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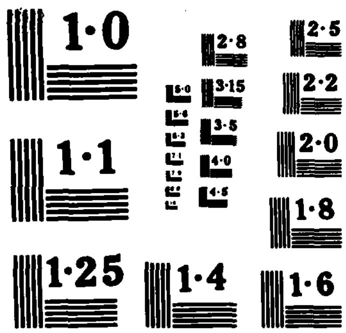

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DOCUMENTATION AND EVALUATION OF UNIFORM COST ACCOUNTING FOR THE F-14[redacted] AIRCRAFT IN FISCAL YEAR 1983

by

Walter Derris Vandivort

December 1984

Thesis Advisors: K. Euske, S. Ansari

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

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The analysis in this study is based on information obtained by on-site visits to Naval Air Rework Facility, North Island,

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Documentation and Evaluation of Uniform Cost Accounting for the F-14 Aircraft in Fiscal Year 1983

by

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Commander, United States Naval Reserve
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Submitted in partial fulfillment of the requirements for the degree of

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ABSTRACT

The purpose of this research is to evaluate the capability of the Uniform Cost Accounting System to fully capture depot level repair costs by weapon system through an examination of the F-14 aircraft depot level repair costs for Fiscal Year 1983.

The analysis in this study is based on information obtained by on-site visits to Naval Air Rework Facility, North Island, California and Naval Air Rework Facility, Alameda, California and by analyzing seven thousand Uniform Cost Accounting Records for work done in Fiscal Year 1983.

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TABLE OF CONTENTS

LIST OF ACRONYMS

ADP - Automated Data Processing

ASO - Aviation Supply Office

AWG - Airborne Weapons Group

DOD - Department of Defense

DOD INST 7220.29-H - Department of Defense Depot Maintenance and Maintenance Support Cost Accounting and Production Handbook

F/E (Components) - Repairable (components)

IRAN - Inspect and repair as necessary

MDR - Master Data Record

NALC - Naval Air Logistics Command

NARF - Naval Air Rework Facility

NAVAIR - Abbreviation for Naval Air Systems Command

NAVAIREWORKFAC - Abbreviation for Naval Air Rework Facility used in messages and instructions

NAVAIRSYSCOM - Abbreviation for Naval Air Systems Command used in messages and instructions

NIIN - National Item Identification Number (the last nine numbers of the National Stock Number)

NSC - Naval Supply Center

NSN - National Stock Number

OASD(MI&L) - Office of the Assistant Secretary of Defense (Management, Installations, and Logistics)

OPDOCS - Operating Documents

OPNAVINST - An instruction from the Office of the Chief of Naval Operations

SMIC - Special Material Identification Code

TMS	-	Type, Model and Series Code
UCA	-	Uniform Cost Accounting system directed by DOD INST 7220.29-H
WIS	-	Weekly Induction Schedule
WSSC	-	Weapon/Support System Code

I. PROBLEM DEFINITION

A. PURPOSE

The purpose of this thesis is to determine how to more fully capture depot level repair costs by weapon system for the Department of Defense (DOD). Under the current DOD cost accounting system outlined in the Department of Defense Depot Maintenance and Maintenance Support Cost Accounting and Production Handbook (DOD INST 7220.29-H), costs unique to a particular weapon system are not fully captured. This thesis uses the Navy's F-14 Tomcat fighter as both a vehicle and an example of a unique weapon system. It attempts to determine why these costs are not fully captured, how they can be more fully captured and the capability of the existing system to present F-14 depot level repair costs in a meaningful manner.

B. BACKGROUND

Department of Defense efforts began as early as 1963 to implement a standard cost accounting and reporting system that would apply to all depot level maintenance activities [Ref. 1]. Since 1975, the Office of the Secretary of Defense (Management Systems) has administered a uniform cost accounting and reporting system for all Department of Defense depot maintenance activities as delineated in DOD INST 7220.29-H. This cost accounting system is designed to measure productivity, identify maintenance capacity, reduce duplication of effort and indicate potential areas for interservice support of the maintenance workoad. Further, it is designed to accumulate depot level maintenance costs by aircraft (F-14 Tomcat), ship (aircraft carrier), weapon system (AWG-9 air-to-air radar system) and weapon system component (AWG-9 radar waveguide). Costs are intended to be combined to give total costs for a particular program. For example, the repair costs for the AWG-9 radar waveguide should be traceable to the AWG-9 radar. Since the AWG-9 radar is only used in the F-14 aircraft, its costs should trace back to the F-14 aircraft. Adding all identified F-14 costs should give the total, yearly depot level maintenance expense for the F-14 program.

The Office of the Assistant Secretary of Defense (Manpower, Installations and Logistics) made an attempt to validate the Navy's fiscal year 1982 reported depot level maintenance repair costs for the F-14 program. The Grumman F-14 Tomcat fighter aircraft was chosen because it was a one of a kind aircraft. The F-14 alone had variable sweep wings, used the AWG-9 radar and shot the Phoenix air-to-air missile. Other important unique equipment included the AWG-15 Fire Control Set, AXX-1 TV Camera Set, ASW-43 Automatic Flight Control Set and the AVA-12 Vertical Display Indicator Group.

Even with all of the unique equipment incorporated into the F-14 aircraft, the search of the DOD data base incorporating depot level maintenance repair costs reported only part of the F-14 program costs. Specifically, costs resulting from direct work on the aircraft or the engine were reported in the data base. However, costs incurred for repairing F-14 components could not be identified and attributed to the F-14 program.

The Office of the Assistant Secretary of Defense made a further search in two other data bases. Both the "Industrial Performance Summary for Naval Air Rework Facilities" and the "Visibility and Management of Operating and Support Costs" gave different cost figures for F-14 depot level maintenance repair. This left doubt as to the accuracy of reporting of the depot level repair costs. It also indicated there was no current way to aggregate depot level maintenance repair costs for the F-14 program.

According to "The Depot Maintenance Cost System, A Primer for Its Use," in fiscal 1982, Department of Defense depot activities spent over $11.7 billion to repair, modernize, modify and maintain weapons and support systems and aircraft. Of the total, $4.9 billion was expended on aircraft. This included $178 million in F-14 aircraft and TF30P414 engine costs. With these large sums of money being spent for repair, it is important to be able to track costs by program. Only if costs can be measured by program can the ultimate cost and worth of each weapon system program be determined.

This thesis attempts to identify methods for tracking depot level repair costs for the F-14. It begins by discussing the mission and capabilities of Naval Air Rework Facility, North Island. Next, it considers the physical flows, document flows and cost flows for the three major repair programs done at NARF, North Island. It then discusses the Uniform Cost Accounting data fields that are critical to tracking F-14 repair costs at the depot level. The last section discusses the major findings of this report and suggests improvements which might improve UCA's abilities to track F-14 costs.

This study is merely one part of a larger ongoing study to evaluate depot level cost reporting to OASD.

II. BACKGROUND INFORMATION

A. CHAIN OF COMMAND

Prime direction for depot level maintenance in the Navy comes from Volume IV of The Naval Aviation Maintenance Program, OPNAVINST 4790.2C [Ref. 2]. In this manual, the chain of command is established for all depot level maintenance operations.

The Commander, Naval Air Systems Command is responsible to the Chief of Naval Material for the "execution and management of complete integrated logistics support programs, resources and guidance applicable to manufacture, rework (which includes maintenance and modification)" of Naval aircraft. Next in the chain of command is the Commander, Naval Aviation Logistics Command (NALC). He reports directly to; the Commander, Naval Air Systems Command (NAVAIRSYSCOM) and is directly responsible for the "management of the execution of naval aviation D-level (Depot level) maintenance programs. At the next lower level of command are the Commanding Officers of the Naval Air Rework Facilities (NARF's). Each NARF commanding officer acts under the command and support of NAVAIRSYSCOM for depot level repair operations and reports to the Commander, NALC, for policy and direction in managing the industrial base. Actual scheduling of D-level repair is done by the Depot Operations Directorate (NALC-04).

B. GENERAL DESCRIPTION

Naval Air Rework Facility, North Island, is located in San Diego, Ca. With the mission "to provide the manpower, skills and facilities required to support Naval Aviation during mobilization," it utilizes 362 acres of land on Naval Air Station, North Island. A workforce of over 5700 people occupy 77 permanent buildings which provide 2.6 million square feet of covered work space with 1,480,000 square feet of production shop space. In fiscal year 1983 NARF, North Island accumulated costs of $359,982,000. As a major contributor to the local economy, NARF, North Island expects to pay out in fiscal year 1984 $141,000,000 in wages to employees and $71,000,000 for locally purchased supplied [Ref. 3].

