

**NAVAL POSTGRADUATE SCHOOL**  
**Monterey, California**



**THESIS**

**A COST BENEFIT ANALYSIS OF THE DEPOT  
MODIFICATION FIELD TEAMS FOR THE  
T-45C AIRCRAFT**

by

James M. Parish  
June 2000

Principal Advisor:  
Associate Advisor:

Donald Eaton  
Jerry McCaffery

**Approved for public release; distribution is unlimited.**

20000720 033

# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE June 2000	3. REPORT TYPE AND DATES COVERED Master's Thesis
4. TITLE AND SUBTITLE : <i>A Cost Benefit Analysis of the DEPOT Modification Field Teams for the T-45C Aircraft.</i>			5. FUNDING NUMBERS
6. AUTHOR(S) Parish, James M.			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSORING / MONITORING AGENCY REPORT NUMBER
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.			12b. DISTRIBUTION CODE
13. ABSTRACT ( <i>maximum 200 words</i> ) This thesis focuses on the current procedures for implementing the Depot modifications on the T-45 training aircraft located at NAS Meridian, Ms. used by the Navy to train its Student Naval Aviators. Using cost-benefit analysis, it analyzes the feasibility of performing the modifications at the existing Contractor Depot Field team site at NAS Kingsville, Tx. or standing up an additional mod line at NAS Meridian, Ms. The analysis demonstrates the savings for the Navy available by expanding the existing mod line at NAS Kingsville, Tx. with out sacrificing any readiness or lost training days.			
14. SUBJECT TERMS Depot Level Maintenance, Cost-benefit Analysis.			15. NUMBER OF PAGES 78
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)  
Prescribed by ANSI Std. Z39-18

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release; distribution is unlimited

**A Cost-Benefit Analysis of the DEPOT Modification  
Field Teams for the T-45C Aircraft**

James M. Parish  
Lieutenant, United States Navy  
B.S., University of Idaho, 1990

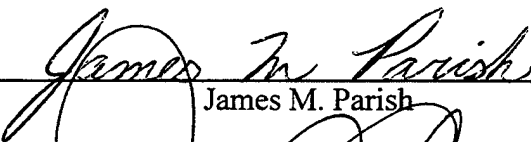
Submitted in partial fulfillment of the  
requirements for the degree of

**MASTER OF SCIENCE IN MANAGEMENT**

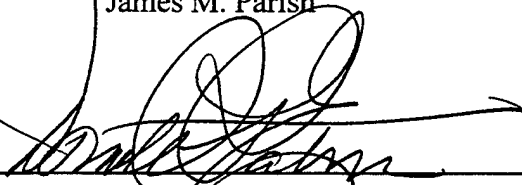
from the

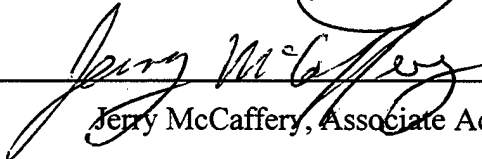
**NAVAL POSTGRADUATE SCHOOL  
June 2000**

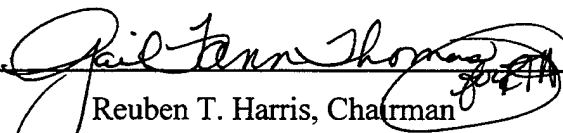
Author:

  
James M. Parish

Approved by:

  
Donald Eaton, Thesis Advisor

  
Jerry McCaffery, Associate Advisor

  
Reuben T. Harris, Chairman  
Department of Systems Management

THIS PAGE INTENTIONALLY LEFT BLANK

## ABSTRACT

This thesis focuses on the current procedures for implementing the Depot modifications on the T-45 training aircraft located at NAS Meridian, MS. used by the Navy to train its Student Naval Aviators. Using cost-benefit analysis, it analyzes the feasibility of performing the modifications at the existing Contractor Depot Field Team site at NAS Kingsville, TX. or standing up an additional mod line at NAS Meridian, MS. The analysis demonstrates the savings for the Navy available by expanding the existing mod line at NAS Kingsville, TX. with out sacrificing any readiness for the T-45 aircraft.

THIS PAGE INTENTIONALLY LEFT BLANK

## TABLE OF CONTENTS

I. INTRODUCTION.....	1
A. PURPOSE.....	1
B. BACKGROUND.....	2
C. RESEARCH QUESTIONS.....	5
D. SCOPE AND METHODOLOGY .....	6
E. THESIS ORGANIZATION.....	7
F. EXPECTED BENEFITS OF THIS THESIS .....	8
II. BACKGROUND.....	9
A. INTRODUCTION TO CLS.....	9
B. CURRENT T-45 MODIFICATIONS.....	10
C. COST AND TIME REQUIREMENTS OF THE MODS.....	12
1. Manpower Estimation Technique .....	13
a. Man-hour Development .....	13
2. Actual Manpower Requirements.....	14
a. Man-power Wage Determination.....	14
3. Facility and Tooling Costs .....	15
a. Navy Tooling Costs .....	16
b. Boeing Tooling Costs.....	16
4. Flight Hour and Pilot Costs.....	17
a. Flight Hour Costs .....	17
c. Pilot Costs and PerDiem Expenses .....	18
III. COST-BENEFIT ANALYSIS.....	19
A. COST DRIVERS .....	19
1. Manpower Requirements .....	19
2. Facility and Tooling Costs.....	21
3. Flight Hour Costs.....	22



4. Aircraft Availability and Readiness.....	22
B. DRAWBACKS .....	24
C. BENIFITS OF CONSOLIDATION.....	25
D. ANALYSIS .....	26
1. One Time Costs.....	27
2. Annual Costs.....	27
IV. CONCLUSIONS AND RECOMMENDATIONS .....	31
A. CONCLUSIONS.....	31
B. RECOMMENDATIONS .....	34
C. FURTHER RESEARCH.....	35
APPENDIX A. NAVY SUPPORT EQUIPMENT COSTS .....	37
APPENDIX B. BOEING SPECIALIZED TOOLING COSTS .....	39
APPENDIX C. MECHANICS TOOL BOX REQUIREMENTS.....	45
APPENDIX D. BOEING STRUCTURE TOOL BOX REQUIREMENTS .....	55
LIST OF REFERENCES.....	59
INITIAL DISTRIBUTION LIST.....	61

## LIST OF FIGURES

1	T-45 Mod Line.....	3
2	T-45 Wing Removed from Aircraft.....	12
3	Wing Stand for T-45 Wing Removal.....	26
4	Annual Cost Projections Assuming 5% Inflation.....	28

THIS PAGE INTENTIONALLY LEFT BLANK

**LIST OF TABLES**

2.1 Current T-45 Approved AFC's.....11

2.2 Wage Rates for CDFT Personnel.....15

3.1 Annual Manpower Cost Comparisom.....20

3.2 Tooling Cost Comparisom.....21

3.3 Readiness Calculations for Callendar Year 2002 .....23

3.4 One Time Costs.....27

3.5 Annual Costs.....28

THIS PAGE INTENTIONALLY LEFT BLANK

## LIST OF ACRONYMS

AFC	Airframes Change
ASPA	Aircraft Service Period Adjustment
CDFT	Contractor Depot Field Team
CFA	Cognizant Field Activity
CLS	Contractor Logistic Support
DoD	Department of Defense
ECP	Engineering Change Proposal
FY	Fiscal Year
GFE	Government Furnished Equipment
IMP	Integrated Maintenance Program
NADEP	Naval Aviation Depot
NASK	Naval Air Station Kingsville
NASM	Naval Air Station Meridian
PEB	Pre-expended bin
PM	Program Manager
RCM	Reliability Centered Maintenance
RFT	Ready For Training
SDLM	Scheduled Depot Level Maintenance
TCAT	Technical Change Action Team
TD	Technical Directive

THIS PAGE INTENTIONALLY LEFT BLANK

## ACKNOWLEDGMENT

The author would like to acknowledge the assistance of The Boeing Goshawk Team and the NAVAIR T-45 Program Office who provided their support throughout the information gathering phase of this thesis. The author also wants to thank LCDR Chris Kennedy and Mr. Mike Mathews for their assistance and expertise.



THIS PAGE INTENTIONALLY LEFT BLANK

## I. INTRODUCTION

### A. PURPOSE

The purpose of this thesis is to examine the current procedure for performing Depot level modifications (mods) on the T-45 Goshawk aircraft. The central question of this thesis is if the Navy should standup an additional Contractor Depot Field Team (CDFT) mod line at NAS Meridian or if it should expand the existing mod line at NAS Kingsville and ferry the aircraft to that site to perform the required modifications. The Navy's inventory of T-45A's is currently undergoing Depot level modifications conducted by the Boeing Corporation's CDFT at Naval Air Station (NAS) Kingsville, Texas. This thesis will concentrate on the most cost effective alternative for performing the required Depot level modifications on the T-45C's located at NAS Meridian, Mississippi. The findings and recommendations of this thesis will be reviewed by the T-45 Program Office to assist them in determining which alternative they should implement in accomplishing the required modifications on the NAS Meridian T-45 aircraft.

This thesis will also address the possible implementation of Contractor Logistic Support (CLS) for other DoD weapon systems. At present, the T-45 is the largest program that is fully supported by CLS in the Navy. In today's environment of decreasing defense funding and manpower reductions across the services, CLS may in fact play an increasingly vital role in the DoD's future.

## **B. BACKGROUND**

The implementation of CLS in Naval Aviation has allowed scarce manpower resources to be re-allocated throughout the fleet. CLS is defined as the contracting out or outsourcing of selected levels of the maintenance and support functions for a particular weapon system. A typical Navy Aircraft Squadron consists of 12 to 15 aircraft and 200 personnel supporting the entire operations, maintenance and administrative effort. [Ref: 1] By implementing the CLS program for the T-45, the Navy has realized manpower reductions in excess of 1,000 active duty personnel. The benefit of the manpower savings to the Navy is most evidenced by higher manning levels in the operational Squadrons throughout the fleet.

The CLS program for the T-45 Gosshawk, the primary jet trainer for Student Naval Aviators, is the Navy's largest fully supported program. The Navy's current inventory of T-45's consists of 73 T-45 A's located at NAS Kingsville TX, and 29 T-45C's based at NAS Meridian MS. Under the CLS Contract, Boeing Corporation is responsible for 100% of the Organizational, Intermediate, and DEPOT level maintenance on these aircraft. Furthermore, the Navy contracts for a specified Ready for Training (RFT) rate per aircraft. Under the existing contract the RFT goal is 65%. [Ref: 4] By adopting this approach, Aircraft availability for the Student Naval Aviators is the responsibility of the Boeing CLS team and they have consistently improved the RFT rate to a current level of 74%. [Ref: 3].

The Naval Aviation Maintenance concept revolves around aircraft operating service periods. DEPOT Level maintenance is performed at certain stages of the aircraft's life based on total flight hours and is determined by engineering estimates. When an aircraft is slated for Scheduled DEPOT Level Maintenance (SDLM), the Navy DEPOT responsible for performing the work will send a team of inspectors to perform a Aircraft Service Period Adjustment (ASPA) inspection on the scheduled aircraft. [Ref: 1] If, in the opinion of the inspectors, the aircraft's material condition was sound enough to make it through an additional year in the fleet, the DEPOT team would extend the SDLM date forward by one year. Figure 1 below shows a T-45 at the NAS Kingsville CDFT mod line.



Figure 1. T-45 Mod Line

The T-45 Program operates under the Reliability Centered Maintenance (RCM) concept. RCM is an analytical process used to determine preventive maintenance (PM) requirements. [Ref: 4] The primary objective of the RCM process is to identify ways to avoid or reduce the consequences of failures that, if allowed to occur, would adversely impact personnel safety, environmental health, mission accomplishment, or economics. Preventive maintenance is only one way that failure consequences can be mitigated. A PM task should be implemented when it is appropriate to do so, but that might not be the best solution in all cases. The RCM analysis might indicate that the best solution is to simply allow the failure to occur, then perform corrective maintenance to repair it. In yet other instances, analysis might indicate that some other action is warranted, such as an item redesign, a change in an operational or maintenance procedure, or any number of other actions which will effectively reduce the consequences of failure to an acceptable level.

Boeing has instituted a program under the auspices of RCM called the Integrated Maintenance Program (IMP). [Ref: 8] The T-45 IMP is based on five maintenance intervals during the aircraft's service life (IMP1 through IMP5). These IMP's are accomplished every 2500 flight hours. After the fifth IMP is completed, the aircraft is cleared for an additional 2500 flight hours until the total service life of the aircraft (1,440 flight hours) is reached.

As far as the CDFT's, their purpose is to install all Depot Level Modifications and Technical Directives (TD's) and to perform all unscheduled Depot Level repairs when

required. Most of the mods are based off the full-scale fatigue tear down results (performed at the factory during production) requiring Depot Level skills. Historically, the CDFT performed mods and TD installations on 45 aircraft in FY 98, 40 in FY 99 and they are scheduled to induct 22 in FY 00. [Ref : 3] (The reason for the small number in FY00 is due to a test aircraft that will hold one of the Mod slots for the entire fiscal year)

Currently, the only aircraft that requires Depot Level mods are the T-45A's based at NAS Kingsville, TX. Based on current flight hour projections (65 hours per month for each aircraft) the first T-45C's based at NAS Meridian will require Depot Level Mods beginning in FY02. [Ref: 2] This thesis will help determine how the Navy/Boeing team will accomplish these mods.

### **C. RESEARCH QUESTIONS**

The primary research question in this thesis is:

1. What is the current process for performing the required Depot Level Mods on the T-45 Aircraft?
2. What is the total cost per aircraft to perform these Depot Level Mods if the aircraft were flown from NAS Meridian, Mississippi to NAS Kingsville, Texas?
3. What is the total cost of performing these Depot Level Mods if an additional Depot Mod Team was stood up in NAS Meridian?

4. Which alternative is the most cost effective to the Navy in the long run?

#### **D. SCOPE AND METHODOLOGY**

This thesis is a cost-benefit analysis of the Boeing Corporations CDFT's currently used to install Depot Level Mods on the Navy's primary jet aircraft trainer, the T-45 Goshawk. The CDFT is responsible for performing all of the approved aircraft modifications including the installation of Technical Directives (TD's) and Airframe Changes (AFC's) when the aircraft are inducted into the mod line. Since no two aircraft are exactly alike, in terms of the amount of man-hours required to incorporate the subject mods, an average man-hour estimate provided by the Boeing Corporations CDFT will be assumed for this analysis.

