REPARABLE INVENTORY REDUCTION:
IMPACTS ON AIR FORCE FIGHTER AIRCRAFT
MISSION CAPABILITY

THESIS

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Abstract

During the 1990's the Air Force experienced severe declines in serviceable inventory levels and a rise in their TNMCS rates. Air Force predictions of TNMCS hours during this time period did not account for the upward trend in TNMCS rates. The Air Force uses a regression equation, consisting of possessed hours, flying hours, and sorties, to predict TNMCS hours.

This research, through simple linear regression, found a significant relationship between serviceable inventory levels and TNMCS rates for 8 of the 10 aircraft studied. Using this relationship, serviceable inventory levels were then added to the Air Force equations and new multiple regression equations were derived. Results indicate the addition of serviceable inventory as an explanatory variable renders a better Theil's *U*-statistic for each of the aircraft studied than the current predictions. The study recommends adding a logistics chain variable to TNMCS predictions and careful consideration of further reparable inventory reductions.

REPARABLE INVENTORY REDUCTION: IMPACTS ON AIR FORCE FIGHTER AIRCRAFT MISSION CAPABILITY

I. Introduction

Chapter Overview

This chapter begins with a discussion of two views prevalent in today's Air Force as they pertain to logistics management. From this discussion, a problem statement is derived. Next, a brief background is presented on inventory reduction efforts the Air Force has been executing since 1991. Following the background discussion, the scope of the study is then established. The resulting research objective and research questions follow. Finally, an overview of the remaining chapters is provided.

Background

American businesses, during the past two decades and perhaps beginning with the implementation of just-in-time manufacturing and other pull-type inventory systems, have set out on a quest to reduce inventory (Krajewski and Ritzman, 1994:722). For many it is an intelligent strategy, given that other components of the logistics chain (e.g., increased transportation and ordering costs) can offset the cost of carrying additional inventory. Additionally, in order to stay competitive within their respective industries, businesses initiating inventory reduction policies must ensure service levels are maintained or improved (Lambert and Stock, 1993:423).

Commensurate with other initiatives in the DoD to make government practices more like business practices, such as acquisition reform, the Office of the Secretary of Defense (OSD) issued Defense Management Report Decision 987 (DMRD 987) in 1990. DRMD 987, The Inventory Reduction Plan, was an attempt to set service-specific inventory reduction goals. The basic premise of the plan was to reduce inventory levels commensurate with the military drawdown (in 1990, inventories were seen as "right-sized," and as the military buildup started to decline with the end of the Cold War it was believed inventories should also decline proportionally). For the Air Force specifically, this meant going from an inventory estimated at $42 billion in 1992 to an inventory of approximately $21 billion (forecasted) in 2003 (Mattern, 1997:8).

Inventory Reduction. There are two methodologies that the DoD employs for inventory reduction (Neumann, 1999b). The two methods are related, yet disparate. The first way of reducing inventory refers to actually *disposing of on-hand inventory*. The goal is to eliminate stock that is obsolete or no longer required. However, this methodology can have negative impacts if not monitored very closely. For example, in 1984 the Air Force scrapped millions of dollars in *usable* spare parts as part of an Air Force-wide inventory reduction crusade (Hiatt, 1984). Although there were no "horror" stories reported as a result of the DMRD 987, the impacts to readiness are still uncertain (Mattern, 1997:10). Since inventory reduction is usually carried out in response to some directive (e.g., DMRD and GAO reports), it could be referred to as a *reactive strategy* since it brings inventories to acceptable levels by disposing of those inventories.

The second method of reducing inventory is through a *proactive strategy*. Here, a series of proactive actions brings inventory to acceptable levels over time. DRMD 987

accomplished this by cutting the Air Force's obligational authority (OA) for initial spares funding. DRMD 987 offered that "more intensive management and the use of premium transportation" would help reduce resupply times to make up for the loss of spares (Inventory, 1991:8). Subsequently, subordinate layers of defense management amended DMRD 987, an OSD document. For example, the Air Staff also tried to take proactive steps by dictating new factors to use as standards in the computations of the DO41 systems (Neumann, 1999b). As Neumann (1999b) explains, this was initiated to allow Air Force Materiel Command (AFMC) to buy spares based on reduced pipeline times. It was hoped when AFMC was faced with this situation (fewer spares and less money), they would respond with new business initiatives to facilitate lower actual pipeline times.

Few would argue with the notion of conducting business operations in a more efficient manner. However, over the past decade in particular, the General Accounting Office (GAO) has issued studies and audits citing numerous examples of inefficient inventory management practices within the Air Force. As such, new initiatives and processes are further substantiated in an era of declining budgets.

The primary mission of the Air Force, to protect and defend the United States of America, has not changed, while its support base has changed (e.g., Agile Logistics and reduced inventories) in response to reduced funding and manpower. This is not to say that military readiness should come at any cost or that military leaders should not be prudent stewards of American tax dollars; however, a thorough understanding of the tradeoffs between readiness and inventory levels is necessary. It seems almost paradoxical that a Defense Management Report Decision, issued by the Office of the Secretary of Defense, would have only one sentence dealing with military readiness when

its primary thrust of reducing aircraft part inventory levels may affect readiness levels. This study seeks to understand how this change in the support base, i.e., reducing inventory levels, has affected mission capability rates.

Problem Statement

Currently in the Air Force, there seems to be two deeply divided views in regards to inventory policy. The first view advocates Agile Logistics policies. The major thrust of these policies promote decreased transportation and repair times in order to lessen dependence on inventory. Another tenant of Agile Logistics includes eliminating or significantly reducing three-level maintenance in favor of two-level maintenance, thereby decreasing a unit's mobility footprint as well as infrastructure. Agile Logistics objectives do appear to be the current panacea to decreasing Air Force costs and have the support of senior management (Hallin, 1998a:1)

The second view, however, believes that Agile Logistics objectives may be reducing readiness levels. Field commanders have stated repeatedly that responsiveness has been affected by the elimination of intermediate maintenance levels (Dehnert, 1998). Additionally, there is some concern amongst this group that drastic inventory reduction policies may also be affecting readiness levels (Dehnert, 1999). Compounding this problem is the concern that transportation and depot repair cycle times have not decreased enough in order to allow the present inventory reductions, thus decreasing mission capability.

From FY94 to FY98 the aggregate Total Not Mission Capable Maintenance (TNMCM) rate for all aircraft increased from 14.0 to 18.2%, respectively (Hallin,

1998b:2). Likewise, the Total Not Mission Capable Supply (TNMCS) rate during FY94 to FY98 for fighter aircraft assigned to Air Combat Command (ACC) increased from 8.8 to 14.5%, respectively (HQ ACC, 1999). Starting a couple years prior, the Air Force embarked on developing a "leaner," and thus "meaner," posture. The term used to encapsulate this movement was called Lean Logistics.

As the new core competencies in the Air Force came about in 1997, from *Joint Vision 2010* and *Global Engagement: A Vision for the 21st Century Air Force*, Lean Logistics was subsequently changed to Agile Logistics. Despite the name change, the new logistics systems were designed to increase responsiveness and reduce costs. For example to reduce costs, three-level maintenance was replaced in favor of two-level maintenance. This transition resulted in $259 million savings and reduced the number of personnel positions by 4,430 (Hallin, 1998a:1). Additionally, Agile Logistics reduced both inventory and manpower for a savings of $800 million over a three-year period (FY97-99 projected) (Hallin, 1998a:2). After reviewing these figures, there seems to be little doubt that the Air Force has saved millions of dollars as a result of these initiatives. What is less clear is the effect on readiness levels.

While it can not be disputed that cost savings are critically important in times of decreasing or static budgets, cost savings do not measure military readiness. Referring to the aforementioned TNMCM and TNMCS rates, it is evident the Air Force has not gotten meaner, but rather meeker. Perhaps the shift in these statistics would not be so problematic if the Air Force was prepared for it. That is, if a conscious decision was made by leadership that a declination in mission capability would occur following the Cold War, then higher not mission capable rates would not be a problem, as they would

be understood and planned for appropriately. However, ~~during this timeframe~~ the Air Force has predicted that TNMCS rates would remain relatively unaffected. Obviously, this should be a major concern to senior leaders in the Air Force, as well as the Department of Defense (DoD). As one senior Air Force logistician appositely stated, "One of our major struggles is our ability to correlate wholesale performance [levels of inventory] with retail results [aircraft mission capable rates]" (Dehnert, 1999).

This research effort first seeks to investigate, identify, and model the relationship of reparable inventory levels and TNMCS rates during the 1990's. If a relationship is found, then the predictive capability of these models will be tested against Air Force TNMCS predictions.

Scope

There are essentially two reasons for an aircraft becoming NMCS: either a reparable item is not available or a consumable item is not available to repair an aircraft that has become unserviceable. Additionally, the broken part must affect a system on the aircraft that is considered essential to the mission of the unit to which the aircraft is assigned, hence the term "not mission capable." Figure 1 illustrates how an aircraft becomes NMCS when a mission critical failure of a reparable item occurs. One exception to this figure is the time that it takes base supply to deliver the part to the flight line. This rather short time period, even though the part is located on base, still represents NMCS time (if parts, or inventory, are available on the flight line, then the aircraft is not mission capable due to maintenance and supply is not the constraint).

As a result of aircraft being NMCS, base supply has primarily two options. If the part is a reparable item, it will be requested through the appropriate depot or fixed at the base if the repair capability exists. However, if the part is a consumable item, a requisition is placed to the Defense Logistics Agency (DLA). All of these parts are referred to as those having a direct impact on mission capability (MICAP). The scope of this research deals specifically with reparable inventory.

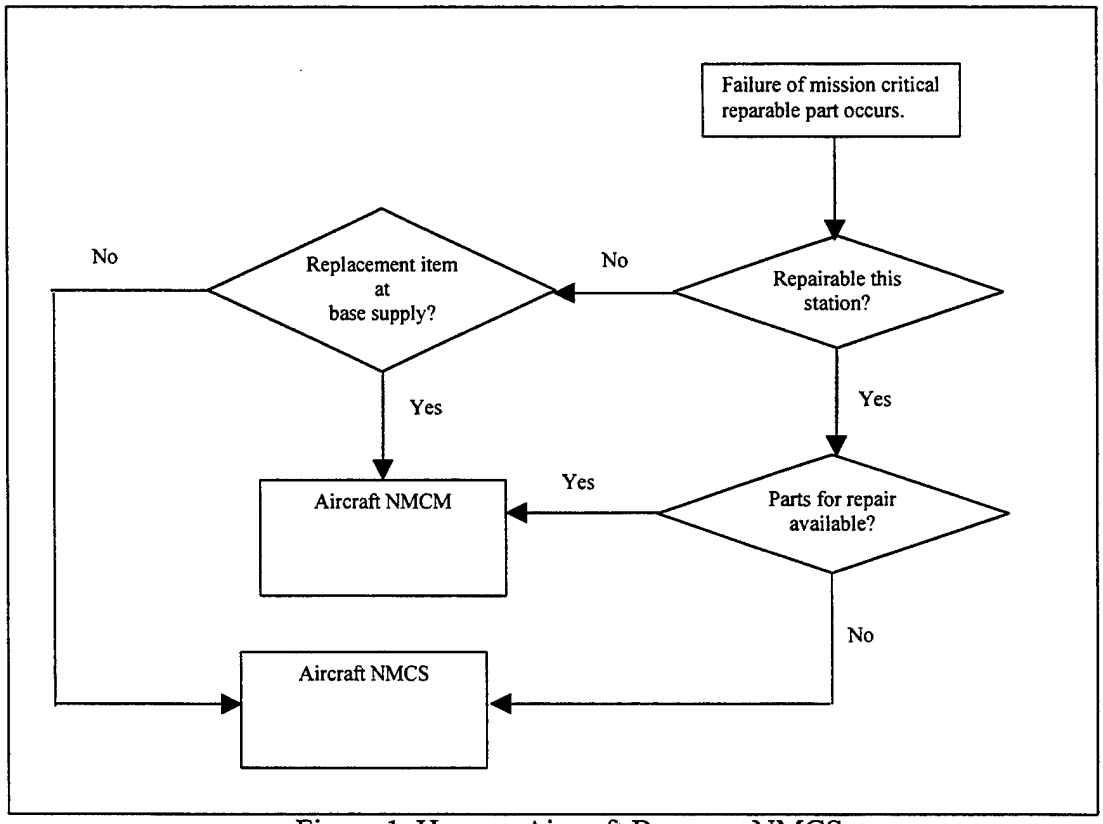


Figure 1. How an Aircraft Becomes NMCS

To narrow the scope further, it is not feasible for this particular research effort to evaluate the Air Force's entire fleet of aircraft. Therefore, only fighter aircraft reparable inventory levels and TNMCS rates will be examined. The fighter fleet is defined as

OA/A-10, F-15A/B/C/D, F-15E, and F-16A/B/C/D assigned to ACC, Air Force Reserve Command (AFRC), Air National Guard, Pacific Air Forces (PACAF), United States Air Forces in Europe (USAFE), and Air Education and Training Command (AETC).

Research Objectives

The objective of this study is to determine how changes in reparable *inventory levels, repair, and transportation* policies, beginning with the inventory reduction plan in 1991, have affected Air Force fighter aircraft readiness. Each of these three variables can be considered as a decision variable. As such, the management question *How can TNMCS rates for fighter aircraft be improved?* is posed, using the three variables as a guide. In order to support the answer to this question, data were collected to address the following research questions:

1) How have the variables (inventory, transportation and repair) been affected in the past ten years? (Chapter II)
2) What other independent variables exist that could contribute to TNMCS? (Chapter II)
3) How strong is the relationship of each variable to TNMCS rates? (Chapter IV)

Summary

This chapter outlined the impetus for this study. First, the problem was defined: "One of our major struggles is our ability to correlate wholesale performance [levels of inventory] with retail results [aircraft mission capable rates]" (Dehnert, 1999). Next, Agile Combat Support and two relevant positions regarding inventory appropriation were

discussed. The background provided information surrounding reactive and proactive measures involved with reducing inventory levels, as well as initiatives taken by the DoD to reduce inventory. The scope of this study was limited to USAF fighter aircraft and their respective reparable inventory levels. Next, research objectives were discussed and the management question, *How can TNMCS rates for fighter aircraft be improved?* was posed. Finally, research questions were derived in order to manage the research effort.

Overview of Remaining Chapters

Chapter II discusses how inventory, transportation, and repair have been affected due to inventory reduction and Agile Logistics. Chapter II also identifies other variables that affect TNMCS. This review includes a discussion of Agile Logistics, the USAF reparable pipeline, and other relevant information as well as interviews with key logisticians and analysts. After the variables are ascertained, an investigation is conducted in order to determine how easily data for the variables can be collected. The data needs, collection, and preparation are presented in Chapter III. Additionally, an experimental design is selected. Hypotheses are then developed and tested in Chapter IV. Finally, the results of the analysis and their implications as well as recommendations for future research are discussed in Chapter V.

II. Literature Review

Introduction

"There are potential risks inherent in some Lean Logistics initiatives. Reducing inventory without process improvement can have a negative impact upon capability. Over-correcting for long pipelines across all items may be a mistake for some items. Potential supply pipeline disruptions are a valid risk point within Lean Logistics. When the system is operating just-in-time, there is less insurance (in the form of stocks) against these disruptions. Applying Lean Logistics approaches to all components based on the results with a limited range of items without fundamental changes to the underlying processes or without selecting critical problem areas to focus upon is a mistake."

The Risks of a Lean Logistics System,
(USAF Baseline Lean Logistics Master Plan and Roadmap, 1995)

In order to answer Research Questions 1 and 2, a review of the literature is necessary to understand the defense supply environment of the past ten years. From Chapter I, three facts have emerged. First, TNMCS rates (in the aggregate) have increased. Second, the Air Force has implemented aggressive inventory reduction policies. Third, Agile Logistics has emerged as a way to manage logistics functions. This chapter's focus is to understand the policies of the past ten years and their effects on inventory, transportation, and repair at and between bases and maintenance depots. To complete this process, it is necessary to have an understanding of three areas. First, it is necessary to understand the USAF reparable pipeline and the tradeoffs that exist within it.

Second, the Agile Logistics concept, including its background and implementation, must be understood. Third, principal inventory reduction actions must be known.

After discussing inventory reduction, a comparison with the private sector will be completed to determine if the impacts of initiatives such as these are isolated to the Air Force, and whether we can learn from the methods civilian companies use in handling these issues. The focus of the next section is to understand how other variables may affect TNMCS rates. This includes a discussion of how the Air Force currently predicts TNMCS rates. The chapter ends with a summary of the aforementioned areas. The answers to Research Questions 1 and 2 will be reported in Chapter V.

USAF Reparable Pipeline

Introduction. To gain an understanding of the Air Force's inventory management structure, it is essential to understand the basic philosophy governing day-to-day actions. The objective of the pipeline is simple...to have the right parts at the right location at the right time so a unit can complete its mission. As stated in Chapter I, if this is not accomplished in an Air Force flying wing, then an aircraft needing a part becomes not mission capable due to supply.

Literally volumes of literature exist for the USAF pipeline and its accompanying supply systems. A great deal of this literature can be found in AFIT logistics theses (Bond and Ruth, 1989; Kettner and Wheatley, 1991; Hill and Walker, 1994; and Barney, 1995). Bond and Ruth (1989), in response to a request from the Air Staff, provided perhaps one of the most extensive overviews of the pipeline to date.

However, in the past ten years it has been especially difficult to describe the pipeline in its entirety because of the numerous changes in business practices (Arostegui, 1999). Due to these changes (and impending ones), it was decided to use graduate classes taught at AFIT as a source, supplemented with relevant published literature. Whenever the classroom lectures were derived from AFIT theses, the theses were used as a source instead.

Overview. The Air Force generally defines its reparable logistics pipeline as a system of supply, repair, and transportation activities that, in concert with one another, form a distribution network that collects unserviceable assets at an operational location and through a series of transactions restore the assets to serviceable condition in order to be used again by the operational units (Moore, 1998). In order to visualize this process, Barney (1995) suggested that the logistics pipeline is analogous to a physical (i.e., petroleum) pipeline since it has properties such as routing, volume, and length (Barney, 1995:2-5). Here, the volume indicates quantities of assets (inventory) and the length of the pipeline represents times involved with transporting and repairing assets to and from the users, bases, and depots (Bond and Ruth, 1989:5). Routing involves decisions involved with what to do with the assets when they reach certain points in the pipeline.

Past illustrations of such a pipeline model have traditionally included six steps: 1) base processing; 2) reparable in-transit; 3) supply-to-maintenance; 4) shop flow; 5) serviceable turn-in; and 6) order and ship time (Vickers, 1997:7). (Note that the term *retrograde times* is often used to describe steps 1 and 2.) Additionally, a recent GAO report included DLA warehousing as one of the steps in this process (GAO, 1999:16). In effect, DLA has taken over the supply-to-maintenance and serviceable turn-in functions.

Although the functions of these activities remains almost the same, the DLA does use a different information system; however, the impacts of DLA taking over these functions have not yet been assessed (Gaudette, 1999). Figure 2 provides a layout of the pipeline; DLA has been added to this model in order to illustrate the change.

Base Repair. To initiate the supply pipeline, the user experiences a failure of a reparable item. The item is removed from the aircraft and it is ascertained whether the base has the capability to fix the part. If the base does have the capability, the item is repaired and put into the base's serviceable stock. Porter (1990:3A) estimated base repair to be 4 days. More recently, the average base repair time as recorded by Synergy, Inc., from the third quarter of FY98 to the second quarter of FY99, was 5.6 days (Synergy, 1999).

Base Processing. If repair capability does not exist at the base, then base processing begins. As Kettner and Wheatley (1991:11) describe, this process consists of four steps: 1) item movement from base maintenance to base supply; 2) request for disposition from the depot item manager; 3) item packing at base supply; and 4) item movement from base supply to the base transportation office. The estimated time for base processing is 4 days (Porter et al., 1990). Although this process seems static throughout the literature reviewed for the past 10 years, changes are currently underway to combine supply and transportation activities to make this process more efficient. In a pilot project conducted by the 20 Fighter Wing at Shaw AFB, SC, after combining these activities, management was able to reduce the base processing time to 2 days (Douglas, 1999).

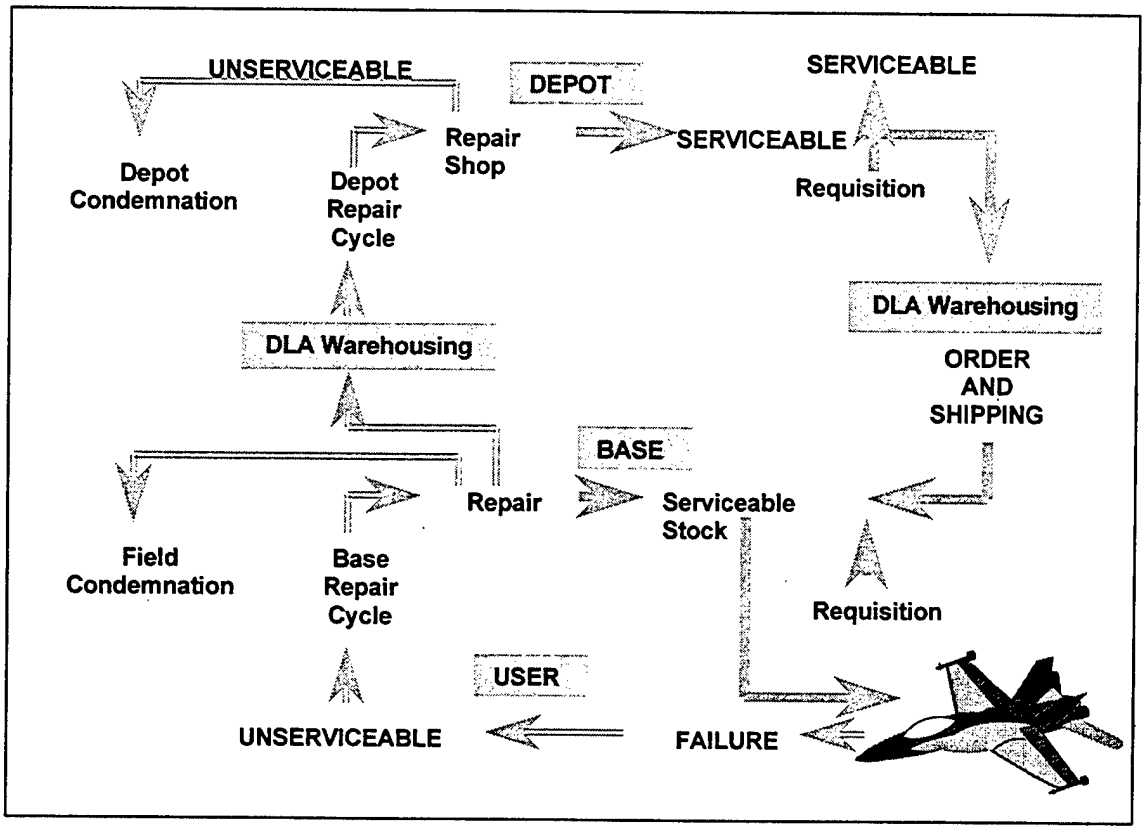


Figure 2. Repair Cycle/Pipeline Diagram (Moore, 1998)

Reparable In-transit. Reparable in-transit time starts where the base-processing segment finishes, at the base transportation office. The process ends when the part arrives at the depot or the DLA warehouse. This segment of the pipeline is also composed of four activities: 1) preparation for movement, 2) scheduling of the transportation carrier, 3) cargo loading, and 4) actual movement of the unserviceable reparable to the maintenance depot or DLA warehouse (Kettner and Wheatley, 1991:12). During a recent study, in which F-16 avionics components were evaluated, in-transit time was measured at 3.2 days (F-16, 1998:25).

Supply-to-maintenance. Supply-to-maintenance time consists of two processes. The first process is DLA processing time, it starts when the unserviceable item arrives at the depot and is completed when its receipt is posted to the appropriate supply records (Kettner and Wheatley, 1991:12). The item is stored until the Air Force Supply Management Activity Group (SMAG) determines that a part needs to be fixed (GAO, 1999:16). The SMAG then directs DLA to send the item to the appropriate depot maintenance activity. Delivery to depot maintenance is the second process. This starts when the SMAG requests the item and is completed upon item delivery (Kettner and Wheatley, 1991:12). This segment of the pipeline is estimated to take three days (Porter et al., 1990).

Shop Flow. The next segment of the pipeline, shop flow, initiates when the unserviceable item arrives at the depot maintenance activity and is completed when the item is repaired and is deemed serviceable (Kettner and Wheatley, 1991:12). This segment of the pipeline is estimated at 30 days (Porter et al., 1990). Recent data collected by Synergy, Inc., indicates that the average shop flow time for the depots, from third quarter FY98 to the second quarter FY99, was 26.8 days (Synergy, 1999). However, the three depots that will remain after 2002 (due to the 1993 Base Realignment and Closure (BRAC) committee decision), averaged 30 days during the same period (Synergy, 1999). Although Vickers (1997) claimed that order and ship time is possibly the longest segment of the pipeline, depot repair cycle times posted in the D041 system and data collected by Synergy, Inc., indicates differently. Instead, shop flow is consistently the longest portion of the pipeline (Synergy, 1999; GAO, 1999b:9).

Serviceable Turn-in. The fifth segment in the reparable pipeline is serviceable turn-in. This segment begins when the item becomes serviceable and is completed when it is transported to depot supply and posted to the accountable records as a serviceable item (Kettner and Wheatley, 1991:13). This segment takes approximately six days (Porter et al., 1990). Here, the serviceable item can take one of two paths. It can either go to the DLA warehouse and await a user request, or it can go to the sixth segment, order and ship time.

Order and Ship Time. The final segment of the pipeline is order and ship time. This segment starts when the customer places an order to the depot for a serviceable item to replace the one that failed. This segment is completed when the base receives the replacement. Although this segment can include all the time of the previous segments, a majority of the time the depot either has a replacement or is in the process of repairing it (Moore, 1998). Data collected by Synergy, Inc. indicates that the average order and ship time, from third quarter FY98 to the second quarter FY99, was 7.4 days (Synergy, 1999). This is down from 16.2-day average as measured by the Air Force Logistics Management Center in 1991 (Kettner and Wheatley, 1991:54). However, since the order and ship time can include the entire aforementioned segment, large variances can be realized. For example, in a study conducted on 10 critical F-16 avionics reparables the average order and ship time was 37 days (F-16, 1998).

Summary. The USAF reparable pipeline is a complex system. The previous discussion simplifies the process to provide the reader with a general overview. However, when one considers the number of parts (hundreds of thousands) that fill the pipeline, the complexity becomes readily apparent. It is clear from this discussion that

pipeline success depends on timely transportation and repair and the number of items in the pipeline. The next section illustrates of the interactions of transportation, repair, and inventory as they work in a simple Repair Cycle Demand Level (RCDL) model.

Interactions of Transportation, Repair, and Inventory

Introduction. As seen in the overview of the reparable pipeline, repair and transportation times are key to the success of the reparable pipeline. In fact, the amount of inventory that is purchased is often dependent upon these two variables. In order to present the relationship among these variables, an RCDL example is shown in Table 1.

RCDL Example. The following terms and equations are used (Moore, 1998):

Daily Demand Rate (DDR): the average daily demand rate for an item as calculated in the Standard Base Supply System (SBSS).

Percentage Base Repairable (PBR): the average fraction of assets of any particular type which can be repaired on base.

Not Repairable This Station (NRTS): the average fraction of assets of any particular type which cannot be repaired on base (1-PBR).

Order and Ship Time (OST): the average time it takes to transmit a stock replenishment requisition between a given base and source of supply, plus the depot response time for packing and crating the serviceable asset, plus the shipment time from the depot to the base.

Repair Cycle Time (RCT): the average amount of time that it takes to repair an item on base, given that it is base repairable.

Retrograde Time (RET): the time it takes to ship an unserviceable reparable item from the base to the next higher level of repair.

Depot Repair Time (DRT): the average amount of time it takes a depot to repair a specific type of asset.

Nonrepairable Cycle Time (NCT): the average amount of time it takes to determine an item is NRTS.

Base Repair Pipeline (RCQ): RCQ= (DDR) X (PBR) X (RCT)

Off-base Repair Pipeline (OSTQ): OSTQ = (DDR) X (1-PBR) X (OST)

Repair Decision Time (NCQ): NCQ = (DDR) X (1-PBR) X (NCT)

Pipeline Stock (Q): Q = RCQ + OSTQ + NCQ

Number of Standard Deviations (C): Used to help calculate safety stock given an authorized service level

Standard Deviation (σ): In the normal distribution, corresponds to service level above the mean. One σ is equal to 34% of the distribution above the mean. Hence, a C factor of one would give a supply system an 84% service level.

Safety Stock (SLQ): $SLQ = C\sqrt{3Q}$

Rounding factor (K): if part costs <$750, then K=.9, otherwise K=.5

Total Stock Requirement (TSR): Truncate (Q + SLQ + K)

Service Levels using standard z-table: z score = (TSR-Q)/(SLQ), translate z value and add .5 to derive service level. The 50th percentile is the average.

As discussed in Chapter I, there are two ways of reducing inventory—proactive and reactive. One way to proactively reduce inventory requirements would be either to reduce repair time or transportation. In this RCDL example, scenario 1 illustrates a base trying to achieve an 84% service level. If they meet the averages (RCT, RET, DRT, OST, and NCT) they have set, then they will achieve the service level. Scenario 2 illustrates what happens when OST can be lowered by one day. The service level will stay the same, but the TSR goes down, thus cost savings are achieved, *ceteris paribus*. In scenario 3, the original computation is that OST is nine days; however, it is not achieved. Ordering inventory on the assumption of a lower OST, and not achieving it, will result in a lower service level. This is computed by TSR = (TSR-TSR at 50% service level)/σ. In all scenarios, the 50% service level is equal to 96 items. Thus, (107-96)/(16.92) $\approx$ .65. This z-value is translated .2422, thus service level is now .2422 + .5 = .7422, instead of 84%. This same process can be achieved with repair times as well and will yield similar results.

Table 1. Computation of Service Levels (RCDL Example)

Scenario One (Actual)					
Daily Demand Rate (DDR)	9				
Percent Base Repairable (PBR)	0.4				
Repair Cycle Time (RCT)	4				
Retrograde Time (RET)	5				
Depot Repair Time (DRT)	7				
Order and Ship Time (OST)	10				
Nonrepairable Cycle Time (NCT)	5				
Base Repair Pipeline (RCQ)	14.4				
Off-base Repair Pipeline (OSTQ)	54	Service Levels			
Repair Decision Time (NCQ)	27	z-score		translation	
Pipeline Stock (Q)	95.4	1.029555288	.3485+.5	approx 84% service level	
Saftey Stock (SLQ)	16.92	Cost/Item	Total Cost		
Rounding factor (K)	0.5				
Total Stock Requirement (TSR)	113	$ 1,000.00	$ 113,000.00		
Scenario Two (Lowering OST By One Day)					
Daily Demand Rate (DDR)	9				
Percent Base Repairable (PBR)	0.4				
Repair Cycle Time (RCT)	4				
Retrograde Time (RET)	5				
Depot Repair Time (DRT)	7				
Order and Ship Time (OST)	9				
Nonrepairable Cycle Time (NCT)	5				
Base Repair Pipeline (RCQ)	14.4				
Off-base Repair Pipeline (OSTQ)	48.6	Service Levels			
Repair Decision Time (NCQ)	27	z-score		translation	
Pipeline Stock (Q)	90	1.030429031	.3485+.5	approx 84% service level	
Saftey Stock (SLQ)	16.43	Cost/Item	Total Cost		
Rounding factor (K)	0.5				
Total Stock Requirement (TSR)	107	$ 1,000.00	$ 107,000.00		
Scenario Three (Compute Lower OST, But Fail to Achieve Process Improvement)					
Daily Demand Rate (DDR)	9				
Percent Base Repairable (PBR)	0.4				
Repair Cycle Time (RCT)	4				
Retrograde Time (RET)	5				
Depot Repair Time (DRT)	7				
Order and Ship Time (OST)	9				
Nonrepairable Cycle Time (NCT)	5				
Base Repair Pipeline (RCQ)	14.4				
Off-base Repair Pipeline (OSTQ)	48.6	Service Levels			
Repair Decision Time (NCQ)	27	z-score		translation	
Pipeline Stock (Q)	90	0.65	.2422 +.5	approx 74% service level	
Saftey Stock (SLQ)	16.43	Cost/Item	Total Cost		
Rounding factor (K)	0.5				
Total Stock Requirement (TSR)	107	$ 1,000.00	$ 107,000.00		

In this scenario the actual requirement is 113, but computing a lower OST and not achieving it results in a lower service level. Also, notice the cost is $107,000, but in order to meet an 84% service level, $113,000 should be spent.

Summary. The RCDL example illustrates that inventory levels are dependent upon the speed of repair and transportation. The interactions of these three components (inventory, repair, and transportation) determine whether the Air Force has a capable, mission-ready force. While service levels do not necessarily correspond to aircraft readiness levels, i.e., TNMCS, there is a relationship. The more complex, availability-based Aircraft Availability Model (AAM) uses these factors as well for determining worldwide expected backorders. The following linkage can now be deduced from this example: mission readiness is determined by inventory available; the amount of inventory is determined by transportation and repair activities; hence, mission readiness is affected by repair and transportation activities. Thus, it can be concluded that inventory, transportation times, and repair times are all variables that affect mission readiness. The next two sections discuss inventory reduction initiatives and Agile Logistics in order to understand their role as it pertains to these three variables.

The Air Force Agile Logistics Concept

Introduction. This section on Agile Logistics discusses the history of the program and how it emerged as a result of Air Staff studies and two-level maintenance practices. Next, key initiatives of Agile Logistics are explained. The section concludes with how the implementation of Agile Logistics is proceeding: from practitioners', consultants' and the GAO's viewpoints.

Implementation of Agile Logistics. As stated in Chapter I, Agile Logistics was formerly referred to as Lean Logistics. The impetus in the literature for reducing pipeline times--thereby "leaning" the inventory in the pipeline-- all point to correspondence issued

in 1988 by Major General Skipton, then Assistant Deputy Chief of Staff for Logistics and Engineering. General Skipton stated studies had shown that a one day reduction in the pipeline would save in excess of $50 million (Skipton, 1988). This study was later confirmed by HQ Air Force Logistics Command when they completed a similar study in 1990, which revealed a one-day reduction in the 58-day pipeline, would result in a savings of $50.9 million (Moore, 1998).

During this same time period (1989-1990), the Air Force started implementing the Two-Level Maintenance policy (2LM). Nearly a decade earlier a researcher at RAND authored a study that explained the complexity of conventional weapons had increased dramatically since the Vietnam era. This complexity, he offered, was increasing the requirements for test equipment, personnel skill levels, and tooling; making support increasingly expensive (Rice, 1979:47). This researcher, Dr. Donald Rice, became Secretary of the Air Force on 1 May 1989 and sought to make 2LM a reality. One of the major tenets of this program was to create a reliable, high-velocity transportation network in which reparables could travel quickly from the base to the depot and back (Barney, 1995: 2-12).

Using General Skipton's direction, the 2LM concept, and results of commercial businesses to reduce their inventories, in 1991 the Air Force logistics directorate asked the RAND Corporation to examine modern business practices and determine how they could be applied to the Air Force's reparable pipeline in order to minimize resource investments (USAF, 1995:17-18; Orr, 1998:12). RAND then presented ideas on how the Air Force could use Theory of Constraints and Just-In-Time practices to improve reparable depot repair processes and pipeline activities (Hill and Walker, 1994:23).

These ideas were subsequently briefed to senior Air Force members and Lean Logistics was born.

In January 1993, a Lean Logistics transition team was sponsored by Maj Gen Nowak, the USAF's Director of Supply under the Deputy Chief of Staff, Logistics, in order to implement the tenets of Lean Logistics. These tenets included the transition to 2LM, more responsive base and depot operations, reengineering depot shop flows, and continuous process improvements (i.e., reducing transportation times), all of which will be discussed in detail later. After a year of planning, Lean Logistics initiatives were implemented on a selective basis in 1994 (Hallin, 1997:1).

As articulated in Chapter I, as a result of *Joint Vision 2010* and *Global Engagement: A Vision for the 21st Century Air Force*, Agile Combat Support became one of the core competencies of the Air Force. Faced with these new policies, and the negative connotations associated with the word "lean," it was decided at CORONA SOUTH 98 (a meeting of the Air Force's general officers) that Lean Logistics should be changed to Agile Logistics (Orr, 1998:12). As of this writing, the name, Agile Logistics, is still being used to represent a number of initiatives used by the Air Force in order to support combat capability. Some of the major initiatives, as they apply to this study, are described in detail below.

Major Initiatives of Agile Logistics. There are several initiatives that have resulted with the implementations of Agile Logistics. This study reviews six of the major initiatives. They are as follows:

Two-Level Maintenance. The cost savings for this initiative was discussed previously in Chapter I. Essentially, this process seeks to convert maintenance

for avionics and engines from three levels of maintenance (3LM) to 2LM. The three levels consist of (1) organizational maintenance: aircraft repair on the flightline using maintenance technicians; (2) intermediate maintenance: "backshop" repair requiring specialized machinery and skills for repair of parts that flightline maintainers could not perform; and (3) consolidated repair facilities (depots): advanced repair of aircraft or aircraft parts that the two aforementioned levels were unable to accommodate. During the implementation of 2LM a series of tests, called CORONET DEUCE for avionics and CORAL THRUST/CORAL for engines, were run to determine the effectiveness of 2LM (USAF, 1995:22). This same document stated, "pipeline times for avionics have been reduced significantly while engine repair processes have made less progress" (USAF, 1995:22). Intriguingly, a study published three years later on the F-16 avionics logistics reported a 71% increase in MICAP incidents (F-16, 1998:37). The study also concluded that AFMC lacked a comprehensive materiel management program and that repair was not keeping pace with demand (F-16, 1998:37).

Worldwide Express (WWX). WWX began as a response for express time-definite delivery of high priority parts in order to support programs such as Lean Logistics and 2LM since they demanded such service (WWX, 1999). Additionally, research indicated there was a large amount of cargo movement outside the Defense Transportation System (DTS) being transported effectively without government oversight (intransit visibility) (WWX, 1999). In order to create a synergistic effect, the DoD and Government Services Administration (GSA) entered a partnership to contract for the U.S. Federal Government an international, small package delivery service. The acquisition strategy for this service calls for "best value" contract to purchase commercial service

from express carriers. The contract provides services by civil reserve air fleet carriers to give the customer time-definite delivery, door-to-door delivery, intransit visibility, for high-priority documents and packages weighing up to 150 lbs. Thus far, contracts have been let to Federal Express, DHL, and UPS to the Central, Pacific, European, and Southern theaters. DoD shippers must use the program. Preliminary analysis estimates annual OSD savings of $50 million with as good, or better service than was provided previously using military airlift (WWX, 1999).

Depot Repair Enhancement Program (DREP) and Contract Repair Enhancement Program (CREP). These programs are designed to convert the push system methodology to a more efficient repair-on-demand system (F-16, 1998:5). The intent of DREP is to increase the availability of serviceable Depot Level Reparables (DLR) at the point of sale between base supply and base maintenance by increasing the velocity of inventory, reducing the size of inventory, and synchronizing the repair process to customer requirements (Stone, 1997:16). It is a six-step process that answers the following questions (Stone, 1997:16):

1) How many assets of a particular reparable national stock number should the reparable business cycle own?
2) Of the assets the system should own, what are the optimum authorized levels for each business cycle partner?
3) On a daily basis, how many authorized levels are empty—what is the total repair need?
4) Of the total repair need, what are the most important repair priorities?

5) Of the total prioritized list of repair needs, which needs are supportable?

6) When a reparable has completed repair, where should the asset be shipped?

In order to answer these questions, three tools are used. Although they come under the guise of DREP, they are separate processes under Agile Logistics. These are the Aircraft Availability Model (AAM), the Execution and Prioritization of Repair Support System (EXPRESS), and Readiness Base Leveling (RBL).

AAM. The AAM is actually part of a larger system that computes requirements, the D041, but represents a leap forward in figuring out what and how many assets are needed. Throughout the Recoverable Consumption Item Requirement System (D041) spare part computation, the AAM computes the safety stock for each item with a demand history. The AAM uses targets, set by the Air Staff, in order to identify the number of parts needed to yield the required availability at the least cost (Gimme, 1997:28). In addition to the AAM, the D041 also accepts requirements for Readiness Spares Packages (RSP) and High Priority Mission Support Kits (HPMSK). Through this process the quantity of assets needed by the repair cycle is determined (Stone, 1997:16).

EXPRESS. This is a system designed to automate segments of the depot component repair program. It is a daily execution system that sees customer demands and sends assets to the depot shop as needed to fill those demands (Carter, 1997:20). This system, using the Distribution and Repair in Variable Environments (DRIVE) model logic developed by RAND, is designed to make critical choices in a constrained depot environment (Carter, 1997:21). The operation is as follows: (1) Customer needs are

prioritized in a sequence; (2) EXPRESS then checks to see what assets are available, first checking the consolidated depot inventory, then items in repair, and finally those items that are in-transit to the repair; (3) these assets then are matched with customer needs (Carter, 1997:21). In addition to considering customers' needs, EXPRESS considers all NSNs competing for depot repair resources. EXPRESS seeks to achieve, using this prioritization sequence, maximization of weapon system availability per repair dollar (Carter, 1997:21).

RBL. RBL is designed to allocate inventory worldwide among bases and the depots in order to minimize expected backorders. The RBL uses base and depot pipeline times, failure rates, on-hand/on-order inventory, and funding information in order to calculate the expected backorder (Arostegui, 1999). Again, for aircraft reparables, allocation is based on achieving the greatest availability for the fleet (Dymond, 1997:22). RBL allocation is performed for a single item at one time. RBL first computes pipelines for each base and the depot with the following equations:

Base Pipeline = OST Pipeline (DDR*(1-PBR)*OST) + Base Repair Cycle (BRC) Pipeline (DDR*PBR*BRC).

Depot Pipeline = Depot Repair Cycle Time (DRCT)*(Sum of all base DDR*(1-PBR))

Notice that these equations are similar to the example provided earlier in computing the Repair Cycle Demand Level (RCDL), but the difference is that where the RCDL relies on creating issue effectiveness as a means of measurement, the RBL relies on maximizing aircraft availability as a means of measurement (Arostegui, 1999).

Results of Agile Logistics. As indicated in Chapter I, Agile Logistics does appear to be the current panacea to complex logistical problems as the Air Force enters the 21st Century. The question then is--what type of effect are these initiatives having on the affected components of the logistics chain? Despite top leadership support, as referenced numerous times in this study by Lt Gen Hallin, the former Deputy Chief of Staff for Installations and Logistics, the jury still seems to be out. For instance, as late as 1998, General Babbitt, Commander of AFMC, expressed his concern about the depots' ability to support the new Expeditionary Aerospace Force concept with the following statement:

> ...we must reexamine our role in furthering the concept of Agile Combat Support, a key enabler of the Expeditionary Aerospace Force (EAF). The availability and timeliness of depot supply and maintenance support must improve. Our current high level of backorders represents a readiness problem. Our inability to quickly respond to every demand brings into question how well we can sustain combat operations (Babbitt, 1998).

These high levels of backorders, General Babbitt refers to, are a symptom of poor inventory management (Lambert and Stock, 1993:425). Although the comments presented by Generals Hallin and Babbitt are broad, there have been several studies, reports, and observations (by academicians, auditors, and practitioners) that assess specific portions of Agile Logistics. Some are described in detail below.

Agile Combat Support from the Oklahoma City Air Logistics Center (OC-ALC) Engine Shop Viewpoint. The Propulsion Directorate at OC-ALC is responsible for worldwide management of many of the Air Force's turbine engines and they repair over 700 engines annually. As Larvick (1998) explains, under Agile Logistics

the engine shop has had to transform from a make-to-stock organization, using a continuous process, to a make-to-order/assemble-to-order business using a job-shop process. This transition has had both positive and negative aspects.

In regards to the positive aspects, the engine shop is more responsive to customer requirements (Larvick, 1998:30). Larvick credits DREP processes (EXPRESS and RBL) as key tools that have identified true customer requirements. In addition, inventory reduction has forced the shop to examine its processes more closely because high inventories in the past had masked many problems with ordering, tracking and prioritizing (Larvick, 1998:29).

Larvick, however, has found that reduced inventory is a "double-edge sword." One of the key observations he made, which is consistent with the production operations management literature (Silver et al., 1998:41), is that the job-shop environment requires a higher amount of work-in-process inventory to buffer against variations in work loads caused by variations in product mix. As Larvick states, "It is those inventories the original Lean Logistics initiative eliminated" (Larvick, 1998:28). Another problem the shop is faced with is that EXPRESS does not handle all the complexities of the engine repair process (Larvick, 1998:30). What this means is that there is not visibility for all engine customer requirements. Henceforth, shop floor managers need to develop databases for non-EXPRESS parts and resolve conflicts between repair resources, which increases the complexity of the shop's operations. Despite these pitfalls, Larvick believes depot operations are moving in the right direction with Agile Logistics. "Even in the commercial world, changes to Just-in-Time or other customer-oriented manufacturing

environments take a great deal of time to successfully implement—some companies plan this to take six years or longer" (Larvick, 1998:31).

C-5 Lean Logistics Demonstration: Phase I. HQ Air Mobility Command (AMC) was tasked to conduct the initial test of the Lean Logistics concept. This demonstration included observing 24 recoverable assets from various aircraft subsystems to which Lean Logistics principles had been applied. This study had a number of positive effects (Surrey and Honious, 1995:18). First, Federal Express-based transportation worked extremely well. There was increased user involvement in setting repair/distribution priorities, which helped shop managers manage workflow. Finally, repair times were reduced on 17 of the 24 items from an average of 30 days to an average of 15.

The observation team also reported a number of problems with implementation (Surrey and Honious, 1995:15). The first problem found was that repairs at base and depot levels were hindered by support part shortages. Second, they found that calculating lean levels is labor intensive (the Air Force still separates Lean Logistics parts from other). Finally, they observed that most base lean levels were lower than the normal demand levels.

F-16 Avionics Logistics Chain Management Study. This report by KPMG, at the direction of HQ AFMC Logistics Directorate, conducted a study of 10 selected National Stock Numbers (NSNs) repaired by the F-16 Avionics Shop at Ogden Air Logistics Center (OO-ALC). These 10 NSNs were responsible for 33% of all MICAP incidents and 52% of all MICAP hours (F-16, 1998:6). The report was cited previously in discussions of the USAF Reparable Pipeline and 2LM. It is important to

know that very few base repairs are authorized for F-16 avionics, making them almost completely dependent on the depot pipeline. Besides those examples cited previously, the study found that many other problems exist within the logistics chain.

First, the study found that base issue effectiveness (BIE) and base stockage effectiveness (BSE), two primary depot indicators of support levels provided to field activities, significantly decreased in 1997. In fact, BIE was down to a low of 33% by the end of FY97, compared to the USAF standard of 66% (F-16, 1998:18). Second, although the budgeted OST goal for FY97 was 10 days, the average for all F-16 avionics was 34.6 days (F-16, 1998:18). Recall the previous RCDL example and what can happen to service levels when OST is improperly computed? In this instance, the total requirement (for the 10 NSNs) came to 350 assets, but in actuality there was a need for 407 assets (F-16, 1998:27). Third, KPMG found that a DREP "cultural change" had not occurred within the avionics shop at OO-ALC. Finally, they found that the express transportation was working well; however, they noted that transportation costs could be reduced by not using fast transportation for retrograde items that are not MICAP (F-16, 1998:42).

One of the limitations in this study was that it did not address when the items they evaluated became 2LM items. This is important because 44 of the F-16's reparable items (out of 196) transitioned to 2LM in FY97. Thus, measurement data would have been taken during a time of transition, which may have unfairly skewed the results.

Time to Tweak the AF's Approach to 2LM? Another paradox found in the literature is also relevant to this study. Colonel Guy R. Vanderman was the Chief of the HQ AFMC Lean Logistics Program Office from 1995 to 1997. During an interview, Colonel Vanderman discussed why the Air Force needed to move a 2LM concept and

how it would help war-fighting capability (Hicks and Nicolai, 1997:7). Interestingly, Colonel Vanderman later published an article that spoke out against the concept because he discovered that many of the assumptions originally conceived to support tremendous savings by going to 2LM, did not stand up when the numbers were calculated. According to Vanderman,

> It was a mistake because we do not utilize avionics technicians remaining at operational units or depots to their fullest capacity, pay a high rate for transporting Line Replaceable Units (LRUs) to and from repair centers, and lose the availability of serviceable Shop Replaceable Units (SRUs) that are unnecessarily consumed into the retrograde, repair, and replenishment of the pipeline. (Vanderman, 1998:10)

Vanderman went on to say that the avionics technicians have the technical knowledge, skill, capability and desire to fix the problem, but are prevented (under Agile Logistics policies) from fixing the item. Also, because the LRUs are extremely heavy and bulky compared to SRUs, Vanderman also claims transportation costs are also more expensive than they need to be (Vanderman, 1998:12). He stated that he had discussed the issue with senior members of the Air Force Logistics Management Agency staff and discovered it was politically incorrect to challenge the Air Force's view on 2LM (Vanderman, 1998:10).

Management Actions Create Spare Parts Shortages and Operational Problems. Accomplished by the GAO, this report analyzed selected parts that were most frequently causing supply problems for the B-1, F-16 and C-5 aircraft. The impetus of this report came from the fact that TNMCS rates had risen from 6.4% in FY90 to 13.9% in FY98 (GAO, 1999b:5). The GAO cited three key reasons that were contributing to supply problems (GAO, 1999b:5). First, they noted weaknesses in forecasting inventory

and executing inventory procurement and repair budgets. Second, they reported that the Air Force was not achieving Agile Logistics goals. Specifically, these goals pertain to the improvement of processes such as timely return of broken items to depot and reducing the time it takes to receive an item once it is ordered by a unit (GAO, 1999b:9). Finally, they concluded that the depot maintenance activities were providing untimely repair.

Of the 155 parts reviewed by the GAO, they found that 57 of the problem parts were related to forecasting of inventory requirements and execution of the SMAG's budget. These forecasting errors, they claimed, resulted in a $500 million shortfall in funding in the FY97 SMAG's budget. Due to funding shortfalls, the SMAG tried to optimize its funds by repairing items that were causing aircraft to be not mission capable. As a consequence, the number of useable items at the base and the depot declined, which resulted in shortages of different inventory items. The shortage of these items also caused aircraft to be not mission capable.

In reference to the Air Force not meeting Agile Logistics goals, the GAO reported that the Air Force reduced the SMAG's budget in anticipation of savings from the implementation of the new logistics processes as part of the Agile Logistics program. Of the 155 items reviewed, 31 did not achieve Agile Logistics process improvement goals. Recall from the RCDL example that when a process improvement is overestimated, lower levels of inventory occur. Thus, after goals are determined, it is imperative to verify whether the goals are met. Since these goals were not met, the GAO claimed that the Air Force units were forced into uneconomical maintenance actions (discussed in further detail following the next paragraph).

Another reason for the shortage of parts, the GAO asserted, was the depots' inability to accomplish timely repair for 53 of the 155 items reviewed. (GAO, 1999b:9). This was due in large part to shortages of component parts to fix broken reparables and shortages of repair shop personnel. The GAO alleged that although component part shortages have been a long-standing and well-documented problem AFMC has not yet developed an effective plan to correct the problem. Furthermore, while manpower shortages were noted as a main constraint, maintenance activities were tasked to repair the items that were breaking on a daily basis, as well as items that had been backlogged from prior years. In other words, the shop personnel were asked to do more with less and were unable to meet the increased demand with the labor supply. The GAO stated that one of the problems behind this was that AFMC had made little progress in developing multi-skilled workers that the depot maintenance activities need in order to operate effectively in a repair-on-demand environment (GAO, 1999b:39). This situation, the GAO maintained, also contributed to Agile Logistics goals not being met.

As mentioned earlier, the GAO also noted poor (uneconomical) maintenance practices stemming from inadequate supply support. For instance, during a two year period in 1996-1998 maintenance personnel spent approximately 178,000 hours removing inventory items on the B-1, F-16, and C-5 aircraft to replace broken items on other aircraft (GAO, 1999b:7). This process, known as cannibalization, equated to about 43 people working 8 hours a day, 5 days a week for 2 years.

Summary. Agile Logistics came about as a way to manage logistics activities in times of reduced budgets. It seeks to improve processes involved in the USAF reparable pipeline. By linking the Agile Logistics initiatives to aircraft availability and reduced

backorders, the Air Force seeks to maximize use of its funds to support war-fighting capability.

Results appear mixed. Although field activities have reported some positive results, consultants and the GAO appear less impressed. Among the criticisms listed, three are especially important. First, inventory levels do not seem to be supporting a job shop approach to remanufacturing. Although repair process improvements may be occurring at the depot, lower inventory levels may have caused the GAO to report "untimely repair" is contributing to TNMCS increases. Second, the transition from 3LM to 2LM is troublesome from many perspectives, i.e., culture, capacity, and reengineering of processes, as evidenced by the F-16 avionics report. Third, Agile Logistics processes are going to take a while to implement and work effectively, especially in a large institution that is not used to change.

Air Force Inventory Reduction

Introduction. Before addressing inventory reduction, it is first necessary to discuss the intent of inventory. Although there have been numerous inventory models proposed over the years, the reasons to maintain inventories have remain unchanged since the beginning of the century. Businesses generally maintain inventory for five reasons: (1) it enables firms to achieve economies of scale; (2) it balances supply and demand; (3) it enables specialization in manufacturing; (4) it provides protection from uncertainties in demand and order cycle; (5) it acts as a buffer between critical interfaces within the channel of distribution (Lambert and Stock, 1993:399). This section describes

actions taken by the Air Force in order to reduce inventory. The stimulus behind these actions came from the GAO and DRMD 987.

Inventory Reduction Efforts. As discussed earlier, one of the ways to reduce inventory is through reactive measures. Again, this is defined as disposing of on-hand inventory. DoD inventory management quickly came under the scrutiny of the GAO at the end of the cold war when the transfer to a peacetime force was imminent. "In 1990, we identified DoD's management of secondary inventory as a high-risk area because levels of inventory were too high and management systems and procedures were ineffective" (GAO, 1999a:2).

In response to this criticism, DoD leadership sided with the GAO and in 1991 issued DRMD 987 citing, "In view of changing world events, national policy, force reductions and budget realities, the DoD needs to make commensurate adjustments to its inventories" (Inventory, 1991:2). This policy was not totally unfounded given that in 1985 the DoD adopted a policy to retain all serviceable and economically repairable material having application to a weapon system in active use by U.S. forces (Inventory, 1991:10).

As a result of the anticipated DRMD 987, Air Force Logistics Command (AFLC) in March of 1990 began a reduction initiative of its own called PACER TRIM (AFLC, 1990:6). The objectives of PACER TRIM were threefold. The first objective was to reduce or terminate contracts for spare parts and equipment no longer required as readiness changed. The second objective was to design new contracts in a flexible manner that could adjust as requirements changed. Finally, the third objective called for initiating aggressive disposal actions to clear warehouses of unserviceable inventory

(AFLC, 1990:6). General McDonald, then Commander of AFLC, stated that a lion's share of this reduction would come from the inventory item managers (ALFC, 1990:6).

By 1991, PACER TRIM seemed to be accomplishing these objectives. As Colonel Newsome, AFLC's Assistant Deputy Chief of Staff for Requirements reported, contracts had been reduced or terminated by $1.2 billion in 1990 and 1991 (Newsome, 1991:1). Additionally, he reported that the depots had disposed of nearly $4 billion of reparable and consumable inventory (Newsome, 1991:1).

Interestingly, one year after these actions had occurred, they still seemed to be inadequate and further pressure was applied to reduce inventory despite the fact that inventory managers across the command had further reduced reparable items by 900,000 from 1991 to 1992. In August, 1992, General Yates, Commander, Air Force Materiel Command, requested his staff do something "dramatic" to reduce inventory in preparation for a visit by the Deputy Assistant Secretary of Defense (Logistics) (Owens, 1992:1). The general's staff responded with inventory reduction goals of over $3 billion a year through 1995 (Illsley, 1992:10). They also added that a major constraint in reducing inventory was the item manager's time and sought to establish an integrated inventory reduction team at each center (Owens, 1992:1). Finally, the staff offered a new program for the command, PACER REDUCE (Illsley, 1992:30).

PACER REDUCE, now the Inventory Reduction Program, sought to continue the trends set in 1991 and 1992. From 1992 to 1996 approximately $10 billion in further inventory reductions took place (Mattern, 1997:9). Additionally, from 1996 to 1997, reparable and consumable inventory were reduced another $4 billion.

What were the effects of this reduction? First, the Air Force was highly motivated to reduce its inventory during this period (and still is). The Office of the Secretary of Defense (OSD) threatened to cut the Air Force's spare parts budgets, if inventory reduction goals were not met (Mattern, 1997:9). Eventually, they did cut the budget. Second, this reduction may have forced the Air Force to throw away old spare parts that may still be useful (Mattern, 1997:9). The combination of these two (reducing spare parts budgets and disposing of possible useful inventory) could spell trouble to fleet readiness; however, it is difficult to quantify these actions. This is due in large part to the fact the Air Force does not track a list of MICAP parts versus those that were disposed of years earlier.

Views on this issue appear mixed at the maintenance depots. Two senior item managers were contacted at the F-16 and F-15 program offices and asked to state their opinions as to whether or not these inventory reduction initiatives possibly led to poor decisions in the disposal of inventory. In the case of the F-15 program office, they have an inventory reduction program that is aimed at disposing obsolete reparable items; however, there is no evidence that needed items have been deleted from the inventory (Mullis, 1999). F-16 depot operations describe a similar program; however, they include the impact of inventory reduction initiatives as one of the drivers that may be causing a decline in mission readiness (Troop, 1999). Interestingly, reasons given by the F-16 support office could affect other programs as well.

As Troop (1999) explains, the move from three-level maintenance to two-level maintenance stimulated the move of base-level inventory to the depot in the early 1990's. During this same time, the enactment of DMRD 987 was in full effect, as was the GAO's

scrutiny. Inventory levels, now above what they had been during the days of three-level maintenance, were seen as excess and direction was given to dispose of this excess inventory.

Summary. This section began by identifying the purpose of inventory. Next, a chronology was established that explained the various programs and initiatives over the past nine years that were taken to reduce levels of inventory. While it is obvious that inventory has been reduced, it is less clear as to the direct (or indirect) impact on TNMCS. What can be derived from the two previous sections (Agile Logistics and Inventory Reduction) is fast transportation seems to be working effectively, availability-based repair (EXPRESS) is impaired by inventory reduction due to new manufacturing process (job shop versus continuous flow), and the Air Force is having difficulty reaching the Agile Logistics goals it has established for itself.

Comparison of Air Force Logistics Management with Private Sector

Introduction. Studies completed on corporations may provide some insight on how to effectively manage the logistics chain. The problem, however, is that objectives are different between government and private institutions. While many consultants like to compare the Air Force with civilian companies, these different objectives can pose problems in a making a valid comparison. Nevertheless, the Air Force can learn good practices from the private sector to improve its own financial management practices. And even though the Air Force will not go bankrupt, budgetary shortfalls can impact the Air Force mission.

The Air Force is Not Alone in its Quest for Optimum Supply Chain Management. Fisher (1997) posed the question, "What is the right supply chain for your product?" He contended that although information management systems performance has never been higher, the performance of many supply chains has never been worse. The major problem is that managers lack a framework for deciding which ones are best for their particular company. This "framework" is essentially a new classification of a company's products. There are two primary framework categories, *functional* and *innovative*. Functional products are routine staples with a predictable demand, while innovative products have a great deal of variability in their demand (Fisher, 1997:107). This correlates strongly with the Air Force's and other researchers' definition of consumable items and reparable items, respectively (Crawford, 1988:1-7; Cohen et al., 1999:8).

The difference between these two categories is readily apparent from standard measurements as seen in Table 2. Due to the differences, Fisher contends that different supply chains are needed. Interestingly though, many companies adopted the latest fad of keeping low inventories, thus reducing inventory carrying costs, warehousing, etc. This strategy is fine for functional products, but the exact opposite is true for innovative products. This strategy also applies throughout the whole inventory chain, including safety stock and pipeline inventory (Fisher, 1997:107).

Fisher states that companies employing a market-responsive strategy (e.g., Agile Logistics) should aim to respond quickly to unpredictable demand. They should also adopt a manufacturing focus of deploying excess buffer capacity; an inventory strategy of

Table 2. Functional Products Versus Innovative Products (Fisher, 1997:107)

	Functional	**Innovative**
Average margin of error in the forecast at the time production is committed	10%	40% to 100%
Average stockout rate	1% to 2%	10% to 40%
Lead time required for made-to-order products	6 months to 1 year	1 day to 2 weeks

deploying significant buffer stocks of parts or finished goods; and a lead-time focus that invests aggressively to reduce lead time (Fisher, 1997:108). From the Agile Logistics review, it is obvious that the Air Force is satisfying two of these requirements. First, they have adapted a repair-on-demand concept. Second, they have invested in lead-time reductions, i.e., premium transportation.

Besides increasing inventories, how should a supply chain with innovative products be managed? Fisher suggests four ways (Fisher, 1997:114-115). First, companies should simply accept their uncertainty and variability—it is inherent in innovative products. Second, companies should continue to reduce uncertainty. For example, by having innovative products share components, demand for components can become more predictable because it is aggregated. Third, uncertainty can also be avoided by cutting lead times. Finally, once uncertainty is reduced to its lowest levels, demand can then be hedged with buffer inventory, or safety stock. Lambert and Stock (1993) also suggest that it is wise to protect against uncertainties with inventory buffers—thus supporting Fisher's views.

