90	(118)	45	(62)
Ending FY 1988	60		45	

G. CHAPTER SUMMARY

This chapter has provided the reader with a general overview of the rational cited by the Navy for its repair source selections and methodologies used in the development of repair requirements. The significant phases of the CDM process were also discussed to illustrate the complexities to be encountered in any attempts to reduce RTAT. Finally, the NAVSUP goals for reducing RTAT were presented.

Chapter III will present an analysis of the causative factors which have contributed to excessive RTAT within contract depots.

III. ANALYSIS OF CONTRACT DEPOT RTAT

A. CHAPTER OVERVIEW

The purpose of this chapter is to address the contract related issues which impact repair turnaround time. Differences between ASO and SPCC methodologies will be highlighted to explain their impact upon RTAT. The specific areas which will be discussed are:

1. Workload Forecasting - as it effects commercial DOPs;
2. Piece Part Lay-in - deciding between contractor or government furnished material;
3. Tooling and Test Equipment - who is responsible for lay-in; and
4. Undefinitized Contractual Actions - preferred options and impacts of recent legislation.

The primary focus of the analysis was to determine which factors had the most profound effect upon RTAT time.

B. WORKLOAD FORECASTING

In the course of this investigation the researcher learned that the development of an accurate workload forecast is essential for: (1) the reduction of repair turnaround time; (2) forecasting piece part lay-in; and (3) forecasting tooling and test equipment requirements.

Briefly stated the workload forecast is a method for identifying yearly repair requirements. The forecast is developed to facilitate reductions in RTAT, shorten the administrative process and stabilize fluctuations in workload at the DOPs [Ref. 9:p. 1.1].

Without a valid workload forecast it is very difficult for the contractor or the government to assess the business risks associated with repair. Historically, these forecasts have only been accurate about 60 percent of the time [Ref. 7]. Due to this historical inaccuracy contractors have become wary of the forecasts provided in repair contracts. Contractors claim that their failure to receive work as scheduled results in either idle capacity or shortages which impact upon their financial position [Ref. 10, 11].

In recognition of these difficulties ASO and SPCC sought to improve the quality of their workload forecasts. By examining their universe of DLRs they were able to differentiate distinct populations characterized by increasing degrees of criticality. SPCC developed its populations by differentiating approximately 107,000 DLRs into categories displaying similar demand frequency, value or criticality. Figure 3.1 provides the results of SPCC's differentiation process. It should be noted that workloads are only forecast for items experiencing demand in the last eight quarters because of the time and effort required for this

