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AN ANALYSIS OF NAVAL AVIATION SQUADRON INFORMATION SYSTEMS AND STRATEGY FOR IMPLEMENTATION

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ABSTRACT

The world is currently experiencing what is termed “the information revolution”. The ability to access, manipulate, and store information has grown tremendously due to computers and advanced telecommunications technology. Organizations, including the U.S. military, must adapt to the new technology available in order to effectively compete in the future world environment. In the case of the military, however, the task-based hierarchical structure and lack of an information technology infrastructure are preventing the efficient use of technology and information system integration. Barriers to integration, such as information hoarding, independent application development, lack of IT management, and external driver specialization, will continue to proliferate in task-task-based-based organizations. The military will be prevented from achieving success in information technology integration by the very structure it has created. Organizations must reengineer around the process rather than the task in order to achieve success in this area, and develop a sound information infrastructure to alleviate personnel from routine and repetitive work. This thesis provides a sample of how reengineering around the process and creating an information infrastructure can increase a naval aviation squadron’s efficiency and make them more competitive in the future.

TABLE OF CONTENTS

LIST OF FIGURES

I. INTRODUCTION

This thesis is about introducing revolutionary change within an organization whose structure and work philosophy have remained constant for decades. Recent environmental events have led to a sense of dissatisfaction with the way work is performed in a naval aviation squadron, and have led to a search for a better method of operations. So much time and effort is expended in performing work within a squadron that is not clear whether or not it is contributing to a desirable output or is merely a case of performing work for work's sake. With the changing environment comes the need to re-focus our effort in creating a more efficient, output oriented organization.

The naval aviation squadron of today is expected to do more with less. In the current downsizing environment, the services are competing with each other for every scarce dollar available. It is apparent that in order for a squadron to survive in today's arena of environmental change, it must focus more on innovation, cost effectiveness, and customer satisfaction (Gore, 1993). Naval Aviation has to look inward at the way it does business; specifically at the way it is structured, how its basic processes are performed, and how they both allow for the implementation of new technology.

The current naval squadron organizational structure is based on the premise that workers have a limited set of basic skills and work best when performing simple tasks. While this task-based structure provides an effective means of training and managing personnel, it also requires a large amount of overhead and process complexity to make it work effectively. For lack of a better system, this structure has been tolerated for years, along with the inefficiencies and costs that are associated with it. Over time, layer upon layer of well intended instructions, directives, and procedures have been added to previous layers to form a hierarchy of bureaucratic red tape and complexity. This, coupled with the fact that no modern squadron information infrastructure has been developed, has resulted in an organization riddled with inefficiency, overwork, and inflexibility.

The current state of information technology in the typical naval aviation squadron is rather primitive, and has been described by some as being in the "stone age". Other than a few of the training squadrons, which are just now beginning to develop an information infrastructure, there are no squadrons with inter-squadron local area networks. Systems like the Naval Aviation Logistics Command Information System (NALCOMIS) exist but serve the needs of only one functional area. A squadron will likely have a number of computers; however, they are isolated from one another and used for the most basic of tasks, such as word processing and limited database uses, or to run organically developed applications. The technology exists that can solve the information infrastructure problems at a reasonable cost. To remain competitive, we must take advantage of this available technology and develop an effective organization capable of dealing with the uncertainty of the future.

A. THE INFORMATION REVOLUTION

Since at least the beginning of written history, environmental effects have forced fundamental change in man and his basic behavior. The invention of fire, the wheel, electricity, and the cotton gin have all had a profound effect on the way man conducted himself afterward. The relatively recent introduction of the computer is but another in the long line of revolutionary inventions to which society in general, and the military in particular, are still adapting. Just as it would be unfathomable to imagine life without electricity today, it will be unthinkable twenty years from now to live without computers.

Within the span of a decade, the personal computer has risen from an expensive and obscure research tool to a relatively inexpensive and widely used platform. It is considered the cornerstone of the information revolution and is transforming the way we do business, communicate and learn (Long & Long, 1993). Businesses and organizations which desire to remain on the cutting edge have adapted computers into their very way of conducting business with dramatic results. With each year that passes, computer technology innovations make the transition from the "old ways" easier and less expensive than ever. Indeed, according to the Commerce Department, business and consumer spending on high-tech equipment accounted for some 38% of economic growth since 1990 (Mandel, 1994). Organizations that can't or won't make the leap to the computer world will quickly find themselves outdistanced by those with the foresight to do so.

The use of information technology has evolved from the automation of structured processes to systems that are truly revolutionary in that they introduce change into fundamental business procedures. It is believed that "more than being helped by computers, companies will live by them, shaping strategy and structure to fit new information technology" (Gurbaxani & Whang, 1991). Computerization is eliminating slack at every level of business, from the internal routines of single companies to the organization of industries and marketplaces. It's removing intermediaries, speeding transactions, rebalancing power relationships, and slashing costly fat - all of which is intensifying competition in the U.S. and around the world (Verity, 1994).

B. THESIS JUSTIFICATION

Through experience and interviews, several key problem areas have been identified which exist in the naval aviation community. In order for naval air to remain a salient force in the nation's defense, these areas must be addressed and improved. The efficiency of the work performed must be increased, a competitive advantage maintained, and work focused toward desirable outputs. The community is currently falling short in these areas and must find a way to drastically improve in all of them.

1. Efficiency

Today's environment is forcing organizations to do more with less; less money, less people, and fewer assets. The years of abundant money in the Department of Defense are long gone, and naval aviation is feeling the pinch. The loss of the A-12 Avenger program, the retirement of the A-6 Intruder, and the reduction of F-14 squadrons are but a few of the examples of the cuts involved. Reductions in personnel and OPTAR are also having a negative effect on the training and readiness of squadrons. The fact is that the squadron of the future will have to work smarter than before to accomplish the same missions because the dollars just aren't there to support "old style" operations.

One of the best methods to working smarter is to achieve a greater efficiency in the work that is performed. Fortunately for navy air, the current situation leaves a lot of room for improvement. The concept of efficiency, in general terms, deals with the ability to accomplish a job with the minimum amount of time and effort. In a more specific sense, efficiency in a squadron can be defined as the amount of time and effort put into a job divided by the amount of *valued* time and effort expended. Valued time and effort is the concept assigned to work that is specifically geared toward desired squadron outputs without being duplicated elsewhere in the organization.