Lambert and Stock state that a majority of companies endure periodic inventory reduction rituals (Lambert and Stock, 1993:399). These crash inventory reductions are instituted every few years and usually last a few months. Lambert and Stock claim these times are characterized by top management edicts, middle management lip service, and insufficient knowledge of how to control inventory (Lambert and Stock, 1993:399).

This phenomenon is supported by a recent study conducted by KPMG and the University of Tennessee. The report said although many companies have made a concerted effort to improve supply chain efficiency over the past few years, 43% of U.S. companies have the same or higher levels of inventory as they did five years ago (Inventory, 1997:8). This was articulated by one of KPMG's senior logistician consultants, "Despite the industry buzz around supply chain management, many companies have a long way to go to improve their supply chain performance and efficiency" (Inventory, 1997:8).

Summary. The Air Force is not alone in its struggle to effectively manage its logistics activities. Fisher (1997) pointed out that many supply chains are performing poorly in today's environment—despite technological advantages. One of the key factors affecting their performance, Fisher attests, is that supply chains for innovative products are not maintaining appropriate levels of inventory in order to meet unpredictable demand. Similarly, this could be the case with Air Force reparables because they share the same qualities as the innovative products. Finally, many companies start inventory reduction campaigns that often prove ineffective because managers do not necessarily understand inventory management.

Other Variables that May Affect TNMCS

Introduction. In pursuing information for this section, opinions were gathered from published literature and interviews. This section covers other variables that may contribute to TNMCS besides the three variables (inventory levels, transportation times and repair times) covered previously.

Other Variables. As Gimmi (1997) explains, inventory levels are not the reason parts become mission capable (MICAP). Instead, he states that factors such as longer than expected repair times, contractor delinquencies, long contract lead times, technical surprises and funding shortfalls, rather than low inventory levels, are keeping spare parts from being where they are needed (Gimmi, 1997:29). Ironically, these are exactly the reasons why top supply chain experts (i.e., Fisher) state that inventory buffers are needed.

At the depot level there are several variables that can cause delays in getting the parts back out to the units. For example, the F-15 depot operation's increased TNMCS rates were caused by constrained capacity, diminishing manufacturing sources, and the transfer of consumable items to DLA (Mullis, 1999). Recall that DLA took over warehousing operations at the depot in 1997--at this same time they also took over responsibility for all consumable items (Gaudette, 1999). F-16 depot operations describe similar factors; however, they include the impact of inventory reduction initiatives as one of the causes of increased TNMCS rates as explained earlier (Troop, 1999).

According to Ham (1999b), other factors that affect TNMCS are inaccurate demand forecasting, contractor delinquencies, awaiting parts to repair LRUs (AWP), diminishing manufacturing sources and materiel shortages (DMSMS), aging aircraft issues (such as changes in failure rates), skilled technical personnel non-availability, and

spare parts funding. Many of these reasons are supported in the other interviews as well. In addition, others have stated that aging aircraft has become a considerable problem facing the readiness of the Air Force's fleet (Hallin, 1998b:1; Bailey, 1999). The factors mentioned in the preceding section are summarized in the form of a cause and effect diagram as illustrated in Figure 3.

Predicted TNMCS Rates. After the literature was reviewed and interviews were conducted, further research was conducted using the Multi-Echelon Resource and Logistics Information Network (MERLIN). It was found that the Air Force predicts TNMCS hours through the use of regression equations. All regression equations use the same independent variables to form the TNMCS equations. The independent variables used are *flying hours, possessed hours, and sorties* (Reynolds, 1999). By using these variables, the Air Force is basing their predictions on failure rates of parts due to flying hours and sorties. This approach is highly supported by years of research (Sherbrooke, 1997:1; Slay and Sherbrooke, 1997:1).

In order to establish a TNMCS rate as opposed to TNMCS hours, the Air Force first predicts TNMCS hours using one of the following equations (statistical printouts shown in Appendix A):

*A/OA-10 TNMCS Hours = 7638 + 2.71019*Flying Hrs + 0.0808412*Possessed Hrs – 5.46947*Sorties*

*F-15A-D TNMCS Hours = -101.149 - 0.364535*Flying Hrs + 0.211585*Possessed Hrs – 4.13984*Sorties*

*F-15E TNMCS Hours = -3573.79 + 1.0864*Flying Hrs + 0.135368*Possessed Hrs – 1.86296*Sorties*

*F-16 TNMCS Hours = -832.911 – 0.364756*Flying Hrs + 0.117839*Possessed Hrs – 0.51937*Sorties*

These predicted TNMCS hours are then divided by possessed hours per mission design (MD) in order to derive a TNMCS rate or percentage. As Appendix A shows, these regression equations appear to follow actual TNMCS rates for the respective mission

design early in 1991 until 1997. However, there is a great deal of disparity from 1997 to 1999 between actual TNMCS rates and projected TNMCS rates, especially in the case of the A-10 and F-16. The difference between actual and predicted TNMCS rates seems to indicate that there may be an additional actor(s) that is having an impact on actual rates. It is this variable that this research seeks to understand and account for, if possible. It is interesting to note (as the TNMCS hours equations illustrate) that the Air Force does not predict TNMCS rates based on mission design series (MDS), but rather they are aggregated by MD.

Section Summary. This section identified additional variables that may cause TNMCS rates to increase. An overview was then presented on how the Air Force computes its predicted TNMCS rates. The original statistical printouts performed by the Air Force are located in Appendix A. In addition, Appendix A also contains charts the illustrate disparities between actual TNMCS rate and the current USAF predictions.

One of the ways to properly illustrate the relationship between a given outcome and all the factors that influence this outcome is a cause and effect diagram (AFPIG, undated:33). As such, a cause and effect diagram has been created in Figure 3 in order to demonstrate these relationships. Here, the factors have been broken down into four areas that adequately express logical relationships. As indicated, the environment the Air Force operates in and the procedures it uses seem to account for a majority of reasons why TNMCS rates are increasing. This research will focus on those variables within the USAF reparable pipeline.

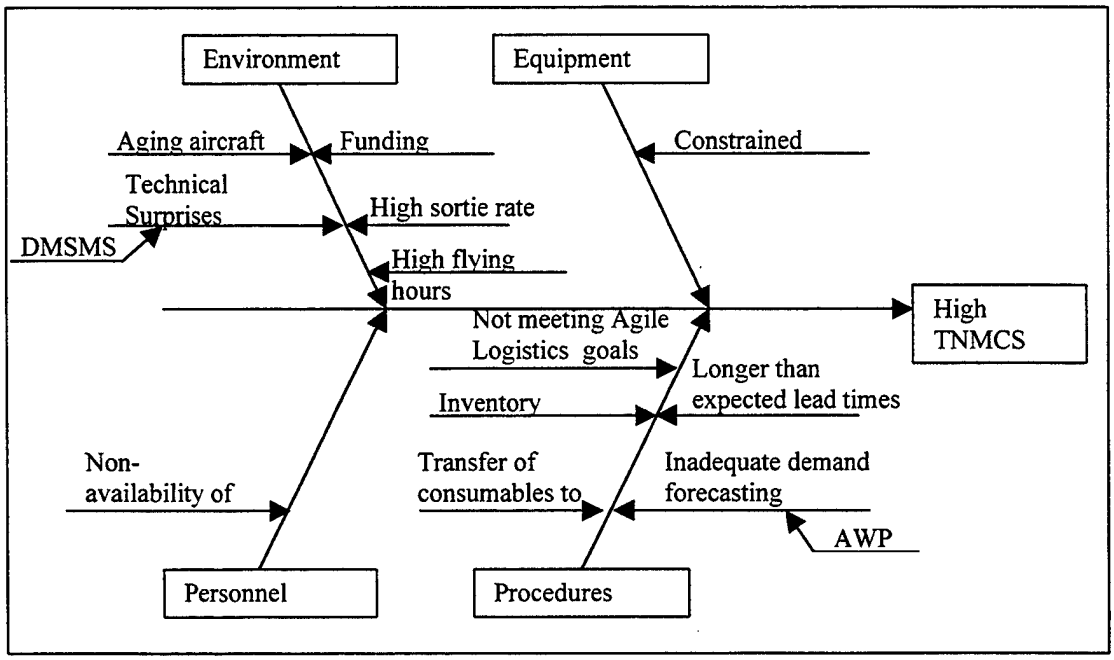


Figure 3. TNMCS Cause and Effect Diagram

Chapter Summary

This chapter provided background information needed to understand the many variables that affect this research. First, the USAF reparable pipeline was introduced and its six segments defined. Next, a simple model was provided that explored the interactions of inventory and transportation and repair times and their relationship to each other within the reparable pipeline. The Air Force Agile Logistics concept was then presented, with a discussion on the implementation, initiatives and results thus far on Agile Logistics. Following this discussion, inventory reduction was introduced, with an overview of the efforts the Air Force has taken from 1991 to the present in order to reduce inventory. Next, a literature review was accomplished with the intention of highlighting areas in the corporate world that may be experiencing similar problems with

logistics. As a result of this review, four ideas were presented on how to better manage innovative products (reparable items). Finally, other factors affecting TNMCS rates were introduced and an overview of how the Air Force currently predicts TNMCS hours was provided. The other factors affecting TNMCS were then summarized and presented in a cause and effect diagram.

Overview of Next Chapter

Chapter III develops the methodology used in this study. First, the independent variables are selected for use in the analysis. Second, data collection and preparation is discussed, and data limitations and assumptions are presented. Finally, the statistical method used in the study, regression, is reviewed. This discussion focuses on the benefits of regression as well as some of the problems that can occur in using this method.

III. Methodology

Introduction

As indicated in the literature review, the USAF reparable pipeline has extremely complex relationships. In the case of the aircraft contained in this study (A/OA-10, F-16A/B/C/D and the F-15A/B/C/D/E), there are five maintenance depots servicing seven major commands at 71 operating locations (Fighter, 1999). With a unique parts list averaging over 2,000 reparables per mission design series (MDS), item management, even with the most advanced information systems, is troublesome. Despite the best efforts of the Air Force, TNMCS rates continue to climb; and the Air Force, especially in the past two years, is having problems predicting those increases.

The objective of this chapter is to develop a methodology to examine possible relationships between the dependent variable, TNMCS data, and a multitude of independent variables. The methodology stems from the problem identified in Chapter I that, "One of our major struggles is our ability to correlate wholesale performance [levels of inventory] with retail results [aircraft mission capable rates]" (Dehnert, 1999). The key word emanating from this problem statement is *correlate*. After conducting initial research as to the availability of data, and further discussions with the research sponsors, it became apparent that the best way to show relationships between TNMCS data and the independent variables was through regression analysis. As such, this chapter outlines data collection, acquisition, and preparation, and the statistical tests and methods necessary to conduct this analysis.

Data

Introduction. This section addresses data assumptions, needs and acquisition, preparation, and limitations. The three questions surrounding data collection activities are (1) what data to collect? (2) where to acquire the data?, and (3) how to prepare the data for analysis? This section answers these three questions.

Assumptions. There are four assumptions necessary for this study. They are as follows:

1. Inventory items collected in the D041 are assumed to highly represent inventory currently held. Similarly, depot repair cycle, base repair cycle, and order and ship times are assumed to accurately represent times for repair and transportation for each year. This assumption is made due to the criteria established in the methodology—all national identification item numbers (NIINs) analyzed must have been in the inventory from 1990-1999.

2. Data taken from the Air Force's Multi-Echelon Resource and Logistics Information Network (MERLIN) and the D041 are accurate and complete. As stated earlier, attempts to validate data from MERLIN were accomplished. The D041 database, however, represents a great deal of information. The input data to the D041 is acquired from many different sources; therefore, mistakes with data entry/transfer can be easily made. However, researchers and consultants from Logistics Management Institute, RAND, KPMG, and Synergy use D041 data in many of their analyses. While limitations may exist, it is viewed as valid. If analysis indicates differently, outliers will be noted.

3. A key assumption necessary for this research is that of the demand for the parts studied. This study assumes a constant demand for the inventory items analyzed.

This is due to the relatively constant flying hours and sorties for the aircraft examined. In some instances, as discussed in Chapter IV, outliers were removed. This approach, using flying hours and sorties to predict demand, is supported in the literature by Sherbrooke (1997) and Slay and Sherbrooke (1997).

4. One of the assumptions necessary, in order to use TNMCS hours and possessed hours for 1999, is that the first half (January to June) of 1999 accurately represents the last half (July to December) of 1999.

Needs and Acquisition. The literature review provided an understanding of many of the variables that may contribute to rising TNMCS rates. Additionally, it provided a timeframe in which activities such as inventory reduction policies and Agile Logistics' initiatives took effect. Table 3 provides a list of the variables taken from the cause and effect diagram, where the data is located, and the years they are available.

Table 3. Potential TNMCS-Causing Independent Variables

Independent Variables	Source	Years Available	Divided By MDS?
Serviceable Inventory Levels	D041	1987 - Present	Yes
Order and Ship Times	D041	1987 - Present	Yes
Base Repair Times	D041	1987 - Present	Yes
Depot Repair Times	D041	1987 - Present	Yes
Flying Hours	MERLIN	1991 - Present	Yes
Average Age of Aircraft	Acft Flight Records	Acquired-Present	Yes
Average Hours Aircraft Has Flown	Acft Flight Records	Acquired-Present	Yes
DMSMS	Depots	Unknown	Yes
Funding for Spare Parts	SMAG	1980-Present	No
Capacity Rates	Depots	Inception-Present	No
# of coordination problems w/DLA	Depots	Unknown	No
AWP	Depots	Unknown	No
# of parts not meeting Agile Logistics goals	AFMC/Depots	1994 – Present	No

Although the independent variables identified may be important enough to explain a great deal of variability in the TNMCS rates, four criteria were established for this study. First, independent variables must cover the time period established in the literature review as relevant (1990-Present) to this study. Second, they should be obtainable through reasonable means. Third, they should be broken out by specific MDS, if possible, in order to provide valid comparisons. Finally, the variables must be components of the reparable pipeline since these are the variables this research intends to study. Four independent variables meet these criteria: serviceable inventory levels, order and ship times, base repair times, and depot repair times.

MERLIN. It was determined through interviews with various agencies (AFMC Studies and Analysis Office, Directorate of Supply for the Deputy Chief of Staff, Installations and Logistics, and AFMC's Deputy Director for Logistics) that collection of TNMCS rates and other data that is needed for analysis (e.g., total active inventory) should come from MERLIN due to the accuracy of the database and its compilation of the MAJCOM data (Neumann, 1999a; Ham, 1999a; Dehnert, 1999). To further verify the accuracy, data were collected and verified through interviews with the respective program offices and compared to data that were available at the MAJCOM levels. The comparison of the MERLIN data to these sources (program offices and MAJCOM) displayed consistency. These results are congruent with the GAO's findings as to the accuracy of MERLIN (GAO, 1999b:17).

Since MERLIN is a web-based product, data collection is fairly easy. The data collection is accomplished by selecting the appropriate variable (e.g., annual A-10 TNMCS rates) and exporting this data to a Microsoft Excel spreadsheet. Data collected

from MERLIN included: TNMCS rates for all the appropriate MDS's, USAF-predicted TNMCS rates for the appropriate MD's, TNMCS hours by MDS by year, possessed hours by MDS by year, and total active inventory (the total number of each MDS by year).

D041. The next step in data acquisition was to determine how to retrieve serviceable inventory levels, repair times, and transportation times. After interviewing the AFMC Studies and Analysis Office, it was evident, based on aggregate reparable inventory levels and the other information needed, that the Recoverable Consumption Item Requirements System (D041) would provide the best data for the time period requested in order to get actual times (Neumann, 1999a). This was also confirmed by Lt Col Marti Ham, Logistics Analyst at AF/ILSY (Ham, 1999b).

The D041 operates on a quarterly schedule to coincide with the quarterly Stock Balance and Consumption Reports (SB and CR). The SB and CRs are "as-of" the last day of each calendar quarter: 31 March, 30 June, 30 September and 31 December. D041 computes spare parts requirements for all customers worldwide on an aggregate basis, and applies all available worldwide assets to these requirements. D041 uses historical failure and program data to determine a failure rate to be applied to a future program. Historical pipeline and lead time data are also recorded and applied to future activity (AFMCMAN 23-1, 1997:16-17). In discussions with Mr. Bill Morgan, Data Analyst, AFMC Studies and Analysis Office, it was determined to use data from the first quarter in each calendar year. This is due in large part to Mr. Morgan's assessment that data from the first quarter tends to be more accurate and complete (Morgan, 1999).

In order to obtain data from the D041, it was necessary to create a software program to facilitate data extraction. This program is illustrated in Appendix B, "Data Collection from the D041 (Using SAS)." The two SAS programs were used to read and merge the D041 files. First, text files were created and read into Microsoft Excel. A weapon system file (maintained by the AFMC Studies and Analysis Office) in Microsoft Access was then used to identify the various weapon system NSNs. These weapon system files were then exported to a text file that were read with the SAS programs (Morgan, 1999).

To keep the inventory consistent throughout the time period, it had to meet the criterion of being in the D041 during the entire time period (1990-1999). This was accomplished via the use of the software programs. Essentially, this means that any part that entered the inventory after 1990 or was deleted before 1999 would not be included in the analysis. Another key point is that since A-10 and O/A-10 inventory levels were collected together, O/A-10 specific inventory items were not included. The data collected from the D041 included: serviceable inventory levels by NIIN, average order and ship times by NIIN, average base repair cycle by NIIN, and average depot repair cycle by NIIN. Note: NIIN is part of the NSN.

Preparation. This section explains how the data was manipulated once it was obtained from its source in order to prepare it for analysis. The results of this section produce a separate spreadsheet for each MDS, which list the dependent variable and independent variables. The spreadsheets are contained in Appendix D.

TNMCS Rates. As indicated, this data was collected from MERLIN on an annual basis. Two dependent variables (TNMCS rates and TNMCS hours) are used in

this study to fully analyze the impacts of inventory reduction and Agile Logistics. Although the Air Force uses TNMCS hours in its model, it is believed that using TNMCS rates will help eliminate the "fluctuation and noise" of TNMCS hours. That is, as possessed hours vary year to year, so do TNMCS hours. In some years where a modification is taking place to a fleet, possessed hours are lower. This in turn lowers the TNMCS hours; however, the percentage is usually in the same range as it would be otherwise because it is a relative scale. The TNMCS rate, a small percentage ranging from around 4% up to 20%, should provide a good scale upon which to judge the impacts of some of the independent variables, particularly serviceable inventory. Since TNMCS rates are derived from possessed hours, which represent the total active inventory, problems (i.e., multicollinearity) may result from the use of this variable with other independent variables that contain the total active inventory. TNMCS hours (discussed below) are also used in the analysis; however, since the range encompasses ten of thousands of hours the degree of variance experienced by the models created in this study may vary widely. This variable may be more appropriate than TNMCS rates in some instances, i.e., those containing total active inventory (TAI) of aircraft per year. (Note: TAI will refer to the number of aircraft per year throughout this text). Therefore, for the sake of comparison, both dependent variables are employed. TNMCS rates are evaluated from 1990 to 1999, while TNMCS hours are evaluated from 1991 to 1999.

There are two problems that need to be confronted with TNMCS rates. First, since the A-10 and O/A-10 serviceable inventories were combined it was necessary to either choose A-10 TNMCS rates, O/A-10 TNMCS, or perform a weighted average of the two. Second, the TNMCS data in MERLIN only dates to 1991.

Early in the data gathering process it became apparent that the A-10 and OA-10 should be treated as one entity. This was due to the commonality amongst the parts as described by Mr. Morgan (Morgan, 1999). Again, there are three possibilities of how to report the A-10/OA-10 TNMCS rates. Select either A-10 or O/A-10 TNMCS rates, if no significant difference exists, or perform a weighted average of the two. The first step was to conduct a z-test of the TNMCS rates for the past 8 1/2 years (Feb 1991 – May 1999). As seen in Appendix C "Decision criteria for the A-10/OA-10," no significant difference exists in TNMCS rates between the two. Therefore, A-10 TNMCS rates are used since they comprised the majority (67.5%) of the A-10/OA-10 total active inventory from 1990-1999 (MERLIN, 1999).

Since TNMCS rates for 1990 did not exist within MERLIN, an alternate source for this data was found. In discussions with Lt Col Ham, it was decided records kept by ACC should provide the closest estimate, since ACC possesses the majority of combat air force (CAF) assets (Ham, 1999c). Additionally, the Air Staff often uses ACC data when total force data is not available (Ham, 1999c). However, the problem with the ACC data is that it is not divided out by MDS. Therefore, it was decided to use the ACC TNMCS rate by MD (F-15A-D) and use these in each of the MDS's. For example, the recorded ACC TNMCS rate for the F-15A-D in 1990 is used in each separate MDS spreadsheet (F-15A, F-15B, F-15C, and F-15D).

TNMCS Hours and Possessed Hours. TNMCS hours are also used as a dependent variable in order to provide a comparison to the current Air Force regression model. As mentioned above, this variable is only used from 1991 to 1999. In order to obtain predicted TNMCS hours, the predicted percentages from each year will be

multiplied by possessed hours. This way a valid comparison can be made between TNMCS hours predicted by the variables used in this study and those predicted by the Air Force. Two areas of preparation were required for TNMCS hours and possessed hours. First, A-10 and OA-10 TNMCS hours and possessed hours were combined for the reasons stated earlier. Next, since 1999 is not yet complete both TNMCS hours and possessed hours (available through June 1999 in MERLIN) were multiplied by a factor of 2 in order to analyze the entire year.

Predicted TNMCS Rates and Hours. In order to assess the models developed in this research a valid comparison is necessary. As discussed in Chapter II, the Air Force currently predicts TNMCS hours using regression equations derived from flying hours, sorties, and possessed hours. The data is only given by month; therefore, it was necessary to acquire an average per year. This data is in MERLIN (in the form of TNMCS rates) and goes back to the beginning of 1991; therefore, it was necessary to develop a predicted TNMCS rate for 1990. For the A-10 and F-15E, this was accomplished by using the percentage decrease of the actual TNMCS rates from 1991 to 1990 and multiplying it times the predicted TNMCS rate of 1991. For the F-16 and the F-15, there was fluctuation of actual TNMCS rates in 1990 versus 1991 by MDS, it was decided to use a predicted value slightly lower than 1991. For the F-16 and F-15 MDS's, a predicted TNMCS rate of 7.9% and 9.2% in 1990 is used, respectively.

Since MERLIN indicates only predicted TNMCS rates, it is necessary to derive predicted TNMCS hours. This was accomplished by taking the TNMCS rate for a particular MDS and multiplying it by possessed hours. In order to attain 1999 predicted

TNMCS hours, possessed hours were doubled and multiplied by the predicted TNMCS rate up through June 1999.

Inventory Levels, Order and Ship Time, Base Repair Cycle, and Depot Repair Cycle. As mentioned, this data was taken from the D041 via the use of the software program found in Appendix B. The data were prepared by summing all the National Item Identification Numbers (NIIN) for each year. Once this was accomplished for each MDS, it was decided that artificial variables needed to be used in order to get a clear picture of the interaction of inventory, transportation, and repair. A total of five variables were created.

In order to understand the effects of inventory reductions, two variables were used. The first variable used was *serviceable inventory*. This variable was derived by summing all the serviceable items by NIIN per year. The second variable used was a ratio. This ratio was determined by dividing serviceable inventory levels per year by the total active inventory (TAI) of aircraft per year. This ratio is referred to as *serviceable inventory/TAI*. In some instances, the MDS's being evaluated have had their numbers reduced since 1990. Thus, the serviceable inventory per aircraft may increase, given that the total active inventory of aircraft decreases faster than serviceable inventory. Theoretically, as this ratio increasing or decreasing, TNMCS rates should decrease or increase, respectively.

The next three variables were developed in order to capture the interaction of inventory, repair, and transportation; and to illustrate the effects of Agile Logistics on TNMCS rates. These variables are also ratios. Recall the RCDL example from Chapter II. If transportation and repair times were reduced, inventory could also be reduced.

Also, if inventory levels remained static and transportation and repair times decreased, service levels would increase. Likewise, if these times were said to be reduced, but not actually reduced (assuming inventory remained static), then service levels would go down. Using these relationships as a guideline the following ratios were constructed: *serviceable inventory/OST, serviceable inventory/BRC, and serviceable inventory/DRC.* If the numerator increases and the denominator remains static, the ratio will increase. Similarly, other increases and decreases are possible. Theoretically, as ratios increase, TNMCS rates should decrease and vice versa.

Limitations. As a result of the assumptions made and data collection and preparation activities performed, limitations to this research were identified. They are as follows:

1. As discussed in the data preparation section, ACC TNMCS data will represent the TNMCS data for the entire USAF TAI in 1990. While this procedure is acceptable from an Air Staff perspective, the TNMCS rates during 1990 might have been significantly different between ACC and the TAI. One modifier that may have ensured like TNMCS rates during this time, however, was DESERT SHIELD/STORM. Since many aircraft from the ANG, AFRC, USAFE, and ACC took part in this operation, it makes sense that MICAP items may have been evenly distributed throughout the theater. While this can not be validated with the available data, it seems highly unlikely during this scenario that a significant difference (ACC versus total fleet TNMCS rates) existed.

2. Due to the reasons stated above, reparable parts specific to the O/A-10 will not be evaluated. However, since there are many commonalties between O/A-10 and A-10

aircraft, it is believed that analyzing common inventory parts will provide useful insight. (Morgan, 1999).

3. This study is analyzing aggregate data. By conducting the analysis in this manner, problems could result. For example, although inventory reductions may have severely affected some items, these effects may not be realized when they are combined and averaged with other parts that have not witnessed a reduction. This applies to the remainder of the D041 data as well (base repair time, depot repair times, and order and ship times). It is believed, however, that trends in the data will emerge and therefore be useful for analysis against the dependent variable. One of the main reasons MDS's were chosen over MD's for analysis was to mitigate this aggregation problem as much as possible.

Summary. This section discussed data needs, acquisition, and preparation. First, independent variables were selected from a list of potential TNMCS-causing variables using four criteria. Using these criteria, four independent variables (serviceable inventory levels, order and ship time, base repair cycle and depot repair cycle) were selected. Next, data acquisition was discussed in order to provide an understanding of the data sources and their validity. The data was then prepared for analysis. This included developing variables that would assess the impacts of inventory reduction and Agile Logistics. A total of five independent variables are used in the analysis. They are *serviceable inventory, serviceable inventory/TAI, serviceable inventory/OST, serviceable inventory/BRC, and serviceable inventory/DRC*. Finally, data limitations were stated. The results from this section are contained in Appendix D: MDS Variables.

Statistical Tests and Methods

Introduction. Following the data acquisition, and in concert with data preparation, statistical tests and specific methodologies were examined. As stated at the beginning of this chapter, regression analysis was the obvious choice due to the necessity of being able to correlate the independent variables with TNMCS rates and hours to assess whether they explain significant variability of the dependent variable.

This section discusses the tool of regression analysis along with assumptions, potential pitfalls, and strategies for avoiding the pitfalls. Data analysis was accomplished using JMP® statistical software and Microsoft Excel's data analysis tool. Next, Theil's *U*-statistic is defined and discussed as a method used to provide a measurement of the output (predictions) from the models developed in this study against the USAF-predicted TNMCS rates and TNMCS hours.

Regression Analysis. Regression analysis is a statistical methodology that exploits the relation among two or more quantitative variables (Neter et al., 1996:3). Regression analysis is widely used in business and natural, biological, and social sciences, and gives insight into performance, phenomenon, and behavior (Neter et al., 1996:3). Neter et al. (1996: 9) state, "regression analysis serves three major purposes: (1) description, (2) control, and (3) prediction." It allows the modeler to fit data to an equation of a line, provides an estimate of the mean of the dependent variable, and predicts future values of the dependent variable based on changes in the independent variable.

For this research, independent variables were collected in order to describe the dependent variable (TNMCS). If a strong relation is found, the model developed could

serve as a prediction tool. Ultimately, the model may provide enough understanding of the relationships to propose new steps to control TNMCS rates. This process, however, requires time and a strong understanding of the logical relationships between the dependent variables and the independent or predictor variables (Neter et al., 1996:9).

The approach of this research is to create a General Linear Model (GLM) for each MDS using TNMCS as the dependent variable and the independent variables identified earlier. As a basis, the GLM is used in order to hypothesize this relationship. The GLM is given as follows: $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + \varepsilon$

Where:

Y is the dependent variable

$x_1, x_2 \ldots x_k$ are the independent variables

$E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k$ is the deterministic portion of the model

ε (eplison) = Random error component

β_i determines the contribution of the independent variable x_i.

Model Development. The process of developing a model, estimating the unknown parameters, and using the model is usually accomplished via five steps (McClave et al., 1998:433). The steps are (McClave et al., 1998:501):

Step 1. Hypothesize the deterministic component of the model. This component relates the mean, $E(y)$, to the independent variables. This involves the choice of the independent variables to be included in the model.

Step 2. Use the sample data to estimate the unknown model parameters (β_0, β_1, β_2,) in the model.

Step 3. Specify the probability distribution of the random error term, ε, and estimate the standard deviation of this distribution, σ.

Step 4. Statistically evaluate the usefulness of the model.

Step 5. When satisfied that the model is useful, use it for predictions, estimation, and other purposes.

Regression Assumptions. McClave et al. (1998:444) provide four key assumptions for regression analysis. They are as follows:

Assumption 1. The mean of the probability distribution of ε is 0. That is, the average of the values of ε over an infinitely long series of experiments is 0 for each setting of the independent variable x.

Assumption 2. The variance of the probability distribution of ε is constant for all settings of the independent variable x.

Assumption 3. The probability distribution of ε is normal.

Assumption 4. The values of ε associated with any two observed values of y are independent. That is, the value of ε associated with one value of y has no effect on the values of ε associated with other y values.

For the purpose of this research, Assumptions 1 and 2 are assumed to be upheld throughout this research and will not be verified. Verification of assumptions 3 and 4 will take place in Chapter IV. For Assumption 3, the Shapiro-Wilk test statistic is employed in order to test the residuals for normality. In order to verify Assumption 4, the

Durbin-Watson test is used to assess the residuals for independence. Although it is prudent to check regression assumptions, it is unlikely that assumptions are ever satisfied exactly in practical applications (McClave et al., 1998:540). In fact, violations of these assumptions are expected in many instances. Experience has shown that least squares regression analysis produces reliable statistical tests as long as departures from these assumptions are not too great (McClave et al., 1998:540).

For this study, all Shapiro-Wilk test statistics over .781 indicate normality (Conover, 1980:468). The Durbin-Watson *d* statistic ranges between 0 and 4. If $d<2$, then residuals are positively autocorrelated, and if $d>2$, then residuals are negatively autocorrelated. Residuals are uncorrelated when $d \approx 2$ ((McClave et al., 1998:780). For this research, when Durbin-Watson test statistics are below 1.5 the p-value will be checked to confirm the existence of dependent residuals. Violations of the regression assumptions are reported in Chapter IV.

Potential Problems with Regression. There are five possible problems this study may have to contend with. These problems are *micronumerosity, parameter estimability, multicollinearity, extrapolation, and autocorrelation.* The first problem, *micronumerosity*, will certainly be faced, and appears in the literature to be more of a heuristic used by regression modelers (Gujarati, 1995:326). The data in this study are limited to ten data points per model. That is, when the dependent variable is regressed against one independent variable only ten data points are derived because one point per year is observed (1990 – 1999). Most modelers like to have at least ten data points per independent variable; however, it is a necessity to have one more observation than the number of parameters to be estimated (Gujarati, 1995:319). Still, in the case of the latter

example, this phenomenon results in *near micronumerosity* (Gujarati; 1995:326). Unlike the other problems, this one can not be dealt with directly and is considered a limitation. However, steps can be taken to deal with this problem. For example, the number of parameters can be reduced if necessary.

Parameter estimability is when the data points, after regression, concentrate at a single x value. In this instance, a straight line can not be fitted to the data. Likewise, if a quadratic model is necessary, the number of levels of observed x values must be one more than the order of the polynomial in x. Figure 4 illustrates this problem. As seen in (a), a line can not be fit to the data set provided. In (b), at least three x values would be necessary in order to fit a curvilinear line. If this problem should occur during the analysis, different independent variables will be assessed.

The third problem is *multicollinearity*. As McClave et al. (1998:551) express, "Often, two or more of the independent variables used in the model for $E(y)$ contribute redundant information. That is, the independent variables are correlated with each other."

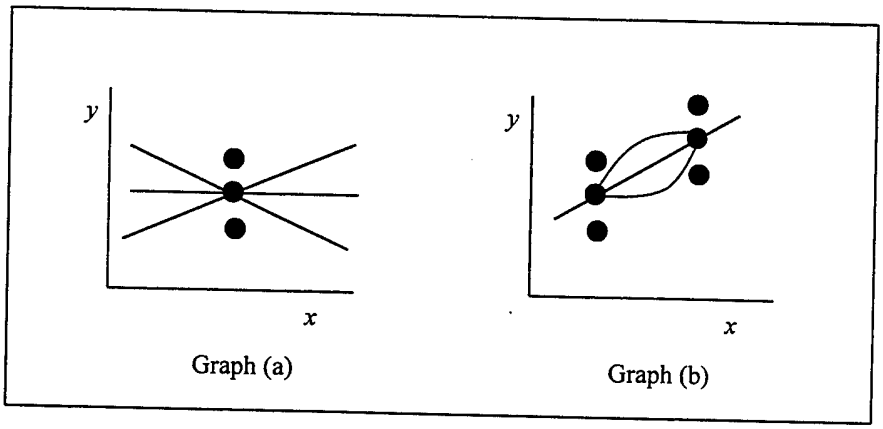


Figure 4. Illustration of Parameter Estimability

Although all independent variables contribute information, some of the information is overlapping. This ends in confusing results (McClave et al., 1998:552). McClave et al. (1998:552) advise that one way of deciding which independent variable to use is byconducting a stepwise regression. However, as Makridakis et al. (1998) notes, multicollinearity not a concern unless there is a need to understand the individual regression coefficients, or it is necessary to understand the contribution of one independent variable to *Y*, without the influence of the other independent variables. Despite the presence of multicollinearity in a regression model, it does not affect the ability of the model to predict (Makridakis et al., 1998:288).

One of the temptations in using regression equations, especially in the case of this study, is *extrapolation*. Extrapolation is trying to predict the dependent variable when values of new independent variables are outside the region in which the original model was used (McClave et al., 1998:552). This, of course, will not create a problem in this study since it will include the full range of independent variables, but care should be used when applying the models that are developed.

The final problem that can occur, particularly in a time series study such as this one, is *autocorrelation*. Autocorrelation is defined as "the correlation between time series residuals at differing points in time" (McClave et al., 1998: 779). What occurs in this instance is that the values of both the dependent and independent variables are observed sequentially over a period of time, and these observations tend to be correlated over time. This often triggers the prediction errors of the regression model to be correlated (McClave et al., 1998:553). When this happens, the assumption of the independent errors is violated and the model may be deemed invalid.

A major cause of autocorrelation among time series data is the omission of one or several key independent variables from the model (Neter et al., 1996:507). Neter et al. (1996:507) recommend that the researcher first search for missing key independent variables. In order to ensure autocorrelation is not occurring in the data set for this research, a Durbin-Watson test is performed. If strong evidence of autocorrelation is established, doubt is cast on the data set and any inferences drawn from them (McClave, et al, 1998: 782); however, this does not make tests based on the data invalid. If the time-series data consists of a small number of data points (fewer than 100), then small departures outside the parameters of the correlogram do not adversely affect the results as much as they would for a much larger number of data points (McClave et al., 1998:540). If severe autocorrelation problems are experienced with any of the models produced during this research it will be noted in the analysis.

Theil's *U*-Statistic. This statistic allows a relative comparison of formal forecasting methods against each other and with naïve approaches (Makridakis et al., 1998:48). By squaring the errors involved in forecasting, this method ensures that large errors in forecasting are given more weight than small errors. It is mathematically defined as:

$$\sqrt{\frac{\sum_{t=1}^{n-1}(FPE_{t+1} - APE_{t+1})^2}{\sum_{t=1}^{n-1}(APE_{t+1})^2}}$$

where $FPE_{t+1} = \frac{F_{t+1} - Y_t}{Y_t}$ (forecast relative change)

and $APE_{t+1} = \frac{Y_{t+1} - Y_t}{Y_t}$ (actual relative change)

Y is the observation and F is the forecast

Rather than trying to compare R-square from regression models, this technique offers a viable approach to check the performance of USAF predictions and this study's predictions during the past ten years. This test will be for each TNMCS predictions in this study where the null hypothesis is rejected and value is added.

For each MDS, a Theil's U-statistic will be used to assess the USAF-predicted TNMCS rates and hours against the predicted rates from this study. The following explanation is provided on the results of the Theil's U-statistic (Makridakis et al., 1998:48):

> $U = 1$: the naïve method is as good as the forecasting technique being evaluated.
>
> $U < 1$: the forecasting technique being used is better than the naïve method. The smaller the U-statistic, the better the forecasting technique is relative to the naïve method.
>
> $U > 1$: there is no point in using a formal forecasting method, since using a naïve method will produce better results.

A naïve forecast is defined as one where forecasts are obtained with minimal amounts of effort and data manipulation and based solely on the most recent information available, i.e., use the most recent observation as a means of predicting or forecasting.

Summary. This section covered the statistical methods employed in this study. First, regression was established as the statistical tool of choice for this study. Next, regression analysis was defined and its uses were articulated. Regression is a powerful tool that can help managers describe, control and predict performance. The steps for constructing a useful regression model were then covered, as were the model assumptions. Finally, problems that can occur when using regression were discussed. Five problems were identified, and then a strategy for dealing with each problem was developed.

After models are developed using regression, there needs to be a way of evaluating the USAF-predictions versus those produced by the models in this research. In order to accomplish this, Theil's *U*-statistic, a statistic employed in forecasting models, will be used to assess the predictions against each other and the naïve forecast.

Chapter Summary

This chapter outlined the methodology for this study. To begin with, data for the study was discussed. Data needs were ascertained and a selection process of independent variables took place that rendered four source variables. Next, data acquisition was covered. Data will come from two main sources, MERLIN and the D041. Data preparation followed and was conducted in order to prepare the data for analysis. It was decided that ACC data would supplement data that MERLIN did not have. Also, it was determined that the A-10/OA-10 will be analyzed as one airframe. To facilitate this, one dependent variable (TNMCS rates) was analyzed for both aircraft in order to determine if any significant differences existed; there was not (see Appendix C). The data section

ended with a discussion on the assumptions and limitations associated with the data. MDS data inputs for the models are in Appendix D.

Following the data section, statistical methodology was discussed. First, the uses of regression were laid out, as were the steps and assumptions used in regression modeling. Next, the problems associated with regression were identified and their remedies articulated. Finally, the Theil's *U*-statistic was covered. This statistic will be used as means to compare predictions of the USAF models versus those in this study.

Overview of Next Chapter

Chapter IV provides the analysis and results based on the methodology developed in this chapter. Hypotheses are discussed first and regression models are then constructed for each MDS. Afterwards, results of this analysis are presented.

IV. Analysis and Results

Introduction

This chapter reports the analysis and the results for this study. First, the approach of the analysis is outlined and hypotheses are developed. Next, the results for each hypothesis are presented. Theil's *U*-statistics are then provided as a comparison between USAF predictions and the predictions from those hypotheses that are rejected. Particulars of the tests for each MDS are then discussed. As a result of this initial testing, additional analysis is performed to further substantiate the findings.

Analysis Approach

Due to some of the problems with multiple regression as outlined in Chapter III, in particular micronumerosity and multicollinearity, simple linear regression was performed to maintain the integrity of the analysis. Using this approach, a series of tests were accomplished on each MDS vice one model with five independent variables.

The following independent variables were regressed against the TNMCS rates and hours:

a) Serviceable Inventory

b) Serviceable Inventory/Total Active Inventory (total aircraft per year)

c) Serviceable Inventory/Order and Ship Time

d) Serviceable Inventory/Base Repair Cycle

e) Serviceable Inventory/Depot Repair Cycle

Hypotheses

Hypotheses and rationale for these hypotheses are discussed below. Results are likely to vary between MDS; however, general logical explanations are given as a basis for the tests. The following statistical hypothesis is used for each variable.

First Order Model

$$H_o: \beta_1 = 0$$
$$H_a: \beta_1 \neq 0$$

Serviceable Inventory. Based upon the literature review, it is obvious that quite substantial inventory reductions have occurred in each MDS during the time frame in question. Additionally, past research indicates that lower inventories might lead to reduced service levels and/or readiness if not offset by decreased repair and transportation times. As the literature review indicated, transportation times have been aided by WWX; however, the repair time improvements are less clear. Although ratios in the following hypotheses are used to account for transportation and repair actions, the effects of aggregation and averages used in the D041 are unknown. As such, the following hypothesis is stated:

Hypothesis 1

H_o: From 1990 through 1999, serviceable inventory levels were not related or were positively related to TNMCS rates/hours.

H_a: From 1990 through 1999, lower serviceable inventory levels were negatively related to TNMCS rates/hours.

Serviceable Inventory/Total Active Inventory. As mentioned in Chapter III, this variable was developed in order to control for the effects that a change in aircraft fleet may have on serviceable inventories. The intent is to have a ratio that reports a *serviceable inventory per aircraft*. Although serviceable inventory itself may be a good predictor variable, this one has been added in order to determine if a relationship exists between serviceable inventory per aircraft and TNMCS rates/hours. Logically, it could be assumed (excluding transportation and repair times) that a lower serviceable inventory per aircraft would be highly related to increased TNMCS rates/hours. Therefore, hypothesis two is as follows:

Hypothesis 2

H_o: From 1990 through 1999, serviceable inventory levels-to-total active inventory ratios were not related or were positively related to TNMCS rates/hours.

H_a: From 1990 through 1999, serviceable inventory levels-to-total active inventory ratios were negatively related to TNMCS rates/hours.

Serviceable Inventory/Order and Ship Time, Serviceable Inventory/Base Repair Cycle, and Serviceable Inventory/Depot Repair Cycle. As discussed in Chapter III, these ratios were created in order to determine the relationship between serviceable inventory and other logistics variables (transportation and repair). As these ratios increase in value, TNMCS rates should decrease (the higher the ratio, presumably the lower TNMCS rates are). As such, hypotheses three, four, and five are as follows:

Hypothesis 3

H_o: From 1990 through 1999, serviceable inventory levels-to-order and ship time ratios were not related or were positively related to TNMCS rates/hours.

H_a: From 1990 through 1999, serviceable inventory levels-to-order and ship time ratios were negatively related to TNMCS rates/hours.

Hypothesis 4

H_o: From 1990 through 1999, serviceable inventory levels-to-base repair cycle time ratios were not related or were positively related to TNMCS rates/hours.

H_a: From 1990 through 1999, serviceable inventory levels-to-base repair cycle time ratios were negatively related to TNMCS rates/hours.

Hypothesis 5

H_o: From 1990 through 1999, serviceable inventory levels-to-depot repair cycle time ratios were not related or were positively related to TNMCS rates/hours.

H_a: From 1990 through 1999, serviceable inventory levels-to-depot repair cycle time ratios were negatively related to TNMCS rates/hours.

Testing of hypotheses are reported in Tables 4 through 8, and specifics are discussed in each MDS section. The null hypotheses will not be rejected unless p-values for the F-statistic for the model are at significance level where $\alpha \leq .05$.

Results

Introduction. Results from the regression analysis are provided in Tables 4 through 8 by hypothesis. Theil's *U* comparisons are presented in Table 9. The independent variables performing the best were (in order) serviceable inventory,

serviceable inventory/total active inventory, and serviceable inventory/base repair cycle. Hypothesis 3, using serviceable inventory/order and ship time as an independent variable, was not rejected in any instance. Hypothesis 5, using serviceable inventory/depot repair cycle as an independent variable, had the null hypothesis rejected twice. Following the results, specifics for each MDS are discussed. Appendix E contains the results of the statistical analysis performed for each MDS. Appendix F contains verification of regression assumptions for all 34 regressions that had a Theil's *U*-statistic computed. With the exception of one case (A/OA-10 TNMCS hours regressed against serviceable inventory/total active inventory), all assumptions were met.

Hypothesis 1 (Table 4). In this test, 14 of the 20 null hypotheses were rejected,

Table 4. Results of Simple Linear Regression on TNMCS Rates and TNMCS Hours, Using Serviceable Inventory as an Independent Variable

MDS/Dep. Var.	Adj. R-square	F-statistic	p-value	Reject Null?
A/OA-10/Rate	.93	106.63	<.0001	Yes
A/OA-10/Hours	.79	27.31	.0020	Yes
F-15A/Rate	.56	12.61	.0075	Yes
F-15A/Hours	.22	3.21	.1162	No
F-15B/Rate	.61	15.19	.0046	Yes
F-15B/Hours	.27	3.92	.0881	No
F-15C/Rate	.60	14.35	.0053	Yes
F-15C/Hours	.58	12.11	.0103	Yes
F-15D/Rate	.34	5.57	.0459	Yes
F-15D/Hours	.53	10.05	.0157	Yes
F-15E/Rate	.53	10.08	.0156	Yes
F-15E/Hours	.57	11.40	.0118	Yes
F-16A/Rate	.01	1.05	.3356	No
F-16A/Hours	.60	12.77	.0091	No*
F-16B/Rate	.00	.02	.8975	No
F-16B/Hours	.50	8.91	.0204	No*
F-16C/Rate	.74	23.80	.0018	Yes
F-16C/Hours	.63	12.98	.0113	Yes
F-16D/Rate	.70	20.00	.0029	Yes
F-16D/Hours	.65	14.11	.0010	Yes

*Opposite from hypothesized.

indicating that a decrease in serviceable inventory leads to higher TNMCS rates. Serviceable inventory was the variable most strongly related to TNMCS of the five tested. As indicated there is strong evidence, across the MDS's that lower inventory levels are associated with higher TNMCS rates/hours.

Hypothesis 2 (Table 5). Serviceable inventory/total active inventory was the second best performing variable. For this variable, 12 of the 20 regressions performed were rejected, suggesting that as serviceable inventory to TAI decreases, TNMCS rates

Table 5. Results of Simple Linear Regression on TNMCS Rates and TNMCS Hours, Using Serviceable Inventory/Total Active Inventory as an Independent Variable

MDS/Dep. Var.	Adj. R-square	F-statistic	p-value	Reject Null?
A/OA-10/Rate	.08	1.65	.2398	No
A/OA-10/Hours[R]	.74	21.00	.0038	Yes
F-15A/Rate	.31	5.07	.0545	No
F-15A/Hours	.48	8.47	.0227	Yes
F-15B/Rate	.09	1.87	.2085	No
F-15B/Hours	.00	.07	.8028	No
F-15C/Rate	.56	12.33	.0080	Yes
F-15C/Hours	.55	10.62	.0140	Yes
F-15D/Rate	.32	5.27	.0507	Yes
F-15D/Hours	.36	5.52	.0511	Yes
F-15E/Rate	.53	10.16	.0153	Yes
F-15E/Hours	.81	35.64	.0006	Yes
F-16A/Rate	.41	7.35	.0261	No*
F-16A/Hours	.12	2.09	.1913	No
F-16B/Rate	.03	1.24	.2980	No
F-16B/Hours	.00	.41	.5421	No
F-16C/Rate	.91	81.51	<.0001	Yes
F-16C/Hours	.81	30.02	.0015	Yes
F-16D/Rate	.77	28.08	.0011	Yes
F-16D/Hours	.75	21.69	.0035	Yes

[R] Regression assumption of independence violated (see Appendix F).
* Opposite from hypothesized.

tend to increase. The trend for this variable was that the older aircraft (A/OA-10, F-15A, F-15B, F-16A, and F-16B) were not affected as much as the newer aircraft were, although on the average the ratio increased for the older aircraft throughout the 1990's. It was believed that (in the case of the older aircraft) as this ratio increased, TNMCS rates/hours would decrease. They did not. In the case of the newer aircraft the total active inventory remained static or increased throughout the decade, while their serviceable inventory levels decreased. This, in turn, lowered their ratios substantially, which supported the alternate hypothesis.

Hypothesis 3 (Table 6). The relationship between serviceable inventory/order and ship time and TNMCS was the weakest of all the variables. In fact, in no cases could

Table 6. Results of Simple Linear Regression on TNMCS Rates and TNMCS Hours, Using Serviceable Inventory/Order and Ship Time as an Independent Variable

MDS/Dep. Var.	Adj. R-square	F-statistic	p-value	Reject Null?
A/OA-10/Rate	.53	7.94	.0259	No*
A/OA-10/Hours	.32	4.35	.0822	No
F-15A/Rate	.13	2.31	.1672	No
F-15A/Hours	.01	1.11	.3280	No
F-15B/Rate	.02	1.18	.3083	No
F-15B/Hours	.00	.08	.7895	No
F-15C/Rate	.18	3.02	.1203	No
F-15C/Hours	.06	1.56	.2524	No
F-15D/Rate	.00	.00	.9741	No
F-15D/Hours	.00	.00	.9857	No
F-15E/Rate	.05	1.38	.2707	No
F-15E/Hours	.00	.39	.5500	No
F-16A/Rate	.39	6.86	.0307	No*
F-16A/Hours	.11	1.95	.2054	No
F-16B/Rate	.56	13.25	.0066	No*
F-16B/Hours	.00	1.00	.3514	No
F-16C/Rate	.12	2.08	.1957	No
F-16C/Hours	.00	.97	.3630	No
F-16D/Rate	.18	2.73	.1427	No
F-16D/Hours	.00	.89	.3820	No

*Opposite from hypothesized

the null hypothesis be rejected. Are these results surprising? Considering the RCDL example from Chapter II, it appears that as order and ship time is reduced, *ceteris paribus*, service levels will increase. In this instance, it is surprising that this ratio has increased for the most part for all MDS's throughout the 1990's yet TNMCS rates/hours have also increased. The increase in this ratio indicates that transportation time has kept pace or stayed ahead of inventory reductions. However, this is one piece of the logistics puzzle. As reported by WWX (1999), it is evident that transportation times have decreased, but from this analysis it appears that transportation is not a constraint to TNMCS rates/hours, or it has not decreased enough to make up for inventory reductions.

Hypothesis 4 (Table 7). Of the five variables examined, serviceable

Table 7. Results of Simple Linear Regression on TNMCS Rates and TNMCS Hours, Using Serviceable Inventory/Base Repair Cycle as an Independent Variable

MDS/Dep. Var.	Adj. R-square	F-statistic	p-value	Reject Null?
A/OA-10/Rate	.63	14.84	.0063	Yes
A/OA-10/Hours	.50	8.09	.0294	Yes
F-15A/Rate	.17	2.91	.1266	No
F-15A/Hours	.14	2.30	.1728	No
F-15B/Rate	.42	7.46	.0258	Yes
F-15B/Hours	.13	2.25	.1776	No
F-15C/Rate	.24	3.88	.0845	No
F-15C/Hours	.32	4.77	.0652	No
F-15D/Rate	.27	4.25	.0731	No
F-15D/Hours	.43	7.13	.0320	Yes
F-15E/Rate	.20	2.98	.1282	No
F-15E/Hours	.19	2.88	.1336	No
F-16A/Rate	.00	.30	.5965	No
F-16A/Hours	.57	11.45	.0117	No*
F-16B/Rate	.00	.09	.7773	No
F-16B/Hours	.48	8.35	.0233	No*
F-16C/Rate	.32	4.74	.0658	No
F-16C/Hours	.51	8.16	.0289	Yes
F-16D/Rate	.35	5.36	.0537	Yes
F-16D/Hours	.52	8.62	.0261	Yes

*Opposite from hypothesized.

inventory/base repair cycle performed third best with the null hypothesis rejected in 7 out of 20 cases. No clear trends emerged from the analysis. This contrasts with Hypothesis 2, where there was a distinction between older and newer aircraft. Curiously, all of the null hypotheses rejected here were also rejected for Hypothesis 2. As more parts migrate from repair at the base level to the depot level as a result of 2LM, this variable should be monitored closely or perhaps changed. This is because in the aggregate level of measurement used (total average of BRC per year), the BRC average will fall as the average BRC days for each NIIN are zeroed out when they are repaired at the depot. As a result, the BRC aggregate average will decrease, but not necessarily as a result of better repair practices. To increase the validity of this measurement in the future, those NIINs converted to depot repair should be removed from the calculations for this variable.

Hypothesis 5 (Table 8). The null hypothesis was rejected in only two instances for the serviceable inventory/depot repair cycle variable. Since only two rejections were witnessed, no clear trend emerged. Additionally, the two rejections were also rejected in Hypothesis 1 for the same MDS/dependent variable combination. This trend, as also seen with the serviceable inventory/base repair cycle variable, may indicate that serviceable inventory levels rather repair times are actually driving this ratio. This ratio should also be tested further in order to check its validity for future studies. A variable that may be more representative of repair time is a total depot repair time per year variable as opposed to an average. However, gathering this information by NIIN would be very time intensive.

Table 8. Results of Simple Linear Regression on TNMCS Rates and TNMCS Hours, Using Serviceable Inventory/Depot Repair Cycle as an Independent Variable

MDS/Dep. Var.	Adj. R-square	F-statistic	p-value	Reject Null?
A/OA-10/Rate	.55	10.74	.0135	Yes
A/OA-10/Hours	.32	4.35	.0822	No
F-15A/Rate	.33	5.33	.0497	Yes
F-15A/Hours	.11	1.99	.2016	No
F-15B/Rate	.20	3.18	.1123	No
F-15B/Hours	.03	1.21	.3086	No
F-15C/Rate	.15	2.53	.1504	No
F-15C/Hours	.15	2.46	.1610	No
F-15D/Rate	.09	1.92	.2034	No
F-15D/Hours	.23	3.42	.1069	No
F-15E/Rate	.00	.67	.4413	No
F-15E/Hours	.11	2.03	.1971	No
F-16A/Rate	.00	.19	.6717	No
F-16A/Hours	.62	13.85	.0074	No*
F-16B/Rate	.00	.14	.7206	No
F-16B/Hours	.48	8.31	.0236	No*
F-16C/Rate	.26	3.77	.0932	No
F-16C/Hours	.37	5.15	.0637	No
F-16D/Rate	.26	3.88	.0896	No
F-16D/Hours	.39	5.39	.0594	No

*Opposite from hypothesized.

Theil's *U*-Statistic. To provide a relative measure of the predictions produced by serviceable inventory, serviceable inventory/total active inventory, serviceable inventory/base repair cycle, and serviceable inventory/depot repair cycle, Theil's *U*-Statistic was employed to compare these predictions to the USAF predictions. As seen in Table 9, variables analyzed in this study produced either better predictions for both TNMCS rates and hours or one or the other for every MDS except F-16A and the F-16B. Again, this is indicative of a strong relationship between serviceable inventory levels and TNMCS rates/hours.

Table 9. Comparison of USAF Predictions and Predictions of Variables Analyzed Using Theil's *U*-Statistic

MDS	USAF-Pred Rates	USAF-Pred Hours	Serv Inv Rates	Serv Inv Hours	Serv Inv/ TAI Rates	Serv Inv/ TAI Hours	Serv Inv/ BRC Rates	Serv Inv/ BRC Hours	Serv Inv/ DRC Rate**
A-10[A]	1.62	.68	.62	.33	*	.30[R]	1.03	.47	1.47
F-15A[A]	1.40	.68	.44	*	*	.97	*	*	.48
F-15B[B]	1.04	.53	.85	*	*	*	1.00	*	*
F-15C[A]	1.44	1.33	1.07	1.12	1.10	1.16	*	*	*
F-15D[A]	1.87	2.08	.78	.75	.79	.78	*	.81	*
F-15E[B]	.76	.22	.72	.50	.68	.38	*	*	*
F-16A	.86	.15	*	*	*	*	*	*	*
F-16B	.84	.85	*	*	*	*	*	*	*
F-16C[A]	1.96	.71	.88	.38	.57	.30	*	.50	*
F-16D[A]	1.19	1.32	.50	.26	.53	.29	.63	.38	*

[A] TNMCS Rates and Hours Predictions from Serv Inv, Serv Inv/TAI, or Serv Inv/BRC as good or better than USAF predictions.
[B] Either TNMCS Rates or Hours Predictions from Serv Inv, Serv Inv/TAI, or Serv Inv/BRC as good or better than USAF predictions.
[R] Regression assumption of independence violated (see Appendix F).
* Null hypothesis was not rejected.
** Null hypotheses for Serv Inv/DRC Hours were not rejected.

A/OA-10. As shown in Appendix A, the A-10 is characterized by increasing TNMCS rates. The USAF-predicted rates in MERLIN have not been able to account for this rise, especially during the past three years. A sharp decline in serviceable inventory has been prevalent over the past ten years; however, as seen in the A-10 variables (Appendix D), 1991 data appears to be an outlier or in error. In fact, it is the largest increase in inventory in one year and its following year (1992) is the biggest decrease in inventory among all MDS's; therefore, it has been removed from the analysis. As such, TNMCS hours are evaluated from 1992 to 1999 since TNMCS hours were available beginning in 1991. For TNMCS rates, 1990 is still included when computing Theil's *U*-statistic.

The analysis for the A/OA-10 revealed that serviceable inventory alone is closely related to TNMCS rates over the past 10 years and is significant as a predictor variable. Serviceable inventory was also a strong predictor variable for TNMCS hours; however, it was not as powerful as it was for TNMCS rates. As expected, there was also a downward trend when serviceable inventory/total active inventory was regressed against TNMCS rates; however, this was not significant. For TNMCS hours, serviceable inventory/total active inventory was a significant variable. Serviceable inventory/order and ship time proved to be insignificant for both TNMCS rates and hours; in both instances it displayed an upward trend. That is, as the ratio got larger, TNMCS rates were rising. This indicates that average order and ship times are decreasing at a faster rate than inventory; however, there appears to be little or no impact on TNMCS rates.

Serviceable inventory/base repair cycle followed the expected trend; as ratios increased, TNMCS decreased. Regressed against both dependent variables, this variable was significant in both instances. The serviceable inventory/depot repair cycle variable showed the same trend; however, while it was significant for TNMCS rates it was not significant for TNMCS hours. These downward trends indicate that average depot and base repair times are not decreasing as fast as inventory levels, substantiating Larvick's (1998) findings.

F-15A. The F-15A TNMCS rates indicate a steady climb from 1990 through the first half of 1999 (Appendix D). During this same time period, reductions have cut serviceable inventory levels to less than half of what they were at the beginning of the decade. Not surprisingly, the relationship between declining inventory levels and rising

TNMCS rates was found to be significant. However, TNMCS hours and serviceable inventory did not display this same relationship; there was an upward trend.

The total active inventory of F-15A's during this time has declined to almost a third of what it was in 1990. Since total active inventory levels fell faster than serviceable inventory levels, the ratio of serviceable inventory-to-total active inventory increased throughout the decade. Regressed against TNMCS rates, this created an effect opposite from that hypothesized. That is, as the ratio increased, so too did TNMCS rates. This is interesting because when the variable was regressed against TNMCS hours a significant relationship was found.

No significant relationships were found with the serviceable inventory/order and ship time ratio. Serviceable inventory-to-base repair time ratio showed an increase throughout the time frame, but was not significant. However, lower serviceable inventory-to-depot repair time ratios were significant to higher TNMCS rates.

F-15B. The F-15B TNMCS rates appear fairly stationary from 1990 to 1996; however, they rose dramatically in 1997 through the first half of 1999 (Appendix D). The USAF prediction model did not account for this increase. In fact, USAF-predicted TNMCS rates decreased during this same time period. Like its single-seat counterpart, the F-15A, the F-15B TNMCS rates were significantly related to serviceable inventory levels. This is not too surprising given that they share many of the same reparable parts. Interestingly, for TNMCS hours, trends were opposite when it came to differences between the F-15A and F-15B for serviceable inventory. Although neither was significant, an upward trend of TNMCS hours occurred as serviceable inventory rose for

the F-15A, while the F-15B's TNMCS hours indicated a decrease as serviceable inventory levels fell.

The serviceable inventory/total active inventory ratio experienced the same problem as the F-15A for TNMCS—total active inventory levels fell faster than serviceable inventory. As stated in Chapter III, it was believed that decreasing aircraft fleets would be the benefactors of a parts "surplus;" however, this does not appear to be the case for the F-15A or F-15B. Unlike the F-15A, however, there was no identifiable relationship between serviceable inventory/total active inventory and TNMCS hours. Also like the F-15A, the serviceable inventory-to-order and ship time ratio proved the least significant of the tests performed for both TNMCS rates and hours. For the inventory-to-repair ratios, outcomes were the opposite of the F-15A for TNMCS rates. The serviceable inventory-to-base repair was to be significant, whereas serviceable inventory-to-depot repair ratio was not. Neither of the repair ratios were significant when regressed against TNMCS hours. These results also correspond to the F-15A.

F-15C. The F-15C has not witnessed dramatic increases in TNMCS rates over the past ten years as the three previous aircraft have; however, there has been an increase. During the decade, serviceable inventory levels decreased markedly (52%), but the TAI decreased by only 10% (Appendix D). As a result of this, serviceable inventory and serviceable inventory-to-total active inventory variables were significantly related to TNMCS rates and TNMCS hours.

Serviceable inventory-to-order and ship time had the same trend as some of the previous analysis; it was increasing as TNMCS rates increased. Also, while there

appears to be decreasing trends with both the inventory-to-repair ratios, neither one was significant.

F-15D. For nine of the ten years, the F-15D did not experience double digit TNMCS rates. Like the F-15C, the F-15D has witnessed quite significant reductions in inventory, but a rather small decline in its TAI. With rather steady TNMCS rates, the model fit was not as strong as the F-15C (see R-square adj. in Tables 3 and 4), but nonetheless serviceable inventory and serviceable inventory/total active inventory variables were found to be significant variables in explaining TNMCS rates and hours. These results parallel the F-15C. Again, not surprising, because like the F-15A and B models, the C and D models share a great deal of inventory.