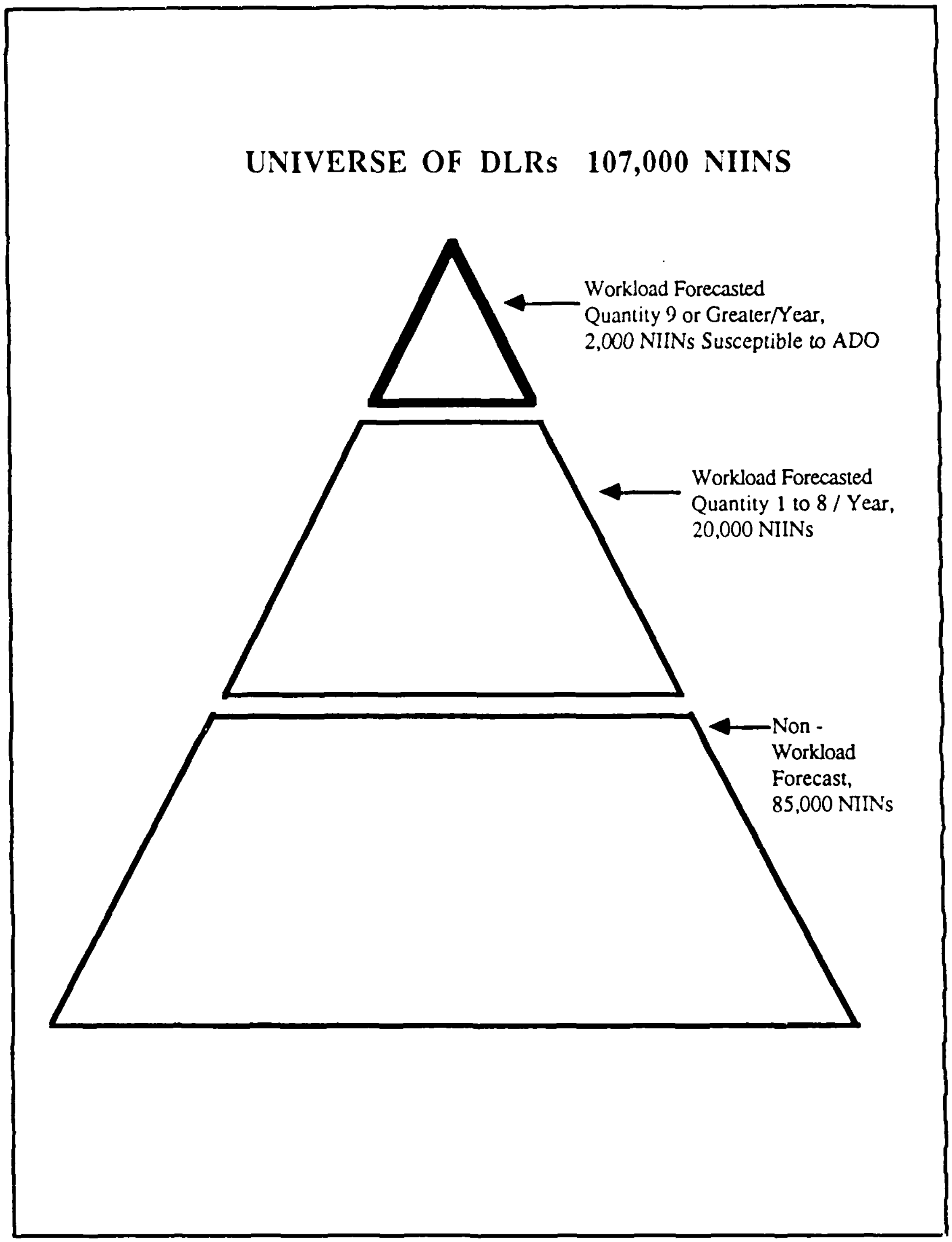

Figure 3.1. SPCC DLR Universe.

Source: SPCC Contract Management Branch

process. ASO undertook a similar effort for the DLRs under its control. Figure 3.2 reflects the results of ASO's differentiation process. Although the data is presented with respect to family groupings similar logic has been utilized in the differentiation process. The larger percentage of DLRs workloaded at ASO (67% vs. 21% at SPCC) can be attributed to the basic difference between the types of assets being managed by the ICPs. SPCC manages material for a number of end users having small populations, while ASO manages components for fewer unique end users having significantly larger populations.

The successful differentiation of demand has provided ASO and SPCC increased leverage in their negotiations with repair contractors.

C. PIECE PART LAY-IN

The availability of piece parts, either contractor furnished or government furnished, represents a key element in any effort to reduce RTAT. Recognition of the impact that piece parts have upon the repair cycle pre-dates the recent concerns over RTAT reduction. In November of 1973 the Naval Audit Service conducted the Navy's portion of an Interservive Audit of the Management of Depot Level Contract Maintenance Programs. They found that [Ref. 12:p. a-1]:

> The extensive use of GFM (government furnished material) could be reduced to facilitate the award and administration of maintenance contracts on a total cost basis; provide contractors with an incentive to use the minimum