The distinction between time and effort and valued time and effort is important because the difference is actually wasted effort. When more than one person or department is performing the same job, the effort is duplicated and the time spent by one wasted. The classic example of this phenomenon is the recording of flight time statistics in a squadron. Both the Maintenance and the Operations Departments track and record flight time statistics. At the end of the month, the statistics must be reconciled between the two so that accurate reports can be prepared for distribution. This process consumes countless hours of administrative accounting for personnel in both departments, most of which is wasted effort. Efficiency in this area could be improved, for example, by providing a central database of flight statistics where they are entered once and everyone draws from the data.

2. Competitive Analysis

Interservice budgetary warfare is being conducted on a daily basis in Washington. A large portion of the debate revolves around the future of the aircraft carriers. The Air Force and Army are arguing that the carriers are too expensive a way to provide "forward presence" and that they do not contribute much to the outcome of the battle. They are pushing for large deck amphibious ships and Air Force squadrons to assume the role carriers now perform. They are asking for a three to four carrier reduction as well as a reduction in F/A-18 E/F production.

Missions once thought to be proprietary in nature are crossing the service lines in the name of jointness. EA-6B Prowler aircraft have assumed many of the electronic warfare missions once owned by the Air Force EF-111 Wild Weasels. Air Force AWACS command and control missions are being assumed by Navy E-2 aircraft in areas once considered sacred. Marine Corps F-18 squadrons are being deployed aboard carriers at a rate far exceeding those of the past.

It is not just the competition among the services for scarce dollars that is the issue. Communities within naval aviation itself are also competing for missions in order to justify their existence. Both the F-14 and F-18 communities are scrambling to fill the role soon to be relegated by the retiring A-6. ES-3's are now deploying with the carrier battle groups and are in direct competition with EP-3's for the electronic intelligence gathering role.

With the shrinking defense budget comes the reality that unneeded service providers will have to be cut. Those communities who can't provide the services required efficiently will likely fall to those who can. It is no longer a question of who can perform the mission, but one of who can perform the mission the best.

3. Outcome-Based Processes

The final area of concern involves focusing on work that produces outputs desirable to the customers and stakeholders of squadron services. Work internal to the squadron which does not directly contribute to satisfying these people is, in essence, wasted work. The more wasted work and redundant tasks are performed, the less time and effort personnel have to focus on jobs that are important, those which provide value toward the desired output goals.

C. METHODOLOGY

This thesis is intended as a thought provoking piece and is largely the result of the dissatisfaction experienced with certain areas of squadron life. It is presented with a combined 17 years of naval aviation involvement, and the new perspective provided through the Information Technology Management curriculum at the Naval Postgraduate School. While the views are not grounded in scientific methodology, extensive research has been conducted into the areas of squadron processes and reengineering.

What follows is a guided tour through the reengineering of a naval aviation squadron. Chapter II provides the background on reengineering necessary to understand our reasoning and methodology for the project. Chapter III provides an analysis of a typical squadron and the problems associated with the current methods of operation. Chapter IV highlights a squadron which has been reengineered. Chapter V brings several important factors to light which are important in considering a reengineering effort. Finally, Chapter VI deals with the findings and recommendations for further research in the area.

This introduction has provided insight into the climate in which organizations today, and more specifically naval aviation squadrons, must operate in. Several factors have been introduced which naval squadrons must focus on in order to survive in this current climate of change and flexibility. A background on reengineering will now be presented and is the basis on which this thesis is built.

II. REENGINEERING

A. INTRODUCTION

The structure of most military organizations is based on Adam Smith's principle of "division of labor" where processes within the organization are divided into simplified, well defined tasks that people specialize in performing (Smith, 1776). In today's world, the processes necessary to piece these tasks back together have become so complicated that it is now ineffective to structure in this manner. This chapter focuses on a relatively new concept called "reengineering" which offers alternatives to the drawbacks commonly found in task-based organizations.

The most basic explanation of reengineering is simply "starting over" (Hammer & Champy, 1993). This implies looking at the work required to create an organization's product or service and the processes required to deliver value to the customer. Three focal points exist that organizations must address in order to be successful in this arena; customers, competition and change (Hammer & Champy, 1993). These focal points apply more and more to military organizations as well as to civilian business. Organizations within the military must focus on why they are in "business", and who they are in business to serve.

The availability of information today has changed the concept of the *customer* from a dependent entity to a well-informed one. Customers now have more information available to them through television, computer, CD ROM, and other media sources than ever before. They are able to focus on quality, price, selection, and service and are no longer limited to one or two choices. Organizations, including military ones, that can't cater to customer satisfaction will be left for ones that can. A command must be able to impart its worth to its customers by providing its service in the most efficient and competent manner possible, or the customer will find one that can.

Another force acting upon military organizations is *competition*. The likelihood of contracting out the country's operational war-fighting and defense capability is far fetched, but competition does exist amongst the various service branches for missions and funding. In 1991, an internal propaganda war was being fought concurrently with Operation Desert Storm. The various branches of the armed services were trying to prove, not only to senior members of the defense establishment, but also to the American people, that their particular branch of the service could perform their mission better than the others. In today's environment of limited funding, public scrutiny, and information availability, this type of competition will continue. If the Navy doesn't perform it's aviation mission up to the expectations of the customer, the Air Force will be available to step in and pick up the load.

The third force an organization must deal effectively with is *change* and the change process itself. Organizations must look beyond quick fix repairs to existing processes and look at the process design itself. In most cases, fixing a piece of the system won't solve a problem. The "division of labor" around which squadrons are organized is no longer state of the art. The environment, people, culture, and technology in/with which the squadron operates has changed. Organizations designed to operate in one environment cannot be fixed to work well in another.

B. REENGINEERING DEFINED

Reengineering is a way to incorporate into a business the effects that customers, competition, and change have on an organization. Long-established procedures and paradigms are completely abandoned and processes, structures and organizations are designed or redesigned from the start. Trying to fine tune what already exists, or making incremental changes that leave the basic structures intact isn't reengineering. What would the organization look like today if it were to be re-created, given the current state of technology, knowledge of organizational structure, customer needs, and organizational goals?