The comparison of alternatives is accomplished in the framework of current CDFT operations and costs compared to the proposed initiative of setting up an additional mod line at NAS Meridian. Cost-benefit analysis will detail the expected benefits and costs of the proposal. Ideally, this involves translating the various impacts into a common value, most commonly total dollars, for use in comparison. Some effects and impacts are difficult or impossible to quantify making them very hard to interpret as well. Qualitative weighting will take the following approach:

“Where necessary, researcher judgement is applied to weight qualitative effects in government related proposals” [Ref :10, p.13]

Cost-benefit analysis, as applied to this research, will compare the existing CDFT mod line at NAS Kingsville expanding to accommodate the T-45C's from NAS Meridian against the proposed startup costs of a new CDFT mod line at NAS Meridian. To perform this comparison, the analysis will concentrate on the costs associated with the existing CDFT mod line at NAS Kingsville and apply them to NAS Meridian. Initial startup tooling costs, additional manpower costs (based upon NAS Meridian wage determination scale) and T-45 flight hour operational costs will be the primary focus. Additionally, benefits will be measured in terms of aircraft availability for NAS Meridian and total dollars saved from choosing one of the two alternatives. Findings and conclusions will be formalized into recommendations that will be applicable to the T-45 Program and throughout the DoD.

#### **E. THESIS ORGANIZATION**

This thesis is divided into four chapters including this Chapter I introduction. Chapter II provides a background of the current Depot Level Modifications being performed on the T-45 aircraft and the pertinent cost data associated with those Mods. Additionally, the methodologies and techniques used in performing the cost-benefit analysis will be defined and explained fully. Chapter III is an explanation of the data and assumptions taken in the research. Finally, Chapter IV will provide a summary of the findings and analysis with clear and concise conclusions and recommendations.



Additionally, I will include appendices that will produce relevant data referred to in this thesis. The primary sources for the data in this thesis will include:

- T-45 Program Office, NAVAIR Headquarters, Patuxent River, Md.
- Boeing Corporation T-45 CLS Office, St. Louis, Mo.
- CDFT Mod Line, NAS Kingsville, Tx.

#### **F. EXPECTED BENEFITS OF THIS THESIS**

This study will provide the necessary decision information for the T-45 Program Office to make an educated and cost effective decision involving the upcoming Depot Level Mods for the T-45C's located at NAS Meridian Mississippi. Given the cost data and price breakdown of the alternatives, the most economical and efficient approach will become evident in the conclusions/summary of findings. The final decision will be made by the T-45 Program Office at NAVAIR in July, 2000. [Ref: 2] Their intentions are to base their decision on the findings and recommendations of this thesis.

## II. BACKGROUND

### A. INTRODUCTION TO CLS

For the purpose of this thesis Contractor Logistic Support (CLS) can be defined as the contracting out or outsourcing of selected levels of the maintenance and support functions for a particular weapon system. For the T-45 Goshawk program, this function includes all Organizational (O-level), Intermediate (I-level), and Depot (D-level) maintenance functions required to support the aircraft. Additionally, the CLS contract specifies that Boeing Corporation provide the in-service engineering for the T-45 program in conjunction with the Navy engineers at the Cognizant Field Activity (CFA) and the Program Office. Grounding authority for the T-45 resides solely with the Program Office and NAVAIR Headquarters. [Ref: 3]

All Technical Directives, Engineering Change Proposals, and Airframe Changes are developed in cooperation between the Naval Aviation Depot (NADEP) engineers and the Boeing Corporation engineers.[Ref: 8] Once a consensus is reached on a proposed modification, the T-45 Program Office at NAVAIR Headquarters has the final authority to approve or disapprove the proposed mod. Logistics issues are addressed during the process by the use of a Technical Change Action Team (TCAT). [Ref: 3] As the Integrated Logistic Support Manager at Boeing stated, “ We are basically acting as a team with the Navy. If a problem occurs with the aircraft during its life cycle,

both our engineers and the NADEP Jacksonville engineers work together to solve the problem and propose any aircraft modifications.” [Ref: 8]

## **B. CURRENT T-45 MODIFICATIONS**

Presently, the T-45 has 35 active Depot Level AFC's requiring installation on each of the Goshawks located at NASM. [Ref: 4] As with all weapon systems currently in production, the manufacturer will implement these TD's as soon as possible on the production line by way of forward fitting these new aircraft and eliminating the requirement for the incorporation of the mod once the aircraft enters service. For the aircraft currently in service, retrofitting via the CDFT mod line is required. All mods have a compliance date that will drive the scheduling of the TD's. The primary TD that is driving the incorporation timeline of the Depot mods is AFC-217, the Air Intake mount redesign. [Ref: 4] To perform this mod, the aircraft wings must be removed from the plane to gain the required access to complete the modification.

AFC-217 must be complied with no later than 4300 total flight hours. Knowing this constraint, the scheduling of all aircraft into the CDFT is based upon the 4300-hour mark as determined by AFC-217. Table 2.1 lists all of the TD's scheduled to be incorporated on the T-45C aircraft. [Ref: 11] Additionally, the total man-hours/clock-hours are listed for this research and the Cost-benefit analysis covered in Chapter III.

TD No.	Title	Affectivity	Man Hours	Clock Hours	COMPLIANCE
AFC-127	Wing LE Lwr Surface	C001-C013	117	57	4800 fit hrs
AFC-145	SMDC Foolproofing	C001	90	65	N/A
AFC-165	Wing LE Skin Redesign	C001-C032	147	80	6050 fit hrs
AFC-169	MLG Uplock Beam	C001	220	75	4320 fit hrs
AFC-171	Engine Mount Redesign	C001-C018	767	144	2500 fit hrs
AFC-172	Fr 21 Doubler	C001-C005	281	120	5000 fit hrs
AFC-173	Fr 29 Radius Block	C001-C005	128	72	400 arrests
AFC-173P2	Fr 28 Angle	C001-C005	141	40	400 arrests
AFC-176	NLG Trunion Beam	C001	55	48	500 cats
AFC-178	Fr 28-32 Boundry Membr	C001-C010	96	85	5400 fit hrs
AFC-180	Fr 20 Brackets	C001-C009	220	119	7200 fit hrs
AFC-198	Wing Rear Spar Att Fitting	C001-008	244	97	7200 fit hrs
AFC-201	Fuel Tank Ceiling Dbl	C001-C018	128	95	6500 fit hrs
AFC-202	Wing Aux Spar Dbl – Uppr	C001-C024	229	148	6480 fit hrs
AFC-202P2	Wing Aux Spar Dbl – Lwr	C001-C060	335	154	6480 fit hrs
AFC-203	MLG Sidestay Support	C001-C022	38	27	8400 fit hrs
AFC-206	Fr 13 Lwr Flange	C001-C013	222	129	4800 fit hrs
AFC-209	Fr 12 Vertical Splice Dbl	C001-C012	325	148	9360 fit hrs
AFC-212	Slat Act Fitting Att Angle	C001-C013	15	7	4800 fit hrs
AFC-213	Fuselage Skin Cutout	C001-C018	90	74	5760 fit hrs
<b>AFC-217</b>	<b>Fr 10/12 Air Intake</b>	<b>C001-C021</b>	<b>496</b>	<b>410</b>	<b>4320 fit hrs</b>
AFC-220	Steering Sys Improve	C001-C031	285	193	N/A
AFC-221	Triaxial Accelerometer	C001-C045	105	96	N/A
AFC-225	Fuel Tank Ceiling Stiff	C001-C036	117	85	8000 fit hrs
AFC-229	Lng Gear Cntrl Hdl	C001-C040	151	86	N/A
AFC-237	Speedbrake Redesign	C001-C070	207	191	N/A
AFC-237P2	Speedbrake Backup	C001-C076	367	318	N/A
AFC-XXX	Wing Gauge Fuel Hole	C001-C139	312	133	5000 IMP
AFC-XXX	Lower Longeron/Sidebrace	C001-C065	282	109	5000 IMP
AFC-XXX	Fr 17/18 Redesign	C001-C057	196	154	8000 fit hrs
AFC-XXX	Rib 2 T-Clip	C001-C065	538	363	1050 arrests
AFC-XXX	Hyd Tube/Aileron & MLG	C001-C024	79	47	N/A
AFC-XXX	Removal of Brake Pressure	C001-C055	531	307	N/A
AFC-XXX	Crew Sta Grab Hndls	(aft)	78	62	N/A
IAFC-205	MLG Roof Bay Fasteners	C001-C021	20	10	N/A
	<b>Total hours required:</b>		<b>7,652</b>	<b>4,348</b>	

Table 2.1. Current T-45 approved AFC's

The requirement to remove the wings from the aircraft to perform AFC-217 and several other mods make this a critical step in the overall CDFT mod line procedure. Figure 2 below shows the wings after removal from a T-45 aircraft undergoing the CDFT mods at the NAS Kingsville site.

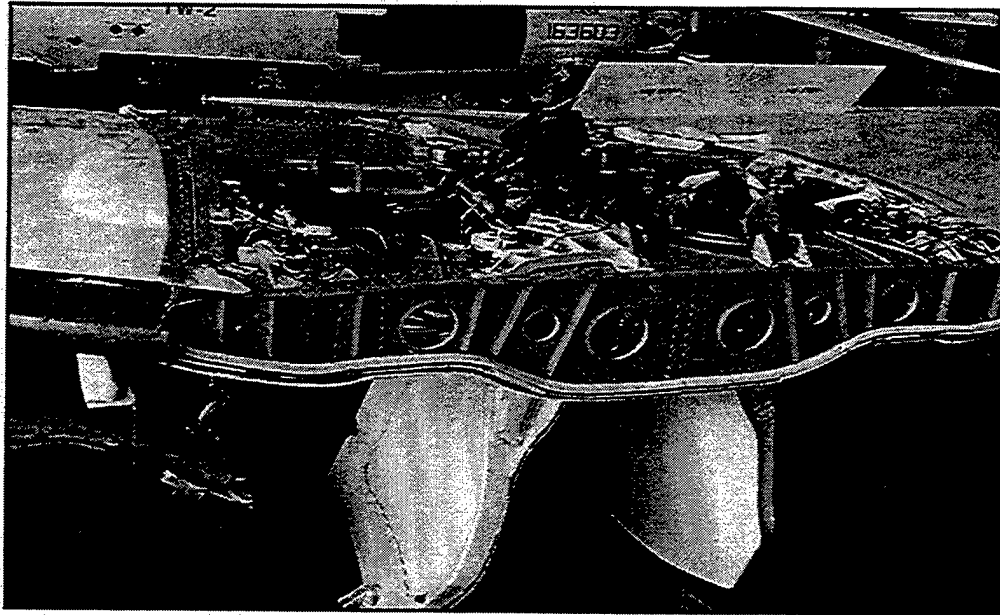


Figure 2. T-45 Wing Removed from Aircraft

### C. COST AND TIME REQUIREMENTS OF THE MODS

The various costs and manpower calculations used in this research will be based on the actual Boeing CLS Contract metrics taken from the Wage Determination data from the Meridian Mississippi area.[Ref: 11] For the purpose of this thesis, I will use the total

average man-hours listed in the ECP's to perform the Depot mods based on the applicable TD's required by the various aircraft.

**1. Manpower Estimation Technique**

In developing a proposal, the Contractor normally breaks the work into two separate man-hour categories; Indirect Labor and Direct Labor. The Indirect Labor categories encompass the manpower required to support and sustain the Mod Line such as supervisors and support role personnel. Based on past Boeing CLS contracts, labor categories for Indirect Labor are: Mod Line Manager, Liaison Engineer, Unit Managers, Product Support/Supply Support, Retrofit Planners, Quality Control (QC) Personnel and Tool and Parts Attendants. The Direct Labor is considered to be the manpower required to perform the actual CDFT modifications on the T-45 aircraft. These personnel include the Mechanics, Electricians, etc... [Ref: 8]

**a. Man-hour Development**

Determining the Indirect Labor man-hours is rather straightforward. Once the Labor categories are technically agreed upon a simple mathematical formula is applied to determine the total man-hours required. This formula is simply:

Standard Man-hours per Month \* Number of Months \* Number of Employees

As an example: Mod Line Manager     $162.75 * 12 \text{ Months} * 1 = 1,953$

## 2. Actual Manpower Requirements

Based on the existing mod line at NASK, the following list breaks down the specific manpower requirements and number of workers to stand up an additional mod line at NASM:

Tool Attendants	(3) Tool Attendants
Mechanics	(16) Structural Mechanics
	(4) Electrical Mechanics
Leads	(4) Aircraft Leads
Supervisors	(1) Day Shift
	(1) Night Shift
Engineering Support	(1) Liaison Engineer
	(2) Retrofit Planner

Under Boeing's current proposal, the CDFT at NASM would not require an additional Mod Line Manager. This position would be handled by the NASK manager and fall under his/her area of responsibility.

### *a. Man-power Wage Determination*

The economies of NASK and NASM are very similar. In calculating the total manpower cost of the additional CDFT mod line, wage determination data provided by the United States Department of Labor was used. If an exact match for a certain job description was not provided by the wage determination study, the closest proximity job

type was utilized. [Ref: 6, p. 204] Table 2.2 below lists the various CDFT mod line jobs and their associated hourly wage rates.

<u>Occupation</u>	<u>Hourly wage</u>	<u>Number required</u>
Tool attendants	16.42	3
Structural mechanics	19.14	16
Electrical mechanics	20.67	4
Lead mechanics	24.78	4
Supervisors	26.73	2
Liaison engineer	30.37	1
Retrofit engineer	30.37	2

Table 2.2. Wage Rates for CDFT Personnel

### 3. Facility and Tooling Costs

The proposed CDFT at NASM would additionally require capitol investment by both the Boeing Corporation as well as the Navy. The required hangar space and facilities are currently available at NASM and are in use by the O-level maintenance personnel in support of the T-45C's. The cost associated with the facilities and the associated overhead expenses will not be considered in this thesis as they are already covered under the existing CLS Contract as Government Furnished Equipment (GFE). [Ref: 3] The additional utility and facility maintenance costs are negligible in the scope of the overall proposal of the CDFT mod line.



**a. Navy Tooling Costs**

In accordance with the current CLS Contract between the Navy and Boeing, the Navy is responsible to provide all Government Furnished Equipment (GFE) peculiar to the T-45 program. [Ref: 9] This GFE includes all Support Equipment and specialized tooling required to complete the Depot mods. Appendix A. lists all of the Support Equipment the Navy would be responsible for providing. The total cost of this SE required to stand up the additional CDFT mod line totals \$ 1,254,000. [Ref: 11]

Additionally, the Navy must provide four Mechanic toolboxes at a cost of \$14,298 each for a total of \$57,195 to support the new CDFT mod line at NAS Meridian. Refer to appendix C. for a comprehensive cost breakdown of the Mechanic tool boxes. [Ref: 8]

**b. Boeing Tooling Costs**

The Boeing Corporation is responsible for providing the specialized general hand tools required to perform the Depot mods on the T-45. These consist of special hand tools such as rivet guns and torque wrenches used on a daily basis by the CDFT line mechanics. Appendix B. lists these specialized hand tools that Boeing is responsible for providing. The total cost of these hand tools to stand up the NASM CDFT line amounts to \$ 65,664. Boeing must also provide 15 Structural mechanics standard toolbox's at a cost of \$6,315 each. Refer to Appendix D. for a comprehensive price breakdown of these toolboxes.