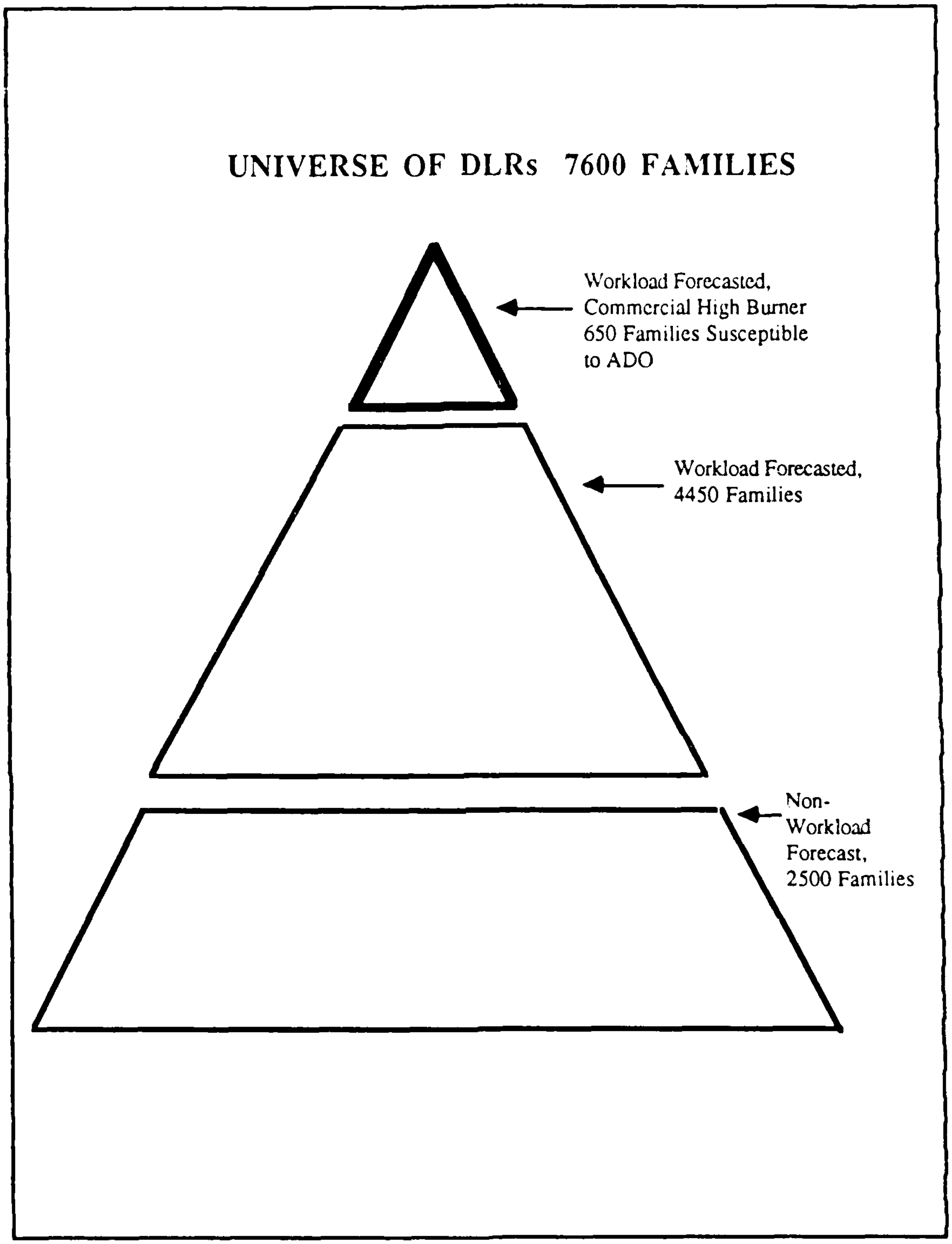

Figure 3.2. ASO DLR Universe.

Source: ASO Weapons Policy, Repairables Branch material required; reduce government administrative costs; and permit greater emphasis on management of high value material.

Although total cost (package) procurements are no longer being performed the remainder of the auditors' comments support ICP management's current calls for increased use of contractor furnished material (CFM).

When the government has responsibility for providing piece parts several methodologies are employed to control the parts distribution to contractors. The least control is afforded by government funded delivery orders. Under this arrangement the contractor prepares material "shopping lists" for ICP review and validation. The Government will then buy all material anticipated for the repair program. Under this arrangement material estimates seldom err on the low side of actual requirements. ICPs can achieve maximum control over the material in contractors' hands by "pushing" material to them following development of detailed supply directives for scheduled repairs.

Additionally, when piece parts are provided as GFM the government assumes responsibility for ensuring their availability. Nonavailability rer nts an "excusable delay" for the contractor. In eff , the contractor would be held blameless for his failure to meet RTAT specifications.

Calls for increased use of CFM are attributed to the high costs and risk which the government assumes under GFM.

However, contractors interviewed during this investigation were concerned that such a change would place undue risk upon their organizations. They stated that, even though much has been done to improve the quality of workload forecasts, they still have concerns over the capital investment which would be required to effect such a change.

One company, AiResearch Manufacturing Company of California, has proposed a revision to the work specifications which would require "complete overhaul" vice "repair to serviceable condition". They claim that this measure would facilitate their projections for piece part requirements and reduce their risks. [Ref. 13]

D. TOOLING AND TEST EQUIPMENT

Test equipment has also been identified as an area of concern by those seeking to reduce RTAT. To address test equipment it is first necessary to determine who is responsible for its provision. During development of the acquisition strategy the HSC will plan for test equipment with regards to the anticipated methodology for repair. This determination will be reflected in the Integrated Logistics Support Plan (ILSP). If test equipment is to be furnished as GFM, the HSC having technical cognizance over the item shall bear its cost [Ref. 4: p. XI-22]. If however test equipment is not provided as GFM the contractor has responsibility for its procurement.