Reengineering can be more formally defined as "The fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service and speed". This formal definition contains four key words that are at the heart of reengineering, fundamental, radical, dramatic and process (Hammer and Champy, 1993).

In order for an organization to begin thinking about reengineering, it must ask the most basic of question about why they are in existence. The *fundamental* aspect of reengineering forces organizations to look at the rules and assumptions about the way they do business (Hammer & Champy, 1993). To be able to reengineer, an organization must be able to forget the old rules and ways of conducting business, and focus on what the customer wants. The primary drive for new business processes then stems from the these focus areas.

The word *radical* is included in the formal definition to force people to think "out of the box". The standard ways of doing business is simply not a good enough rational. A new way of accomplishing work must be formulated. Making superficial changes to existing processes does not constitute reengineering (that is called business improvement). Reengineering involves reinventing the way businesses are run, and requires radical thought.

Reengineering isn't about marginally improving a business, but *dramatically* improving the way a business operates and performs. An organization should never allow itself to become complacent or satisfied with its current state of performance. Only now is the military beginning to realize that business as usual cannot continue and that dramatic changes need to be made in order to satisfy the customer. It is the questioning of the way things used to be done, and redesigning new processes and structure that will eventually lead to dramatic improvements in the service of military organizations.

Arguably the most important of the four key words in the formal definition is the concept of the *process*. Processes encompass everything that is accomplished in an organization, but are the most difficult to identify. Processes are a combination of people, tasks, structure and an organizations culture. The individual people and tasks are easily identified but the manner in which they are all tied together is not. Hammer and Champy [1993] define a process as "a collection of activities that take one or more kinds of input and create an output that is of value to the customer." It is the process that delivers the product to the customer, not the individual tasks.

Task-based thinking has influenced the organizational design of companies for the last two hundred years. However, organizations, in both the public and private sectors, are beginning to realize that they cannot continue business as usual if they are to survive. Reengineering then, is basically the search for new methods of organizing work, with a no-holds-barred attitude towards organizational structure, boundaries, tradition, conventional thinking, and paradigms.

C. PROCESS REDESIGN

The current military organizational model is based on the basic premise that workers have a limited set of basic skills, and they work best when performing simple tasks. However, these tasks require a large amount of overhead and complex processes to put them together once they are completed. For lack of a better system, this arrangement has been tolerated for years in the military, along with the inefficiencies and cost that are associated with a complex bureaucracy. A reengineered organization defies the division of labor theory and looks at processes as single entities. It is the process which must be kept simple for it is the process which ultimately produce the end product or service for the customer.

Process reengineering requires that several jobs be combined into a one. The once-simple tasks performed by specialists are combined in a natural order to form processes performed by generalists. When processes are large, the team concept can be used, with each member of the team performing/managing a particular piece of the process. The formation of *task forces* allow specialists to work together in teams to manage a process and ensure that it is properly designed and implemented (Drucker, 1988).

The advantages of a single person, or team, handling an integrated process can be enormous. Workers can make decisions at the work level. The benefits include less delay time in completing processes, less managerial overhead, better customer response, and higher worker motivation (Hammer & Champy, 1993). Team members share the responsibility for the process as a whole (big picture) rather than just single tasks within it. With empowered workers or teams handling a process, managerial checks and controls can be significantly reduced. Controls serve to insure process compliance to standard operating procedures and dictated policy and are of no direct value to the process output. In a reengineered organization, non-value adding work is reduced or eliminated.

Workers are not only trained in how to perform their work, but also educated in the entire process and ultimate goals of the organization. Most of the administrative work involved in compensating for the fragmentation of work, i.e. monitoring, tracking, reconciling, etc., is eliminated, and people spend more time performing real work that leads to accomplishing the organization's goals. Emphasis changes from training to education, to educate the workers why something is done as opposed to how a task is performed.

The manager's role in a reengineered organization also changes, from a director to a coach. Managers become problem solvers and advice givers rather than supervisors (Hammer & Champy, 1993). The bureaucratic glue once required to paste all of the processes together is dissolved and managers are allowed to assume an advisory role. Managers in the reengineered organization must possess strong interpersonal skills and the ability to adapt to change.

The role of company executives also changes in the organization; from score-keeper to leader (Hammer & Champy, 1993). The once vertical hierarchy is flattened and strategic managers are brought closer to the people who work in the organization. Communication is opened and ideas are shared freely. Executives can keep their fingers on the pulse of the company and lead by example rather than by decree. Perhaps most important, the executive is free from much of the process micromanagment necessary in task-based organizations, and free to set strategic direction for the company.

D. INFORMATION TECHNOLOGY AND REENGINEERING

Information Technology plays a crucial role in business reengineering, but information technology itself can be easily misused. There is a huge difference between automating a task and process redesign. Simply applying a technology to an already existing task is not reengineering, it is simply "paving a cow path." Applying automation to an existing task will likely improve the task but will do nothing for the process as a whole. The managerial glue still exists which holds all the automated processes together. Organizations that equate technology with automation can't reengineer (Hammer & Champy, 1993).

Technology should be used in conjunction with reengineering to better design a process and all it's associated work functions. In fact, technology can make reengineering possible because it allows people to do many more tasks than was once possible. Thus, information technology is an enabler that facilitates the reengineering process.

In order to properly apply information technology in a reengineering sense, inductive reasoning needs to be used rather than deductive reasoning. Thinking inductively requires that organization be innovative in their thinking of how to use the technology that is available (Hammer & Champy, 1993). For instance, the organization should be thinking "How can we use technology to allow us to do things that we are not already doing"? With deductive thinking, the organization might try and fit technology to existing tasks rather than redesigning the processes to fit the state of information technology that is available. Technology allows organizations to break old paradigms and create new ways of organizing work.