The other three variables were all insignificant at $\alpha \leq .05$, for TNMCS rates. However, the serviceable inventory/base repair variable was significant when regressed against TNMCS hours, while the other two variables (serviceable inventory/order and ship time and serviceable inventory/depot repair cycle) were not. Most of these results compared to that of the F-15C.

F-15E. The F-15E is an interesting aircraft to analyze for two reasons. First, it is the newest of the fighter aircraft in this study, coming into the Air Force's inventory in 1988. Second, similar to the A-10 and unlike the F-15A-D and F-16A-D, the USAF prediction model is built particularly for the F-15E. That is, there is no aggregation of models when predicting TNMCS rates so there should be a more accurate prediction.

Being relatively new when this study started analysis (1990), the F-15E also presented some problems. For example, the actual TNMCS rates were extraordinarily high in 1989 and 1990 due to parts not yet being available in the field (ACC, 1999).

From 1991 to the present, the F-15E started exhibiting more realistic trends. For this reason, it was decided to exclude 1990 data from analysis in order to give a clearer picture of what was occurring. In 1991, possessed hours (and therefore TNMCS hours) were approximately half of what they were in 1992. As discussed in Chapter III, this is one of the problems associated with using TNMCS hours versus TNMCS rates. However, it was decided to leave in 1991 data to determine if the prediction models built from serviceable inventory and serviceable inventory/total active inventory regressions could register close to that of the USAF's. As seen in Table 8, these models performed exceedingly well.

Unlike the other F-15 models, the F-15E's TAI has increased during the 1990's, which makes sense, given it is a new aircraft. However, it also has witnessed a decline in serviceable inventory over the past decade. Additionally, TNMCS rates have slowly increased since 1991. As a result, the serviceable inventory and serviceable inventory/total active inventory null hypotheses were rejected for TNMCS rates and hours. Although average aggregate order and ship times, base repair cycle times, and depot repair times decreased significantly over the decade, no clear trends evolved when they were placed into a ratio with serviceable inventory. As a result, all were insignificant.

F-16A and F-16B. The F-16A and B are combined because prediction models were not developed for either one since all null hypotheses were unable to be rejected. Both the F-16A and B are characterized by significantly increased TNMCS rates during 1997 and 1998, but initial results from 1999 indicates this trend may be changing as both have experience a decreased in TNMCS rates. Although inventory rates have decreased

over time, TNMCS rates have fluctuated during the decade. Additionally, TAI was cut substantially from 1994 to 1995, and therefore, dramatically raised the inventory-to-aircraft ratio. These factors led to all variables being insignificant. The variables that registered as significant with p-values <.05, were opposite from those hypothesized, and thus were not rejected.

F-16C. Although the specific cause is unknown, possibly a modification or well-deserved downtime following the DESERT STORM, 1993 possessed hours, and therefore TNMCS hours, were extremely low in 1993. In fact, they increased more than sevenfold in 1994 from those in 1993. Therefore, 1993 was viewed as an outlier and removed from the statistical analysis.

For the F-16C there is a noticeable increase in TNMCS rates in 1994 and 1997 (Appendix D). Additionally, the TAI increased during the 1990's, while the serviceable inventory decreased. As was the case with the F-15C, D, and E models, this combination of factors led to the rejection of the null hypotheses for serviceable inventory and serviceable inventory-to-total active inventory for both TNMCS rates and hours. With the exception of serviceable inventory/base repair cycle regressed against TNMCS hours, the other variables analyzed were insignificant.

F-16D. As was the case with the F-16C, 1993 data were removed from the analysis of the F-16D for the same reasons. The F-16D, like the F-16C, has witnessed marked increases in TNMCS rates in 1994 and 1997. Additionally, serviceable inventory has decreased by about 50% and TAI has increased 18% since the beginning of the decade. This led to a fairly strong correlation between TNMCS rates and serviceable inventory and serviceable inventory/total active inventory variables. The same trend with

serviceable inventory/order and ship time appearing in previous analysis also occurred in this instance. That is, the relationship between this variable and the dependent variable was not strong. Of the inventory-to-repair ratios, serviceable inventory/base repair cycle was found to be significant with both TNMCS rates and hours. More than anything, this relationship seems driven by the strong correlation between TNMCS rates and hours and serviceable inventory. Generally, the results were close to those seen with the F-16C. The association between A and B models as well as C and D models has been a recurrent theme throughout the analysis and will be discussed in Chapter V.

Supplemental Analysis (Table 10). The rejection rate of Hypothesis 1 and the results of the Theil's *U* tests indicate the variable of serviceable inventory is a promising one as a possible predictor of TNMCS hours. As such, it was decided to conduct further analysis in order to substantiate serviceable inventory's use as a predictor variable for TNMCS. This supplemental analysis is conducted to further substantiate this variable's validity and is based only on TNMCS hours. The analysis is based on January 1991 through January 1999. As was the case with the initial analysis, the A/OA-10 has 1991 data deleted from its analysis, while the F-16C and F-16D have 1993 data deleted from their analyses.

In addition to the assumptions outlined in Chapter III, two more assumptions are necessary to conduct this analysis. The first assumption is that serviceable inventory levels increase or decrease linearly from one year to another. For example, the serviceable inventory level for the F-16C is 372,191 in 1990 and in 1991 it is 420,336. Therefore, January 1990 begins with a serviceable inventory level of 372,191 and January 1991 begins with a serviceable level of 420,336. In order to derive the monthly

value 372,191 is subtracted from 420,336 and divided by 12. This number is then added (or subtracted) to (from) the preceding month, depending on whether the serviceable inventory increases or decreases from one year to the next. In this instance, the serviceable inventory level for February 1990 is 376,203.

The second assumption is based on the fact that MERLIN does not contain information for January 1991; its data begins with February 1991. Accordingly, February 1991 data is used for January 1991 in the case of flying hours, possessed hours, sorties, and TNMCS hours.

Table 10. Comparison of USAF Predictions and Multiple Regression Predictions (with and without Serviceable Inventory) Using Theil's *U*-Statistic

MDS	Current USAF Prediction (computed by MD)	USAF Prediction Variables w/out Serv Inv (computed by MDS)	Predictions using Serv Inv with other Variables (computed by MDS)
A/OA-10	1.79	1.77	.67
F-15A	1.85	.87	.82
F-15B	1.29	1.10	.89
F-15C	1.30	1.04	.75
F-15D	1.60	.79	.75
F-15E	.98	.98	.89
F-16A	.49	.35	.30
F-16B	1.11	1.05	.91
F-16C	2.58	1.52	1.08
F-16D	1.87	1.64	1.02

In order to check the validity of serviceable inventory, three measurements are made. First, Theil's *U*-statistic is computed for current USAF predictions in MERLIN. This Theil's *U*-statistic is based on monthly calculation vice an annual calculation, as it was in the original analysis. Next, a multiple regression is performed for each MDS using all the variables the Air Force uses to compute its TNMCS hours (flying hours, possessed hours, and sorties). The objective of this regression is to disaggreagate the

MDS's and provide an additional measurement. Theil's *U*-statistic is then computed for these results. Finally, a multiple regression is conducted for each MDS using the aforementioned variables and adding in serviceable inventory. Supporting analysis is contained in Appendix G.

These results indicate two key findings. First, disaggregating by MDS is generally better than using an MD prediction for any particular MDS. Second, there is very little difference between A/OA-10 and the F-15E MD and MDS Theil's *U*-statistic. This is because their predictions are already disaggregated. The subtle changes in their Theil's *U*-statistic are a result of feeding new information into the regression equation.

Only in one instance (F-16A) was the current USAF prediction better than the MDS breakout. In *all* instances, using serviceable inventory in the multiple regression equation provided the best Theil's *U*-statistic, despite only slightly improved r-square statistics in some instances. This result substantiates and verifies initial results. Additionally, only two (F-16C and F-16D) are not as good as a naïve forecast; however, with 1991 removed the F-16D does go below the naïve forecast (.96).

Results Summary. This section covered the statistical tests and analyses for each MDS. Regression analysis was performed on both TNMCS rates and hours for each of the five independent variables examined in this study. The results of the regression showed that serviceable inventory and serviceable inventory/total active inventory were highly related with TNMCS rates and hours for most of the MDS's. Next, Theil's *U*-statistic was then employed to ascertain the effectiveness of the variables analyzed in this study against USAF TNMCS predictions. The particulars of each MDS test were then discussed. In a few instances (A-10, F-15E, F-16C, F-16D), one of the years included in

the study was determined an outlier for one of a couple reasons and removed. Finally, supplemental analysis was provided was conducted. The results of these tests further substantiated serviceable inventory as a viable predictor of TNMCS rates.

Chapter Summary

This chapter described the analysis and results of this study. First, the general approach to the analysis was discussed. Due to problems outlined in Chapter III, i.e., micronumerosity and multicollinearity, an approach was developed that would deal with these obstacles in a direct manner. Next, hypotheses were developed for each of the five variables. These hypotheses were then tested for each MDS using regression analysis. Serviceable inventory and serviceable inventory/total active inventory variables proved to be the best predictor variables of actual TNMCS rates and hours. After hypotheses were rejected, models were then created using the appropriate regression equation. These results were then used to derive predicted TNMCS rates and hours for each year. These predictions were then compared to USAF-predicted TNMCS rates and hours using Theil's *U*-statistic to determine their effectiveness in forecasting TNMCS rates/hours. Except in two instances, where the null hypotheses could not be rejected (the F-16A and B), the models developed in this study either had similar performance or outperformed the current USAF predictions from 1990 to the first half of 1999. Finally, supplemental analysis was performed in order to confirm these results. The analysis illustrated that when serviceable inventory is added to the three variables the USAF uses in its regression equation, Theil's *U*-statistics are better for each MDS.

Overview of Next Chapter

Chapter V concludes this research effort. First, the research questions presented in Chapter I are answered. Next, managerial recommendations are made. Finally, research limitations are examined and future recommendations are suggested.

V. Conclusions and Recommendations

Introduction

This chapter discusses the conclusions drawn from the research. Each of the research questions is addressed and managerial implications are discussed. Limitations of the study are then presented. Finally, future research areas are suggested.

Summary of Findings

This section answers the research questions presented in Chapter I. As indicated in Chapter I, answers to Research Questions 1 and 2 are obtained from the literature review, while Research Question 3 is addressed in the analysis completed in Chapter IV.

Research Question #1: How have the variables (inventory, transportation and repair) been affected in the past ten years? As the literature review indicated, although the pipeline has seen new business practices (primarily as a result of Agile Logistics) the basic USAF reparable pipeline has remained essentially unchanged since its inception. Therefore the general flow of assets, save the ones going from 3LM to 2LM, is basically the same as it was ten years ago. However, WWX has greatly increased the rapidity with which parts are delivered from the depots to the bases. Also, the bases have less flexibility in their repair in that they can do only minor maintenance when they may have the resources to accomplish more. At the depot level, the environment has gone from a continuous flow production to more of a job shop process.

It is obvious from the literature review as well as the data collected that serviceable inventory levels have plummeted during the 1990's. This drop may be okay

for an aircraft whose total active inventory is declining, but it appears unlikely from this research that this approach works well for aircraft whose total active inventory have remained constant or is increasing (e.g., for the F-15E, F-16C, and F16D). Unfortunately, the USAF--in its zeal to reduce inventory levels—has not appeared to leave *any* of the fighter aircraft untouched during this period.

If there is any success story during this time, it is probably the implementation of rapid transportation. As indicated in the literature review, WWX has already contributed to cost savings. However, this research shows that increasing the ratios of serviceable inventory-to-order and ship time appears to have little or no impact on TNMCS rates. Also, as seen in the literature review, the question has been raised about whether cost could be avoided by not using premium transportation for non-mission critical items. Although premium transportation in theory should help to deliver parts faster and reduce inventory levels (RCDL example), the effects are still unclear.

Finally, repair appears to be a major constraint. From the literature review, a couple of interesting points were revealed regarding depot repair. First, there is a question of whether the change to Agile Logistics is being embraced by the work force. Second, although people may want to make the change, it appears as though adequate resources, i.e., buffer inventory, are not being provided to support this new environment. A positive note here is that it appears as though information systems such as EXPRESS and RBL are doing a good job in helping identify the parts that need to be repaired and getting them where they need to be.

At the base level (other than the example provided by Vanderman (1998)), it is unclear as to what effect Agile Logistics is creating other than reducing the amount of

repair at a particular base. It would seem that since 2LM-driven base repairs are less extensive now than they were at the beginning of the decade, average base repair times would decrease. However, during the literature review it was noted that although average base repair was 4 days in 1990, it increased to 5.6 days from 1998 to 1999.

In summary, the transition to Agile Logistics has not yet yielded the results it has promised. It must be understood that positive results from a change of this magnitude will not occur quickly. However, the USAF, as reported by the GAO (1999b), has been overly optimistic in its results, which may have led to poor decisions regarding other factors of the logistics chain, e.g., inventory levels.

Research Question #2: What other independent variables exist that could contribute to TNMCS? As illustrated in Figure 3 (in Chapter II), there are many other variables that can contribute to higher TNMCS rates besides the variables analyzed in this study. It is important to note these for two reasons. First, over time they can become significant drivers, e.g., aging aircraft and non-availability of skilled workers. Second, if prediction equations developed from one set of variables cannot account for the variability in TNMCS rates, then other variables need to be considered.

For this research, it was important to be able to identify possible confounds to the study if the desired results were not achieved, in order to explain why the hypotheses were not rejected. In the case of the F-16 A and F-16B, it appears that the variables the Air Force are currently using work well as indicated by their Theil's *U*-statistic registering less than 1 for both aircraft. However, there still may be other variables that have contributed to the F-16A's and F-16B's shaky TNMCS performance over the last couple of years. For example, both these models currently reside with Air National

Guard units. It could be the intention of management that parts do not get fixed as fast for an ANG unit as they do for an active duty unit, or that DMSMS is taking its toll on these older aircraft. Finding the root causes of TNMCS can be challenging for researchers and may be impossible for management, given time constraints.

What is clear from the RCDL example in Chapter II is that repair, transportation, and inventory play a major role in reducing the TNMCS rates or hours. However, it appears from this research that one may not totally compensate for the other. Although average order and ship times are declining at a phenomenal rate, they could not offset declining inventory levels. This may necessitate transportation times to become even faster. Obviously, this will not be without its costs.

Of the variables discussed in this research, the one that should concern management the most is the availability of skilled workers at the depots. As the GAO, reported, AFMC management has not risen to the challenge of creating a multi-skilled workforce that is needed in a flexible-manufacturing environment (1999b). If the people are not adequately trained to perform their jobs, how can they be expected to embrace the new culture of Agile Logistics? This research identified two major shifts in TNMCS rates. The first shift took place in 1994 and the other in 1997. An initial two-level maintenance conversion for some parts also took place in 1994 and other parts followed to the depot in 1997. A coincidence perhaps, but an unlikely one. Without a flexible workforce, the Air Force is likely to find TNMCS rates increasing in the future.

Research Question #3: How strong is the relationship of each variable to TNMCS rates? The relationship of the variables examined in this study to TNMCS rates were mixed. Serviceable inventory and serviceable inventory/total active inventory

were the strongest, while serviceable inventory/order and ship time ran counter to alternate hypothesis in all cases. The following list indicates the percentage of significance for the twenty regressions performed per independent variable:

70% of the serviceable inventory regressions

60% of the serviceable inventory/total active inventory regressions

40% of the serviceable inventory/base repair cycle regressions

10% of the serviceable inventory/depot repair cycle regressions

0% of the serviceable inventory/order and ship time regressions

Interestingly, serviceable inventory and serviceable inventory/total active inventory were all significant when regressed against TNMCS rates and hours for the newer aircraft (F-15C, F-15D, F-15E, F-16C, and F-16D). This research suggests that when the total active inventory is static or increasing, inventory reduction should be considered carefully. Performing these reductions in an era of complex changes to key processes only seems to have exacerbated problems for the Air Force. It is only after the results of these actions can be ascertained should inventory reductions, either reactive or proactive, occur.

Managerial Recommendations

This study proposes five recommendations for management. They are not necessarily cost free, but are observations that may help improve readiness or at least help better predict effects to readiness.

Disaggregate Predicted TNMCS Hours. This research indicates that there are significant differences between A/B aircraft models and C/D aircraft models when it

comes to predicting TNMCS rates and hours. Forty percent of the USAF-predicted TNMCS hours and seventy percent of the USAF-predicted TNMCS rates were higher than the naïve forecast method. However, when separate predictors were used, e.g., A-10 and F-15E, 75% of the USAF-predicted hours and rates were better than a naïve forecast. Each MDS does not have to be separated; however, those using the same components, e.g., C and D models, should be separated for purposes of predicting TNMCS rates, especially for the fighter aircraft contained in this research.

Being able to more accurately predict supply shortfalls will allow for a better defense of budgets for spare parts and repair facilities. It should also help with initial program objective memorandum submittals. Additionally, it will help the operational commands better understand how they develop their TNMCS goals. As of the date of this research, ACC has a TNMCS goal of 7%, while the actual TNMCS rate is 15.5% for the F-16C. ACC is no doubt considering the USAF-predicted F-16 TNMCS rate which is currently 9.4%. Finally, a better understanding of what causes TNMCS to rise may help improve the implementation of Agile Logistics support policies.

Carefully Consider Inventory Reductions for Parts that Remain in Use Over 5 Years. One of the criteria for selecting inventory items for this research was that the item had to be in the inventory throughout the period studied (1990-1999). As indicated by the results of this study, the reductions of these parts are highly related to TNMCS rates and hours, especially for the newer aircraft. The database is in place to allow planners to check these statistics. This is perhaps one that should be used when computing spare parts requirements.

Consider Adding Logistics Chain Variables to TNMCS Predictions. This study indicates that adding logistics chain variables to a TNMCS prediction equation may add great utility to the equation. Because one logistics variable was able to predict TNMCS rates as good or better than the USAF predictions in 8 of the 10 aircraft studied, it makes sense that a logistics chain variable(s) would help improve predictions. While serviceable inventory and serviceable inventory/total active inventory appear to be good candidates, others may be developed as well. Another key variable that could have an affect on predictions might be the number of multi-skilled workers at the depots.

Scrutinize Expedited Transportation. The KMPG study (F-16, 1998) expressed concern that the Air Force might be wasting money on expedited transportation when there was not a need for it. This study either highlights that problem, or illustrates that transportation needs to become even more expeditious. It is obvious that order and ship times have been reduced using expedited transportation, but what exactly is the Air Force getting as a result? Can it be shown that without the expedited transportation system that TNMCS rates or hours would be doubled? Obviously, those are difficult questions to answer due to the sheer magnitude of the Air Force's operation. However, they are valid questions. As TNMCS rates continue to rise and average transportation times continue to decrease, it is becoming apparent that transportation may not be the constraint in the logistics chain. It is, however, the easiest of the processes to improve.

Add Inventory Buffers until Agile Logistics Has Proven Itself. As Larvick (1998) stated, "Even in the commercial world, changes to Just-in-Time or other customer-oriented manufacturing environments take a great deal of time to successfully implement—some companies plan this to take six years or longer." While the Air Force

might be effective in making wide-sweeping organizational changes, it is open for debate how well it can make "grass root" changes to its processes, e.g., changing from a continuous flow process to a job shop process. It could be argued that they take much longer than their industry counterparts to implement process changes to manufacturing. For example, a company has a great incentive to make wholehearted changes to its processes—in response to continual evaluation from stockholders. However, if the Air Force is having difficulty training its people (as the GAO reports) for a change such as this, how does the Air Force expect to convert operations more effectively? It can not; therefore, during these periods of change, additional inventory should be added to hedge against the risk of problems during process implementation.

Limitations of Research

There are four major limitations that were annotated throughout this research. The first limitation is the small data set examined. While inferences and conclusions can be drawn from a regression employing small data sets, it is more convincing argument if the data set is large. Once this limitation was known, it was countered by performing simple linear regression versus multiple regression. Still, with 10 data points (and in some cases only 8) results should be given careful consideration and substantiated if possible.

The second limitation deals with the fact that only inventory items that entered into the Air Force's inventory before 1990 and remained through 1999 were considered. While it was explained early on that this was necessary in order to maintain consistency throughout the analysis, it is still a limitation. This is because the number of "problem

parts" included in the analysis are unknown. It is possible, although not probable, that items responsible for TNMCS rates during 1999 were not included within the inventory evaluated in this study.

The third limitation to this research is that the data used was not necessarily representative of the fleet evaluated. This refers to 1990 TNMCS data since this data was unavailable in MERLIN. As a result, ACC TNMCS rates had to be used. While this is seen as acceptable from an Air Staff perspective, it does bring into question the validity of results for 1990 in particular. Also, in order to evaluate 1999, TNMCS hours and possessed hours were doubled since data was only available through June. While this should not have caused a problem, the first half of the year could have been affected due to funding or increased flying due to operations in Bosnia.

The final limitation is that this research examined aggregate levels of inventory and aggregated average order and ship times, base repair times, and depot repair times. While it was believed that trends would emerge despite aggregation, the how's and why's can not be answered in discrete terms. For example, if the question "what part inventories should not be reduced any further?' was raised, this research can not point to any particular answer. All that can be stated is that in the aggregate, more inventory is needed. It can not state which parts or items are the key drivers.

Recommendations for Future Research

Throughout this research it became evident that two major research projects can be undertaken. While there are others, e.g., disaggregating current USAF prediction equations, these two in particular would help further this area of research.

Recommendation 1: Using USAF TNMCS prediction equations, add logistics chain variables to determine if predictive capabilities improve. As indicated in the managerial recommendations, it would behoove the Air Force to add a logistics chain variable(s) to its regression equation. While it is rather easy to collect data by month for possessed hours, flying hours, and number of sorties, it is more difficult to gather this type of data for the logistics variables. For example, the D041 only produces data on a quarterly basis. Even then, as indicated by Morgan (1999), this data may not be totally accurate. Data can be obtained from such sources as Logistics Management Institute, Synergy Corporation, and Dynamics Research Corporation. This data includes average monthly depot and base repair times and order and ship times. Using this data, it would be possible to add in a logistics chain variable to the USAF prediction equation.

Recommendation 2: Analyze three level maintenance (3LM) versus two level maintenance (2LM) on the same reparables over the same time horizon. Over 180 common reparable parts can be found on http://www.afmc-mil.wpafb.af.mil/HQ-AFMC/LG/agile/ (Agile, 1999). These common parts are both repaired at the base level and at the depot level (i.e., items are 3LM for some aircraft and 2LM for others). The conversion date for a majority of the parts (76%) is in FY94. Using this data and other sources, such as Reparable/Serviceable Item Pipeline Analysis Tool (RIPDAT) [found at http://leanlog.synergyinc.com/ripdat/], it would be possible to compare and contrast MICAP and TNMCS rates as well as other logistics variables (repair time for like maintenance actions) for these parts. A portion of this study should be devoted to a cost analysis, e.g., how much it costs the depot versus the base to perform the same maintenance action on the item.

Chapter Summary

This chapter answered the three research questions posed in Chapter I. In general, it was found that there have been significant reductions in serviceable inventory. This research indicates these reductions are strongly related to increase TNMCS rates and hours. Next, five managerial recommendations were proposed. One of the recommendations calls for the Air Force to investigate adding a logistic variable(s) to their current TNMCS prediction equation. Limitations of this study, a total of four, were then presented. The largest limitation of this study is a small data set. Therefore, researchers and managers alike were advised to use caution when using these results. Finally, two recommendations for future research were provided.

Thesis Summary

The Air Force faced a very austere environment during the 1990's. It was continually scrutinized by Congress to better manage inventory and make better use of its dwindling resources. In response, the Air Force embarked on a series of changes that would lean infrastructure and improve their logistics responsiveness. Although cost savings seem to have been attained, there is great concern about how these changes will affect a 21st Century Air Force. A more agile force essentially means fewer people and less infrastructure. Given this environment, the Air Force needs to proceed cautiously with rapid change and ensure safety mechanisms are in place before embarking on organization-transforming initiatives. One of these safety mechanisms is inventory.

Appendix A: Predicted TNMCS Equations and Charts

Revised

A-10 Results
4/9/1997 9:41 AM

Multiple Regression Analysis

Dependent variable: TNMCS_HRS

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	738.98	400.394	1.84563	0.0673
FLYING_HOU	2.71019	0.670338	4.04302	0.0001
POSS_HRS	0.0808412	0.0103305	7.82548	0.0000
SORTIES	-5.46947	1.23956	-4.41242	0.0000

Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Model	2.76085E9	3	9.20283E8	228.66	0.0000
Residual	5.1114E8	127	4.02473E6		
Total (Corr.)	3.27199E9	130			

R-squared = 84.3783 percent
R-squared (adjusted for d.f.) = 84.0093 percent
Standard Error of Est. = 2006.17
Mean absolute error = 1529.58
Durbin-Watson statistic = 0.996476

A-10 TNMCS

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between TNMCS_HRS and 3 independent variables. The equation of the fitted model is

TNMCS_HRS = 738.98 + 2.71019*FLYING_HOU + 0.0808412*POSS_HRS - 5.46947*SORTIES

OK

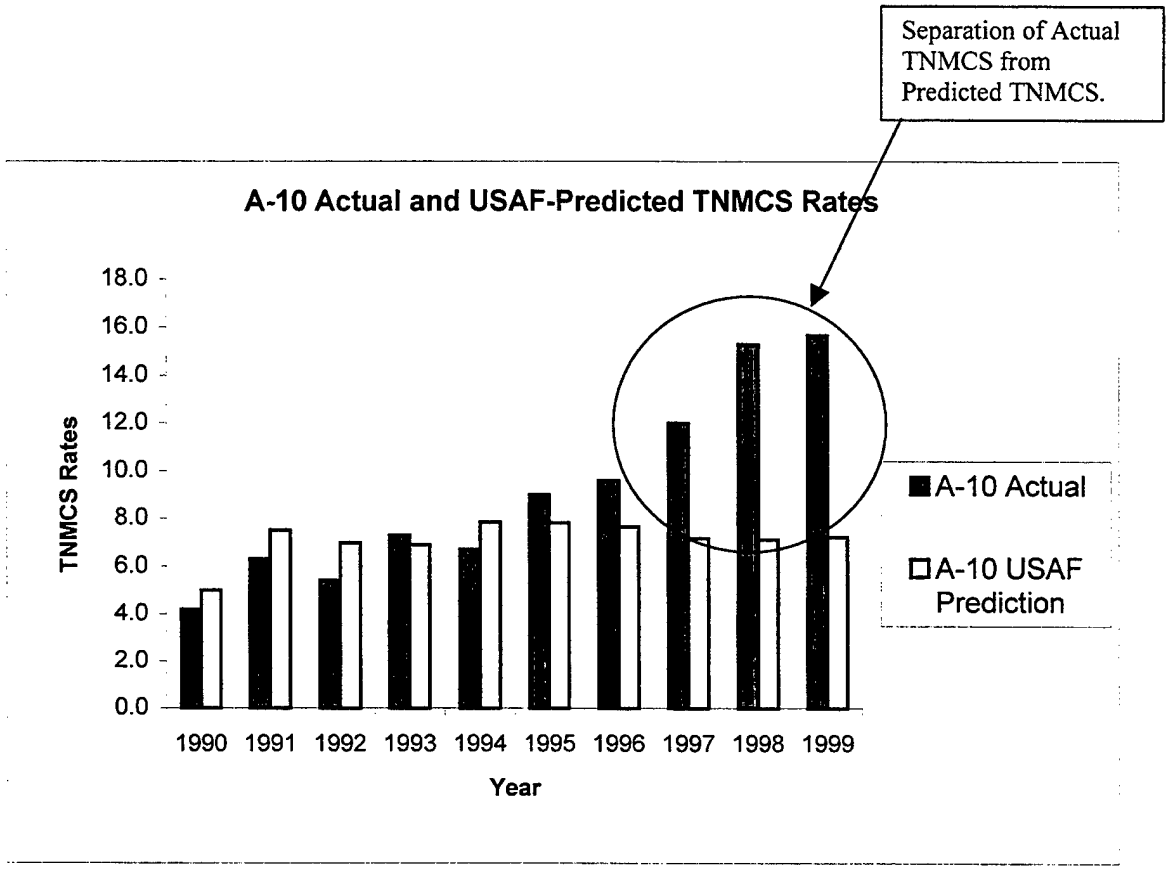
Since the P-value in the ANOVA table is less than 0.01, there is a statistically significant relationship between the variables at the 99% confidence level.

The R-Squared statistic indicates that the model as fitted explains 84.3783% of the variability in TNMCS_HRS. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 84.0093%. The standard error of the estimate shows the standard deviation of the residuals to be 2006.17. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 1529.58 is the average value of the residuals. The Durbin-Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is less than 1.4, there may be some indication of serial correlation. Plot the residuals versus row order to see if there is any pattern which can be seen.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.0001, belonging to FLYING_HOU. Since the P-value is less than 0.01, the highest order term is statistically significant at the 99% confidence level. Consequently, you probably don't want to remove any variables from the model.

(131)

Appendix A: Predicted TNMCS Equations and Charts



Appendix A: Predicted TNMCS Equations and Charts

C/W

F15 A-D Results
4/8/1997 3:48 PM

Multiple Regression Analysis

Dependent variable: TNMCS_HOUR

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	-101.149	169.63	-0.596292	0.5515
FLYING_HRS	-0.364535	0.372493	-0.978637	0.3287
POSS_HRS	0.211585	0.00660739	32.0224	0.0000
SORTIES	-4.13984	0.689225	-6.00652	0.0000

Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Model	1.53305E10	3	5.11015E9	1647.60	0.0000
Residual	8.00205E8	258	3.10157E6		
Total (Corr.)	1.61307E10	261			

R-squared = 95.0392 percent
R-squared (adjusted for d.f.) = 94.9815 percent
Standard Error of Est. = 1761.13
Mean absolute error = 1274.75
Durbin-Watson statistic = 1.37498

F-15 A/D
TNMCS
OK

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between TNMCS_HOUR and 3 independent variables. The equation of the fitted model is

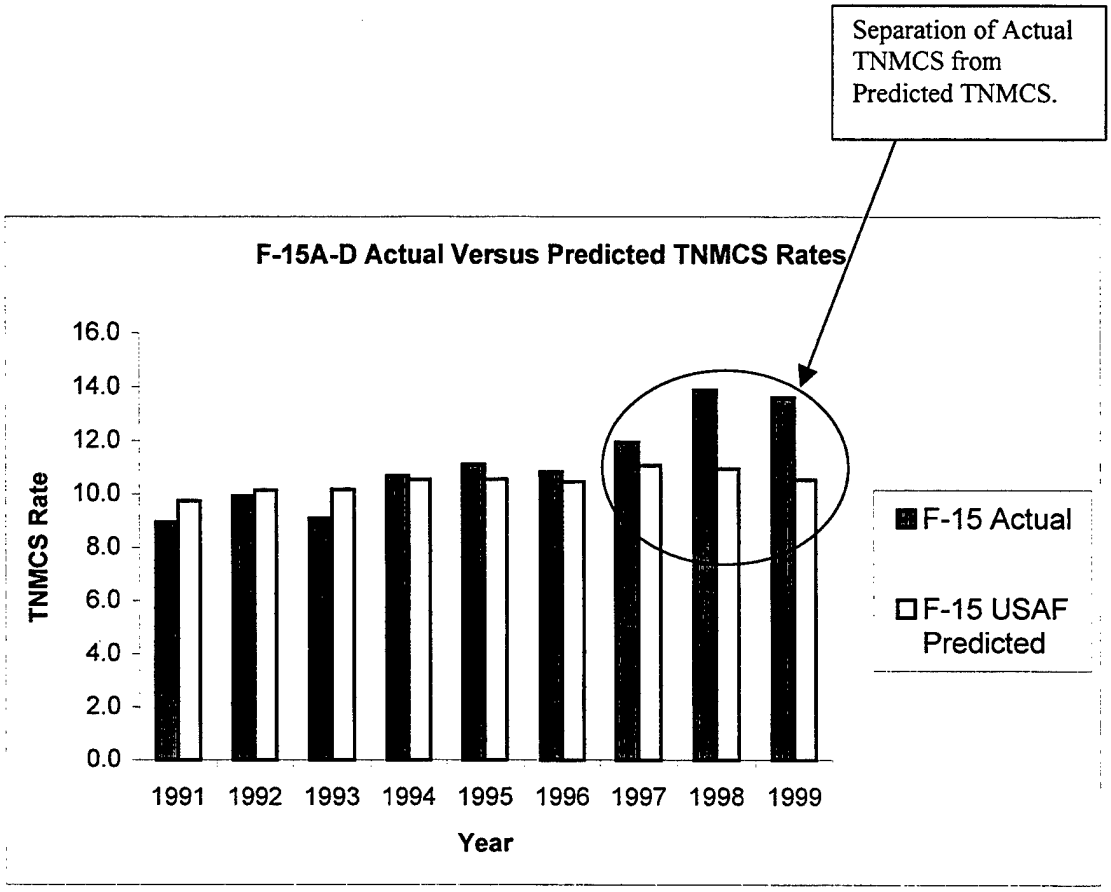
TNMCS_HOUR = -101.149 - 0.364535*FLYING_HRS + 0.211585*POSS_HRS - 4.13984*SORTIES

Since the P-value in the ANOVA table is less than 0.01, there is a statistically significant relationship between the variables at the 99% confidence level.

The R-Squared statistic indicates that the model as fitted explains 95.0392% of the variability in TNMCS_HOUR. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 94.9815%. The standard error of the estimate shows the standard deviation of the residuals to be 1761.13. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 1274.75 is the average value of the residuals. The Durbin-Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is less than 1.4, there may be some indication of serial correlation. Plot the residuals versus row order to see if there is any pattern which can be seen.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.3287, belonging to FLYING_HRS. Since the P-value is greater or equal to 0.10, that term is not statistically significant at the 90% or higher confidence level. Consequently, you should consider removing FLYING_HRS from the model.

Appendix A: Predicted TNMCS Equations and Charts



Appendix A: Predicted TNMCS Equations and Charts

JUL-09-1999 07:00 FROM DYNAMICS RESEARCH TO 99376567988 P.07/21

VARIABLES REMOVED

F15 E Results
4/9/1997 7:14 AM

Multiple Regression Analysis

Dependent variable: TNMCS_HRS

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	-3573.79	841.56	-4.24662	0.0001
FLYING_HRS	1.0864	0.453335	2.39647	0.0203
POSS_HRS	0.135368	0.0160339	8.44264	0.0000
SORTIES	-1.86296	1.07152	-1.73862	0.0883

Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Model	8.10582E8	3	2.70194E8	137.78	0.0000
Residual	9.80561E7	50	1.96112E6		
Total (Corr.)	9.08638E8	53			

R-squared = 89.2084 percent
R-squared (adjusted for d.f.) = 88.561 percent
Standard Error of Est. = 1400.4
Mean absolute error = 1054.67
Durbin-Watson statistic = 1.33945

FLE TNMCS_HRS = -3573.79 + 1.0864(fly-hrs) + 0.135368(poss-hrs) - 1.86296(sorties)

F-15E TNMCS

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to describe the relationship between TNMCS_HRS and 3 independent variables. The equation of the fitted model is

TNMCS_HRS = -3573.79 + 1.0864*FLYING_HRS + 0.135368*POSS_HRS - 1.86296*SORTIES

OK

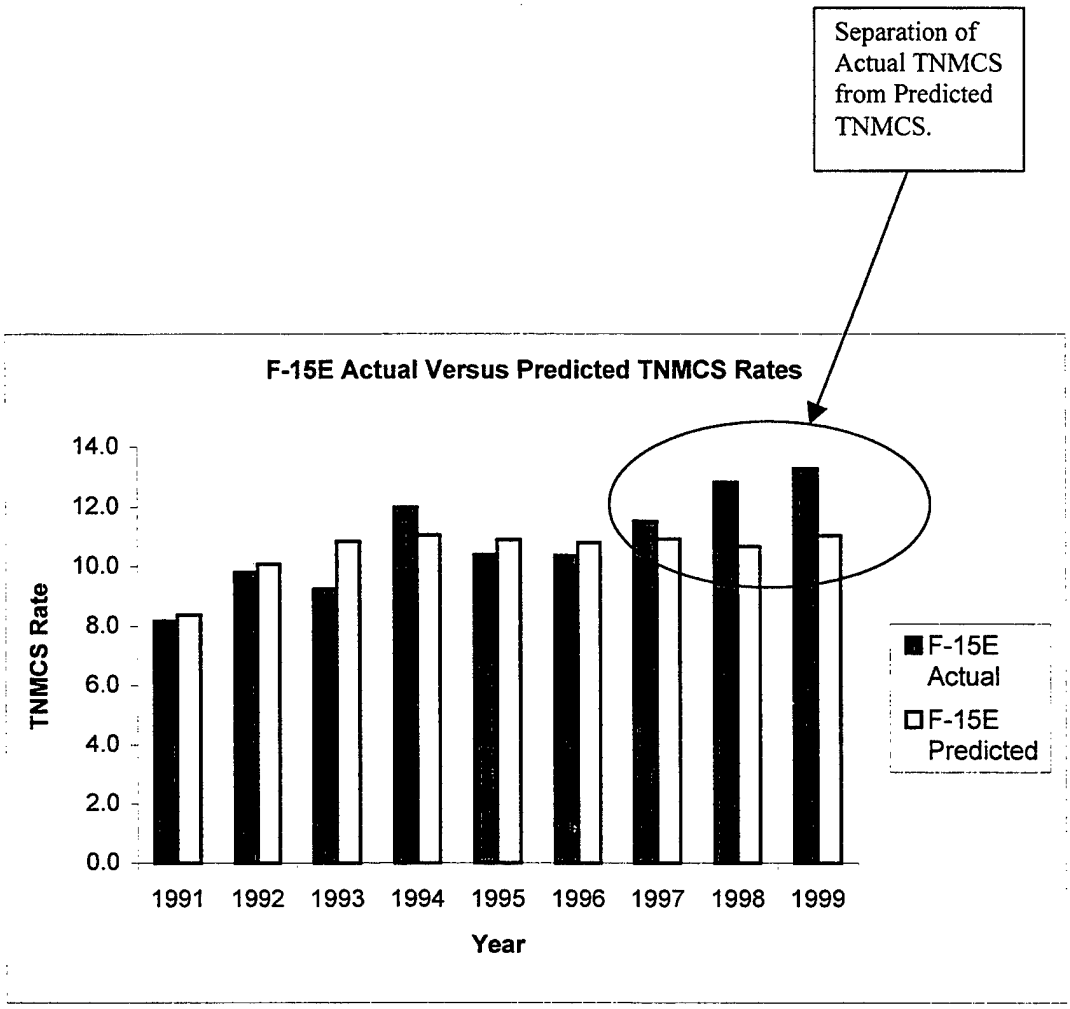
Since the P-value in the ANOVA table is less than 0.01, there is a statistically significant relationship between the variables at the 99% confidence level.

The R-Squared statistic indicates that the model as fitted explains 89.2084% of the variability in TNMCS_HRS. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 88.561%. The standard error of the estimate shows the standard deviation of the residuals to be 1400.4. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 1054.67 is the average value of the residuals. The Durbin-Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is less than 1.4, there may be some indication of serial correlation. Plot the residuals versus row order to see if there is any pattern which can be seen.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.0883, belonging to SORTIES. Since the P-value is less than 0.10, that term is statistically significant at the 90% confidence level. Depending on the confidence level at which you wish to work, you may or may not decide to remove SORTIES from the model.

6

Appendix A: Predicted TNMCS Equations and Charts



Appendix A: Predicted TNMCS Equations and Charts

JUL-09-1999 07:00 FROM DYNAMICS RESEARCH TO 99376567988 P.06/21

Ulrichs
Remodels C/W

F16 A-D Results
4/8/1997 2:44 PM

Multiple Regression Analysis

Dependent variable: TNMCS_HRS

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	-832.911	373.966	-2.22724	0.0268
FLYING_HRS	-0.364756	0.328773	-1.10944	0.2683
POSS_HRS	0.117839	0.0058537	20.1306	0.0000
SORTIES	-0.51937	0.642954	-0.807787	0.4200

Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Model	1.37646E11	3	4.5882E10	2484.97	0.0000
Residual	4.76366E9	258	1.84638E7		
Total (Corr.)	1.4241E11	261			

R-squared = 96.655 percent
R-squared (adjusted for d.f.) = 96.6161 percent
Standard Error of Est. = 4296.95
Mean absolute error = 3019.24
Durbin-Watson statistic = 0.62385

F-16A/D
TNMCS
OK

The StatAdvisor

The output shows the results of fitting a multiple linear regression model to ~~describe the relationship between TNMCS_HRS~~ and 3 ~~independent variables. The equation of the~~ fitted model is

TNMCS_HRS = -832.911 - 0.364756*FLYING_HRS + 0.117839*POSS_HRS - 0.51937*SORTIES

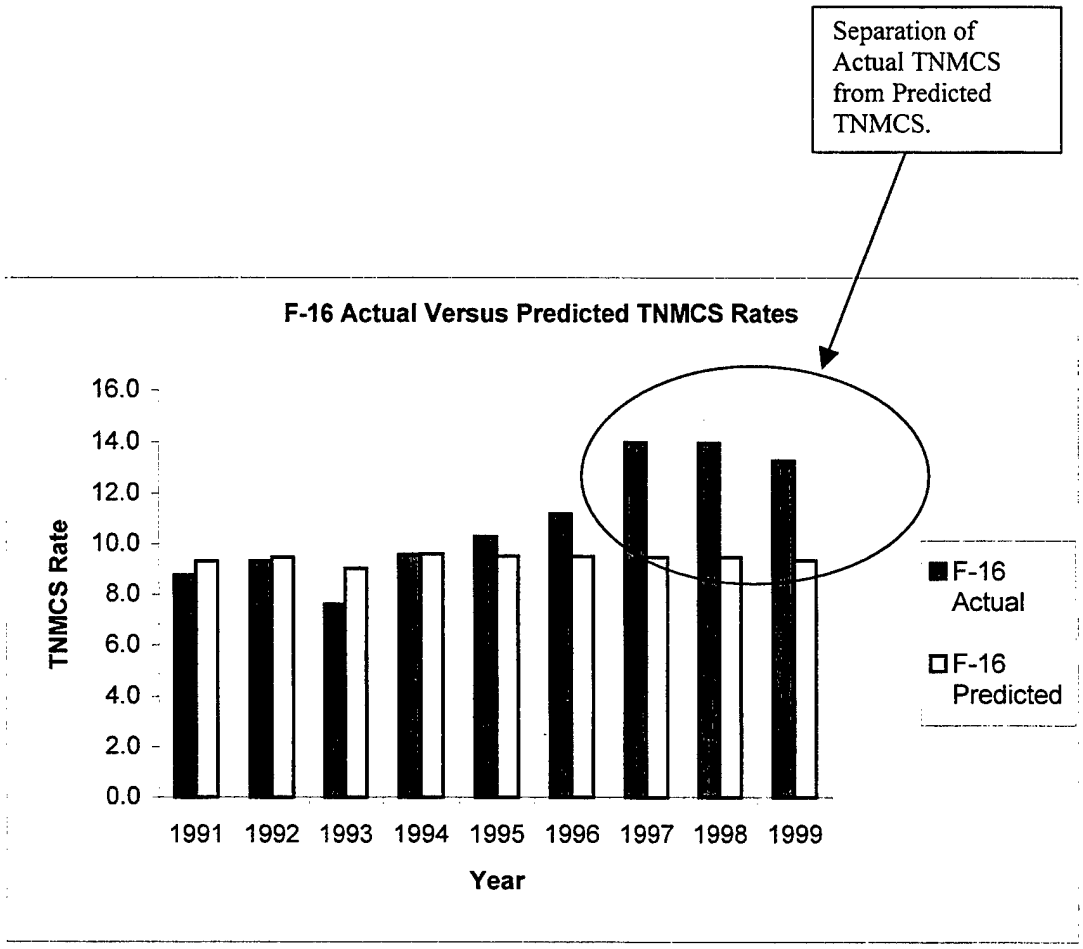
Since ~~the P-value~~ in the ANOVA table is less than 0.01, ~~there is a~~ statistically ~~significant relationship~~ between the variables at the 99% confidence level.

The R-Squared statistic indicates that the model as fitted explains 96.655% of the variability in TNMCS_HRS. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 96.6161%. The standard error of the estimate shows the standard deviation of the residuals to be 4296.95. This value can be used to construct prediction limits for new observations by selecting the Reports option from the text menu. The mean absolute error (MAE) of 3019.24 is the average value of the residuals. The Durbin-Watson (DW) statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in your data file. Since the DW value is less than 1.4, there may be some indication of serial correlation. Plot the residuals versus row order to see if there is any pattern which can be seen.

In determining whether the model can be simplified, notice that the highest P-value on the independent variables is 0.4200, belonging to SORTIES. Since the P-value is greater or equal to 0.10, that term is not statistically significant at the 90% or higher confidence level. Consequently, you should consider removing SORTIES from the model.

(22)

Appendix A: Predicted TNMCS Equations and Charts



Appendix B: Data Collection from the D041 (Using SAS)

```
data mds;
 infile 'e:\d041work\hutson\f015.txt' missover;
 input niin $ 5-13 mds $ 16-20;
 if mds eq 'F015D';

proc sort;
 by niin;

data mds;
 set mds;
 by niin;
 if first.niin;
run;

data mar99;
 infile 'd:\d041.mar99\ddb\ddb01' lrecl=690;
 input niin $ 9-17 brc99 52-54 drc99 55-57 ost99 75-76 bpd99 397-399 rit99 401-403 stom99 405-407
sflow99 409-411
     stin99 413-415;

proc sort;
 by niin;

data mar98;
 infile 'd:\d041.mar98\ddb\ddb01' lrecl=690;
 input niin $ 9-17 brc98 52-54 drc98 55-57 ost98 75-76 bpd98 397-399 rit98 401-403 stom98 405-407
sflow98 409-411
     stin98 413-415;

proc sort;
 by niin;

data mar97;
 infile 'd:\d041 data\mar97\ddb01' lrecl=690;
 input niin $ 9-17 brc97 52-54 drc97 55-57 ost97 75-76 bpd97 397-399 rit97 401-403 stom97 405-407
sflow97 409-411
     stin97 413-415;

proc sort;
 by niin;

data mar96;
 infile 'd:\d041 data\mar96\ddb01' lrecl=690;
 input niin $ 9-17 brc96 52-54 drc96 55-57 ost96 75-76 bpd96 397-399 rit96 401-403 stom96 405-407
sflow96 409-411
     stin96 413-415;

proc sort;
 by niin;

data mar95;
```

```
 infile 'd:\d041 data\mar95\ddb01' lrecl=690;
 input niin $ 9-17 brc95 52-54 drc95 55-57 ost95 75-76 bpd95 397-399 rit95 401-403 stom95 405-407
sflow95 409-411


     stin95 413-415;

proc sort;
 by niin;

data mar94;
 infile 'd:\d041 data\mar94\ddb01' lrecl=690;
 input niin $ 9-17 brc94 52-54 drc94 55-57 ost94 75-76 bpd94 397-399 rit94 401-403 stom94 405-407
sflow94 409-411
     stin94 413-415;

proc sort;
 by niin;

data mar93;
 infile 'd:\d041 data\mar93\ddb01' lrecl=690;
 input niin $ 9-17 brc93 52-54 drc93 55-57 ost93 75-76 bpd93 397-399 rit93 401-403 stom93 405-407
sflow93 409-411
     stin93 413-415;

proc sort;
 by niin;

data mar92;
 infile 'd:\d041 data\mar92\ddb01' lrecl=690;
 input niin $ 9-17 brc92 52-54 drc92 55-57 ost92 75-76 bpd92 397-399 rit92 401-403 stom92 405-407
sflow92 409-411
     stin92 413-415;

proc sort;
 by niin;

data mar91;
 infile 'd:\d041 data\mar91\ddb01' lrecl=690;
 input niin $ 9-17 brc91 52-54 drc91 55-57 ost91 75-76 bpd91 397-399 rit91 401-403 stom91 405-407
sflow91 409-411
     stin91 413-415;

proc sort;
 by niin;

data mar90;
 infile 'd:\d041 data\mar90\ddb01' lrecl=690;
 input niin $ 9-17 brc90 52-54 drc90 55-57 ost90 75-76 bpd90 397-399 rit90 401-403 stom90 405-407
sflow90 409-411
     stin90 413-415;

proc sort;
 by niin;
```

```
data mergebrc;
 merge mds(in=a) mar98(in=b) mar97(in=c) mar96(in=d) mar95(in=e) mar94(in=f) mar93(in=g)
     mar92(in=h) mar91(in=i) mar90(in=j) mar99(in=k);
 by niin;

 if a and b and c and d and e and f and g and h and i and j and k;
 keep niin brc90 brc91 brc92 brc93 brc94 brc95 brc96 brc97 brc98 brc99;

data _null_;
 set mergebrc;
 file 'e:\d041work\hutson\brc.dat';
 put niin $9. (brc90 brc91 brc92 brc93 brc94 brc95 brc96 brc97 brc98 brc99) (3.);

data mergeost;
 merge mds(in=a) mar98(in=b) mar97(in=c) mar96(in=d) mar95(in=e) mar94(in=f) mar93(in=g)
     mar92(in=h) mar91(in=i) mar90(in=j) mar99(in=k);
 by niin;
 if a and b and c and d and e and f and g and h and i and j and k;
 keep niin ost90 ost91 ost92 ost93 ost94 ost95 ost96 ost97 ost98 ost99;

data _null_;
 set mergeost;
 file 'e:\d041work\hutson\ost.dat';
 put niin $9. (ost90 ost91 ost92 ost93 ost94 ost95 ost96 ost97 ost98 ost99) (3.);
run;

data mergedrc;
 merge mds(in=a) mar98(in=b) mar97(in=c) mar96(in=d) mar95(in=e) mar94(in=f) mar93(in=g)
     mar92(in=h) mar91(in=i) mar90(in=j) mar99(in=k);
 by niin;
 if a and b and c and d and e and f and g and h and i and j and k;
 keep niin drc90 drc91 drc92 drc93 drc94 drc95 drc96 drc97 drc98 drc99
    bpd90 bpd91 bpd92 bpd93 bpd94 bpd95 bpd96 bpd97 bpd98 bpd99
    rit90 rit91 rit92 rit93 rit94 rit95 rit96 rit97 rit98 rit99
    stom90 stom91 stom92 stom93 stom94 stom95 stom96 stom97 stom98 stom99
    sflow90 sflow91 sflow92 sflow93 sflow94 sflow95 sflow96 sflow97 sflow98 sflow99
    stin90 stin91 stin92 stin93 stin94 stin95 stin96 stin97 stin98 stin99;

proc print;
 var niin drc90 drc91 drc92 drc93 drc94 drc95 drc96 drc97 drc98 drc99
    bpd90 bpd91 bpd92 bpd93 bpd94 bpd95 bpd96 bpd97 bpd98 bpd99
    rit90 rit91 rit92 rit93 rit94 rit95 rit96 rit97 rit98 rit99
    stom90 stom91 stom92 stom93 stom94 stom95 stom96 stom97 stom98 stom99
    sflow90 sflow91 sflow92 sflow93 sflow94 sflow95 sflow96 sflow97 sflow98 sflow99
    stin90 stin91 stin92 stin93 stin94 stin95 stin96 stin97 stin98 stin99;
 sum drc90 drc91 drc92 drc93 drc94 drc95 drc96 drc97 drc98 drc99
    bpd90 bpd91 bpd92 bpd93 bpd94 bpd95 bpd96 bpd97 bpd98 bpd99
    rit90 rit91 rit92 rit93 rit94 rit95 rit96 rit97 rit98 rit99
    stom90 stom91 stom92 stom93 stom94 stom95 stom96 stom97 stom98 stom99
    sflow90 sflow91 sflow92 sflow93 sflow94 sflow95 sflow96 sflow97 sflow98 sflow99
    stin90 stin91 stin92 stin93 stin94 stin95 stin96 stin97 stin98 stin99;
quit;
```

```
data _null_;
 set mergedrc;
 file 'e:\d041work\hutson\drc.dat';
 put niin $9. (drc90 drc91 drc92 drc93 drc94 drc95 drc96 drc97 drc98 drc99) (3.);
run;

----
data nsn;
 set mergeost;
 keep niin;

proc sort;
 by niin;

data nsn;
 set nsn;
 by niin;
 if first.niin;

data mar99;
 infile 'd:\d041.mar99\ddb\ddb42';
 input type $ 1-2 nsn $ 5-19 serbd 20-25 serc 26-31 seri 32-37 unserb 38-43 unsercs 44-49
     unserca 50-55 unseri 56-61 unserd 62-67 toc 68-73 unsero 74-79 unserwd 80-85
     unserdi 86-91 dotm 92-97 serwb 98-103 serwd 104-109 sero 110-115 niin $ 9-17 alc $ 3-4;
 if serc eq . then delete;
 uns99 = unserb + unsercs + unserca + unseri + unserd + unsero + unserwd + unserdi + toc;
 ser99 = serbd + serc + seri + serwb + serwd + sero;

proc sort;
 by niin;

data mar98;
 infile 'd:\d041.mar98\ddb\ddb42';
 input type $ 1-2 nsn $ 5-19 serbd 20-25 serc 26-31 seri 32-37 unserb 38-43 unsercs 44-49
     unserca 50-55 unseri 56-61 unserd 62-67 toc 68-73 unsero 74-79 unserwd 80-85
     unserdi 86-91 dotm 92-97 serwb 98-103 serwd 104-109 sero 110-115 niin $ 9-17 alc $ 3-4;
 if serc eq . then delete;
 uns98 = unserb + unsercs + unserca + unseri + unserd + unsero + unserwd + unserdi + toc;
 ser98 = serbd + serc + seri + serwb + serwd + sero;

proc sort;
 by niin;

data mar97;
 infile 'd:\d041 data\mar97\ddb42';
 input type $ 1-2 nsn $ 5-19 serbd 20-25 serc 26-31 seri 32-37 unserb 38-43 unsercs 44-49
     unserca 50-55 unseri 56-61 unserd 62-67 toc 68-73 unsero 74-79 unserwd 80-85
     unserdi 86-91 dotm 92-97 serwb 98-103 serwd 104-109 sero 110-115 niin $ 9-17 alc $ 3-4;
 if serc eq . then delete;
 uns97 = unserb + unsercs + unserca + unseri + unserd + unsero + unserwd + unserdi + toc;
 ser97 = serbd + serc + seri + serwb + serwd + sero;

proc sort;
 by niin;
```

```
data mar96;
 infile 'd:\d041 data\mar96\ddb42';
 input type $ 1-2 nsn $ 5-19 serbd 20-25 serc 26-31 seri 32-37 unserb 38-43 unsercs 44-49
     unserca 50-55 unseri 56-61 unserd 62-67 toc 68-73 unsero 74-79 unserwd 80-85
     unserdi 86-91 dotm 92-97 serwb 98-103 serwd 104-109 sero 110-115 niin $ 9-17 alc $ 3-4;
 if serc eq . then delete;

 uns96 = unserb + unsercs + unserca + unseri + unserd + unsero + unserwd + unserdi + toc;
 ser96 = serbd + serc + seri + serwb + serwd + sero;

proc sort;
 by niin;

data mar95;
 infile 'd:\d041 data\mar95\ddb42';
 input type $ 1-2 nsn $ 5-19 serbd 20-25 serc 26-31 seri 32-37 unserb 38-43 unsercs 44-49
     unserca 50-55 unseri 56-61 unserd 62-67 toc 68-73 unsero 74-79 unserwd 80-85
     unserdi 86-91 dotm 92-97 serwb 98-103 serwd 104-109 sero 110-115 niin $ 9-17 alc $ 3-4;
 if serc eq . then delete;
 uns95 = unserb + unsercs + unserca + unseri + unserd + unsero + unserwd + unserdi + toc;
 ser95 = serbd + serc + seri + serwb + serwd + sero;

proc sort;
 by niin;

data mar94;
 infile 'd:\d041 data\mar94\ddb42';
 input type $ 1-2 nsn $ 5-19 serbd 20-25 serc 26-31 seri 32-37 unserb 38-43 unsercs 44-49
     unserca 50-55 unseri 56-61 unserd 62-67 toc 68-73 unsero 74-79 unserwd 80-85
     unserdi 86-91 dotm 92-97 serwb 98-103 serwd 104-109 sero 110-115 niin $ 9-17 alc $ 3-4;
 if serc eq . then delete;
 uns94 = unserb + unsercs + unserca + unseri + unserd + unsero + unserwd + unserdi + toc;
 ser94 = serbd + serc + seri + serwb + serwd + sero;

proc sort;
 by niin;

data mar93;
 infile 'd:\d041 data\mar93\ddb42';
 input type $ 1-2 nsn $ 5-19 serbd 20-25 serc 26-31 seri 32-37 unserb 38-43 unsercs 44-49
     unserca 50-55 unseri 56-61 unserd 62-67 toc 68-73 unsero 74-79 unserwd 80-85
     unserdi 86-91 dotm 92-97 serwb 98-103 serwd 104-109 sero 110-115 niin $ 9-17 alc $ 3-4;
 if serc eq . then delete;
 uns93 = unserb + unsercs + unserca + unseri + unserd + unsero + unserwd + unserdi + toc;
 ser93 = serbd + serc + seri + serwb + serwd + sero;

proc sort;
 by niin;

data mar92;
 infile 'd:\d041 data\mar92\ddb42';
 input type $ 1-2 nsn $ 5-19 serbd 20-25 serc 26-31 seri 32-37 unserb 38-43 unsercs 44-49
     unserca 50-55 unseri 56-61 unserd 62-67 toc 68-73 unsero 74-79 unserwd 80-85
```

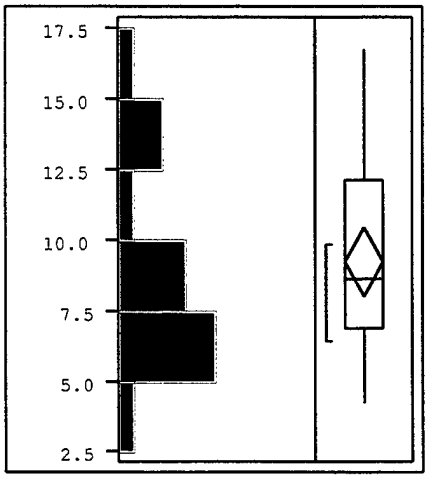
```
    unserdi 86-91 dotm 92-97 serwb 98-103 serwd 104-109 sero 110-115 niin $ 9-17 alc $ 3-4;
 if serc eq . then delete;
 uns92 = unserb + unsercs + unserca + unseri + unserd + unsero + unserwd + unserdi + toc;
 ser92 = serbd + serc + seri + serwb + serwd + sero;

proc sort;
 by niin;

data mar91;
 infile 'd:\d041 data\mar91\ddb42';
 input type $ 1-2 nsn $ 5-19 serbd 20-25 serc 26-31 seri 32-37 unserb 38-43 unsercs 44-49
    unserca 50-55 unseri 56-61 unserd 62-67 toc 68-73 unsero 74-79 unserwd 80-85
    unserdi 86-91 dotm 92-97 serwb 98-103 serwd 104-109 sero 110-115 niin $ 9-17 alc $ 3-4;
 if serc eq . then delete;
 uns91 = unserb + unsercs + unserca + unseri + unserd + unsero + unserwd + unserdi + toc;
 ser91 = serbd + serc + seri + serwb + serwd + sero;

proc sort;
 by niin;

data mar90;
 infile 'd:\d041 data\mar90\ddb42';
 input type $ 1-2 nsn $ 5-19 serbd 20-25 serc 26-31 seri 32-37 unserb 38-43 unsercs 44-49
    unserca 50-55 unseri 56-61 unserd 62-67 toc 68-73 unsero 74-79 unserwd 80-85
    unserdi 86-91 dotm 92-97 serwb 98-103 serwd 104-109 sero 110-115 niin $ 9-17 alc $ 3-4;
 if serc eq . then delete;
 uns90 = unserb + unsercs + unserca + unseri + unserd + unsero + unserwd + unserdi + toc;
 ser90 = serbd + serc + seri + serwb + serwd + sero;

proc sort;
 by niin;

data mergeser;
 merge nsn(in=a) mar98(in=b) mar97(in=c) mar96(in=d) mar95(in=e) mar94(in=f) mar93(in=g)
    mar92(in=h) mar91(in=i) mar90(in=j) mar99(in=k);
 by niin;
 if a;
 keep niin ser90 ser91 ser92 ser93 ser94 ser95 ser96 ser97 ser98 ser99;

data _null_;
 set mergeser;
 file 'e:\d041work\hutson\ser.dat';
 put niin $9. (ser90 ser91 ser92 ser93 ser94 ser95 ser96 ser97 ser98 ser99) (7.);

data mergeuns;
 merge nsn(in=a) mar98(in=b) mar97(in=c) mar96(in=d) mar95(in=e) mar94(in=f) mar93(in=g)
    mar92(in=h) mar91(in=i) mar90(in=j) mar99(in=k);
 by niin;
 if a;
 keep niin uns90 uns91 uns92 uns93 uns94 uns95 uns96 uns97 uns98 uns99;

data _null_;
 set mergeuns;
 file 'e:\d041work\hutson\uns.dat';
```

```
put niin $9. (uns90 uns91 uns92 uns93 uns94 uns95 uns96 uns97 uns98 uns99) (7.); run;
```

Appendix C: Data Preparation

Decision Criteria for A-10/OA-10 TNMCS Rates:

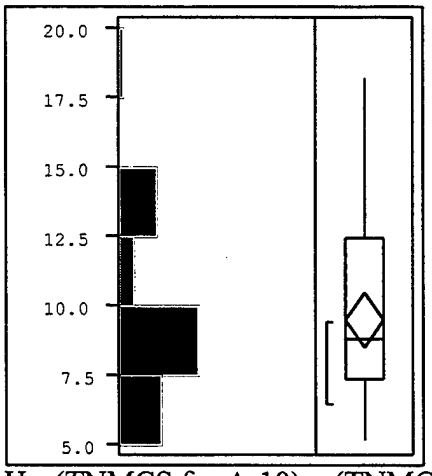
A-10



A-10

Moments	
Mean	9.26176
Std Dev	3.46882
Std Error Mean	0.5949
Upper 95% Mean	10.47209
Lower 95% Mean	8.05144
N	34
Sum Weights	34
Test for Normality	
Shapiro-Wilk W Test	
W	Prob<W
0.909706	0.0091

O/A-10



OA-10

Moments	
Mean	9.51471
Std Dev	2.90247
Std Error Mean	0.49777
Upper 95% Mean	10.52742
Lower 95% Mean	8.50199
N	34
Sum Weights	34
Test for Normality	
Shapiro-Wilk W Test	
W	Prob<W
0.920186	0.019

H_o: (TNMCS for A-10) – (TNMCS for OA-10) = 0
H_a: (TNMCS for A-10) – (TNMCS for OA-10) $\neq$ 0

Rejection region $|z| > z_{.10/2}$. JMP statistical software yielded the following results:

Test Mean=value		z Test	
Hypothesized Value	9.26176	Test Statistic	0.4252
Actual Estimate	9.51471	Prob > |z|	0.6707
Using Std Dev of	3.46882		

It is concluded at α = .05 that no significant difference exists between the A-10 and OA-10.