Utilizing techniques similar to those employed in the analysis of piece part requirements the ICPs have been able to identify test equipment shortages. In those cases where a RTAT reduction was determined to be attainable and cost effective additional test equipment has been requested / required [Ref. 7].

E. UNDEFINITIZED CONTRACTUAL ACTIONS

Contract vehicles of all types have been utilized in repair contracting. In the course of this investigation the researcher learned that the principal contracting methods / techniques used by ASO and SPCC for the repair of DLRs are priced and unpriced orders under BOAs. While there are several methods available from which to choose[2], management at the ICPs feel that in the existing acquisition environment the two methods mentioned above are best suited for meeting their needs and goals.

In November 1986 the National Defense Authorization Act for Fiscal Year 1987 authorized appropriations for the military functions of DoD and mandated improvements in defense procurement procedures. Specifically, Section 908 of the Act, Public Law 99-661 required that limitations be placed on the use of undefinitized contractual actions (UCAs). Unpriced orders (UPOs) are categorized under the

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[2]FAR Part 16 contains a complete description of the contract types and the conditions under which they may be selected.

broad heading of undefinitized contractual actions (UCAs). This grouping includes letter contracts, unpriced change orders resulting from engineering change proposals and UPOs under BOAs. All group members share a common characteristic, they are normally issued in advance of pricing and are therefore priced after-the-fact.

Unpriced order BOAs have historically been recognized as legitimate methods for reducing RTAT for two reasons: (1) a BOA allows for the placement of an order without a price proposal; and (2) less documentation is required to award and issue an order than under a more traditional form of contract that is based on contractor proposals, field pricing reports, and negotiations.

From a business standpoint UCAs were having a negative impact upon procurement. A number of the negative aspects which where considered in developing this legislation were: (1) the Government is at a disadvantage in negotiating price; (2) the contractor's incentive to control costs is diminished; (3) the Government's inability to use expired funds, set aside in excessively high pre-negotiation cost estimates; and (4) the tendency for contractors to realize a higher profit than the actual risk incurred would otherwise dictate. [Ref. 14]

Spurred by the inefficiencies noted above, the Congress enacted Public Law 99-661 to limit the use of funds for undefinitized contractual actions. The law requires the service Secretaries to report to Congress when the level of obligations for UCAs exceeds 10 percent of total obligations for their respective Service. Additionally, the law stipulates that if a service Secretary exceeds the 10 percent limitation for UCA obligations in any six-month period, the Secretary will be prohibited from further use of UCAs.

ASO and SPCC are concerned about the enactment of this law because of the wording which characterizes unpriced BOAs as undefinitized contractual actions. Although management at the ICPs contend that the law will have negative effects upon the timeliness of repair contracting and obligation rates, it is too early to evaluate the full impact of the UPO initiatives.

F. CHAPTER SUMMARY

This chapter described the complexities that workload forecasting, piece part lay-in, tooling and test equipment, and undefinitized contractual actions present the ICPs in their attempts to reduce repair turnaround time within commercial depots.

Chapter IV shows how the various terms and conditions of commercial repair BOAs have been developed in response to ICP RTAT reduction goals through an examination of five actual basic ordering agreements.

IV. KEY ISSUES IN COMMERCIAL REPAIR BOAS

A. CHAPTER OVERVIEW

Using a modified case study approach, this chapter shows how the various terms and conditions of commercial repair BOAs address the complexities highlighted in Chapter III. The primary purpose of the chapter is to underscore the benefits derived from the chosen terms and conditions as analyzed through the case study format. Repair BOAs analyzed are with the following contractors: (1) Varian Associates, Inc., Microwave Tube Division; (2) Hughes Aircraft Co., Ground Systems Group; (3) Western Division GTE Government Systems Corp.; (4) AiResearch Manufacturing Company of California; and (5) Kaiser Electronics. These particular contractors where chosen by contracting and technical personnel familiar with commercial repair contracting to provide the researcher a wide variety of contracting methodologies currently being utilized in RTAT reduction efforts.

B. REPAIR BOA TERMS AND CONDITIONS

There is a divergence of opinion as to what actually constitutes an effective commercial repair BOA. Some outside influences which affect the selection of terms and conditions include equipment type, program requirements, maturity of program, service regulations, the contractor, the quality and depth of contract administration expertise available, and the contracting officer himself. Both ASO and SPCC utilize an extensive "tailoring" process to address these outside influences in the development of their commercial repair BOAs.