One of the major stumbling blocks to the effective implementation of IT is a lack of knowledge of what is available. Some of the current trends are:

- Shared databases which allow the sharing of the same information concurrently throughout an organization. These systems increase efficiency and reduce overhead time by eliminating multiple data repositories, decreasing data entry time, increasing data accuracy, and allowing the data to be accessed by all who need it.
- Expert systems which allow generalists the ability to perform the work of experts. These systems capture the knowledge of subject matter experts and present it to less knowledgeable workers in a usable format.
- Decision support systems which allow decisions to be made at the worker level that used to have to travel up the chain of command for approval. These systems make the worker feel empowered and allow for faster and more effective decision making, eventually leading to greater customer satisfaction.
- Telecommunications networks which will allow companies to structure their organization the way that best suits them.Organizations will no longer be forced to a centralize in order to facilitate control and communication. Local area networks (LAN's), wireless data communication networks, and cellular communications will allow organizations to best structure itself to meet customer needs.

- Compact Disk (CD) technology which will allow once cumbersome publication management to be virtually eliminated and allow instant access to any publication or instruction from any remote location equipped to communicate.

As more organizations reorganize business processes around information technology, it will be increasingly important for other organizations to keep up or become incompatible and obsolete. It's hard to imagine a business today of significant size able to adequately compete while using a manual entry accounting system. Equally unfavorable will be future businesses unable to communicate effectively and quickly through the use of LAN's, electronic mail, and remote access to information.

E. FOCUS ON OUTPUTS

Reengineering is a valuable tool for integrating organizations into the future competitive marketplace. Unfortunately, it focuses only on the rethinking of processes necessary to provide the customer with the best product. A company may have reengineered to focus on certain measurable outputs that completely miss the mark on customer satisfaction. It also fails to address the importance of a quantifiable method of measuring outputs.

In order for an organization to be completely successful in the future, reengineering is not enough. The outputs of the organization must be identified and reengineered processes focused toward them. Many organizations (including the military) have fallen victim to funding inputs rather than outputs. Dollars are appropriated or apportioned to organizations who decide what they can and can't do with the level of funding they have received. This method results in ambiguous outputs and unmanageable processes.

Organizations must focus on result oriented processes in their reengineering efforts. The desired end product is the most important goal and focus must be placed on achieving it efficiently and competently. This is how the customer eventually receives the most bang for the buck.

F. REENGINEERING IN THE MILITARY

Most of the concepts brought to light in this chapter involve generic ideas applied to the current business environment. The obvious question then becomes "can reengineering principles be applied successfully to the military command and control structure?". Many viewpoints undoubtedly exist which hold a pessimistic answer to the question. Arguments against reengineering in the military include:

- The military is too large an organization to successfully complete such a grand undertaking.
- The mission of the military is far too important to tinker with the traditional command and control structure. The risk is too great.
- Because senior military personnel are products of their "upbringing" through the ranks, it will be impossible to get the senior level support required to effect the change.
- The pressures of combat demand a rigid structure with centralized decision making capability. No room exists for questioning or debating orders.
- The way the military is currently structured is the way it's always been done and it has been successful.

It is the central premise of this thesis that the very arguments against reengineering support, rather than undermine, the need for undertaking the effort. We present our case in the following chapters using a naval aviation squadron and its processes and structure to lay the groundwork for getting the point across.

III. CURRENT SYSTEM ANALYSIS

This chapter outlines the organizational structure, task requirements, and state of information technology typical of those found in today's naval aviation squadrons. We present an analysis of squadron processes based on two IDEF-0 models - one which we created and one created by the Naval Aviation Maintenance Office (NAMO) in Patuxet River, Maryland. Problems with the current squadron design are then presented as an argument for reengineering squadron processes.

A. SQUADRON STRUCTURE AND ANALYSIS

1. The Strategic Apex

The naval aviation squadron, like most military organizations, is based on a rigid vertical command-and-control hierarchy. At the top of the hierarchy is the Commanding Officer (CO) who is responsible for the squadron and its happenings. As with most military organizations, the CO is given absolute responsibility for the command and the authority to back it up. In the case of an operational squadron, the CO reports to the Air Wing Commander (CAG) as well as to the Type Commander at the unit's home station.

Directly under the CO in the pecking order is the Executive Officer (XO). The XO is a screened Commander who will fleet up to take command of the squadron when the present CO's tour is complete. The XO is considered to be the administrative head of the squadron, with all paperwork and information flowing through his/her office. The XO heads most squadron boards and committees and is the President of the officers coffee mess. His responsibilities free up the CO to lead the squadron without allowing him/her to get buried in minutia.

The third member of the "strategic apex" is the Command Master Chief (CMC). The CMC is generally the senior enlisted member in the squadron and is responsible to the

CO for the morale and discipline of the enlisted personnel assigned. The CMC is generally a counselor and a wealth of knowledge on naval customs and traditions.

The strategic apex of a squadron controls the strategic planning and goal setting of the organization. Policy and tasking are directed downward, with the understanding that the status of assigned tasks be reported back up the chain. This level represents the highest overall decision making authority in the squadron, both administratively and operationally.

2. Departments

Under the strategic apex, a squadron is divided into functional units called departments. A department is directly responsible to the strategic apex for achieving certain functional duties within the squadron. The departments operate autonomously, each with differing and sometimes conflicting agendas. Each department is headed by a O-4 (LCDR) who reports directly to the strategic apex and has the responsibility for the operation of their department. The four departments common to every naval aviation squadron are Maintenance, Operations, Administration, and Safety. Although squadrons exist with additional departments, these four are the core departments and will be the only ones addressed in this thesis.

a. Maintenance

Maintenance is the largest department in the squadron and is tasked with the physical maintenance and support of the aircraft assigned to the squadron. It is unique among departments in that it is assigned the majority of the squadron's enlisted personnel. It is also the only department with two chains of command - operational and administrative.

The Maintenance department has its own strategic apex in the form of the Maintenance Officer (MO), the Assistant Maintenance Officer (AMO), and the Maintenance Master Chief. They have a support staff of chiefs and Aviation Maintenance Administration Specialists (AZ's) who all operate out of Maintenance Control. Maintenance Control coordinates the maintenance effort on all the aircraft and serves as the operational point of command for the individual work centers in the department. The workcenters liaison directly with Maintenance Control for all maintenance related activities and aircraft problems. Maintenance Control also serves as the duty officer's link with the Maintenance department in the execution of the daily flight schedule. Figure 1 represents the operational chain of command within the Maintenance department.