In addition to the requirement for Boeing to provide the standard hand tools to set up the additional CDFT mod line, they are also required to furnish the materials to stock a Pre-Expended Bin (PRE-EX) of commonly used hardware items. These items include nuts, bolts, washers, rivets and other like materials. The total cost to the Boeing Corporation to establish the additional PEB is \$ 267,450. [Ref: 11]

#### **4. Flight Hour and Pilot Costs**

The other costs that must be considered in this decision to either standup the additional CDFT mod line or use the existing line at NASK is the cost of ferrying the aircraft between NASM and NASK. If the additional line is established, the Navy will save these costs.

##### ***a. Flight Hour Costs***

In determining the cost per Flight hour, the Program Office provides an average cost of \$ 2,210.00/hour to operate the T-45.[Ref: 3] This cost estimate from NAVAIR covers all operating costs associated with the aircraft system including: POL, CLS Manpower, O, I, and D level Supply Support, Ground training costs, spares replenishment, Mission Support Personnel and all other indirect support costs. For the purposes of this thesis, the flight time between NASM and NASK will be estimated at 1.3 hours total time. [Ref: 3] Calculating the flight time by the cost per hour we determine the total cost to fly a T-45 aircraft between the two bases as follows:

$\$2,210 \times 1.3 = \$2,873$  each way

The round trip cost then becomes \$5,746 per aircraft if the additional CDFT mod line is not stood up at NASM.

*c. Pilot Costs and PerDiem Expenses*

Because the scheduling of the T-45's are driven by AFC-217 and the 4300 flight hour requirement, the CDFT mod line at NASK will swap each aircraft inducted for mods on a one for one basis. The next scheduled aircraft will only be released to fly to NASK once notification is received that the aircraft currently in the CDFT has been completed all required mods and passed its functional check flight. By operating in this fashion, the need for the ferrying pilot to be paid any sort of PerDiem, return airfare, lodging and rental car expenses is eliminated; therefore, saving the Navy these additional costs. [Ref: 2]

In Chapter III, I will discuss the previously presented data in further detail. It will become clear from the data the true expenses of the different options addressed in this thesis.

### **III. COST-BENEFIT ANALYSIS**

#### **A. COST DRIVERS**

There are numerous cost drivers associated with the decision process to stand up the additional CDFT mod line at NASM. For the purposes of this thesis, I will focus on the primary costs covered previously in Chapter II. These cost drivers include:

- Manpower requirements
- Facility and Tooling costs
- Flight hour costs
- Aircraft readiness and availability

Each of these cost drivers will be discussed in this chapter and weighted appropriately in accordance with the principles of Cost-benefit analysis discussed in Chapter I.

#### **1. Manpower Requirements**

When considering the proposed additional mod line being established at NAS Meridian, the primary cost driver is the additional manpower required. The main benefit of expanding the existing mod line at NAS Kingsville is the savings on total manpower. By expanding the NASK mod line, we reduce the total additional manpower required

from 31 personnel to only six additional mechanics. [Ref: 8] Table 3.1 shows the breakdown of both the labor requirements and the total annual cost differences between the two proposals.

<b>Occupation</b>	<b>Wage/hr.</b>	<b># NASK</b>	<b># NASM</b>	<b>Annual cost NASK</b>	<b>Annual cost NASM</b>
Tool Attendants	\$16.42	0	3	\$0	\$96,205
Structural Mechanics	\$19.14	4	16	\$149,522	\$598,087
Electrical Mechanics	\$20.67	2	4	\$80,737	\$161,474
Lead Mechanics	\$24.78	0	4	\$0	\$193,581
Supervisors	\$26.73	0	2	\$0	\$104,407
Liaison Engineers	\$30.37	0	1	\$0	\$59,313
Retrofit Engineers	\$30.37	0	2	\$0	\$118,625
<b>TOTALS</b>		<b>6</b>	<b>32</b>	<b>\$230,259</b>	<b>\$1,331,692</b>

Table 3.1. Annual Manpower Cost Comparison

As shown in Table 3.1, the total annual cost for manpower is calculated at \$230,259 for NAS Kingsville to increase their existing capacity to accommodate the additional aircraft into the CDFT mod line. The manpower cost for standing up the additional CDFT mod line as NAS Meridian amounts to \$1,331,692 annually. The large cost savings in manpower for the NAS Kingsville option can be attributed to centralization of the manpower at a single site and the support personnel that are currently in place.

## 2. Facility and Tooling Costs

The tooling cost comparisons identify the bare minimums required to stand up the additional mod line at NAS Meridian. Additionally, the tools required for NAS Kingsville are listed to accommodate the additional technicians required to expand their existing mod line capacity. Table 3.2 is a breakdown of all required tooling and Support Equipment to support the two individual proposals.

<b>Item</b>	<b>Cost NASM</b>	<b>Cost NASK</b>
Support Equipment	\$1,254,000	\$0
Special hand tools	\$65,664	\$0
Structure tool box	\$94,739	\$25,263
Mechanics tool box	\$57,195	\$14,298
Pre-ex items	\$267,450	\$0
<b>Total Tooling Costs</b>	<b>\$1,739,048</b>	<b>\$39,561</b>

Table 3.2. Tooling Cost Comparison

It is obvious that the costs for setting up a new CDFT mod line at NAS Meridian will account for a large percentage of the capital investment required. The specialized SE required to stand up the additional mod line at NAS Meridian represents the largest tooling cost. The entire SE package, specialized hand tools and PEB items have already been procured and are in place at NAS Kingsville resulting in saving these additional costs. [Ref: 4]

### **3. Flight Hour Costs**

Flight hour cost data is used to determine the cost of ferrying the T-45 aircraft from NAS Meridian to NAS Kingsville in the event the proposed new CDFT mod line is forgone in lieu of the option to expand capacity at the existing CDFT mod line site. As mentioned in Chapter II, the total roundtrip cost associated with ferrying the T-45's from NAS Meridian to NAS Kingsville are estimated at \$5,746 per aircraft.

### **4. Aircraft Availability and Readiness**

Aircraft availability and readiness are very difficult to quantify in a Cost-benefit analysis; however, they are important and deserve consideration. [Ref: 5,p. 168] To properly address the issue of readiness gained by choosing to stand up the additional CDFT mod line at NAS Meridian, we must first assign a weighting factor to the readiness. Since this thesis deals in costs represented in dollars, readiness will also be estimated in dollars. An estimated readiness figure of \$10,000 will be used for each day lost by ferrying the aircraft to and from NAS Kingsville. In order to fairly represent this lost readiness I must make a couple of assumptions.

- A total of two days of readiness will be forgone by ferrying aircraft from NAS Meridian to NAS Kingsville.
- One day of readiness is valued at approximately \$10,000 based on Student Pilot training costs per day and the associated expenses including one additional day in the training pipeline.

Utilizing these assumptions, I can then compute the value of the readiness gained by choosing to standup the new CDFT mod line at NAS Meridian. Table 3.3 lists the proposed induction schedule of the T-45C's at NASM for calendar year 2002 and the readiness figures used in this cost-benefit analysis. The total annual readiness savings for the NASM aircraft are 60 training days calculated to be worth a total of \$600,000.

Table 3.3. Readiness Calculations for Calendar Year 2002

<u>Aircraft</u>	<u>Scheduled induction date</u>	<u>Lost days</u>	<u>Readiness factor</u>
AO-25	1/9/01	2	\$20,000
AO-35	1/23/01	2	\$20,000
AO-18	4/11/01	2	\$20,000
AO-24	4/13/01	2	\$20,000
AO-09	4/17/01	2	\$20,000
AO-48	4/23/01	2	\$20,000
AO-45	5/2/01	2	\$20,000
AO-19	5/11/01	2	\$20,000
AO-50	6/29/01	2	\$20,000
AO-49	7/4/01	2	\$20,000
AO-33	7/22/01	2	\$20,000
AO-58	8/1/01	2	\$20,000
AO-10	8/12/01	2	\$20,000
AO-62	8/13/01	2	\$20,000
AO-32	8/18/01	2	\$20,000
AO-56	8/18/01	2	\$20,000
AO-57	8/19/01	2	\$20,000
AO-44	8/30/01	2	\$20,000
AO-46	9/1/01	2	\$20,000
AO-55	9/1/01	2	\$20,000



AO-30	9/8/01	2	\$20,000
AO-28	9/12/01	2	\$20,000
AO-39	9/12/01	2	\$20,000
AO-60	9/19/01	2	\$20,000
AO-20	10/9/01	2	\$20,000
AO-38	10/15/01	2	\$20,000
AO-43	11/14/01	2	\$20,000
AO-13	11/29/01	2	\$20,000
AO-54	12/20/01	2	\$20,000
AO-16	12/31/01	2	\$20,000
	<b>TOTALS</b>	<b>60</b>	<b>\$600,000</b>

## B. DRAWBACKS

There are several minor drawbacks involved in not standing up the additional CDFT at NAS Meridian. The primary one is the political and economic impact. As with any decisions involving the discretionary portion of the budget, the impact of adding additional jobs to a congressional district can have far reaching political ramifications. [Ref: 7, p. 133] If the decision is made to standup the new CDFT mod line at NAS Meridian, the resulting 31 full time jobs created will help the local community's economy by providing these additional jobs and revenue to the area. The same is true if the mods are performed at NAS Kingsville, but to a much smaller extent. Either way, there will be only one community benefiting from the CDFT mod line decision. The loser gains nothing and is considered a drawback in this thesis.

The other drawback in reaching a consensus on the mod line location decision are the hidden costs incurred by standing up the additional mod line. These include additional shipping requirements to supply part kits to two separate sites, additional publications and ECP drawings required, and other coordination and communication issues that can complicate the existing CDFT mod line operations. [Ref: 8] The cost of these problems may be minimal; however, they do deserve mention as additional factors in this decision process.

### **C. BENIFITS OF CONSOLIDATION**

The primary savings in terms of consolidation come from the savings in tooling costs and manpower. By simply expanding the operations at NAS Kingsville from the existing four mod line slots to six, we are able to minimize the costs of Support Equipment and additional specialized tools for the NAS Kingsville location. In addition, some of the specialized jigs, test equipment and wing stands for the T-45 aircraft were procured under the initial support contract and could require extensive lead times to obtain the additional equipment for the NAS Meridians mod line. On the following page , Figure 3 shows one of the specialty wing stands designed for wing removal during the CDFT mod line procedure.

Manpower savings due to consolidation are also quite extensive. The primary positions that are eliminated are the support personnel, engineering personnel, and the supervisory positions. Although it is assumed that additional skilled personnel are

available for hire in the Meridian area, there is no guarantee that this is the case. In fact, it may be necessary to attract these skilled personnel by using increased wages or bonuses further driving costs higher.

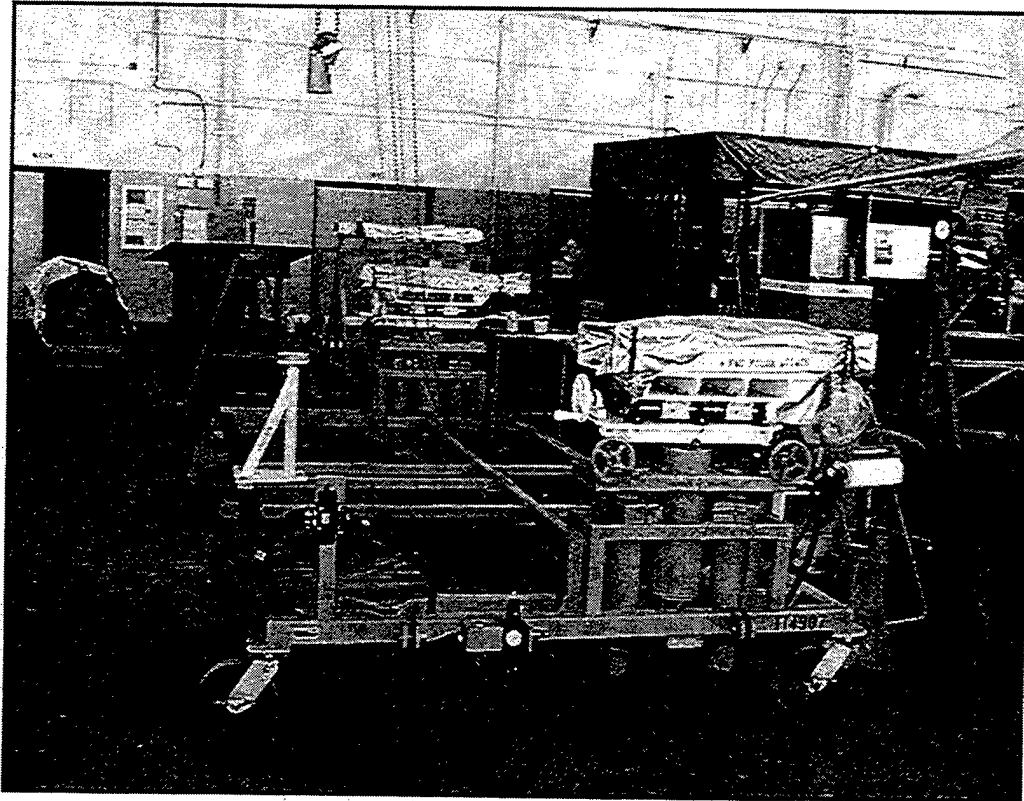


Figure 3. Wing Stand for T-45 Wing Removal

#### D. ANALYSIS

Throughout this thesis, I have concentrated on the various costs and benefits involved in making the proper choice concerning the location of the CDFT mod line for the T-45C aircraft. These various costs can be best separated into two separate categories. One time costs and annual operating costs.