Table 3 identifies the commercial repair BOAs drawn upon for this analysis. A comparative analysis demonstrates the manner in which five different commercial repair BOAs treat each factor.

TABLE 3

COMMERCIAL REPAIR BOAS

Contractor	Contract Number
Varian Associates, Inc.	N00104-85-GA003
Hughes Aircraft Co.	N00104-84-GA037
GTE Government Systems Corp.	N00104-85-GA007
AiResearch Mfg. Company of CA.	N00383-85-G5427
Kaiser Electronics	N00383-86-D3551

1. Workload Forecasts

One of the major elements identified in Chapter III as having an effect upon the repair contract is the realistic estimation of repair quantities. Prior knowledge of the workload was shown to be essential for the efficient scheduling of manpower and machines to support a repairables program. The following is a breakdown of the repair BOAs workload forecast considerations:

Varian:	- No workload forecast provided in BOA. - Workload forecast provided in advance delivery orders written by SPCC.
Hughes:	- BOA provides workload forecast for select group of critical assets. - Advance delivery orders contain workload forecasts for remaining items.
GTE:	- No workload forecast provided in BOA. - Workload forecast provided in quarterly program reviews.
AiResearch:	- Workload forecast provided for each family of repairables within the BOA.
Kaiser:	- Estimated quantity of carcasses to be repaired provided for each family of repairables cited on the" Listing of Assemblies to be Repaired."

In recognition of its contribution to RTAT reduction efforts, workload forecasts are generally being provided to contractors in ADOs for the critical, fast moving items which are in short supply; the primary products of Varian, Hughes, and GTE. Standard BOAs, on the other hand, are being used for items experiencing only moderate demand.

The Government and contractor negotiate "realistic" workloads on a quarterly basis for critical items, and an annual basis for all others. An additional benefit gained by this practice is the contractors' ability to immediately induct into repair those carcasses cited on the ADO. This procedure alone can result in a conservative four- to seven-day reduction in RTAT by reducing the administrative burden associated with the induction of DLRs.

When the planned workload is not available production workers will be idled and may have to be reassigned. If carcasses arrive at random times, repairs will normally be delayed pending carcass induction and personnel reassignment. Such inaccuracies in forecasted workload can and do cause major problems for the DOPs. If the DOP can assure itself of a consistent workload it can staff the repair facility accordingly and integrate the DLR workload into its production efforts, thus avoiding unplanned excesses or shortages in personnel and equipment.

2. Piece Parts

The contracting officer has several options from which to choose when planning for piece part lay-in. Based upon the level of risk the contractor is willing to assume piece parts may be provided, either, as Government Furnished Material (GFM) or Contractor Furnished Material (CFM).

Piece part requirements are obviously driven by workload forecasts. The importance of accurate forecasting was addressed earlier with respect to dedicating personnel and facilities at the DOP's. The same arguments apply to the stocking and ordering of piece parts. The following is a breakdown of program piece part considerations:

Varian: - Contractor shall furnish parts.

Hughes: - Government furnishes material based upon the annual workload forecast.
- Contractor acquires parts through direct procurement when GFM not available.

GTE: - Government furnishes material yearly based upon the workload forecast.
- Contractor requisitions material through direct procurement when GFM not available.

AiResearch: - Consumable parts shall be furnished by the Government either "in kind" or by the placement of orders by the Government.
- Contractor will submit replenishment recommendations to ASO for review and validation of range and depth.
- Material not available from the Government within 30 days shall be acquired by the contractor on an "as required" basis.

Kaiser: - Same as AiResearch.

Through tailoring the unique nature of each contractor's repair program is addressed. Four of the repair contractors receive GFM while one, Varian, does not. The use of GFM in these cases appears to result in more responsive turnaround times, by minimizing long procurement lead times, since contractors do not delay procurements pending receipt of repairable carcasses. Given the historical inaccuracy of the workload forecast, which drives the piece part lay-in, it is understandable why the DOPs would seek to minimize their risk through GFM requests. Varian, who chooses not to utilize GFM is able to maintain its responsive RTAT because stable demand for its product over the years has generated sufficient data to justify lay-in of CFM.

However, there is a cost associated with GFM which the ICPs need to consider. They should conduct a cost-benefit analysis to ensure that costs of GFM are lower than the pipeline investment required for any given level of readiness.