C. DUTIES AND RESPONSIBILITIES

Specific duties for the Naval Air Rework Facility, North Island, include:

a. D-level maintenance of aircraft and aircraft power plants assigned to the active and naval reserve operating forces.

b. D-level maintenance of aviation components in support of active and reserve operating forces.

c. Modification of active and reserve operating force aircraft power plants.

d. Modification of components used by active and reserve operating forces.

e. Drive-in and field team repair, customer service and other D-level support of active and reserve operating forces aircraft.

f. D-level rework of support equipment and aerial target drones.

g. Procurement of metrology standards and services.

h. Support of the NAVAIR engineering support offices (NESO) and weapon system managers (WSM).

NARF, North Island is designated the depot level repair point (DLRP) for the following aircraft; F-14, F-18, F-4'S, F-4 J/S, F-14, F-18, H-46 A, H-46 E. CH-46 A, E2C, E2B, C-2, TE-2A and engines; T-58, T-64, H-53, J079, LM-2500, LM-1500, F-404. It also performs depot level maintenance on selected aviation components of all types. This maintenance includes rework or complete rebuilding of parts, assemblies and end items. If required, NARF, North Island will also manufacture parts, do material modification, testing and reclamation. Further, it can be assigned any required task that is beyond the capability of organizational and intermediate maintenance departments.

III. COST ACCUMULATION

A. INTRODUCTION

The purpose of Chapter III is to describe the depot level repair process at NARF, North Island. This is the first step in deciding how to best capture DOD 7220.29H (UCA) costs for the F-14 aircraft at the depot level.

Almost all depot level repair costs for the F-14 come from one of three areas. The first area is direct repair of the airplane. This repair includes disassembly and assembly, inspection and examination, corrosion control and painting, and any related metal repair. The second area where major costs are accumulated is in engine repair. Depot level engine shops undertake engine repair when the work is beyond the capability of Intermediate level maintenance. The third and last major area for which F-14 repair costs are accumulated is component repair. The component repair program includes all electrical, hydraulic, and mechanical components which are repaired to be put directly back into the aircraft (concurrent repair) or to be returned to the supply system RFI (Ready For Issue) as spare parts. For NARF, North Island, this component repair program accumulated $135 million in costs in FY-1983.

In the first two areas, aircraft and engine repair, methods exist within UCA to fully capture costs. However, in the area of component repair, F-14 UCA records contain no unique coding to identify the costs as resulting from F-14 depot level repair. This chapter provides the background necessary to understand the depot level repair cycle for the F-14. This will allow later suggestions to be made to help capture more component repair costs under the DOD 7220.29-H system.

B. AIRCRAFT REPAIR

1. Purpose

As delineated in OPNAVINST 4790.2C (Volume Four), F-14 depot level repair "is performed at determined intervals during the service life of an aircraft to maintain or restore the inherent design levels of performance, reliability, and material condition of the aircraft." This repair is based on the IRAN concept (inspect and repair as necessary). It is designed to return the aircraft to a "like new" condition without doing unnecessary disassembly of the aircraft which might re-introduce problems associated with new aircraft. This repair cycle also includes updating aircraft configuration by installing any outstanding airframe changes.

2. Scheduling

Scheduling of F-14 depot level repair is done once yearly at the Fleet Readiness Support Conference. This Conference is chaired by NALC-04 and is composed of representatives from NAVAIR, NALC, and all six NARF's. Its location is rotated between all six NARF's and NALC (Patuxent River, Maryland).

NARF, North Island and NARF, Norfolk are the only two facilities that do F-14 aircraft repair. Since there is ample F-14 aircraft work for both facilities, little competition exists between the two facilities in this area [Ref. 4]. The scheduling evolution merely consists of the two NARF's dividing the workload with NALC-04's approval.

3. Physical Repair Flow

Once an F-14 is scheduled for Scheduled Depot Level Maintenance (SDLM) at NARF North Island, the Aircraft Planning Division does liaison with the reporting custodian (squadron) and coordinates the arrival of the aircraft. Upon arrival, the aircraft goes immediately into the induction phase. This phase ensures that the aircraft is protected from the elements during the repair cycle. In addition, Examination and Evaluation personnel inspect the F-14 to determine the depth of repair required under the IRAN concept. The aircraft then goes through the predisassembly phase to be put in the corrosion control phase. In the corrosion control phase the F-14 is first x-rayed to find any hidden corrosion damage and later the Aircraft Painters repair any surface corrosion. The next phase of the repair, Disassembly, takes 69 days and is the longest phase of the repair. During this phase many of the aircraft components are removed from the aircraft for replacement or repair. Additionally, some operable components are also removed from the aircraft to facilitate repair evolutions. These components by-pass repair to be stored in the ASKARS (Automatic Kitting Storage and Return System) until needed. Also in Disassembly, the engines are removed as a matter of convenience to facilitate other repairs.

Once Disassembly is complete, Examination and Evaluation (E&E) personnel take an in-depth look at the aircraft to tailor the rest of the repair to the needs of the particular aircraft. After this 9 day examination, the aircraft is inducted into the Metal Phase. In this phase which lasts 64 days, the airframe is repaired and updated to the current desired fleet configuration. After the Metal Phase, the F-14 is re-assembled in the Assembly Phase. Once re-assembled it goes through an extensive ground test phase. Once certified safe for flight, the aircraft is flown to ensure it is ready to resume fleet operations. After making the necessary repairs to any discrepancies found in the flight check, NARF does some final painting and delivers the aircraft to the reporting custodian. This total depot level repair evolution for the F-14 is currently scheduled to take 177 days which will be reduced to 156 days in fiscal year 1985.

4. Document Flow

The Aircraft Planning Division is responsible for initiating the Document flow for each individual F-14 repair evolution. Once an induction date for the Tomcat is known, this Branch requests Operating Documents for the repair by submitting a Schedule Change Sheet (11 Naval District NAVAIREWORKFAC Form 4710/41) to the Data Processing Department.

Operating Documents (OPDOC's) are "those documents (Shop Orders, Job Cards, etc.) required to identify, route and control workload within the NAVAIREWORKFAC" [Ref. 5]. These documents provide start and completion dates for each F-14 and delineate each major step of the repair cycle. A complete set of Operating Documents has been prepared for each type of aircraft by the Operations Analysis Division.

Contained in the OPDOCS are the Master Data Records. The Master Data Record (MDR) NAVAIR FORM 4720/13B is the primary source document for the day to day operation of the Naval Air Rework Facility. Its engineered data elements are "used to Prepare Shop Orders, Job Cards, and Work-in-Progress records which are passed through subsequent computer routines to provide data for planning, scheduling, workload history, cost accounting, operation reports and reports to higher commands" [Ref. 5: Vol. 5]. The MDR file is updated continuously by the Operations Analysis Division, using information generated both locally and by the Aviation Supply Office (ASO).

Once the F-14 has been inspected by the Induction team, the MDR file is individualized to take into account the needs of that particular aircraft [Ref. 5: Vol. 3]. The MDR file is then used to produce the actual shop orders and job cards used to repair the aircraft.

Shop Order Cards control the flow of the work being done. Each line gives a task to be performed, the production shop responsible, the shop's geographical location, the start and completion dates by Julian Date, the engineering standard for time required to complete the task and the shop responsible for "selling" the job as correctly completed at the end of the evolution. At the top of the card is the operative Job Number used to track the cost, a Sequence Number used by production planning to schedule repair, and a Link Number used to track individual repair operations.

Job Cards are used to transact labor and materials by line item. There is one Job Card for each line on a Shop Order.

These OPDOC's are produced by the Data Processing Department based on the repair schedule, and then distributed to the individual production shops. If the documents have not been received five days prior to the listed start day, the system can be over-ridden to produce the documents manually.

To summarize, Shop Orders and the Job Cards control the repair process. The Shop Orders control the flow and the tasking of work, and the Job Orders control the accumulation of costs.

5. Cost Flow

As the F-14 begins the repair cycle it is assigned two job numbers. The first job number is for the normal repair associated with the SDLM repair cycle. The second job number is for additional modifications required to be completed on the aircraft during rework. All work done on the aircraft is charged to the F-14 based on these two job numbers.

As the F-14 progresses through the production line, costs are made against the aircraft by using a transactor. This device enters the costs into the computer run management information system. This entry is done by placing the employee's identification card into one slot and a Job Card into a second slot. This Job Card contains a link number to identify the

Shop Order Card that is being used to perform the work. First, the employee manually types in a line number from the applicable Shop Order Card which identifies the transaction to the specific task being accomplished. Next, the employee enters the information required for the computer to compute the cost of the transaction.

The computer program validates the employee's identification number, ensures the link number card originates from a valid job number, computes the cost, accumulates it to the job order number, and notes accomplishment of the task. Thus, the cost accounting system tracks and aggregates production shop costs during the repair cycle of an F-14.

If materials are needed to complete a task, the production shop draws the needed material from the Material Division. The cost of the material is charged against the aircraft job number at the time of issue.