## 1. One Time Costs

As shown in Table 3.4, NAS Kingsville's one time up front costs for tooling totals \$53,859. This represents the additional toolboxes required to support the six new mechanics who would be needed to expand the mod line. Conversely, the total tooling costs to standup the additional line at NAS Meridian would amount to \$1,739,048. This large cost differential is represented largely in part due to the unique Support Equipment required to support the Depot modifications on the T-45 aircraft. Currently, the Navy's total inventory of this peculiar Support Equipment is being utilized at the NAS Kingsville mod line and can not be shared between two separate sites. [Ref: 3]

<u>Item</u>	<u>cost NASM</u>	<u>Cost NASK</u>
Support Equipment	\$1,254,000	\$0
Special hand tools	\$65,664	\$0
Structure tool box	\$94,739	\$25,263
Mechanics tool box	\$57,195	\$28,596
Pre-ex items	\$267,450	\$0
<b>Total Tooling Costs</b>	<b>\$1,739,048</b>	<b>\$53,859</b>

Table 3.4. One Time Costs

## 2. Annual Costs

To analyze the annual costs associated with the CDFT mod line decision I have summarized the three primary annual costs. The largest of these costs is the manpower required to standup the additional CDFT mod line at NAS Meridian. As mentioned earlier, as a benefit of consolidation, the manpower savings for NAS Kingsville represent cost savings of \$1,101,433 in the first year. These cost savings are partially offset by the

cost to ferry the aircraft back and forth to the NAS Kingsville site and the readiness factor estimate derived from non-availability of the training aircraft. Table 3.5 below shows the breakdown of these costs:

Item	Cost NASM	Cost NASK
Manpower	\$1,331,692	\$230,259
Flight Hour Costs	\$0	\$172,380
Readiness Factor	\$0	\$600,000
<b>Total Tooling Costs</b>	<b>\$1,331,692</b>	<b>\$1,002,639</b>

Table 3.5. Annual Costs.

The total annual savings is calculated to be \$329,053 each year if the decision is made to expand the current CDFT mod line at the NAS Kingsville site.

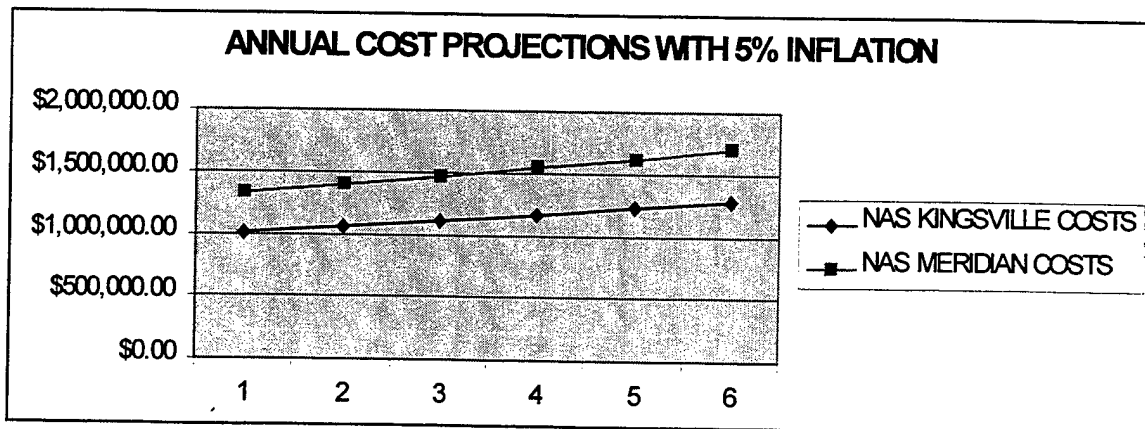


Figure 4. Annual Cost Projections Assuming 5 % Inflation

As shown above in Figure 4, the annual cost of the CDFT mod line operations will increase throughout the life of the contract. For simplicity, I chose a modest inflationary rate of five percent annual inflation. If the NAS Meridian option is chosen, the annual operating costs would increase from current year levels of 1.3 million dollars

per year to over 1.7 million after year six. For the NAS Kingsville mod line the costs would increase from 1.0 million to 1.27 million for the life of the contract. When calculated for the entire contract period, the total annual operating cost savings by keeping the existing mod line at NAS Kingsville is estimated to be \$2,238,190 each year. When this figure is taken in conjunction with the one time cost figure for initial tooling of \$1,739,048 the total differential cost to standup the new mod line at NAS Meridian is \$3,977,238.

As shown throughout this chapter, the cost data overwhelmingly favors expanding the CDFT mod line operations at the NAS Kingsville site. The decision process and other pertinent factors will be discussed further in Chapter IV of this thesis.

THIS PAGE INTENTIONALLY LEFT BLANK

#### IV. CONCLUSIONS AND RECOMMENDATIONS

This thesis studied the costs and benefits involved in the decision process involved with performing the depot level modifications on the T-45C aircraft located at NAS Meridian Mississippi. The data and supporting documentation provides ample material to draw the necessary conclusions pertinent to this thesis and its objectives. This chapter begins with conclusions and recommendations followed by issues that are valid for further research.

##### A. CONCLUSIONS

1. **The choice to expand the CDFT mod line at NAS Kingsville will provide a five-year overall savings of \$3,977,238.**

This savings is attributable to the combined savings of consolidation at the NAS Kingsville facility, the savings achieved by more efficient use of manpower assets, and the elimination of the capital expenditures required to procure the necessary tooling and PEB items required to accomplish these depot level mods. Although the T-45C's at NAS Meridian would have to be ferried to the NAS Kingsville site, the costs are negated by the overall savings of manpower and tooling. The readiness lost by ferrying the aircraft will be a consideration for the future. As new T-45C's are delivered monthly from the manufacturer to NAS Meridian, the aircraft availability will become less of a factor in this decision process. [Ref: 9]



- 2. Expanding the CDFT mod line at NAS Kingsville will maximize the coordination and control required during the performance of the depot level mods.**

By keeping the entire mod line operation in one location (the NAS Kingsville site) we mitigate any risks involved that deal with coordination and communication within the Boeing organization and the Program Office at NAVAIR. The mod line manager would be on site the entire time instead of traveling between the two sites to ensure the operation is running smoothly. Additionally, NAVAIR would only be dealing with one central point of contact instead of trying to collect vital information from two separate locations.

Another coordination issue involved with the expansion of the mod line at NAS Kingsville is the reduction in the technical publications, ECP's, technical drawings etc... that are needed to support an operational depot mod line. The expenses involved in reproducing these documents for the additional mod line were not factored into this thesis; however, they would be an added expense and a coordination challenge to keep up with the necessary maintenance and changes these documents require. If the latest changes and directives are not complied with totally, the results could have very far reaching safety considerations to the aircraft and the Student Naval Aviators flying them. It is imperative that all documents related to these ECP's and AFC's be given the proper attention to detail and document control.

- 3. The socioeconomic and political considerations have little impact on the overall decision process of the CDFT mod line location.**

The implications surrounding the decision process for the T-45C CDFT mod line should be strictly based upon monetary considerations. The value to the local community of the 31 additional jobs that would be gained at NAS Meridian is far outweighed by the capital costs involved for the tooling and the wages throughout the years of projected operations. The Navy would be best served by keeping one CDFT mod line where they could exercise maximum coordination and control of the operation.

Another concern in standing up an additional mod line at NAS Meridian is the ability to find qualified engineers and mechanics from the local job market. As mentioned in Chapter III, the possibility exists that Boeing Corporation may be forced to offer bonuses and/or higher wages to attract the necessary qualified personnel to perform these complex mods on the T-45C aircraft and subsequently driving the cost of the CLS contract higher. Additionally, there is the learning curve involved with performing these modifications on the aircraft. The CDFT mod line at NAS Kingsville has been successfully performing these 35 AFC's for over two years. They have been able to average 40 days to complete all of the required AFC's. [Ref: 8] To standup an additional CDFT mod line that hasn't had the experience necessary to perform these modifications in the time allowed by the existing CLS Contract will increase risk. (To the Boeing Corporation in terms of overall expense and the Navy in terms of time lost for each aircraft extended in the mod line pipeline beyond the number of hours contracted to complete the scheduled modifications.)

The political ramifications that were mentioned in Chapter III are a valid concern in this thesis. The Congressional District that gains the additional jobs will also be looked upon favorably by the voting taxpayers. This should not come into play during this decision process; however, past history dictates that this political element sometimes overrides all other considerations including fiscal discipline. If all other considerations were kept equal and no consideration was given to the political aspect of the CDFT mod line decision, the choice would be simple.

## **B. RECOMMENDATIONS**

The recommendations for the proposed plan of action in this thesis are based solely upon the empirical cost data contained in Chapter III. The recommendations are as follows:

- **Expand the existing CDFT mod line at NAS Kingsville Texas from the existing four line slots to six. This increase in capacity will give the NASK site the ability to perform the mods on both the T-45A's located at NASK as well as the mods required on the T-45C's located at NAS Meridian.**
- **Ensure that the CDFT mod line at NASK plans, schedules and inducts all of the NASM aircraft on a one for one basis. This can easily be accomplished provided the induction aircraft is not released to fly to NASK until the replacement**

**aircraft has passed the functional check flight required at completion of all its modifications.**

- **When possible, complete any scheduled depot IMP level maintenance in conjunction with the CDFT mods. Certain maintenance requirements on the T-45 aircraft will coincide with their induction at the CDFT mod line. Performing applicable inspections while the aircraft is undergoing the CDFT mods could reduce many man-hours of labor. (e.g., a wing-off inspection requirement in the IMP program)**

The above recommendations, if properly implemented, will keep the cost of the overall CLS Contract minimized while maximizing the benefit gained by consolidation and efficiency of operations. The existing CDFT mod line has consistently produced an extremely high quality product. Running at near zero rework requirements, Boeing has managed to stay on, or ahead, of schedule throughout the execution of the current CLS Contract. By expanding the NAS Kingsville mod line, they can continue this performance.

### **C. FURTHER RESEARCH**

In discussing further research with regards to this thesis, I will concentrate solely on the aspect of future possibilities for CLS implementation. CLS has worked very well for the T-45 program overall. This can be attributed to the relative small size of the

program and the operating environment. Training Commands lack the "sense of urgency" experienced in fleet aviation operations. The possibilities for implementing CLS more extensively in the fleet today might be possible in some of the various Readiness Squadrons. A Feasibility study would need to be completed on this subject prior to any decisions being made.

**APPENDIX A. NAVY SUPPORT EQUIPMENT COSTS**

<b>PART NUMBER</b>	<b>NOMENCLATURE</b>	<b>QTY</b>	<b>PRICE</b>	<b>TOTAL</b>
A273190	Adaptor, Fuel Drain	1	\$274.00	\$274.00
CP30117	Sling, ECU Rear	1	\$2,520.00	\$2,520.00
CP30119	Adaptor, Sling ECU Front	1	\$1,485.00	\$1,485.00
CP30120/2	Sling, ECU	1	\$2,414.00	\$2,414.00
CP30162/3	Stand, Transport	1	\$14,631.00	\$14,631.00
CP30164/2	Stand, ECU Service	1	\$12,763.00	\$12,763.00
CP30165/2	Cart, ECU Install	1	\$3,545.00	\$3,545.00
CP30166	Adaptor, Hoist Serv. Stand	1	\$553.00	\$553.00
DA000A6010-403TD	Wing Sling	1	\$5,760.00	\$5,760.00
DA132A0206-1	Rigging Set, Flight Control	1	\$31,046.00	\$31,046.00
DA132A0252-1	Simulator Target WOW	3	\$634.00	\$1,902.00
DA132A0254-1	Adapter Kit, Landing Gear	1	\$9,777.00	\$9,777.00
DA132A0262-501	Dolly, Wing Rem/Inst.	1	\$106,464.00	\$106,464.00
DA132A0267-1	Set, Adaptor TDR Cable	1	\$6,647.00	\$6,647.00
DA132A0268-1	Support, Fwd Fuselage	4	\$8,810.00	\$35,240.00
DA132A0285-1	Support, Aft Fuselage	4	\$11,000.00	\$44,000.00
DA132A0302-1	Support, Wing Frame 9	4	\$4,444.75	\$17,779.00
DA132A0335-1	Bar, Nose Steering	1	\$3,255.00	\$3,255.00
DA132M0343-1	Adaptor, Brake Bleed	4	\$2,650.00	\$10,600.00
DA132M0433-1	Test Set, Fuel System	1	\$71,069.00	\$71,069.00
DA132M0434-1	Adapter, Fuel Drain	1	\$2,383.00	\$2,383.00
DA132M0437-1	NWS Breakout Box	1	\$1,128.00	\$1,128.00
DA132M0438-1	Test Set, YAW Damper Sys	1	\$131,500.00	\$131,500.00
DA132M0440-3	Pin, Safety, Canopy Strut	1	\$396.00	\$396.00
DA132M0445-1	Bleed/Sof Test Adapter	1	\$4,163.00	\$4,163.00
DA132M0543-1	Adaptor, Fuel Drain Valve	1	\$3,403.00	\$3,403.00
DA132M0722-1	Guard Debris, Port	1	\$8,354.00	\$8,354.00
DA132M0723-1	Guard Debris, Starboard	1	\$8,354.00	\$8,354.00
DISGS458	Support Wing	8	\$4,382.00	\$35,056.00
DMC896	Kit, Connector Service	4	\$4,709.00	\$18,836.00
ES8000/39B1	ECA Test Set (ECATS)	1	\$99,230.00	\$99,230.00
HU32608/2	Tool Adjusting SIFCU	1	\$327.00	\$327.00
H8571-C	Cable Adapter	1	\$22.30	\$22.30
KB132K0059-002	R.A.T. Actuator Lock	4	\$756.00	\$3,024.00
KB132K0492-000	Kit, Hoist, Engine Change	1	\$61,985.00	\$61,985.00
KB132K0562-000	Tool, Fuel Tank Drain	1	\$1,300.00	\$1,300.00
KB132K0685-000	Key, Defuel	1	\$173.92	\$173.92
KB132K0906-000	Gage, Movement, Ail/Flap	2	\$5,977.00	\$11,954.00
KB132K0925-000	Adaptor, Inflation Rsvr	1	\$566.00	\$566.00

KB132L0001-000	Sling, Vertical Stab	1	\$1,803.00	\$1,803.00
KB132L0015-000	Sling, Canopy	1	\$4,050.00	\$4,050.00
LA3ON-CA	Personal Printer	1	\$340.00	\$340.00
SAA1005	Test Set, Spin Up	1	\$21,348.00	\$21,348.00
SAO10341	Adaptor, Priming Brakes	2	\$5,110.00	\$10,220.00
SAO10451	Hose Assembly	1	\$800.00	\$800.00
SD7441	Pad, Jacking	12	\$130.73	\$1,568.76
SMH1308/8	Stand, Engine Parking	4	\$2,272.00	\$9,088.00
T45-612	Kit, Air Data Accessories	1	\$2,825.00	\$2,825.00
UT693	Tool, Ground Idle Adjust	1	\$201.00	\$201.00
VL1216A	Platform, Cockpit Access	4	\$2,785.00	\$11,140.00
0503KQC-01	Test Set, Fuel Qty Ind.	1	\$12,784.00	\$12,784.00
10591B	Cable, Mic/Tel.	4	\$327.00	\$1,308.00
10638G	Cable, Cockpit Intercom	6	\$475.00	\$2,850.00
10954A	Headset, Electrical	6	\$121.44	\$728.64
1107983	Pin, Throttle Rig	1	\$32.00	\$32.00
2001006	Test Set, Tacan Ramp	1	\$18,010.00	\$18,010.00
622-2211-002	Ramp Test Set, VOR/ILS	1	\$66,375.00	\$66,375.00
8018-012	Jack, 5 Ton Tripod	12	\$5,920.00	\$71,040.00
MD-A-32115	Mobile Diesel Power Unit	1	\$36,722.00	\$36,722.00
68A4J1000-1	Diesel Hyd Test Stand	1	\$25,450.00	\$25,450.00
9780-0315	Electrical Hyd Test Stand	1	\$70,102.00	\$70,102.00
	Overhead Crane	1	\$75,000.00	\$75,000.00
8878-010	Crane, Hanger Deck	1	\$36,551.00	\$36,551.00
	<b>TOTAL COST</b>			<b>\$1,254,215.62</b>