Appendix D: MDS Variables

A/OA-10 Variables					
A/OA-10	TNMCS Rate	USAF Predicted TNMCS Rate	TNMCS Hrs	USAF Predicted TNMCS Hrs	Possessed Hrs
1990	4.2	5	N/A	N/A	N/A
1991	6.3	7.5	254888	286192	3815896
1992	5.4	7	237615	300327	4290384
1993	7.3	6.9	231711	218369	3164765
1994	6.7	7.8	111590	118153	1514785
1995	9	7.8	265192	232684	2983131
1996	9.6	7.7	281809	234458	3044913
1997	12	7.2	355568	212183	2946989
1998	15.3	7.1	421090	206481	2908178
1999	15.1	7.2	445009	211975	2944103
Raw Data for Independent Variables					
A/OA-10	SERV INV	TAI	OST	BRC	DRC
1990	165831	635	44517	8433	132343
1991	287119	633	37833	7255	126404
1992	145000	499	38522	6893	123034
1993	128020	408	37294	7116	121806
1994	140533	369	36772	6996	121073
1995	132288	401	35176	6939	118001
1996	118909	385	24693	7081	114071
1997	116597	365	23876	6033	103013
1998	89852	360	19344	5800	88884
1999	84988	361	19202	5762	82361
Independent variables					
A/OA-10	SERV INV	SERV/TAI	SERV/OST	SERV/BRC	SERV/DRC
1990	165831	261	3.725	19.665	1.253
1991	287119	454	7.589	39.575	2.271
1992	145000	291	3.764	21.036	1.179
1993	128020	314	3.433	17.99	1.051
1994	140533	381	3.822	20.088	1.161
1995	132288	330	3.761	19.064	1.121
1996	118909	309	4.815	16.793	1.042
1997	116597	319	4.883	19.327	1.132
1998	89852	250	4.645	15.492	1.011
1999	84988	235	4.426	14.75	1.032

Note: 1991 data was excluded from the analysis (see Chapter IV, A/OA-10).

F-15A Variables					
F-15A	TNMCS Rate	USAF Predicted TNMCS Rate	TNMCS Hrs	USAF Predicted TNMCS Hrs	Possessed Hrs
1990	7.4	9.2	N/A	N/A	N/A
1991	12	9.7	184820	148844	1534473
1992	14.1	10.2	238775	172561	1691778
1993	12.7	10.2	168338	135663	1330026
1994	13.2	10.6	143257	114883	1083798
1995	14.5	10.6	128250	93634	883338
1996	16.5	10.5	135309	86106	820061
1997	17.3	11.1	138473	88640	798555
1998	16.2	11	125268	85102	773652
1999	16.6	10.7	130893	84466	789404
Raw Data for Independent Variables					
F-15A	SERV INV	TAI	OST	BRC	DRC
1990	277695	305	47307	9371	111646
1991	304920	298	41603	8164	105596
1992	237134	227	42619	7870	103864
1993	227082	199	40955	7720	102614
1994	268110	132	40012	7478	103966
1995	210107	80	37659	8460	106741
1996	177743	90	25319	7519	98173
1997	192517	84	23014	6503	85465
1998	146634	78	19994	6355	70492
1999	126191	84	19731	6199	72818
Independent Variables					
F-15A	SERV INV	SERV/TAI	SERV/OST	SERV/BRC	SERV/DRC
1990	277695	910	5.870	29.633	2.487
1991	304920	1023	7.329	37.349	2.888
1992	237134	1045	5.564	30.131	2.283
1993	227082	1141	5.545	29.415	2.213
1994	268110	2031	6.701	35.853	2.579
1995	210107	2626	5.579	24.835	1.968
1996	177743	1975	7.020	23.639	1.811
1997	192517	2292	8.365	29.604	2.253
1998	146634	1880	7.334	23.074	2.080
1999	126191	1502	6.396	20.357	1.733

F-15B Variables					
F-15B	TNMCS Rate	USAF Predicted TNMCS Rate	TNMCS Hrs	USAF Predicted TNMCS Hrs	Possessed Hrs
1990	7.4	9.2	N/A	N/A	N/A
1991	8.1	9.7	8984	10696	110268
1992	9.9	10.2	23846	24636	241528
1993	7.3	10.2	14975	20801	203929
1994	9.7	10.6	16821	18409	173669
1995	11.6	10.6	15670	14373	135599
1996	9	10.5	9711	11361	108201
1997	16.1	11.1	19162	13172	118664
1998	21.9	11	26968	13552	123203
1999	20.9	10.7	25667	13166	123051
Raw Data for Independent Variables					
F-15B	SERV INV	TAI	OST	BRC	DRC
1990	326319	50	50364	9346	124815
1991	339492	51	44313	8064	119280
1992	267065	43	45832	7715	118306
1993	248462	43	44194	7655	116147
1994	303149	20	43018	7565	115126
1995	235053	16	40399	8368	117211
1996	203338	17	27678	7566	109347
1997	213690	13	25709	6852	97348
1998	165959	12	22021	6594	80402
1999	143245	16	21527	6379	79975
Independent Variables					
F-15B	SERV INV	SERV/TAI	SERV/OST	SERV/BRC	SERV/DRC
1990	326319	6526	6.479	34.915	2.614
1991	339492	6657	7.661	42.100	2.846
1992	267065	6211	5.827	34.616	2.257
1993	248462	5778	5.622	32.457	2.139
1994	303149	15157	7.047	40.073	2.633
1995	235053	14691	5.818	28.090	2.005
1996	203338	11961	7.347	26.875	1.860
1997	213690	16438	8.312	31.187	2.195
1998	165959	13830	7.536	25.168	2.064
1999	143245	8953	6.654	22.456	1.791

F-15C Variables					
F-15C	TNMCS Rate	USAF Predicted TNMCS Rate	TNMCS Hrs	USAF Predicted TNMCS Hrs	Possessed Hrs
1990	7.4	9.2	N/A	N/A	N/A
1991	7.3	9.7	175664	234025	2412630
1992	7.6	10.2	194241	260718	2556057
1993	7.6	10.2	197184	263831	2586582
1994	10.2	10.6	262958	274034	2585226
1995	10.3	10.6	269887	278671	2628975
1996	9.8	10.5	252606	271747	2588071
1997	10.8	11.1	283811	292497	2635111
1998	13.7	11	347643	280150	2546816
1999	12.6	10.7	330414	281414	2630035
Raw Data for Independent Variables					
F-15C	SERV INV	TAI	OST	BRC	DRC
1990	274713	384	47118	8753	113449
1991	304608	383	40987	7308	107035
1992	239043	362	41782	7120	105702
1993	231383	359	40381	7045	103233
1994	278465	359	39535	6770	104326
1995	219110	357	37280	8075	105323
1996	181527	351	25106	7781	98981
1997	197370	350	22854	6485	84944
1998	153858	344	19862	5872	71301
1999	133211	347	19558	5706	71915
Independent Variables					
F-15C	SERV INV	SERV/TAI	SERV/OST	SERV/BRC	SERV/DRC
1990	274713	715	5.830	31.385	2.421
1991	304608	795	7.432	41.681	2.846
1992	239043	660	5.721	33.573	2.261
1993	231383	645	5.730	32.844	2.241
1994	278465	776	7.044	41.132	2.669
1995	219110	614	5.877	27.134	2.080
1996	181527	517	7.230	23.330	1.834
1997	197370	564	8.636	30.435	2.324
1998	153858	447	7.746	26.202	2.158
1999	133211	384	6.811	23.346	1.852

F-15D Variables					
F-15D	TNMCS Rate	USAF Predicted TNMCS Rate	TNMCS Hrs	USAF Predicted TNMCS Hrs	Possessed Hrs
1990	7.4	9.2	N/A	N/A	N/A
1991	7.1	9.7	22812	31203	321681
1992	6.8	10.2	26016	39239	384699
1993	7.6	10.2	28486	38298	375470
1994	7.4	10.6	28505	40626	383266
1995	9	10.6	33613	39404	371736
1996	6.9	10.5	28131	42519	404946
1997	7.6	11.1	30143	43966	396092.1
1998	8.5	11	32939	42682	388016
1999	12.5	10.7	47440	40653	379935
Raw Data for Independent Variables					
F-15D	SERV INV	TAI	OST	BRC	DRC
1990	283756	60	51438	9020	137255
1991	309260	65	44475	7591	129981
1992	244344	46	45706	7195	128235
1993	236289	46	44202	7213	124616
1994	282743	46	43374	7065	125426
1995	223091	51	41024	8105	126063
1996	185359	51	27777	7591	118411
1997	201034	52	25743	6788	104068
1998	157722	52	21918	6387	86459
1999	136609	51	21440	6168	82690
Independent Variables					
F-15D	SERV INV	SERV/TAI	SERV/OST	SERV/BRC	SERV/DRC
1990	283756	4729	5.516	31.459	2.067
1991	309260	4758	6.954	40.740	2.379
1992	244344	5312	5.346	33.960	1.905
1993	236289	5137	5.346	32.759	1.896
1994	282743	6147	6.519	40.020	2.254
1995	223091	4374	5.438	27.525	1.770
1996	185359	3634	6.673	24.418	1.565
1997	201034	3866	7.809	29.616	1.932
1998	157722	3033	7.196	24.694	1.824
1999	136609	2679	6.372	22.148	1.652

F-15E Variables					
F-15E	TNMCS Rate	USAF Predicted TNMCS Rate	TNMCS Hrs	USAF Predicted TNMCS Hrs	Possessed Hrs
1990	17.3	17.9	N/A	N/A	N/A
1991	8.1	8.4	50095	51690	615360
1992	9.9	10.1	125105	127668	1264036
1993	9.2	10.8	137800	161630	1496578
1994	12	11.1	186267	172550	1554502
1995	10.4	10.9	163583	171554	1573890
1996	10.4	10.8	163385	170431	1578062
1997	11.5	10.9	177080	167512	1536812
1998	12.8	10.7	195297	162642	1520021
1999	13.3	11	196275	162241	1474916
Raw Data for Independent Variables					
F-15E	SERV INV	TAI	OST	BRC	DRC
1990	187804	98	43986	9425	111202
1991	225554	129	36722	7612	104392
1992	156749	168	36951	7160	101204
1993	164316	195	36168	7014	98516
1994	168964	194	35759	6866	99135
1995	189084	194	34378	6533	98827
1996	131780	195	22938	6127	91897
1997	154502	198	21781	5885	80976
1998	125131	196	18409	5780	71744
1999	114563	206	18132	5640	68210
Independent Variables					
F-15E	SERV INV	SERV/TAI	SERV/OST	SERV/BRC	SERV/DRC
1990	187804	1916	4.270	19.926	1.689
1991	225554	1748	6.142	29.631	2.161
1992	156749	933	4.242	21.892	1.549
1993	164316	843	4.543	23.427	1.668
1994	168964	871	4.725	24.609	1.704
1995	189084	975	5.500	28.943	1.913
1996	131780	676	5.745	21.508	1.434
1997	154502	780	7.093	26.254	1.908
1998	125131	638	6.797	21.649	1.744
1999	114563	556	6.318	20.313	1.680

Note: 1990 data was excluded from the analysis (see Chapter IV, F-15E).

F-16A Variables					
F-16A	TNMCS Rate	USAF Predicted TNMCS Rate	TNMCS Hrs	USAF Predicted TNMCS Hrs	Possessed Hrs
1990	6	7.9	N/A	N/A	N/A
1991	12.3	9.3	451442	342681	3684741
1992	12.6	9.5	557287	418706	4407433
1993	11.5	9	52266	40811	453454
1994	10	9.6	292351	281471	2931991
1995	12.9	9.5	213950	157286	1655640
1996	12.7	9.5	157050	117428	1236079
1997	16.5	9.5	171216	98732	1039284
1998	15	9.5	127846	80819	850729
1999	12.4	9.4	97014	73527	782206
Raw Data for Independent Variables					
F-16A	SERV INV	TAI	OST	BRC	DRC
1990	324648	579	60775	9834	175344
1991	423820	621	51976	8705	164521
1992	376211	640	52192	7890	161261
1993	299562	631	50518	8047	158015
1994	288814	494	49818	8889	160123
1995	277630	211	48164	10299	163811
1996	224483	129	33869	10671	157636
1997	251210	130	32229	8879	142318
1998	186166	132	26472	7173	125231
1999	162815	113	26256	7378	113405
Independent Variables					
F-16A	SERV INV	SERV/TAI	SERV/OST	SERV/BRC	SERV/DRC
1990	324648	561	5.342	33.013	1.851
1991	423820	682	8.154	48.687	2.576
1992	376211	588	7.208	47.682	2.333
1993	299562	475	5.930	37.227	1.896
1994	288814	585	5.797	32.491	1.804
1995	277630	1316	5.764	26.957	1.695
1996	224483	1740	6.628	21.037	1.424
1997	251210	1932	7.795	28.293	1.765
1998	186166	1410	7.033	25.954	1.487
1999	162815	1441	6.201	22.068	1.436

F-16B Variables					
F-16B	TNMCS Rate	USAF Predicted TNMCS Rate	TNMCS Hrs	USAF Predicted TNMCS Hrs	Possessed Hrs
1990	6.0	7.9	N/A	N/A	N/A
1991	14.7	9.3	51419	32433	348745
1992	13.6	9.5	85603	59936	630909
1993	14	9	41188	27523	305807
1994	10.6	9.6	54055	48943	509828
1995	12.6	9.5	45142	34077	358704
1996	11.1	9.5	34437	29475	310266
1997	19.7	9.5	51889	25032	263494
1998	16.7	9.5	34060	19399	204200
1999	10.7	9.4	20417	17926	190705
Raw Data for Independent Variables					
F-16B	SERV INV	TAI	OST	BRC	DRC
1990	305988	98	52283	8839	141603
1991	410045	116	44847	7857	132213
1992	363372	84	44763	7162	129361
1993	288044	84	43212	7313	127409
1994	277338	75	42581	8092	129887
1995	267024	47	41151	9598	134386
1996	213929	43	28888	9937	130449
1997	241687	45	27286	8200	116684
1998	178042	42	22695	6367	104584
1999	155093	30	22666	6610	96756
Independent Variables					
F-16B	SERV INV	SERV/TAI	SERV/OST	SERV/BRC	SERV/DRC
1990	305988	3122	5.853	34.618	2.161
1991	410045	3535	9.143	52.188	3.101
1992	363372	4326	8.118	50.736	2.809
1993	288044	3429	6.666	39.388	2.261
1994	277338	3698	6.513	34.273	2.135
1995	267024	5681	6.489	27.821	1.987
1996	213929	4975	7.405	21.529	1.640
1997	241687	5371	8.858	29.474	2.071
1998	178042	4239	7.845	27.963	1.702
1999	155093	5170	6.843	23.463	1.603

F-16C Variables					
F-16C	TNMCS Rate	USAF Predicted TNMCS Rate	TNMCS Hrs	USAF Predicted TNMCS Hrs	Possessed Hrs
1990	6.0	7.9	N/A	N/A	N/A
1991	6	9.3	308509	478020	5139995
1992	7.8	9.5	591567	721585	7595631
1993	5.5	9.0	64468	105698	1174426
1994	10	9.6	796258	799123	8324198
1995	10	9.5	851346	812834	8556149
1996	11.2	9.5	975356	828549	8721569
1997	13.6	9.5	1185684	829376	8730273
1998	13.8	9.5	1192408	821382	8646129
1999	15.5	9.4	1131677	794877	8456136
Raw Data for Independent Variables					
F-16C	SERV INV	TAI	OST	BRC	DRC
1990	372191	714	82709	14796	259772
1991	420336	903	69842	12360	249587
1992	440951	1053	70685	11415	243362
1993	354453	1174	69211	11688	235841
1994	369255	1062	68414	12271	233948
1995	355868	1084	66238	12371	240219
1996	294307	1088	46259	13098	221234
1997	325108	1094	44344	11533	204326
1998	257490	1094	36235	10346	181884
1999	191966	1095	35592	10191	158997
Independent Variables					
F-16C	SERV INV	SERV/TAI	SERV/OST	SERV/BRC	SERV/DRC
1990	372191	521	4.500	25.155	1.433
1991	420336	465	6.018	34.008	1.684
1992	440951	419	6.238	38.629	1.812
1993	354453	302	5.121	30.326	1.503
1994	369255	348	5.397	30.092	1.578
1995	355868	328	5.373	28.766	1.481
1996	294307	271	6.362	22.470	1.330
1997	325108	297	7.331	28.189	1.591
1998	257490	235	7.106	24.888	1.416
1999	191966	175	5.394	18.837	1.207

Note: 1993 data was excluded from the analysis (see Chapter IV, F-16C).

F-16D Variables					
F-16D	TNMCS Rate	USAF Predicted TNMCS Rate	TNMCS Hrs	USAF Predicted TNMCS Hrs	Possessed Hrs
1990	6.0	7.9	N/A	N/A	N/A
1991	6.5	9.3	21524	30694	330040
1992	4.9	9.5	61667	120421	1267589
1993	5.7	9.0	34386	53997	599967
1994	8.6	9.6	120326	134278	1398732
1995	8.8	9.5	123061	133067	1400708
1996	9.7	9.5	136473	133385	1404050
1997	13.6	9.5	189190	132056	1390062
1998	14	9.5	192185	130634	1375096
1999	13.6	9.4	181762	125987	1340284
Raw Data for Independent Variables					
F-16D	SERV INV	TAI	OST	BRC	DRC
1990	364338	152	76084	13992	232725
1991	413547	170	64423	11708	223921
1992	434380	177	64880	10858	218086
1993	348057	183	63463	11123	211303
1994	363275	188	62671	11663	209456
1995	350762	198	60662	11878	216834
1996	289172	185	42376	12546	199821
1997	320368	185	40499	11040	184095
1998	254528	186	33217	9734	165118
1999	189275	180	32684	9613	145125
Independent Variables					
F-16D	SERV INV	SERV/TAI	SERV/OST	SERV/BRC	SERV/DRC
1990	364338	2397	4.789	26.039	1.566
1991	413547	2433	6.419	35.322	1.847
1992	434380	2454	6.695	40.006	1.992
1993	348057	1902	5.484	31.292	1.647
1994	363275	1932	5.797	31.148	1.734
1995	350762	1772	5.782	29.530	1.618
1996	289172	1563	6.824	23.049	1.447
1997	320368	1732	7.911	29.019	1.740
1998	254528	1368	7.663	26.148	1.541
1999	189275	1052	5.791	19.689	1.304

Note: 1993 data was excluded from the analysis (see Chapter IV, F-16D).

Appendix E: Statistical Results

Simple linear regression was performed for the two dependent variables using the five independent variables. In total, 100 regressions were performed. Theil's U-statistic was calculated in each instance where the null was rejected. The below example is intended to help the reader interpret the spreadsheet.

A/OA-10 TNMCS Rate By Serviceable Inventory (Key for Statistical Results)

Regression Statistics	
R Square	0.938394655
Adjusted R Square	0.929593891
Standard Error	1.065503872
Observations	9

Regression information.

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	121.0529105	121.0529105	106.6265042	1.73093E-05
Residual	7	7.947089514	1.135298502		
Total	8	129			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	28.21674894	1.856556278	15.19843448	1.2848E-06
SERV INV	-0.000150934	1.46169E-05	-10.32601105	1.73093E-05

RESIDUAL OUTPUT

Column 1: These are the predictions resulting from the regression equations. They are ordered by year. Column 3 contains actual TNMCS rates/hours of each MDS. Column 4 is the USAF's prediction for that particular year.

Predicted TNMCS Rate (1)	*Residuals*	*Actual TNMCS Rate(3)*	*USAF Pred TNMCS Rate (4)*	*Denominator (5)*	*Serv Inv Num (6)*	*USAF-Num (7)*
3.187201607	1.012798393	4.2	5	0.081632653	0.049168751	0.145124717
6.331309165	-0.931309165	5.4	7	0.123799726	0.08715284	0.005486968
8.894169629	-1.594169629	7.3	6.9	0.006755489	0.001751728	0.022705949
7.005531644	-0.305531644	6.7	7.8	0.117843618	0.012531198	0.032078414
8.249983029	0.750016971	9	7.8	0.004444444	0.005530896	0.044567901
10.26932992	-0.669329917	9.6	7.7	0.0625	0.020715321	0.25
10.61828948	1.381710519	12	7.2	0.075625	0.002888873	0.466944444
14.65502111	0.644978887	15.3	7.1	0.000170874	0.000357196	0.266606861
15.38916442	-0.289164416	15.1	7.2	0.472771804	0.180096802	1.233515254

	Theil's U
USAF Pred	1.615275026
Serv Inv Pred	0.617201846

Column 5 is the calculation for the denominator of Theil's U (Chapter 3). Column 6 is the numerator from the predictions of each regression. Column 7 is the numerator of the USAF predictions. The bottom number of each of these columns represents the sum of the preceding numbers. Theil's U for the respective variable and the USAF's prediction is shown in the adjacent table.

Appendix E: Statistical Results

A/OA-10 TNMCS Rate By Serviceable Inventory

Regression Statistics	
R Square	0.938394655
Adjusted R Square	0.929593891
Standard Error	1.065503872
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	121.0529105	121.0529105	106.6265042	1.73093E-05
Residual	7	7.947089514	1.135298502		
Total	8	129			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	28.21674894	1.856556278	15.19843448	1.2848E-06
SERV INV	-0.000150934	1.46169E-05	-10.32601105	1.73093E-05

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv Num*	*USAF-Num*
3.187201607	1.012798393	4.2	5	0.081632653	0.049168751	0.145124717
6.331309165	-0.931309165	5.4	7	0.123799726	0.08715284	0.005486968
8.894169629	-1.594169629	7.3	6.9	0.006755489	0.001751728	0.022705949
7.005531644	-0.305531644	6.7	7.8	0.117843618	0.012531198	0.032078414
8.249983029	0.750016971	9	7.8	0.004444444	0.005530896	0.044567901
10.26932992	-0.669329917	9.6	7.7	0.0625	0.020715321	0.25
10.61828948	1.381710519	12	7.2	0.075625	0.002888873	0.466944444
14.65502111	0.644978887	15.3	7.1	0.000170874	0.000357196	0.266606861
15.38916442	-0.289164416	15.1	7.2	0.472771804	0.180096802	1.233515254

	Theil's U
USAF Pred	1.615275026
Serv Inv Pred	0.617201846

Appendix E: Statistical Results

A/OA-10 TNMCS Hours By Serviceable Inventory

Regression Statistics	
R Square	0.819890989
Adjusted R Square	0.78987282
Standard Error	50231.69424
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	68917192101	68917192101	27.31315829	0.001964386
Residual	6	15139338636	2523223106		
Total	7	84056530737			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	831214.0015	104372.3165	7.963931712	0.000208629
SERV INV	-4.497162074	0.860503376	-5.22619922	0.001964386

RESIDUAL OUTPUT

Predicted TNMCS Hrs	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
179125.5008	58489.49921	237615	300327	0.000617369	0.010012472	0.003152784
255487.3128	-23776.3128	231711	218369	0.268747588	0.143006592	0.000802253
199214.3238	-87624.32377	111590	118153	1.894711914	0.067065984	0.08486526
236293.4251	28898.57493	265192	232684	0.00392645	0.003052479	0.031881811
296460.9564	-14651.65645	281809	234458	0.068504175	0.029875856	0.258879347
306858.3952	48709.70484	355568	212183	0.033956331	0.00028908	0.364290844
427134.9948	-6045.494821	421090	206481	0.00322673	9.02338E-05	0.306260157
449009.1911	-3999.991147	445009	211975	2.273690557	0.253392695	1.050132456

	Theil's U
USAF Pred	0.679604681
Serv Inv Pred	0.333834615

Appendix E: Statistical Results

A/OA-10 TNMCS Rates By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.190783196
Adjusted R Square	0.075180795
Standard Error	3.861697771
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	24.61103226	24.61103226	1.650339395	0.239788197
Residual	7	104.3889677	14.91270968		
Total	8	129			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	20.97326005	9.100342981	2.304666988	0.05461423
SERV/TAI	-0.038720944	0.030141115	-1.28465536	0.239788197

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	10.86709356	-6.66709356
2	9.705465228	-4.305465228
3	8.814883507	-1.514883507
4	6.220580232	0.479419768
5	8.195348396	0.804651604
6	9.008488229	0.591511771
7	8.621278785	3.378721215
8	11.29302395	4.006976052
9	11.87383811	3.226161886

Appendix E: Statistical Results

A/OA-10 TNMCS Hours By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.777747113
Adjusted R Square	0.740704965
Standard Error	55799.95018
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	65374724096	65374724096	20.99627472	0.003761919
Residual	6	18681806641	3113634440		
Total	7	84056530737			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	931834.2959	140655.516	6.624939588	0.000570032
SERV/TAI	-2101.7251	458.674702	-4.582169216	0.003761919

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv/TAI Num*	*USAF-Num*
320232.292	-82617.292	237615	300327	0.000617369	0.028596117	0.003152784
271892.615	-40181.615	231711	218369	0.268747588	0.00707291	0.000802253
131077.033	-19487.033	111590	118153	1.894711914	0.058227074	0.08486526
238265.013	26926.987	265192	232684	0.00392645	4.98236E-06	0.031881811
282401.24	-591.94009	281809	234458	0.068504175	0.111697806	0.258879347
261383.989	94184.1109	355568	212183	0.033956331	0.001706042	0.364290844
406403.021	14686.479	421090	206481	0.00322673	0.000282719	0.306260157
437928.897	7080.30252	445009	211975	2.273690557	0.20758765	1.050132456

	Theil's U
USAF Pred	0.679604681
Serv Inv/TAI Pred	0.302158682

Appendix E: Statistical Results

A/OA-10 TNMCS Rates By Serviceable Inventory/OST

Regression Statistics	
R Square	0.531369144
Adjusted R Square	0.464421879
Standard Error	2.938740751
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	68.54661959	68.54661959	7.937129965	0.025873658
Residual	7	60.45338041	8.636197202		
Total	8	129			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-12.7211552	7.912792133	-1.60766958	0.151942882
SERV/OST	5.341267286	1.89588751	2.817291246	0.025873658

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	7.175065438	-2.975065438
2	7.383374862	-1.983374862
3	5.615415391	1.684584609
4	7.693168365	-0.993168365
5	7.367351061	1.632648939
6	12.99704678	-3.39704678
7	13.36025296	-1.360252956
8	12.08903134	3.210968659
9	10.91929381	4.180706194

Appendix E: Statistical Results

A/OA-10 TNMCS Hours By Serviceable Inventory/OST

Regression Statistics	
R Square	0.420044764
Adjusted R Square	0.323385558
Standard Error	90137.88058
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	35307505641	35307505641	4.34562606	0.082208124
Residual	6	48749025097	8124837516		
Total	7	84056530737			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-236666.8391	256406.5898	-0.923013872	0.391606392
SERV/OST	126469.308	60667.9005	2.084616526	0.082208124

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	239363.6361	-1748.636066
2	197502.2951	34208.70487
3	246698.8559	-135108.8559
4	238984.2281	26207.77186
5	372282.8787	-90473.57874
6	380882.7917	-25314.69168
7	350783.0964	70306.40362
8	323086.3179	121922.8821

Appendix E: Statistical Results

A/OA-10 TNMCS Rates By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.679479018
Adjusted R Square	0.633690306
Standard Error	2.430379355
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	87.65279334	87.65279334	14.8394439	0.006274538
Residual	7	41.34720666	5.906743808		
Total	8	129			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	37.47746841	7.333568186	5.110400212	0.001383416
SERV/BRC	-1.53891304	0.399489406	-3.852199877	0.006274538

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv/BRC Num*	*USAF-Num*
7.214743484	-3.014743484	4.2	5	0.081632653	0.004936946	0.145124717
5.104893707	0.295106293	5.4	7	0.123799726	0.213037433	0.005486968
9.792422825	-2.492422825	7.3	6.9	0.006755489	0.000348189	0.022705949
6.563783268	0.136216732	6.7	7.8	0.117843618	0.016490001	0.032078414
8.139630221	0.860369779	9	7.8	0.004444444	0.051101201	0.044567901
11.63450173	-2.034501733	9.6	7.7	0.0625	0.197386191	0.25
7.734896091	4.265103909	12	7.2	0.075625	0.019213943	0.466944444
13.6366276	1.663372402	15.3	7.1	0.000170874	0.000441546	0.266606861
14.77850107	0.321498927	15.1	7.2	0.472771804	0.50295545	1.233515254

	Theil's U
USAF Pred	1.615275026
Serv Inv/BRC Pred	1.031428139

Appendix E: Statistical Results

A/OA-10 TNMCS Hours By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.574272403
Adjusted R Square	0.503317804
Standard Error	77228.21681
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	48271345909	48271345909	8.09351906	0.029377032
Residual	6	35785184828	5964197471		
Total	7	84056530737			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	967152.5901	238292.0177	4.058686478	0.006660381
SERV/BRC	-37274.36433	13102.11928	-2.844911081	0.029377032

RESIDUAL OUTPUT

Predicted TNMCS Hrs	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv/BRC-Num*	*USAF-Num*
183049.062	54565.93802	237615	300327	0.000617369	0.074544812	0.003152784
296586.7757	-64875.77574	231711	218369	0.268747588	0.212427057	0.000802253
218385.1594	-106795.1594	111590	118153	1.894711914	0.005991905	0.08486526
256554.1084	8637.891558	265192	232684	0.00392645	0.050162287	0.031881811
341204.1898	-59394.88984	281809	234458	0.068504175	0.149102199	0.258879347
246750.9506	108817.1494	355568	212183	0.033956331	0.007794257	0.364290844
389698.1378	31391.36216	421090	206481	0.00322673	0.004312716	0.306260157
417355.7162	27653.48382	445009	211975	2.273690557	0.504335233	1.050132456

	Theil's U
USAF Pred	0.679604681
Serv Inv/BRC Pred	0.470970793

Appendix E: Statistical Results

A/OA-10 TNMCS Rates By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.605392506
Adjusted R Square	0.549020007
Standard Error	2.696674321
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	78.09563326	78.09563326	10.73914613	0.013541762
Residual	7	50.90436674	7.272052391		
Total	8	129			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	52.21810004	13.09687955	3.987064235	0.005276146
SERV/DRC	-38.60578044	11.78060137	-3.277063644	0.013541762

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv/DRC Num*	*USAF-Num*
3.845057147	0.354942853	4.2	5	0.081632653	0.09608301	0.145124717
6.7018849	-1.3018849	5.4	7	0.123799726	0.646959498	0.005486968
11.6434248	-4.343424797	7.3	6.9	0.006755489	0.009110806	0.022705949
7.396788948	-0.696788948	6.7	7.8	0.117843618	7.74921E-05	0.032078414
8.941020166	0.058979834	9	7.8	0.004444444	0.070571506	0.044567901
11.99087682	-2.390876821	9.6	7.7	0.0625	0.131681548	0.25
8.516356581	3.483643419	12	7.2	0.075625	0.030986091	0.466944444
13.18765601	2.112343985	15.3	7.1	0.000170874	0.031676214	0.266606861
12.37693463	2.723065375	15.1	7.2	0.472771804	1.017146165	1.233515254

Theil's U	
USAF Pred	1.615275026
Serv Inv/DRC Pred	1.466783106

Appendix E: Statistical Results

A/OA-10 TNMCS Hours By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.4200553
Adjusted R Square	0.32339785
Standard Error	90137.06187
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	35308391204	35308391204	4.345813999	0.082202999
Residual	6	48748139533	8124689922		
Total	7	84056530737			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1495452.302	577354.7041	2.590179471	0.041201983
SERV/DRC	-1101390.115	528330.408	-2.084661603	0.082202999

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	196913.3561	40701.64388
2	337891.2909	-106180.2909
3	216738.3782	-105148.3782
4	260793.9828	4398.017195
5	347803.8019	-65994.50191
6	248678.6915	106889.4085
7	381946.8955	39142.60451
8	358817.7031	86191.49693

Appendix E: Statistical Results

F-15A TNMCS Rates By Serviceable Inventory

Regression Statistics	
R Square	0.611929836
Adjusted R Square	0.563421066
Standard Error	1.955925403
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	48.25984654	48.25984654	12.61482883	0.007490445
Residual	8	30.60515346	3.825644182		
Total	9	78.865			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	22.75782398	2.528525761	9.000431924	1.85246E-05
SERV INV	-4.01628E-05	1.13079E-05	-3.551736031	0.007490445

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
11.60482193	-4.204821927	7.4	9.2	0.38641344	0.04046674	0.092822776
10.51139035	1.488609646	12	9.7	0.030625	0.00520966	0.108350694
13.23386428	0.86613572	14.1	10.2	0.009858659	0.004421594	0.031857608
13.6375805	-0.937580503	12.7	10.2	0.001550003	0.009080707	0.043539587
11.98978213	1.210217866	13.2	10.6	0.009699265	0.000187309	0.089168596
14.31934362	0.180656376	14.5	10.6	0.01902497	0.003690171	0.173132514
15.6191717	0.880828297	16.5	10.5	0.002350781	0.018997078	0.142334711
15.02580685	2.274193148	17.3	11.1	0.004042902	0.001493601	0.091800827
16.8685955	-0.668595498	16.2	11.0	0.000609663	0.004524166	0.131742112
17.68964313	-1.089643125	16.6	10.7	0.464174683	0.088071028	0.904749426

Theil's U	
USAF Pred	1.3961222
Serv Inv Pred	0.4355879

Appendix E: Statistical Results

F-15A TNMCS Hours By Serviceable Inventory

Regression Statistics	
R Square	0.314478971
Adjusted R Square	0.216547396
Standard Error	32917.71914
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3479592126	3479592126	3.21121119	0.116239676
Residual	7	7585033635	1083576234		
Total	8	11064625761			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	77681.12374	44423.15125	1.748663063	0.123834332
SERV INV	0.367243774	0.204936827	1.791985265	0.116239676

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	189661.0954	-4841.095424
2	164767.1089	74007.89107
3	161075.5745	7262.425487
4	176142.8521	-32885.85209
5	154841.6114	-26591.61144
6	142956.1339	-7647.633928
7	148381.7935	-9909.193451
8	131531.5474	-6263.74735
9	124023.9829	6868.817129

Appendix E: Statistical Results

F-15A TNMCS Rates By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.387531055
Adjusted R Square	0.310972437
Standard Error	2.457192588
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	30.56263668	30.56263668	5.06188676	0.054578911
Residual	8	48.30236332	6.037795416		
Total	9	78.865			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	9.0170294	2.368121442	3.80767187	0.005179768
SERV/TAI	0.003064042	0.001361879	2.24986372	0.054578911

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	11.80676454	-4.40676454
2	12.15222325	-0.152223254
3	12.21786023	1.882139766
4	12.51345576	0.186544236
5	15.24051707	-2.040517072
6	17.06423851	-2.564238512
7	15.06827457	1.431725434
8	16.03941304	1.260586964
9	14.77719317	1.42280683
10	13.62005985	2.979940148

Appendix E: Statistical Results

F-15A TNMCS Hours By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.547583265
Adjusted R Square	0.482952303
Standard Error	26741.67923
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	6058803906	6058803906	8.47246038	0.022636366
Residual	7	5005821856	715117407.9		
Total	8	11064625761			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	237099.0611	29639.41466	7.999451535	9.11891E-05
SERV/TAI	-47.72727958	16.39690601	-2.91074911	0.022636366

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv/TAI Num*	*USAF-Num*
188263.4836	-3443.483614	184820	148844	0.085224696	0.077747844	0.128350347
187241.0844	51533.91563	238775	172561	0.087020985	0.003586052	0.018726764
182636.7189	-14298.71888	168338	135663	0.022198589	0.000338808	0.028411189
140158.448	3098.551992	143257	114883	0.010973775	0.013264088	0.058388373
111751.117	16498.88303	128250	93634	0.003029075	0.003449921	0.147181235
142841.3961	-7532.896051	135309	86106	0.000546827	0.006321646	0.135638521
127714.3863	10758.2137	138473	88640	0.009093602	0.025489267	0.084137626
147375.4468	-22107.64682	125268	85102	0.002016351	0.075880634	0.137358246
165399.619	-34506.81899	130893	84466	0.220103902	0.206078259	0.738192301

	Theil's U
USAF Pred	1.831348029
Serv Inv/TAI Pred	0.967614166

Appendix E: Statistical Results

F-15A TNMCS Rates By Serviceable Inventory/OST

Regression Statistics	
R Square	0.223915655
Adjusted R Square	0.126905112
Standard Error	2.765996472
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	17.65910813	17.65910813	2.308157936	0.167181057
Residual	8	61.20589187	7.650736484		
Total	9	78.865			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	4.389158168	6.418778933	0.683799553	0.513417014
SERV/OST	1.470384673	0.967828053	1.5192623	0.167181057

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	13.02040665	-5.620406646
2	15.16601788	-3.166017877
3	12.57044349	1.529556512
4	12.54195739	0.158042606
5	14.24182324	-1.041823235
6	12.59272471	1.907275288
7	14.7114688	1.788531199
8	16.68923838	0.610761616
9	15.17281257	1.027187429
10	13.79310689	2.806893108

Appendix E: Statistical Results

F-15A TNMCS Hours By Serviceable Inventory/OST

Regression Statistics	
R Square	0.136385102
Adjusted R Square	0.013011545
Standard Error	36947.01931
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1509050109	1509050109	1.105464616	0.328006096
Residual	7	9555575652	1365082236		
Total	8	11064625761			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	248357.3297	89811.87615	2.765306108	0.027881984
SERV/OST	-14069.78885	13381.81917	-1.051410774	0.328006096

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	145235.9198	39584.08024
2	170072.4025	68702.59746
3	170344.9797	-2006.979727
4	154079.3358	-10822.33584
5	169859.1984	-41609.19838
6	149585.4003	-14276.9003
7	130660.5564	7812.043613
8	145170.9028	-19903.10282
9	158373.0042	-27480.20425

Appendix E: Statistical Results

F-15A TNMCS Rates By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.266517074
Adjusted R Square	0.174831708
Standard Error	2.689008437
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	21.01886902	21.01886902	2.906866013	0.12659991
Residual	8	57.84613098	7.230766373		
Total	9	78.865			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	21.95520002	4.71393763	4.657507533	0.001628713
SERV/BRC	-0.278458561	0.16332327	-1.704953376	0.12659991

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	13.70351395	-6.303513953
2	11.55495695	0.445043054
3	13.56485791	0.535142094
4	13.76440637	-1.06440637
5	11.97157809	1.228421914
6	15.0395862	-0.539586201
7	15.37266776	1.127332236
8	13.71161909	3.588380914
9	15.53010283	0.669897172
10	16.28671086	0.313289138

Appendix E: Statistical Results

F-15A TNMCS Hours By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.247670684
Adjusted R Square	0.140195067
Standard Error	34484.45267
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2740383429	2740383429	2.304436036	0.172796681
Residual	7	8324242332	1189177476		
Total	8	11064625761			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	64709.53535	60462.70837	1.070238782	0.320020416
SERV/BRC	3189.657407	2101.172509	1.518036902	0.172796681

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	183841.1297	978.8702871
2	160818.3307	77956.6693
3	158532.5643	9805.435742
4	179068.8623	-35811.86234
5	143925.7704	-15675.77042
6	140110.4233	-4801.923286
7	159137.2264	-20664.6264
8	138307.0529	-13039.25292
9	129640.34	1252.460041

Appendix E: Statistical Results

F-15A TNMCS Rates By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.400046979
Adjusted R Square	0.325052851
Standard Error	2.431956389
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	31.54970496	31.54970496	5.334377382	0.049718017
Residual	8	47.31529504	5.91441188		
Total	9	78.865			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	25.78949573	5.140704102	5.016724405	0.001031078
SERV/DRC	-5.265671312	2.279879419	-2.309627109	0.049718017

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv/DRC Num*	*USAF-Num*
12.69229032	-5.29229032	7.4	9.2	0.38641344	0.036600144	0.092822776
10.58429386	1.41570614	12	9.7	0.030625	0.000768514	0.108350694
13.76733501	0.332664991	14.1	10.2	0.009858659	0.010382423	0.031857608
14.13670787	-1.436707874	12.7	10.2	0.001550003	0.006073478	0.043539587
12.21025698	0.989743018	13.2	10.6	0.009699265	0.004906856	0.089168596
15.42464621	-0.924646211	14.5	10.6	0.01902497	0.00028327	0.173132514
16.25595579	0.244044206	16.5	10.5	0.002350781	0.041761166	0.142334711
13.92813442	3.371865577	17.3	11.1	0.004042902	0.006215412	0.091800827
14.8361046	1.363895396	16.2	11.0	0.000609663	1.57418E-05	0.131742112
16.66427492	-0.064274924	16.6	10.7	0.464174683	0.107007005	0.904749426

Theil's U	
USAF Pred	1.3961222
Serv Inv/DRC Pred	0.480137226

Appendix E: Statistical Results

F-15A TNMCS Hours By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.221043733
Adjusted R Square	0.109764266
Standard Error	35089.39518
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2445766181	2445766181	1.986383826	0.201562995
Residual	7	8618859580	1231265654		
Total	8	11064625761			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	49304.31895	75774.43992	0.650672166	0.536023188
SERV/DRC	47944.53297	34017.90057	1.409391296	0.201562995

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	187749.402	-2929.40204
2	158767.4523	80007.5477
3	155404.2706	12933.72942
4	172944.8239	-29687.82388
5	143677.4463	-15427.44633
6	136108.2785	-799.7785332
7	157303.3554	-18830.75545
8	149036.1842	-23768.38424
9	132390.4867	-1497.686661

Appendix E: Statistical Results

F-15B TNMCS Rates By Serviceable Inventory

Regression Statistics	
R Square	0.655070025
Adjusted R Square	0.611953778
Standard Error	3.41819084
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	177.5167711	177.5167711	15.19311334	0.004558554
Residual	8	93.47222895	11.68402862		
Total	9	270.989			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	28.72545045	4.377760632	6.561676816	0.000176305
SERV INV	-6.76083E-05	1.73451E-05	-3.897834442	0.004558554

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
6.663575283	0.736424717	7.4	9.2	0.008948137	0.098887212	0.049443401
5.772971054	2.327028946	8.1	9.7	0.049382716	0.009028235	0.000952599
10.66963791	-0.769637912	9.9	10.2	0.068972554	0.218471754	0.084824111
11.92735525	-4.627355249	7.3	10.2	0.108087821	0.040546525	0.013557891
8.230059759	1.469940241	9.7	10.6	0.03836752	0.016181808	0.01153225
12.83391504	-1.233915038	11.6	10.6	0.050237812	0.265590287	0.01598626
14.9781125	-5.978112498	9	10.5	0.622345679	0.040973348	0.311736111
14.2782313	1.821768697	16.1	11.1	0.129778944	0.074510572	0.461865165
17.50524341	4.394756591	21.9	11.0	0.002085027	0.007206394	0.216076395
19.0408985	1.859101504	20.9	10.7	1.078206211	0.771396135	1.165974184

	Theil's U
USAF Pred	1.039904728
Serv Inv Pred	0.845839212

Appendix E: Statistical Results

F-15B TNMCS Hours By Serviceable Inventory

Regression Statistics	
R Square	0.359197461
Adjusted R Square	0.267654241
Standard Error	5584.65427
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	122376959.7	122376959.7	3.923801916	0.088070219
Residual	7	218318543.2	31188363.31		
Total	8	340695502.9			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	32676.9026	7650.347908	4.271296285	0.00369477
SERV INV	-0.062416587	0.031509861	-1.980858883	0.088070219

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	11486.97051	-2502.970514
2	16007.61669	7838.383312
3	17168.75246	-2193.752463
4	13755.37655	3065.623451
5	18005.69648	-2335.696483
6	19985.23855	-10274.73855
7	19339.10204	-177.0020397
8	22318.30817	4649.591828
9	23736.03854	1930.561462

Appendix E: Statistical Results

F-15B TNMCS Rates By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.189559146
Adjusted R Square	0.088254039
Standard Error	5.239519977
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	51.3684433	51.3684433	1.87117068	0.208527594
Residual	8	219.6205567	27.45256959		
Total	9	270.989			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	6.195562091	4.68496486	1.322435125	0.222577778
SERV/TAI	0.000564438	0.000412629	1.367907409	0.208527594

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	9.87930089	-2.47930089
2	9.952861809	-1.852861809
3	9.701183329	0.198816671
4	9.456991571	-2.156991571
5	14.75100732	-5.051007323
6	14.48761925	-2.887619248
7	12.94684174	-3.946841738
8	15.47362511	0.626374892
9	14.00169667	7.898303328
10	11.24887231	9.651127687

Appendix E: Statistical Results

F-15B TNMCS Hours By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.009519778
Adjusted R Square	-0.131977396
Standard Error	6943.158578
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3243345.646	3243345.646	0.067278928	0.802803448
Residual	7	337452157.2	48207451.04		
Total	8	340695502.9			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	16307.95702	6842.323117	2.383394754	0.048638758
SERV/TAI	0.150804305	0.581398903	0.25938182	0.802803448

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	17311.81693	-8327.816929
2	17244.57451	6601.425494
3	17179.33236	-2204.332355
4	18593.76574	-1772.765741
5	18523.3948	-2853.394797
6	18111.73619	-8401.23619
7	18786.83179	375.2682074
8	18393.568	8574.332002
9	17658.07969	8008.520308

Appendix E: Statistical Results

F-15B TNMCS Rates By Serviceable Inventory/OST

Regression Statistics	
R Square	0.128901394
Adjusted R Square	0.020014069
Standard Error	5.432059233
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	34.93085994	34.93085994	1.183805309	0.308271884
Residual	8	236.0581401	29.50726751		
Total	9	270.989			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-2.708162276	13.80013595	-0.19624171	0.849314324
SERV/OST	2.18115829	2.004689162	1.088028175	0.308271884

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	11.42402326	-4.024023257
2	14.00218887	-5.90218887
3	10.00153922	-0.101539217
4	9.554474081	-2.254474081
5	12.66251871	-2.962518709
6	9.982443919	1.617556081
7	13.31584106	-4.315841065
8	15.42135327	0.678646733
9	13.72991269	8.170087314
10	11.80570493	9.094295071

Appendix E: Statistical Results

F-15B TNMCS Hours By Serviceable Inventory/OST

Regression Statistics	
R Square	0.0108769
Adjusted R Square	-0.1304264
Standard Error	6938.40031
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3705710.862	3705710.862	0.076975554	0.789453681
Residual	7	336989792	48141398.86		
Total	8	340695502.9			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	22904.51062	17906.28072	1.27913278	0.24161759
SERV/OST	-717.1486814	2584.834798	-0.277444687	0.789453681

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	17410.271	-8426.271005
2	18725.65496	5120.345038
3	18872.64667	-3897.646665
4	17850.74463	-1029.744626
5	18731.93335	-3061.933355
6	17635.93708	-7925.437077
7	16943.66027	2218.439732
8	17499.7934	9468.106604
9	18132.45865	7534.141353

Appendix E: Statistical Results

F-15B TNMCS Rates By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.482278341
Adjusted R Square	0.417563133
Standard Error	4.187733199
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	130.6921252	130.6921252	7.452318548	0.025850056
Residual	8	140.2968748	17.53710934		
Total	9	270.989			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	31.28596169	7.119379434	4.394478757	0.002303701
SERV/BRC	-0.600621686	0.220016526	-2.729893505	0.025850056

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv/BRC Num*	*USAF-Num*
10.31503636	-2.91503636	7.4	9.2	0.008948137	0.080535733	0.049443401
5.999967444	2.100032556	8.1	9.7	0.049382716	0.00538941	0.000952599
10.49464209	-0.594642089	9.9	10.2	0.068972554	0.205813082	0.084824111
11.79129605	-4.491296048	7.3	10.2	0.108087821	0.115645976	0.013557891
7.217506482	2.482493518	9.7	10.6	0.03836752	0.084207318	0.01153225
14.41479423	-2.814794231	11.6	10.6	0.050237812	0.280545098	0.01598626
15.14411494	-6.14411494	9	10.5	0.622345679	0.155177823	0.311736111
12.55466452	3.545335479	16.1	11.1	0.129778944	0.126691557	0.461865165
16.16940505	5.730594951	21.9	11.0	0.002085027	0.020055567	0.216076395
17.79857284	3.101427164	20.9	10.7	1.078206211	1.074061565	1.165974184

	Theil's U
USAF Pred	1.039904728
Serv Inv/BRC Pred	0.998076139

Appendix E: Statistical Results

F-15B TNMCS Hours By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.24296692
Adjusted R Square	0.134819337
Standard Error	6070.040786
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	82777736.89	82777736.89	2.246623671	0.177583005
Residual	7	257917766	36845395.14		
Total	8	340695502.9			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	33239.67068	10381.09918	3.201941347	0.015025242
SERV/BRC	-485.3131817	323.7851468	-1.498874134	0.177583005

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	12808.13017	-3824.130167
2	16439.90854	7406.091457
3	17487.62839	-2512.628385
4	13791.92372	3029.076277
5	19607.46235	-3937.462349
6	20196.76667	-10486.26667
7	18104.44391	1057.656087
8	21025.21961	5942.680387
9	22341.61664	3324.983361

Appendix E: Statistical Results

F-15B TNMCS Rates By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.284616355
Adjusted R Square	0.195193399
Standard Error	4.922665672
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	77.12790145	77.12790145	3.182810869	0.112255702
Residual	8	193.8610986	24.23263732		
Total	9	270.989			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	30.89279385	10.59832013	2.914876459	0.019443277
SERV/DRC	-8.347335564	4.678885919	-1.784043405	0.112255702

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	9.069341585	-1.669341585
2	7.134798831	0.965201169
3	12.04944547	-2.149445474
4	13.03614934	-5.736149344
5	8.912646625	0.787353375
6	14.15318522	-2.553185223
7	15.37036965	-6.370369646
8	12.56943706	3.530562943
9	13.66293062	8.237069377
10	15.94169559	4.958304408

Appendix E: Statistical Results

F-15B TNMCS Hours By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.146882783
Adjusted R Square	0.025008895
Standard Error	6443.747791
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	50042303.7	50042303.7	1.205203063	0.308605417
Residual	7	290653199.2	41521885.6		
Total	8	340695502.9			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	33924.68858	14683.64751	2.310372036	0.054157104
SERV/DRC	-7251.631552	6605.498778	-1.097817409	0.308605417

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	13285.2612	-4301.261196
2	17554.79204	6291.207959
3	18411.97729	-3436.97729
4	14829.74171	1991.258286
5	19382.38666	-3712.386657
6	20439.79868	-10729.29868
7	18006.52749	1155.572512
8	18956.4848	8011.415201
9	20936.13014	4730.469862

Appendix E: Statistical Results

F-15C TNMCS Rates By Serviceable Inventory

Regression Statistics	
R Square	0.642070975
Adjusted R Square	0.597329847
Standard Error	1.436179218
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	29.60011404	29.60011404	14.35079988	0.005325139
Residual	8	16.50088596	2.062610745		
Total	9	46.101			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	16.93332933	1.954979485	8.661640419	2.45397E-05
SERV INV	-3.25458E-05	8.59127E-06	-3.788244961	0.005325139

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
7.992566943	-0.592566943	7.4	9.2	0.000182615	0.001435699	0.109208326
7.019609378	0.280390622	7.3	9.7	0.001688872	0.045285978	0.122021017
9.153476672	-1.553476672	7.6	10.2	0	0.056267443	0.115540359
9.402777724	-1.802777724	7.6	10.2	0.117036011	0.093953946	0.002120845
7.870454992	2.329545008	10.2	10.6	9.61169E-05	0.002381701	0.000641447
9.802212686	0.497787314	10.3	10.6	0.00235649	0.014153667	0.004189315
11.02538259	-1.225382586	9.8	10.5	0.010412328	0.000877133	0.000787432
10.50975901	0.290240987	10.8	11.1	0.072102195	0.026984355	0.064443897
11.92589313	1.774106865	13.7	11.0	0.006446801	2.42434E-08	0.018831051
12.59786687	0.002133129	12.6	10.7	0.210321429	0.241339947	0.437783689

	Theil's U
USAF Pred	1.442739847
Serv Inv Pred	1.071205626

Appendix E: Statistical Results

F-15C TNMCS Hours By Serviceable Inventory

Regression Statistics	
R Square	0.633621451
Adjusted R Square	0.581281659
Standard Error	38742.34001
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	18170612652	18170612652	12.10592207	0.010275186
Residual	7	10506782365	1500968909		
Total	8	28677395017			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	441610.4686	54564.12825	8.093421131	8.46302E-05
SERV INV	-0.856344076	0.246121391	-3.47935656	0.010275186

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
180761.2123	-5097.21227	175664	234025	0.011183703	0.058993845	0.143210499
236907.4116	-42666.41161	194241	260718	0.000229561	0.056775547	0.117729187
243467.0072	-46283.00723	197184	263831	0.111266689	0.092001588	0.003155143
203148.6154	59809.38455	262958	274034	0.000694334	0.003660767	0.001115954
253976.9181	15910.08192	269887	278671	0.004100095	0.015458176	0.005030418
286160.8975	-33555.29749	252606	271747	0.015260277	0.001971737	0.001182555
272593.8383	11216.76171	283811	292497	0.050585075	0.017727362	0.056553702
309855.0817	37787.71828	347643	280150	0.002456086	6.85346E-05	0.019866922
327536.0179	2877.98214	330414	281414	0.195775821	0.246657557	0.347844381

	Theil's U
USAF Pred	1.33294727
Serv Inv Pred	1.122451762

Appendix E: Statistical Results

F-15C TNMCS Rates By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.606412883
Adjusted R Square	0.557214494
Standard Error	1.506019574
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	27.95624034	27.95624034	12.32586857	0.007952013
Residual	8	18.14475966	2.268094958		
Total	9	46.101			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	17.69357897	2.317751377	7.633941734	6.10791E-05
SERV/TAI	-0.01301825	0.003708035	-3.510821637	0.007952013

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
8.380343562	-0.980343562	7.4	9.2	0.000182615	2.90576E-05	0.109208326
7.33988976	-0.03988976	7.3	9.7	0.001688872	0.042059319	0.122021017
9.09711092	-1.49711092	7.6	10.2	0	0.050214037	0.115540359
9.303045147	-1.703045147	7.6	10.2	0.117036011	0.117420516	0.002120845
7.595732539	2.604267461	10.2	10.6	9.61169E-05	0.003419008	0.000641447
9.703582708	0.596417292	10.3	10.6	0.00235649	0.012703667	0.004189315
10.96091859	-1.160918595	9.8	10.5	0.010412328	0.002086047	0.000787432
10.35240206	0.447597943	10.8	11.1	0.072102195	0.028679565	0.064443897
11.87101547	1.828984531	13.7	11.0	0.006446801	4.90606E-05	0.018831051
12.69595924	-0.095959243	12.6	10.7	0.210321429	0.256660276	0.437783689

	Theil's U
USAF Pred	1.442739847
Serv Inv/TAI Pred	1.104682736

Appendix E: Statistical Results

F-15C TNMCS Hours By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.602693549
Adjusted R Square	0.545935485
Standard Error	40344.43498
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	17283680981	17283680981	10.61864169	0.013890731
Residual	7	11393714035	1627673434		
Total	8	28677395017			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	458876.8042	63347.4621	7.243807234	0.000170842
SERV/TAI	-336.0860133	103.137347	-3.258625737	0.013890731

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
191580.49	-15916.49001	175664	234025	0.011183703	0.059100162	0.143210499
236945.8405	-42704.84046	194241	260718	0.000229561	0.053858488	0.117729187
242262.3473	-45078.34734	197184	263831	0.111266689	0.107904232	0.003155143
198185.4624	64772.53756	262958	274034	0.000694334	0.0043204	0.001115954
252602.8368	17284.16322	269887	278671	0.004100095	0.014463068	0.005030418
285062.8847	-32457.28473	252606	271747	0.015260277	0.003275672	0.001182555
269353.1001	14457.49992	283811	292497	0.050585075	0.018964835	0.056553702
308558.4268	39084.37321	347643	280150	0.002456086	2.57992E-06	0.019866922
329855.6114	558.3886341	330414	281414	0.195775821	0.261889439	0.347844381

	Theil's U
USAF Pred	1.33294727
Serv Inv/TAI Pred	1.156590087

Appendix E: Statistical Results

F-15C TNMCS Rates By Serviceable Inventory/OST

Regression Statistics	
R Square	0.2742323
Adjusted R Square	0.183511338
Standard Error	2.04507386
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	12.64238327	12.64238327	3.022810745	0.120295813
Residual	8	33.45861673	4.182327091		
Total	9	46.101			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1.668474683	4.681612061	0.356388924	0.730765803
SERV/OST	1.184504207	0.681288611	1.738623232	0.120295813

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	8.574512805	-1.174512805
2	10.47149656	-3.171496556
3	8.445255095	-0.845255095
4	8.455679976	-0.855679976
5	10.01153688	0.188463118
6	8.630296486	1.669703514
7	10.23294115	-0.432941153
8	11.89800104	-1.098001039
9	10.84405863	2.855941373
10	9.736221381	2.863778619

Appendix E: Statistical Results

F-15C TNMCS Hours By Serviceable Inventory/OST

Regression Statistics	
R Square	0.181833238
Adjusted R Square	0.064952272
Standard Error	57895.09159
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	5214503605	5214503605	1.555713002	0.2524041
Residual	7	23462891412	3351841630		
Total	8	28677395017			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	80114.6991	143247.8094	0.559273467	0.593409147
SERV/OST	25605.46933	20529.0097	1.247282246	0.2524041

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	270409.9342	-94745.93421
2	226608.6009	-32367.6009
3	226833.9559	-29649.95592
4	260466.9697	2491.030337
5	230608.6472	39278.35281
6	265253.0736	-12647.47363
7	301246.7321	-17436.13207
8	278463.6217	69179.17833
9	254515.4648	75898.53524

Appendix E: Statistical Results

F-15C TNMCS Rates By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.326334061
Adjusted R Square	0.242125819
Standard Error	1.970300531
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	15.04432655	15.04432655	3.875322081	0.08452861
Residual	8	31.05667345	3.882084182		
Total	9	46.101			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	15.8988941	3.195012211	4.976160669	0.001084695
SERV/BRC	-0.198317075	0.100740988	-1.968583775	0.08452861

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	9.674710542	-2.274710542
2	7.632751839	-0.332751839
3	9.240704689	-1.640704689
4	9.385451969	-1.785451969
5	7.741676324	2.458323676
6	10.51768613	-0.217686131
7	11.2722518	-1.472251803
8	9.863143733	0.936856267
9	10.70259496	2.997405041
10	11.26902801	1.330971989

Appendix E: Statistical Results

F-15C TNMCS Hours By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.405333635
Adjusted R Square	0.320381297
Standard Error	49357.99581
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	11623912763	11623912763	4.771306419	0.065222243
Residual	7	17053482254	2436211751		
Total	8	28677395017			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	428478.4514	80139.32283	5.346669229	0.001068033
SERV/BRC	-5513.138909	2523.94729	-2.18433203	0.065222243

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	198682.8552	-23018.85522
2	243383.33	-49142.33001
3	247407.2491	-50223.24909
4	201710.9143	61247.08573
5	278882.9261	-8995.926147
6	299859.5635	-47253.9635
7	260686.8976	23123.70242
8	284023.3209	63619.4791
9	299769.9433	30644.0567

Appendix E: Statistical Results

F-15C TNMCS Rates By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.240246142
Adjusted R Square	0.14527691
Standard Error	2.092409275
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	11.07558741	11.07558741	2.529726069	0.150383678
Residual	8	35.02541259	4.378176574		
Total	9	46.101			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	17.55614061	4.964808482	3.536116383	0.007663204
SERV/DRC	-3.44955002	2.168830933	-1.59051126	0.150383678

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	9.20316937	-1.80316937
2	7.739159884	-0.439159884
3	9.755050895	-2.155050895
4	9.824434354	-2.224434354
5	8.348666482	1.851333518
6	10.37982675	-0.079826752
7	11.22981065	-1.429810647
8	9.541004907	1.258995093
9	10.11247409	3.587525912
10	11.16640262	1.433597379

Appendix E: Statistical Results

F-15C TNMCS Hours By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.25979971
Adjusted R Square	0.154056812
Standard Error	55067.51194
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	7450378922	7450378922	2.45689984	0.160994774
Residual	7	21227016095	3032430871		
Total	8	28677395017			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	461482.9302	131642.0725	3.505588461	0.009918107
SERV/DRC	-90740.31417	57890.40029	-1.567450108	0.160994774