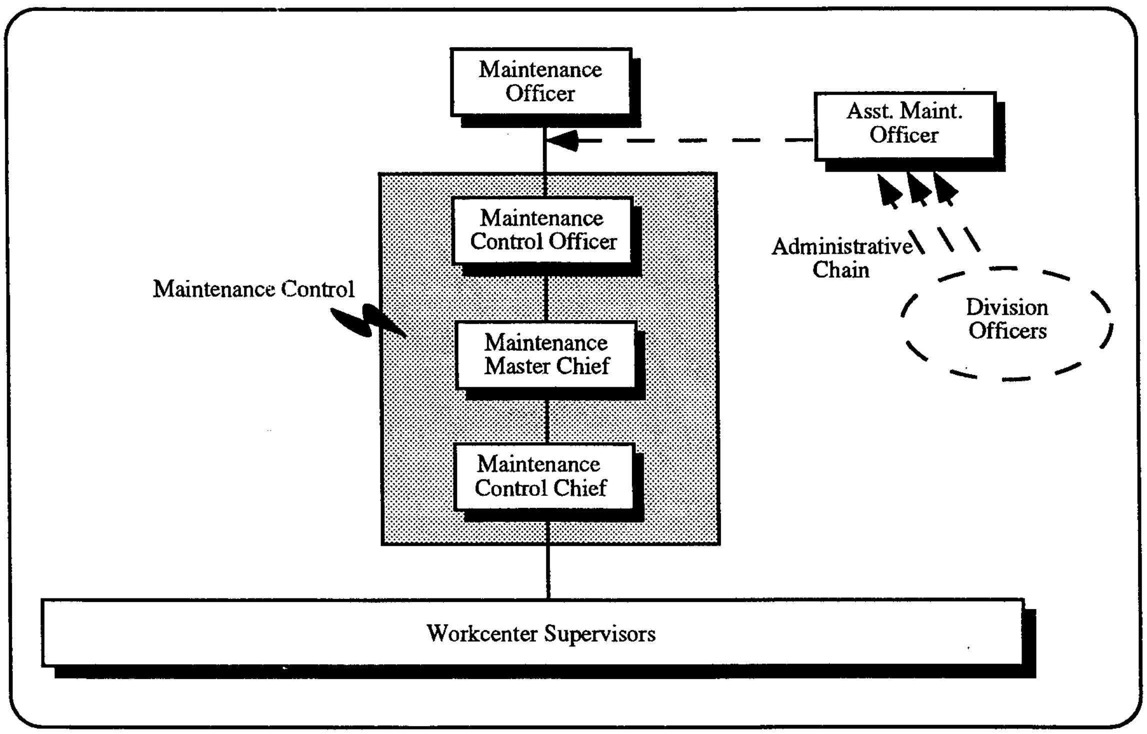


Figure 1. Maintenance Department Operational Chain of Command.

Because of its size and many specialization ratings, the department is further sub-divided into divisions, branches, and workcenters, each with an officer or a senior chief responsible for its management. These divisions and branches represent the administrative chain of command within the department and exist to divide the department into manageable units. Figure 2 represents the administrative chain of command within the department.