3. Repair Turnaround Time

Specific and enforceable time limits must be considered if the overall goals for RTAT reduction are to be met. Inclusion of liquidated damages[3] for failures to meet specified delivery times may provide the needed "incentive" to ensure timely return of an asset and preclude future litigations. Another factor to consider is how long it will take to perform the repair. It may not be physically possible to affect the needed repair in either the 45 or 60 days of ASO's or SPCC's given goal. The following is a breakdown of repair program RTAT considerations:

Varian: - Turnaround times set forth in each BOA delivery order.

Hughes: - 60-day turnaround time, provided that item is not beyond economical repair, or does not have parts affected by long delivery timeframes.

GTE: - 90-day turnaround time, provided that required piece parts and GFM test equipment are available.

AiResearch: - 60-day turnaround time, provided that GFM piece parts are available.

Kaiser: - 90-day turnaround time, provided that GFM piece parts are available.

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[3]Liquidated damages are sums of money which have been expressly stipulated, by the parties of a contract, as the amount to be paid if either party fails to uphold its end of the agreement.

Four of the five repair BOAs treat RTAT in essentially the same manner, they acknowledge the fact that repair times are contingent upon the availability of piece parts. By tying RTAT to piece parts availability these contractors have constructed a mechanism which further reduces their risk of performance. In order to pass some of this risk of performance back to contractors might it not be more effective to incentivize RTAT along a graduated scale?

C. CHAPTER SUMMARY

This chapter highlighted the benefits derived from principal terms and conditions of commercial repair BOAs which affect the reduction of RTAT time. Five different BOAs were compared and analyzed.

The complexities identified in Chapter III and the benefits highlighted in this chapter form the basis for the conclusions and recommendations outlined in the next chapter. One should not view the terms and conditions outlined in this chapter as being all inclusive but rather as significant issues that must be addressed in RTAT reduction efforts.

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

This thesis has examined the Contract Depot Repair process and current contracting techniques to determine if the RTAT of DLRs managed by ASO and SPCC can be reduced.

At present ASO and SPCC are exerting considerable effort to reach the Naval Supply Systems Command's RTAT goals of 45 and 60 days, respectively. If RTAT for DLRs can be reduced the Navy may ultimately reach the anticipated savings of 100 million dollars.

The DOP repair cycle is a complicated process that requires numerous interfaces between various organizations and people. As a carcass is moved through the repairables cycle these organizations and people must coordinate their actions and ideas if they are to significantly reduce repair turnaround time.

Chapter II provided the reader with a general overview of the Contract Depot Maintenance cycle to illustrate the complexities involved in any attempts to reduce RTAT. It also provided a brief description of the rationale cited by the Navy for its repair source selections and methodologies used in the development of repair requirements.

Chapter III described the difficulties that workload forecasting, piece part lay-in, tooling and test equipment, and undefinitized contractual actions present the ICPs in their attempts to reduce repair turnaround time within commercial depots.

Chapter IV attempted to highlight the RTAT reduction benefits currently being realized by the ICPs through their handling of commercial repair BOAs.

B. CONCLUSIONS AND RECOMMENDATIONS

The author has determined that the commercial repair of DLRs can not be treated in a purely statistical fashion with 100 percent of the emphasis placed on strict adherence to quantifiable measures. When attempted in the past this approach rapidly overloaded the ICPs and the contractors' abilities to handle data efficiently. However, the current procedure in which commercial repair of DLRs is treated as an integrated program involving contractor and ICP management personnel and contracting does appear to be working.

The specific conclusions and recommendations which follow are based on the analysis in Chapter III of issues affecting RTAT reduction and Chapter IV's review of current practices and procedures for commercial repair of DLRs. Recommendations offered are possible actions which can be taken to reduce commercial DOP repair turnaround time.

1. Workload Forecasting

Workload forecasting drives many of the policies and procedures used by commercial depots. Based on forecasted workloads, DOPs plan repair part and tooling/test equipment requirements to support the repairs of DLRs. Due to the historical inaccuracies of the workload forecasts the DOPs have been reluctant to dedicate personnel and facilities to support their repairables programs.

The ICPs should implement a decision support system (DSS) at all commercial repair depots to facilitate improvements in the accuracy and consistency of their workload forecasts. Currently, the ICPs only have approximately 30 percent of their commercial repair depots on automated tracking systems.