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	203247.5341	-27583.53409
2	256275.4892	-62034.48924
3	258100.6191	-60916.61914
4	219280.5876	43677.41236
5	272710.2002	-2823.200196
6	295069.0021	-42463.40213
7	250645.0157	33165.58432
8	265677.496	81965.30395
9	293401.0558	37012.94415

Appendix E: Statistical Results

F-15D TNMCS Rates By Serviceable Inventory

Regression Statistics	
R Square	0.410530043
Adjusted R Square	0.336846298
Standard Error	1.382411517
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	10.64750718	10.64750718	5.571514374	0.045929138
Residual	8	15.28849282	1.911061602		
Total	9	25.936			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	12.42087574	1.89028233	6.570910357	0.00017461
SERV INV	-1.92057E-05	8.13659E-06	-2.360405553	0.045929138

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
6.971155708	0.428844292	7.4	9.2	0.001643535	0.006989532	0.127801858
6.481334666	0.618665334	7.1	9.7	0.00178536	0.017086872	0.222624479
7.728089009	-0.928089009	6.8	10.2	0.01384083	0.001729466	0.1443255
7.882790566	-0.282790566	7.6	10.2	0.000692521	0.00290165	0.171788435
6.990611037	0.409388963	7.4	10.6	0.046749452	0.013623722	0.044346289
8.136266809	0.863733191	9	10.6	0.054444444	0.047472402	0.157050754
8.860934609	-1.960934609	6.9	10.5	0.010291955	0.019352679	0.253636316
8.559885957	-0.959885957	7.6	11.1	0.014023546	0.01376674	0.104629549
9.391721315	-0.891721315	8.5	11.0	0.221453287	0.101108263	0.043853287
9.797210323	2.702789677	12.5	10.7	0.364924932	0.224031327	1.270056468

	Theil's U
USAF Pred	1.865562261
Serv Inv Pred	0.783524549

Appendix E: Statistical Results

F-15D TNMCS Hours By Serviceable Inventory

Regression Statistics	
R Square	0.58953422
Adjusted R Square	0.530896252
Standard Error	4807.545031
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	232368270.3	232368270.3	10.0537968	0.01569096
Residual	7	161787424.6	23112489.22		
Total	8	394155694.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	52001.93159	6845.852659	7.596121941	0.00012669
SERV INV	-0.096097441	0.030307267	-3.170772273	0.01569096

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
22282.83684	529.1631608	22812	31203	0.019726875	0.01205932	0.336010497
28521.09835	-2505.098349	26016	39239	0.009013903	0.000967367	0.142242285
29295.16324	-809.1632404	28486	38298	4.44881E-07	0.016634238	0.18106229
24831.05269	3673.947305	28505	40626	0.032111433	0.011445305	0.041273133
30563.45727	3049.542727	33613	39404	0.026596949	0.0324843	0.183228976
34189.40593	-6058.205934	28131	42519	0.005115398	0.008151722	0.241451302
32683.07854	-2539.878539	30143	43966	0.008604521	0.016790934	0.104462052
36845.25092	-3905.950924	32939	42682	0.193792615	0.06762251	0.042451751
38874.15621	8565.643794	47440	40653	0.294962139	0.166155697	1.272182286

	Theil's U
USAF Pred	2.076784985
Serv Inv Pred	0.750541103

Appendix E: Statistical Results

F-15D TNMCS Rates By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.397356436
Adjusted R Square	0.32202599
Standard Error	1.397773385
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	10.30583651	10.30583651	5.274845152	0.050731248
Residual	8	15.63016349	1.953770436		
Total	9	25.936			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	12.43680023	1.947796393	6.385061744	0.000212491
SERV/TAI	-0.000997691	0.000434401	-2.296703105	0.050731248

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv/TAI Num*	*USAF-Num*
7.718452882	-0.318452882	7.4	9.2	0.001643535	0.006355524	0.127801858
7.689939381	-0.589939381	7.1	9.7	0.00178536	0.002256096	0.222624479
7.137238522	-0.337238522	6.8	10.2	0.01384083	0.001794483	0.1443255
7.311942913	0.288057087	7.6	10.2	0.000692521	0.020781308	0.171788435
6.304405016	1.095594984	7.4	10.6	0.046749452	0.015707314	0.044346289
8.072566716	0.927433284	9	10.6	0.054444444	0.045071368	0.157050754
8.810701644	-1.910701644	6.9	10.5	0.010291955	0.02015939	0.253636316
8.579687996	-0.979687996	7.6	11.1	0.014023546	0.014358597	0.104629549
9.410687952	-0.910687952	8.5	11.0	0.221453287	0.1035797	0.043853287
9.764376978	2.735623022	12.5	10.7	0.364924932	0.230063779	1.270056468

	Theil's U
USAF Pred	1.865562261
Serv Inv/TAI Pred	0.794003391

Appendix E: Statistical Results

F-15D TNMCS Hours By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.440840976
Adjusted R Square	0.360961116
Standard Error	5611.158699
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	173759981.2	173759981.2	5.51880002	0.051146713
Residual	7	220395713.6	31485101.94		
Total	8	394155694.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	48749.2817	7825.480067	6.229557968	0.000432641
SERV/TAI	-4.125830591	1.756261023	-2.349212638	0.051146713

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv/TAI Num*	*USAF-Num*
29119.21449	-6307.214492	22812	31203	0.019726875	0.001284521	0.336010497
26833.58714	-817.5871371	26016	39239	0.009013903	0.001277711	0.142242285
27556.05595	929.9440497	28486	38298	4.44881E-07	0.032248711	0.18106229
23389.50521	5115.494795	28505	40626	0.032111433	0.010432407	0.041273133
30701.52342	2911.476581	33613	39404	0.026596949	0.02798268	0.183228976
33753.99087	-5622.790867	28131	42519	0.005115398	0.008910532	0.241451302
32798.66195	-2655.46195	30143	43966	0.008604521	0.011955264	0.104462052
36235.16146	-3295.86146	32939	42682	0.193792615	0.087471699	0.042451751
37697.79952	9742.00048	47440	40653	0.294962139	0.181563526	1.272182286

	Theil's U
USAF Pred	2.076784985
Serv Inv/TAI Pred	0.784569041

Appendix E: Statistical Results

F-15D TNMCS Rates By Serviceable Inventory/OST

Regression Statistics	
R Square	0.000140473
Adjusted R Square	-0.124841968
Standard Error	1.800429001
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.003643308	0.003643308	0.001123942	0.974077107
Residual	8	25.93235669	3.241544587		
Total	9	25.936			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	7.934583559	4.37472779	1.813731949	0.107276356
SERV/OST	0.023020388	0.686658368	0.033525242	0.974077107

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	8.061574755	-0.661574755
2	8.094657423	-0.994657423
3	8.057650413	-1.257650413
4	8.057642796	-0.457642796
5	8.084647041	-0.684647041
6	8.059769824	0.940230176
7	8.088201158	-1.188201158
8	8.114355948	-0.514355948
9	8.100238345	0.399761655
10	8.081262297	4.418737703

Appendix E: Statistical Results

F-15D TNMCS Hours By Serviceable Inventory/OST

Regression Statistics	
R Square	4.92899E-05
Adjusted R Square	-0.142800812
Standard Error	7503.677831
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	19427.88161	19427.88161	0.000345046	0.985698187
Residual	7	394136267	56305181		
Total	8	394155694.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	31258.04156	19522.64686	1.601116989	0.153384668
SERV/OST	-56.14496699	3022.541595	-0.018575416	0.985698187

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	30867.63364	-8055.633639
2	30957.89091	-4941.89091
3	30957.90949	-2471.909486
4	30892.04819	-2387.048195
5	30952.72183	2660.278171
6	30883.37998	-2752.179976
7	30819.59044	-676.39044
8	30854.0222	2085.277803
9	30900.30333	16539.49667

Appendix E: Statistical Results

F-15D TNMCS Rates By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.347067589
Adjusted R Square	0.265451038
Standard Error	1.454925041
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	9.001544994	9.001544994	4.25241674	0.073116665
Residual	8	16.93445501	2.116806876		
Total	9	25.936			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	12.91957701	2.391545778	5.402186792	0.000644334
SERV/BRC	-0.157466632	0.076360828	-2.062138875	0.073116665

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	7.965907224	-0.565907224
2	6.504331266	0.595668734
3	7.571970812	-0.771970812
4	7.761164023	-0.161164023
5	6.617724529	0.782275471
6	8.58529098	0.41470902
7	9.074516105	-2.174516105
8	8.25603152	-0.65603152
9	9.031060955	-0.531060955
10	9.432002585	3.067997415

Appendix E: Statistical Results

F-15D TNMCS Hours By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.504704051
Adjusted R Square	0.433947487
Standard Error	5281.013415
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	198931976	198931976	7.132964377	0.031964405
Residual	7	195223718.8	27889102.69		
Total	8	394155694.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	53608.0819	8683.383498	6.173639793	0.000456851
SERV/BRC	-740.8520652	277.3936201	-2.670761011	0.031964405

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
23425.50916	-613.5091574	22812	31203	0.019726875	0.011371049	0.336010497
28448.56042	-2432.560424	26016	39239	0.009013903	0.001074216	0.142242285
29338.68031	-852.6803143	28486	38298	4.44881E-07	0.025468019	0.18106229
23959.00398	4545.996016	28505	40626	0.032111433	0.000193924	0.041273133
33216.04882	396.9511759	33613	39404	0.026596949	0.048291474	0.183228976
35517.76469	-7386.564688	28131	42519	0.005115398	0.002933909	0.241451302
31666.94252	-1523.742525	30143	43966	0.008604521	0.006202812	0.104462052
35313.31606	-2374.016059	32939	42682	0.193792615	0.096645551	0.042451751
37199.67402	10240.12598	47440	40653	0.294962139	0.192180954	1.272182286

	Theil's U
USAF Pred	2.076784985
Serv Inv/BRC Pred	0.807183054

Appendix E: Statistical Results

F-15D TNMCS Rates By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.19342135
Adjusted R Square	0.092599019
Standard Error	1.617073895
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	5.016576146	5.016576146	1.918437594	0.203425493
Residual	8	20.91942385	2.614927982		
Total	9	25.936			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	13.76760375	4.138063155	3.327064676	0.010429846
SERV/DRC	-2.955275471	2.133654672	-1.385076747	0.203425493

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	7.657974619	-0.257974619
2	6.736203068	0.363796932
3	8.136505925	-1.336505925
4	8.163996784	-0.563996784
5	7.105640103	0.294359897
6	8.537715837	0.462284163
7	9.141454947	-2.241454947
8	8.058732157	-0.458732157
9	8.376470869	0.123529131
10	8.885305688	3.614694312

Appendix E: Statistical Results

F-15D TNMCS Hours By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.328205655
Adjusted R Square	0.232235034
Standard Error	6150.395656
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	129364127.8	129364127.8	3.419855492	0.106879149
Residual	7	264791567	37827366.72		
Total	8	394155694.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	60124.88575	15936.63084	3.7727476	0.006957894
SERV/DRC	-15312.31317	8280.125612	-1.84928513	0.106879149

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	23692.7459	-880.745897
2	30948.2035	-4932.203498
3	31090.64323	-2604.643229
4	25606.92805	2898.071946
5	33027.01201	585.9879859
6	36155.19496	-8023.994959
7	30545.23047	-402.0304738
8	32191.54558	747.7544154
9	34827.99629	12611.80371

Appendix E: Statistical Results

F-15E TNMCS Rates By Serviceable Inventory

Regression Statistics	
R Square	0.590087807
Adjusted R Square	0.531528922
Standard Error	1.164123156
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	13.65594316	13.65594316	10.07682796	0.015611839
Residual	7	9.486279064	1.355182723		
Total	8	23.14222222			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	16.91941229	1.952680703	8.664710141	5.45686E-05
SERV INV	-3.82169E-05	1.20391E-05	-3.174401984	0.015611839

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
8.299442333	-0.199442333	8.1	8.4	0.049382716	0.016136988	0.000512286
10.9289547	-1.028954703	9.9	10.1	0.00499949	0.021150196	0.027497903
10.63976758	-1.439767579	9.2	10.8	0.092627599	0.027942192	0.010476561
10.46213552	1.537864476	12	11.1	0.017777778	0.003469093	0.001678723
9.693211916	0.706788084	10.4	10.9	0	0.020338927	0.00147929
11.88319196	-1.483191959	10.4	10.8	0.01118713	0.00217633	0.002968853
11.01482803	0.485171969	11.5	10.9	0.012778828	0.003320806	0.034144612
12.13729599	0.662704012	12.8	10.7	0.001525879	0.003514526	0.032287598
12.54117197	0.758828033	13.3	11.0	0.19027942	0.098049059	0.111045826

Theil's U	
USAF Pred	0.763932892
Serv Inv Pred	0.717836942

Appendix E: Statistical Results

F-15E TNMCS Hours By Serviceable Inventory

Regression Statistics	
R Square	0.619666044
Adjusted R Square	0.565332622
Standard Error	30508.96442
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	10615625053	10615625053	11.40487784	0.011805146
Residual	7	6515578368	930796909.7		
Total	8	17131203421			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	324364.9893	51175.2264	6.338320553	0.000389561
SERV INV	-1.065533612	0.315516325	-3.377110872	0.011805146

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
84029.6209	-33934.6209	50095	51690	2.242072072	0.414157215	0.002616888
157343.6611	-32238.66111	125105	127668	0.010297127	0.00842156	0.03628392
149280.7683	-11480.76826	137800	161630	0.123706877	0.092626281	0.009909174
144328.168	41938.83197	186267	172550	0.014830898	0.047728242	0.00183128
122889.6317	40693.36825	163583	171554	1.47246E-06	0.015803697	0.001855381
183948.9699	-20564.46987	163385	170431	0.00702683	0.011266809	0.003429373
159737.9151	17342.48487	177080	167512	0.010582399	0.000579575	0.03400538
191033.7029	4263.097136	195297	162642	2.50879E-05	0.00094994	0.030369873
202294.2621	-6019.26208	196275	162241	2.408542763	0.59153332	0.12030127

	Theil's U
USAF Pred	0.223489913
Serv Inv Pred	0.495578464

Appendix E: Statistical Results

F-15E TNMCS Rates By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.592132859
Adjusted R Square	0.533866124
Standard Error	1.16121562
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	13.70327021	13.70327021	10.16245143	0.015322179
Residual	7	9.438952017	1.348421717		
Total	8	23.14222222			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	14.17465479	1.114058516	12.7234383	4.28868E-06
SERV/TAI	-0.003736945	0.001172242	-3.187860008	0.015322179

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv/TAI Num*	*USAF-Num*
7.640679461	0.459320539	8.1	8.4	0.049382716	0.009463547	0.000512286
10.6879742	-0.787974198	9.9	10.1	0.00499949	0.034009795	0.027497903
11.02573274	-1.82573274	9.2	10.8	0.092627599	0.013781519	0.010476561
10.91996861	1.080031388	12	11.1	0.017777778	0.000121744	0.001678723
10.53240507	-0.132405072	10.4	10.9	0	0.014428785	0.00147929
11.64924675	-1.249246748	10.4	10.8	0.01118713	0.000538473	0.002968853
11.2586678	0.241332204	11.5	10.9	0.012778828	0.007730208	0.034144612
11.78890161	1.011098389	12.8	10.7	0.001525879	0.008841527	0.032287598
12.09642376	1.203576238	13.3	11.0	0.19027942	0.088915599	0.111045826

Theil's U	
USAF Pred	0.763932892
Serv Inv/TAI Pred	0.683585857

Appendix E: Statistical Results

F-15E TNMCS Hours By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.835834797
Adjusted R Square	0.812382626
Standard Error	20044.04963
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	14318855942	14318855942	35.63997419	0.000558799
Residual	7	2812347480	401763925.7		
Total	8	17131203421			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	262637.332	19230.0584	13.6576461	2.65674E-06
SERV/TAI	-120.7977142	20.23438579	-5.969922461	0.000558799

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv/TAI Num*	*USAF-Num*
51424.86969	-1329.869691	50095	51690	2.242072072	0.24556767	0.002616888
149929.4694	-24824.46944	125105	127668	0.010297127	0.033939245	0.03628392
160847.6027	-23047.6027	137800	161630	0.123706877	0.043796498	0.009909174
157428.7496	28838.25042	186267	172550	0.014830898	0.010059835	0.00183128
144900.6567	18682.34326	163583	171554	1.47246E-06	0.011599905	0.001855381
181002.8562	-17618.35618	163385	170431	0.00702683	0.002837444	0.003429373
168377.2893	8703.110661	177080	167512	0.010582399	0.003049987	0.03400538
185517.2362	9779.563827	195297	162642	2.50879E-05	1.75019E-05	0.030369873
195457.9702	817.0298361	196275	162241	2.408542763	0.350868086	0.12030127

Theil's U	
USAF Pred	0.223489913
Serv Inv/TAI Pred	0.381675913

Appendix E: Statistical Results

F-15E TNMCS Rates By Serviceable Inventory/OST

Regression Statistics	
R Square	0.16488602
Adjusted R Square	0.045584023
Standard Error	1.66159963
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3.815828912	3.815828912	1.382089351	0.278177109
Residual	7	19.32639331	2.76091333		
Total	8	23.14222222			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	6.965008914	3.346056348	2.081557568	0.075910372
SERV/OST	0.683177402	0.581119477	1.175622963	0.278177109

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	11.1612236	-3.061223599
2	9.863100293	0.036899707
3	10.06877406	-0.868774064
4	10.1930742	1.806925802
5	10.72258399	-0.322583986
6	10.88989853	-0.489898529
7	11.81108003	-0.311080027
8	11.60875227	1.191247729
9	11.28151303	2.018486968

Appendix E: Statistical Results

F-15E TNMCS Hours By Serviceable Inventory/OST

Regression Statistics	
R Square	0.052529098
Adjusted R Square	-0.082823888
Standard Error	48153.49973
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	899886670.1	899886670.1	0.38808969	0.553051732
Residual	7	16231316751	2318759536		
Total	8	17131203421			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	95411.86923	96969.40258	0.983937889	0.357924592
SERV/OST	10491.38814	16840.96222	0.62296845	0.553051732

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	159852.1111	-109757.1111
2	139917.1492	-14812.14918
3	143075.6309	-5275.630936
4	144984.4777	41282.52232
5	153116.0299	10466.97012
6	155685.4384	7699.061632
7	169831.7972	7248.602844
8	166724.6993	28572.10068
9	161699.3664	34575.63357

Appendix E: Statistical Results

F-15E TNMCS Rates By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.298258817
Adjusted R Square	0.198010077
Standard Error	1.523147605
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	6.902371829	6.902371829	2.975187679	0.128203921
Residual	7	16.23985039	2.319978628		
Total	8	23.14222222			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	17.51693218	3.901568999	4.489714828	0.00283305
SERV/BRC	-0.275185141	0.159539342	-1.724873236	0.128203921

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	9.362819046	-1.262819046
2	11.49249146	-1.592491456
3	11.07020826	-1.870208265
4	10.74495693	1.255043071
5	9.552274732	0.847725268
6	11.59822844	-1.198228441
7	10.29235196	1.207648037
8	11.55945955	1.240540451
9	11.92720962	1.372790381

Appendix E: Statistical Results

F-15E TNMCS Hours By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.291337419
Adjusted R Square	0.190099908
Standard Error	41645.17264
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	4990960594	4990960594	2.877761562	0.133626921
Residual	7	12140242827	1734320404		
Total	8	17131203421			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	334411.471	106674.8317	3.134867575	0.016497074
SERV/BRC	-7399.764089	4362.048304	-1.69639664	0.133626921

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	115146.3121	-65051.31215
2	172413.4792	-47308.47924
3	161058.2295	-23258.2295
4	152312.1789	33954.82108
5	120240.8001	43342.19988
6	175256.7605	-11872.26045
7	140141.5728	36938.82724
8	174214.2599	21082.54009
9	184103.107	12171.89304

Appendix E: Statistical Results

F-15E TNMCS Rates By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.086904185
Adjusted R Square	-0.043538074
Standard Error	1.737447481
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.011155968	2.011155968	0.666227232	0.441257197
Residual	7	21.13106625	3.018723751		
Total	8	23.14222222			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	14.90328504	5.006295389	2.976908849	0.020604929
SERV/DRC	-2.317755058	2.839594637	-0.816227439	0.441257197

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	9.895440341	-1.795440341
2	11.3134488	-1.413448798
3	11.03747401	-1.837474009
4	10.95294293	1.04705707
5	10.46876414	-0.068764141
6	11.57963181	-1.179631808
7	10.48101435	1.018985652
8	10.86081448	1.939185519
9	11.01046914	2.289530857

Appendix E: Statistical Results

F-15E TNMCS Hours By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.224940625
Adjusted R Square	0.114217857
Standard Error	43552.43116
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3853503603	3853503603	2.031566129	0.1970895
Residual	7	13277699818	1896814260		
Total	8	17131203421			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	332654.5075	125492.3315	2.650795499	0.032903677
SERV/DRC	-101454.7876	71179.84933	-1.425330182	0.1970895

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	113446.7792	-63351.77919
2	175517.0771	-50412.07706
3	163436.8689	-25636.86886
4	159736.7011	26530.29894
5	138542.8066	25040.19343
6	187168.671	-23784.17099
7	139079.0333	38001.36674
8	155703.9746	39592.82542
9	162254.7884	34020.21157

Appendix E: Statistical Results

F-16A TNMCS Rates By Serviceable Inventory

Regression Statistics	
R Square	0.115994032
Adjusted R Square	0.005493286
Standard Error	2.801957799
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	8.24125996	8.24125996	1.049712657	0.335552735
Residual	8	62.80774004	7.850967505		
Total	9	71.049			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	15.52235025	3.371017855	4.604647887	0.001744821
SERV INV	-1.18363E-05	1.15527E-05	-1.024554858	0.335552735

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	11.6797112	-5.679711198
2	10.50587923	1.794120766
3	11.0693948	1.530605197
4	11.97663723	-0.476637233
5	12.10385405	-2.103854047
6	12.2362315	0.6637685
7	12.86529663	-0.165296633
8	12.54894719	3.95105281
9	13.31882908	1.681170925
10	13.59521909	-1.195219087

Appendix E: Statistical Results

F-16A TNMCS Hours By Serviceable Inventory

Regression Statistics	
R Square	0.645847458
Adjusted R Square	0.595254237
Standard Error	107520.8399
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.47578E+11	1.47578E+11	12.76549413	0.009061925
Residual	7	80925117020	11560731003		
Total	8	2.28504E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-210642.0188	129938.1736	-1.621094194	0.149028356
SERV INV	1.612471246	0.451308137	3.572883168	0.009061925

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	472755.5446	-21313.54464
2	395987.4011	161299.5989
3	272393.0926	-220127.0926
4	255062.2516	37288.7484
5	237028.3732	-23078.37318
6	151330.3639	5719.836128
7	194426.8829	-23210.68286
8	89545.30314	38300.19686
9	51892.48707	45121.31293

Appendix E: Statistical Results

F-16A TNMCS Rates By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.478945874
Adjusted R Square	0.413814108
Standard Error	2.151173361
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	34.02862538	34.02862538	7.353491309	0.02658672
Residual	8	37.02037462	4.627546828		
Total	9	71.049			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	8.407619397	1.551863375	5.417757473	0.000632486
SERV/TAI	0.003525074	0.001299934	2.71173216	0.02658672

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	10.3841446	-4.3841446
2	10.81341117	1.48658883
3	10.47976231	2.120237693
4	10.08111876	1.418881243
5	10.46853155	-0.468531553
6	13.04584775	-0.145847748
7	14.54187595	-1.841875954
8	15.21941738	1.28058262
9	13.3792016	1.620798399
10	13.48668893	-1.086688931

Appendix E: Statistical Results

F-16A TNMCS Hours By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.230148442
Adjusted R Square	0.120169648
Standard Error	158526.1684
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	52589738435	52589738435	2.092661987	0.191257421
Residual	7	1.75914E+11	25130546055		
Total	8	2.28504E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	401252.0628	126113.7432	3.181668012	0.015454731
SERV/TAI	-146.6037255	101.3433985	-1.446603604	0.191257421

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	301197.9711	150244.0289
2	315074.0406	242212.9594
3	331653.1639	-279387.1639
4	315541.1147	-23190.11466
5	208353.521	5596.478959
6	146135.4418	10914.75822
7	117957.2791	53258.92091
8	194489.7207	-66644.22067
9	190019.4472	-93005.64716

Appendix E: Statistical Results

F-16A TNMCS Rates By Serviceable Inventory/OST

Regression Statistics	
R Square	0.461658513
Adjusted R Square	0.394365827
Standard Error	2.18656764
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	32.80037566	32.80037566	6.860456025	0.030686324
Residual	8	38.24862434	4.781078042		
Total	9	71.049			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-1.20113372	5.159134699	-0.232816895	0.82174961
SERV/OST	2.03352745	0.776378584	2.619247225	0.030686324

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	9.661566728	-3.661566728
2	15.38055021	-3.080550212
3	13.45696322	-0.856963223
4	10.85729199	0.642708008
5	10.58800268	-0.588002678
6	10.52065488	2.379345122
7	12.27704227	0.422957729
8	14.64926284	1.850737157
9	13.09977559	1.900224407
10	11.40888958	0.991110417

Appendix E: Statistical Results

F-16A TNMCS Hours By Serviceable Inventory/OST

Regression Statistics	
R Square	0.217774707
Adjusted R Square	0.106028236
Standard Error	159795.0763
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	49762295905	49762295905	1.948828501	0.205389979
Residual	7	1.78741E+11	25534466417		
Total	8	2.28504E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-366045.8909	434257.8369	-0.842922936	0.427131421
SERV/OST	89486.68859	64102.00686	1.396004477	0.205389979

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	363641.818	87800.18198
2	278993.1304	278293.8696
3	164592.9192	-112326.9192
4	152742.669	139608.331
5	149778.9856	64171.01435
6	227069.947	-70019.74704
7	331461.0451	-160244.8451
8	263274.8581	-135429.3581
9	188866.3274	-91852.52738

Appendix E: Statistical Results

F-16A TNMCS Rates By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.036597841
Adjusted R Square	-0.083827429
Standard Error	2.925080341
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.60023998	2.60023998	0.303904992	0.596501079
Residual	8	68.44876002	8.556095003		
Total	9	71.049			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	13.9825574	3.380658941	4.136044968	0.00327113
SERV/BRC	-0.055427264	0.100543622	-0.551275785	0.596501079

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	12.15274752	-6.15274752
2	11.28397234	1.016027664
3	11.33967446	1.260325537
4	11.91919192	-0.41919192
5	12.18166081	-2.181660811
6	12.48840542	0.411594581
7	12.81654874	-0.116548736
8	12.41437597	4.085624033
9	12.54401397	2.455986026
10	12.75940886	-0.359408856

Appendix E: Statistical Results

F-16A TNMCS Hours By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.620692261
Adjusted R Square	0.566505441
Standard Error	111273.9021
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.4183E+11	1.4183E+11	11.45467222	0.011687133
Residual	7	86673169079	12381881297		
Total	8	2.28504E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-182204.7048	128899.9777	-1.413535581	0.200391194
SERV/BRC	12948.81968	3825.946124	3.384475177	0.011687133

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	448233.9809	3208.019133
2	435220.9482	122066.0518
3	299835.1016	-247569.1016
4	238517.5821	53833.41789
5	166856.4476	47093.55236
6	90196.18445	66854.01555
7	184151.0777	-12934.87771
8	153865.275	-26019.77504
9	103545.1023	-6531.302318

Appendix E: Statistical Results

F-16A TNMCS Rates By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.023614669
Adjusted R Square	-0.098433498
Standard Error	2.944724126
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.677798595	1.677798595	0.193486468	0.671671789
Residual	8	69.37120141	8.671400176		
Total	9	71.049			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	14.28487009	4.852650097	2.943725553	0.018603327
SERV/DRC	-1.146851129	2.607244426	-0.439870968	0.671671789

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	12.16148449	-6.161484488
2	11.33048466	0.969515339
3	11.60934402	0.990655982
4	12.11069031	-0.610690312
5	12.21629367	-2.216293672
6	12.34116497	0.558835026
7	12.65168616	0.048313838
8	12.26052692	4.239473084
9	12.57998322	2.420016776
10	12.63834157	-0.238341574

Appendix E: Statistical Results

F-16A TNMCS Hours By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.664269156
Adjusted R Square	0.616307607
Standard Error	104687.0801
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.51788E+11	1.51788E+11	13.85003548	0.007440764
Residual	7	76715693231	10959384747		
Total	8	2.28504E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-393708.5991	172661.604	-2.280232489	0.056616859
SERV/DRC	345042.5279	92714.39825	3.72156358	0.007440764

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	495150.1129	-43708.11292
2	411252.2684	146034.7316
3	260416.8303	-208150.8303
4	228644.9207	63706.07935
5	191076.043	22873.95697
6	97652.39574	59397.80426
7	215336.8725	-44120.67249
8	119224.9976	8620.502444
9	101667.2589	-4653.458883

Appendix E: Statistical Results

F-16B TNMCS Rates By Serviceable Inventory

Regression Statistics	
R Square	0.002207211
Adjusted R Square	-0.122516887
Standard Error	3.961664003
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.27774664	0.27774664	0.017696751	0.897455671
Residual	8	125.5582534	15.69478167		
Total	9	125.836			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	13.52348134	4.70626673	2.873505076	0.020717105
SERV INV	-2.23465E-06	1.67982E-05	-0.133029135	0.897455671

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	12.83970497	-6.83970497
2	12.6071739	2.092826101
3	12.71147176	0.888528239
4	12.87980355	0.620196454
5	12.90372772	-2.303727719
6	12.92677591	-0.326775909
7	13.0454247	-1.945424699
8	12.98339526	6.716604741
9	13.12561962	3.574380383
10	13.17690262	-2.476902621

Appendix E: Statistical Results

F-16B TNMCS Hours By Serviceable Inventory

Regression Statistics	
R Square	0.560020468
Adjusted R Square	0.497166249
Standard Error	12905.94314
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1484051463	1484051463	8.909830995	0.020371968
Residual	7	1165943579	166563368.5		
Total	8	2649995042			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2435.604262	15365.95455	0.158506538	0.878533615
SERV INV	0.16549464	0.055443316	2.984934002	0.020371968

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	70295.85385	-18876.85385
2	62571.72252	23031.27748
3	50105.34229	-8917.342293
4	48333.55668	5721.443321
5	46626.64496	-1484.644964
6	37839.70706	-3403.107063
7	42433.50728	9455.092725
8	31900.60092	2159.599076
9	28102.66443	-7685.464435

Appendix E: Statistical Results

F-16B TNMCS Rates By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.1340989
Adjusted R Square	0.025861263
Standard Error	3.690554341
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	16.87446923	16.87446923	1.238930409	0.298001253
Residual	8	108.9615308	13.62019135		
Total	9	125.836			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	6.315137861	6.047578106	1.044242464	0.326897589
SERV/TAI	0.001516751	0.00136267	1.113072508	0.298001253

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	11.05092885	-5.050928853
2	11.6766555	3.023344499
3	12.87638477	0.723615232
4	11.51622051	1.983779491
5	11.92383932	-1.323839318
6	14.93234727	-2.332347275
7	13.86111375	-2.761113752
8	14.4613363	5.238663703
9	12.74478859	3.955211413
10	14.15638514	-3.45638514

Appendix E: Statistical Results

F-16B TNMCS Hours By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.055411484
Adjusted R Square	-0.079529733
Standard Error	18910.14423
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	146840157.8	146840157.8	0.41063424	0.542049433
Residual	7	2503154884	357593554.9		
Total	8	2649995042			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	69370.00178	36291.30585	1.911477147	0.09754537
SERV/TAI	-5.098986394	7.957126697	-0.640807491	0.542049433

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	51345.74423	73.25577389
2	47312.51506	38290.48494
3	51885.09181	-10697.09181
4	50514.76593	3540.23407
5	40400.81576	4741.18424
6	44002.07014	-9565.470143
7	41984.25234	9904.347658
8	47754.91284	-13694.71284
9	43009.43188	-22592.23188

Appendix E: Statistical Results

F-16B TNMCS Rates By Serviceable Inventory/OST

Regression Statistics	
R Square	0.623473312
Adjusted R Square	0.576407476
Standard Error	2.433634431
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	78.45538766	78.45538766	13.24683389	0.006592588
Residual	8	47.38061234	5.922576542		
Total	9	125.836			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-7.017226596	5.53162723	-1.26856462	0.240262714
SERV/OST	2.704017993	0.742939642	3.63962002	0.006592588

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	8.80812883	-2.80812883
2	17.70614527	-3.006145271
3	14.93314372	-1.333143717
4	11.0073073	2.492692696
5	10.59454725	0.005452747
6	10.52882819	2.071171806
7	13.00727719	-1.907277188
8	16.93373715	2.76626285
9	14.1957618	2.504238203
10	11.4851233	-0.785123296

Appendix E: Statistical Results

F-16B TNMCS Hours By Serviceable Inventory/OST

Regression Statistics	
R Square	0.124601525
Adjusted R Square	-0.000455399
Standard Error	18204.40142
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	330193424.8	330193424.8	0.996358463	0.351439966
Residual	7	2319801617	331400231.1		
Total	8	2649995042			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-1507.084132	48443.96032	-0.031109846	0.976050366
SERV/OST	6360.896642	6372.510091	0.998177571	0.351439966

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	56651.85323	-5232.853226
2	50128.68056	35474.31944
3	40893.59421	294.4057921
4	39922.62285	14132.37715
5	39768.02619	5373.973807
6	45598.29726	-11161.69726
7	54834.85044	-2946.250442
8	48394.07295	-14333.87295
9	42017.60231	-21600.40231

Appendix E: Statistical Results

F-16B TNMCS Rates By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.010586622
Adjusted R Square	-0.113090051
Standard Error	3.94499401
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.332178113	1.332178113	0.085599179	0.777292944
Residual	8	124.5038219	15.56297774		
Total	9	125.836			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	11.67488597	4.434811994	2.632554882	0.030058716
SERV/BRC	0.036465104	0.124635758	0.292573373	0.777292944

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	12.93723287	-6.937232868
2	13.57794484	1.122055158
3	13.5249834	0.075016604
4	13.11117127	0.388828729
5	12.92465846	-2.324658462
6	12.68937419	-0.089374188
7	12.45992604	-1.359926044
8	12.74965933	6.950340667
9	12.69456871	4.005431285
10	12.53048088	-1.830480881

Appendix E: Statistical Results

F-16B TNMCS Hours By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.544098712
Adjusted R Square	0.478969957
Standard Error	13137.38478
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1441858890	1441858890	8.354200981	0.023304158
Residual	7	1208136152	172590878.9		
Total	8	2649995042			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	5562.886507	14814.18276	0.37551086	0.718400832
SERV/BRC	1199.807249	415.1060106	2.890363469	0.023304158

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	68179.02031	-16760.02031
2	66436.43573	19166.56427
3	52820.82157	-11632.82157
4	46684.01141	7370.98859
5	38942.47921	6199.520791
6	31392.97254	3043.627462
7	40926.03462	10962.56538
8	39113.39415	-5053.194149
9	33714.43047	-13297.23047

Appendix E: Statistical Results

F-16B TNMCS Rates By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.016877719
Adjusted R Square	-0.106012566
Standard Error	3.932432062
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.12382463	2.12382463	0.137339732	0.720560583
Residual	8	123.7121754	15.46402192		
Total	9	125.836			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	10.783295	5.898206982	1.82823272	0.10492081
SERV/DRC	0.995167373	2.68533227	0.370593756	0.720560583

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	12.93373866	-6.933738659
2	13.86970409	0.830295911
3	13.57869669	0.02130331
4	13.03315168	0.466848316
5	12.90820148	-2.308201482
6	12.76068529	-0.160685293
7	12.41531334	-1.315313339
8	12.84458032	6.85541968
9	12.47745079	4.222549212
10	12.37847765	-1.678477655

Appendix E: Statistical Results

F-16B TNMCS Hours By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.542740153
Adjusted R Square	0.477417318
Standard Error	13156.94454
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1438258714	1438258714	8.308582294	0.023568585
Residual	7	1211736328	173105189.7		
Total	8	2649995042			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-9098.992743	19770.10376	-0.46024001	0.659299004
SERV/DRC	25898.62775	8984.900883	2.882461152	0.023568585

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	71222.93336	-19803.93336
2	63649.64219	21953.35781
3	49452.16402	-8264.164019
4	46200.41076	7854.589237
5	42361.39135	2780.608652
6	33373.29555	1063.304446
7	44544.70858	7343.89142
8	34990.385	-930.1850011
9	32414.66919	-11997.46919

Appendix E: Statistical Results

F-16C TNMCS Rates By Serviceable Inventory

Regression Statistics	
R Square	0.772731303
Adjusted R Square	0.740264346
Standard Error	1.753727098
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	73.19997775	73.19997775	23.8005462	0.001796534
Residual	7	21.52891114	3.075558735		
Total	8	94.72888889			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	23.29817399	2.709917682	8.597373322	5.73913E-05
SERV INV	-3.83764E-05	7.86631E-06	-4.878580347	0.001796534

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
9.014812301	-3.014812301	6.0	7.9	0	0 037841863	0.307520661
7.167179102	-1.167179102	6	9.3	0.09	0.056323234	0.077160494
6.376049007	1.423950993	7.8	9.5	0.053254438	0.003669789	1.14143E-06
9.127485498	0.472514502	10	9.6	0.001736111	0.001396651	0.002534843
9.641230761	0.358769239	10	9.5	0.0144	0.006459693	0.028617361
12.00372214	-0.803722139	11.2	9.5	0.045918367	0.061535459	0.135100004
10.82168973	2.778310267	13.6	9.5	0.000216263	0.00079463	0.101523453
13.41662715	0.383372855	13.8	9.5	0.015175383	0.000976356	0.196672968
15.93120431	-0.431204314	15.5	9.4	0.220700563	0.168997674	0.849130924

Theil's U	
USAF Pred	1.961487788
Serv Inv Pred	0.875061634

Appendix E: Statistical Results

F-16C TNMCS Hours By Serviceable Inventory

Regression Statistics	
R Square	0.683912888
Adjusted R Square	0.631231703
Standard Error	189422.9439
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	4.65812E+11	4.65812E+11	12.98210897	0.011324707
Residual	6	2.15286E+11	35881051664		
Total	7	6.81098E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1910267.892	293922.8273	6.499215829	0.000631632
SERV INV	-3.106766755	0.862255601	-3.603069382	0.011324707

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
604381.9813	-295872.9813	308509	478020	0.841812153	0.027575935	0.177611433
540335.9846	51231.01539	591567	721585	0.119726315	0.003145761	2.34555E-05
763078.7339	33179.26612	796258	799123	0.004786371	0.003436354	0.002339274
804669.0204	46676.97957	851346	812834	0.021217808	0.000583721	0.029735854
995924.6886	-20568.78864	975356	828549	0.046501429	0.085651482	0.133451657
900233.1658	285450.3342	1185684	829376	3.21611E-05	0.004794686	0.097919609
1110306.52	82101.07974	1192408	821382	0.00259394	0.023347077	0.079780431
1313874.305	-182196.9051	1131677	794877	1.036670179	0.148535016	0.520861713

	Theil's U
USAF Pred	0.708828082
Serv Inv Pred	0.37852461

Appendix E: Statistical Results

F-16C TNMCS Rates By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.917506582
Adjusted R Square	0.905721808
Standard Error	1.056578697
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	86.91437909	86.91437909	77.85525509	4.85108E-05
Residual	7	7.814509797	1.116358542		
Total	8	94.72888889			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	20.42502537	1.190703328	17.15374846	5.61679E-07
SERV/TAI	-0.029519361	0.003345515	-8.823562494	4.85108E-05

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv/TAI Num*	*USAF-Num*
5.03729337	0.96270663	6.0	7.9	0	0.013000024	0.307520661
6.684105876	-0.684105876	6	9.3	0.09	0.001929984	0.077160494
8.063589531	-0.263589531	7.8	9.5	0.053254438	0.005176805	1.14143E-06
10.16121011	-0.561210114	10	9.6	0.001736111	0.005846985	0.002534843
10.73406955	-0.734069548	10	9.5	0.0144	0.015374926	0.028617361
12.43995671	-1.23995671	11.2	9.5	0.045918367	0.030231017	0.135100004
11.65264826	1.947351735	13.6	9.5	0.000216263	0.000563426	0.101523453
13.47718225	0.322817749	13.8	9.5	0.015175383	0.000328334	0.196672968
15.24994433	0.250055665	15.5	9.4	0.220700563	0.0724515	0.849130924

Theil's U	
USAF Pred	1.961487788
Serv Inv/TAI Pred	0.572956924

Appendix E: Statistical Results

F-16C TNMCS Hours By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.833438563
Adjusted R Square	0.805678323
Standard Error	137504.3437
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	5.67653E+11	5.67653E+11	30.02274394	0.001544421
Residual	6	1.13445E+11	18907444527		
Total	7	6.81098E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1833384.353	180819.4881	10.13930728	5.35232E-05
SERV/TAI	-3007.29006	548.8455251	-5.47930141	0.001544421

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv/TAI Num*	*USAF-Num*
433525.7986	-125016.7986	308509	478020	0.841812153	0.003219893	0.177611433
574060.9349	17506.06505	591567	721585	0.119726315	0.000206535	2.34555E-05
787756.3953	8501.604721	796258	799123	0.004786371	4.31325E-05	0.002339274
846116.5494	5229.450576	851346	812834	0.021217808	0.002738092	0.029735854
1019904.1	-44548.19958	975356	828549	0.046501429	0.063605785	0.133451657
939696.9153	245986.5847	1185684	829376	3.21611E-05	0.003177481	0.097919609
1125571.631	66835.96876	1192408	821382	0.00259394	0.021414843	0.079780431
1306172.076	-174494.6756	1131677	794877	1.036670179	0.094405761	0.520861713

Theil's U	
USAF Pred	0.708828082
Serv Inv/TAI Pred	0.301772003

Appendix E: Statistical Results

F-16C TNMCS Rates By Serviceable Inventory/OST

Regression Statistics	
R Square	0.226212196
Adjusted R Square	0.115671081
Standard Error	3.235959979
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	21.42882997	21.42882997	2.046407766	0.195650233
Residual	7	73.30005892	10.47143699		
Total	8	94.72888889			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.406840662	7.623376227	-0.053367517	0.958930203
SERV/OST	1.808671431	1.264339165	1.430527094	0.195650233

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	7.73219171	-1.73219171
2	10.47843918	-4.478439177
3	10.87611153	-3.076111535
4	9.355210514	0.244789486
5	9.310365243	0.689634757
6	11.10021013	0.099789866
7	12.85343246	0.746567536
8	12.44578268	1.354217323
9	9.348256547	6.151743453

Appendix E: Statistical Results

F-16C TNMCS Hours By Serviceable Inventory/OST

Regression Statistics	
R Square	0.138997575
Adjusted R Square	-0.004502829
Standard Error	312630.5215
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	94670974947	94670974947	0.968621488	0.363031251
Residual	6	5.86427E+11	97737842978		
Total	7	6.81098E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-53157.18415	953664.705	-0.055739909	0.957358778
SERV/OST	151525.4947	153960.2688	0.984185698	0.363031251

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	858781.4821	-550272.4821
2	892097.3734	-300530.3734
3	764680.4885	31577.51153
4	760923.4756	90422.52444
5	910871.7348	64484.16523
6	1057751.857	127931.643
7	1023600.084	168807.5157
8	764097.9044	367579.4956

Appendix E: Statistical Results

F-16C TNMCS Rates By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.403996742
Adjusted R Square	0.318853419
Standard Error	2.839988089
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	38.27016249	38.27016249	4.744902241	0.065807644
Residual	7	56.4587264	8.065532343		
Total	8	94.72888889			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	20.5868331	4.776402673	4.31011255	0.003522618
SERV/BRC	-0.365614748	0.167845643	-2.178279652	0.065807644

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	11.38985293	-5.389852929
2	8.153091947	-2.153091947
3	6.463470096	1.336529904
4	9.584871262	0.015128738
5	10.06944654	-0.069446544
6	12.37161096	-1.17161096
7	10.28038383	3.319616171
8	11.48745736	2.312542642
9	13.69981508	1.800184924

Appendix E: Statistical Results

F-16C TNMCS Hours By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.576192981
Adjusted R Square	0.505558478
Standard Error	219337.6874
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3.92444E+11	3.92444E+11	8.157387061	0.028948695
Residual	6	2.88654E+11	48109021100		
Total	7	6.81098E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1940207.113	379528.054	5.112157302	0.002195047
SERV/BRC	-37581.49532	13158.26175	-2.856113979	0.028948695

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv/BRC Num*	*USAF-Num*
662144.3766	-353635.3766	308509	478020	0.841812153	0.111678676	0.177611433
488468.3528	103098.6472	591567	721585	0.119726315	0.000487302	2.34555E-05
809316.7976	-13058.79764	796258	799123	0.004786371	9.54723E-05	0.002339274
859126.2318	-7780.23175	851346	812834	0.021217808	0.020003663	0.029735854
1095765.431	-120409.5312	975356	828549	0.046501429	0.097705169	0.133451657
880808.4496	304875.0504	1185684	829376	3.21611E-05	0.025013654	0.097919609
1004883.39	187524.2096	1192408	821382	0.00259394	0.007119789	0.079780431
1232291.37	-100613.9702	1131677	794877	1.036670179	0.262103725	0.520861713

Theil's U	
USAF Pred	0.708828082
Serv Inv/BRC Pred	0.502824342

Appendix E: Statistical Results

F-16C TNMCS Rates By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.350199169
Adjusted R Square	0.257370479
Standard Error	2.96539351
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	33.17397821	33.17397821	3.772531629	0.093218659
Residual	7	61.55491068	8.793558668		
Total	8	94.72888889			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	26.99710814	8.607740758	3.136375606	0.016462342
SERV/DRC	-11.04510167	5.686607759	-1.942300602	0.093218659

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	11.17212532	-5.172125316
2	8.395763286	-2.395763286
3	6.984334457	0.815665543
4	9.56392205	0.03607795
5	10.6345463	-0.634546297
6	12.30383885	-1.103838845
7	9.422981912	4.177018088
8	11.36075073	2.439249267
9	13.6617371	1.838262895

Appendix E: Statistical Results

F-16C TNMCS Hours By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.461975459
Adjusted R Square	0.372304702
Standard Error	247132.7095
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3.14651E+11	3.14651E+11	5.151907659	0.063686825
Residual	6	3.66447E+11	61074576083		
Total	7	6.81098E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2523306.832	729640.1602	3.458289401	0.013495474
SERV/DRC	-1087052.016	478923.6577	-2.269781412	0.063686825

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	692574.0766	-384065.0766
2	553662.1318	37904.8682
3	807543.5334	-11285.53342
4	912913.7039	-61567.70392
5	1077204.435	-101848.5351
6	793672.293	392011.207
7	984386.2914	208021.3086
8	1210847.935	-79170.53469

Appendix E: Statistical Results

F-16D TNMCS Rates By Serviceable Inventory

Regression Statistics	
R Square	0.740737282
Adjusted R Square	0.703699751
Standard Error	1.901430825
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	72.30748129	72.30748129	19.99963979	0.002893635
Residual	7	25.30807427	3.615439181		
Total	8	97.61555556			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	22.39317983	2.947022589	7.5985776	0.000126431
SERV INV	-3.88767E-05	8.69316E-06	-4.472095682	0.002893635

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
8.228938594	-2.228938594	6.0	7.9	0.006944444	0.000941902	0.222040863
6.31585748	0.18414252	6.5	9.3	0.060591716	0.008690261	0.493596318
5.505940211	-0.605940211	4.9	9.5	0.570179092	0.004528343	0.04234636
8.270264474	0.329735526	8.6	9.6	0.000540833	2.53173E-05	0.006944444
8.756728007	0.043271993	8.8	9.5	0.010459711	0.027192795	0.000474382
11.15114094	-1.451140936	9.7	9.5	0.161653736	0.142498861	0.180114193
9.938344935	3.661655065	13.6	9.5	0.000865052	0.012197519	0.111111111
12.49798363	1.50201637	14	9.5	0.000816327	0.010503347	0.090859184
15.03480173	-1.434801732	13.6	9.4	0.81205091	0.206578345	1.147486856

Theil's U	
USAF Pred	1.188727284
Serv Inv Pred	0.504371767

Appendix E: Statistical Results

F-16D TNMCS Hours By Serviceable Inventory

Regression Statistics	
R Square	0.701658715
Adjusted R Square	0.651935167
Standard Error	36399.53206
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	18696289291	18696289291	14.11119581	0.009437438
Residual	6	7949555607	1324925935		
Total	7	26645844898			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	335350.9948	56607.5963	5.924134157	0.001031025
SERV INV	-0.633432847	0.168623722	-3.756487163	0.009437438

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv-Num*	*USAF-Num*
73396.74129	-51872.74129	21524	30694	3.478353239	0.004642552	7.451234747
60200.43479	1466.56521	61667	120421	0.904823075	0.059841651	0.051189894
105240.6774	15085.32264	120326	134278	0.000516649	0.006761459	0.006915516
113166.8226	9894.177426	123061	133067	0.011877193	0.016291857	0.000629569
152179.9516	-15707.45161	136473	133385	0.149215084	0.173041731	0.175265033
132419.3805	56770.21948	189190	132056	0.000250594	0.009112472	0.105844338
174124.5992	18059.90085	192185	130634	0.002941082	0.030741128	0.084226251
215457.9927	-33695.99271	181762	125987	4.547976917	0.30043285	7.875305348

Theil's U	
USAF Pred	1.315905115
Serv Inv Pred	0.257018617

Appendix E: Statistical Results

F-16D TNMCS Rates By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.800471028
Adjusted R Square	0.771966889
Standard Error	1.66806695
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	78.13842411	78.13842411	28.0826245	0.001124217
Residual	7	19.47713145	2.78244735		
Total	8	97.61555556			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	21.17462879	2.268067104	9.335979854	3.35892E-05
SERV/TAI	-0.006278867	0.001184847	-5.299304152	0.001124217

RESIDUAL OUTPUT

Predicted TNMCS Rates	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv/TAI Num*	*USAF-Num*
6.124432354	-0.124432354	6.0	7.9	0.006944444	0.009984267	0.222040863
5.900472165	0.599527835	6.5	9.3	0.060591716	0.017730301	0.493596318
5.765508659	-0.865508659	4.9	9.5	0.570179092	0.008132623	0.04234636
9.041887179	-0.441887179	8.6	9.6	0.000540833	0.021175572	0.006944444
10.05145728	-1.251457277	8.8	9.5	0.010459711	0.035591508	0.000474382
11.36018263	-1.660182634	9.7	9.5	0.161653736	0.115642349	0.180114193
10.30139595	3.298604047	13.6	9.5	0.000865052	0.010864413	0.111111111
12.58243809	1.417561906	14	9.5	0.000816327	0.004822565	0.090859184
14.57222569	-0.972225686	13.6	9.4	0.81205091	0.223943599	1.147486856

Theil's U	
USAF Pred	1.188727284
Serv Inv/TAI Pred	0.525143142

Appendix E: Statistical Results

F-16D TNMCS Hours By Serviceable Inventory/TAI

Regression Statistics	
R Square	0.783339866
Adjusted R Square	0.747229843
Standard Error	31019.05955
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	20872752567	20872752567	21.69314264	0.003476077
Residual	6	5773092331	962182055.2		
Total	7	26645844898			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	329238.9144	44519.89337	7.395321272	0.000313858
SERV/TAI	-112.386165	24.12968296	-4.657589788	0.003476077

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv/TAI Num*	*USAF-Num*
55845.02409	-34321.02409	21524	30694	3.478353239	0.146475949	7.451234747
53429.29673	8237.703269	61667	120421	0.904823075	0.017908437	0.051189894
112073.5736	8252.426385	120326	134278	0.000516649	0.003465084	0.006915516
130143.9852	-7082.985183	123061	133067	0.011877193	0.019300747	0.000629569
153569.0112	-17096.51123	136473	133385	0.149215084	0.159899973	0.175265033
134617.6664	54571.93364	189190	132056	0.000250594	0.007827496	0.105844338
175446.3026	16738.19736	192185	130634	0.002941082	0.023242927	0.084226251
211061.7401	-29299.74015	181762	125987	4.547976917	0.378120612	7.875305348

Theil's U	
USAF Pred	1.315905115
Serv Inv/TAI Pred	0.288340768

Appendix E: Statistical Results

F-16D TNMCS Rates By Serviceable Inventory/OST

Regression Statistics	
R Square	0.280317968
Adjusted R Square	0.177506249
Standard Error	3.167968285
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	27.36339415	27.36339415	2.726517665	0.142677548
Residual	7	70.2521614	10.03602306		
Total	8	97.61555556			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-2.436999882	7.319248646	-0.332957657	0.748916172
SERV/OST	1.866363716	1.130295828	1.651217025	0.142677548

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	6.500322333	-0.500322333
2	9.54364547	-3.04364547
3	10.05854683	-5.158546832
4	8.381453291	0.218546709
5	8.354755576	0.445244424
6	10.29898578	-0.598985779
7	12.32690073	1.273099271
8	11.8641659	2.135834099
9	8.371224089	5.228775911

Appendix E: Statistical Results

F-16D TNMCS Hours By Serviceable Inventory/OST

Regression Statistics	
R Square	0.129107471
Adjusted R Square	-0.016041284
Standard Error	62190.12148
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3440177642	3440177642	0.889483833	0.382025708
Residual	6	23205667257	3867611209		
Total	7	26645844898			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-46762.58621	186889.4432	-0.250215236	0.810768101
SERV/OST	26479.83656	28076 71353	0.943124505	0.382025708

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	123217.9638	-101693.9638
2	130523.3479	-68856.3479
3	106728.8632	13597.13679
4	106350.0779	16710.92207
5	133934.6787	2537.821296
6	162706.5928	26483.00723
7	156141.3437	36043.15629
8	106583.732	75178.26798

Appendix E: Statistical Results

F-16D TNMCS Rates By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.433853994
Adjusted R Square	0.352975993
Standard Error	2.809795542
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	42.35089864	42.35089864	5.364301654	0.053702355
Residual	7	55.26465691	7.894950988		
Total	8	97.61555556			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	20.28761532	4.741501331	4.27873239	0.003661087
SERV/BRC	-0.372719982	0.16092595	-2.31609621	0.053702355

RESIDUAL OUTPUT

Predicted TNMCS Rate	*Residuals*	*Actual TNMCS Rate*	*USAF Pred TNMCS Rate*	*Denominator*	*Serv Inv/BRC Num*	*USAF-Num*
10.58235139	-4.582351387	6.0	7.9	0.006944444	0.010763884	0.222040863
7.122494841	-0.622494841	6.5	9.3	0.060591716	0.005379803	0.493596318
5.376756418	-0.476756418	4.9	9.5	0.570179092	0.00025512	0.04234636
8.678265101	-0.078265101	8.6	9.6	0.000540833	0.003128815	0.006944444
9.281048013	-0.481048013	8.8	9.5	0.010459711	0.051488501	0.000474382
11.69681485	-1.996814846	9.7	9.5	0.161653736	0.181132414	0.180114193
9.47171357	4.12828643	13.6	9.5	0.000865052	0.064665339	0.111111111
10.54160426	3.458395742	14	9.5	0.000816327	0.002162572	0.090859184
12.94895157	0.651048434	13.6	9.4	0.81205091	0.318976449	1.147486856

Theil's U	
USAF Pred	1.188727284
Serv Inv/BRC Pred	0.626740386

Appendix E: Statistical Results

F-16D TNMCS Hours By Serviceable Inventory/BRC

Regression Statistics	
R Square	0.589630543
Adjusted R Square	0.521235633
Standard Error	42690.04745
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	15711203991	15711203991	8.620971163	0.026077796
Residual	6	10934640908	1822440151		
Total	7	26645844898			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	341380.5298	74133.23115	4.604959537	0.003672839
SERV/BRC	-7288.491017	2482.330061	-2.936149036	0.026077796

RESIDUAL OUTPUT

Predicted TNMCS Hours	*Residuals*	*Actual TNMCS Hours*	*USAF Pred TNMCS Hours*	*Denominator*	*Serv Inv/BRC Num*	*USAF-Num*
83938.30273	-62414.30273	21524	30694	3.478353239	0.303942191	7.451234747
49800.61381	11866.38619	61667	120421	0.904823075	0.009355947	0.051189894
114361.1888	5964.811204	120326	134278	0.000516649	0.000658421	0.006915516
126148.5306	-3087.530638	123061	133067	0.011877193	0.089988974	0.000629569
173388.5384	-36916.03838	136473	133385	0.149215084	0.188887864	0.175265033
129876.9709	59312.62908	189190	132056	0.000250594	0.047853251	0.105844338
150798.5448	41385.95515	192185	130634	0.002941082	0.007028414	0.084226251
197873.9099	-16111.90989	181762	125987	4.547976917	0.647715062	7.875305348

Theil's U	
USAF Pred	1.315905115
Serv Inv/BRC Pred	0.377383469

Appendix E: Statistical Results

F-16D TNMCS Rates By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.356555896
Adjusted R Square	0.26463531
Standard Error	2.995476438
Observations	9

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	34.80540192	34.80540192	3.878955859	0.089556305
Residual	7	62.81015363	8.972879091		
Total	8	97.61555556			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	25.88380741	8.367244643	3.093468461	0.017481705
SERV/DRC	-9.956823434	5.055491529	-1.969506501	0.089556305

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Rate*	*Residuals*
1	10.2961003	-4.296100299
2	7.495114694	-0.995114694
3	6.051975177	-1.151975177
4	8.614953646	-0.014953646
5	9.777129941	-0.977129941
6	11.47473856	-1.774738558
7	8.55662519	5.04337481
8	10.53544832	3.464551677
9	12.89791417	0.702085828

Appendix E: Statistical Results

F-16D TNMCS Hours By Serviceable Inventory/DRC

Regression Statistics	
R Square	0.47305954
Adjusted R Square	0.38523613
Standard Error	48374.87945
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	12605071129	12605071129	5.386485675	0.059377355
Residual	6	14040773770	2340128962		
Total	7	26645844898			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	444558.9729	137347.345	3.236749665	0.01775923
SERV/DRC	-191343.9745	82444.56597	-2.320880366	0.059377355

RESIDUAL OUTPUT

Observation	*Predicted TNMCS Hrs*	*Residuals*
1	91176.63445	-69652.63445
2	63443.28629	-1776.286295
3	112696.9956	7629.004432
4	135030.9691	-11969.96912
5	167654.5445	-31182.04452
6	111576.076	77613.52404
7	149603.8552	42580.64485
8	195004.2389	-13242.23894

Appendix F: Verification of Regression Assumptions

Recall from Chapter III, that four assumptions are necessary for regression. Two are verified here. The first assumption is that the random error ε has a normal probability distribution. The second assumption is that the random errors are independent. Two statistical tests were chosen to verify these assumptions, the Shapiro-Wilk test and the Durbin-Watson test. The below table contains the results of the Durbin-Watson *d* statistic and the Shapiro-Wilk test for normality.

In one case for A/OA-10, when TNMCS hours were regressed against serviceable inventory/total active inventory, the Durbin-Watson test statistic was 1.10 with a p-value of .0370. This may represent autocorrelated residuals and so doubt this cast on inferences drawn. However, since other variables may be used in lieu of this one with TNMCS hours, i.e., serviceable inventory or serviceable inventory/base repair cycle, it is at the discretion of the researcher or implementing agency when using the results from this particular regression. Tests were only conducted on the models where Theil's U-statistics were computed.

Appendix F: Verification of Regression Assumptions

MDS/Dep. Var.	Model Used (Variable)	Shapiro-Wilk	Durbin-Watson
A/OA-10/Rates	Serv Inv	.96	1.84
A/OA-10/Hours	Serv Inv	.94	2.20
A/OA-10/Hours	Serv Inv/TAI	.97	1.10*
A/OA-10/Rates	Serv Inv/BRC	.94	2.00
A/OA-10/Hours	Serv Inv/BRC	.96	1.90
F-15A/Rates	Serv Inv	.90	1.73
F-15A/Hours	Serv Inv/TAI	.95	1.99
F-15B/Rates	Serv Inv	.92	1.80
F-15B/Rates	Serv Inv/BRC	.95	1.72
F-15C/Rates	Serv Inv	.95	2.13
F-15C/Hours	Serv Inv	.95	2.00
F-15C/Rates	Serv Inv/TAI	.94	2.03
F-15C/Hours	Serv Inv/TAI	.95	1.91
F-15D/Rates	Serv Inv	.94	1.66
F-15D/Hours	Serv Inv	.96	1.76
F-15D/Rates	Serv Inv/TAI	.95	1.50
F-15D/Hours	Serv Inv/TAI	.96	1.40
F-15D/Hours	Serv Inv/BRC	.90	1.57
F-15E/Rates	Serv Inv	.90	2.01
F-15E/Hours	Serv Inv	.92	1.34
F-15E/Rates	Serv Inv/TAI	.93	1.76
F-15E/Hours	Serv Inv/TAI	.95	1.93
F-16A	Null not rejected	N/A	N/A
F-16B	Null not rejected	N/A	N/A
F-16C/Rates	Serv Inv	.98	1.41
F-16C/Hours	Serv Inv	.93	1.53
F-16C/Rates	Serv Inv/TAI	.95	2.17
F-16C/Hours	Serv Inv/TAI	.94	1.73
F-16C/Hours	Serv Inv/BRC	.98	1.78
F-16D/Rates	Serv Inv	.93	1.94
F-16D/Hours	Serv Inv	.97	1.65
F-16D/Rates	Serv Inv/TAI	.89	1.93
F-16D/Hours	Serv Inv/TAI	.94	1.89
F-16D/Rates	Serv Inv/BRC	.99	1.80
F-16D/Hours	Serv Inv/BRC	.99	1.80

* See text for explanation

Appendix G: Supplemental Analysis

During the hypotheses testing serviceable inventory was shown to have a significant relationship to TNMCS rates and hours for almost every MDS in this study. This supplemental analysis is conducted to further substantiate this variable's validity and is based only on TNMCS hours. The analysis is based on January 1991 through January 1999. As was the case with the initial analysis, the A/OA-10 has 1991 deleted from its analysis, while the F-16C and F-16D have 1993 data deleted from their analyses. Supporting analysis is contained in the following pages.