**APPENDIX B. BOEING SPECIALIZED TOOLING COSTS**

<b>PART NUMBER</b>	<b>NOMENCLATURE</b>	<b>QTY</b>	<b>PRICE</b>	<b>TOTAL</b>
RH10	Rivet Squeezers	2	\$325.00	\$650.00
RH15	Rivet Squeezers	3	\$350.00	\$1,050.00
PSMT1665-1	Hand Rivet Squeezers	3	\$110.00	\$330.00
PSMT1055-1	Hand Rivet Squeezers	2	\$125.00	\$250.00
	Squeeze Sets	2	\$135.00	\$270.00
PD-25	Huck Rivet Gun	1	\$2,650.00	\$2,650.00
G784	Rivet Gun	1	\$2,250.00	\$2,250.00
G704B-40SR	Rivet Gun	1	\$2,300.00	\$2,300.00
U-0007-82	Rivet Gun	1	\$2,095.00	\$2,095.00
RV30GD	Rivet Gun	2	\$2,175.00	\$4,350.00
RD	Rivet Gun (avdel)	4	\$1,250.00	\$5,000.00
RV882-3	3/32 Rivet Puller,Angle	3	\$195.00	\$585.00
RV882-4	1/8 Rivet Puller,Angle	3	\$195.00	\$585.00
RV882A-5	5/32 Rivet Puller,Angle	3	\$195.00	\$585.00
RV882A-6	3/16 Rivet Puller,Angle	3	\$195.00	\$585.00
RV872-4	1/8 Rivet Puller,Offset	3	\$195.00	\$585.00
RV872-3	3/32 Rivet Puller,Offset	3	\$195.00	\$585.00
RV872-5	5/32 Rivet Puller,Offset	3	\$195.00	\$585.00
RV872-6	3/16 Rivet Puller,Offset	3	\$195.00	\$585.00
RV812A-4	1/8 Rivet Puller,Straight	3	\$195.00	\$585.00
RV812A-6	3/16 Rivet Puller,Straight	3	\$195.00	\$585.00
RV812A-3	3/32 Rivet Puller,Straight	3	\$195.00	\$585.00
RV812A-5	5/32 Rivet Puller,Straight	3	\$195.00	\$585.00
	Jobolt Puller Set	2	\$500.00	\$1,000.00
JA-10	Pneumatic Jobolt Gun	2	\$325.00	\$650.00
RV36GA	Hand Rivet Gun	2	\$120.00	\$240.00
RVA365-6	6" Olympic Extension	2	\$85.00	\$170.00
JD15	Drill Motor	2	\$250.00	\$500.00
AA02	Drill Motor	2	\$250.00	\$500.00
KB10	Pancake Drill	2	\$325.00	\$650.00
RA30	Pneumatic Rivet Gun	1	\$175.00	\$175.00
RA35	Pneumatic Rivet Gun	1	\$175.00	\$175.00
AF01	90 Deg. Drill Motor	2	\$325.00	\$650.00
AF05	90 Deg. Drill Motor	2	\$325.00	\$650.00
AA02	Drill Motor	2	\$250.00	\$500.00
AA05	Drill Motor	4	\$250.00	\$1,000.00
AA10	Drill Motor	4	\$250.00	\$1,000.00
AJ10	90 Deg. Drill Motor	1	\$325.00	\$325.00
MA10	Rivet Shaver	2	\$225.00	\$450.00
AD10	Drill Motor	4	\$250.00	\$1,000.00



WC20	¼" Air Ratchet	6	\$125.00	\$750.00
TG50	Nut Runner, 50 in lbs	1	\$240.00	\$240.00
TG25	Nut Runner, 25 in lbs	3	\$240.00	\$720.00
LK10	Hi-Loc Installation Gun	3	\$325.00	\$975.00
LL10	Hi-Loc Installation Gun	3	\$325.00	\$975.00
	Protrusion Guages	1	\$45.00	\$45.00
	Torque Tip Set	1	\$95.00	\$95.00
	Hi-Torque Socket Adapters	1	\$200.00	\$200.00
	Impact Tool	2	\$65.00	\$130.00
	Bushing Boards	3	\$150.00	\$450.00
ILED12-545-100	Coal Working Tool	2	\$2,500.00	\$5,000.00
TD216G5-32	Coal Working Go-No-Gage	1	\$85.00	\$85.00
	Hard Hats	4	\$25.00	\$100.00
DB29A	Drill Index, 29pc	6	\$145.00	\$870.00
DB29B	Drill Index, 29pc	2	\$145.00	\$290.00
TD383K2-1	Drill Blocks	4	\$25.00	\$100.00
	Align-A-Drill	6	\$65.00	\$390.00
UW1640	1 1/4" Special Socket	1	\$45.00	\$45.00
EX-751-B3/4	½"- 3/4" Socket Adapter	1	\$25.00	\$25.00
95460	Dynaswivel	3	\$40.00	\$120.00
HW202	Hand Ratchet Handle	1	\$35.00	\$35.00
PSMT3096-3	¼" "T" Wrench	1	\$20.00	\$20.00
	Bastard Rat Tail File	3	\$10.00	\$30.00
650	6" Prybar	1	\$15.00	\$15.00
1250	12" Prybar	1	\$25.00	\$25.00
RWB100-40	Wrench	1	\$25.00	\$25.00
482	Spanner Wrench	1	\$45.00	\$45.00
472	Spanner Wrench	1	\$45.00	\$45.00
	Hose Connection "T" Shape	1	\$10.00	\$10.00
T125-9	Extension	1	\$20.00	\$20.00
CSA12B	Scraper	2	\$25.00	\$50.00
AT501R	Rivet Cutter	3	\$85.00	\$255.00
	Jack Pads	12	\$0.00	\$0.00
311	Nibbler	1	\$25.00	\$25.00
KB132K0418-000	Fuel Caps	4	\$0.00	\$0.00
	Rivet Sets	10	\$26.00	\$260.00
	Offset Rivet Sets	6	\$35.00	\$210.00
AT750J-21	Bucking Bar	1	\$24.00	\$24.00
AT728	Bucking Bar	1	\$24.00	\$24.00
R3	Chisel	2	\$15.00	\$30.00
	Brass Punch	1	\$25.00	\$25.00
	Pry Bar	1	\$0.00	\$0.00
	Offset Bucking Bars	6	\$30.00	\$180.00
	Alignment Block	2	\$0.00	\$0.00
	Putty Knife	1	\$8.00	\$8.00

	Clamp Lamp	2	\$0.00	\$0.00
	Fuel Pump w/hose	1	\$0.00	\$0.00
	Gas Mask w/hose	1	\$25.00	\$25.00
	Faceshield	1	\$10.00	\$10.00
40910C94	Drill Motor	1	\$210.00	\$210.00
42062895	Drill Motor	1	\$210.00	\$210.00
	Tin Snips, Green	1	\$12.00	\$12.00
	Tin Snips, Yellow	1	\$12.00	\$12.00
	Tin Snips, Red	1	\$12.00	\$12.00
PSMT1326-70	Anchor Nut Jig	1	\$15.00	\$15.00
	Hacksaws	3	\$15.00	\$45.00
155-903	5/16"- 6" Telescoping Guages	1	\$65.00	\$65.00
186-901	Radius Guage Set	1	\$45.00	\$45.00
YA-207	Nut Holder	2	\$25.00	\$50.00
	Air Nozzle w/hose	1	\$19.00	\$19.00
	Small Hole Guage Set	1	\$35.00	\$35.00
	.5000-.625" Hole Guage	1	\$45.00	\$45.00
TDTDM500	Tap and Die Set	1	\$275.00	\$275.00
RTD42	Re-Threading Set	1	\$125.00	\$125.00
368-927	Hole Micrometer Set	1	\$95.00	\$95.00
	Hydraulic Deservicing Hose	1	\$0.00	\$0.00
404	6" C-Clamps	4	\$10.00	\$40.00
556	3" C-Clamp	9	\$6.00	\$54.00
44	C-Clamp	1	\$12.00	\$12.00
54	C-Clamp	1	\$12.00	\$12.00
55	C-Clamp	1	\$15.00	\$15.00
MT1	2" C-Clamp	12	\$5.00	\$60.00
11SP	Vise Grip C-Clamps	4	\$20.00	\$80.00
	Bushing Clamp	1	\$8.00	\$8.00
406	6" C-Clamp	4	\$10.00	\$40.00
24SP	Vise Clamps	2	\$20.00	\$40.00
	Electrician Tool Pouches	4	\$245.00	\$980.00
	Backshell Tool	3	\$150.00	\$450.00
4002	Wire Bander	1	\$65.00	\$65.00
MS90387-2	Tie-Wrap Gun	1	\$65.00	\$65.00
MS90387-1	Tie-Wrap Gun	1	\$65.00	\$65.00
	Proximity Switches	3	\$0.00	\$0.00
	Needle Nose Pliers	1	\$20.00	\$20.00
	Wire Stripper	1	\$45.00	\$45.00
	Solder Stations	2	\$0.00	\$0.00
	Safety Wire Screwdrivers	3	\$18.00	\$54.00
	Safety Wire Pliers	2	\$65.00	\$130.00
	Fuel Cell Flashlights	3	\$25.00	\$75.00
ECU-250A	Drop Lights	1	\$40.00	\$40.00
4V363	Drop Lights	2	\$35.00	\$70.00

	VOM Multimeter w/leads&clips	1	\$85.00	\$85.00
	Fluke 87 Multimeter	1	\$125.00	\$125.00
	Digital Multimeters	3	\$100.00	\$300.00
HT-900B	Heat Gun	1	\$65.00	\$65.00
HT71002	Heat Gun	1	\$65.00	\$65.00
	Safety Gloves	3	\$12.00	\$36.00
	Proximity Switch Tester	1	\$0.00	\$0.00
	Alphabet Stamp Set	1	\$45.00	\$45.00
	Numerical Stamp Set	1	\$45.00	\$45.00
	1 13/16' Socket 3/4"Drive	2	\$35.00	\$70.00
	2" Socket 3/4"Drive	1	\$45.00	\$45.00
	1 1/4" Socket 1/2"Drive	1	\$40.00	\$40.00
	41mm Socket 3/4"Drive	1	\$50.00	\$50.00
	1 11/16" Socket 3/4"Drive	1	\$35.00	\$35.00
	27mm Socket 3/8"Drive	1	\$35.00	\$35.00
	1 7/16" Socket	1	\$35.00	\$35.00
	1 1/2" Socket 3/8"Drive	1	\$35.00	\$35.00
	1 3/16" Socket 1/2"Drive	1	\$35.00	\$35.00
	1 3/16" Crowsfoot 3/8"Drive	1	\$40.00	\$40.00
	1 1/4" Crowsfoot 3/8"Drive	1	\$40.00	\$40.00
	1 3/8" Crowsfoot	1	\$40.00	\$40.00
	1 5/8" Crowsfoot 3/8"Drive	1	\$40.00	\$40.00
	Spanner Wrench 3/8"Drive	2	\$25.00	\$50.00
	1/4" Hi-loc Ratchet	1	\$55.00	\$55.00
	5.5mm Combo Wrench	1	\$25.00	\$25.00
	Extension 3/4"Drive	1	\$20.00	\$20.00
	1 13/16" Combo Wrench	1	\$35.00	\$35.00
STM8	Socket 1/4"Drive	2	\$15.00	\$30.00
TM1	Adapter	2	\$25.00	\$50.00
43P	Cam Locks	1	\$45.00	\$45.00
	Bonney Wrench Set	2	\$160.00	\$320.00
	Pocket Telecopic Magnet	4	\$10.00	\$40.00
	Vernier Caliper	1	\$95.00	\$95.00
	Digital Caliper	2	\$125.00	\$250.00
	Depth Micrometer	2	\$110.00	\$220.00
	Torque Wrenches 30-200 in.lbs	2	\$140.00	\$280.00
	Torque Wrench 0-75 ft.lbs	1	\$85.00	\$85.00
	Torque Wrench 10-100 ft.lbs	1	\$110.00	\$110.00
HG501A	Heat Gun	1	\$65.00	\$65.00
	Ink Pad w/Stamp (Black Ink)	1	\$5.00	\$5.00
	Ink Pad w/Stamp (White Ink)	1	\$5.00	\$5.00
GA236-A	Electric Engraver	1	\$12.00	\$12.00
	Creepers, Seat	5	\$75.00	\$375.00
	Cockpit Shelf	4	\$25.00	\$100.00
T97002	Hydraulic Sample Kit	1		\$0.00

S2H	Strap Wrench	1	\$40.00	\$40.00
	Bung Wrench	1	\$35.00	\$35.00
	Triple Beam Scale	1	\$75.00	\$75.00
	Ground Idle Adjustment Tool	1		\$0.00
	Caulking Gun	1	\$35.00	\$35.00
	Pneumatic Sealant Gun	3	\$85.00	\$255.00
	Hand Sealant Gun	1	\$50.00	\$50.00
DMC-896	Daniels Kit	4	\$750.00	\$3,000.00
	Air Data Accessories Kit	1		\$0.00
	TACAN Ramp Test Set	1		\$0.00
TB50	Torque Guns	9	\$285.00	\$2,565.00
JB10	Jobolt Gun	2	\$285.00	\$570.00
	Nose Wheel Steering B/O Box	1		\$0.00
DA132M0440-3	Canopy Safety Pin	1		\$0.00
HU32608/2RR	SIFCU Adjusting Tool	1		\$0.00
AC10	Drill Motor	1	\$210.00	\$210.00
	Wheel Spin Up Test Set	1		\$0.00
	Fuel Quantity Test Set	1		\$0.00
	Vise Grip Pliers	8	\$20.00	\$160.00
P-1200X4X45	C-Clamps	6	\$25.00	\$150.00
P-800	C-Clamps	4	\$25.00	\$100.00
P-1200X4	C-Clamps	6	\$25.00	\$150.00
P-1200X8	C-Clamp	6	\$25.00	\$150.00
	VOR/ILS Test Set	1		\$0.00
	Head Sets w/Long Cords	2		\$0.00
	Head Sets w/Short Cords	4		\$0.00
			<b>TOTAL COST</b>	<b>\$65,664.00</b>