One recent change has been made to the flow of F-14 costing for depot level repair. Until October 1, 1984, costs for any components taken from the airplane for concurrent repair began with a job code of three and were charged to the component repair program. As of 1 October, these jobs are coded zero and are charged to the aircraft repair program. This change is significant and is discussed in Chapter IV.

All costs are accumulated in the Depot Maintenance Cost Accounting System. It is from this data base that DOD 7220.29-H (UCA) costs are later extracted.

C. ENGINE REPAIR

Depot level engine repair is very similar to aircraft repair. The following discussion is a summary of the unique aspects of the engine repair cycle.

The budget for engine repair is controlled by NALC-04. Each quarter NALC convenes the Fleet Readiness Support Conference to distribute the engine repair workload (the same conference as for aircraft repair). Prior to attending the conference, the Power Plant Planning and Workload Control Branch from NARF, North Island computes a normal cost for each TMS (type, model and series) engine for which NARF, North Island has repair capability. Once arriving at the conference, the NARF, North Island planners bid on the engine repair work available based on NARF, North Island's computed cost of repair. The workload is then distributed with work going to the lowest bidder first. All NARF's participate in this process except for NARF, Pensacola, which doesn't repair engines.

Since engine repair facilities are normally below capacity, two NARF's that repair the same TMS engines constantly compete for work. However, since NARF, Norfolk is the only depot with the capability to repair F-14 engines, no competition exists for TF-30P414 repair.

Once NALC has assigned the quarterly workload, NARF, North Island designs an induction plan for the following quarter. Non-RFI engines are drawn from the Naval Supply Center at NAS North Island and sent to the appropriate production shop for repair. North Island performs all organizational and depot level repair. If any intermediate level repair is required the engine is sent to NAS Miramar. Once all repair work is completed, the engine is tested by NARF North Island and returned RFI to the Naval Supply Center. This evolution is representative of the TF-30 engine repair cycle at NARF, Norfolk.

One additional problem exists for all NARF's in the engine repair cycle. Since the turn-around time of the engine is so short (30-45 days), the assigned workload is constantly being changed as urgent requirements surface. If catastrophic failures become common for the TF-30 (as happened in 1976), NALC may take money from the J-79 program at North Island, and give it to the TF-30 program at NARF Norfolk. This means the engine program is often being re-negotiated on a daily basis [Ref. 6].

Document and cost flows are essentially the same as those of aircraft repair. The major difference is that each engine has only one job number that starts with the digit two, signifying engine repair.

D. COMPONENT REPAIR

1. Introduction

Component repair is divided into two major programs. The first (and largest) part of the component repair process is the repair of F/E (repairable) components. These are retrograde components designated as repairable by NAVAIR that are stored at Naval Supply Center (NSC) warehouses at NAS North Island. When NARF, North Island has the production capacity, it draws a retrograde F/E item from NSC and sends it to a feeder (production) shop for repair. Once the item is repaired, it is returned to NSC in an RFI status. NSC in turn, either stores the part until the supply system makes a demand for it or ships it in response to an already existing demand.

The second part of the component repair program is concurrent repair. As an F-14 is disassembled, components are inspected. As mentioned previously, operable components bypass the repair system and are routed to the ASKARS storage facility to be stored until the assembly phase of the F-14 repair. Non-RFI components are replaced by placing a demand on the supply system to obtain a new or RFI component. When a defective component is in short supply, the time to obtain the part may exceed the amount of time before the part is needed for the assembly phase of the F-14 repair. In this case, concurrent rework procedures are used. The non-operable part is routed to the feeder (production) shops for repair. Once repaired it is certified to be RFI and then it is routed to ASCARS for storage to await the assembly phase.

2. Priorities

To understand the system it is important to remember that feeder shops are divided by function. A shop that repairs a particular type of component does the specific type of repair for both the F/E equipment and concurrent repair equipment. Therefore, a priority system responsive to both operational needs and SDLM repair needs has to be maintained.

The Components Planning and Workload Control Division finalizes the priorities (and therefore the induction schedule) for all component repair. The priorities for F/E repair come from three sources and are consolidated in the Weekly Induction Schedule (WIS). The WIS is an ADP file that once completed automates the induction of components for repair.

The first source in planning the WIS is the BO8 Probe. This is a weekly list of repair requirements generated by the Aviation Supply Office (ASO) for NARF, North Island. The Probe reflects the operational needs of the Navy. Parts that are keeping aircraft NMCS (not mission capable-supply) or PMCS (partially mission capable-supply) that are not available in the supply system will show up on the BO8 Probe making them high priority for induction.

The second factor in determining priorities for the WIS are the quarterly CLAMP (Closed Loop Aeronautical Maintenance Program) and HI-Burner (high priority item) negotiations. CLAMP and HI-Burner items are components that are in high demand and low supply in the fleet. These two programs attempt to shorten the repair turn-around-time by giving these items priority for repair.

To schedule the CLAMP and HI-Burner items for the succeeding quarter, a conference is held each quarter at ASO, Philadelphia, PA. This conference is chaired by NALC-04 and attended by all NARF's. Its purpose is to go through all CLAMP and HI-Burner items, line item by line item, and distribute the workload based on NARF capacity, lowest normal cost (by component), and the requirement to keep all six NARF's working.

Once North Island learns at the conference how many CLAMP and HI-Burner items it needs to repair, it inducts this workload based on a weekly cycle for a 13 week quarter. This is the second input to the WIS.

The third input comes from urgent requirements or schedule changes and results in manual overrides of the WIS system. An urgent requirement may come from an F-14 on a forward deployed carrier that has become NMCS for a component that is not available in the supply system. This situation results in a direct induction requirement override from ASO. A schedule change might result from a component being scheduled to start repair but the repair materials not being available. Also, an immediate need might surface on the aircraft repair line at NARF, North Island for concurrent repair of a component. In any of these cases, the WIS ADP system is overriden by a Type 26 card to make the change.

This evolution controls the repair of from 13,000 to 15,600 items per quarter [Ref. 7] and results in the accumulation of costs under an average of 5300 job numbers. The WIS considers the priorities of operational units (CLAMP, HI-Burner and ASO overrides), the supply system (F/E repair) and is merged with the needs of the SDLM aircraft repair line (concurrent repair) at NAS, North Island. Appendix A presents the F/E priority system.

3. Physical Flow of Component Repair

Once the WIS is finalized the component repair process begins. The WIS generates both OPDOCS to use in repairing the component and routing cards to control the interaction of the repair cycle with NSC. When these documents are received by the Component Control Office, a demand is placed on NSC to issue a non-RFI component for repair. An issue document is produced by NSC and all documents are sent to the warehouse. NSC personnel issue the component and Component Control personnel make sure all necessary documents are bagged and attached to the component. The component is then sent to the feeder shop(s) responsible for its repair.

After the repair has been completed, the part is delivered to the Component Control Office. Contractor personnel working for this office inspect the documentation to ensure it contains an RFI tag to certify it was repaired in accordance with the applicable MDR. Additionally, the Component Control Office sends a card to the data processing personnel to stop the turnaround time.

The new RFI component is turned over to NSC personnel. After packaging, one of the supply clerks issues a ship or stow card which determines the destination of the repaired part.

4. Document Flow

Once WIS causes the computer to generate the Shop Order and Job Cards documents for component repair, these documents are routed to and remain with the actual component being repaired. First, the documents are routed to the Component Control Office in Building 36. A green ZUA card is given to Supply Personnel and results in a white ZUC card which is an order for the supply warehouse to issue the component. These cards, plus the OPDOC's, are sent to Building 662, the main supply warehouse. After the part is issued, the white card is sent back to the Component Control Office, to start repair turn around time. All other documents are attached to the component. The Shop Order included in the OPDOC's then provides the geographical location of the shop responsible for the repair and the component is forwarded there. From the warehouse on, the document flow matches the physical flow since all documents are attached to the components being repaired.

5. Cost Flow

The cost flows are recorded by the same procedural methods documented in aircraft repair. Again, the main thing to remember is that cost accumulation for concurrent rework of components was in the component repair program (code 3) until 1 October 1984. From that date on the concurrent repair costs will be accumulated under the aircraft repair program (code 0).

In the next section, a close look is taken at Uniform Cost Accounting Data (UCA) fields. This is directed to finding ways to use the Navy documentation procedures presently in use to better track F-14 repair costs in the UCA system.

IV. UNIFORM COST ACCOUNTING

This section considers how cost data can be aggregated by weapon system (F-14) for the Uniform Cost Accounting System. It identifies key UCA elements to be used to trace costs back to the F-14 weapon system. Each element is discussed in turn to consider ways to optimize its use to capture F-14 program costs under the present Navy system. Additionally, suggestions are made to facilitate the use of the existing data fields to more fully capture costs.