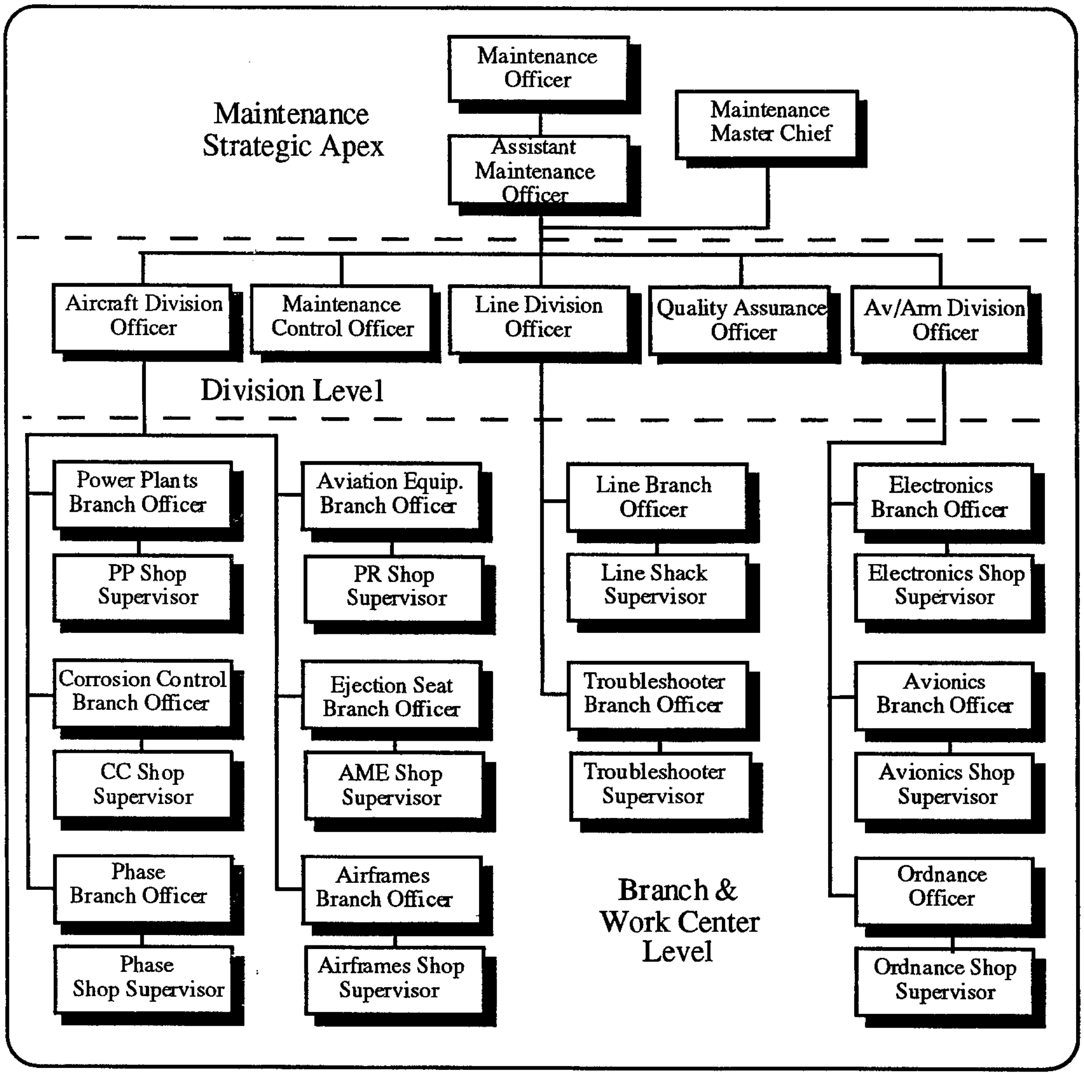


Figure 2. Maintenance Department Administrative Chain of Command.

It is important that the difference between the operational and administrative chains of command be understood. Operationally, a Shop Supervisor reports directly to Maintenance Control on any matter dealing directly with the maintenance effort and his/her shop's responsibility. If it has anything to do with the maintenance of aircraft, the operational chain is used. If the same Shop Supervisor wants to take leave, needs an evaluation, or gets into legal trouble, it is handled through the administrative chain. The Division and Branch Officers are responsible for the tasks necessary to keep the personnel in their respective divisions/branches happy and able to work. Generally, if a matter doesn't deal directly with maintaining aircraft, it belongs to the administrative chain.

b. Operations

The Operations department is responsible for the planning and execution of the squadron's activities. These include but are not limited to:

- Creating and publishing the daily flight schedule.
- Tactical academic training of all squadron aircrew.
- Coordinating the operational aspects of all squadron movements and deployments.
- Monitoring the progress of all airborne aircrew training.
- Maintaining and updating the aircrew's NATOPS flight qualification jackets and flight log books.
- Providing intelligence assistance for squadron/airwing strike planning.

The department is headed by the Operations Officer and is assigned a small cadre of officers under him/her. Typical jobs in the department include Assistant Operations Officer, Schedules Officer, Training Officer, Operations Admin Officer, Tactics Officer, and one-two Intelligence Officers. A small number of enlisted personnel are usually assigned to handle administrative and intelligence duties. The Operations Yeoman types the flight schedule and performs any administrative tasks required by the operations staff. Intelligence Specialists work closely with the Intelligence Officers to provide strike planning support to the squadron aircrew. A Graphic representation of the typical Operations structure is presented in Figure 3.

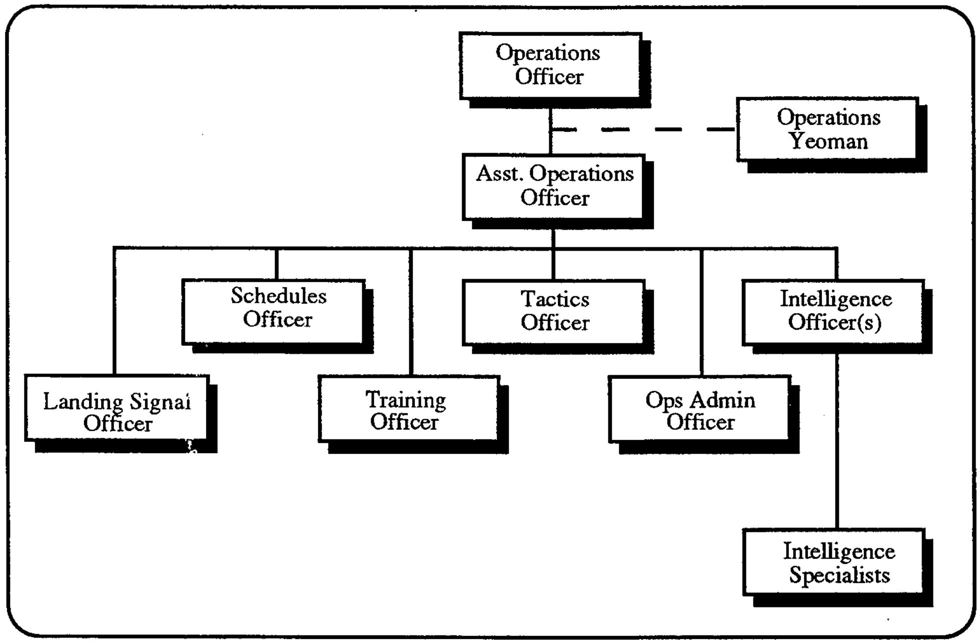


Figure 3. Operations Department Organizational Structure.

c. Administration

The Administration department supports the squadron's personnel and handles the paperwork burden for the strategic apex. Their areas of responsibility include, but are not limited to:

- Maintaining the pay and service records of all personnel assigned to the squadron.
- Performing any word processing required for squadron personnel such as evaluations, awards, promotions, and articles.
- Maintaining the instruction library for the squadron.
- Promoting the squadron in a positive light (public affairs).
- Performing legal services for the CO/XO.
- Maintaining the cleanliness of squadron spaces (janitorial).
- Updating and maintaining message traffic, both in and out of the squadron.

- Coordinating and tracking advancement requirements for enlisted personnel.

The department is run by the Administrative Officer (AO) and is divided into separate halves under him/her. The Personnel division, is headed by the Personnel Officer and is tasked with supporting the squadron's enlisted members. All service record business, promotion proceedings, and discharges are performed by the Personnel office. The office is also responsible for tracking squadron manning.

The Admin division is headed by the Assistant Administrative Officer and handles all departmental matters not directly involved with enlisted personnel support. The Admin division also liaisons closely with the strategic apex for direct tasking. Typical jobs in the department include Personnel Supervisor, Personnel Staff, Legal Officer, Public Affairs Officer, Educational Services Officer, First Lieutenant, Admin Supervisor, and Admin staff. The Administrative department structure is illustrated in Figure 4.

d. Safety

The Safety department is the smallest department in the squadron and is charged by the CO to uphold and promote his/her safety policy. The department head is the Safety Officer, usually a graduate of the safety school in Monterey, CA. In addition to running the department, the safety officer is trained to act as Command coordinator if a mishap occurs in the squadron. Other departmental responsibilities include:

- Maintaining the squadrons NATOPS records and publications library.
- Conducting safety/NATOPS training for aircrew and shop personnel.
- Conducting NATOPS check rides for aircrew.
- Conducting periodic safety meetings with designated command representatives.