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX C. MECHANICS TOOL BOX REQUIREMENTS.**

<b>NOMENCLATURE</b>	<b>PART NUMBER</b>	<b>QTY.</b>	<b>INDV. COST</b>	<b>TOTAL COST</b>
Upper Tool Box	KRL651	1	\$2,240.00	\$2,240.00
Lower Tool Box	KRL656	1	\$2,730.00	\$2,730.00
Rectangular Mirror	GA294	2	\$6.65	\$13.30
Angle Mirror	GA51A	1	\$5.75	\$5.75
Mechanical Fingers	GA353	1	\$12.25	\$12.25
Flex Magnet	PT40	2	\$12.45	\$24.90
12" Ruler	YA120A	1	\$7.40	\$7.40
Cannon Plug Pliers	PWC52A	2	\$24.60	\$49.20
Scissors		1	\$5.65	\$5.65
Round Mirror	GA295	2	\$6.80	\$13.60
1" C-Clamp	# 50	6	\$5.10	\$30.60
6mm Combo Wrench	OEXM6	2	\$18.50	\$37.00
7mm Combo Wrench	OEXM7	2	\$18.50	\$37.00
8mm Combo Wrench	OEXM8	2	\$18.50	\$37.00
9mm Combo Wrench	OEXM9	2	\$18.50	\$37.00
10mm Combo Wrench	OEXM10	2	\$18.50	\$37.00
11mm Combo Wrench	OEXM11	2	\$18.55	\$37.10
12mm Combo Wrench	OEXM12	2	\$19.45	\$38.90
13mm Combo Wrench	OEXM13	2	\$19.45	\$38.90
14mm Combo Wrench	OEXM14	2	\$20.90	\$41.80
15mm Combo Wrench	OEXM15	2	\$22.10	\$44.20
16mm Combo Wrench	OEXM16	2	\$23.40	\$46.80
17mm Combo Wrench	OEXM17	2	\$24.50	\$49.00
18mm Combo Wrench	OEXM18	2	\$25.75	\$51.50
19mm Combo Wrench	OEXM19	2	\$28.50	\$57.00
20mm Combo Wrench	OEXM20	2	\$30.75	\$61.50
21mm Combo Wrench	OEXM21	2	\$31.95	\$63.90
22mm Combo Wrench	OEXM22	2	\$33.95	\$67.90
23mm Combo Wrench	OEXM23	2	\$38.75	\$77.50
1/4" Combo Wrench	OEX8	2	\$20.80	\$41.60
5/16" Combo Wrench	OEX10A	2	\$20.80	\$41.60
11/32" Combo Wrench	OEX11A	2	\$20.80	\$41.60
3/8" Combo Wrench	OEX12A	2	\$20.80	\$41.60
7/16" Combo Wrench	OEX14A	2	\$20.80	\$41.60
1/2" Combo Wrench	OEX16A	2	\$22.10	\$44.20
9/16" Combo Wrench	OEX18A	2	\$24.45	\$48.90
5/8" Combo Wrench	OEX20A	2	\$26.25	\$52.50
11/16" Combo Wrench	OEX22A	2	\$28.75	\$57.50
3/4" Combo Wrench	OEX24A	2	\$31.95	\$63.90
13/16" Combo Wrench	OEX26A	2	\$37.95	\$75.90

7/8" Combo Wrench	OEX28A	2	\$39.00	\$78.00
15/16" Combo Wrench	OEX30A	2	\$44.00	\$88.00
1" Combo Wrench	OEX32A	2	\$54.80	\$109.60
1 1/16" Combo Wrench	OEX34	2	\$63.50	\$127.00
1 1/8" Combo Wrench	OEX36	2	\$76.50	\$153.00
6" Adjust. Wrench	AD6	2	\$26.75	\$53.50
8" Adjust. Wrench	AD8	2	\$31.25	\$62.50
10" Adjust. Wrench	AD10	2	\$35.75	\$71.50
12" Adjust. Wrench	AD12	2	\$52.25	\$104.50
1/4" Angle Wrench	VS8A	1	\$18.50	\$18.50
5/16" Angle Wrench	VS10A	1	\$18.50	\$18.50
11/32" Angle Wrench	VS11A	1	\$19.35	\$19.35
3/8" Angle Wrench	VS12A	1	\$19.35	\$19.35
7/16" Angle Wrench	VS14A	1	\$19.65	\$19.65
1/2" Angle Wrench	VS16A	1	\$20.80	\$20.80
9/16" Angle Wrench	VS18A	1	\$23.00	\$23.00
5/8" Angle Wrench	VS20A	1	\$24.90	\$24.90
11/16" Angle Wrench	VS22A	1	\$27.00	\$27.00
3/4" Angle Wrench	VS24A	1	\$30.50	\$30.50
13/16" Angle Wrench	VS26A	1	\$35.25	\$35.25
7/8" Angle Wrench	VS28A	1	\$38.75	\$38.75
10mm Angle Wrench	VSM5210A	2	\$19.35	\$38.70
11mm Angle Wrench	VSM5211A	2	\$19.75	\$39.50
12mm Angle Wrench	VSM5212A	2	\$20.90	\$41.80
13mm Angle Wrench	VSM5213A	2	\$23.25	\$46.50
14mm Angle Wrench	VSM5214A	2	\$23.35	\$46.70
15mm Angle Wrench	VSM5215A	2	\$23.40	\$46.80
16mm Angle Wrench	VSM5216A	2	\$25.50	\$51.00
17mm Angle Wrench	VSM5217A	2	\$27.25	\$54.50
18mm Angle Wrench	VSM5218A	2	\$28.50	\$57.00
19mm Angle Wrench	VSM5219A	2	\$30.50	\$61.00
7mm-8mm Offset Ratchet	RYAM78	1	\$8.85	\$8.85
5mm Socket 1/4"Dr.	TMMD5	2	\$7.05	\$14.10
5.5mm Socket 1/4"Dr.	TMMD5.5	2	\$7.05	\$14.10
6mm Socket 1/4"Dr.	TMMD6	2	\$7.05	\$14.10
7mm Socket 1/4"Dr.	TMMD7	2	\$7.05	\$14.10
8mm Socket 1/4"Dr.	TMMD8	2	\$7.05	\$14.10
9mm Socket 1/4"Dr.	TMMD9	2	\$7.05	\$14.10
10mm Socket 1/4"Dr.	TMMD10	2	\$7.05	\$14.10
11mm Socket 1/4"Dr.	TMMD11	2	\$7.05	\$14.10
12mm Socket 1/4"Dr.	TMMD12	2	\$7.05	\$14.10
13mm Socket 1/4"Dr.	TMMD13	2	\$7.05	\$14.10
14mm Socket 1/4"Dr.	TMMD14	2	\$7.05	\$14.10
5mm Deep Socket 1/4"Dr.	STMMD5	2	\$10.45	\$20.90
5.5mm Deep Socket 1/4"Dr.	STMMD5.5	2	\$10.45	\$20.90

6mm Deep Socket 1/4"Dr.	STMMD6	2	\$10.45	\$20.90
7mm Deep Socket 1/4"Dr.	STMMD7	2	\$10.45	\$20.90
8mm Deep Socket 1/4"Dr.	STMMD8	2	\$10.45	\$20.90
9mm Deep Socket 1/4"Dr.	STMMD9	2	\$10.45	\$20.90
10mm Deep Socket 1/4"Dr.	STMMD10	2	\$10.45	\$20.90
11mm Deep Socket 1/4"Dr.	STMMD11	2	\$10.45	\$20.90
12mm Deep Socket 1/4"Dr.	STMMD12	2	\$10.45	\$20.90
13mm Deep Socket 1/4"Dr.	STMMD13	2	\$10.45	\$20.90
14mm Deep Socket 1/4"Dr.	STMMD14	2	\$10.45	\$20.90
1/4" Socket 3/8" Dr.	FO81	2	\$7.05	\$14.10
5/16" Socket 3/8" Dr.	F101	2	\$7.05	\$14.10
11/32" Socket 3/8" Dr.	F111	2	\$7.05	\$14.10
3/8" Socket 3/8" Dr.	F121	2	\$7.05	\$14.10
7/16" Socket 3/8" Dr.	F141	2	\$7.05	\$14.10
1/2" Socket 3/8" Dr.	F161	2	\$7.05	\$14.10
9/16" Socket 3/8" Dr.	F181	2	\$7.40	\$14.80
5/8" Socket 3/8" Dr.	F201	2	\$7.40	\$14.80
11/16" Socket 3/8" Dr.	F221	2	\$7.70	\$15.40
3/4" Socket 3/8" Dr.	F241	2	\$7.70	\$15.40
13/16" Socket 3/8" Dr.	F261	2	\$8.80	\$17.60
7/8" Socket 3/8" Dr.	F281	2	\$9.75	\$19.50
15/16" Socket 3/8" Dr.	F301	2	\$10.45	\$20.90
1" Socket 3/8" Dr.	F321	2	\$11.40	\$22.80
3/16" Socket 1/4" Dr.	TMD6	2	\$6.00	\$12.00
7/32" Socket 1/4" Dr.	TMD7	2	\$6.00	\$12.00
1/4" Socket 1/4" Dr.	TMD8	2	\$6.00	\$12.00
9/32" Socket 1/4" Dr.	TMD9	2	\$6.00	\$12.00
5/16" Socket 1/4" Dr.	TMD10	2	\$6.00	\$12.00
11/32" Socket 1/4" Dr.	TMD11	2	\$6.00	\$12.00
3/8" Socket 1/4" Dr.	TMD12	2	\$6.00	\$12.00
7/16" Socket 1/4" Dr.	TMD14	2	\$6.00	\$12.00
1/2" Socket 1/4" Dr.	TMD16	2	\$6.00	\$12.00
9/16" Socket 1/4" Dr.	TMD18	2	\$6.00	\$12.00
1/4" Deep Socket 3/8" Dr.	SF081	1	\$9.95	\$9.95
5/16" Deep Socket 3/8" Dr.	SF101	1	\$9.95	\$9.95
3/8" Deep Socket 3/8" Dr.	SF121	1	\$9.95	\$9.95
7/16" Deep Socket 3/8" Dr.	SF141	1	\$9.95	\$9.95
1/2" Deep Socket 3/8" Dr.	SF161	1	\$9.95	\$9.95
9/16" Deep Socket 3/8" Dr.	SF181	1	\$11.20	\$11.20
19/32" Deep Socket 3/8" Dr.	SF191	1	\$11.20	\$11.20
5/8" Deep Socket 3/8" Dr.	SF201	1	\$11.20	\$11.20
11/16" Deep Socket 3/8" Dr.	SF221	1	\$13.30	\$13.30
3/4" Deep Socket 3/8" Dr.	SF241	1	\$13.30	\$13.30
13/16" Deep Socket 3/8" Dr.	SF261	1	\$14.95	\$14.95
7/8" Deep Socket 3/8" Dr.	SF281	1	\$16.95	\$16.95



15/16" Deep Socket 3/8" Dr.	SF301	1	\$18.70	\$18.70
1" Deep Socket 3/8" Dr.	SF321	1	\$20.45	\$20.45
4mm Deep Socket 1/4"Dr. 6pt	STMM4	1	\$10.45	\$10.45
4.5mm Deep Socket 1/4"Dr. 6pt	STMM4.5	1	\$10.45	\$10.45
5mm Deep Socket 1/4"Dr. 6pt	STMM5	1	\$10.45	\$10.45
5.5mm Deep Socket 1/4"Dr. 6pt	STMM5.5	1	\$10.45	\$10.45
6mm Deep Socket 1/4"Dr. 6pt	STMM6	1	\$10.45	\$10.45
7mm Deep Socket 1/4"Dr. 6pt	STMM7	1	\$10.45	\$10.45
8mm Deep Socket 1/4"Dr. 6pt	STMM8	1	\$10.45	\$10.45
9mm Deep Socket 1/4"Dr. 6pt	STMM9	1	\$10.45	\$10.45
10mm Deep Socket 1/4"Dr. 6pt	STMM10	1	\$10.45	\$10.45
11mm Deep Socket 1/4"Dr. 6pt	STMM11	1	\$10.45	\$10.45
12mm Deep Socket 1/4"Dr. 6pt	STMM12	1	\$10.45	\$10.45
13mm Deep Socket 1/4"Dr. 6pt	STMM13	1	\$10.45	\$10.45
14mm Deep Socket 1/4"Dr. 6pt	STMM14	1	\$10.45	\$10.45
15mm Deep Socket 1/4"Dr. 6pt	STMM15	1	\$10.45	\$10.45
6mm Socket 3/8"Dr.	FM6	2	\$7.15	\$14.30
7mm Socket 3/8"Dr.	FM7	2	\$7.15	\$14.30
8mm Socket 3/8"Dr.	FM8	2	\$7.15	\$14.30
9mm Socket 3/8"Dr.	FM9	2	\$7.15	\$14.30
10mm Socket 3/8"Dr.	FM10	2	\$7.15	\$14.30
11mm Socket 3/8"Dr.	FM11	2	\$7.15	\$14.30
12mm Socket 3/8"Dr.	FM12	2	\$7.15	\$14.30
13mm Socket 3/8"Dr.	FM13	2	\$7.15	\$14.30
14mm Socket 3/8"Dr.	FM14	2	\$7.55	\$15.10
15mm Socket 3/8"Dr.	FM15	2	\$7.55	\$15.10
16mm Socket 3/8"Dr.	FM16	2	\$7.55	\$15.10
17mm Socket 3/8"Dr.	FM17	2	\$7.85	\$15.70
18mm Socket 3/8"Dr.	FM18	2	\$7.85	\$15.70
19mm Socket 3/8"Dr.	FM19	2	\$7.85	\$15.70
20mm Socket 3/8"Dr.	FM20	2	\$8.95	\$17.90
21mm Socket 3/8"Dr.	FM21	2	\$8.95	\$17.90
22mm Socket 3/8"Dr.	FM22	2	\$9.75	\$19.50
23mm Socket 3/8"Dr.	FM23	2	\$10.45	\$20.90
26mm Socket 3/8"Dr.	FM26	2	\$11.40	\$22.80
10mm Swivel Socket 3/8"Dr.	FUM10	1	\$26.25	\$26.25
12mm Swivel Socket 3/8"Dr.	FUM12	1	\$26.25	\$26.25
13mm Swivel Socket 3/8"Dr.	FUM13	1	\$26.25	\$26.25
14mm Swivel Socket 3/8"Dr.	FUM14	1	\$27.00	\$27.00
15mm Swivel Socket 3/8"Dr.	FUM15	1	\$27.00	\$27.00
16mm Swivel Socket 3/8"Dr.	FUM16	1	\$27.00	\$27.00
17mm Swivel Socket 3/8"Dr.	FUM17	1	\$28.00	\$28.00
18mm Swivel Socket 3/8"Dr.	FUM18	1	\$28.00	\$28.00
19mm Swivel Socket 3/8"Dr.	FUM19	1	\$28.00	\$28.00
6mm Deep Socket 3/8"Dr.	SFM6	1	\$10.25	\$10.25