A. KEY DATA FIELDS

1. Introduction

DOD Instruction 7220.29-H provides the guidance used by each Depot Level Maintenance activity in reporting costs to the Uniform Cost Accounting System. The required data submission format consists of 50 data fields. These fields cover a wide range of topics from the name of the facility to the total costs for government furnished equipment.

However, in attempting to track depot level repair costs back to a particular weapon system such as the F-14, five UCA fields appear to be of central importance. These are: Field 9-Item Identification Number, Field 10-Item Nomenclature, Field 12-Weapon System Support Code, Field 13-Work Breakdown Structure Code, and Field 14-Work Performance Category. Each of these fields is discussed to identify:

(1) the existing information contained in the field, (2) observations concerning the information currently provided, and (3) suggestions to better accumulate F-14 depot level costs.

2. Field 9

a. Existing Coding

Field 9 is the item identification number. It is a field of 13 alphanumeric characters with punctuation marks prohibited. It is desigend by DOD Instruction 7220.29-H to "identify the specific item on which depot maintenance was performed." This instruction requires that if the item is an aircraft or an aircraft engine, it will be identified in Field 9 the type, model, series (TMS) code. For the F-14 aircraft this code is F14A (without punctuation). For the F-14 engine it is TF30P414. If the rework is done on a component of the F-14 aircraft, Field 9 contains the National Stock Number of the component. For instance, the left hand landing gear strut for the F-14 is coded 1620001236777 in Field 9.

b. Observations About Coding Field 9

The coding of Field 9 is adequate for aircraft types and their respective engines because every type of plane and engine has a unique TMS code. Therefore, the costs can be attributed to the proper weapon system using Field 9. However, in the area of component repair, the National Stock Number (as given) does not identify which weapon system uses the component. To identify component costs as F-14 costs, two actions appear to be necessary. Both relate to the National

Stock Number being used in Field 9 and both require an understanding of the different reporting procedures for concurrent component repair and F/E component repair previously explained in Chapter III. To quickly review from Chapter III, concurrent component repair consists of taking an inoperable component from an aircraft undergoing a repair cycle (SDLM), repairing the component and putting it back in the same aircraft. This consists of 10% of the component repair program [Ref. 7]. Repair of retrograde components in the Supply System is called F/E component repair. It consists of approximately 90% of the components repaired.

c. Suggestions

(1) Proper Use of the SMIC. The first possible action involves using the Special Material Identification Code (SMIC). Field 9 does not contain the complete National Stock Number. For a component, the number in Field 9 contains the thirteen numbers in the middle of the National Stock Number. A complete National Stock Number is prefixed by a Dual Cognizance Code and a Material Control Code and suffixed by a Special Material Identification Code. Using the previous example, an F-14 left hand landing gear strut has a complete National Stock Number of 2RE-1620-00-123-6777-PF (not just 1620001236777). 2R is the cognizance code that indicates the material is controlled by the Naval Aviation Supply Office. The E is a material control code that indicates the item is a depot level repairable under CLAMP or one of the other programs that designates the component for intensive management

action. Neither part of the prefix appears to be needed to trace depot repair costs of F/E components to a particular weapon system.

The suffix, SMIC, of the National Stock Number appears to be crucial in tracing component costs. It is a two letter identifier that is unique for each weapon system (aircraft) or end use item that is so coded (2R items controlled by ASO). A component coded PF (as the example), is identified by the PF as belonging to the F-14. An SMIC of PQ indicates the component is used on the TF30-P412/414 engines that power the F-14. An SMIC of CY indicates the component belongs to the AWG-9 radar which is unique to the F-14. All three SMIC's identify the components as belonging to the family of F-14 components.

At the present time, the SMIC for a particular component is included with the NSN on the Master Data Record (MDR) that controls each component's repair evolution. This means all North Island F/E component job numbers (that begin with a three) can be cross-referenced to the MDR. If the SMIC on the MDR is an F-14 family SMIC, the cost can be identified to UCA as an F-14 program cost.

To test this capability to identify items as belonging to the F-14 an examination was made of the Component Capability Report. This report is a computer generated listing of those components for which NARF, North Island has repair capability. The report for Week 49, dated 1 September 1984, showed 445 line items coded PF as F-14 components. In addition, there were 1663 items coded CY to identify them as belonging to the AWG-9 radar which is unique to the F-14.

Next, the five pages of the report with the most total PF (F-14 SMIC) items were selected for analysis. In Fiscal Year 1983, 223 total repair operations were performed on the components coded PF for belonging to the F-14 in these five pages. Further examination showed that for the five pages of components having the most CY (AWG-9) coded items, 3861 repair operations were performed on AWG-9 items in Fiscal Year 1983.

These numbers indicate at least three things. First, the Special Material Identification Code can be a useful tool in tracing component repair costs back to the F-14. This is particularly meaningful since the SMIC is already included on the MDR and can be accessed when extracting UCA data from the NARF cost accounting system. Second, the large number of component repair operations indicate it is worthwhile to relate these costs back to the F-14 in order to better determine total F-14 depot level repair costs. Third, more thought is needed on how component repair costs are to be aggregated. Only DOD can say if it desires to separate AWG-9 costs from other F-14 component costs or if these costs should be lumped together. If DOD wishes to track individual systems, such as the AWG-9, Field 9 might need to be modified to include two extra spaces (for a total of 15) for the SMIC.

(2) Components Without National Stock Numbers. A second and distinct issue should be discussed when considering Field 9. This is the lack of National Stock Numbers for some major end assemblies.

The October 1983 version of the Naval Air Systems Command publication, "Avionics Installation Plan" indicates the following list of avionics equipment includes some of the components unique to the F-14 aircraft:

AN/ASW-27B	Digital Communication System
SP/147/A	Lobing Switch
CP-1448/A	Signal Data Converter
AN/AXX-1	TV Camera Set
AN/AWG-15	Fire Control Set
AN/ASW-43	Automatic Fire Control System
AQU-5/A	Magnetic Compass
CP-1106C/A	Air Data Computer
AN/ASN-105	Approach Power Control Set
AN/ASA-105	Multi Purpose Display Set
AN/AVA-12	Vertical Display Indicator Group

Any attempt to search the UCA data base for repair costs pertaining to these unique items would begin with finding the National Stock Number for each component. All records with this NSN in Field 9 could then be selected from the UCA data base and the costs totaled.

A search for NSN's was made using the expertise of the Operations Analysis Division of NARF, North Island. First, a search was made of the MCRL (Master Cross Reference List) Part 1. It contains a listing of repairables for the Department of Defense. By entering the MCRL with the part number, it should be possible to find the National Stock Number.

However, this search was successful for only 2 of the 11 items, the AN/AVA-12 and the CP-1106 C/A.

A second attempt to find National Stock Numbers for the remaining nine items used the Naval Air Systems Command (NAVAIRSYCOM) computer network called the Master Component Rework Capability List (MCR-2). This computer program is intended to help locate information on repairables for the six Naval Air Rework Facilities. Upon request, the Repairable Assets Management Office (RAMO) at NARF, North Island made a search of the MRC-2 data base. For a second time, no NSN's could be found for any of the nine items.

An investigation was made of why 9 of 11 assemblies appeared to have no National Stock Numbers. Mr. Fugelburg [Ref. 8] of the Operations Analysis Division at NARF, North Island indicated it was common for end use items not to have National Stock Numbers.

The lack of National Stock Numbers for end use items prevents using Field 9 (and therefore UCA) to track the depot level repair costs for a particular system. The impact depends on the component's importance. For instance, one of the nine items for which no National Stock Number could be found was the AWG-15 Fire Control Set. This is the component which takes all F-14 weapon firing impulses and actually causes the weapon launch to take place. Although it is an important piece of equipment, no easy way to track its depot repair costs could be found.

To summarize, Field 9 is important in tracking the depot level repair costs for the aircraft and engine programs. These costs can be tracked because both programs have unique Type Equipment Codes. Concurrent repair of components that are removed from an aircraft to be repaired and put back in the same aircraft are coded F14A in Field 9 and costed as part of the aircraft program as of 1 October 1984. These costs are also highly visible, but are only 10% of the component repair process. Therefore, it is important to track the costs of F/E component repair since they encompass the other 90% of component program costs. However, it will be necessary to use more tools. For a Naval Air Rework Facility, one choice of tools to accumulate F-14 F/E component repair costs is the use of SMIC codes. This use of SMIC codes would be more effective if all end items have a National Stock Number (and therefore a SMIC).