The DSS could be modeled after SPCC's proposed Commercial Asset Visibility, Phase II upgrade, (CAV II). This system has been designed to operate in a fully automated mode, allow a wide range of transaction reporting, and provide specific carcass tracking and accountability while material is at the commercial DOP. CAV II will allow nine basic types of transactions to be reported: receipts, inductions, completions, shipments, requests for survey, BER notifications, periodic inventories, reversals, and skeletonized Reports of Discrepancies. CAV II is being proposed to replace SPCC's current asset reporting system which is hampered by: (1) the limited range of transactions which can be reported, (2) the manual effort required to transfer contractor inputs to SPCC programs, and (3) the imbalances created between financial and inventory records by its basic format. The potential benefits of daily mechanized transaction reports from commercial repair facilities would be the increased efficiency of the ICPs day-to-day management of high value mission essential assets and a reduction in administrative efforts and therefore RTAT time.

Greater usage of advance delivery orders should also be investigated. The elimination of unnecessary administrative time via this procedure has been proven effective and results in no loss of asset control.

2. Piece Part Lay-in

Piece parts have a significant role in the timely repair of failed DLRs.

To improve the availability of piece parts and preclude excusable delays, granted to contractors for delinquent GFM, more emphasis should be placed on early logistics support of new weapons system procurements by the ICPs to ensure that sufficient material has been acquired to support the repair program. This should improve the availability of piece parts in the long run. The ICPs should emphasize the use of Material Requirements Planning programs at DOPs to capture piece part usage on DLRs as they are repaired. Retention of this information by the ICPs would facilitate more accurate determinations of repair part requirements and assist in reducing contractors' financial risks for material acquisition.

3. Undefinitized Contractual Actions

The author believes that recent legislation calling for a reduction in the number of unpriced orders (UPOs) will have negative impact on the commercial repair of DLRs. The ICPs should seek regulatory relief or redress from this legislation. This might be accomplished through a legal interpretation that repair efforts are important enough to be excluded from the provisions of this legislation. A recent study concluded that, while the use of unpriced orders has enabled procurement managers to aggressively meet goals, "...the ability to choose the level of UPO activity should be left to the acquisition manager as long as the definitization requirements are met" [Ref. 15:pp. 41-43].

C. RESEARCH QUESTIONS

1. Primary Research Question

What are the key contracting issues and what methodologies might be utilized to reduce Repair Turnaround Time within the Contract Depot Maintenance program?

The research leads the author to conclude that additional changes to the contracting techniques currently employed at ASO and SPCC are not required to address the key contracting issues of (1) workload forecasting, (2) piece part lay-in, or (3) undefinitized contractual actions. Instead, it is believed that a spirited application of the techniques now in place can be made to reduce RTAT.

Increased management awareness and attention to the benefits of streamlining the induction process as discussed above, under Workload Forecasting, can have an effect on the ICPs' ability to minimize RTAT.

Additionally, increased automation of the repair planning process through the installation of a decision support system, and emphasize on Material Requirements Planning programs has implications for improved efficiency and management information not available from the current system.

2. Subsidiary Question 1

What is Contract Depot Maintenance and how has it been utilized on Navy repairable components?

As discussed in Chapters I and II, contract depot maintenance is the repair of failed items needed in support of the Military Departments missions by commercial sources of repair. At ASO and SPCC contract depot maintenance is utilized (1) when organic support capabilities do not exist; (2) as interim support for new items pending establishment of organic support; and (3) when mature systems have reached the end of their mission-essential status to free organic capability for new systems.

3. Subsidiary Question 2

What are the principal contracting variables or factors which affect Repair Turnaround Time?

As discussed in Chapter III of this thesis the specific areas of concern to the ICPs in their attempts to reduce RTAT time are: (1) Workload Forecasting; (2) Piece Part Lay-in; (3) Tooling and Test Equipment; and (4) Undefinitized Contractual Actions.

4. Subsidiary Question 3

What are the critical areas where improvements can be made within the contracting process to facilitate Repair Turnaround Time reductions?

The answer to this question was addressed in Chapter IV and the previous section of this chapter. It appears from the research findings that increased management attention and spirited application of the techniques currently in place can result in further reductions of RTAT time. Additional savings might be realized through the installation of a DSS, and seeking redress on the UPO limitation.

D. RECOMMENDATIONS FOR FURTHER RESEARCH

Research conducted for this thesis has revealed the following areas for further study. Since the research was limited in scope and methodology, these areas potentially have significant implications for continued improvements to the procurement process:

1. Determine the feasibility of developing repair sources with "broad scopes of repair," the ability to repair equipment from multiple manufacturers. As discussed in Rand's Report "Depot Maintenance of Aviation

Components: Contractor vs. Organic Repair" [Ref. 5:p. 6] a broad scope of repair has the potential to increase a contractor's efficiency and therefore lead to a reduction in its RTAT.