Appendix G: Supplemental Analysis

A/OA-10 (Regression with Possessed Hours, Flying Hours, and Sorties)
Theil's *U*-statistic for This Model and USAF Predictions

Regression Statistics	
R Square	0.305727032
Adjusted R Square	0.280013218
Standard Error	6936.951092
Observations	85

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	1716429095	572143031.6	11.88960284	1.57126E-06
Residual	81	3897824526	48121290.45		
Total	84	5614253621			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	5320.525476	3267.422712	1.628355418	0.107333164
Possessed	-0.038737945	0.017035639	-2.273935597	0.025615933
Flying	2.44641982	1.872198077	1.306709931	0.195009146
Sorties	0.693634924	3.171912488	0.218680347	0.827449111

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*USAF Pred*	*Denominator*	*Numerator USAF Model*
1	30224.96538	-311.965379	0.019079947	29913	28408.45	0.033049011	0.000176973
2	28606.88814	-4131.888136	0.307156029	24475	24077.064	0.020019793	0.017812024
3	34576.45105	-13564.45105	0.089622846	21012	24278.475	0.021542393	0.002040449
4	30386.37819	-6290.378185	0.106132455	24096	23146.86	0.002183669	1.18338E-05
5	30819.9892	-7849.989204	0.005328692	22970	23052.891	0.069212287	2.933681454
6	18603.76147	-1676.761469	0.513749672	16927	56270	0.002312538	0.15439463
7	28245.6529	-12132.6529	0.494346645	16113	22764.14	0.031769915	0.304635214
8	24570.01632	-11329.01632	0.050775053	13241	22134.372	0.237878127	0.045876101
9	22682.63695	-2983.636954	0.271169829	19699	22535.051	0.049415311	0.060330796
10	25578.05123	-10258.05123	0.098759456	15320	20158.533	0.000153812	0.045038509
11	20324.46584	-4814.465837	0.009386555	15510	18761.253	0.033269196	0.001962416
12	16836.32549	1502.674505	0.030174894	18339	17651.92	0.013401354	0.017315584
13	17276.34654	3185.653458	0.047754851	20462	18048.795	0.039136758	0.000452856
14	20885.537	-4471.536998	0.047532326	16414	15978.56	0.012813346	4.25165E-05
15	21850.56543	-3578.565427	0.044089599	18272	18164.973	0.008778804	0.018598738
16	23820.6675	-3836.667498	0.090716753	19984	17492.116	0.004025999	0.006639917
17	24735.0253	-6019.0253	0.125648856	18716	17087.59	0.000611978	0.005591269
18	24887.25723	-6634.257232	0.011691676	18253	16853.515	0.078712017	0.067033417
19	25347.66133	-1973.661328	0.015281194	23374	18648.15	0.001837678	0.015701996
20	25261.42672	-2889.426718	0.010918083	22372	19443.06	0.035361885	0.00221391
21	20502.64206	-2337.642056	0.045943451	18165	19217.652	0.002570683	0.00013155
22	22979.56301	-3893.563007	0.071831176	19086	19294.344	0.001058652	0.000725626
23	23580.30353	-5115.303529	0.016592735	18465	18979.128	0.000294727	0.003601235
24	20526.5282	-2378.528201	0.106527151	18148	19256.09	0.348404364	0.01381985
25	13359.2345	-5923.234503	1.134610614	7436	9569.44	0.002266354	0.02984456
26	15002.6861	-7920.686096	1.509606159	7082	8366.612	0.030164656	0.049940448
27	17013.37232	-8701.372319	0.442703923	8312	9894.64	0.053356998	0.002960632
28	15762.47228	-5530.472279	0.315654803	10232	9779.73	4.81499E-05	0.002857463
29	15909.66144	-5748.661442	0.390658912	10161	9614.046	0.002479866	0.000835888
30	16005.90066	-6350.900662	0.174242452	9655	9361.228	0.024265605	0.000106202
31	15189.22474	-4030.22474	0.154012147	11159	11059.501	0.011143972	0.030378344
32	16716.28052	-4379.280516	0.063695382	12337	10392.055	0.098147641	0.016696695
33	11585.60515	-3113.605153	0.314338634	8472	10066.134	0.024423285	0.004350704
34	14545.90395	-4749.903954	0.399603826	9796	10354.812	0.024266744	0.027421413
35	14462.4655	-6192.465497	0.18559669	8270	9892.16	0.002433937	0.045530374
36	12240.79327	-3562.793271	0.017766205	8678	10442.64	1.520296388	0.017397604
37	20534.68999	-1156.689995	0.020425915	19378	20522.628	0.000883542	0.021613066
38	22723.48942	-2769.489425	0.00069868	19954	17105.166	0.073426496	0.169381294
39	25888.43532	-527.4353181	0.009206907	25361	17148.74	0.017448451	0.009472314
40	24444.45464	-2433.454639	0.073084547	22011	19542.72	0.003525913	0.000528618
41	26654.48758	-5950.487578	0.034932435	20704	20197.93	0.002817649	0.03706964
42	25672.62331	-3869.623309	0.00445341	21803	17816.76	0.016871511	0.051220889

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	USAF Pred	Denominator	Numerator USAF Model
43	23180.00139	1454.998615	0.057943786	24635	19700.538	0.008580768	0.015899946
44	28283.01784	-5930.01784	0.000199259	22353	19246.65	0.00030285	0.026858346
45	22426.46661	315.533392	0.054540991	22742	19078.675	0.002152026	0.000190678
46	26998.16955	-5311.169554	2.553E-05	21687	22001.036	0.003279776	0.031508501
47	23038.57831	-109.5783144	0.01106645	22929	19079.42	0.003184919	9.02463E-05
48	19222.93352	2412.066479	0.000386156	21635	21852.821	0.002119361	0.024289702
49	22205.85405	425.145949	0.055012628	22631	19259.152	0.006347226	0.00567789
50	26136.04922	-5308.049218	0.000170666	20828	19122.714	0.028969256	0.007065957
51	24645.09547	-272.0954677	0.023339423	24373	22622.214	0.00097488	0.062148467
52	27335.52307	-3723.52307	0.012001517	23612	17535.91	0.002089774	0.027473756
53	25119.32854	-2586.728537	0.014044278	22532.6	18618.8616	0.001210625	0.014981087
54	24418.90589	-2670.305894	0.00391677	21748.6	18990.6717	0.012407972	0.071028928
55	22810.08334	1361.116659	0.003726022	24171.2	18374.9256	0.002018288	0.067909235
56	23781.66213	1475.437868	0.033394196	25257.1	18958.2302	0.00149815	0.01858795
57	19663.99765	4615.502353	0.000636259	24279.5	20836.0068	0.00386738	0.092458135
58	25176.96983	612.4301698	0.009502184	25789.4	18406.7496	0.001008522	0.054985158
59	22456.47128	2513.928722	0.008354586	24970.4	18923.0657	0.018040527	1.25641E-05
60	19334.11987	2282.380129	0.001184254	21616.5	21527.9904	0.039985198	0.110594771
61	25195.11151	743.8884935	0.002395932	25939	18750.2617	2.25954E-05	0.112288194
62	24546.03123	1269.668774	0.001234562	25815.7	17123.6888	0.001332892	0.082215709
63	25851.13092	907.0690799	7.95694E-05	26758.2	19355.9916	0.000164314	0.161558954
64	26862.51233	238.6876732	0.018671213	27101.2	16345.9029	0.003877131	0.187206541
65	25085.52028	3703.179723	0.002512472	28788.7	17062.7232	0.003501387	0.075536287
66	25642.1789	1443.021101	0.016178593	27085.2	19172.9524	0.020303714	0.25605679
67	27499.49537	3445.104634	0.074590411	30944.6	17238.9324	0.0157523	0.329674737
68	26377.04445	8451.355547	0.096603497	34828.4	17060.8434	0.013150048	0.142254393
69	20009.4491	10825.0509	0.035368597	30834.5	17698.4024	0.000654425	0.194234512
70	25824.39723	5798.90277	0.118854214	31623.3	18033.9054	0.000424178	0.245093393
71	21372.39157	10902.20843	0.152963263	32274.6	16618.882	0.001622676	0.265122889
72	20951.93673	12622.76327	0.207026285	33574.7	16956.4809	0.020163937	0.418907973
73	23065.76408	15276.53592	0.06878048	38342.3	16611.7132	0.012086503	0.252215856
74	24071.33581	10055.66419	0.115363862	34127	14871.0764	0.010582572	0.363769971
75	26046.37708	11591.32292	0.03988105	37637.7	17054.5644	0.011893113	0.217992922
76	26016.76081	7516.339193	0.1102052	33533.1	15960.1662	0.004290961	0.299203314
77	24597.66025	11132.03975	0.011580278	35729.7	17387.2686	0.004702668	0.186094886
78	29434.56625	3844.933749	0.025397049	33279.5	17866.166	4.3701E-07	0.217116192
79	27953.92857	5303.571427	0.132449894	33257.5	17750.6745	0.017913276	0.314665219
80	25605.07644	12103.62356	0.15452149	37708.7	19052.896	0.001384898	0.242300638
81	21482.40356	14822.99644	0.067136263	36305.4	17743.6534	0.004547276	0.189410186
82	24450.22891	9406.971089	0.119304637	33857.2	18056.625	0.001466368	0.208801191
83	20866.25269	11694.44731	0.155192524	32560.7	17089.7307	0.004523773	0.270324585
84	21923.58077	12827.11923	0.305592997	34750.7	17821.4973	0.01238607	0.352911792
85	19407.85093	19210.34907	**10.19683085**	38618.2	17974.0673	**3.260866466**	**10.45215345**

	Theil's U
USAF Pred	**1.790343572**
New Model w/out Serv Inv	**1.768341342**

Appendix G: Supplemental Analysis

A/OA-10 (Regression with Possessed Hours, Flying Hours, Sorties, and Serviceable Inventory)
Theil's *U*-statistic for This Model

Regression Statistics	
R Square	0.898223584
Adjusted R Square	0.893134763
Standard Error	2672.542358
Observations	85

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	5042855009	1260713752	176.5091794	7.46884E-39
Residual	80	571398612.5	7142482.656		
Total	84	5614253621			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	52285.90227	2514.115583	20.79693655	5.25213E-34
Possessed	-0.00170297	0.006783835	-0.251033508	0.802431863
Flying	0.235657846	0.728524848	0.323472626	0.747181405
Sorties	2.28314767	1.224234435	1.864959525	0.065853916
Serv Inv	-0.360076112	0.016685145	-21.58064051	4.23868E-35

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*Denominator*
1	21078.74194	8834.258064	0.018111677	29913	0.033049011
2	20449.31945	4025.680548	0.017489938	24475	0.020019793
3	24248.80726	-3236.807263	0.014652427	21012	0.021542393
4	21552.55605	2543.443954	0.000418625	24096	0.002183669
5	22476.98822	493.0117785	0.045797769	22970	0.069212287
6	21842.67492	-4915.674919	0.101818912	16927	0.002312538
7	21514.24927	-5401.249265	0.18511297	16113	0.031769915
8	20173.57908	-6932.579077	0.009777891	13241	0.237878127
9	18389.68733	1309.312673	0.074670798	19699	0.049415311
10	20702.94048	-5382.940481	0.031796428	15320	0.000153812
11	18241.79393	-2731.79393	0.001389619	15510	0.033269196
12	17760.82444	578.1755575	0.014307546	18339	0.013401354
13	18268.39601	2193.603995	0.020182118	20462	0.039136758
14	19320.90913	-2906.909127	0.009163669	16414	0.012813346
15	19843.26392	-1571.263918	4.25706E-06	18272	0.008778804
16	20021.69996	-37.69996312	0.008202614	19984	0.004025999
17	20525.91656	-1809.916562	0.006245391	18716	0.000611978
18	19732.08406	-1479.084065	0.045693054	18253	0.078712017
19	19472.25085	3901.749155	0.015682028	23374	0.001837678
20	19444.92299	2927.077013	0.009012364	22372	0.035361885
21	16041.14839	2123.851607	0.011035935	18165	0.002570683
22	17177.7294	1908.2706	0.005405182	19086	0.001058652
23	17061.79838	1403.201618	0.019010435	18465	0.000294727
24	15602.07656	2545.923441	0.00092683	18148	0.348404364
25	7988.495691	-552.4956912	0.06931798	7436	0.002266354
26	9039.772982	-1957.772982	0.083587414	7082	0.030164656
27	10359.51158	-2047.511582	0.002519621	8312	0.053356998
28	9814.772324	417.2276756	0.000473529	10232	4.81499E-05
29	10383.65578	-222.6557818	0.016907665	10161	0.002479866
30	10976.22952	-1321.229522	0.005154074	9655	0.024265605
31	10465.84941	693.1505895	0.004317117	11159	0.011143972
32	11603.80047	733.1995339	0.00514857	12337	0.098147641
33	9357.223422	-885.2234222	0.023718618	8472	0.024423285
34	11100.76001	-1304.760011	0.099450376	9796	0.024266744
35	11359.24242	-3089.242425	0.05010475	8270	0.002433937
36	10529.16428	-1851.164279	0.122314046	8678	1.520296388
37	16343.00618	3034.993821	0.01215391	19378	0.000883542
38	17817.67678	2136.323217	0.047845455	19954	0.073426496
39	20996.34105	4364.658952	0.007486372	25361	0.017448451
40	19816.66927	2194.330729	0.001567932	22011	0.003525913
41	21575.57234	-871.5723423	3.38214E-05	20704	0.002817649

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	Denominator
42	21923.40649	-120.4064897	0.032923276	21803	0.016871511
43	20678.8953	3956.104699	0.004014761	24635	0.008580768
44	23913.92643	-1560.926426	0.005235142	22353	0.00030285
45	21124.66469	1617.335307	0.00384751	22742	0.002152026
46	23097.6476	-1410.647602	0.000597787	21687	0.003279776
47	22398.75975	530.2402517	0.00234417	22929	0.003184919
48	20524.85521	1110.144785	0.000995457	21635	0.002119361
49	23313.60299	-682.6029929	0.026541441	22631	0.006347226
50	24514.93936	-3686.939358	0.002046105	20828	0.028969256
51	23430.86843	942.1315667	0.009951586	24373	0.00097488
52	26043.39292	-2431.392922	0.01106053	23612	0.002089774
53	25015.8517	-2483.251699	0.010126669	22532.6	0.001210625
54	24016.086	-2267.486003	0.000172175	21748.6	0.012407972
55	23885.82466	285.3753413	0.001520653	24171.2	0.002018288
56	24314.53079	942.5692062	0.013977797	25257.1	0.00149815
57	21293.41031	2986.089689	0.000373468	24279.5	0.00386738
58	25320.19102	469.2089805	0.003703934	25789.4	0.001008522
59	23400.8582	1569.541796	1.71587E-05	24970.4	0.018040527
60	21513.06505	103.4349512	0.000558083	21616.5	0.039985198
61	25428.33656	510.6634408	0.000316432	25939	2.25954E-05
62	25354.28337	461.4166261	0.000127814	25815.7	0.001332892
63	27050.05878	-291.8587785	0.004682665	26758.2	0.000164314
64	28932.26366	-1831.063659	3.6624E-05	27101.2	0.003877131
65	28952.71041	-164.0104057	0.004067009	28788.7	0.003501387
66	28921.14479	-1835.94479	0.000653395	27085.2	0.020303714
67	31636.94061	-692.3406115	0.009755406	30944.6	0.0157523
68	31772.01861	3056.381391	0.003143497	34828.4	0.013150048
69	28881.77962	1952.720376	0.001408157	30834.5	0.000654425
70	32780.37762	-1157.077617	0.000622554	31623.3	0.000424178
71	31485.56605	789.0339484	0.001416985	32274.6	0.001622676
72	32359.79156	1214.908438	0.015232323	33574.7	0.020163937
73	34198.53416	4143.765844	2.91505E-05	38342.3	0.012086503
74	34334.01468	-207.0146768	0.002327448	34127	0.010582572
75	35991.28952	1646.410485	0.005227285	37637.7	0.011893113
76	36254.30452	-2721.204522	4.4227E-06	33533.1	0.004290961
77	35659.17917	70.520835	0.015209225	35729.7	0.004702668
78	37685.88972	-4406.389718	0.014843283	33279.5	4.3701E-07
79	37312.0417	-4054.541698	0.002803899	33257.5	0.017913276
80	35947.65353	1761.046466	0.003784952	37708.7	0.001384898
81	33985.48683	2319.913171	0.002144732	36305.4	0.004547276
82	35538.54835	-1681.34835	0.001650358	33857.2	0.001466368
83	33936.13528	-1375.435278	6.49923E-06	32560.7	0.004523773
84	34833.70892	-83.0089213	0.019510979	34750.7	0.01238607
85	33764.16299	4854.037015	**1.45702253**	38618.2	**3.260866466**

	Theils' U
New Model with Serv Inv	**0.66844646**

Appendix G: Supplemental Analysis

F-15A (Regression with Possessed Hours, Flying Hours, and Sorties)
Theil's *U*-statistic for This Model and USAF Predictions

Regression Statistics	
R Square	0.724114578
Adjusted R Square	0.715215048
Standard Error	1936.044505
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	914939040.9	304979680.3	81.3654877	6.53403E-26
Residual	93	348588954.2	3748268.325		
Total	96	1263527995			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2926.875319	748.5879505	3.909861649	0.00017535
Flying Hours	0.791802634	1.33639563	0.592491188	0.554959603
Sorties	-3.804287178	1.896179239	-2.006290913	0.04772977
Possessed Hours	0.161554027	0.019266107	8.385400693	5.27738E-13

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*USAF Pred*	*Denominator*	*Numerator USAF Model*
1	15895.70492	1282.295077	0.005572252	17178	8827.86	0	0.236288354
2	15895.70492	1282.295077	0.009783715	17178	8827.86	0.005002733	0.073256348
3	16693.87828	1699.121723	0.010921491	18393	13743.618	0.057774459	0.008171893
4	15894.17768	-1922.177684	0.003569139	13972	12309.3	0.003156619	0.011167703
5	15591.71906	-834.7190585	0.054631615	14757	13280.476	0.007049308	0.001509968
6	16967.21364	-3449.213644	0.025518583	13518	12944.568	0.021867579	0 018313029
7	17676.4379	-2159.437898	0.051635775	15517	13687.668	0.209245665	0.293824152
8	19088.99349	3526.006508	0.004471852	22615	14203.925	0.041716008	0.000344089
9	19508.30826	-1512.30826	0.002305245	17996	17576.5	0.004543281	0.107133918
10	18344.95862	864.0413764	0.017090893	19209	13318.672	0.051849914	0.000784793
11	17346.23369	-2511.233691	0.004971482	14835	14296.876	0.018084675	0.010005784
12	17875.99709	-1045.997089	0.002894582	16830	15346.071	0.094840577	0.020126825
13	22918.47623	-905.4762259	0.035895484	22013	19625.344	0.004114442	0.103683649
14	19254.39421	4170.605786	0.000518116	23425	16336.826	0.034865698	0.019050198
15	19584.2038	-533.203801	0.010556332	19051	15817.824	0.000223797	0.151749241
16	17378.62385	1957.376152	0.038223368	19336	11914.682	0.021224644	0.18567399
17	18372.6578	3780.3422	0.001369932	22153	13821.136	0.03838083	0.117892925
18	16993.0599	819.9401015	0.003016879	17813	10206.648	0.001461572	0.113676749
19	17515.60102	978.3989769	0.004486894	18494	12488.172	0.00082438	0.023723012
20	17786.19271	1238.80729	0.007274756	19025	16176.503	0.000171297	0.078111568
21	17651.31625	1622.683751	0.020265478	19274	13956.808	5.45106E-06	0.120262208
22	16575.21369	2743.786307	0.004252896	19319	12635	0.001630121	0.041246374
23	17279.12621	1259.873794	0.025538165	18539	14615.465	0.009364234	0.109164459
24	17370.34454	2962.65546	0.001168455	20333	14207.706	0.020765018	0.030683398
25	16707.96371	695.0362907	0.001276117	17403	13841.334	0.012632504	0.058577183
26	14825.31654	621.6834596	0.019742131	15447	11235	0.024321217	0.020548268
27	15208.40691	-2170.406906	0.008086273	13038	10823.724	0.000135914	0.049840477
28	14362.42527	-1172.42527	0.120069736	13190	10279.269	0.062974742	0.000803046
29	14450.47747	-4570.477474	0.024648012	9880	10253.779	0.064798073	0.130560803
30	13946.1289	-1551.128898	0.030044219	12395	8825.04	0.003281131	0.013321015
31	15253.45862	-2148.458615	0.031033385	13105	11674.41	0.094425482	0.198240343
32	14823.38453	2308.615471	0.006360385	17132	11297.105	0.037103233	0.002114969
33	15198.31165	-1366.311652	0.008629945	13832	13044.12	0.050748702	0.144559495
34	15663.0418	1284.958197	0.000994413	16948	11688.938	0.0307718	0.039312491
35	14509.4435	-534.4434951	0.055105866	13975	10614.656	0.020114242	0.000671895
36	15273.58074	-3280.580742	0.003553751	11993	11630.755	0.048677023	0.030320819
37	15353.94285	-714.9428529	0.016916539	14639	12550.674	0.056122286	0.015883816
38	13075.00097	-1904.000973	0.084224586	11171	9326.032	0.004376277	0.005980186
39	13673.98869	-3241.98869	0.1170574	10432	9568.128	9.37363E-05	4.4061E-05
40	13900.1682	-3569.168204	0.095644475	10331	10261.754	0.000277187	0.011004946
41	13698.01062	-3195.010617	0.025790215	10503	9419.232	0.002594662	0.057124732

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	USAF Pred	Denominator	Numerator USAF Model
42	12724.71166	-1686.711661	0.089394574	11038	8527.701	0.003673427	0.00468854
43	13669.24338	-3300.243379	0.051222083	10369	9613.196	0.148889254	0.393663604
44	12023.25722	2346.74278	0.006568421	14370	7864.218	0.049187029	0.00183507
45	12347.62805	-1164.628048	0.014418047	11183	10567.422	0.000617978	0.039333073
46	12247.80064	-1342.800645	0.048257676	10905	8687.124	0.104132716	0.302585343
47	12028.42997	2395.570033	0.00820338	14424	8425.404	0.001360354	0.105701081
48	12585.58212	1306.417882	0.017284236	13892	9202.512	0.061567712	0.024927345
49	12271.37467	-1826.374666	0.001056121	10445	8251.676	0.016581648	0.191191644
50	11450.55829	339.441709	0.016401425	11790	7222.875	0.007426083	0.198686068
51	11296.07769	1509.922306	2.14642E-06	12806	7550.7	0.00561973	0.115754626
52	11827.23835	18.76165192	0.062306622	11846	7489.049	0.05602896	0.016182671
53	11998.91493	-2956.914934	0.065385528	9042	7535.057	0.001986466	0.036426859
54	10951.09311	-2312.093112	0.15046575	8639	6913.26	0.0004991	0.000281932
55	12183.06075	-3351.06075	0.000968021	8832	8686.944	0.050005305	0.15021496
56	11081.79035	-274.7903489	0.006110813	10807	7383.931	0.000406914	0.024660188
57	11433.80146	-844.8014633	0.003552865	10589	8891.916	0.000164956	0.069480459
58	11084.16701	-631.1670146	0.001047773	10453	7661.83	0.003506706	0.138760206
59	10733.64343	338.3565716	0.000848396	11072	7178.202	0.00599114	0.108024311
60	11606.5032	322.496804	0.006743633	11929	8289.96	0.008786803	0.054360238
61	11790.40501	-979.6050104	7.44104E-05	10810.8	8029.52	0.000485476	0.141789433
62	10665.85551	-93.25551345	0.000602743	10572.6	6501.8	0.001189241	0.160608337
63	11196.76607	-259.5660684	0.00077063	10937.2	6700.128	0.006156937	0.144969247
64	9775.380939	303.6190609	0.014278803	10079	5914.68	0.017554475	0.285762854
65	10210.02053	1204.379466	0.008249	11414.4	6026.49	0.001377878	0.166312178
66	9953.998478	1036.701522	1.85883E-07	10990.7	6335.749	0.001053308	0.127461935
67	10629.26145	4.738546202	0.053161427	10634	6710.121	0.038104626	0.297686092
68	10257.94395	2451.856055	0.035408924	12709.8	6907.824	0.09295355	0.000276217
69	11226.436	-2391.636004	0.020564329	8834.8	8623.566	0.132087012	0.307445572
70	10778.76598	1266.934019	0.003729797	12045.7	7147	0.000326928	0.095409941
71	11092.24425	735.655755	0.050623411	11827.9	8107.164	0.049205434	0.212516175
72	11790.36428	2661.235722	0.001725272	14451.6	8999	0.035620307	0.052575574
73	11123.83263	600.2673733	0.002677409	11724.1	8410.44	0.011276639	0.113829014
74	9872.451905	606.6480952	0.004792909	10479.1	6523.558	0.018843942	0.184088664
75	11192.12314	725.4768602	0.019044445	11917.6	7421.484	0.049608389	0.032415166
76	10907.84802	-1644.648024	0.013811498	9263.2	7117.53	0.003543329	0.075484585
77	10903.23285	-1088.632852	0.004545634	9814.6	7269.586	0.017801877	0.184295885
78	10462.38672	661.7132782	0.006957608	11124.1	6910.722	0.001002987	0.16290318
79	10548.51347	927.8865278	0.001916987	11476.4	6986.5724	0.021073596	0.064914074
80	10312.87593	-502.4759292	0.124427894	9810.4	6886.4152	0.198967066	0.36383149
81	10725.84632	3460.553676	0.088293912	14186.4	8268.9192	0.008708953	0.314665213
82	11294.91175	4215.388249	0.011555775	15510.3	7552.435	0.047486188	0.08842731
83	10463.07703	1667.322967	0.002396553	12130.4	7518.144	0.008139579	0.084630755
84	10442.16106	593.8389385	0.005741885	11036	7507.101	0.004302628	0.052119285
85	11148.35539	-836.255394	0.015862809	10312.1	7792.62	0.028399151	0.04932318
86	9873.084683	-1298.784683	0.003295377	8574.3	6284.104	0.050017121	0.25719506
87	9999.689098	492.2109024	0.011050083	10491.9	6143.495	0.019806943	0.056769204
88	10118.20198	-1102.901979	0.063155131	9015.3	6515.4696	0.220098809	0.40800739
89	10979.1934	2265.606604	0.00070726	13244.8	7486.236	0.061499866	0.074110217
90	9607.963138	352.2368616	0.003109627	9960.2	6354.5427	0.001427356	0.127076666
91	9781.079099	555.4209007	0.02925074	10336.5	6785.9064	0.008210343	0.196007613
92	9505.264143	1767.835857	0.033678613	11273.1	6696.8475	0.004050952	0.170865586
93	9921.790694	2068.809306	0.004158551	11990.6	7330.7637	0.017950627	0.074094197
94	9610.864252	773.2357478	0.0023868	10384.1	7120.2288	0.002005248	0.032158397
95	10426.41399	-507.3139914	0.012586538	9919.1	8056.944	0.000238858	0.023141329
96	10878.62124	-1112.821241	0.00553862	9765.8	8256.8793	0.035956094	0.119806618
97	10890.81058	726.7894248	2.205479925	11617.6	8237.3546	2.904574507	9.93448502

	Theils' U
USAF Pred	**1.84940241**
New Model w/out Serv Inv	**0.87138543**

Appendix G: Supplemental Analysis

F-15A (Regression with Possessed Hours, Flying Hours, Sorties, and Serviceable Inventory)
Theil's *U*-statistic for This Model

Regression Statistics	
R Square	0.757592874
Adjusted R Square	0.747053434
Standard Error	1824.614877
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	957239805.7	239309951.4	71.88169929	1.75214E-27
Residual	92	306288189.5	3329219.451		
Total	96	1263527995			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	5623.157947	1034.361665	5.436355713	4.4405E-07
Flying Hours	-0.09584722	1.283861188	-0.074655439	0.940650954
Sorties	-2.578153764	1.819848795	-1.4166857	0.159952124
Possessed Hours	0.187661923	0.019578852	9.584929758	1.70477E-15
Serv Inv	-0.024984592	0.007009215	-3.56453512	0.000580356

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*Denominator*
1	14577.97972	2600.020281	0.020489519	17178	0
2	14719.11351	2458.886487	0.021429069	17178	0.005002733
3	15878.36907	2514.63093	0.004565103	18393	0.057774459
4	15214.73304	-1242.733043	0.003033402	13972	0.003156619
5	15526.52653	-769.5265299	0.042493049	14757	0.007049308
6	16559.9847	-3041.984701	0.024112982	13518	0.021867579
7	17616.12308	-2099.123085	0.052291523	15517	0.209245665
8	19066.67488	3548.325116	0.004316418	22615	0.041716008
9	19481.79309	-1485.793095	0.003493785	17996	0.004543281
10	18145.28796	1063.712044	0.015536471	19209	0.051849914
11	17229.31313	-2394.313134	0.005641249	14835	0.018084675
12	17944.23086	-1114.230857	0.018452611	16830	0.094840577
13	24299.19373	-2286.193727	0.017990211	22013	0.004114442
14	20472.44931	2952.550691	0.00676739	23425	0.034865698
15	20978.0376	-1927.0376	0.003296635	19051	0.000223797
16	18242.16152	1093.838482	0.02342191	19336	0.021224644
17	19193.77637	2959.223634	4.69779E-05	22153	0.03838083
18	17661.16235	151.8376535	0.000170769	17813	0.001461572
19	18261.22193	232.7780674	0.000401018	18494	0.00082438
20	18654.6497	370.3503031	0.00217038	19025	0.000171297
21	18387.67592	886.3240753	0.010530565	19274	5.45106E-06
22	17341.13024	1977.869756	0.001002706	19319	0.001630121
23	17927.25349	611.7465126	0.02310369	18539	0.009364234
24	17515.09091	2817.909088	0.001035258	20333	0.020765018
25	16748.77699	654.2230148	0.003276396	17403	0.012632504
26	14450.85561	996.1443855	0.018933422	15447	0.024321217
27	15163.48824	-2125.488244	0.005183268	13038	0.000135914
28	14128.66975	-938.6697549	0.119917879	13190	0.062974742
29	14447.58634	-4567.586341	0.020229846	9880	0.064798073
30	13800.24883	-1405.248835	0.020083082	12395	0.003281131
31	14861.55483	-1756.554835	0.039127842	13105	0.094425482
32	14539.73157	2592.268434	0.001392702	17132	0.037103233
33	14471.34769	-639.3476892	0.020294411	13832	0.050748702
34	14977.51467	1970.485329	0.000368315	16948	0.0307718
35	13649.742	325.2579967	0.023595404	13975	0.020114242
36	14139.6712	-2146.671201	0.001316344	11993	0.048677023
37	14203.87652	435.1234831	0.001552221	14639	0.056122286
38	11747.75079	-576.7507946	0.045605184	11171	0.004376277
39	12817.6084	-2385.608403	0.063938002	10432	9.37363E-05

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	Denominator
40	12968.83186	-2637.831856	0.055157917	10331	0.000277187
41	12929.31002	-2426.310018	0.008812208	10503	0.002594662
42	12023.95194	-985.9519392	0.046808113	11038	0.003673427
43	12757.09147	-2388.091466	0.088023819	10369	0.148889254
44	11293.64126	3076.358745	0.00111331	14370	0.049187029
45	11662.47372	-479.4737235	0.003752852	11183	0.000617978
46	11590.07649	-685.0764941	0.079659933	10905	0.104132716
47	11346.16285	3077.837155	0.019233885	14424	0.001360354
48	11891.58903	2000.410966	0.008439227	13892	0.061567712
49	11721.19228	-1276.19228	0.009916275	10445	0.016581648
50	10749.88172	1040.118281	0.02647367	11790	0.007426083
51	10887.68075	1918.319248	0.001569634	12806	0.00561973
52	11338.64406	507.3559418	0.052943266	11846	0.05602896
53	11767.69397	-2725.69397	0.062249688	9042	0.001986466
54	10894.96882	-2255.968816	0.147534708	8639	0.0004991
55	12150.26124	-3318.261242	0.001675471	8832	0.050005305
56	11168.51601	-361.5160054	0.0063703	10807	0.000406914
57	11451.55165	-862.5516497	0.00222871	10589	0.000164956
58	10952.89842	-499.8984247	0.000830076	10453	0.003506706
59	10770.83826	301.1617442	0.000776815	11072	0.00599114
60	11620.4078	308.5921957	0.005518408	11929	0.008786803
61	11696.95756	-886.1575648	9.31415E-06	10810.8	0.000485476
62	10539.60643	32.9935728	0.000354479	10572.6	0.001189241
63	11136.25677	-199.0567717	0.002021623	10937.2	0.006156937
64	9587.236527	491.7634726	0.015548366	10079	0.017554475
65	10157.61838	1256.781619	0.01192449	11414.4	0.001377878
66	9744.255357	1246.444643	8.8041E-05	10990.7	0.001053308
67	10530.87409	103.1259141	0.058947201	10634	0.038104626
68	10127.9664	2581.833604	0.031239063	12709.8	0.09295355
69	11081.20323	-2246.403225	0.024076378	8834.8	0.132087012
70	10674.84253	1370.857469	0.005410951	12045.7	0.000326928
71	10941.82835	886.0716466	0.056209616	11827.9	0.049205434
72	11647.37438	2804.225617	0.003788492	14451.6	0.035620307
73	10834.59356	889.5064388	0.006470861	11724.1	0.011276639
74	9535.993901	943.1060992	0.007180733	10479.1	0.018843942
75	11029.60941	887.9905927	0.014004987	11917.6	0.049608389
76	10673.56055	-1410.360554	0.009397182	9263.2	0.003543329
77	10712.56594	-897.9659392	0.004145568	9814.6	0.017801877
78	10492.17629	631.923706	0.004758147	11124.1	0.001002987
79	10709.06711	767.3328894	0.006029111	11476.4	0.021073596
80	10701.51202	-891.112024	0.095195085	9810.4	0.198967066
81	11159.52855	3026.871452	0.06873843	14186.4	0.008708953
82	11790.90754	3719.392459	0.005683496	15510.3	0.047486188
83	10961.09452	1169.305482	5.48235E-06	12130.4	0.008139579
84	11007.59737	28.402631	0.018064415	11036	0.004302628
85	11795.38173	-1483.281732	0.025908275	10312.1	0.028399151
86	10234.14052	-1659.840516	3.374E-05	8574.3	0.050017121
87	10541.70482	-49.80482001	0.027608843	10491.9	0.019806943
88	10758.62455	-1743.324546	0.022258767	9015.3	0.220098809
89	11899.77382	1345.02618	0.001541206	13244.8	0.061499866
90	10480.16704	-519.9670443	0.002651963	9960.2	0.001427356
91	10849.42254	-512.9225403	0.003908013	10336.5	0.008210343
92	10626.92294	646.1770561	0.007392278	11273.1	0.004050952
93	11021.35738	969.2426162	0.000955718	11990.6	0.017950627
94	10754.78566	-370.6856613	0.024188348	10384.1	0.002005248
95	11534.0979	-1614.997903	0.05755567	9919.1	0.000238858
96	12145.46776	-2379.667758	0.003416353	9765.8	0.035956094
97	12188.40685	-570.8068495	**1.94640598**	11617.6	**2.904574507**

	Theils' U
New Model with Serv Inv	**0.818607**

Appendix G: Supplemental Analysis

F-15B (Regression with Possessed Hours, Flying Hours, and Sorties) Theil's *U*-statistic for This Model and USAF Predictions

Regression Statistics	
R Square	0.175355092
Adjusted R Square	0.148753643
Standard Error	651.3898784
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	8391050.998	2797016.999	6.591937695	0.000434649
Residual	93	39460715.95	424308.7736		
Total	96	47851766.95			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	666.701217	243.8228427	2.734367337	0.007483444
Possessed Hours	0.172062719	0.039412649	4.365672509	3.28356E-05
Flying Hours	-1.504745405	3.71232474	-0.405337763	0.686160202
Sorties	-3.689550486	5.00615594	-0.737002708	0.462975969

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*USAF Pred*	*Denominator*	*Numerator USAF Model*
1	900.8802547	-54.88025474	0.004208153	846	638.802	0	0.059983305
2	900.8802547	-54.88025474	0.35059364	846	638.802	0.271729289	0.525234292
3	905.9246225	-500.9246225	0.36331185	405	1018.122	0.85733882	0.096974573
4	1024.115191	-244.1151906	0.001184875	780	906.12	0.143039119	0.022395506
5	1048.150834	26.84916621	0.204349939	1075	958.272	0.296138453	0.157914931
6	975.9546261	-485.9546261	1.064923824	490	917.189	0.017596835	1.490053684
7	930.6562174	-505.6562174	1.001229374	425	1023.132	0.689876817	0.411424144
8	1203.261162	-425.2611617	0.491672328	778	1050.605	0.064769596	0.121893426
9	1521.528545	-545.5285448	0.000922074	976	1247.625	0.179928951	0.135657871
10	1360.363104	29.63689588	0.61019499	1390	1030.522	0.280366441	0.091242243
11	1739.798204	-1085.798204	0.041367084	654	1073.868	0.610500893	0.264589112
12	1298.016404	-133.016404	0.081242631	1165	828.594	0.020303192	1.232103811
13	1663.061033	-332.0610326	0.047938988	1331	2624.152	0.017684404	0.693830172
14	1445.422101	-291.4221012	0.110664635	1154	2262.676	0.37534204	0.128285016
15	1477.106961	383.8930385	0.934421044	1861	2274.327	0.567548893	0.625879084
16	1464.055858	1798.944142	0.003722404	3263	1790.716	0.119928593	0.004376494
17	2332.080548	-199.0805484	0.070988529	2133	2348.864	0.028169838	8.10929E-05
18	2343.309536	-568.3095356	0.017051001	1775	1794.208	0.025420036	0.042247271
19	1723.778582	-231.7785819	0.032219599	1492	1856.836	0.11051614	0.020113019
20	1720.188706	267.8112942	0.031963008	1988	2199.596	0.001311693	0.023107976
21	1704.581361	355.4186385	0.506852854	2060	1757.798	0.144105005	0.370886913
22	1375.41186	1466.58814	0.00360419	2842	1587.45	0.18853074	0.00648671
23	1778.61921	-170.6192102	0.064893639	1608	1836.895	0.206662969	0.053992649
24	1929.374384	409.6256159	0.003015801	2339	1965.36	0.034270098	0.011091269
25	2034.449239	-128.4492388	0.000152469	1906	2152.332	0.016388298	0.008676932
26	1685.53499	-23.53499035	0.010865752	1662	1839.544	0.005839093	0.001589524
27	1615.754915	173.2450853	0.123114205	1789	1722.738	0.009678424	0.006927468
28	985.2822298	627.7177702	2.3653E-05	1613	1464.099	0.040347933	0.020546636
29	1281.155285	7.844714682	0.019248245	1289	1520.209	0.153488882	0.09086787
30	962.8333403	-178.8333403	0.53111532	784	1172.56	0.007522907	1.066319659
31	1423.360847	-571.3608474	1.12243739	852	1661.58	0.03141049	1.431266803
32	1603.652641	-902.6526414	2.268899266	701	1720.295	0.157272777	2.492524758
33	2034.906894	-1055.906894	0.121877838	979	2085.72	0.000176328	0.735077659
34	1333.778754	-341.7787543	0.091575647	992	1831.362	0.000740805	0.663213208
35	1319.193767	-300.1937665	0.106697436	1019	1826.864	0.131842394	0.189741888
36	1721.852004	-332.852004	1.378113088	1389	1832.87	0.825494565	1.769656524
37	1757.589624	-1630.589624	33.32768859	127	1974.765	15.37627875	57.07374193
38	1358.172755	-733.1727554	1.083442814	625	1584.449	0.64256256	0.486252951
39	1776.553494	-650.5534944	0.018171476	1126	1561.824	0.101651108	0.016671259
40	1636.78662	-151.7866202	0.000829653	1485	1630.386	4.53468E-05	7.43892E-05

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	USAF Pred	Denominator	Numerator USAF Model
41	1432.22651	42.77349034	0.007781778	1475	1487.808	0.090611204	0.026837103
42	1161.116216	-130.1162161	0.030204832	1031	1272.635	0.00015899	0.194374935
43	1223.183032	-179.1830318	0.006776537	1044	1498.547	0.065406593	0.002567111
44	1225.05821	85.9417897	0.24971054	1311	1258.104	0.377976414	0.123319367
45	1461.879592	655.1204083	0.277204978	2117	1656.618	0.043001868	0.299301509
46	1441.394016	1114.605984	0.000818198	2556	1397.822	0.312566737	0.00838242
47	1200.112226	-73.11222601	0.892463872	1127	1361.016	2.195761218	1.130510469
48	1732.319651	1064.680349	0.035977646	2797	1598.712	0.029696765	0.108674532
49	1784.471356	530.5286441	0.000445695	2315	1392.946	0.272290117	0.003599378
50	1155.873118	-48.87311806	0.426122389	1107	1245.888	0.354385209	0.492913079
51	1170.62802	-722.6280199	0.619671968	448	1225.2	0.096266143	1.678169883
52	939.6622219	-352.6622219	0.56132448	587	1167.358	0.069724787	1.659795462
53	871.7897391	-439.7897391	0.00052774	432	1188.25	6.793745713	1.425094329
54	1567.92416	-9.924159786	0.000479074	1558	1042.29	0.013199916	0.085347985
55	1702.898877	34.10112308	0.118385366	1737	1281.84	0.047859434	0.35701829
56	1519.347377	597.6526227	0.022165709	2117	1079.125	0.10196513	0.008564423
57	1756.182192	-315.1821916	0.031298978	1441	1245.084	0.007285884	0.037117057
58	1572.93476	-254.9347605	0.125392842	1318	1040.38	0.210707468	0.427838075
59	1456.284974	466.7150256	0.241175434	1923	1060.905	0.413122048	0.097819637
60	1631.377908	-944.3779076	0.476040425	687	1288.44	0.553908604	0.012187903
61	1672.300341	-474.0003409	0.674418665	1198.3	1274.144	0.311875131	0.129066993
62	1513.179874	-984.0798739	1.554079661	529.1	959.6	0.171009057	0.151945248
63	1407.490512	-659.590512	0.769265265	747.9	954.144	0.023479139	0.135306722
64	1289.266401	-655.9664006	0.435475919	633.3	908.408	2.444707292	1.22869156
65	1205.581535	417.9184652	0.019658338	1623.5	921.51	0.158525127	5.92241E-05
66	1204.728005	-227.6280047	0.052487803	977.1	989.594	0.003111107	0.002269663
67	1255.455727	-223.8557266	0.098733048	1031.6	985.05	0.022314266	0.000457204
68	1201.647447	-324.1474468	1.640829495	877.5	855.442	0.637085946	0.743843837
69	1301.132458	-1124.032458	2.997278542	177.1	933.912	7.670804265	0.186101381
70	974.2070337	-306.6070337	1.439192799	667.6	744	0.238891937	0.506256976
71	1142.195432	-800.895432	1.806173812	341.3	816.309	2.739495384	0.020465008
72	1364.886606	-458.6866062	0.080542356	906.2	857.375	0.063080685	0.066700957
73	1390.979425	-257.1794254	0.026066432	1133.8	899.76	0.005462798	0.109458378
74	1400.653166	-183.0531664	0.228791776	1217.6	842.488	0.337441146	0.586029481
75	1342.495336	582.4046642	0.019151277	1924.9	992.796	0.010241453	0.157011335
76	1463.716668	266.3833317	0.065709336	1730.1	967.365	0.039327743	0.303414336
77	1629.709068	443.4909316	0.029201365	2073.2	1120.208	0.016239895	0.147906875
78	1454.723147	354.276853	0.143507145	1809	1011.675	0.072771698	0.491259958
79	1611.708525	685.2914748	0.043368946	2297	1029.073	0.378088465	0.007537558
80	1362.955121	-478.3551207	0.581443062	884.6	1084.0235	0.040172014	0.563942253
81	1381.828853	-674.5288532	0.979078621	707.3	1371.6	3.296537459	1.166448862
82	1291.637954	699.8620456	0.034323255	1991.5	1227.6	0.050899348	0.015283241
83	1173.244029	368.9559712	0.009088432	1542.2	1296	0.040067465	0.119903993
84	1703.877034	147.0229657	0.059003962	1850.9	1316.88	0.001668314	0.106102265
85	1476.902859	449.5971411	0.433437079	1926.5	1323.6	0.19156809	0.812593924
86	1501.370647	1268.329353	0.035188174	2769.7	1033.076	0.038961232	0.192213719
87	1703.445519	519.5544806	0.014276638	2223	1008.703	0.17823362	0.016906316
88	1550.114899	-265.6148988	0.445637661	1284.5	995.456	0.764484417	0.9472525
89	1550.117922	857.4820781	0.060232425	2407.6	1157.436	0.015775928	0.195999317
90	1514.319703	590.8802969	0.463310435	2105.2	1039.3119	0.060942282	0.591443704
91	1191.955393	1432.944607	0.056899957	2624.9	1005.888	0.067091045	0.125376803
92	1318.863916	626.1360845	0.180167501	1945	1015.56	0.000397946	0.173895432
93	1080.62253	825.5774699	0.889429545	1906.2	1095.12	0.609107288	1.407415655
94	1596.17093	1797.72907	0.036241279	3393.9	1132.4882	0.121006159	0.064916476
95	1567.198421	646.101579	0.069750557	2213.3	1348.578	0.000417058	0.129155363
96	1583.560149	584.5398509	0.102988773	2168.1	1372.68	0.001847878	0.108263793
97	1379.116299	695.7837012	**66.94518711**	2074.9	1361.52	**55.62458983**	**92.53332328**

Theils' U	
USAF Pred	**1.289780092**
New Model w/out Serv Inv	**1.097049614**

Appendix G: Supplemental Analysis

F-15B (Regression with Possessed Hours, Flying Hours, Sorties, and Serviceable Inventory)
Theil's *U*-statistic for This Model

Regression Statistics	
R Square	0.374827012
Adjusted R Square	0.347645578
Standard Error	570.2367178
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	17936134.83	4484033.707	13.78981729	7.53499E-09
Residual	92	29915632.12	325169.9143		
Total	96	47851766.95			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2130.668513	344.3416324	6.187658745	1.6714E-08
Possessed Hours	0.139114761	0.03503427	3.97081946	0.000142006
Flying Hours	-1.174334989	3.250398322	-0.361289563	0.718711362
Sorties	-1.145492715	4.407549795	-0.259893312	0.795526805
Serv Inv	-0.007640732	0.001410264	-5.417946287	4.80099E-07

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*Denominator*
1	161.2723502	684.7276498	0.569813289	846	0
2	207.388625	638.611375	0.008113456	846	0.271729289
3	328.7967842	76.20321578	0.787850052	405	0.85733882
4	420.5182831	359.4817169	0.535123007	780	0.143039119
5	504.4136023	570.5863977	6.04999E-06	1075	0.296138453
6	487.3558528	2.644147181	0.120442895	490	0.017596835
7	595.0539299	-170.0539299	0.001467353	425	0.689876817
8	761.7199333	16.28006675	0.010851196	778	0.064769596
9	894.9564618	81.04353817	0.248700552	976	0.179928951
10	903.2699137	486.7300863	0.086697029	1390	0.280366441
11	1063.276593	-409.2765925	0.396933791	654	0.610500893
12	752.9624612	412.0375388	0.218191691	1165	0.020303192
13	1875.183074	-544.1830737	0.163345751	1331	0.017684404
14	1691.937694	-537.9376936	0.001754242	1154	0.37534204
15	1812.666248	48.33375208	0.656536349	1861	0.567548893
16	1755.088821	1507.911179	0.003324607	3263	0.119928593
17	2321.142652	-188.1426523	0.064267187	2133	0.028169838
18	2315.736271	-540.7362714	0.032135429	1775	0.025420036
19	1810.192845	-318.1928449	0.02960972	1492	0.11051614
20	1731.264473	256.7355275	0.046442069	1988	0.001311693
21	1631.577609	428.4223914	0.4244903	2060	0.144105005
22	1499.849846	1342.150154	0.000355042	2842	0.18853074
23	1661.55054	-53.55053974	0.098792888	1608	0.206662969
24	1833.584118	505.4158818	0.000189765	2339	0.034270098
25	1938.220925	-32.2209247	2.80597E-05	1906	0.016388298
26	1672.096343	-10.09634294	0.004016544	1662	0.005839093
27	1683.668737	105.3312632	0.048547447	1789	0.009678424
28	1218.820948	394.1790521	0.003170296	1613	0.040347933
29	1379.820575	-90.82057538	0.044894014	1289	0.153488882
30	1057.115995	-273.1159948	0.36466638	784	0.007522907
31	1325.438885	-473.4388854	0.777330327	852	0.03141049
32	1452.177205	-751.1772053	0.77508668	701	0.157272777
33	1596.153441	-617.1534409	0.063686994	979	0.000176328
34	1239.063203	-247.0632028	0.044786463	992	0.000740805
35	1228.935099	-209.935099	0.011748927	1019	0.131842394
36	1278.548074	110.4519262	0.657290445	1389	0.825494565
37	1253.110234	-1126.110234	12.17861482	127	15.37627875
38	1068.202977	-443.2029766	0.153998844	625	0.64256256
39	1371.26679	-245.26679	0.028157614	1126	0.101651108
40	1296.054603	188.9453973	0.024094905	1485	4.53468E-05

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	Denominator
41	1244.490376	230.5096237	0.001153385	1475	0.090611204
42	1081.09325	-50.0932504	0.015034045	1031	0.00015899
43	1170.414411	-126.4144106	0.012523573	1044	0.065406593
44	1194.167244	116.8327565	0.403419098	1311	0.377976414
45	1284.31466	832.6853404	0.337853191	2117	0.043001868
46	1325.490784	1230.509216	0.001508391	2556	0.312566737
47	1226.269953	-99.26995253	1.136933467	1127	2.195761218
48	1595.312783	1201.687217	0.060377821	2797	0.029696765
49	1627.72399	687.2760105	0.006082019	2315	0.272290117
50	1287.540606	-180.5406062	0.598489216	1107	0.354385209
51	1304.398278	-856.3982782	1.706274678	448	0.096266143
52	1172.197533	-585.1975332	1.789875131	587	0.069724787
53	1217.325082	-785.3250816	0.003327051	432	6.793745713
54	1533.081984	24.91801608	0.006347333	1558	0.013199916
55	1612.873907	124.126093	0.116279941	1737	0.047859434
56	1524.685698	592.3143018	0.005371889	2117	0.10196513
57	1596.161641	-155.1616411	0.013334355	1441	0.007285884
58	1484.398719	-166.3987193	0.110376271	1318	0.210707468
59	1485.121856	437.8781445	0.24064037	1923	0.413122048
60	1630.329742	-943.3297424	0.495559081	687	0.553908604
61	1681.920227	-483.6202267	0.696045669	1198.3	0.311875131
62	1528.833919	-999.7339186	1.985459795	529.1	0.171009057
63	1493.435469	-745.5354694	1.121904673	747.9	0.023479139
64	1425.475692	-792.1756915	0.124079358	633.3	2.444707292
65	1400.420708	223.0792916	0.061846339	1623.5	0.158525127
66	1380.846984	-403.746984	0.133307422	977.1	0.003111107
67	1388.351804	-356.751804	0.153634519	1031.6	0.022314266
68	1281.848407	-404.3484071	1.493361016	877.5	0.637085946
69	1249.432652	-1072.332652	5.692381606	177.1	7.670804265
70	1090.137798	-422.5377978	1.42982984	667.6	0.238891937
71	1139.585988	-798.2859878	0.899663511	341.3	2.739495384
72	1229.925076	-323.725076	0.022942567	906.2	0.063080685
73	1271.060337	-137.2603369	0.010804289	1133.8	0.005462798
74	1335.451346	-117.8513455	0.178455705	1217.6	0.337441146
75	1410.536838	514.3631623	0.016049204	1924.9	0.010241453
76	1486.243172	243.8568278	0.052442145	1730.1	0.039327743
77	1677.002774	396.1972261	0.013313011	2073.2	0.016239895
78	1569.78999	239.2100101	0.106343799	1809	0.072771698
79	1707.077919	589.9220815	0.111019338	2297	0.378088465
80	1649.950398	-765.350398	1.272240818	884.6	0.040172014
81	1705.072655	-997.7726551	0.154335757	707.3	3.296537459
82	1713.633023	277.8669768	0.003725738	1991.5	0.050899348
83	1663.758819	-121.5588194	0.004465427	1542.2	0.040067465
84	1953.955743	-103.0557431	0.000852057	1850.9	0.001668314
85	1872.472212	54.02778822	0.239446916	1926.5	0.19156809
86	1826.999717	942.7002828	0.007601765	2769.7	0.038961232
87	1981.515118	241.4848821	0.07191141	2223	0.17823362
88	1880.626414	-596.1264142	0.130074293	1284.5	0.764484417
89	1944.334621	463.2653787	0.004795713	2407.6	0.015775928
90	1938.471091	166.7289089	0.168874566	2105.2	0.060942282
91	1759.781729	865.118271	0.001642822	2624.9	0.067091045
92	1838.608241	106.3917593	0.010101446	1945	0.000397946
93	1710.715926	195.4840741	0.509200813	1906.2	0.609107288
94	2033.667932	1360.232068	0.002528549	3393.9	0.121006159
95	2042.638818	170.6611817	0.00090394	2213.3	0.000417058
96	2101.555821	66.54417912	0.000752656	2168.1	0.001847878
97	2015.419114	59.4808861	**43.63265126**	2074.9	**55.62458983**

	Theils' U
New Model with Serv Inv	**0.885670931**

Appendix G: Supplemental Analysis

F-15C (Regression with Possessed Hours, Flying Hours, and Sorties) Theil's *U*-statistic for This Model and USAF Predictions

Regression Statistics	
R Square	0.218693876
Adjusted R Square	0.193490452
Standard Error	4425.404364
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	509805199.6	169935066.5	8.677149626	3.90185E-05
Residual	93	1821330952	19584203.78		
Total	96	2331136151			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	19176.72925	14947.96719	1.282898805	0.202715571
Possessed Hours	0.087379944	0.068762855	1.270743388	0.206989513
Flying Hours	-0.028609403	0.246727771	-0.115955341	0.907937954
Sorties	-3.203226111	0.83914001	-3.817272533	0.000243043

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*USAF Pred*	*Denominator*	*Numerator USAF Model*
1	15262.80323	-861.8032346	0.003581219	14401	14320.467	0	3.12725E-05
2	15262.80323	-861.8032346	0.260497585	14401	14320.467	9.76427E-06	0.268932521
3	21796.12121	-7350.121213	0.024091323	14446	21914.172	0.03751459	0.027649479
4	19486.2185	-2242.218501	4.17817E-05	17244	19646.1	0.040283498	0.000130069
5	20593.5369	111.4630993	0.194106413	20705	20901.664	0.273998272	0.219697415
6	18989.1073	-9122.107303	1.008286982	9867	19571.825	0.006410382	1.285225618
7	18984.79947	-9907.799472	0.076915718	9077	20263	0.588279029	0.292548462
8	18556.38643	-2517.386425	0.056427729	16039	20948.545	0.058339763	0.199903322
9	23722.98771	-3809.987713	0.007296715	19913	27084.125	0.030191091	0.052921255
10	18153.98462	-1700.984618	0.004156748	16453	21033.91	0.057491524	0.041137913
11	21458.77182	-1060.771815	0.091803299	20398	23735.077	0.025809388	0.188188208
12	23301.40211	-6180.402113	0.07249495	17121	25969.788	1.18753E-05	0.275493467
13	21671.80977	-4609.809767	0.063936761	17062	26048.38	0.001367725	0.10724577
14	20745.24946	-4314.249461	0.041083522	16431	22018.532	0.000328931	0.107324647
15	19463.41096	-3330.410964	0.001281488	16133	21515.868	0.000885222	0.010105353
16	16230.52709	-577.5270942	0.116095831	15653	17274.776	0.030395683	0.270626079
17	18257.42137	-5333.42137	0.338590529	12924	21066.962	0.246760793	0.52320529
18	14024.28592	-7520.285916	0.020865304	6504	15852.308	2.341784585	0.260847658
19	17396.49158	-939.4915772	0.104707891	16457	19778.804	0.010821966	0.169738943
20	23494.25459	-5325.254588	0.046679704	18169	24949.183	0.011792126	0.090848576
21	20121.50081	-3925.50081	0.000930613	16196	21672.336	0.047692994	0.002323733
22	19238.92567	494.0743284	0.025779239	19733	20513.73	0.001984228	0.071097103
23	22022.31363	-3168.313631	0.01198628	18854	24115.615	0.004544479	0.061330756
24	22189.1712	-2064.171204	0.063999309	20125	24794.202	0.014990276	0.160893587
25	22752.23955	-5091.23955	0.068194667	17661	25733.448	0.010169445	0.090352817
26	20492.01272	-4612.012721	0.063340168	15880	21188.675	0.16385162	0.008027596
27	18311.40535	3996.594649	0.023771602	22308	20885.202	0.090662862	0.028564015
28	19030.45682	-3439.456825	0.0017636	15591	19361.251	0.021800311	0.01060258
29	18547.74766	-654.7476628	0.008296244	17893	19498.387	0.028186006	0.015320997
30	16518.76096	-1629.760956	0.162805196	14889	17103.76	0.000275209	0.280250948
31	20649.58134	-6007.581345	0.03291141	14642	22524.048	0.022781575	0.096371362
32	19508.27872	-2656.278725	0.387014122	16852	21397.424	0.052356565	0.532262545
33	23479.70657	-10483.70657	0.1673033	12996	25290.6	0.034531454	0.356659861
34	20726.71828	-5315.718284	0.126740909	15411	23172.342	0.002438415	0.220961854
35	20136.42226	-5486.422256	0.047439967	14650	21894.184	0.065906981	0.217375537
36	21601.87516	-3190.87516	0.087127611	18411	25241.35	0.000194855	0.229725142
37	23588.44603	-5434.446027	0.001478641	18154	26978.328	0.003971069	0.004145256
38	19996.0777	-698.0777015	0.036073417	19298	20466.821	0.028414729	0.005411921
39	18885.73023	3665.26977	0.006835013	22551	21131.328	0.000278	0.000414796
40.	20310.6155	1864.384499	0.045491559	22175	22634.286	0.002254911	0.014549571

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	USAF Pred	Denominator	Numerator USAF Model
41	18498.34961	4729.650386	0.062863119	23228	20553.216	0.00154158	0.047485791
42	18316.15538	5823.844618	0.010094946	24140	19078.332	0.002558331	0.001028307
43	20493.56704	2425.432965	0.021985021	22919	22144.897	0.001980656	0.013108027
44	18500.72039	3398.279609	0.000365414	21899	19274.997	0.022079363	0.012935497
45	25571.61689	-418.6168862	0.000184472	25153	27643.668	0.020189684	0.007490076
46	21237.37064	341.6293562	0.016053862	21579	23755.872	0.017260108	0.046529483
47	21478.14206	-2734.142063	0.000175145	18744	23398.74	0.054454404	0.021807272
48	22869.93713	248.06287	0.00464989	23118	25885.98	0.000802753	0.003469291
49	20886.58124	1576.418755	0.000401715	22463	23824.666	0.006428237	5.838E-06
50	20211.77766	450.2223367	0.0043371	20662	20607.725	0.002203935	0.000959434
51	20271.26969	1360.730309	1.09968E-05	21632	22272	0.005022165	0.005668248
52	20027.26533	71.73466587	0.012052853	20099	21727.625	0.007529117	0.000167858
53	19636.4215	2206.578497	0.046591	21843	21582.597	0.002577736	0.027236861
54	18237.19972	4714.800281	0.013814576	22952	19347.12	0.005602802	0.000319
55	21972.32697	2697.67303	0.020933856	24670	25079.936	0.003507213	0.005083309
56	19639.61196	3569.388042	0.010127479	23209	21450.095	0.00366993	0.049423483
57	24138.64651	-2335.646505	0.007919954	21803	26962.684	0.00838086	0.001851371
58	21858.66109	1940.338907	0.002316601	23799	24737.13	0.003308944	0.000812979
59	21284.52843	1145.471569	0.002271543	22430	23108.576	0.007137726	0.014829007
60	23255.97043	1069.029569	0.005948174	24325	27056.4	0.022934348	0.049355175
61	22517.25113	-1876.051135	0.000692952	20641.2	26045.248	0.001059909	0.001279716
62	19425.84154	543.358456	0.060971034	19969.2	20707.6	0.040165626	0.01893445
63	19040.44254	4930.85746	0.000384777	23971.3	21223.488	0.032795662	6.65684E-06
64	19159.98512	470.2148821	0.069384649	19630.2	19692.048	0.050012618	0.040837751
65	18849.4157	5170.784296	0.000297523	24020.2	20053.26	0.018466036	2.85922E-07
66	20341.77932	414.3206784	1.28215E-05	20756.1	20743.256	0.001492619	0.005892177
67	19879.87847	74.32153135	0.002247155	19954.2	21547.449	0.0049938	9.03177E-05
68	20418.38781	945.9121935	0.06097117	21364.3	21174.664	0.008831212	0.111307309
69	24631.94579	-5275.345787	0.015612414	19356.6	26484.318	0.036151964	0.0086311
70	20618.3997	2418.600297	0.025009767	23037	21238.7	0.022879895	0.04473797
71	23195.58099	-3643.180994	0.042629596	19552.4	24425.037	0.001676187	0.131860128
72	24389.87147	-4036.971467	0.034744941	20352.9	27452.875	7.65181E-06	0.102932491
73	24202.97954	-3793.779538	0.000506666	20409.2	26939.04	0.000381245	0.001900605
74	21267.09563	-459.3956306	0.00291286	20807.7	21697.458	0.004993704	0.005829954
75	21155.08936	1123.010639	0.003986489	22278.1	23866.854	1.06491E-05	0.001315768
76	20944.19083	1406.609167	0.037123391	22350.8	23158.905	0.020462254	0.005146638
77	21241.57494	4306.42506	0.014831063	25548	23944.552	0.003183136	0.003015731
78	20995.29171	3111.308287	0.007535367	24106.6	22703.6145	0.00271072	1.16478E-07
79	20758.8906	2092.609405	0.016523939	22851.5	22859.7273	0.002211384	0.003118868
80	20988.64311	2937.456886	0.000921167	23926.1	22649.9163	0.005617746	0.006528352
81	24993.22537	726.1746265	0.01491946	25719.4	27652.5863	0.000414772	0.00064283
82	22054.09767	3141.502328	0.000480425	25195.6	24543.508	0.004868977	0.007758363
83	23989.75203	-552.2520261	0.023961531	23437.5	25656.768	0.025499065	0.001944438
84	23552.08921	3628.010794	0.005964583	27180.1	26146.6052	0.003933633	0.000227003
85	23376.26154	2099.138455	0.048861567	25475.4	25884.912	0.003046424	0.061353093
86	21250.25131	5631.248688	0.065280351	26881.5	20571.3564	0.000211026	0.047262568
87	19622.77144	6868.228562	0.083920423	26491	20646.9738	0.005115994	0.07548261
88	20711.6164	7674.183602	0.139900729	28385.8	21107.6365	0.019555519	0.110278725
89	21738.07239	10617.22761	0.113752963	32355.3	22928.8752	0.000575811	0.122448095
90	20666.33637	10912.56363	0.050511472	31578.9	20256.9444	0.007486223	0.041487277
91	21749.31883	7097.281171	0.06653556	28846.6	22414.4752	9.42838E-05	0.048066245
92	21685.86727	7440.832727	0.050262288	29126.7	22802.367	0.00249885	0.042617066
93	24052.71157	6529.988427	0.093883188	30582.7	24569.8128	0.003654897	0.078808594
94	23060.94951	9370.65049	0.007411106	32431.6	23846.1589	0.017451108	0.000775527
95	25355.33552	2791.964483	0.007860483	28147.3	27244.1358	0.000822615	5.40578E-05
96	24844.47822	2495.521784	0.003767594	27340	27133.0497	0.001033197	0.000270896
97	24783.05089	1678.149105	**5.319895541**	26461.2	26911.187	**4.913298496**	**8.24085337**