3. Field 10

a. Existing Coding

Field 10 is a 20 digit field required by DODINST 7220.29-H to describe "the specific item on which maintenance was performed." For aircraft popular names are used, such as "TOMCAT" for the F-14 or "PHANTOM" for the F-4. For engines, the engine type is used in Field 10. The TF-30-P414 used in the F-14 is coded "TURBOFAN ENG." A J79 engine used in the F-4 would be coded "TURBOJET ENG" in Field 10. Items with an NSN in Field 9 (F/E components) are directed to use the description carried in the Federal Supply Catalog in Field 10.

b. Observations on Coding in Field 10

No new information is provided for aircraft or engine UCA records in Field 10. "TOMCAT" in Field 10 of a UCA record only occurs when Field 9 is coded F15A. Any attempts to retrieve data on the F14 can be accomplished through the use of Field 9. Therefore, coding Field 10 "TOMCAT" is duplication. For the TF30 engine, a coding of "TURBOFAN ENG" in Field 10 is ambiguous. Since the Navy has other fan engines (for example, the TF41 engine in the A7E), Field 9 will have to be accessed to see what type of engine required repair.

For components, the "descriptions generally carried in the Federal Supply Catalog" (DODINST 7220.29-H) is required to be used in Field 10. However, these descriptions are cryptic and often hard to use. In some cases, even with the description, it is still difficult to decide what the part is. For example, one page of NARF, North Island's Component Capability List of 1 September 1984 containing 10 Federal Supply Catalog descriptions for PF (F-14 SMIC) components had 3 "adapter assemblies," a "servocylinder" and 2 "Wing assembly, air." Although the observer had sixteen years of aviation experience, only 3 of 10 parts (Computer, target; Drive, constant sp; and Fuel Control, Main), had any immediate meaning.

In all three cases described above, it appears Field 10 could be better utilized in other ways.

c. Suggestions

If a National Stock Number appears in Field 9, an alternate use of Field 10 would be to print out the SMIC of the item in Field 9. This would allow the F/E component costs to quickly be associated with a weapon system by the SMIC in Field 10. If the SMIC belongs to a subordinate system (such as the CY for AWG-9 belongs to PF for the F-14), Field 10 could be used to print out all relevant SMIC's in descending order. For example, if the NSN in Field 9 was an AWG-9 component, Field 10 would be coded PF-CY. Then, if the DOD user wanted to obtain the total depot repair costs for the AWG-9 radar, the data base search could first select all reocrds with CY in the fourth and fifth spaces in Field 10. However, if the user wanted all F-14 F/E component repair costs, the request would be for all records with PF in the first two spaces in Field 10. This family coding of records by weapon system could be done when each NARF creates the record. It would require a local NARF dictionary of SMIC codes that identifies each SMIC (when possible) to a weapon system.

One additional benefit might accrue from putting the SMIC code or progression of codes in Field 10. One of the reasons proposed for not being able to track costs to the F-14 has been that many of the components are used by more than one aircraft. If this is in fact true, codes in Field 10 such as: BX Common Armament and Fire Control Equipment), DX (Common Aircraft Electrical Material), EX, FX, NX, PX and XX should help identify the commonality. This coding should also give some measure of how much commonality really exists for F/E component repair operations.

4. Field 12

a. Existing

DOD INST 7220.29-H directs Field 12 to be alphanumeric, four spaces in length, and filled with the weapon support system code. This field was thus intended as a key to identifying program costs such as those for the F-14. The codes to be used were "the existing codes that DOD components use to report depot level repair costs." If a specific weapon cannot be identified, the coding of Field 12 is controlled by the coding of the Work Breakdown Structure Code (WBSC) in Field 13. If the WBSC in Field 13 for an item can be identified to a major commodity group (e.g., aircraft or missiles) and also to a specific category (e.g., fighters or bombers), then Field 12 is coded 997. If only a major commodity group (aircraft) is identified in Field 13, then Field 12 is coded 998. Field 12 is coded 999 when no breakdown can be made in Field 13. In this last case, Field 13 must be coded L11 which means "All Other Items Not Identified to Above Categories" (DOD INST 7220.29-H, D-3).

One deviation to these procedures is stated on page 10 of enclosure (2) to NAVCOMPT INST 7310.9D [Ref. 9]. This instruction directs that, "For reporting to OSD when the TMS for an aircraft is identified in Field 9, '1111' will be entered in tape positions 75-78 (Field 12)." The 1111 is an indication that it is an aircraft described by its TMS code in Field 9. This deviation, however, is not important with respect to accumulating weapon systems costs since Field 9 does contain the necessary data.

b. Observations on Coding in Field 12

The majority of costs for F-14 depot level repair come from the aircraft program, the engine program and the component program. The use of Field 12 is considered for each program.

(1) <u>Aircraft Program</u>. In tracing aircraft costs back to the F-14 program, Field 12 is used as a pointer to Field 9. As indicated above, UCA records from the aircraft program are identified by a 1111 in Field 12. This 1111 in Field 12 causes the TMS code in Field 9 to be used to identify the specific aircraft type. For example, a Tomcat would be an F14A (4 characters, no punctuation) in Field 9. After Field 9 identifies the F-14 records, the aircraft program costs can be easily compiled. Table 10 of OASD report RCS DD-M(A) 1397 for fiscal year 1983 lists $81,671,000 of costs accumulated for F-14 aircraft repair.

As of 1 October, 1984, there has been a change in the costing procedures used by the NARFs. Prior to 1 October 1984 (i.e., Fiscal Year 1985) costs for concurrent rework of components were coded 997/998 or 999 in Field 12, had an NSN in Field 9, and were not traceable by normal methods to the F-14 Program. As of 1 October 1984, the costs for concurrent rework of components are being transferred to the aircraft repair program. This means Field 12 is coded 1111 and Field 9 is coded F14. Therefore, the costs are identified to UCA as additional F-14 aircraft program costs. With these costs, the aircraft program will reflect higher costs in Fiscal Year 1985. However, component costs should decrease by a like amount. It also means these concurrent repair costs will be invisible to UCA by NSN since the NSN of the component is no longer on the UCA record. This means DOD cannot extract all repair costs incurred for a specific component by using the component's unique NSN. It can only use the NSN to call up repair costs for components undergoing repair in the F/E program. Any repair costs for the same type of component in the concurrent rework program cannot be traced back to the component. Therefore, part of the capability to track repair costs of individual components will be lost with the 1 October 1984 change.

(2) Engine Program. When tracking engine costs for a particular engine, the applicable records can be called up by searching for the proper WSSC code in Field 12. For the TF30P414, the WSSC code is TBUX. Using this method, Table 10 of OASD Report RCS DD-M((A) 1397 for Fiscal Year 1983 identifies $91,552,000 spent on TF30P414 depot level repair actions.

(3) F/E Component Program. A problem in tracking F-14 program costs is in the F/E components program. Coding F/E component repair costs back to a particular weapon system requires identifying the end use weapon system for a large number of items. For example, NARF, North Island's Component

Capability Report dated 1 September 1984 contains 21,907 line items for which NARF, North Island has repair capability.

When the six NARF's held a meeting in 1975 to decide how to extract UCA data from their cost accounting systems, manual intervention was frequently involved in transforming the data. This resulted in an agreement to code all component rework by 998 to reduce the workload to manageable levels [Ref. 10].

c. Suggestions

Expanded use of Field 12 will capture most of the F/E component repair costs associated with the F-14 program. This will require all NARF's to use the SMIC located on the MDR to identify the F/E component as belonging to the F-14. Then, Field 12 can be coded AFWA, the Weapon Support Code for the F-14. This coding of Field 12 will be unique for F-14 F/E components and clearly identify to which weapon system the costs belong.

If AFWA is used in Field 12, no change should be made to the coding of Field 9. To ensure capability is not lost to track costs by individual item, Field 9 should continue to be coded with the F/E Component's NSN.

5. <u>Field 13</u>

a. Existing

Field 13 contains the Work Breakdown Structure Code. The coding is based on Appendix D of DOD INST 7220.29-H. It is a three character alphanumeric code with the first letter being A for aricraft. The second character is a number from one to nine that identifies the type of specific aircraft for which the repair action took place. A one, for example, as the second character indicates a fighter aircraft. A two indicates a bomber aircraft. The numbers go up to nine which designates an aircraft not covered by the previous eight categories. Finally, the third character is a number which identifies the type of item being repaired. A one, for example, as the third character indicates the repair was to the basic airframe. A four would indicate the item was electronics equipment, a five armament equipment, up to seven, which is coded Other.

b. Second Character

The second character of this field can be ambiguous if it is coded 1 for fighter or 2 for bomber. With today's multi-role aircraft the distinction between a fighter and bomber is blurred. Although the first letter of its TMS code is F, an F-18 is primarily a bomber, not a fighter. An F-4 performs both the fighter and bomber roles as does an F-16. Perhaps only the F-14 is exclusively a fighter since it has no developed capability to bomb.