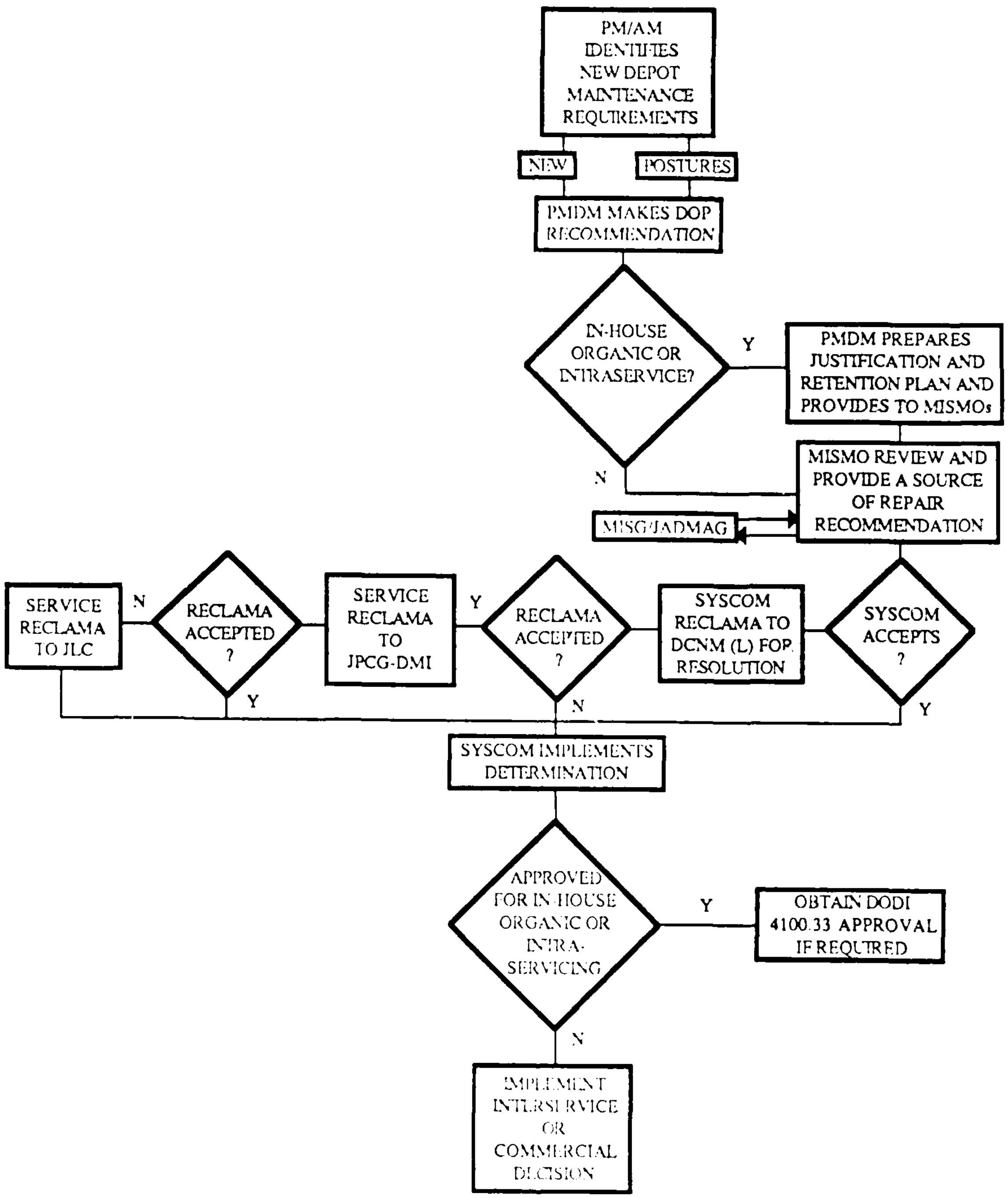
2. Investigate the potential for additional RTAT time reductions by "breaking out" subcomponents to their original manufacturers. Such a procedure would eliminate the processing time currently required by the prime contractor for receipt and trans-shipment of components not undergoing in-house repair.

3. For those items having both organic and contracted sources of repair determine specific processing differences and their effect on RTAT. This could identify processing techniques which would contribute to RTAT reduction efforts.

4. Examine the applicability of cost reimbursement contracts, which place greater performance risk on the Government, on systems or items having low to moderate demand.

APPENDIX

DOP SELECTION DECISION TREE [Ref. 16: Encl.(3)-5]



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