	Theils' U
USAF Pred	**1.295088714**
New Model w/out Serv Inv	**1.04055485**

Appendix G: Supplemental Analysis

F-15C (Regression with Possessed Hours, Flying Hours, Sorties, and Serviceable Inventory)
Theil's *U*-statistic for This Model

Regression Statistics	
R Square	0.623101743
Adjusted R Square	0.606714862
Standard Error	3090.309456
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	1452534998	363133749.6	38.0244265	9.51744E-19
Residual	92	878601152.9	9550012.532		
Total	96	2331136151			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	27423.23668	10471.27961	2.61890024	0.010316685
Possessed Hours	0.075104012	0.048033766	1.563567011	0.12135271
Flying Hours	0.217572299	0.174065335	1.249946168	0.21448947
Sorties	-1.38793705	0.613803934	-2.261205855	0.026103118
Serv Inv	-0.080298309	0.008081924	-9.935543903	3.12028E-16

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*Denominator*
1	14182.51385	218.4861457	0.000233895	14401	0
2	14621.24374	-220.2437392	0.016953882	14401	9.76427E-06
3	16321.11204	-1875.112042	0.027767008	14446	0.03751459
4	14836.80011	2407.199891	0.082370999	17244	0.040283498
5	15755.91195	4949.088053	0.060976333	20705	0.273998272
6	14979.76565	-5112.765652	0.426330515	9867	0.006410382
7	15519.55801	-6442.558006	0.000528265	9077	0.588279029
8	15830.37413	208.625873	0.018080702	16039	0.058339763
9	17756.32388	2156.676125	0.000249712	19913	0.030191091
10	16767.6706	-314.6705982	0.020613161	16453	0.057491524
11	18035.79603	2362.203969	0.012142301	20398	0.025809388
12	19368.69863	-2247.698633	0.017262645	17121	1.18753E-05
13	19311.48344	-2249.483438	0.012135321	17062	0.001367725
14	18310.55732	-1879.557324	0.019984059	16431	0.000328931
15	18455.76808	-2322.768076	0.007782431	16133	0.000885222
16	17076.22242	-1423.222424	0.107306606	15653	0.030395683
17	18051.56075	-5127.560752	0.610911982	12924	0.246760793
18	16605.50937	-10101.50937	0.050401182	6504	2.341784585
19	17917.1615	-1460.161501	0.008837935	16457	0.010821966
20	19716.12739	-1547.127387	0.015719557	18169	0.011792126
21	18473.98669	-2277.986687	0.003371627	16196	0.047692994
22	18792.56776	940.4322413	0.000859431	19733	0.001984228
23	19432.49372	-578.4937222	0.00010105	18854	0.004544479
24	19935.4732	189.5267959	0.016508434	20125	0.014990276
25	20246.76365	-2585.763653	0.014751001	17661	0.010169445
26	18024.99379	-2144.993791	0.066947713	15880	0.16385162
27	18199.16812	4108.831883	0.010091356	22308	0.090662862
28	17831.96665	-2240.966647	8.05399E-05	15591	0.021800311
29	17753.0801	139.919896	0.009138911	17893	0.028186006
30	16599.52877	-1710.528769	0.044202444	14889	0.000275209
31	17772.31954	-3130.319535	0.000369763	14642	0.022781575
32	17133.55425	-281.5542463	0.075551658	16852	0.052356565
33	17628.05226	-4632.052257	0.010024035	12996	0.034531454
34	16712.16083	-1301.160829	0.006412852	15411	0.002438415
35	15884.11729	-1234.117292	0.019557741	14650	0.065906981
36	16362.21225	2048.787746	0.005493256	18411	0.000194855
37	16789.44109	1364.558905	0.056466386	18154	0.003971069
38	14984.12728	4313.872717	0.113472803	19298	0.028414729
39	16050.32891	6500.671094	0.062242333	22551	0.000278
40	16548.88329	5626.116713	0.096460784	22175	0.002254911

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	Denominator
41	16340.85825	6887.141753	0.108620183	23228	0.00154158
42	16484.61418	7655.38582	0.042373784	24140	0.002558331
43	17949.80672	4969.193282	0.031562416	22919	0.001980656
44	17827.25301	4071.746995	0.049408962	21899	0.022079363
45	20285.26253	4867.737468	0.004237146	25153	0.020189684
46	19941.70665	1637.293347	0.00322917	21579	0.017260108
47	19970.24361	-1226.243607	0.011536219	18744	0.054454404
48	21104.76713	2013.232869	0.004376048	23118	0.000802753
49	20933.70483	1529.295172	0.00130218	22463	0.006428237
50	19851.40611	810.5938876	0.00065116	20662	0.002203935
51	21104.75044	527.2495633	0.001808605	21632	0.005022165
52	21018.95909	-919.9590865	0.00046991	20099	0.007529117
53	21407.30556	435.6944361	0.009421226	21843	0.002577736
54	20831.8529	2120.147103	0.006187214	22952	0.005602802
55	22864.62215	1805.377848	0.002191477	24670	0.003507213
56	22054.11802	1154.881981	0.006132437	23209	0.00366993
57	23620.49389	-1817.493887	0.00031308	21803	0.00838086
58	23413.21649	385.7835082	0.000818426	23799	0.003308944
59	23110.84546	-680.8454629	2.15626E-06	22430	0.007137726
60	24357.93668	-32.93668405	0.02495623	24325	0.022934348
61	24483.95187	-3842.751867	0.013744476	20641.2	0.001059909
62	22389.10904	-2419.909039	0.002597386	19969.2	0.040165626
63	22953.57851	1017.72149	0.01515087	23971.3	0.032795662
64	22580.80022	-2950.600217	0.004540386	19630.2	0.050012618
65	22697.47028	1322.729723	0.006454974	24020.2	0.018466036
66	22685.95132	-1929.85132	0.016530998	20756.1	0.001492619
67	22622.87253	-2668.672535	0.003715449	19954.2	0.0049938
68	22580.59798	-1216.297978	0.038985705	21364.3	0.008831212
69	23574.93791	-4218.33791	0.001175299	19356.6	0.036151964
70	22373.40466	663.5953368	0.020819859	23037	0.022879895
71	22876.42907	-3324.029074	0.028041539	19552.4	0.001676187
72	23627.0683	-3274.168302	0.027014194	20352.9	7.65181E-06
73	23754.40166	-3345.201662	0.004003943	20409.2	0.000381245
74	22099.12711	-1291.427111	0.002368376	20807.7	0.004993704
75	23290.72684	-1012.626836	0.002248169	22278.1	1.06491E-05
76	23407.11291	-1056.31291	0.005527923	22350.8	0.020462254
77	23886.21787	1661.782126	0.000300444	25548	0.003183136
78	23663.76867	442.8313308	0.002946247	24106.6	0.00271072
79	24159.99042	-1308.490423	0.000412244	22851.5	0.002211384
80	24390.07226	-463.9722639	0.000132649	23926.1	0.005617746
81	25994.96475	-275.5647529	0.000367803	25719.4	0.000414772
82	25688.85175	-493.2517486	0.012503874	25195.6	0.004868977
83	26254.89022	-2817.390216	0.000533258	23437.5	0.025499065
84	26638.87256	541.227439	0.002128446	27180.1	0.003933633
85	26729.35631	-1253.956308	0.00546934	25475.4	0.003046424
86	24997.46713	1884.03287	0.001491581	26881.5	0.000211026
87	25452.80969	1038.190312	0.009311071	26491	0.005115994
88	25829.58038	2556.219624	0.04275034	28385.8	0.019555519
89	26486.20788	5869.092119	0.031702127	32355.3	0.000575811
90	25818.00934	5760.890657	0.004022401	31578.9	0.007486223
91	26843.79034	2002.809664	0.00567544	28846.6	9.42838E-05
92	26953.52647	2173.173533	0.010070691	29126.7	0.00249885
93	27659.75319	2922.946814	0.022714579	30582.7	0.003654897
94	27822.37224	4609.227759	0.00032963	32431.6	0.017451108
95	28736.11904	-588.8190359	0.003115698	28147.3	0.000822615
96	28911.13838	-1571.138377	0.007897182	27340	0.001033197
97	28890.7989	-2429.598898	**2.79508523**	26461.2	**4.913298496**

	Theils' U
New Model with Serv Inv	**0.754242418**

Appendix G: Supplemental Analysis

F-15D (Regression with Possessed Hours, Flying Hours, and Sorties)
Theil's *U*-statistic for This Model and USAF Predictions

Regression Statistics	
R Square	0.02702071
Adjusted R Square	-0.004365718
Standard Error	825.8584522
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	1761519.065	587173.0217	0.860904261	0.464349221
Residual	93	63429923.03	682042.1831		
Total	96	65191442.09			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1778.827313	1408.04918	1.263327544	0.209629419
Possessed Hours	0.044186817	0.045743099	0.96597776	0.336560582
Flying Hours	-1.442057722	1.775217339	-0.81232742	0.418678283
Sorties	1.047649502	2.582820226	0.405622308	0.685951815

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*USAF Pred*	*Denominator*	*Numerator USAF Model*
1	2207.66631	1819.33369	0.204108675	4027	1834.365	0	0.296462267
2	2207.66631	1819.33369	0.001053024	4027	1834.365	0.182641086	0.011044147
3	2175.322498	130.6775016	5.73264E-05	2306	2729.202	0.000722878	0.007525149
4	2261.459698	-17.45969831	0.02191636	2244	2444.04	0.01106059	0.098108533
5	2340.205689	-332.2056893	0.077078863	2008	2710.872	0.023374877	0.250758543
6	2258.482655	-557.4826545	1.032514809	1701	2706.522	0.416673665	1.635848519
7	2331.432637	-1728.432637	1.457089027	603	2778.584	2.237579378	5.137439475
8	2232.880955	-727.8809545	0.130794412	1505	2871.755	1.219520314	0.166239066
9	2622.709074	544.2909262	0.127408559	3167	3780.625	0.007268276	0.02856068
10	2306.560392	1130.439608	0.089235531	3437	2901.78	0.363429719	0.286713355
11	2391.711526	-1026.711526	2.160836514	1365	3205.363	0.450324572	5.001891289
12	2455.520524	-2006.520524	3.474445571	449	3501.81	7.887465836	23.35933139
13	2546.929926	-836.9299264	0.000990455	1710	3880.084	0.163291611	0.145573932
14	2347.183741	53.8162592	0.01751894	2401	3053.436	0.013309913	0.056064417
15	2360.205722	317.7942775	0.12740011	2678	3246.507	0.043415744	0.04602547
16	2280.13739	955.86261	0.000245174	3236	2661.474	0.064054667	0.067449355
17	2366.330636	50.66936374	0.112110325	2417	3257.422	0.279581485	0.23957238
18	1948.281208	-809.2812079	0.465949113	1139	2322.028	0.136620775	1.367458167
19	2337.486701	-777.4867006	0.026854979	1560	2891.928	0.628767669	0.718090019
20	2541.355176	255.6448242	0.034116416	2797	4118.947	0.000573805	0.047868496
21	2347.376491	516.6235091	0.000807644	2864	3475.952	0.062674703	0.102864212
22	2228.392238	-81.39223795	0.328783198	2147	3065.555	0.216938139	1.272724472
23	2378.081633	-1231.081633	0.220505706	1147	3569.14	0.454184336	2.052891856
24	2458.608663	-538.6086626	0.014053777	1920	3563.412	0.046494141	0.571639955
25	2561.613364	-227.6133638	0.005738544	2334	3785.652	0.0265073	0.032073372
26	2537.192083	176.8079167	0.001465544	2714	3131.997	0.003261698	0.018855317
27	2455.101487	103.8985133	0.057387011	2559	2931.672	0.030375899	0.006631394
28	2391.976549	613.0234511	0.003540231	3005	2796.612	0.099523977	0.045355108
29	2235.797009	-178.7970091	0.133440024	2057	2696.967	0.251216839	0.114432714
30	2336.589349	751.4106514	0.088122754	3088	2392.16	0.009948254	0.000353386
31	2479.312472	916.6875278	0.005813813	3396	3337.95	0.126741032	0.065491682
32	2445.939452	-258.9394516	0.37444733	2187	3056.082	0.170104385	1.399033579
33	2623.271263	-1338.271263	0.125658978	1285	3871.8	0.254298475	1.425974243
34	2388.51207	-455.5120699	0.07375355	1933	3467.472	0.000257193	0.43591418
35	2426.9565	-524.9565003	0.084241121	1902	3178.24	0.004250327	0.750974419
36	2578.042587	-552.0425871	0.159979237	2026	3674.25	0.020067114	1.2703148
37	2549.347416	-810.3474164	0.00676216	1739	4022.469	0.089070841	0.286161628
38	2401.002064	-143.0020643	0.036465071	2258	3188.262	0.04962358	0.025739641
39	2329.816168	431.1838322	0.102434775	2761	3123.264	0.052230707	0.001044968
40	2508.329989	883.6700109	0.135558214	3392	3302.748	0.016295365	0.052278018

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	USAF Pred	Denominator	Numerator USAF Model
41	2576.125602	1248.874398	0.011391137	3825	3049.44	0.062991157	0.000804913
42	2456.760547	408.2394533	0.048868506	2865	2756.481	0.151460882	0.313962883
43	2383.343263	-633.3432629	0.048427527	1750	3355.328	0.266846041	0.025692976
44	2268.890531	385.1094685	0.27446464	2654	2934.508	0.303039049	1.093801513
45	2583.413959	-1390.413959	0.000175671	1193	3968.685	1.388960048	0.608462768
46	2583.187884	15.8121159	0.291063229	2599	3529.588	0.346553511	0.803395281
47	2471.167675	-1402.167675	0.039434865	1069	3398.544	1.550246289	1.721795682
48	2612.284304	-212.2843035	0.062535243	2400	3802.712	0.048767361	0.403176318
49	2470.169141	-600.1691411	0.144715264	1870	3393.908	0.008757757	0.48630187
50	2406.375293	-711.3752935	0.012609688	1695	2999.051	0.100371212	0.306308372
51	2422.336407	-190.3364074	0.174529968	2232	3170.1	0.270101874	0.021656973
52	2459.54218	932.4578198	0.001069716	3392	3063.532	0.071027278	0.023105882
53	2377.05953	110.9404704	0.045479356	2488	3003.605	0.034930528	0.007019449
54	2422.411873	530.588127	0.547160673	2953	2744.55	0.350794459	0.145267075
55	2517.656752	2184.343248	0.015474151	4702	3576.496	0.127811572	0.000584237
56	2436.094047	584.9059532	0.002212765	3021	3134.652	0.006903129	0.116436144
57	2627.89206	142.1079404	0.176723245	2770	3800.848	0.122879355	0.011083453
58	2576.534548	1164.465452	0.016120827	3741	3449.38	0.056725717	0.010723236
59	2375.013394	474.9866064	0.057927118	2850	3237.392	0.111345152	0.386648331
60	2584.939514	-685.9395143	0.100633596	1899	3671.16	0.42212357	0.095238055
61	2530.384053	602.415947	0.03243529	3132.8	3718.844	0.15038888	0.146136343
62	2482.111016	-564.2110158	0.002474255	1917.9	3115.5	0.034609695	0.194607073
63	2370.09995	-95.3999496	0.319026154	2274.7	3120.768	0.371581545	0.086497585
64	2376.494841	1284.805159	0.012844191	3661.3	2992.3	0.218133109	0.084876904
65	2366.243245	-414.9432455	0.009546049	1951.3	3017.97	0.014851681	0.251728494
66	2379.749592	-190.6495919	0.103318466	2189.1	3168.117	0.035438394	0.496608033
67	2480.646573	-703.6465727	0.106493816	1777	3319.668	0.002057289	0.883310142
68	2437.495344	-579.8953442	0.201114759	1857.6	3527.706	0.000223968	1.838587672
69	2718.455955	-833.0559551	0.19246666	1885.4	4404.204	0.008361179	1.01405135
70	2540.144255	-827.1442552	0.092418816	1713	3611.6	0.603093234	0.320670632
71	2522.540067	520.7599327	5.71796E-06	3043.3	4013.334	0.010747543	0.320427496
72	2720.522781	7.277219404	0.000115757	2727.8	4450.5	0.0030198	0.328947117
73	2607.24853	-29.34853029	0.021742643	2577.9	4142.4	0.062990699	0.244644762
74	2311.021329	-380.1213286	0.072507928	1930.9	3205.97	0.000579944	0.679452671
75	2497.339162	-519.9391623	0.243411343	1977.4	3569.02	0.042551841	0.815192375
76	2545.0846	-975.5846	0.001957769	1569.5	3354.855	0.36275773	0.553270571
77	2584.245169	-69.44516942	0.112536835	2514.8	3682.228	0.140908465	0.000948828
78	2615.172359	843.6276409	0.203926125	3458.8	3536.2635	0.047546894	0.05661897
79	2651.068861	1561.931139	0.000209335	4213	3389.9875	0.138907926	0.02610537
80	2581.844549	60.95545135	4.56684E-06	2642.8	3323.501	1.43176E-09	0.285319893
81	2648.347708	-5.647708039	0.005433483	2642.7	4054.3607	0.000525835	0.161794081
82	2508.500874	194.7991257	0.172844259	2703.3	3766.29	0.209895696	0.795022937
83	2588.684608	-1123.884608	0.017269894	1464.8	3875.172	0.449892192	1.082231419
84	2639.796645	-192.4966451	0.021301195	2447.3	3971.1366	0.007016706	0.371545367
85	2599.481698	-357.1816983	0.072994758	2242.3	3734.04	0.0444598	0.21142033
86	2375.314348	-605.814348	4.6245E-07	1769.5	2800.52	0.146464632	0.084288675
87	2445.496675	1.203325027	0.144887798	2446.7	2960.4303	0.151713545	0.001371384
88	2468.384936	931.3150638	0.003161157	3399.7	3309.0933	0.034427238	0.060169145
89	2577.754689	191.1453108	0.552531905	2768.9	3602.826	0.435088149	0.224134485
90	2537.107688	2058.192312	0.029478268	4595.3	3284.424	0.069907668	0.000960667
91	2591.322084	788.9779161	0.002204613	3380.3	3522.7296	0.031579465	0.04020219
92	2620.883738	158.7162616	0.092295195	2779.6	3457.3665	0.172394051	0.586805826
93	2469.945934	-844.4459339	0.116930992	1625.5	3754.764	0.807952695	0.206983799
94	2530.757448	555.8425524	0.004762516	3086.6	3826.1289	0.052718636	0.308412072
95	2590.909299	-213.0092985	6.6682E-05	2377.9	4092.039	0.001404004	0.534437918
96	2447.582299	19.41770057	0.19075296	2467	4205.37	0.25329412	0.049651545
97	2631.130978	1077.469022	**16.74717266**	3708.6	4258.3124	**27.03386136**	**68.82767312**

	Theils' U
USAF Pred	**1.595612767**
New Model w/out Serv Inv	**0.787076069**

Appendix G: Supplemental Analysis

F-15D (Regression with Possessed Hours, Flying Hours, Sorties, and Serviceable Inventory)
Theil's *U*-statistic for This Model

Regression Statistics	
R Square	0.038394021
Adjusted R Square	-0.003414935
Standard Error	825.4674598
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	2502961.583	625740.3958	0.918320494	0.456815602
Residual	92	62688480.51	681396.5273		
Total	96	65191442.09			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3027.550891	1847.634949	1.638608802	0.10471038
Possessed Hours	0.016427898	0.052901834	0.310535504	0.756856192
Flying Hours	-0.979511929	1.828943748	-0.535561539	0.593553954
Sorties	0.619794509	2.613977806	0.237107793	0.81310035
Serv Inv	-0.002385474	0.002286841	-1.04313084	0.29962101

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*Denominator*
1	2160.062538	1866.937462	0.211968627	4027	0
2	2172.967157	1854.032843	0.001706201	4027	0.182641086
3	2139.659968	166.3400317	0.000176937	2306	0.000722878
4	2213.326166	30.67383449	0.011036661	2244	0.01106059
5	2243.744577	-235.7445769	0.060030427	2008	0.023374877
6	2192.982239	-491.9822388	0.931896353	1701	0.416673665
7	2245.056589	-1642.056589	1.262636615	603	2.237579378
8	2182.57364	-677.5736395	0.199625878	1505	1.219520314
9	2494.573347	672.4266531	0.137322877	3167	0.007268276
10	2263.401594	1173.598406	0.084333164	3437	0.363429719
11	2363.110739	-998.1107393	2.072133232	1365	0.450324572
12	2413.90469	-1964.90469	2.602191506	449	7.887465836
13	2434.295803	-724.2958026	0.000313219	1710	0.163291611
14	2370.736415	30.2635852	0.022986389	2401	0.013309913
15	2313.978082	364.021918	0.135393157	2678	0.043415744
16	2250.608232	985.3917678	0.001118762	3236	0.064054667
17	2308.762606	108.2373945	0.140250175	2417	0.279581485
18	2044.166257	-905.1662571	0.441166671	1139	0.136620775
19	2316.528114	-756.5281135	0.053223162	1560	0.628767669
20	2437.105727	359.8942733	0.037977618	2797	0.000573805
21	2318.924917	545.0750825	0.000914097	2864	0.062674703
22	2233.590294	-86.59029449	0.330185854	2147	0.216938139
23	2380.704862	-1233.704862	0.197733805	1147	0.454184336
24	2430.03958	-510.0395805	0.00653135	1920	0.046494141
25	2489.168194	-155.1681945	0.007970565	2334	0.0265073
26	2505.625095	208.3749046	0.003100276	2714	0.003261698
27	2407.884145	151.1158552	0.064029703	2559	0.030375899
28	2357.468307	647.5316929	0.003495514	3005	0.099523977
29	2234.664234	-177.6642339	0.146587289	2057	0.251216839
30	2300.44218	787.5578199	0.112716728	3088	0.009948254
31	2359.256125	1036.743875	0.002376275	3396	0.126741032
32	2352.545001	-165.5450012	0.291035362	2187	0.170104385
33	2464.836054	-1179.836054	0.068613071	1285	0.254298475
34	2269.594144	-336.5941441	0.048216277	1933	0.000257193
35	2326.452102	-424.4521024	0.0388066	1902	0.004250327
36	2400.682412	-374.6824123	0.095816793	2026	0.020067114
37	2366.133869	-627.1338692	0.000532905	1739	0.089070841
38	2298.14434	-40.14434021	0.056669834	2258	0.04962358
39	2223.473466	537.5265339	0.130797009	2761	0.052230707
40	2393.460353	998.5396473	0.167649751	3392	0.016295365

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	Denominator
41	2436.14374	1388.85626	0.015686223	3825	0.062991157
42	2385.939206	479.0607944	0.038117811	2865	0.151460882
43	2309.356389	-559.356389	0.057711416	1750	0.266846041
44	2233.593992	420.406008	0.249142349	2654	0.303039049
45	2517.721839	-1324.721839	0.010297982	1193	1.388960048
46	2477.935583	121.064417	0.279102476	2599	0.346553511
47	2442.055601	-1373.055601	0.014598339	1069	1.550246289
48	2529.160412	-129.160412	0.058643549	2400	0.048767361
49	2451.194326	-581.1943263	0.169697639	1870	0.008757757
50	2465.334781	-770.3347811	0.015050071	1695	0.100371212
51	2439.94045	-207.9404505	0.16115091	2232	0.270101874
52	2495.994714	896.0052861	0.0003154	3392	0.071027278
53	2427.759721	60.24027854	0.036370673	2488	0.034930528
54	2478.511116	474.4888839	0.535394738	2953	0.350794459
55	2541.270028	2160.729972	0.013604959	4702	0.127811572
56	2472.557316	548.442684	0.001410538	3021	0.006903129
57	2656.539903	113.4600971	0.167113188	2770	0.122879355
58	2608.638406	1132.361594	0.009189437	3741	0.056725717
59	2491.381935	358.6180651	0.068460296	2850	0.111345152
60	2644.700178	-745.7001783	0.081013718	1899	0.42212357
61	2592.289361	540.5106388	0.042543643	3132.8	0.15038888
62	2564.07479	-646.1747896	0.008956779	1917.9	0.034609695
63	2456.210553	-181.510553	0.278452921	2274.7	0.371581545
64	2460.971779	1200.328221	0.01649905	3661.3	0.218133109
65	2421.588965	-470.2889645	0.0178216	1951.3	0.014851681
66	2449.5938	-260.4938003	0.11090556	2189.1	0.035438394
67	2506.024729	-729.0247291	0.105869833	1777	0.002057289
68	2435.793948	-578.1939481	0.171661921	1857.6	0.000223968
69	2655.042757	-769.6427569	0.172235756	1885.4	0.008361179
70	2495.465433	-782.4654332	0.094306645	1713	0.603093234
71	2517.248202	526.051798	0.000977178	3043.3	0.010747543
72	2632.66693	95.13306967	1.77157E-05	2727.8	0.0030198
73	2566.418682	11.48131841	0.038255302	2577.9	0.062990699
74	2435.110497	-504.2104973	0.077285579	1930.9	0.000579944
75	2514.195684	-536.7956842	0.266567454	1977.4	0.042551841
76	2590.434998	-1020.934998	0.001705104	1569.5	0.36275773
77	2579.609215	-64.80921468	0.1095686	2514.8	0.140908465
78	2626.372331	832.427669	0.198597512	3458.8	0.047546894
79	2671.610656	1541.389344	2.74634E-06	4213	0.138907926
80	2635.818184	6.981816252	0.000733488	2642.8	1.43176E-09
81	2714.27489	-71.57489006	0.002281503	2642.7	0.000525835
82	2577.07121	126.2287896	0.201610522	2703.3	0.209895696
83	2678.610364	-1213.810364	0.030536532	1464.8	0.449892192
84	2703.269479	-255.9694794	0.038950178	2447.3	0.007016706
85	2725.294223	-482.9942226	0.151104643	2242.3	0.0444598
86	2641.130907	-871.6309065	0.010394525	1769.5	0.146464632
87	2627.106797	-180.406797	0.1038021	2446.7	0.151713545
88	2611.41404	788.2859601	0.000702838	3399.7	0.034427238
89	2678.770215	90.12978532	0.490719589	2768.9	0.435088149
90	2655.647329	1939.652671	0.022875306	4595.3	0.069907668
91	2685.279956	695.0200439	0.00019342	3380.3	0.031579465
92	2732.588304	47.01169584	0.134663827	2779.6	0.172394051
93	2645.517866	-1020.017866	0.076441796	1625.5	0.807952695
94	2637.17998	449.4200199	0.013646632	3086.6	0.052718636
95	2738.472913	-360.5729133	0.00382413	2377.9	0.001404004
96	2614.048265	-147.0482648	0.157764499	2467	0.25329412
97	2728.717975	979.8820246	**15.31581483**	3708.6	**27.03386136**

	Theils' U
New Model with Serv Inv	**0.752689768**

Appendix G: Supplemental Analysis

F-15E (Regression with Possessed Hours, Flying Hours, and Sorties)
Theil's *U*-statistic for This Model and USAF Predictions

Regression Statistics	
R Square	0.732314175
Adjusted R Square	0.723679148
Standard Error	2100.927609
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	1122993368	374331122.8	84.80740223	1.61529E-26
Residual	93	410492404	4413896.817		
Total	96	1533485772			

	Coefficients	*Standard Error*	*t Stat*
Intercept	-4265.177868	1179.402689	-3.616388116
Possessed Hours	0.179312374	0.01904502	9.41518457
Flying Hours	1.174425669	0.546400415	2.149386489
Sorties	-3.765017347	1.331058003	-2.828589994

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*USAF Pred*	*Denominator*	*Numerator USAF Model*
1	3596.273589	1094.726411	0.054460337	4691	5013.492	0	0.004726145
2	3596.273589	1094.726411	0.021565045	4691	5013.492	0.000463566	0.009557511
3	5278.875311	-688.8753108	0.137428245	4590	5048.604	0.1158075	0.106789696
4	4729.573393	-1701.573393	0.06830337	3028	4527.952	0.032039581	0.078296467
5	4361.365179	-791.3651789	0.006870397	3570	4417.28	0.043548792	0.001211254
6	4610.909654	-295.9096543	0.008855371	4315	4439.247	0.000474563	0.004457937
7	4815.054357	-406.0543573	0.002159904	4409	4697.103	0.008479532	0.002433181
8	4610.092755	204.9072447	0.012694463	4815	4597.516	0.024979097	0.004311211
9	4596.504638	-542.5046385	0.065968146	4054	4370.152	0.041212806	0.004383132
10	3835.759903	1041.240097	0.104684697	4877	4608.604	0.028132032	0.093017621
11	4117.045937	1577.954063	0.01707454	5695	4207.574	0.003907622	0.029715827
12	5306.836734	744.1632664	0.069641287	6051	5069.28	0.043912099	0.080238263
13	8915.836855	-1596.836855	0.029370575	7319	9033.028	0.076474654	0.019441023
14	8088.681089	1254.318911	0.142911721	9343	8322.504	0.175586384	0.191087728
15	8959.996567	-3531.996567	0.014402366	5428	9512.16	0.703274432	0.002535052
16	9328.58649	651.4135098	0.017611165	9980	9706.704	0.012259238	0.021506311
17	10199.41652	-1324.41652	0.139763485	8875	10338.57	0.069874593	0.202676286
18	9846.914749	-3317.914749	0.001131368	6529	10524.488	0.373280012	0.006393924
19	10737.60819	-219.6081909	0.084606829	10518	11040.072	0.076072751	0.060330064
20	10359.60272	3059.397283	0.018666293	13419	10835.55	0.00431034	0.043149187
21	12466.6339	1833.366096	0.019930503	14300	11512.554	0.000616289	0.023608516
22	12636.19129	2018.808707	0.001435347	14655	12457.796	0.021703693	0.001729578
23	11940.7811	555.2188986	0.009594491	12496	11886.525	0.00040992	0.00122304
24	13467.00162	-1224.00162	0.000721483	12243	12680.01	0.041630264	0.010794333
25	14412.14767	328.8523348	0.007519579	14741	13469.004	0.012757765	0.005339157
26	11797.72676	1278.273238	0.00764636	13076	11998.882	0.00354005	0.015582776
27	13441.41078	-1143.410784	0.002368378	12298	13930.29	4.46969E-06	0.00325015
28	12922.49433	-598.4943291	0.106347749	12324	13025.11	0.043149578	0.114902736
29	13782.97996	-4018.979962	0.115410146	9764	13941.504	4.56912E-05	0.126586629
30	13015.03279	-3317.032794	0.015265005	9698	13171.935	0.081876942	0.005324816
31	13671.20369	-1198.203688	0.008131401	12473	13180.676	0.001290073	0.008933091
32	14045.74381	-1124.743812	0.010127367	12921	14099.886	3.83343E-07	0.000806699
33	14229.30254	-1300.302539	0.1405288	12929	13295.988	0.077014943	0.141016718
34	14187.71636	-4846.716359	0.351371061	9341	14196.123	0.016120653	0.347555753
35	13692.0235	-5537.023502	0.267985659	8155	13661.88	0.055720312	0.272096239
36	14301.62587	-4221.625869	0.038524634	10080	14333.88	0.069951853	0.025368146
37	14724.47148	-1978.471483	0.02102996	12746	14351.48	0.017601083	0.010832064
38	12588.61201	1848.387989	0.005562713	14437	13110.432	0.003078301	0.000987858
39	14161.2366	1076.763398	0.010856576	15238	14784.242	0.000369725	0.008148303
40	13943.27822	1587.72178	0.029090743	15531	14155.497	0.012812648	0.020205695

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	USAF Pred	Denominator	Numerator USAF Model
41	14640.03129	2648.968708	0.059180885	17289	15081.319	0.001715088	0.050364846
42	13799.08393	4205.916066	0.000269632	18005	14124.983	0.019110126	0.001693808
43	15220.34938	295.6506224	0.017348613	15516	14774.988	0.000474541	0.007609178
44	13810.32349	2043.676509	0.003573746	15854	14500.53	0.012422111	0.000172806
45	15034.76502	-947.7650238	0.005647894	14087	13878.59	0.010247125	0.007162564
46	14454.32711	1058.672891	0.000734359	15513	14320.79	0.000321143	0.006324007
47	14814.61223	420.3877667	0.005385783	15235	14001.35	0.010769085	0.017214043
48	15697.93545	1118.064555	0.003092479	16816	14817.133	0.018772389	1.9131E-06
49	15447.13879	-935.1387897	0.009100363	14512	14535.259	0.044607349	0.008641401
50	12831.38419	-1384.384189	0.115581696	11447	12796.023	0.019366368	0.148740642
51	13745.67186	-3891.671862	0.052926303	9854	14268.754	0.008249373	0.074471829
52	13015.98338	-2266.983379	0.007082	10749	13438.11	0.143156878	0.00342843
53	13911.42199	904.5780123	2.51143E-05	14816	14186.616	0.00835171	0.000256601
54	13387.75089	74.24910952	0.068052648	13462	13699.334	0.014642762	0.043775506
55	15344.8188	-3511.818802	0.055543337	11833	14649.6	0.004860917	0.048735049
56	15446.75813	-2788.758126	0.002644492	12658	15270.255	0.04067911	0.001442607
57	15861.93287	-650.9328692	0.00544992	15211	14730.228	0.008159395	0.0108802
58	15462.06961	1122.93039	0.04192771	16585	14998.368	0.007034339	0.045872161
59	14580.01278	3395.987219	0.003600593	17976	14423.86	0.037823066	1.17916E-08
60	15558.6489	-1078.648902	0.008463422	14480	14478.048	0.000915815	0.003557142
61	15373.91453	-1332.114535	0.001164952	14041.8	14905.413	0.000475205	0.001385637
62	13256.43384	479.2661623	0.000153726	13735.7	13213.006	0.007803805	1.48323E-05
63	15119.40374	-170.3037443	0.033133991	14949.1	14896.2	0.080445475	0.045342978
64	13430.24649	-2721.146493	0.007176329	10709.1	13892.345	0.160999586	0.001945244
65	14098.89772	907.2022843	0.000206865	15006.1	14533.776	0.006958798	0.000102829
66	13970.1299	-215.8298954	0.005668342	13754.3	13906.469	6.13133E-05	0.008176607
67	14897.53913	-1035.539133	0.01434309	13862	15105.727	0.001346703	0.009591024
68	15013.44974	-1660.149738	0.029834166	13353.3	14710.858	0.000736545	0.006648966
69	15297.35802	-2306.458015	8.26762E-05	12990.9	14079.744	0.010120599	3.44455E-05
70	14179.67833	118.1216685	0.002835586	14297.8	14374.044	0.000117675	0.004608125
71	13381.339	761.3609983	0.016425217	14142.7	13172.12	0.012814982	0.006830915
72	14354.24123	-1812.541225	0.019117684	12541.7	13710.585	0.000200301	0.006533365
73	14453.29966	-1734.09966	4.92488E-05	12719.2	13732.936	0.001483526	0.000858893
74	13298.36011	-89.26010948	0.000273527	13209.1	12836.34	0.037666396	0.000173417
75	15554.23926	218.4607408	0.051350291	15772.7	15598.752	0.012955733	0.037381782
76	13993.81112	3574.188877	0.010583306	17568	14518.448	0.001925036	0.012907614
77	14989.88856	1807.31144	0.007789609	16797.2	14801.27	0.052575816	0.008387412
78	14428.20009	-1482.500088	0.001589101	12945.7	14484.0349	0.006257973	0.000110496
79	13453.73865	516.0613454	0.020772643	13969.8	13833.7185	0.028019297	0.024126701
80	14294.77218	2013.427823	0.013712085	16308.2	14138.3028	1.40369E-05	0.036218523
81	14337.43241	1909.66759	0.005479542	16247.1	13143.4596	0.000993865	0.011736718
82	14532.22588	1202.674117	0.003951628	15734.9	13974.752	0.026066111	0.000236595
83	14183.62689	-989.1268946	0.013643461	13194.5	13436.5284	0.001935613	0.005403249
84	14155.18659	-1541.186588	0.009674582	12614	13583.8854	0.043713282	0.024938749
85	14010.59388	1240.706124	0.00262839	15251.3	13259.2962	0.030065845	0.004241002
86	11824.89893	781.9010685	0.005302189	12606.8	11613.5899	0.029552094	0.006442106
87	13856.02158	917.9784206	0.023219707	14774	13762.1438	0.003603737	0.022151763
88	13409.63584	2251.264164	0.006239155	15660.9	13462.0164	5.96949E-07	0.014768666
89	14435.97181	1237.028192	1.03726E-07	15673	13769.7872	0.011251723	0.002086163
90	14015.54773	-5.047731526	0.055326596	14010.5	13294.643	0.051620307	0.052229234
91	13898.20536	3295.49464	0.047775882	17193.7	13991.7801	0.011498517	0.060929701
92	15279.25353	3758.146467	0.061906796	19037.4	14793.317	0.001229015	0.094295539
93	14968.08998	4736.710019	0.02182037	19704.8	13858.8754	0.010626838	0.034873891
94	14762.76219	2910.737808	0.044014103	17673.5	13993.7168	1.20303E-05	0.061932364
95	13904.38129	3707.818709	0.017751021	17612.2	13213.935	0.007384781	0.024747603
96	13752.17452	2346.525482	0.000233676	16098.7	13328.0595	0.009654316	0.002878874
97	14270.80768	246.0923205	**3.208478187**	14516.9	13653.122	**3.367650393**	**3.226166887**

	Theils' U
USAF Pred	**0.978768345**
New Model w/out Serv Inv	**0.97608142**

Appendix G: Supplemental Analysis

F-15E (Regression with Possessed Hours, Flying Hours, Sorties, and Serviceable Inventory)
Theil's *U*-statistic for This Model

Regression Statistics	
R Square	0.762021278
Adjusted R Square	0.751674377
Standard Error	1991.659195
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	1168548788	292137197	73.6472961	7.54562E-28
Residual	92	364936984.1	3966706.349		
Total	96	1533485772			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3415.186355	2527.133155	1.351407364	0.179878716
Possessed Hours	0.153837684	0.019556905	7.866156981	6.82953E-12
Flying Hours	1.783442815	0.548271586	3.252845596	0.00159829
Sorties	-4.353924027	1.27374008	-3.418220165	0.000940781
Serv Inv	-0.037704153	0.011125875	-3.388870718	0.001034861

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*Denominator*
1	3865.963854	825.0361461	0.016845725	4691	0
2	4082.15004	608.8499602	0.005168074	4691	0.000463566
3	4927.232795	-337.2327947	0.070039404	4590	0.1158075
4	4242.741602	-1214.741602	0.003918958	3028	0.032039581
5	3759.557584	-189.5575843	0.003770363	3570	0.043548792
6	4095.790289	219.2097107	0.000139445	4315	0.000474563
7	4358.045574	50.95442645	0.011759785	4409	0.008479532
8	4336.876831	478.1231692	0.009629853	4815	0.024979097
9	4526.504677	-472.5046766	0.028954972	4054	0.041212806
10	4187.164846	689.8351539	0.060210968	4877	0.028132032
11	4498.285477	1196.714523	0.0024982	5695	0.003907622
12	5766.35251	284.6474902	0.098657262	6051	0.043912099
13	9219.604189	-1900.604189	0.021435276	7319	0.076474654
14	8271.440508	1071.559492	0.15060602	9343	0.175586384
15	9053.830643	-3625.830643	0.008544039	5428	0.703274432
16	9478.268393	501.7316075	0.01685612	9980	0.012259238
17	10170.71457	-1295.714569	0.181068381	8875	0.069874593
18	10305.50159	-3776.501585	0.001338096	6529	0.373280012
19	10756.83081	-238.8308095	0.096021624	10518	0.076072751
20	10159.74987	3259.250126	0.02088305	13419	0.00431034
21	12360.82448	1939.175523	0.022824718	14300	0.000616289
22	12494.57723	2160.422772	0.002694965	14655	0.021703693
23	11735.21426	760.785738	0.002144402	12496	0.00040992
24	12821.66088	-578.6608831	0.005849156	12243	0.041630264
25	13804.65808	936.3419235	0.008876153	14741	0.012757765
26	11687.20122	1388.798782	0.005014631	13076	0.00354005
27	13223.96463	-925.964634	0.000557116	12298	4.46969E-06
28	12614.27337	-290.2733674	0.080207394	12324	0.043149578
29	13254.26894	-3490.268935	0.075644573	9764	4.56912E-05
30	12383.44746	-2685.447458	0.002706997	9698	0.081876942
31	12977.57542	-504.5754234	0.004118748	12473	0.001290073
32	13721.48562	-800.4856198	0.002685363	12921	3.83343E-07
33	13598.57248	-669.5724779	0.120315452	12929	0.077014943
34	13825.61989	-4484.619889	0.315207883	9341	0.016120653
35	13399.35289	-5244.352887	0.203746757	8155	0.055720312
36	13761.02967	-3681.029666	0.018915565	10080	0.069951853
37	14132.34141	-1386.341408	0.023012644	12746	0.017601083
38	12503.44215	1933.557854	0.009605273	14437	0.003078301
39	13823.08027	1414.919731	0.018826322	15238	0.000369725
40	13440.20859	2090.79141	0.043614735	15531	0.012812648

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	Denominator
41	14045.48405	3243.51595	0.084099036	17289	0.001715088
42	12991.21873	5013.781272	0.005497186	18005	0.019110126
43	14181.05504	1334.944961	0.035037432	15516	0.000474541
44	12949.67038	2904.32962	0.000400119	15854	0.012422111
45	13769.8728	317.1271959	0.023968173	14087	0.010247125
46	13332.09886	2180.90114	0.012292222	15513	0.000321143
47	13515.06911	1719.930892	0.034327719	15235	0.010769085
48	13993.29863	2822.701375	0.002094538	16816	0.018772389
49	13742.39682	769.6031795	0.000696601	14512	0.044607349
50	11830.01817	-383.0181677	0.067448284	11447	0.019366368
51	12826.87833	-2972.878335	0.018139086	9854	0.008249373
52	12076.15075	-1327.150755	0.029923107	10749	0.143156878
53	12956.60608	1859.393916	0.002155199	14816	0.00835171
54	12774.18016	687.8198392	0.048466163	13462	0.014642762
55	14796.66361	-2963.663609	0.056467381	11833	0.004860917
56	15469.85996	-2811.859965	0.00311927	12658	0.04067911
57	15917.95473	-706.9547337	0.003359638	15211	0.008159395
58	15703.33423	881.6657712	0.03300807	16585	0.007034339
59	14962.81679	3013.183209	0.004707243	17976	0.037823066
60	15713.32165	-1233.32165	0.01865533	14480	0.000915815
61	16019.54379	-1977.743791	0.000120727	14041.8	0.000475205
62	13889.98547	-154.2854689	0.002347746	13735.7	0.007803805
63	15614.64333	-665.5433344	0.04654521	14949.1	0.080445475
64	13934.2695	-3225.1695	0.002394119	10709.1	0.160999586
65	14482.10661	523.9933899	0.000927008	15006.1	0.006958798
66	14211.18784	-456.8878363	0.014201361	13754.3	6.13133E-05
67	15501.09254	-1639.092543	0.015913065	13862	0.001346703
68	15101.94968	-1748.649684	0.025056342	13353.3	0.000736545
69	15104.61992	-2113.719923	6.90422E-05	12990.9	0.010120599
70	14189.85652	107.9434806	0.004527539	14297.8	0.000117675
71	13180.64404	962.0559623	0.009092504	14142.7	0.012814982
72	13890.27184	-1348.571844	0.011018886	12541.7	0.000200301
73	14035.71331	-1316.513311	0.000503584	12719.2	0.001483526
74	13494.5274	-285.4274044	0.000504031	13209.1	0.037666396
75	16069.25275	-296.5527495	0.035764396	15772.7	0.012955733
76	14585.14946	2982.850539	0.008000159	17568	0.001925036
77	15225.85465	1571.345347	0.017264233	16797.2	0.052575816
78	15152.7417	-2207.041699	0.000563553	12945.7	0.006257973
79	13662.47861	307.3213896	0.010739265	13969.8	0.028019297
80	14860.50368	1447.696318	0.007327043	16308.2	1.40369E-05
81	14851.14826	1395.951737	0.00059169	16247.1	0.000993865
82	15339.69435	395.2056538	0.013010604	15734.9	0.026066111
83	14989.2862	-1794.786205	0.031350072	13194.5	0.001935613
84	14950.21176	-2336.211759	0.00143288	12614	0.043713282
85	14773.81727	477.4827307	0.000404618	15251.3	0.030065845
86	12913.58185	-306.7818487	0.000425532	12606.8	0.029552094
87	15034.0585	-260.0584976	0.005151046	14774	0.003603737
88	14600.55837	1060.341631	0.000501564	15660.9	5.96949E-07
89	15322.26431	350.7356856	0.004627901	15673	0.011251723
90	15076.71343	-1066.21343	0.023583684	14010.5	0.051620307
91	15042.11028	2151.589721	0.023448088	17193.7	0.011498517
92	16404.56854	2632.831458	0.041097267	19037.4	0.001229015
93	15845.45051	3859.349487	0.009258006	19704.8	0.010626838
94	15777.53306	1895.966937	0.023250079	17673.5	1.20303E-05
95	14917.34884	2694.851159	0.004952384	17612.2	0.007384781
96	14859.27356	1239.426436	0.005793316	16098.7	0.009654316
97	15742.23378	-1225.333778	**2.660534807**	14516.9	**3.367650393**

	Theils' U
New Model with Serv Inv	**0.888834642**

Appendix G: Supplemental Analysis

F-16A (Regression with Possessed Hours, Flying Hours, and Sorties)
Theil's *U*-statistic for This Model and USAF Predictions

Regression Statistics	
R Square	0.934434289
Adjusted R Square	0.932319266
Standard Error	3724.563355
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	18386779780	6128926593	441.8081142	7.09127E-55
Residual	93	1290130613	13872372.18		
Total	96	19676910393			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1566.181324	664.5885282	2.356618054	0.020540511
Possessed Hours	0.109611327	0.015402453	7.116485252	2.26682E-10
Flying Hours	-0.091740067	1.220089813	-0.075191241	0.94022406
Sorties	0.425758155	2.068342668	0.205845077	0.837361864

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*USAF Pred*	*Denominator*	*Numerator USAF Model*
1	38522.40603	1480.593969	0.001369894	40003	25322	0	0.134687147
2	38522.40603	1480.593969	0.003354413	40003	25322	3.39255E-05	0.02611945
3	42073.37081	-2303.370814	0.031873636	39770	33304.91	0.018683047	0.005651765
4	40463.71393	-6129.713935	0.010094416	34334	31344.162	0.007548449	0.021852631
5	41066.27529	-3749.275291	0.052752266	37317	32241.53	0.019320531	0.001709173
6	39509.57385	-7379.573852	0.000680063	32130	30587.235	0.092633365	0.095746233
7	40816.09644	1092.903557	0.018985669	41909	31967.05	0.016498109	0.135971147
8	40775.70656	6516.293443	0.015281498	47292	31838.364	0.002864237	0.076429602
9	39227.71881	5533.28119	0.000519772	44761	31686.699	0.004688797	0.051867002
10	40745.39377	950.6062269	0.024654975	41696	31501.983	0.012054877	0.135294239
11	39008.1015	7265.898504	0.015245003	46274	30937.225	4.72259E-05	0.075867782
12	40281.78252	5674.217483	0.006397643	45956	33210.24	0.000642639	0.063567482
13	43352.01423	3768.985768	0.001052304	47121	35534.301	0.009500881	0.04436369
14	41148.4242	1379.575803	0.00856431	42528	32603.05	0.01981178	0.114206728
15	44024.34195	4489.658047	0.002146216	48514	34141.881	0.003949851	0.069142949
16	43358.73076	2106.269239	0.014335028	45465	32708.221	0.014096502	0.012241854
17	44864.18095	-4797.180955	0.001927453	40067	35036.62	0.019214899	0.091347538
18	43618.11186	2002.888136	0.01165589	45621	33511.248	0.009493228	0.115474769
19	44660.75222	5405.247778	0.000928661	50066	34563.264	0.005745632	0.049889139
20	44860.94008	1410.059919	1.91911E-05	46271	35088.32	0.002891232	0.036135404
21	43591.19722	191.8027772	0.016299132	43783	34987.2	0.036703359	0.148593706
22	45510.42996	6660.570042	0.027545673	52171	35293.593	8.82133E-05	0.098764763
23	43920.91218	8740.087819	0.002115756	52661	36265.292	0.033524017	0.010758091
24	44997.75971	-1978.759706	0.020636545	43019	37556.937	0.788012681	0.001432226
25	5524.993699	-693.9936987	0.041952584	4831	3202.956	0.013198114	0.09421456
26	5151.824428	-875.824428	0.139440364	4276	2793.154	0.000686058	0.06064367
27	5718.908992	-1554.908992	0.192273006	4164	3110.995	0.000886792	0.040325154
28	5811.497417	-1771.497417	1.029043153	4040	3203.822	0.05152001	0.014466016
29	6291.026298	-3168.026298	0.517946696	3123	3608.91	0.01396075	0.005026279
30	6005.140497	-2513.140497	0.220498647	3492	3270.591	0.054337586	0.030233362
31	6327.980625	-2021.980625	0.192547001	4306	3698.82	0.000398886	0.022014055
32	6319.217412	-1927.217412	0.041076633	4392	3753.113	0.032682581	0.14312922
33	6237.065869	-1051.065869	0.003000027	5186	3524.4	0.022971009	0.191217158
34	6299.101385	-327.1013849	0.135482186	5972	3704.246	0.067885901	0.020871637
35	6041.437078	-1625.437078	0.240605536	4416	3553.224	0.006210125	0.012869916
36	6063.417387	-1995.417387	0.158847876	4068	3567.024	39.30254316	1.471354687
37	41356.73623	-11785.73623	0.024918834	29571	34505.46	0.000109191	0.004741192
38	34596.76726	-4716.767263	0.077038964	29880	27843.85	0.002799642	0.000337025
39	36153.64036	-7854.64036	0.096012036	28299	27750.456	0.018914875	0.001575621
40	31969.70641	-7562.70641	0.011310564	24407	25530.303	0.033887851	0.025349018

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	USAF Pred	Denominator	Numerator USAF Model
41	31973.54778	-3073.547778	0.046145424	28900	25014.07	0.013133636	0.003504992
42	31084.68266	-5496.682659	0.157551438	25588	23877.034	0.024241862	0.009315358
43	30179.22165	-8575.221649	0.012963953	21604	24073.654	0.031626154	0.029199697
44	28343.26519	-2897.265195	0.006679361	25446	21754.326	0.003456401	0.015204346
45	25907.37025	-1957.37025	0.054781124	23950	20812.358	0.033889812	0.00083756
46	24114.64291	-4573.642908	0.038030216	19541	18847.872	0.011428344	0.005881008
47	20855.37342	-3403.373422	0.01788573	17452	15953.445	0.000223661	0.011986511
48	20081.89304	-2368.893044	0.009283792	17713	15802.304	1.56175E-07	0.020521772
49	19412.01622	-1706.016215	0.006980135	17706	15168.538	0.004292152	0.111691897
50	17289.79846	1576.201536	0.055812173	18866	12948.595	0.075242124	0.309717854
51	18361.40987	5679.590133	0.0021111	24041	13541.637	0.053814119	0.047788186
52	17615.64006	848.3599375	0.002657745	18464	13208.515	0.007294773	0.044649059
53	17757.58099	-870.5809883	0.002894213	16887	12985.497	0.005990267	0.105828755
54	17215.20121	978.7987943	0.016681215	18194	12700.434	0.026773262	0.013905276
55	17182.36348	-1965.363481	0.014523199	15217	13071.552	0.000496297	0.042773671
56	17430.68832	-1874.688319	0.006854618	15556	12408.851	0.031822193	0.122869042
57	16813.32851	1517.671488	0.000759463	18331	12878.205	0.000919978	0.06379831
58	17285.15011	489.8498937	9.29794E-05	17775	13144.896	0.005514786	0.051566936
59	16613.6687	-158.6686956	0.000187004	16455	12418.59	3.32389E-08	0.041859743
60	16683.06188	-225.0618796	0.044393084	16458	13091.364	0.038031872	0.002713259
61	16039.79368	-2791.393677	0.009239883	13248.4	12391.12	0.000126148	0.041029272
62	14358.79	-1259.19	0.056466335	13099.6	10416.046	0.01068369	0.007541673
63	14536.66536	-2791.06536	0.051202381	11745.6	10607.994	0.00144832	0.01361425
64	13855.24079	-2556.640793	0.076041899	11298.6	9928.122	0.000929671	0.007212893
65	13974.76928	-3020.669282	0.0095083	10954.1	9994.524	0.113837938	0.217593662
66	13221.47096	1428.529041	0.002251922	14650	9540.248	0.024826143	0.043012552
67	12927.36817	-585.668169	0.070760335	12341.7	9303.368	0.173910023	0.449302578
68	12836.41649	4652.083511	0.031010471	17488.5	9215.854	0.020426839	0.111595422
69	12349.46853	2639.53147	3.91069E-07	14989	9146.809	0.023837267	0.057081941
70	12666.87375	7.926249069	0.000553354	12674.8	9093.654	0.001721568	0.072998875
71	11863.11564	285.784359	0.00145436	12148.9	8724.384	0.000465436	0.072779905
72	11937.69315	473.3068501	0.016209714	12411	9133.5	0.02120777	0.022571945
73	11953 6225	-1350.022503	0.0265461	10603.6	8738.976	0.010881333	0.02910384
74	11044.92521	-1547.425214	0.021060545	9497.5	7688.542	0.214686722	0.335901132
75	11881.17273	2016.927272	1.10268E-05	13898.1	8393.636	0.030196692	0.067101728
76	11521.13121	-38.13121105	0.070883289	11483	7882.836	0.153456787	0.456577186
77	11726.45214	4254.847856	0.032508388	15981.3	8222.18	0.019145694	0.139525087
78	11287.25763	2482.742373	0.095323204	13770	7800.4959	0.055942384	0.400691317
79	11769.93724	5256.962764	0.103667068	17026.9	8310.4648	0.000332118	0.277159187
80	11755.07744	5582.122561	0.144263404	17337.2	8373.2335	0.002771393	0.326575345
81	11318.21886	6931.68114	0.06233833	18249.9	8342.25	0.018979233	0.16317906
82	11806.86629	3928.833712	0.066736286	15735.7	8363.5748	0.000928162	0.197487667
83	11315.08401	3941.215994	0.008806791	15256.3	8263.4203	0.035625904	0.075776312
84	11215.2147	1161.485298	0.008882091	12376.7	8177.0224	0.000495488	0.116262998
85	10960.72429	1140.475707	0.003059213	12101.2	7881.072	0.01789491	0.093244809
86	9902.616883	579.7831168	0.030213647	10482.4	6787.176	0.026115922	0.247912489
87	10059.88924	2116.510757	0.025019028	12176.4	6957.128	0.003181433	0.17267245
88	9672.243495	1817.356505	0.030581381	11489.6	6429.834	0.000189106	0.18911454
89	9610.722091	2036.877909	0.02051961	11647.6	6651.083	0.003219575	0.165940915
90	9412.891744	1573.808256	0.008529657	10986.7	6241.9516	0.000261896	0.138861934
91	9810.631692	998.2683077	0.006106958	10808.9	6714.796	8.49094E-05	0.132853206
92	9872.399999	836.9000008	0.001691509	10709.3	6769.5604	0.026910544	0.053838143
93	9320.698016	-368.1980162	0.000245704	8952.5	6467.616	0.006552814	0.128304207
94	9525.510374	151.689626	0.020478012	9677.2	6470.4524	0.010203146	0.19253672
95	9129.997447	1524.702553	0.026943074	10654.7	6408.4408	0.054865875	0.017318468
96	9498.246465	-1339.246465	0.003006647	8159	6756.8452	0.006337011	0.071404761
97	9291.495567	-482.9955668	**5.04981779**	8808.5	6628.279	**42.2019118**	**10.1167748**

Theils' U	
USAF Pred	**0.4896153**
New Model w/out Serv Inv	**0.34591691**

Appendix G: Supplemental Analysis

F-16A (Regression with Possessed Hours, Flying Hours, Sorties, and Serviceable Inventory)
Theil's *U*-statistic for This Model

Regression Statistics	
R Square	0.934829764
Adjusted R Square	0.931996276
Standard Error	3733.440092
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	18394561501	4598640375	329.9218465	1.22954E-53
Residual	92	1282348893	13938574.92		
Total	96	19676910393			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2949.016309	1966.968801	1.499269489	0.137227515
Possessed Hours	0.110230758	0.015461403	7.129415145	2.22826E-10
Flying Hours	0.12523666	1.257000683	0.099631338	0.920853794
Sorties	0.255409948	2.085769682	0.122453572	0.902806909
Serv Inv	-0.006867893	0.00919168	-0.747185825	0.456856823

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*Denominator*
1	38441.11006	1561.88994	0.001471733	40003	0
2	38468.35785	1534.642148	0.002688556	40003	3.39255E-05
3	41832.12564	-2062.125636	0.031042025	39770	0.018683047
4	40383.22068	-6049.220684	0.009103976	34334	0.007548449
5	40877.59259	-3560.592594	0.046898496	37317	0.019320531
6	39088.09229	-6958.092293	0.00127895	32130	0.092633365
7	40410.23305	1498.766953	0.021168633	41909	0.016498109
8	40411.27673	6880.723265	0.017026054	47292	0.002864237
9	38920.4091	5840.590903	0.000743814	44761	0.004688797
10	40558.8273	1137.172698	0.027083393	41696	0.012054877
11	38658.67255	7615.327447	0.017556112	46274	4.72259E-05
12	39866.85386	6089.146144	0.007623537	45956	0.000642639
13	43006.73029	4114.269707	0.001462808	47121	0.009500881
14	40901.4455	1626.554498	0.008753621	42528	0.01981178
15	43974.99195	4539.008053	0.002251879	48514	0.003949851
16	43307.50541	2157.494587	0.014455896	45465	0.014096502
17	44884.36254	-4817.362543	0.001599035	40067	0.019214899
18	43796.71036	1824.289642	0.011004933	45621	0.009493228
19	44813.85635	5252.143648	0.000600228	50066	0.005745632
20	45137.38086	1133.619137	4.85391E-07	46271	0.002891232
21	43813.50363	-30.50362942	0.014260524	43783	0.036703359
22	45940.87304	6230.126956	0.027098473	52171	8.82133E-05
23	43992.14948	8668.850519	0.002257272	52661	0.033524017
24	45062.86528	-2043.865285	0.000591945	43019	0.788012681
25	4948.537824	-117.5378239	0.005079465	4831	0.013198114
26	4580.752075	-304.7520747	0.058002553	4276	0.000686058
27	5166.846071	-1002.846071	0.092686064	4164	0.000886792
28	5269.953196	-1229.953196	0.708448375	4040	0.05152001
29	5751.609592	-2628.609592	0.323039511	3123	0.01396075
30	5476.732847	-1984.732847	0.119957537	3492	0.054337586
31	5797.378218	-1491.378218	0.104066719	4306	0.000398886
32	5808.831689	-1416.831689	0.012052693	4392	0.032682581
33	5755.343764	-569.3437638	0.000851537	5186	0.022971009
34	5797.730383	174.2696168	0.064451134	5972	0.067885901
35	5537.09998	-1121.09998	0.135227545	4416	0.006210125
36	5563.937764	-1495.937764	0.163405707	4068	39.30254316
37	41524.62483	-11953.62483	0.027060195	29571	0.000109191
38	34795.25503	-4915.255026	0.084010125	29880	0.002799642