7mm Deep Socket 3/8"Dr.	SFM7	1	\$10.25	\$10.25
8mm Deep Socket 3/8"Dr.	SFM8	1	\$10.25	\$10.25
9mm Deep Socket 3/8"Dr.	SFM9	1	\$10.25	\$10.25
10mm Deep Socket 3/8"Dr.	SFM10	1	\$10.25	\$10.25
11mm Deep Socket 3/8"Dr.	SFM11	1	\$10.25	\$10.25
12mm Deep Socket 3/8"Dr.	SFM12	1	\$10.25	\$10.25
13mm Deep Socket 3/8"Dr.	SFM13	1	\$10.25	\$10.25
14mm Deep Socket 3/8"Dr.	SFM14	1	\$10.25	\$10.25
15mm Deep Socket 3/8"Dr.	SFM15	1	\$10.25	\$10.25
16mm Deep Socket 3/8"Dr.	SFM16	1	\$10.25	\$10.25
17mm Deep Socket 3/8"Dr.	SFM17	1	\$10.25	\$10.25
18mm Deep Socket 3/8"Dr.	SFM18	1	\$10.25	\$10.25
19mm Deep Socket 3/8"Dr.	SFM19	1	\$10.25	\$10.25
10mm Deep Socket 1/2"Dr.	SM10	1	\$10.25	\$10.25
11mm Deep Socket 1/2"Dr.	SM11	1	\$10.25	\$10.25
12mm Deep Socket 1/2"Dr.	SM12	1	\$10.25	\$10.25
13mm Deep Socket 1/2"Dr.	SM13	1	\$10.25	\$10.25
14mm Deep Socket 1/2"Dr.	SM14	1	\$10.80	\$10.80
15mm Deep Socket 1/2"Dr.	SM15	1	\$11.50	\$11.50
16mm Deep Socket 1/2"Dr.	SM16	1	\$11.90	\$11.90
17mm Deep Socket 1/2"Dr.	SM17	1	\$13.50	\$13.50
18mm Deep Socket 1/2"Dr.	SM18	1	\$13.50	\$13.50
19mm Deep Socket 1/2"Dr.	SM19	1	\$14.15	\$14.15
10mm Deep Socket 1/4"Dr.	STMMD10	2	\$10.45	\$20.90
8mm Deep Socket 1/4"Dr.	STMMD8	2	\$10.45	\$20.90
7mm Deep Socket 1/4"Dr.	STMMD7	2	\$10.45	\$20.90
6mm Deep Socket 1/4"Dr.	STMMD6	2	\$10.45	\$20.90
5mm Deep Socket 1/4"Dr.	STMMD5	2	\$10.45	\$20.90
10mm Shallow Socket 1/4"Dr.	TMMD10	2	\$7.05	\$14.10
8mm Shallow Socket 1/4"Dr.	TMMD8	2	\$7.05	\$14.10
7mm Shallow Socket 1/4"Dr.	TMMD7	2	\$7.05	\$14.10
6mm Shallow Socket 1/4"Dr.	TMMD6	2	\$7.05	\$14.10
5mm Shallow Socket 1/4"Dr.	TMMD5	2	\$7.05	\$14.10
10" Wobble Extension 1/4"Dr.	TMXW100	1	\$16.35	\$16.35
6" Wobble Extension 1/4"Dr.	TMXW60	2	\$12.70	\$25.40
2" Wobble Extension 1/4"Dr.	TMXW2	2	\$8.80	\$17.60
1" Wobble Extension 1/4"Dr.	TMXW1	2	\$7.10	\$14.20
10" Reg. Extension 1/4"Dr.	TMXK100	2	\$12.90	\$25.80
6" Reg. Extension 1/4"Dr.	TMXK60	2	\$11.50	\$23.00
4" Reg. Extension 1/4"Dr.	TMXK4	2	\$10.85	\$21.70
2" Reg. Extension 1/4"Dr.	TMXK2	2	\$7.90	\$15.80
1" Reg. Extension 1/4"Dr.	TMX1	2	\$6.50	\$13.00
Universal Joint 1/4"Dr.	TMU8	2	\$24.20	\$48.40
Adapter 1/4"- 3/8" Dr.	TA3	2	\$7.50	\$15.00
Tip Holder 1/4" Dr.	TMC109	2	\$15.30	\$30.60

Ratchet 1/4" Dr.	TM830	2	\$42.50	\$85.00
Speed Handle 1/4" Dr.	TMS4E	2	\$24.75	\$49.50
11" Reg. Extension 3/8"Dr.	FXK11	1	\$19.85	\$19.85
8" Reg. Extension 3/8" Dr.	FXK8	1	\$17.50	\$17.50
6" Reg. Extension 3/8" Dr.	FXK6	2	\$16.55	\$33.10
4" Reg. Extension 3/8" Dr.	FXK4	2	\$14.95	\$29.90
3" Reg. Extension 3/8" Dr.	FXK3	2	\$12.30	\$24.60
Universal Joint 3/8"Dr. (Short)	FU80A	1	\$30.50	\$30.50
Universal Joint 3/8"Dr. (Long)	FU8A	1	\$26.25	\$26.25
Adapter 1/2"- 3/4" Dr.	GLA12A	1	\$12.40	\$12.40
Adapter 1/2"- 3/8" Dr.	GAX1	1	\$14.00	\$14.00
Ratchet 3/8" Dr.	FN720A	2	\$41.50	\$83.00
Breaker Bar 3/8" Dr.	F10LB	1	\$34.95	\$34.95
Speed Handle 3/8" Dr.	F4LB	2	\$26.00	\$52.00
Tip Holder 3/8" Dr.	FBS8	2	\$9.95	\$19.90
Speed Handle Knob 1/4" Dr.		1	\$13.00	\$13.00
1/4" Swivel Ball Universal Joint	IPM800A	1	\$20.55	\$20.55
1/4" Short Handle Ratchet	TMK739	1	\$35.75	\$35.75
File Kit	HBN120	1	\$32.15	\$32.15
Standard Feeler Guage	FB-325A	1	\$6.10	\$6.10
Metric Feeler Guage	FB-320	1	\$6.85	\$6.85
7" Flat File	HB80MA	1	\$5.70	\$5.70
Standard Hex Wrench Set	AW9K	2	\$4.25	\$8.50
Metric Hex Wrench Set	AWM7K	2	\$4.45	\$8.90
3/16" Hex Driver 3/8" Dr.	FABL6	1	\$15.85	\$15.85
Knife	YA113A	1	\$21.25	\$21.25
6" Ruler	GAM2A	2	\$3.40	\$6.80
Scribe	YA339	1	\$3.95	\$3.95
Easy Out Extractors	EX-3	3	\$2.35	\$7.05
Easy Out Extractors	EX-2	1	\$2.25	\$2.25
Easy Out Extractors	EX-1	2	\$1.95	\$3.90
5/32" Hex Driver 1/4" Dr.	TMA5	2	\$9.95	\$19.90
Brass Punch	PPC1001	1	\$16.25	\$16.25
3/16" Center Punch	PPC4A	2	\$13.10	\$26.20
1/4" Punch	PPC108A	1	\$11.85	\$11.85
1/8" Tapered Punch	PPC204A	1	\$10.65	\$10.65
3/16" Reg. Punch	PPC106A	2	\$9.80	\$19.60
3/32" Taper Center Punch	PPC404A	1	\$7.40	\$7.40
1/16" Reg. Punch	PPR2	2	\$5.90	\$11.80
Hook Tool	3ASH90A	2	\$4.30	\$8.60
Hook Tool	3ASH45A	2	\$4.30	\$8.60
Hook Tool	3ASAA	2	\$4.30	\$8.60
Hook Tool	3ASHA	2	\$4.30	\$8.60
3/8" Hex Driver	SDA24B	1	\$8.10	\$8.10
5/16" Hex Driver	SDA20B	1	\$7.40	\$7.40

1/4" Hex Driver	SDA16B	1	\$7.00	\$7.00
7/32" Hex Driver	SDA14B	1	\$6.70	\$6.70
3/16" Hex Driver	SDA12B	1	\$6.45	\$6.45
5/32" Hex Driver	SDA10B	1	\$6.30	\$6.30
9/64" Hex Driver	SDA9B	1	\$6.15	\$6.15
1/8" Hex Driver	SDA8B	1	\$5.90	\$5.90
7/64" Hex Driver	SDA7B	1	\$5.85	\$5.85
3/32" Hex Driver	SDA6B	1	\$5.85	\$5.85
5/64" Hex Driver	SDA5B	1	\$5.85	\$5.85
1/16" Hex Driver	SDA4B	1	\$4.70	\$4.70
.05" Hex Driver	SDA050B	1	\$4.70	\$15.75
Cotter Pin Extractor	CP3B	1	\$15.75	\$30.75
4" Diagonal Cutter	E740ACG	1	\$30.75	\$22.25
6" Diagonal Cutter	86ACP	1	\$22.25	\$25.00
7" Diagonal Cutter	87ACP	1	\$25.00	\$23.75
6" Needle Nose Pliers	95ACP	1	\$23.75	\$21.30
5" Needle Nose Pliers	94BCP	1	\$21.30	\$30.25
Angled Needle Nose Pliers	E718CG	1	\$30.25	\$17.35
Channel Lock Pliers	HL112B	1	\$17.35	\$30.95
Channel Lock Pliers	90AP	1	\$30.95	\$39.75
Common Pliers	137	1	\$39.75	\$23.30
Common Pliers	46P	1	\$23.30	\$23.30
7" Needle Nose Pliers	96ACP	1	\$26.25	\$26.25
Angled Snap Ring Pliers	PR219A	1	\$10.50	\$10.50
Reg. Snap Ring Pliers	PR21A	1	\$8.95	\$8.95
Wire Crimpers	AD-1377	1	\$24.95	\$24.95
Safety Wire Pliers	PR311	2	\$74.20	\$148.40
4" Diagonal Cutter	E746CG	1	\$36.65	\$36.65
# 2 Phillips Screwdriver	SDDP82	2	\$13.60	\$27.20
# 3 Phillips Screwdriver	SDDP63	2	\$14.60	\$29.20
# 2 Phillips Screwdriver	SDDP42	2	\$12.80	\$25.60
# 1 Phillips Screwdriver	SDDP31	2	\$10.30	\$20.60
# 1 Phillips Screwdriver	SDDP61	2	\$12.70	\$25.40
# 1 Phillips Screwdriver	SDDP101	2	\$14.55	\$29.10
Phillips Screwdriver	SSDEP61B	2	\$10.65	\$21.30
Phillips Screwdriver	SSDEP31B	2	\$9.90	\$19.80
Phillips Screwdriver	SSDEP30B	2	\$9.95	\$19.90
# 2 Stubby Phillips	SDDP22	2	\$8.95	\$17.90
# 1 Stubby Phillips	SDDP21	2	\$8.35	\$16.70
# 1- # 2 Offset	STO12B	2	\$3.90	\$7.80
# 3- # 4 Offset	STO34B	2	\$7.30	\$14.60
Straight Slot Stubby	SDD1	2	\$9.25	\$18.50
Straight Slot Offset	020	2	\$15.75	\$31.50
Straight Slot Offset	030	2	\$15.75	\$31.50
Straight Slot	SDD8	2	\$18.75	\$37.50

Straight Slot	SDD6	2	\$14.75	\$29.50
Straight Slot	SDD4	2	\$11.80	\$23.60
Straight Slot	SDD2	2	\$9.85	\$19.70
Straight Slot	SSDE42B	2	\$7.65	\$15.30
Straight Slot	SSDE44B	1	\$8.50	\$8.50
Straight Slot	SSDE46B	1	\$9.05	\$9.05
12 oz. Hammer	BPN12B	1	\$19.10	\$19.10
8 oz. Hammer	BPN8B	1	\$18.40	\$18.40
Wire Brush	AC58C	1	\$2.65	\$2.65
Flashlight	ECF200A	2	\$38.85	\$77.70
Safety Glasses		1	\$6.25	\$6.25
Rubber Mallet	BF620B	1	\$13.60	\$13.60
Flex Tip Flashlight	MX-6736/U	1	\$39.75	\$39.75
Duckbill Pliers	61CP	1	\$22.00	\$22.00
11" Needle Nose Pliers	911CP	1	\$39.95	\$39.95
Ratcheting Screwdriver 1/4" Dr.	TMR4	1	\$43.95	\$43.95
Soldering Station	R60B	1	\$163.20	\$163.20
Soldering Iron	P60A1	1	\$0.00	\$0.00
Iron Stand w/Sponge		1	\$0.00	\$0.00
Air Drill	PD3C	1	\$219.00	\$219.00
Air Drill	PCR3A	1	\$279.00	\$279.00
Drill Chuck Key	PD3A3	2	\$6.90	\$13.80
Combo Wrench Set		2	\$65.80	\$131.60
Short Ratchet 1/2" Dr.	S832	1	\$85.00	\$85.00
Long Ratchet 1/2" Dr.	SL832	1	\$90.50	\$90.50
# 22 B-Nut Crowsfoot	FRHM22	1	\$18.55	\$18.55
# 21 B-Nut Crowsfoot	FRHM21	1	\$17.75	\$17.75
# 20 B-Nut Crowsfoot	FRHM20	1	\$17.75	\$17.75
# 19 B-Nut Crowsfoot	FRHM19	1	\$14.20	\$14.20
# 18 B-Nut Crowsfoot	FRHM18	1	\$14.20	\$14.20
# 17 B-Nut Crowsfoot	FRHM17	1	\$14.20	\$14.20
# 16 B-Nut Crowsfoot	FRHM16	1	\$13.20	\$13.20
# 15 B-Nut Crowsfoot	FRHM15	1	\$12.55	\$12.55
# 14 B-Nut Crowsfoot	FRHM14	1	\$12.55	\$12.55
# 13 B-Nut Crowsfoot	FRHM13	1	\$12.55	\$12.55
# 12 B-Nut Crowsfoot	FRHM12	1	\$11.30	\$11.30
# 11 B-Nut Crowsfoot	FRHM11	1	\$11.30	\$11.30
# 10 B-Nut Crowsfoot	FRHM10	1	\$11.30	\$11.30
# 9 B-Nut Crowsfoot	FRHM9	1	\$11.30	\$11.30
1" Standard Crowsfoot	FCO32	1	\$20.75	\$20.75
15/16" Standard Crowsfoot	FCO30	1	\$19.95	\$19.95
7/8" Standard Crowsfoot	FCO28	1	\$19.95	\$19.95
13/16" Standard Crowsfoot	FCO26	1	\$18.55	\$18.55
3/4" Standard Crowsfoot	FCO24	1	\$17.00	\$17.00
11/16" Standard Crowsfoot	FCO22	1	\$17.00	\$17.00