One action would remove the ambiguity. Since the tactical inventory contains only a few different kinds of aircraft, the recommended solution is for DOD INST 7220.29-H to list a Field 13 category for each aircraft. This would remove confusion at the NARF level and promote the uniformity of reported results.

c. Third Character

The last number in Field 13 represents a questionable level of detail. If the repair action took place during an SDLM cycle of an F-14, it appears unnecessary to determine if the repair action was to 1 (Basic Airframe), 2 (Aircraft and Engine Accessories and Components) or any type of item identified by the other 5 codes. Consideration should be given to deleting or changing the use of the third character of Field 13.

6. Field 14

a. Existing

Field 14 consists of three alphanumeric characters called the Work Performance Category. According to DOD INST 7220.29-H, the Work Performance Category "is a code to indicate the type of maintenance work provided on the item identified in Field 9 or the type of maintenance support." The first character of Field 14 uses the codes for type of work given in Appendix E of DOD INST 7220.29-H. This character is important because it controls the entry for labor hours and costs in Fields 17-24 and guides further dollar entries in Fields 36, 43 and 44.

DOD INST 7220.29-H states the last two characters in Field 14 should be used as required by each reporting activity "for its internal management and budget reviews and justification."

b. Observations

The first character of Field 14 both categorizes the type of repair work and directs the coding of labor and cost data in various Fields from 17-44. This character appears to be important and useful but not required to track costs back to a weapon system.

The second and third characters can be left blank according to NAVCOMP INST 7310.9D. The NARF's use the two spaces differently. For example, NARF, Norfolk leaves them blank while NARF, North Island uses them to further subdivide the program costs identified by the first character.

c. Comment

Although Field 14 is important, it is not a necessary field to track depot level repair costs back to the F-14 (or other major weapon systems).

Next, previous attempts to use the SMIC to code repair costs to weapons systems are discussed. Then specific procedures to more fully capture all F-14 costs are developed. Finally, an attempt is made to capture Fiscal Year 1983 F-14 costs from the records coded 997-999 in Field 12 of the UCA data base.

V. COST ACCUMULATION METHODS

This chapter examines the use of the SMIC to code job costs for concurrent repair of components. It also describes a method to capture total F-14 depot level repair costs for Fiscal Year 1983. This method involves manually aggregating F-14 repair costs for the component program.

A. CURRENT USE OF THE SMIC

When DOD INST 7220.29-H was implemented NAVAIR published a series of Uniform Cost Accounting (UCA) bulletins to promulgate relevant system information. UCA Bulletin Number Three dated 27 September 1976, states in paragraph 4(e) that NARF, Alameda (only) will use "the SMIC to tie (UCA costs) back to major weapon systems." The procedures for using the SMIC to tie UCA costs back to major weapon systems are documented in the NAVAIR Industrial Financial Management System (NIFMS) Manual dated September 1978. These procedures, in simplified form, involved building an ADP file labeled ZN7DTO which has seven fields:

1. Item Identification Code
2. Federal Supply Class
3. NIIN
4. SMIC
5. Item Nomenclature
6. Standard Inventory Price
7. Filler

Fig. 5.1 File 7N7DTO Data Fields

This file contains all the data necessary to identify F-14 component repair costs to the UCA data base. Fields two and three when combined in order give the NSN used in Field 9 of UCA. The SMIC in Field 4 of ZN7DTO is written to File 7N7LVO and used by Program 7N7M to identify the applicable weapon system for coding Field 12 of UCA (Appendix C).

This manual and UCA Bulletin Number Three indicate that SMIC coding of repair has been done at NARF, Alameda since the inception of UCA reporting. Therefore, an attempt was made to call up F-14 component repair costs for Fiscal Year 1983 using UCA Field 12 and the WSSC of the F-14. All four F-14 WSSC start with AFW, so a data search of the Fiscal Year 1983 UCA data base was made for all records starting with AFW in Field 12 and having an NSN in Field 9. Since F-14 WSSC codes differ only in the last character, this search should have produced all applicable records.

This search produced four records from NARF, Alameda that appeared to have been coded to the F-14 by the SMIC data file: Two records were for a starter, one for a valve and one for a frequency analyzer. Since NARF, Alameda does little F-14 repair, it is difficult to tell whether the SMIC is used to code component records or these records are miscoded. However, after studying all four records (Appendix D), it appears the records are valid because Field 9 contains an NSN and Field 10 contains a Federal Catalog description. Neither field contains F-14 coding. Therefore, the SMIC appears to be the only possible reason an F-14 code was placed in Field 12.

It appears that one NARF has been using the SMIC for identifying UCA repair costs since the inception of UCA reporting. Therefore, two actions are recommended. First, a follow-on study should be done to determine if past component repair costs were better tracked for UCA at NAS Alameda than at the other NARF's. Second, it should be determined if the cost accounting prototype scheduled for implementation at NARF, Cherry Point uses, or can use the SMIC to track component repair costs to a weapon system.

B. CAPTURING F-14 DEPOT LEVEL REPAIR COSTS

Since the research conducted for this study indicates that total F-14 Depot Level Repair Costs can be effectively captured for UCA, the following is presented as an illustration of how the costs can be captured.

1. Manual Method

Capturing depot level repair costs manually as done for this study is a very time consuming task. However, the logic involved is important because it points to ways to capture the costs using ADP methods.

Aircraft program repair costs (including concurrent repair of components) are easily recognized by scanning Field 12. If Field 12 is coded 1111, then the user can look in Field 9 to see what type of aircraft was repaired. When Field 9 shows F-14A, the repair costs are recorded. As previously mentioned, these costs are easily captured by current ADP methods. Table 10 of OASD Report RCS DD-M(A)1397 for Fiscal Year 1983 lists $81,671,000 of costs accumulated for F-14 depot level aircraft repair.

For engines, Field 12 is again examined. If TBUX is in Field 12, then Field 9 should show TF30P414. Since the TF30P414 engine (two per aircraft) are used in the F-14, these costs should be added to aircraft repair costs. For Fiscal Year 1983, TF30-P412/414 engine costs are identified by the same Table 10 as being $91,552,000. When added to F14 aircraft program costs this gives an intermediate F14 program cost of $173,223,000.

This leaves to be determined component repair costs for 1983. The first step in tracing these costs is to identify all UCA records coded 997/998/999 in the UCA data base. From this population select all records that begin Field 13 with an A or an L. Step two is to obtain the Component Capability List for the NARF originating the records. Step three is to find the NSN from Field 9 of the UCA record on the NARF Component Capability List and read off the SMIC. Step four is to use the SMIC to identify the use of the component. Step five is to note the cost to be included in F-14 component program costs if the SMIC is PF, PQ of CY (F-14 SMIC's).

Since NARF, Norfolk and NARF, North Island do all routine depot level repair of F-14 components, the foregoing search for component costs was done for each facility. For NARF, Norfolk, using the Component Capability Report dated

13 October 1984, 1128 of 3249 records (coded 997, 998 or 999 in Field 12 and A or L in Field 13) were identified as F-14 records. No identificatoin could be made for 70 records (2.2% and $459,350). Total dollar cost of repair for the 1128 F-14 records was $46,768,613. For NARF, North Island, using the Component Capability List dated 1 September 1984, 297 of 3900 records were identified as F-14 records. No identification could be made for 573 records (14.7%), because of either a missing SMIC (202), an unidentifiable SMIC (57) or the NSN not being listed on the Component Capability report (314). Total dollar cost of repair for the 287 F-14 records was $2,216,085. Adding costs for these two facilities results in a total of $48,984,698 for the F-14 component repair program. This total ignores the incidental costs for F-14 component repair done at other DOD depot level facilities.

The Total of all F-14 costs for depot level repair in Fiscal Year 1983 is $222,207,698. This includes costs from the aircraft, engine and component repair programs. Although the task to arrive at this number was extremely time consuming because of the need to individually identify component repair records, it could be duplicated in a fraction of the time by using ADP methods.

2. Common Cost Pools

The manual identification of component records at NARF, North Island gave additional insight into common costs. These common costs are for repair of items used by more than one (or possibly many) aircraft. Of 3788 records from NARF

North Island with an NSN in Field 9, 997-999 in Field 12, and A or L in Field 13, only 706 (18%) were identified as belonging to a common cost pool. Even if all records not identified for any reason were added to the common cost pool, the pool would only include 33.7 percent of the total number of records with an NSN in Field 9. This indicates that common cost pools are not so large as to prevent a valid effort to track UCA component repair costs back to a unique weapon system.

These same figures present evidence that at least two thirds of all component repair records can be tracked to a major weapon system by the SMIC. If tools (other than the Component Capability List) were used to augment the effort to identify the 14.7% (573 records) not identified originally, as high as 80% of the records could possibly be coded back to a weapon system. Either figure indicates that use of the SMIC would improve the oversight capabilities of the UCA system.