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	Denominator
39	36501.32369	-8202.323692	0.099848944	28299	0.018914875
40	32119.33951	-7712.339515	0.013412873	24407	0.033887851
41	32247.0234	-3347.023403	0.050004665	28900	0.013133636
42	31309.91765	-5721.917648	0.158785091	25588	0.024241862
43	30212.72886	-8608.72886	0.014633763	21604	0.031626154
44	28524.20491	-3078.204911	0.007023767	25446	0.003456401
45	25957.19959	-2007.19959	0.053295268	23950	0.033889812
46	24052.18989	-4511.189887	0.035733941	19541	0.011428344
47	20751.02542	-3299.025416	0.01610962	17452	0.000223661
48	19961.19913	-2248.199125	0.008141262	17713	1.56175E-07
49	19303.59364	-1597.59364	0.007700517	17706	0.004292152
50	17210.45959	1655.540411	0.055742265	18866	0.075242124
51	18364.96801	5676.031989	0.002092148	24041	0.053814119
52	17619.45647	844.5435251	0.003013918	18464	0.007294773
53	17814.08216	-927.0821593	0.002686061	16887	0.005990267
54	17251.05549	942.9445146	0.017566014	18194	0.026773262
55	17233.81312	-2016.813118	0.015776074	15217	0.000496297
56	17509.8778	-1953.877802	0.006181818	15556	0.031822193
57	16889.73357	1441.266425	0.000481509	18331	0.000919978
58	17384.95778	390.0422169	0.000273972	17775	0.005514786
59	16727.36501	-272.3650079	0.000387733	16455	3.32389E-08
60	16782.07358	-324.0735791	0.04919778	16458	0.038031872
61	16186.97099	-2938.57099	0.011646295	13248.4	0.000126148
62	14513.28266	-1413.682661	0.065311609	13099.6	0.01068369
63	14747.32151	-3001.721514	0.058162991	11745.6	0.00144832
64	14023.48388	-2724.883885	0.082389891	11298.6	0.000929671
65	14098.32535	-3144.225348	0.009399924	10954.1	0.113837938
66	13229.63555	1420.364445	0.002350529	14650	0.024826143
67	12940.05345	-598.3534527	0.069019649	12341.7	0.173910023
68	12893.99284	4594.507163	0.031085069	17488.5	0.020426839
69	12346.29566	2642.704344	9.50985E-06	14989	0.023837267
70	12635.7134	39.08660137	0.001032927	12674.8	0.001721568
71	11758.44426	390 4557422	0.002228647	12148.9	0.000465436
72	11825.09467	585.9053323	0.013439739	12411	0.02120777
73	11832.87417	-1229.274174	0.024536865	10603.6	0.010881333
74	10985.21191	-1487.711908	0.021324356	9497.5	0.214686722
75	11868.57972	2029.520277	6.92769E-05	13898.1	0.030196692
76	11578.57614	-95.57614301	0.067883456	11483	0.153456787
77	11817.45958	4163.840416	0.030150804	15981.3	0.019145694
78	11378.979	2391.021002	0.08880716	13770	0.055942384
79	11952.79352	5074.106482	0.096246473	17026.9	0.000332118
80	11958.5737	5378.626297	0.136891974	17337.2	0.002771393
81	11497.63495	6752.265054	0.054376031	18249.9	0.018979233
82	12066.34426	3669.355737	0.058044639	15735.7	0.000928162
83	11580.68277	3675.617227	0.005179425	15256.3	0.035625904
84	11485.97092	890.7290842	0.004976968	12376.7	0.000495488
85	11247.48903	853.7109668	0.000489114	12101.2	0.01789491
86	10250.57212	231.8278758	0.021017198	10482.4	0.026115922
87	10411.14964	1765.250362	0.016238579	12176.4	0.003181433
88	10025.47241	1464.127588	0.020961791	11489.6	0.000189106
89	9961.238653	1686.361347	0.011992848	11647.6	0.003219575
90	9783.526029	1203.173971	0.003429173	10986.7	0.000261896
91	10175.94008	632.9599201	0.001755747	10808.9	8.49094E-05
92	10260.5628	448.737197	0.007275251	10709.3	0.026910544
93	9716.104228	-763.6042282	0.000813395	8952.5	0.006552814
94	9953.194529	-275.9945291	0.011103947	9677.2	0.010203146
95	9531.958124	1122.741876	0.047480987	10654.7	0.054865875
96	9936.856898	-1777.856898	0.010513265	8159	0.006337011
97	9711.672631	-903.1726306	**3.87208605**	8808.5	**42.20191176**

	Theils' U
New Model with Serv Inv	**0.302905**

Appendix G: Supplemental Analysis

F-16B (Regression with Possessed Hours, Flying Hours, and Sorties)
Theil's *U*-statistic for This Model and USAF Predictions

Regression Statistics	
R Square	0.488131361
Adjusted R Square	0.471619469
Standard Error	1329.181363
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	156685794.1	52228598.02	29.56241311	1.63876E-13
Residual	93	164305248	1766723.096		
Total	96	320991042			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	968.5939386	396.0482674	2.445646196	0.016341061
Possessed Hours	0.182186588	0.028903685	6.303230582	9.65198E-09
Flying Hours	2.521706913	4.121976855	0.611771245	0.54218182
Sorties	-7.31494599	5.382512399	-1.359020741	0.177426734

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*USAF Pred*	*Denominator*	*Numerator USAF Model*
1	4188.169243	3105.830757	0.181310959	7294	2282.56	0	0.472056033
2	4188.169243	3105.830757	0.155216867	7294	2282.56	1.92472E-05	0.399695596
3	4439.733883	2886.266117	0.037118762	7326	2714.625	0.066345271	0.144966665
4	4391.109747	1047.890253	0.000568859	5439	2649.663	0.027808429	0.107358818
5	4423.908346	108.091654	0.385684206	4532	2749.876	0.158099236	7.72785E-07
6	4425.424966	-1695.424966	0.080651443	2730	2726.016	0.094674556	0.048223838
7	4583.85136	-1013.85136	0.020367083	3570	2970.494	0.013513248	0.05705434
8	4553.712455	-568.7124547	0.008708409	3985	3132.268	0.00909307	0.08198285
9	4772.336801	-407.3368014	0.005106842	4365	3223.989	0.006356089	0.097045738
10	5049.801205	-336.8012048	0.222143776	4713	3353.208	0.062155685	0.002236389
11	5205.53479	-1667.53479	0.132484328	3538	3315.12	0.01208881	0.016252142
12	5356.365035	-1429.365035	8.31982E-05	3927	3475.962	1.082087348	0.404708838
13	8085.079894	-73.07989406	0.007960375	8012	5513.771	0.002840363	0.09818938
14	6908.259203	676.740797	0.025421592	7585	5074.425	0.000221945	0.092895325
15	6470.619341	1227.380659	0.115947515	7698	5386.188	0.04122514	0.299139652
16	6107.530706	3153.469294	0.023797421	9261	5050.682	0.012297735	0.10448887
17	6963.789172	1270.210828	0.001261769	8234	5240.406	0.124900522	0.006359046
18	5134.884166	189.1158344	0.00194509	5324	4667.391	0.016457555	0.056316353
19	5742.072202	264.9277984	0.047607158	6007	4743.558	0.027713076	0.00123852
20	6099.480563	-1092.480563	0.081592793	5007	4795.598	0.009190249	0.034597337
21	7054.331496	-1567.331496	0.050745967	5487	4555.68	0.025838497	0.000195587
22	5642.362162	-1037.362162	0.087255551	4605	4528.263	0.987876276	0.931624454
23	6469.724371	2712.275629	0.023933564	9182	4737.222	4.28186E-06	0.16919747
24	7777.561461	1423.438539	0.028396337	9201	5424.111	0.496916969	0.003182549
25	3172.510429	-457.5104287	0.003876673	2715	2195.934	0.021489508	0.149576631
26	2919.175496	193.8245039	0.097050298	3113	2062.97	0.108415029	0.337143809
27	2848.893133	1289.106867	0.049151743	4138	2330.465	0.013010771	0.118483189
28	2853.24075	812.7592501	0.057122858	3666	2241.643	0.091842394	0.003108078
29	3165.654933	-610.6549327	0.103769284	2555	2350.62	0.554748029	0.774621824
30	3021.933751	1436.066249	0.044042455	4458	2209.278	0.094855157	0.027631418
31	3732.427184	-647.4271836	0.058980256	3085	2343.96	0.000988629	0.039657914
32	3713.661228	-725.6612282	0.1005866	2988	2373.644	0.228399542	0.50791906
33	3015.448352	1400.551648	0.01667592	4416	2286.499	0.024343348	0.08388592
34	3245.712813	481.2871867	0.000566003	3727	2447.991	0.020837507	0.052419006
35	3113.131113	75.86888698	0.012953008	3189	2335.696	0.000255759	0.044652501
36	3495.139802	-357.1398016	0.003798957	3138	2464.128	1.341846853	0.257553986
37	7190.458485	-417.458485	0.147762348	6773	5180.472	0.181438515	0.003777503
38	5382.542082	-1494.542082	0.269424901	3888	4304.278	0.042762155	0.132742714
39	4684.785845	-1600.785845	6.969E-05	3084	4500.549	0.695525712	0.138360118
40	5703.216603	-47.21660287	0.030045987	5656	4508.851	0.114755156	0.273660691

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	USAF Pred	Denominator	Numerator USAF Model
41	6259.486305	1312.513695	0.040643285	7572	4613.2	0.004119565	0.13496211
42	5657.449655	1428.550345	0.243364266	7086	4304.26	0.235949704	0.009043457
43	5441.656765	-1797.656765	0.506401286	3644	4317.858	0.060189163	0.086473763
44	4706.951641	-1956.951641	0.567019109	2750	3821.57	0.003385124	0.082462119
45	5101.249532	-2191.249532	0.381104196	2910	3699.696	0.000914491	0.0292718
46	4564.123241	-1742.123241	0.079286774	2822	3319.872	0.060479045	0.014904412
47	4506.032016	-990.0320164	0.002803584	3516	3171.48	0.056805489	0.101239439
48	4584.539436	-230.5394358	0.230844022	4354	3235.274	0.073573759	7.53076E-05
49	4697.506878	-1524.506878	1.82039E-05	3173	3135.216	0.087018492	0.18168604
50	4091.468512	17.53148755	0.115022177	4109	2756.52	0.728864649	1.290268202
51	5033.70057	2583.29943	0.000212865	7617	2949.588	0.187357026	0.032101988
52	4383.028369	-63.0283689	1.114662404	4320	2955.26	0.299705558	0.050275709
53	4019.041563	-2064.041563	0.011513726	1955	2923.641	0.96954494	0.344187781
54	3463.668122	416.3318777	0.421935216	3880	2733.05	0.106128175	0.003856794
55	4315.2631	-1699.2631	0.537615874	2616	2856.96	0.089587629	0.107425325
56	3176.997642	-1343.997642	0.11481346	1833	2690.415	0.356864468	0.012415284
57	3920.127472	-992.1274716	0.003162815	2928	2723.76	0.247955019	0.304830702
58	4139.336149	246.6638508	0.020911431	4386	2769.408	0.008653326	0.220513325
59	4100.749956	693.2500439	0.081030666	4794	2734.385	0.069408178	0.017156082
60	4536.130428	-1005.130428	0.019940619	3531	2903.076	0.006136333	0.07453967
61	4345.275976	-537.6759763	0.002076274	3807.6	2843.568	0.016084656	0.209870154
62	4094.998414	195.5015861	1.98121E-05	4290.5	2546.178	0.000962366	0.131594517
63	4138.895099	18.50490103	0.000424998	4157.4	2600.98	0.014022196	0.094754949
64	3740.657753	-75.55775303	0.39264975	3665.1	2385.357	0.114704869	5.17302E-06
65	3942.595996	-1518.795996	0.261710585	2423.8	2432.136	0.001172634	0.000403772
66	3538.29843	-1197.49843	1.189586013	2340.8	2292.096	0.048630349	0.060169525
67	3814.657363	-1990.057363	0.162233258	1824.6	2398.786	0.256453483	0.027151439
68	3855.686327	-1107.086327	0.299279219	2748.6	2447.948	0.008016783	3.7632E-06
69	3871.528115	-1369.028115	0.084467813	2502.5	2497.168	0.037113002	0.058736065
70	3852.024651	-867.4246513	3.015037174	2984.6	2378.106	0.317561666	0.096328226
71	3564.690355	-2261.990355	0.252986458	1302.7	2229.024	0.694593715	0.002128434
72	3589.711681	-1201.311681	0.014148392	2388.4	2448.5	0.077616038	0.131952296
73	3417.040395	-363.2403949	0.024464926	3053.8	2186.208	0.053674957	0.397904079
74	3172.984994	588.3150058	0.019088699	3761.3	1834.974	1.995E-05	0.199616261
75	3256.110681	521.9893186	0.074014644	3778.1	2097.61	0.021532752	0.40369793
76	3153.815971	1178.684029	0.05978711	4332.5	1932	0.000614513	0.242948305
77	3192.003781	1033.096219	0.069969573	4225.1	2089.62	0.003786803	0.199961439
78	2916.261169	1048.838831	0.079863343	3965.1	2075.76	0.019726323	0.359494768
79	3244.078138	1277.921862	0.121028002	4522	2144.61	0.018024339	0.439839989
80	3344.733347	1784.366653	0.108788146	5129.1	2130.09	0.000187857	0.31341311
81	3390.253565	1668.546435	0.114728415	5058.8	2187.36	0.001285818	0.385397293
82	3465.261299	1774.938701	0.06365799	5240.2	2099.678	0.017353218	0.221570861
83	3401.935883	1147.964117	0.022312718	4549.9	2083.269	0.003711784	0.221673145
84	3634.467904	638.2320964	0.019233815	4272.7	2130.508	0.001687133	0.226976076
85	3528.975591	568.2244086	0.161148909	4097.2	2061.6	0.059486367	0.701728188
86	3050.593825	2045.906175	0.12791746	5096.5	1664.3076	0.039937236	0.248268094
87	2619.480849	1458.519151	0.005256729	4078	1538.592	0.181992832	0.04007301
88	2507.834468	-169.5344681	0.342485622	2338.3	1521.956	0.078946027	0.000566612
89	2665.234945	-983.9349453	0.03811212	1681.3	1625.64	0.04531406	0.115013486
90	2437.299264	-398.0992642	0.233862679	2039.2	1469.01	0.043867158	0.003529451
91	2391.70109	-779.6010901	0.008338819	1612.1	1490.9528	0.255269085	0.281963701
92	2648.190163	-221.5901628	0.283245112	2426.6	1570.5708	0.064274139	0.011188907
93	2775.441158	-964.0411578	0.013481991	1811.4	1554.72	0.389022225	0.581637709
94	2599.691456	341.5085439	2.14857E-05	2941.2	1559.7326	0.002380426	0.164078432
95	2810.668101	-12.96810084	0.009008598	2797.7	1606.32	0.015030934	0.273726032
96	2842.604751	298.0952494	0.012154186	3140.7	1676.976	0.036096007	0.077573148
97	2824.465887	-280.4658871	**14.90008366**	2544	1669.2536	**13.4060315**	**16.59682857**

	Theils' U
USAF Pred	**1.1126599**
New Model w/out Serv Inv	**1.05425152**

Appendix G: Supplemental Analysis

F-16B (Regression with Possessed Hours, Flying Hours, Sorties, and Serviceable Inventory)
Theil's *U*-statistic for This Model

Regression Statistics	
R Square	0.497816359
Adjusted R Square	0.475982288
Standard Error	1323.682488
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	159794591.9	39948647.97	22.79997859	4.15019E-13
Residual	92	161196450.2	1752135.328		
Total	96	320991042			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	391.1553643	586.0759688	0.667414098	0.506178336
Possessed Hours	0.171525612	0.029876116	5.741228648	1.19861E-07
Flying Hours	0.353483495	4.415882637	0.080048209	0.936372784
Sorties	-4.49893241	5.762080929	-0.780782579	0.436934804
Serv Inv	0.003589627	0.002694864	1.332025118	0.186142373

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*Denominator*
1	4652.596194	2641.403806	0.132530871	7294	0
2	4638.634639	2655.365361	0.110720709	7294	1.92472E-05
3	4898.94182	2427.05818	0.007445692	7326	0.066345271
4	4806.851017	632.1489828	0.002981448	5439	0.027808429
5	4828.983753	-296.9837529	0.22345684	4532	0.158099236
6	4872.331767	-2142.331767	0.274139623	2730	0.094674556
7	4999.382803	-1429.382803	0.057348786	3570	0.013513248
8	4839.929553	-854.9295527	0.026273721	3985	0.00909307
9	5010.935443	-645.9354426	0.017751518	4365	0.006356089
10	5294.57	-581.5700005	0.158518335	4713	0.062155685
11	5414.450837	-1876.450837	0.215991204	3538	0.01208881
12	5571.280329	-1644.280329	0.000275146	3927	1.082087348
13	8077.139208	-65.13920751	0.007396286	8012	0.002840363
14	6895.95469	689.0453104	0.027464032	7585	0.000221945
15	6440.9929	1257.0071	0.168401756	7698	0.04122514
16	6101.988444	3159.011556	0.026783891	9261	0.012297735
17	6718.364686	1515.635314	0.000887803	8234	0.124900522
18	5078.659551	245.3404491	0.002135076	5324	0.016457555
19	5760.994556	246.0054435	0.025005667	6007	0.027713076
20	5956.897731	-949.8977314	0.074567047	5007	0.009190249
21	6854.259859	-1367.259859	0.020653792	5487	0.025838497
22	5393.560208	-788.5602081	0.356484218	4605	0.987876276
23	6432.524916	2749.475084	0.026911389	9182	4.28186E-06
24	7694.721252	1506.278748	0.005955629	9201	0.496916969
25	3425.066206	-710.0662064	6.99588E-07	2715	0.021489508
26	3115.270863	-2.270863221	0.113901948	3113	0.108415029
27	3087.382341	1050.617659	0.021645922	4138	0.013010771
28	3057.194546	608.8054538	0.047653195	3666	0.091842394
29	3355.273571	-800.2735708	0.210671937	2555	0.554748029
30	3285.280225	1172.719775	0.031208619	4458	0.094855157
31	3872.548555	-787.5485545	0.058413945	3085	0.000988629
32	3733.612943	-745.6129425	0.168462342	2988	0.228399542
33	3189.600371	1226.399629	0.006626175	4416	0.024343348
34	3367.531759	359.4682408	0.000522935	3727	0.020837507
35	3274.228179	-85.22817906	0.027189418	3189	0.000255759
36	3663.841033	-525.8410333	0.01145264	3138	1.341846853
37	7108.819373	-335.819373	0.044235071	6773	0.181438515
38	5312.506519	-1424.506519	0.161938015	3888	0.042762155
39	4648.590403	-1564.590403	2.11811E-05	3084	0.695525712
40	5641.806531	14.19346948	0.061202958	5656	0.114755156

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	Denominator
41	6172.74906	1399.25094	0.038103178	7572	0.004119565
42	5607.942933	1478.057067	0.064769681	7086	0.235949704
43	5447.379074	-1803.379074	0.246474265	3644	0.060189163
44	4559.106602	-1809.106602	0.602999211	2750	0.003385124
45	5045.458156	-2135.458156	0.375433503	2910	0.000914491
46	4605.033496	-1783.033496	0.118730144	2822	0.060479045
47	4488.383336	-972.3833359	0.004972132	3516	0.056805489
48	4601.924937	-247.9249367	0.129532604	4354	0.073573759
49	4740.032389	-1567.032389	2.92519E-06	3173	0.087018492
50	4114.426845	-5.426845004	0.412142475	4109	0.728864649
51	4979.090886	2637.909114	3.9566E-06	7617	0.187357026
52	4335.151137	-15.15113686	0.188375891	4320	0.299705558
53	3829.978994	-1874.978994	0.050641404	1955	0.96954494
54	3440.053738	439.9462617	0.157158671	3880	0.106128175
55	4154.157824	-1538.157824	0.226638849	2616	0.089587629
56	3078.388692	-1245.388692	0.197136739	1833	0.356864468
57	3741.853526	-813.8535264	0.012672484	2928	0.247955019
58	4056.38881	329.6111904	0.032665386	4386	0.008653326
59	4001.293305	792.7066954	0.034440026	4794	0.069408178
60	4420.671677	-889.6716773	0.011768724	3531	0.006136333
61	4190.656126	-383.0561256	0.007915657	3807.6	0.016084656
62	3951.737919	338.7620806	0.00141988	4290.5	0.000962366
63	3995.72843	161.6715704	0.000237244	4157.4	0.014022196
64	3601.064666	64.0353344	0.158898347	3665.1	0.114704869
65	3884.784196	-1460.984196	0.272515789	2423.8	0.001172634
66	3606.0974	-1265.2974	0.698265846	2340.8	0.048630349
67	3780.626386	-1956.026386	0.335235679	1824.6	0.256453483
68	3805.035016	-1056.435016	0.231214544	2748.6	0.008016783
69	3824.158084	-1321.658084	0.115269867	2502.5	0.037113002
70	3834.234195	-849.6341949	0.608354699	2984.6	0.317561666
71	3630.601329	-2327.901329	0.922585421	1302.7	0.694593715
72	3639.660419	-1251.260419	0.025191046	2388.4	0.077616038
73	3432.87938	-379.0793804	0.0341874	3053.8	0.053674957
74	3196.657421	564.642579	0.025257286	3761.3	1.995E-05
75	3180.33385	597.7661502	0.10152909	3778.1	0.021532752
76	3128.660203	1203.839797	0.055522163	4332.5	0.000614513
77	3204.226901	1020.873099	0.058768631	4225.1	0.003786803
78	2940.841026	1024.258974	0.111779903	3965.1	0.019726323
79	3196.328228	1325.671772	0.18726668	4522	0.018024339
80	3172.235235	1956.864765	0.126436501	5129.1	0.000187857
81	3234.999207	1823.800793	0.146806862	5058.8	0.001285818
82	3301.901374	1938.298626	0.062605065	5240.2	0.017353218
83	3238.749341	1311.150659	0.033095346	4549.9	0.003711784
84	3444.976449	827.723551	0.033179166	4272.7	0.001687133
85	3318.921317	778.2786831	0.29758684	4097.2	0.059486367
86	2861.415098	2235.084902	0.103849468	5096.5	0.039937236
87	2435.618036	1642.381964	3.4442E-05	4078	0.181992832
88	2362.232679	-23.93267893	0.123242359	2338.3	0.078946027
89	2502.181052	-820.8810515	0.021523526	1681.3	0.04531406
90	2285.861813	-246.6618128	0.096835374	2039.2	0.043867158
91	2246.666059	-634.5660588	0.001214078	1612.1	0.255269085
92	2482.771398	-56.17139789	0.103613872	2426.6	0.064274139
93	2592.500911	-781.1009112	0.07809661	1811.4	0.389022225
94	2434.990309	506.2096906	0.003115918	2941.2	0.002380426
95	2633.521009	164.1789906	0.031742876	2797.7	0.015030934
96	2642.246928	498.4530718	0.000606326	3140.7	0.036096007
97	2621.335623	-77.33562251	**11.05488953**	2544	**13.4060315**

	Theils' U
New Model with Serv Inv	**0.908086221**

Appendix G: Supplemental Analysis

F-16C (Regression with Possessed Hours, Flying Hours, and Sorties) Theil's *U*-statistic for This Model and USAF Predictions

Regression Statistics	
R Square	0.745277118
Adjusted R Square	0.735842937
Standard Error	12963.35123
Observations	85

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	39826250663	13275416888	78.9975445	5.54447E-24
Residual	81	13611926480	168048475.1		
Total	84	53438177144			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-92871.78082	11819.36219	-7.857596656	1.43233E-11
Possessed Hours	0.268745085	0.022762207	11.80663572	2.73328E-19
Flying Hours	2.699727383	0.883191764	3.056785054	0.003030138
Sorties	-5.163232399	1.815079483	-2.84463157	0.005628034

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*USAF Pred*	*Denominator*	*Numerator USAF Model*
1	30770.78573	-4435.78573	0.028370989	26335	33347.12	0	0.070897682
2	30770.78573	-4435.78573	0.006669432	26335	33347.12	0.028169419	0.272556552
3	28604.31041	2150.689587	0.025626067	30755	44503.7	0.069931055	0.381104994
4	17698.69534	4923.304658	0.004537109	22622	41608.2	0.003710534	1.008973982
5	22767.77418	-1523.774183	0.015720757	21244	43967.278	0.001000613	0.938692177
6	19252.37536	2663.624636	0.000349445	21916	42498.489	0.016910916	0.912087924
7	25175.68562	-409.6856183	0.045914363	24766	45696.502	0.012410568	0.519098896
8	22218.23142	5306.768583	0.021870472	27525	45368.536	0.016437988	0.589654369
9	19925.41894	4070.581058	0.344184373	23996	45132.16	0.260867393	0.128341241
10	22174.21179	14077.78821	0.205451179	36252	44848.506	4.87054E-05	0.059006162
11	19567.15648	16431.84352	0.076406631	35999	44805.04	0.000933694	0.099882441
12	27148.24666	9950.753343	0.0654484	37099	48476.19	0.087866645	0.136828999
13	57586.99448	-9490.994484	9.33776E-07	48096	61819.07	1.23468E-05	0.033697657
14	47880.52384	46.47615908	0.041878442	47927	56755.945	0.001340892	0.046935247
15	59489.88811	-9807.888112	0.001555311	49682	60065.166	0.000132554	0.020911807
16	52213.3302	-1959.330201	0.084266536	50254	57438.472	0.00130728	0.064363147
17	63025.08236	-14588.08236	0.100889316	48437	61186.386	0.049872276	0.163222789
18	53005.08233	-15385.08233	0.058468753	37620	57188.955	0.135049412	0.050134305
19	60541.6337	-9096.633698	0.056418401	51445	59868.378	0.003136174	0.018757226
20	66545.50339	-12219.50339	0.052702781	54326	61371.754	0.012116771	0.034738274
21	60817.66669	-12471.66669	0.000484396	48346	58471.392	0.010080416	0.011004325
22	54264.04734	-1064.047342	0.022651997	53200	58271.568	0.001564113	0.04012375
23	59102.90878	-8006.908775	0.066622552	51096	61752.446	6.75655E-07	0.07255182
24	64326.56472	-13188.56472	0.054677691	51138	64900.935	0.073426184	0.005798502
25	76952.73221	-11957.73221	0.000342297	64995	68889.051	0.005730207	0.000223272
26	61277.49011	-1202.490107	0.022288995	60075	61046.174	0.016966065	0.001656571
27	76868.89677	-8968.896775	0.003676271	67900	65454.888	0.002739651	0.005071917
28	75570.9306	-4116.930604	0.007390972	71454	66618.339	0.000277358	0.001945321
29	76406.95468	-6142.954677	0.012889738	70264	67112.465	0.010064432	6.15849E-05
30	71192.28149	-7977.281493	0.044877503	63215	63766.404	0.005325086	0.00072093
31	81219.66218	-13391.66218	0.049765923	67828	69525.332	0.003089333	0.001790265
32	79189.2582	-15131.2582	0.056112002	64058	66927.906	0.000271757	0.001737499
33	80288.04111	-15174.04111	0.075249034	65114	67784.15	0.000516624	0.00098483
34	84455.78433	-17861.78433	0.018526191	66594	68637.408	0.000210419	0.00020363
35	74692.17256	-9064.172555	0.029588868	65628	64677.71	0.002852316	8.31648E-06
36	80421.94471	-11288.94471	0.068539174	69133	69322.26	0.004352606	0.006310485
37	82671.01062	-18099.01062	0.000956303	64572	70063.826	0.000418521	0.000381786
38	65247.83371	-1996.833712	0.041327636	63251	61989.305	0.022034535	0.007217807
39	85498.42203	-12858.42203	0.054789139	72640	67266.342	0.011717228	0.000675349
40	81779.90286	-17002.90286	2.75322E-05	64777	66664.73	0.066440858	0.046645277

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	USAF Pred	Denominator	Numerator USAF Model
41	81134.10799	339.8920128	0.004828162	81474	67483.776	0.014081055	0.004382
42	77467.21915	-5661.219148	0.08714521	71806	66412.692	0.006607816	0.003123148
43	87166.39517	-21197.39517	0.010238862	65969	69981.888	0.017344422	0.017288899
44	81332.22255	-6675.222547	0.035186784	74657	65982.917	0.00695468	1.46036E-05
45	82435.26506	-14004.26506	0.031400476	68431	68145.701	0.004753463	0.001902388
46	85275.09595	-12126.09595	0.003565603	73149	70164.288	0.001139267	0.012407969
47	79985.92214	-4367.922136	0.032409313	75618	67469.855	6.63607E-05	0.000968123
48	88615.19596	-13613.19596	0.049715123	75002	72649.17	0.001958135	7.22252E-06
49	88406.21223	-16723.11223	0.002384497	71683.1	71884.666	0.000538727	0.006106205
50	73519.67997	-3500.379966	0.053658533	70019.3	64417.824	0.000625155	0.001164735
51	87989.48884	-16219.48884	0.037563116	71770	69380.366	0.00409996	3.87586E-05
52	81084.39172	-13909.89172	0.020683296	67174.5	66727.686	0.014353092	0.008604363
53	84883.12731	-9660.827311	0.013701426	75222.3	68991.213	0.000474171	0.007144824
54	82389.30272	-8805.002724	0.008549706	73584.3	67225.98	0.015244997	0.031677395
55	89473.74424	-6803.944244	0.030011241	82669.8	69573.16	0.036653412	0.125686973
56	84175.48815	14321.51185	0.0033973	98497	69188.606	0.006647703	0.047712185
57	84725.16829	5741.031714	0.017140255	90466.2	68951.383	0.009159092	0.10518418
58	87280.19303	11843.90697	0.004452914	99124.1	69784.002	0.005367572	0.052961483
59	85247.33298	6614.567019	0.010845655	91861.9	69050.112	0.00872071	0.009891675
60	92850.12541	-9566.725415	0.007621815	83283.4	74147.1	0.000243652	0.016620689
61	89254.2914	-7270.891401	0.002645607	81983.4	71246.4	0.004825425	0.026059762
62	72071.54576	4216.854235	0.000842448	76288.4	63053.79	0.033457932	0.070603861
63	92456.96714	-2214.267139	0.019092675	90242.7	69971.814	0.001622411	0.092159209
64	81408.20236	12469.39764	0.015736764	93877.6	66481.96	0.004721313	0.104596835
65	88551.50631	11776.59369	0.035730205	100328.1	69966.738	0.00020151	0.120235865
66	82787.84598	18964.45402	0.019147631	101752.3	66963.4875	1.58424E-07	0.096862152
67	87631.8289	14079.9711	0.068899044	101711.8	70043.7522	0.016421497	0.189315978
68	88047.84862	26697.95138	0.026150749	114745.8	70490.532	0.005571746	0.098529676
69	87624.93483	18555.76517	0.047414883	106180.7	70162.6394	0.001198625	0.145122721
70	86735.99631	23120.80369	0.024721371	109856.8	69407.2876	0.006321096	0.086286279
71	83849.78124	17272.81876	0.029387401	101122.6	68852.6855	0.004094549	0.129076334
72	90258.1017	17335.1983	0.028690173	107593.3	71262.7863	0.001533467	0.147904687
73	93582.25984	18224.34016	0.084769466	111806.6	70427.9616	0.004678106	0.141917472
74	71606.6889	32552.7111	0.031905064	104159.4	62039.6898	0.002011739	0.14477604
75	90226.25987	18604.94013	0.012649206	108831.2	69199.1246	0.022554668	0.059557061
76	80246.59745	12240.10255	0.007317401	92486.7	65927.1908	0.006007726	0.098506728
77	91743.82042	7911.479577	0.00111081	99655.3	70627.6265	0.018511231	0.03943732
78	82775.2074	3321.3926	0.023817562	86096.6	66306.2216	0.011428537	0.089811535
79	82013.46393	13287.23607	0.04055832	95300.7	69498.7778	0.009259231	0.134955667
80	85278.30017	19192.69983	0.016889229	104471	69461.0368	0.009447503	0.060876432
81	80739.69846	13576.90154	0.034235265	94316.6	68540.3136	0.004995217	0.11719664
82	83531.4126	17451.1874	0.016889014	100982.6	68694.26	0.008836252	0.056193919
83	78366.62968	13123.47032	0.051764245	91490.1	67551.9155	0.015310817	0.127208454
84	81995.19478	20815.60522	0.008296057	102810.8	70179.6718	0.006659733	0.053447521
85	85056.41531	9364.284687	**2.98067378**	94420.7	70652.1592	**1.294037552**	**8.638525076**

	Theils' U
USAF Pred	**2.583725428**
New Model w/out Serv Inv	**1.517692486**

Appendix G: Supplemental Analysis

F-16C (Regression with Possessed Hours, Flying Hours, Sorties, and Serviceable Inventory)
Theil's *U*-statistic for This Model

Regression Statistics	
R Square	0.867903757
Adjusted R Square	0.861298944
Standard Error	9393.470108
Observations	85

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	46379194689	11594798672	131.4047598	2.44615E-34
Residual	80	7058982454	88237280.68		
Total	84	53438177144			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	53847.74006	19058.14904	2.825444377	0.005959695
Possessed Hours	0.128715369	0.023153405	5.559241468	3.4613E-07
Flying Hours	0.886461213	0.673678289	1.315852428	0.191981872
Sorties	-1.362685707	1.387208082	-0.982322497	0.328902508
Serv Inv	-0.205349692	0.023828784	-8.617715877	4.95617E-13

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*Denominator*
1	29758.17586	-3423.175864	0.013593268	26335	0
2	29405.40221	-3070.402205	0.005619952	26335	0.028169419
3	28780.76154	1974.238459	0.002923305	30755	0.069931055
4	24284.84885	-1662.848853	0.05686445	22622	0.003710534
5	26638.50275	-5394.502746	0.019467588	21244	0.001000613
6	24880.09667	-2964.096672	0.016964262	21916	0.016910916
7	27620.49167	-2854.491666	0.002476697	24766	0.012410568
8	26292.48473	1232.51527	0.00015043	27525	0.016437988
9	23658.40594	337.59406	0.194167213	23996	0.260867393
10	25678.30444	10573.69556	0.116509808	36252	4.87054E-05
11	23624.91159	12374.08841	0.089407437	35999	0.000933694
12	26334.9115	10764.0885	0.016796219	37099	0.087866645
13	43287.96117	4808.038834	0.029198718	48096	1.23468E-05
14	39708.53227	8218.467726	0.001701024	47927	0.001340892
15	47705.32415	1976.675853	0.005173366	49682	0.000132554
16	46680.56688	3573.433122	0.004782666	50254	0.00130728
17	51912.40684	-3475.406843	0.049507028	48437	0.049872276
18	48397.31722	-10777.31722	0.004190003	37620	0.135049412
19	53880.15133	-2435.151332	0.00371432	51445	0.003136174
20	57461.32684	-3135.326838	0.012507165	54326	0.012116771
21	54421.57197	-6075.571969	0.002164892	48346	0.010080416
22	55449.46197	-2249.461974	0.015321847	53200	0.001564113
23	57681.173	-6585.173004	0.043963522	51096	6.75655E-07
24	61851.54366	-10713.54366	0.000663145	51138	0.073426184
25	66311.88571	-1316.885707	0.000552515	64995	0.005730207
26	58547.25137	1527.74863	5.83936E-05	60075	0.016966065
27	68359.06719	-459.0671927	0.005590954	67900	0.002739651
28	66376.93473	5077.065267	0.000750399	71454	0.000277358
29	68306.63069	1957.369305	0.001190854	70264	0.010064432
30	65639.72281	-2424.722808	0.00148733	63215	0.005325086
31	70265.94474	-2437.944735	0.008649075	67828	0.003089333
32	70366.03137	-6308.031368	0.003251525	64058	0.000271757
33	68766.72466	-3652.724659	0.007362618	65114	0.000516624
34	72181.15243	-5587.152426	0.000871961	66594	0.000210419
35	67594.4533	-1966.453299	0.000433509	65628	0.002852316
36	70499.43235	-1366.432349	0.010889534	69133	0.004352606
37	71786.23111	-7214.23111	0.000612985	64572	0.000418521
38	64849.70781	-1598.707806	0.003283214	63251	0.022034535
39	76264.24018	-3624.240183	0.01832904	72640	0.011717228
40	74611.35075	-9834.350748	0.004615933	64777	0.066440858

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	Denominator
41	77073.00821	4400.991786	0.002356773	81474	0.014081055
42	75761.28643	-3955.286431	0.041991045	71806	0.006607816
43	80683.28212	-14714.28212	0.008640309	65969	0.017344422
44	80789.0337	-6132.033696	0.022505157	74657	0.00695468
45	79630.83338	-11199.83338	0.022453386	68431	0.004753463
46	83403.01175	-10254.01175	0.007301746	73149	0.001139267
47	81868.60074	-6250.600738	0.020417199	75618	6.63607E-05
48	85806.96272	-10804.96272	0.042484915	75002	0.001958135
49	87142.41413	-15459.31413	0.020719566	71683.1	0.000538727
50	80337.57519	-10318.27519	0.047183654	70019.3	0.000625155
51	86979.45144	-15209.45144	0.051859997	71770	0.00409996
52	83518.53153	-16344.03153	0.02333306	67174.5	0.014353092
53	85483.31426	-10261.01426	0.014058747	75222.3	0.000474171
54	82503.37706	-8919.077064	0.00144583	73584.3	0.015244997
55	85467.77449	-2797.97449	0.034406857	82669.8	0.036653412
56	83162.50809	15334.49191	0.009776092	98497	0.006647703
57	80727.39573	9738.804273	0.029892715	90466.2	0.009159092
58	83482.93751	15641.16249	0.013104521	99124.1	0.005367572
59	80514.67083	11347.22917	4.44173E-05	91861.9	0.00872071
60	82671.17421	612.2257887	2.74126E-06	83283.4	0.000243652
61	81845.50981	137.8901932	0.000562548	81983.4	0.004825425
62	74343.90921	1944.490788	0.003421454	76288.4	0.033457932
63	85780.34745	4462.352554	0.014973911	90242.7	0.001622411
64	82834.78719	11042.81281	0.020666781	93877.6	0.004721313
65	86832.30723	13495.79277	0.027670437	100328.1	0.00020151
66	85063.28904	16689.01096	0.015560365	101752.3	1.58424E-07
67	89019.09664	12692.70336	0.059735259	101711.8	0.016421497
68	89886.6247	24859.1753	0.022674978	114745.8	0.005571746
69	88902.03284	17278.66716	0.028680772	106180.7	0.001198625
70	91874.67555	17982.12445	0.010351093	109856.8	0.006321096
71	89945.73369	11176.86631	0.017603088	101122.6	0.004094549
72	94176.69416	13416.60584	0.020284212	107593.3	0.001533467
73	96482.8768	15323.7232	0.021998054	111806.6	0.004678106
74	87576.53474	16582.86526	0.01012462	104159.4	0.002011739
75	98350.55913	10480.64087	0.000974086	108831.2	0.022554668
76	95883.3605	-3396.660495	0.000329632	92486.7	0.006007726
77	101334.4664	-1679.166361	0.016946775	99655.3	0.018511231
78	99069.70489	-12973.10489	0.003767115	86096.6	0.011428537
79	100585.036	-5284.335984	0.000381037	95300.7	0.009259231
80	102610.714	1860.286026	0.003686021	104471	0.009447503
81	100659.3074	-6342.707427	0.001001127	94316.6	0.004995217
82	103966.8332	-2984.233189	0.00906681	100982.6	0.008836252
83	101105.6429	-9615.542861	0.000206073	91490.1	0.015310817
84	104124.1629	-1313.362928	0.01380393	102810.8	0.006659733
85	106499.9539	-12079.25393	**1.514207076**	94420.7	**1.294037552**

	Theils' U
New Model with Serv Inv	**1.081730801**

Appendix G: Supplemental Analysis

F-16D (Regression with Possessed Hours, Flying Hours, and Sorties) Theil's *U*-statistic for This Model and USAF Predictions

Regression Statistics	
R Square	0.558584909
Adjusted R Square	0.542236202
Standard Error	3491.594354
Observations	85

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	1249610326	416536775.4	34.16691645	2.25998E-14
Residual	81	987489721.5	12191231.13		
Total	84	2237100048			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-1079.887467	1352.478875	-0.798450524	0.426943955
Possessed Hours	0.211875617	0.039303146	5.390805571	6.75296E-07
Flying Hours	-12.3479491	3.882829619	-3.180141883	0.002086364
Sorties	12.5459251	5.730305389	2.189399037	0.031445565

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*USAF Pred*	*Denominator*	*Numerator USAF Model*
1	1318.650568	2894.349432	0.2473603	4213	1917.92	0.035967532	0.126103377
2	1318.650568	2095.349432	0.07320424	3414	1917.92	0.557458623	0.266983794
3	1788.701472	-923.7014723	1.056328484	865	2629.03	0.27790571	2.164732195
4	2210.028335	-889.0283346	0.136548552	1321	2593.677	0.007317307	1.772534446
5	1696.142214	-488.1422142	0.141740093	1208	2966.734	0.0067164	1.797390811
6	1563.792496	-454.7924963	0.005889463	1109	2728.527	0.625368633	0.634457498
7	1900.892196	85.10780406	0.125918482	1986	2869.35	0.181031825	0.001822765
8	2126.268014	704.7319863	0.072070478	2831	2746.21	0.017639893	0.019626318
9	3215.008714	-760.0087138	0.473383903	2455	2851.606	0.479506888	0.864316718
10	2444.111191	-1689.111191	3.344987365	755	3037.38	0.657065918	5.825925311
11	2747.84265	-1380.84265	0.817419483	1367	3189.34	1.950180581	0.003325754
12	2040.078159	1235.921841	2.536063753	3276	3354.834	0.004387647	3.776212258
13	8710.037717	-5217.037717	0.620169299	3493	9859.08	0.156764308	1.605571213
14	7626.766439	-2750.766439	0.095162267	4876	9302.02	0.015702002	1.433948291
15	5769.167103	-1504.167103	1.683108896	4265	10103.892	0.060494084	2.209483241
16	8749.184393	-5533.184393	5.798112871	3216	9555.637	0.008643911	4.311436443
17	11258.89352	-7743.893522	3.007020164	3515	10192.702	0.237223037	1.45354819
18	11322.27774	-6095.277739	0.00101087	5227	9464.796	0.332271631	0.100896472
19	8406.188204	-166.1882043	0.109785657	8240	9900.315	0.179080984	0.456348454
20	7483.234897	-2730.234897	0.602125384	4753	10319.414	0.311088407	0.303729229
21	3715.827015	3688.172985	0.184929951	7404	10023.456	0.017590985	0.235980749
22	9605.977845	-3183.977845	0.718985245	6422	10018.704	0.007549667	0.300768042
23	12425.40631	-5445.40631	0.002049897	6980	10501.974	0.774299144	0.114971418
24	12805.975	316.0249962	0.071370398	13122	10755.261	0.062290604	0.018212204
25	13352.57362	-3505.573622	0.007589856	9847	11617.848	0.002578292	0.010322969
26	10204.86845	-857.8684497	0.004144119	9347	10347.475	0.000773753	0.018480289
27	10208.71159	-601.7115853	0.015984371	9607	10877.652	0.011162372	0.001669556
28	11836.60642	-1214.606418	0.081776375	10622	11014.544	0.049113436	0.077627969
29	11305.52754	-3037.527541	0.003819736	8268	11227.48	0.059218175	0.007327633
30	10790.99556	-510.995557	0.186541851	10280	10987.754	0.011575081	0.062386044
31	13613.98247	-4439.982466	0.014446676	9174	11741.656	0.048051469	0.000289527
32	12287.66276	-1102.662757	0.009416283	11185	11341.1	0.00074358	5.85208E-05
33	12575.36479	-1085.364791	0.201807991	11490	11575.564	0.121072503	0.117881364
34	12653.65779	-5161.657788	0.03054751	7492	11436.96	0.102618803	0.006676059
35	11201.44023	-1309.440225	0.20872681	9892	10504.15	0.000578876	0.043625493
36	14173.32137	-4519.321374	0.667570791	9654	11720.114	0.182217733	0.42806319
37	13420.80122	-7887.801221	0.02358445	5533	11849.278	0.659110385	0.002461652
38	10874.71551	-849.7155054	0.13343399	10025	10299.52	0.104582076	0.048485185
39	9605.006085	3661.993915	0.003265468	13267	11059.56	0.029663811	5.53519E-05
40	10223.8669	758.1331035	0.107309763	10982	11080.705	0.077334839	0.079006296

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	USAF Pred	Denominator	Numerator USAF Model
41	11525.50211	-3597.502114	0.078418909	7928	11014.827	0.00344016	0.084272303
42	10613.10767	-2220.107675	0.001272915	8393	10694.474	0.138012294	0.000327122
43	11810.44487	-299.444867	0.055625271	11511	11359.2	0.003783035	0.016890628
44	9504.129476	2714.870524	0.007739221	12219	10722.985	0.000118476	0.013677531
45	13426.94019	-1074.940193	0.049443287	12352	10922.976	0.007143753	1.79196E-05
46	14054.57175	-2746.57175	0.064960805	11308	11255.712	0.015746832	0.010199428
47	12771.11628	-2882.116278	0.092945888	9889	11031.02	0.035392228	0.000785853
48	14764.2622	-3014.862198	0.008830904	11749.4	12026.619	0.00777478	0.01125733
49	11817.52509	-1104.125094	0.029492969	10713.4	11960.018	0.032091191	0.027895741
50	10634.06758	-1839.867578	0.02116535	8794.2	10583.554	0.026652302	0.015115783
51	11509.30801	-1279.408013	0.025032402	10229.9	11311.114	0.000920663	0.008196515
52	11538.03706	-1618.537063	0.001372979	9919.5	10845.66	0.042368866	0.006415349
53	11593.74553	367.5544727	0.000873154	11961.3	11166.789	0.017888529	0.001836598
54	10714.94651	-353.4465147	0.002470945	10361.5	10874.108	0.029767613	0.007638472
55	12664.25564	-515.0556423	0.003067698	12149.2	11243.622	0.003862901	0.0007818
56	12067.00537	-672.9053715	0.002227071	11394.1	11054.4	0.002732432	0.009282349
57	12527.40872	-537.7087177	0.046606628	11989.7	10891.936	0.02441952	0.060364175
58	11274.89542	2588.404576	0.001879052	13863.3	10917.536	0.001386983	0.034647813
59	12746.05315	600.9468501	0.00460487	13347	10766.496	1.90142E-05	0.012860413
60	14310.91666	-905.7166643	0.045539767	13405.2	11891.6	0.030231759	0.103515233
61	12875.32382	2860.676185	0.163761953	15736	11423.04	0.025786204	0.268724961
62	11894.9323	6367.967699	2.6444E-05	18262.9	10105.564	0.146324713	6.04063E-05
63	11182.98543	93.91457052	0.000443453	11276.9	11134.958	0.006441895	0.001359218
64	10134.32748	237.4725187	0.003182021	10371.8	10787.552	0.07146052	0.037314626
65	12559.33292	585.0670799	0.086808677	13144.4	11140.88	0.018781868	0.104663704
66	11073.02438	3872.775619	0.20716249	14945.8	10693.3539	0.106584613	0.334356066
67	13022.60325	6802.596752	0.070309701	19825.2	11183.0108	0.005205709	0.133072068
68	13137.95463	5256.845369	0.105442484	18394.8	11162.7565	0.014521909	0.273697662
69	14638.35737	5973.142627	0.024487761	20611.5	10988.054	0.033302731	0.079452723
70	13624.69584	3225.404161	0.014794837	16850.1	11040.2624	0.000828815	0.108160599
71	14315.45442	2049.545583	0.006437585	16365	10823.3764	0.005770057	0.053904738
72	13808.86138	1313.038619	0.031188412	15121.9	11322.3735	1.25637E-05	0.064886214
73	12397.73599	2670.564009	0.581927394	15068.3	11216.3328	0.201632783	0.632919689
74	10339.77305	11494.72695	0.152431387	21834.5	9846.7256	0.007207629	0.173847151
75	11456.07353	8524.726465	0.015155409	19980.8	10876.9092	0.071782308	0.04361174
76	12167.71748	2459.782516	2.29837E-05	14627.5	10454.8248	0.011321455	0.014825166
77	13141.22616	-70.12615745	0.228002406	13071.1	11290.0755	0.039809883	0.159376331
78	9437.702365	6241.397635	0.042428732	15679.1	10460.86	0.00348426	0.12794372
79	13374.98198	3229.618016	0.003705452	16604.6	10996.308	0.021307707	0.035188519
80	13170.03771	1010.762289	0.052941009	14180.8	11066.009	0.00731437	0.100942388
81	12130.75204	3262.847962	0.006453005	15393.6	10888.1568	0.014362108	0.030006582
82	12312.22287	1236.577132	0.099181423	13548.8	10882.2578	0.067677242	0.209286065
83	12806.56526	4266.934739	0.031132006	17073.5	10875.2229	0.001596535	0.087922852
84	13378.80657	3012.493435	5.35302E-07	16391.3	11328.702	0.022549535	0.023570159
85	13917.90741	11.99258778	26.09570918	13929.9	11413.4132	9.752761649	34.22781399

	Theils' U
USAF Pred	**1.873379555**
New Model w/out Serv Inv	**1.635764379**

Appendix G: Supplemental Analysis

F-16D (Regression with Possessed Hours, Flying Hours, Sorties, and Serviceable Inventory)
Theil's *U*-statistic for This Model

Regression Statistics	
R Square	0.772493669
Adjusted R Square	0.761118352
Standard Error	2522.286723
Observations	85

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	1728145623	432036405.7	67.90964132	6.07473E-25
Residual	80	508954425	6361930.313		
Total	84	2237100048			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	22627.69014	2902.89026	7.794883071	2.03776E-11
Possessed Hours	0.093008811	0.031527077	2.950124816	0.00416475
Flying Hours	-2.616948399	3.020996367	-0.866253408	0.388941812
Sorties	1.431021789	4.333351094	0.330234444	0.74208607
Serv Inv	-0.051170413	0.005900059	-8.672863965	3.86131E-13

Observation	*TNMCS Hours New Model*	*Residuals*	*Numerator New Model*	*Actual TNMCS Hours*	*Denominator*
1	2478.373793	1734.626207	0.05913016	4213	0.035967532
2	2389.537692	1024.462308	0.213375623	3414	0.557458623
3	2442.015341	-1577.015341	1.704638186	865	0.27790571
4	2450.359512	-1129.359512	0.665432743	1321	0.007317307
5	2285.593346	-1077.593346	0.601466525	1208	0.0067164
6	2045.855617	-936.8556171	0.000964259	1109	0.625368633
7	2020.43724	-34.43724027	0.12241563	1986	0.181031825
8	2136.13941	694.86059	1.18742E-05	2831	0.017639893
9	2445.244659	9.755340728	0.265875872	2455	0.479506888
10	2020.875399	-1265.875399	0.716100279	755	0.657065918
11	2005.901449	-638.9014492	1.148295717	1367	1.950180581
12	1811.142472	1464.857528	0.071416964	3276	0.004387647
13	4368.476688	-875.4766883	0.033339001	3493	0.156764308
14	4238.214155	637.7858447	0.000313943	4876	0.015702002
15	4178.60492	86.39507984	0.179497281	4265	0.060494084
16	5022.957645	-1806.957645	0.899668789	3216	0.008643911
17	6565.404038	-3050.404038	0.32452664	3515	0.237223037
18	7229.398477	-2002.398477	0.12368547	5227	0.332271631
19	6401.719239	1838.280761	0.065732144	8240	0.179080984
20	6865.594336	-2112.594336	0.023733744	4753	0.311088407
21	6671.764232	732.2357675	0.039656604	7404	0.017590985
22	7896.430035	-1474.430035	0.134853655	6422	0.007549667
23	9338.314177	-2358.314177	0.278835058	6980	0.774299144
24	9436.222527	3685.777473	1.19756E-06	13122	0.062290604
25	9832.640167	14.35983253	0.003742925	9847	0.002578292
26	8744.565968	602.4340324	0.009919561	9347	0.000773753
27	8676.066896	930.9331039	0.010958115	9607	0.011162372
28	9616.329483	1005.670517	0.008033401	10622	0.049113436
29	9220.041807	-952.0418068	0.02140948	8268	0.059218175
30	9070.227998	1209.772002	0.01115025	10280	0.011575081
31	10259.51395	-1085.513947	0.03258991	9174	0.048051469
32	9528.84752	1656.15248	0.010339814	11185	0.00074358
33	10352.65467	1137.34533	0.051402392	11490	0.121072503
34	10097.02379	-2605.023789	0.007341011	7492	0.102618803
35	9250.087667	641.9123331	0.008573688	9892	0.000578876
36	10569.94194	-915.9419397	0.276376893	9654	0.182217733
37	10608.25841	-5075.258414	0.002698407	5533	0.659110385
38	9737.581699	287.4183009	0.143623174	10025	0.104582076
39	9467.76076	3799.23924	0.002771991	13267	0.029663811
40	10283.49647	698.5035337	0.060914121	10982	0.077334839

Appendix G: Supplemental Analysis

continued

Observation	TNMCS Hours New Model	Residuals	Numerator New Model	Actual TNMCS Hours	Denominator
41	10638.44395	-2710.443953	0.072561566	7928	0.00344016
42	10528.5855	-2135.585504	2.08663E-07	8393	0.138012294
43	11507.16611	3.833892652	0.013845886	11511	0.003783035
44	10864.51739	1354.482611	0.000660614	12219	0.000118476
45	12666.0578	-314.0577955	0.014443647	12352	0.007143753
46	12792.48466	-1484.48466	0.060152308	11308	0.015746832
47	12662.39641	-2773.39641	0.043651216	9889	0.035392228
48	13815.49626	-2066.096256	0.047916341	11749.4	0.00777478
49	13285.32035	-2571.920346	0.107129656	10713.4	0.032091191
50	12300.76728	-3506.567276	0.079192784	8794.2	0.026652302
51	12704.69451	-2474.794512	0.047382452	10229.9	0.000920663
52	12146.29458	-2226.794581	2.19145E-07	9919.5	0.042368866
53	11956.65639	4.643612744	0.017105668	11961.3	0.017888529
54	11925.90216	-1564.40216	0.000288237	10361.5	0.029767613
55	12325.11284	-175.9128427	0.003459177	12149.2	0.003862901
56	12108.65234	-714.5523418	0.001093788	11394.1	0.002732432
57	12366.53092	-376.8309187	0.042899107	11989.7	0.02441952
58	11379.98138	2483.318619	0.010461658	13863.3	0.001386983
59	11929.03051	1417.969493	0.003481944	13347	1.90142E-05
60	12617.6202	787.5797994	0.083402206	13405.2	0.030231759
61	11864.6533	3871.346704	0.171372435	15736	0.025786204
62	11748.64387	6514.256127	0.000719613	18262.9	0.146324713
63	11766.81333	-489.9133253	0.006039187	11276.9	0.006441895
64	11248.15276	-876.3527563	0.003568532	10371.8	0.07146052
65	12524.81782	619.5821777	0.041858476	13144.4	0.018781868
66	12256.54199	2689.25801	0.194903583	14945.8	0.106584613
67	13226.94527	6598.254729	0.054625073	19825.2	0.005205709
68	13761.25277	4633.54723	0.102577792	18394.8	0.014521909
69	14720.05613	5891.443868	0.014687537	20611.5	0.033302731
70	14352.14803	2497.951974	0.007014395	16850.1	0.000828815
71	14953.77063	1411.229371	3.56805E-06	16365	0.005770057
72	15090.98767	30.91232893	1.99988E-05	15121.9	1.25637E-05
73	15000.67482	67.62517696	0.245431552	15068.3	0.201632783
74	14369.50613	7464.993868	0.04808272	21834.5	0.007207629
75	15192.98056	4787.819442	0.001940278	19980.8	0.071782308
76	15507.62609	-880.1260939	0.049179427	14627.5	0.011321455
77	16314.95802	-3243.858016	0.001349521	13071.1	0.039809883
78	15198.92228	480.1777181	2.16213E-06	15679.1	0.00348426
79	16627.65484	-23.05484319	0.027267563	16604.6	0.021307707
80	16922.69982	-2741.899819	0.015717232	14180.8	0.00731437
81	17171.42399	-1777.823986	0.056666077	15393.6	0.014362108
82	17213.19068	-3664.390684	0.002426883	13548.8	0.067677242
83	17740.96004	-667.4600413	0.013658032	17073.5	0.001596535
84	18386.63869	-1995.338689	0.09576933	16391.3	0.022549535
85	19002.45335	-5072.553348	10.13882215	13929.9	9.752761649

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Appendix H: Acronyms

2LM: Two-Level Maintenance

3LM: Three-Level Maintenance

AAM: Aircraft Availability Model

ACC: Air Combat Command

AETC: Air Education and Training Command

AFB: Air Force Base

AFIT: Air Force Institute of Technology

AFMC: Air Force Materiel Command

AFMCMAN: Air Force Materiel Command Manual

AFPIG: Air Force Process Improvement Guide

AFRC: Air Force Reserve Command

AMC: Air Mobility Command

ANG: Air National Guard

AWP: Awaiting Parts to Repair

BIE: Base Issue Effectiveness

BRAC: Base Realignment and Closure

BRC: Base Repair Cycle

BSE: Base Stockage Effectiveness

CREP: Contract Repair Enhancement Program

DDR: Daily Demand Rate

DLA: Defense Logistics Agency

DMRD: Defense Management Report Decision

DMSMS: Diminishing Manufacturing Sources and Materiel Shortages

DOD: Department of Defense

DREP: Depot Repair Enhancement Program

DRIVE: Distribution and Repair In Variable Environments

DRC: Depot Repair Cycle

DRT: Depot Repair Time

EAF: Expeditionary Aerospace force

EXPRESS: Execution and Prioritization of Repair Support System

FY: Fiscal Year

GAO: General Accounting Office

GLM: General Linear Model

GSA: Government Services Administration

HPMSK: High Priority Mission Support Kits

ITV: Intransit Visibility

LRU: Line Replaceable Unit

MAJCOM: Major Command

MD: Mission Design

MDS: Mission Design Series

MERLIN: Multi-Echelon Resource and Logistics Information Network

MICAP: Mission Capability

NCQ: Repair Decision Time

NCT: Nonrepairable Cycle Time

NIIN: National Item Identification Number

NMCS: Not Mission Capable (Supply)

NRTS: Not Repairable This Station

NSN: National Stock Number

OC-ALC: Oklahoma City Air Logistics Center

OO-ALC: Ogden Air Logistics Center

OSD: Office of Secretary of Defense

OST: Order and Ship Time

OSTQ: Off-base Repair Pipeline

PACAF: Pacific Air Forces

PBR: Percentage Base Repairable

Q: Pipeline Stock

RBL: Readiness Base Leveling

RCDL: Repair Cycle Demand Level

RCQ: Base Repair Pipeline

RCT: Repair Cycle Time

RET: Retrograde Time

RSP: Readiness Spares Package

SB and CR: Stock Balance and Consumption Reports

SLQ: Safety Stock

SMAG: Supply Management Activity Group

SRU: Shop Replaceable Unit

TAI: Total Active Inventory

TNMCM: Total Not Mission Capable (Maintenance)

TNMCS: Total Not Mission Capable (Supply)

TSR: Total Stock Requirement

USAF: United States Air Force

USAFE: United States Air Forces in Europe

WWX: Worldwide Express

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Vita

Captain Gregory E. Hutson was born on 22 December 1967 in Hinsdale, Illinois. He graduated from Springstead High School in Spring Hill, Florida in June 1986. He enlisted in the delayed enlistment program in August 1986, and was subsequently called to active duty in December 1986. During his enlistment he served as a personnel specialist at Robins AFB, GA and served a short tour in Saudi Arabia during DESERT SHIELD and DESERT STORM.

In August 1993, Captain Hutson enrolled in the Air Force Reserve Officer Training Corps at the University of Central Florida. During his time as a cadet, he served as the cadet corps commander. He graduated Cum Laude, earning a Bachelor of Science degree in Business Administration in May 1995. He was a Distinguished Graduate from the Air Force Reserve Officer Training Corps program and earned a Regular commission in August 1995.

Upon graduation, Captain Hutson was assigned to the Air Force SEEK EAGLE Office where he served in three positions; program manager, program manager/executive officer, and program manager for Computerized Physical Fit, a tri-service program sponsored by the Office of Secretary of Defense.

He entered the Logistics Management program at the Graduate School of Logistics and Acquisition Management at the Air Force Institute of Technology in May 1998. Upon graduation, he will be assigned to the 388th Fighter Wing at Hill AFB, UT as an aircraft maintenance officer.

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13. ABSTRACT (*Maximum 200 Words*)

During the 1990's the Air Force experienced severe declines in serviceable inventory levels and a rise in their TNMCS rates. Air Force predictions of TNMCS hours during this time period did not account for the upward trend in TNMCS rates. The Air Force uses a regression equation, consisting of possessed hours, flying hours, and sorties, to predict TNMCS hours.

This research, through simple linear regression, found a significant relationship between serviceable inventory levels and TNMCS rates for 8 of the 10 aircraft studied. Using this relationship, serviceable inventory levels were then added to the Air Force equations and new multiple regression equations were derived. Results indicate the addition of serviceable inventory as an explanatory variable renders a better Theil's *U*-statistic for each of the aircraft studied than the current predictions. The study recommends adding a logistics chain variable to TNMCS predictions and careful consideration of further reparable inventory reductions.

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