5/8" Standard Crowsfoot	FCO20	1	\$15.75	\$15.75
9/16" Standard Crowsfoot	FCO18	1	\$14.95	\$14.95
1/2" Standard Crowsfoot	FCO16	1	\$14.95	\$14.95
7/16" Standard Crowsfoot	FCO14	1	\$14.95	\$14.95
3/8" Standard Crowsfoot	FCO12	1	\$14.95	\$14.95
Drop Light	ECU-250A	3	\$46.00	\$138.00
			<b>Grand Total</b>	<b>\$14,298.75</b>
	<b>Four Mechanics Tool Boxes @</b>		<b>\$14,298.75</b>	<b>\$57,195.00</b>

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX D. BOEING STRUCTURES TOOL BOX REQUIREMENTS.**

<b>NOMENCLATURE</b>	<b>P/N / MAT. CODE</b>	<b>QTY.</b>	<b>INDV. COST</b>	<b>TOTAL COST</b>
Kennedy Tool Box	2F009	1	\$485.00	\$485.00
Kennedy Side Module	2F015	1	\$197.50	\$197.50
Duplicator Strap #40	AT532-61	2	\$15.50	\$31.00
Duplicator Strap #30	AT532-62	2	\$15.50	\$31.00
Duplicator Strap #21	AT532-63	1	\$15.50	\$15.50
Duplicator Strap #30	AT532D-62	1	\$15.50	\$15.50
Duplicator Strap #21	AT532D-63	1	\$15.50	\$15.50
12" Divider		1	\$18.95	\$18.95
6" Divider w/rubber tips		1	\$12.85	\$12.85
Rivet Cutter w/blades	#193	1	\$36.95	\$36.95
Deburring Tool	AT513	1	\$11.65	\$11.65
File Card/Brush	40024004	1	\$10.25	\$10.25
Course Flat File / w Handle	40024011	1	\$12.35	\$12.35
Fine Flat File / w Handle	40024013	1	\$12.35	\$12.35
Course Round File / w Handle	40024031	1	\$12.35	\$12.35
Fine Roundt File / w Handle	40024032	1	\$12.35	\$12.35
Deburring Tool	AT514	1	\$10.75	\$10.75
Spread Filleter	K652-3095-1GT	1	\$7.85	\$7.85
#12 Combo Square (Starrett)	C-111-H-12-4R	1	\$35.75	\$35.75
Ratchet 1/4" Dr.	TM830	1	\$42.50	\$42.50
1/4" Socket 1/4" Dr.	GTM8	1	\$4.35	\$4.35
1/4" Combo Wrench	OEX8B	1	\$20.80	\$20.80
8mm Socket 1/4" Dr.	TMM8	1	\$7.05	\$7.05
8mm Combo Wrench	OSHM80B	1	\$21.65	\$21.65
7mm Socket 1/4" Dr.	TMM7	1	\$7.05	\$7.05
7mm Combo Wrench	OSHM70B	1	\$21.65	\$21.65
6mm Socket 1/4" Dr.	TMM6	1	\$7.05	\$7.05
6mm Combo Wrench	OXIM6SB	1	\$14.20	\$14.20
5.5mm Socket 1/4" Dr.	TMM5.5	1	\$7.05	\$7.05
5.5mm Combo Wrench	OSIM5.5SB	1	\$15.65	\$15.65
5mm Socket 1/4" Dr.	TMM5.5	1	\$7.05	\$7.05
5mm Combo Wrench	OXIM5SB	1	\$14.20	\$14.20
8" 5/32 Punch	PPC905A	1	\$19.10	\$19.10
Putty Knife	40032262	1	\$5.65	\$5.65
1/4" Combo Wrench 6pt.	OXI8SB	1	\$14.20	\$14.20
11/32" Socket	40028318	1	\$5.85	\$5.85
Rivet Gun	USN006605	1	\$235.00	\$235.00
Rivet Gun	RA30	1	\$205.00	\$205.00
Rivet Gun	RA20	1	\$190.00	\$190.00
Drill Motor	AA30	1	\$250.00	\$250.00



Drill Motor	AA10	1	\$250.00	\$250.00
90deg. Drill Motor	AD20	1	\$325.00	\$325.00
90deg. Drill Motor	AD10	1	\$325.00	\$325.00
Drill Guide		1	\$12.65	\$12.65
45deg. Drill Motor	AG20	1	\$375.00	\$375.00
45deg. Drill Motor	AG10	1	\$375.00	\$375.00
10" Rivet Set, 3/16	AT100A-8	1	\$28.00	\$28.00
7" Rivet Set, 3/16 Angle	AT101A-7	1	\$25.65	\$25.65
7" Rivet Set, 1/8 Angle	MM120-17	1	\$25.65	\$25.65
7" Rivet Set, Flush Angle	MM180-9	1	\$25.65	\$25.65
7" Rivet Set, 5/32 Angle	AT101A-7	1	\$25.65	\$25.65
5 1/2" Rivet Set, 3/16 Angle	AT105A-3	1	\$21.25	\$21.25
5" Rivet Set, 3/32	AT100A-5	1	\$21.25	\$21.25
5" Rivet Set, 5/32	AT100A-5	2	\$21.25	\$42.50
5" Rivet Set, 5/32 Angle	AT105A-5	1	\$21.25	\$21.25
5 1/2" Rivet Set 1/8 Angle	AT105A	1	\$21.25	\$21.25
2" Rivet Set, Flush	ST100-SG	1	\$18.75	\$18.75
3" Rivet Set, Flush	TD154M3-2	1	\$18.75	\$18.75
3" Rivet Set, 1/8	AT100A-3-1/8	2	\$18.75	\$37.50
3" Rivet Set, 5/32	AT100A-3-5/32	1	\$18.75	\$18.75
3" Rivet Set, 3/16 Angle	AT101A-3-3/16	1	\$18.75	\$18.75
3 1/2" Rivet Set, 3/32 Angle	SM20	1	\$18.75	\$18.75
3" Rivet Set, 3/32 Angle	AT101A-3-3/32	1	\$18.75	\$18.75
3 1/2" Rivet Set, Flush	TD154M3-4	1	\$18.75	\$18.75
3" Rivet Set, 1/4	AT100A-3-4	1	\$18.75	\$18.75
3" Rivet Set, 1/4 Angle	AT101A-3-1/4	1	\$18.75	\$18.75
Bucking Bar	AT750S-1	1	\$35.85	\$35.85
Bucking Bar	AT750P-3	1	\$35.85	\$35.85
Bucking Bar	AT736	1	\$28.95	\$28.95
Bucking Bar	AT676	1	\$28.95	\$28.95
Bucking Bar	AT670	1	\$28.95	\$28.95
Bucking Bar	AT633	1	\$28.95	\$28.95
Bucking Bar	AT681	1	\$28.95	\$28.95
Bucking Bar	AT638	1	\$28.95	\$28.95
5/32 Wing Nut Clecos	WNX-52	16	\$2.75	\$44.00
3/16 Wing Nut Clecos		16	\$2.75	\$44.00
1/4 Wing Nut Clecos		16	\$2.75	\$44.00
3/4" x 1/2" Side Grip Clecos	40020509	4	\$5.85	\$23.40
5/32 Compression Clecos	MEL 5/32	30	\$1.75	\$52.50
3/32 Compression Clecos	MEL 3/32	30	\$1.75	\$52.50
1/8 Compression Clecos	MEL 1/8	30	\$1.75	\$52.50
3/16 Compression Clecos	MEL 3/16	30	\$1.75	\$52.50
Cleco Pliers		1	\$18.95	\$18.95
Pneumatic Vacuum Cleaner	40020548	1	\$15.20	\$15.20
Vacuum Tube	40023418	1	\$0.00	\$0.00

Countersink 3/8 x 1/8		1	\$11.25	\$11.25
Countersink 3/8 x 21		1	\$11.25	\$11.25
Countersink 3/8 x 10		1	\$11.25	\$11.25
Drill Stop # 10	40032990	1	\$8.55	\$8.55
Drill Stop # 20		1	\$8.55	\$8.55
Drill Stop # 30		1	\$8.55	\$8.55
Drill Stop # 21	40032057	1	\$8.55	\$8.55
Drill Stop # 40		1	\$8.55	\$8.55
# 1 Screw Extractor	40023940	1	\$2.25	\$2.25
# 2 Screw Extractor	40023941	1	\$3.15	\$3.15
# 3 Screw Extractor	40023942	1	\$4.20	\$4.20
5/16 Deep Socket, 1/4 Dr.	STM10	1	\$9.75	\$9.75
Punch Pin	PPC404A	1	\$7.40	\$7.40
1/4" Drive Ratchet	VG-43186	1	\$32.75	\$32.75
12" Starrett Ruler	C344	1	\$18.55	\$18.55
12" General Ruler	CF1216	1	\$10.95	\$10.95
6" General Ruler	CF-616	1	\$8.65	\$8.65
6" Starrett Ruler	C334	1	\$11.45	\$11.45
Oval Inspection Mirror		1	\$10.60	\$10.60
Round Inspection Mirror		1	\$6.85	\$6.85
Micrometer	52-222-001	1	\$125.85	\$125.85
Rotary File,Cyl. 1/4"	40006034	1	\$10.85	\$10.85
Rotary File,Ball 1/4" Fine	40006204	1	\$12.75	\$12.75
Rotary File,Cyl 1/8"Safe-end	40005101	1	\$10.85	\$10.85
Rotary File,Ball 1/2"Med.	40006239	1	\$12.75	\$12.75
Rotary File,Tree 1/2"Med.	40006434	1	\$13.85	\$13.85
Rotary File,Tree 3/8"Med	40006533	1	\$13.85	\$13.85
Rotary File,Ball 3/8 Fine	40006207	1	\$12.75	\$12.75
Rotary File,Ball 3/16 Fine	40006203	1	\$12.75	\$12.75
Countersink 3/8, 50deg.		1	\$8.10	\$8.10
Countersink 1/2, 50deg.		1	\$8.10	\$8.10
Countersink 3/4", 50deg.		1	\$8.10	\$8.10
Countersink 1/4, 50deg.		1	\$8.10	\$8.10
Rotary File,Cyl. 1/2Med.	40006042	1	\$10.85	\$10.85
7" Vise Grip Pliers	40018802	1	\$18.35	\$18.35
4" Vise Grip Pliers	40089276	1	\$12.45	\$12.45
3/16 Punch	PPC186A	1	\$10.65	\$10.65
5/32 Punch	40029448	1	\$10.65	\$10.65
1/8 Punch	40029447	1	\$10.65	\$10.65
3/32 Punch	40029446	1	\$10.65	\$10.65
3/32 Center Punch	PPC404A	1	\$10.65	\$10.65
Air Blow Gun		1	\$8.65	\$8.65
12' Measuring Tape	40027306	1	\$12.25	\$12.25
Mallet Hammer		1	\$19.65	\$19.65
12oz. Ball Peen Hammer	40023116	1	\$19.10	\$19.10

8oz. Ball Peen Hammer	40022875	1	\$18.40	\$18.40
3/8" Chisel	40020362	1	\$9.75	\$9.75
Die Grinder	UB10	1	\$315.00	\$315.00
Die Grinder	UA10	1	\$285.00	\$285.00
9/16"-1/2" Die Grinder Wrench		1	\$0.00	\$0.00
3/4"-5/8" Die Grinder Wrench		1	\$0.00	\$0.00
2" Sanding Drum Holder	40023882	1	\$8.65	\$8.65
1" Sanding Drum Holder	40023880	1	\$6.35	\$6.35
1/2" Sanding Drum Holder	40023878	1	\$5.15	\$5.15
3" Sanding Disc Holder	40023315	1	\$10.55	\$10.55
2" Sanding Disc Holder	40023314	1	\$8.65	\$8.65
1" Sanding Disc Holder	40023312	1	\$6.35	\$6.35
Flashlight		1	\$28.45	\$28.45
1/4" Air Ratchet	WC20	1	\$125.00	\$125.00
			<b>GRAND TOTAL</b>	<b>\$6,315.95</b>
		15 Boxes @	\$6,315.95	<b>\$94,739.25</b>

## LIST OF REFERENCES

1. The Naval Aviation Maintenance Program (NAMP) (OPNAV Instruction 4790.2H), Chief of Naval Operations (Code N881), 1999
2. Telephone conversation between CDR Mark Stone, T-45 APML, Naval Air Systems Command and the author, 19 January 2000.
3. Telephone conversation between LCDR Chris Kennedy, T-45 DAPML, Naval Air Systems Command and the author, 15 January 2000.
4. Boeing Aircraft Corporation's "CITIS" Database (Secure) ECP/TD Listings. [<https://www.citis.mdc.com/>] March 2000.
5. Anderson, L.G., *Cost-Benefit Analysis, a Practical Guide*, pp.167-169, Lexington Books, Inc., Boston MA., 1977.
6. Ray, A.L., *Cost-Benefit Analysis: Issues and Methodologies*, pp. 203-207, Johns Hopkins University Press., 1984.
7. Boardman, A.A. and Greenberg, D.H., *Cost-Benefit Analysis: Concepts and Practices*, pp. 134-136, Prentice Hall, 1997.
8. Interview between Mr. Mike Mathews, Boeing Corporation CDFT Mod Line Manager, NAS Kingsville, TX., and the author, 9 May 2000.
9. Interview between Mr. Bill Pierce, T-45 Logistic Budget Analyst, T-45 Program Office, NAVAIR Headquarters, Pax River , MD., 12 May 2000.
10. General Accounting Office (Joyner, C.C.). Consumer Product Safety Commission, Better Data Needed to Help Identify and Analyze Potential Hazards, GAO/HEHS-97-147. 1997.

11. E-Mail and Excel Spreadsheet Attachments from Mr. Mike Mathews, Boeing Corporation, CDFT Mod Line Manager, NAS Kingsville, TX., to the author, March 12, 2000.

## INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center..... 2  
8725 John J. Kingman Road, Ste 0944  
Fort Belvoir, VA 22060-6218
2. Dudley Knox Library..... 2  
Naval Postgraduate School  
411 Dyer Road  
Monterey, California 93943-5101
3. Adm. Donald Eaton , Code SM/ET ..... 1  
Naval Postgraduate School  
Monterey, CA 93943
4. Professor Jerry McCaffery, Code SM/Mm..... 1  
Naval Postgraduate School  
Monterey, CA 93943
5. LT James M. Parish ..... 2  
44623 Cedar Court  
California, Md. 20619
6. NAVAIRSYSCOMHQ..... 2  
Attn: CDR Mark Stone, AIR-3.1.2G  
BLDG 2272, Suite 154  
47123 Buse Rd. # IPT  
Paxuxent River, Md. 20670-1547