C. SUMMARY

This chapter shows the potential of the SMIC to track weapon system costs has been recognized since the earliest days of UCA reporting. Also, it shows costs can be captured by weapon system if OASD determines the need exists.

Next, general observations are presented on the operation and value of the UCA reporting system. Recommendations are made for consideration in improving the UCA system. Finally, a recommendation for further research is made and a summary presented.

VI. CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the findings of the study and offers recommendations for system improvement or further study.

A. CONCLUSIONS AND RECOMMENDATIONS--DEPOT LEVEL

As stated at the outset, the research conducted for this study was an attempt to evaluate the capability of the UCA system to capture depot level repair costs by weapon systems. The research demonstrated that costs for the aircraft and engine programs are being captured by weapon system. However, costs for repair of components coded 997, 998 and 999 in UCA Field 12 are not currently identified to a weapon system. Therefore, a method is needed to code records normally having 997, 998 or 999 in Field 12 in a way that identifies for the UCA what weapon system uses the component.

The vehicle for coding weapon system component records is the Special Material Identification Code (SMIC). This is the two character suffix for the National Stock Number and exists on the basic work documents at the NARF level. There is a unique SMIC for each type of aircraft, engine and many major aircraft weapon systems. This SMIC can be used to override the general coding in Field 12 (997, 998, 999) and provide a weapon support code for each component belonging to a unique weapon system.

Two ways appear to be feasible to use the SMIC to provide unique coding to the component record for UCA.

The first is to capture the SMIC from the Master Data Record for each job number. Then the SMIC would be used to code UCA Field 12 with the WSSC of the unique weapon system.

A second method that appears to be feasible is for each NARF to take all component records at the end of each quarter (with an NSN in Field 9), and sort them against the Component Capability List. The SMIC for each NSN could be captured and used to recode Field 12 with a unique Weapon/Support System Code (WSSC).

Recommendation One--Each NARF examine their data systems to recommend what is in their view the best way to capture the SMIC for each component repair record.

DOD INST 7220.29-H (as amplified by NAVCOMPINST 7310.9D) does not fully specify how information should be presented for some UCA data fields. For example, the second character of Field 13 is coded by the type of aircraft for which the work was done (e.g., fighter, bomber). At the present, many aircraft have multiple roles leaving each NARF to choose the aircraft's proper code.

Recommendation 2: Each NARF prepare a list of areas where it is interpreting DOD INST 7220.29H rather than following direction. This should identify areas that require amplification in future changes of DOD INST 7220.29-H.

B. CONCLUSIONS AND RECOMMENDATIONS--NALC LEVEL

To ensure future standardization of UCA reporting at the six NARF's, the NALC should ensure any UCA requirements are incorporated in the Navy Industrial Financial Management System (NIFMS) Prototype.

> Recommendation 3: Examine the new NIFMS prototype to see what modifications are necessary to use the SMIC to code UCA component records by weapon system.

One solution to some of the cost identification problems within UCA may be to code each UCA record having an NSN in Field 9 with a SMIC. The SMIC, for instance, could go in the last two characters of Field 14 which are now reserved for local use.

For this solution to work, weapon system family groupings of SMIC's would have to be established. A grouping for the F-14 would appear to be PF, PQ and PY. A grouping for the F-4 would appear to be AY, BF, MF, NN. All SMIC's belonging to a specific weapon system should be categorized.

> Recommendation 4: Refine and promulgate the dictionary of SMIC codes to identify all SMIC codes with their particular aircraft or weapon system.

Many components (and the items these components are installed in) are used in more than one aircraft. The T56 engine, for example- is installed in the C-2, C-130, E-2 and P-3. The repair costs for T-56 can be prorated to each of these aircraft based on percentage of total T-56 assets used.

Recommendation 5: Identify appropriate percentages for allocating depot level repair costs for common items.

C. RECOMMENDATIONS AND CONCLUSIONS--OASD LEVEL

The NIFMS promulgated in 1978 and incorporated at NARF, Alameda apparently used the SMIC to identify component costs to unique weapons systems. A historical study should be done to see how effective these efforts were. This study would have to be done using an aircraft that routinely receives repair at NARF, Alameda. Possible choices are the A-6, P-3 or S-3.

Recommendation 6: OASD commission a study of the past effectiveness of the SMIC, as used at NARF, Alameda, in identifying component costs by weapon system.

The Federal Supply Catalog Management Data List [Ref. 11] gives extensive listings of SMIC's for the Army, Navy and Air Force. Only the Marines appear to make no use of the SMIC. These listings cover all types of weapon systems (not just aviation), and could be included on all UCA records. Since the same two letter codes mean different things for each service (PF in the Navy means F-14, in the Air Force PF stands for the J-65 engine, and in the Army PF stands for Special Purpose Electronic Trailer), if feasible every service could put the SMIC in their own unique location on the UCA records. Another option might be to put the SMIC in one location for all services and use the SMIC after the UCA records have been sorted by originating service.

Recommendation 7: Recommend a location be designated on UCA records for placing the applicable SMIC. This SMIC should be mandatory for all records coded 997, 998 and used when possible for records coded 999 in Field 12 and having an NSN in Field 9. This requirement should apply to all four uniformed services.

D. RECOMMENDATIONS FOR FURTHER STUDY

In addition to the specific recommendations for further study made above, the following is a suggestion for additional research to enhance the scope of this report:

1. Conduct an all service review to see if there is a better alternative than the SMIC for identifying miscellaneous costs coded 997, 998 and 999 in UCA Field 12.

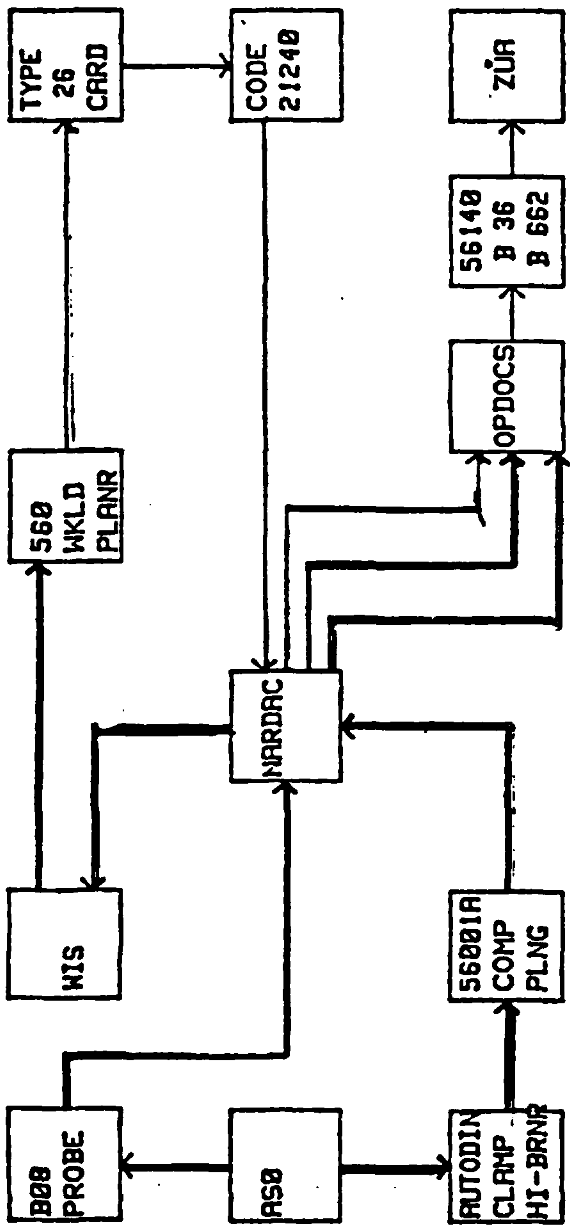
E. SUMMARY

In conclusion, it is important to note the dedication and enthusiasm of the NARF individuals responsible for implementing UCA reporting. Although this system often appears as unfunded overhead, NARF personnel comply fully with its charter in so far as that charter is understood.

As this study has shown, in general it is possible to track costs by weapon systems. In particular, F-14 program costs can be more fully tracked using the SMIC. However, making the SMIC part of the automated data processing system will require changes to the identification data fields required by DOD INST 7220.29-H.