The department is generally assigned only three to four officers and one senior enlisted person. The typical jobs include NATOPS Officer, Ground Safety Officer, and Safety Chief. The structure is shown in Figure 5.

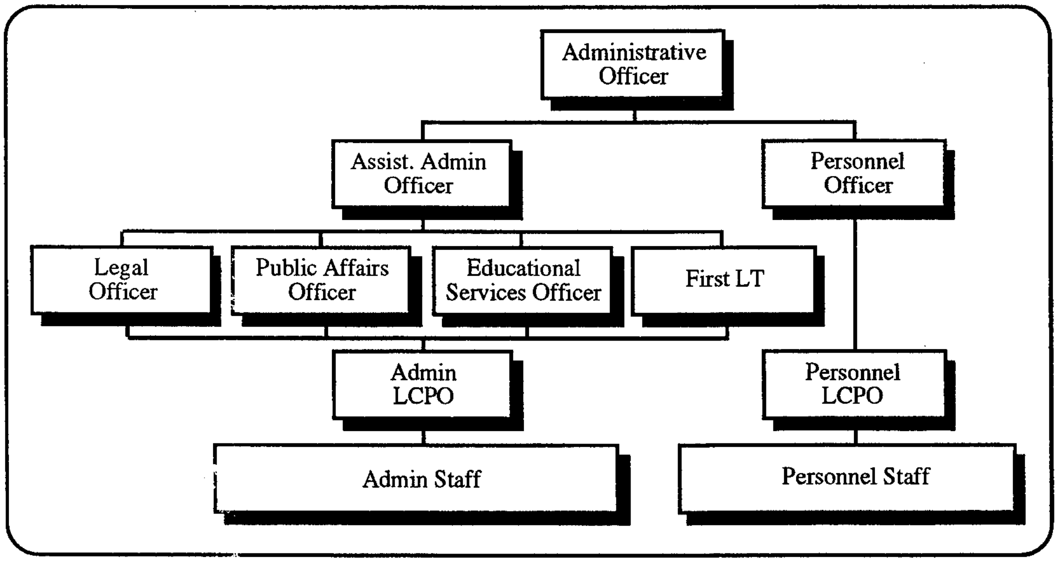


Figure 4. Administrative Department Structure.

3. Structural Analysis

The structure of a naval aviation squadron can be described as a classic divisionalized form, as explained by Henry Mintzberg, with each division operating as a separate machine bureaucracy (Mintzberg, 1981). Mintzberg describes this type of an organization as one where the bulk of the work is done in quasi-autonomous units called divisions. The divisions serve specific market areas and house their own functional units. The divisions are given a certain amount of autonomy but are responsible to the strategic apex for achieving certain measurable results (Bolman & Deal, 1991). Figure 6 diagrams a squadron in divisionalized form using Mintzberg representation.

Mintzberg divides an organization structurally into five sectors; the operating core, middle line, strategic apex, technostructure, and support staff (Mintzberg, 1981).

At the base of the image is the *operating core*, which performs the basic work of the organization (Bolman & Deal, 1991). In the case of a naval squadron, this sector is organized by departments, each structured as its own machine bureaucracy. The departmental structure will be discussed in a later section.

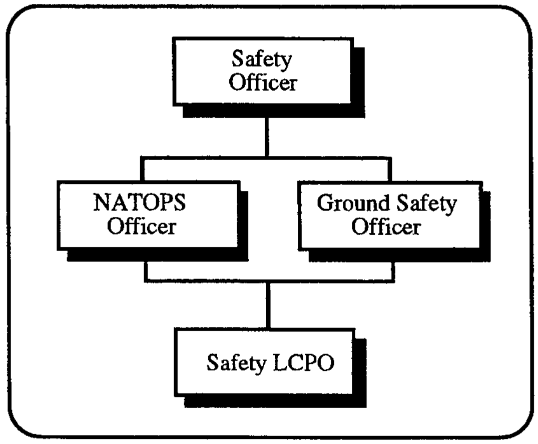


Figure 5. Safety Department Structure.

Directly above the operating core is the *middle line* which is composed of those managers who supervise, control, and provide resources for the operating core (Bolman & Deal, 1991). In the squadron model, these are the department heads. They are empowered by the strategic apex (CO, XO, CMC) to operate autonomously yet are held accountable for specific results.

The *technostructure* of an organization consists mainly of analysts whose role it is to standardize the work of others by inspecting outputs and processes. In the case of the squadron, this function is performed either by groups outside the organization, or it is pushed down to the department level. At the squadron level, this sector is non-existent.

The *support staff* performs tasks that indirectly facilitate the work of the operating core (Bolman & Deal, 1991). In the squadron model, the support staff is represented by the Administrative department because many of the tasks they perform fit the definition given. In reality, Admin can fit into both the support staff and the operating core sectors, since many of their functions are also direct support. It is shown this way for simplicity.