APPENDIX A

F/E COMPONENT PRIORITY SYSTEM



COMPONENT SCHEDULING

B08 AUTOMATIC INDUCTIONS

CLAMP, HI-BURNER AUTOMATIC INDUCTIONS

MANUAL INDUCTIONS

Source: NARF North Island Training Lecture Outline

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APPENDIX B

NAVY SMIC ASSIGNMENTS

SMIC	Description/Application
AA	A-1
AE	E-1
AH	H-1
AN	J33 (T-33)
AP	P-2
AQ	TF30-P6/P408 (A-7)
AS	S-2
AV	OV-10 (Non-JSJ)
AX	Common Airframe Material
AY	AWG-10 MCS (Airborne Weapons Group Missile Control System)
AZ	AIMS
BA	A-3
BE	C2/E2 (Common)
BF	F-4 (JSL)
BH	H-2
BM	BQM-34
BN	J34 (P-2)
BP	P-3 (common)
BQ	T53 (Non-JSL) (H-1)
BT	T-2
BU	U-6
BX	Common Armament and Fire Control Equipment
BY	AN/USM-247 (VAST)
BZ	TACOS
CJ	RA-5C
CS	S-3
CX	NAFI Material
CY	AWG-9

SMIC	Description/Application
CZ	ASTAC (Antisubmarine Tactical Support Center)
DA	A-4
DH	H-3
DQ	T56 (C-2, C-130, E-3, P-3)
DT	T-28
DX	Common Aircraft Electrical Material
DY	IHAD (integrated Helicopter Avionics System)
DZ	Shoehorn
EC	C-117
EE	E-2C (peculiar)
EF	F-8
EM	AQM-37
EN	J52 (A-4, A-6)
EP	EP-3E (Peculiar)
EQ	T58 (H-2, H-3, H-46, H-52)
ET	T-33
EU	U-16
EV	OV-10 (JSL)
EX	Common Electronic Communications Equipment and Parts, Prime Manufacturers
EY	BRASO Non-Stock-numbered--Part Number Entries
FA	A-6 (Common)
FC	C-118
FE	EA-6B (Peculiar to EX-CAP Version)
FF	F-9
FN	J57 (A-3, F-9)
FP	P-3C (Peculiar)
FQ	T64 (H-53)
FR	O-470 (T-34)
FT	T-34
FX	Common Electronic Communications Equipment and Parts, Miscellaneous Manufacturers

SMIC	Description/Application
GA	A-7 (Common)
GC	C-119
GE	EA-6B (ICAP Configuration)
GH	H-34
GM	MQM-74
GN	J60 (T-2B, T-39)
GQ	T76 (Non-JSL) (OV-10)
GT	T-39
GX	General Aeronautical Material
HX	Meteorological Material
HZ	LAMPS (Light Airborne Multi-Purpose System)
JA	A-5
JQ	T50 (H-50)
JX	Ground Photographic Items
JZ	AN/ARC-159
KA	AV-8A
KC	C-121
KN	J65 (A-4)
KX	Aircraft Cameras
KZ	AN/ARN-52
LA	EA-6B
LC	C-130
LH	H-43
LN	J69 (BQM-34)
LQ	T76 (JSL) (OV-10)
LX	Safety and Survival Equipment
LZ	TACAMO III
MA	A-7 (JSL)
MC	C-131
MF	F-4 (Non-JSL)
MH	H-46
MN	J85 (T-2C, T-38)
MQ	T53 (JSL) (H-1)

SMIC	Description/Application
MR	R1820 (Cl, C117, S2, T28, U16)
MX	Common Guided Missile Material
NC	C-1
NF	F-4 (UK)
NH	H-50 (DASH)
NN	J79 (A5, F4)
NQ	T400 (H-1)
NX	Common Jet Engine Accessory Material
NZ	AN/APN-141
PF	F-14
PH	H-52
PN	J400 (MQM-74)
PQ	TF30-P412/414 (F-14A)
PX	Common Aircraft Engine Material
PZ	AN/APN-153
QH	H-53 (Non-JSL)
QN	TF41 (A-7E)
QR	R2800 (C-118, C-131)
QX	Common Aircraft Propeller Material
QZ	AN/ASN-30
RA	A-6E (Peculiar)
RC	General Communication Equipment
RH	UH-1 (JSL)
RS	SATCOM (Army)
RU	SATCOM (Air Force)
RX	Auxiliary Power Units
RY	AWG-21
RZ	TACAMO IV B
SE	ALQ-92
SF	F-18
SM	Lo Mix/Red E
SN	TF34 (S-3)
SQ	Submarine Antenna Quality Assurance Material
SX	Special Tools

SMIC	Description/Application
SY	Condor Missile Avionic Group
SZ	AN/ASN-92 (CAINS)
TA	A-7E (Peculiar)
TD	Training Devices
TM	General Electronic End Items
TN	F404 (A-18, F-18)
TX	Avionics Support Equipment and Parts
TZ	AN/ARN-84
UA	TA-7C
UH	Common to H-3/H-34/H-46/H-53
UN	F402 (AV-8A)
UR	R3350 (C-121, P-2)
UX	Common Aircraft Instruments
VY	DATS (Dynamic Alignment Test Set)
VZ	HATS (Hybrid Automatic Test Set)
WH	H-53 (JSL)
WX	Common Aircraft Instrument Parts
WZ	AN/APN-194
XX	Common Aircraft, Control Equipment, Landing Gear, Seats, Miscellaneous Accessories and Parts
X4	Nuclear Standard Navy Items
YX	Common Aircraft Systems Components, Furnishings, In-Flight Refueling, Tires, Tubes, and Parts
ZX	Common Aircraft Electrical Power Supply Components, Reciprocating Engine Accessories and Parts
ZZ	AN/ALQ-126

Source: Federal Supply Catalog Management Data List (ML)

APPENDIX C

NARF ALAMEDA SMIC CODED RECORD

G1.3.8 Program ZN7M. This program reads the job order to type equipment code/item identification code match file (ZN7LVO) and sorts the records into TEC/IIC sequence giving the sorted job order to TEC/IIC match file (ZN7MVO). The valid SMIC file (ZN7IRO) is read and the data is loaded into an internal data table. The ZN7MVO records are then matched to either the valid TEC file (ZN7FRO) or the valid MDR file (ZN7HRO) to obtain the appropriate supplemental data. The supplemental data includes item identification number, item name, standard inventory price and weapon/support system code. The output record is written to the expanded match file (ZN7MUO) which is then sorted into job order number sequence creating the sorted expanded match file (ZN7MRO).

Source: Navy Industrial Fund Management System
Appendix G, Page 6

APPENDIX D

NARF ALAMEDA UCA RECORDS
(CODED BY SMIC)

Type	F	F
Quarter	4	4
Fiscal Year	83	83
Program Element	72007N	72007N
Facility	NARF Alameda	NARF Alameda
In US/OUT US	1	1
Owner Operator	1	1
Reporting Facility	N5885	N5885
Item ID	2995002623207	2995010037291
Nomenclature	STARTER	STARTER
Price	2500	4770
WPN SYS/SUPPRT Code	AFWA	AFWA
Work Break	A13	A13
Work Perf	I	I
Customer	7N	7N
FLD17	4024	5705
FLD18	239	345
FLD19	211	521
FLD20	15	39
FLD21	0	0
FLD22	0	0
FLD23	0	0
FLD24	0	0
FLD25	14503	20214
FLD26	0	0
FLD27	0	0
FLD28	0	0
FLD29	0	0
FLD30	0	0
FLD31	0	0
FLD32	4004	5434
FLD33	0	0
FLD34	4800	7197
FLD35	124	189
FLD36	0	0
FLD37	0	0
FLD38	0	0
FLD39	0	0
FLD40	0	0
FLD41	0	0
FLD42	0	0
FLD43	0	0
FLD44	0	0
FLD45	23	48

FLD46	0	0
FLD47	7	14
FLD48	16	34
FLD49	0	0
FLD50	27	24
RECORD NUMBER		
	60210	60246

Type	F	F
Quarter	4	4
Fiscal Year	83	83
Program Element	72007N	72007N
Facility	NARF Alameda	NARF Alameda
In US/OUT US	1	1
Owner Operator	1	1
Reporting Facility	N5835	N5885
Item ID	5895002395988	6625001238726
Nomenclature	Valve	FREQ Anal
Price	488	3840
WPN SYS/SUPPRT CODE	AFWA	AFWA
Work Break	A14	A14
Work Perf	I	I
Customer	7N	7N
FLD17	382	0
FLD18	27	0
FLD19	0	167
FLD20	0	11
FLD21	0	0
FLD22	0	0
FLD23	0	0
FLD24	0	0
FLD25	3445	0
FLD26	7040	0
FLD27	0	0
FLD28	0	0
FLD29	0	0
FLD30	0	0
FLD31	0	0
FLD32	428	0
FLD33	0	0
FLD34	497	161
FLD35	13	3
FLD36	0	0
FLD37	0	0
FLD38	0	0
FLD39	0	0
FLD40	0	0
FLD41	0	0
FLD42	0	0
FLD43	0	0
FLD44	0	0
FLD45	2	4
FLD46	0	0
FLD47	0	0
FLD48	2	1
FLD49	0	3
FLD50	28	99
RECORD NUMBER	61191	61769

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