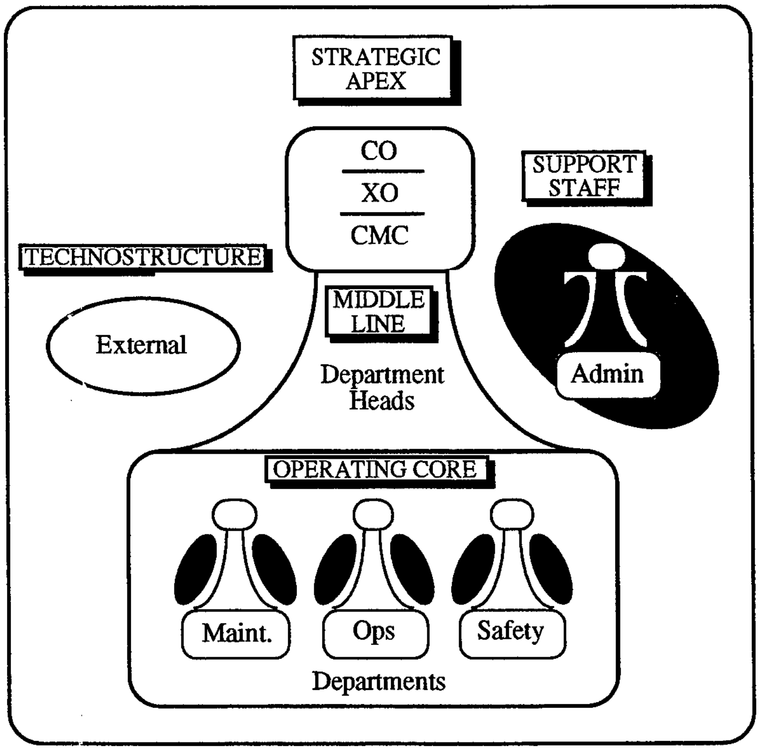


Figure 6. Mintzberg Representation of Squadron Structure.

The fifth sector, the *strategic apex*, consists of the top-level managers who relate primarily to the organization's external environment. They create the organization's goals and provide strategic direction. In the squadron, these individuals are the CO, XO, and CMC.

As mentioned earlier, the departments in a squadron can be described as machine bureaucracies. In a machine bureaucracy, the most important decisions are made at the strategic apex, with the day-to-day operations controlled by managers and standardized procedures. Many layers commonly exist between the apex and the operating layers and the structure has large support staffs and technostructures (Bolman & Deal, 1991).

Because the Maintenance department is the largest and most complex in the squadron, it will be used as the example. Figure7 illustrates how the department fits the machine bureaucracy description.

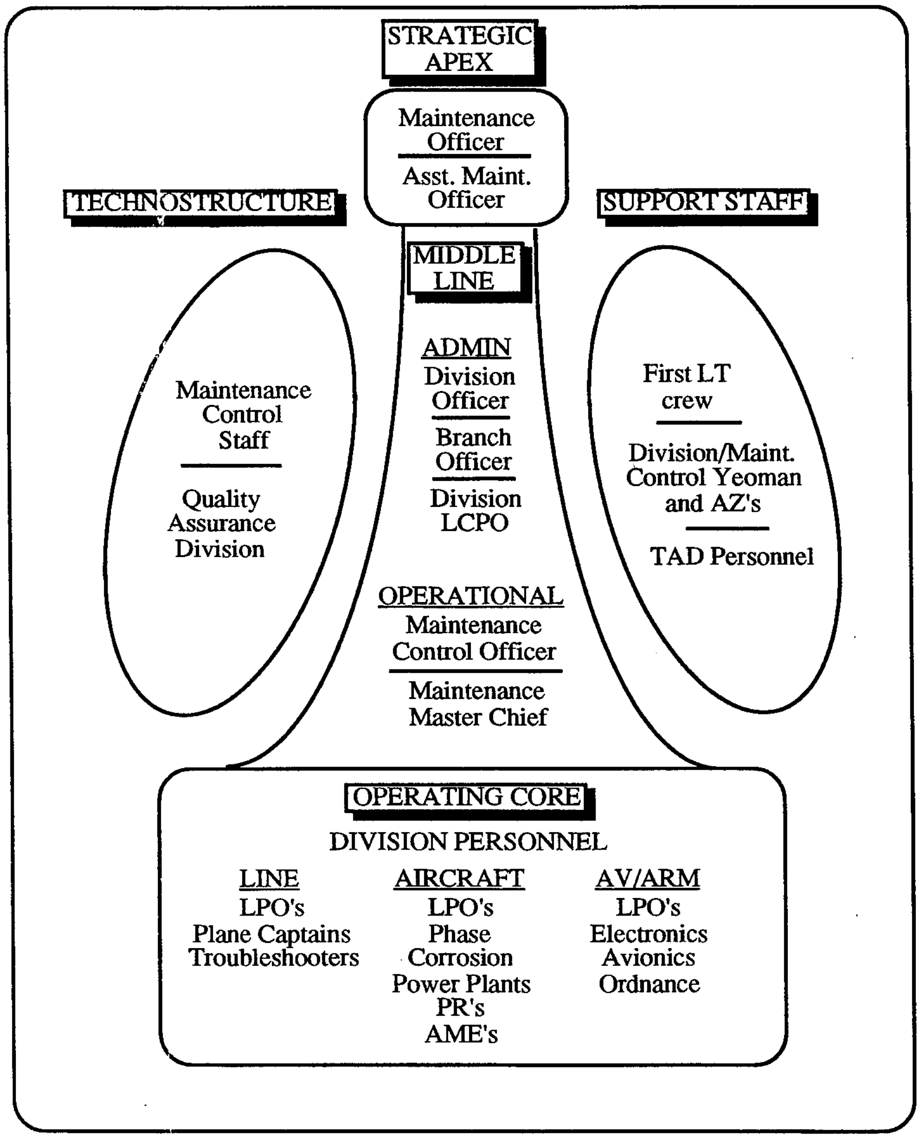


Figure 7. The Maintenance Department as a Machine Bureaucracy.

4. Specialization of Tasks

The task structure of today's naval squadrons can be traced to Adam Smith's principle of "Division of Labor" (Smith, 1776). Smith formulated that complex tasks are broken down into increasingly simpler ones until it becomes easy to train and manage the person performing the task. The result of this "assembly line process" is a large fragmentation of work and job specialization. Middle-level managers and workers have very limited discretion about how to do their jobs and follow a strict set of work guidelines established at the apex.

The structure of the naval aviation squadron is perfectly adapted to take advantage of the division of labor. The jobs performed in the offices and shops are strictly controlled and highly standardized. Squadron personnel are trained in only one area of expertise (ratings) and will remain in that area until senior enough to manage. Several managerial layers exist to help deal with the complex problems generated by the task-based design.

This organizational structure is ideally suited for the planning and control of organizational goals. The idea is that since work is broken down into manageable pieces, it is easily supervised for quality and consistency. One function of a Division Officer (mid-level manager) is to manage the work of the various workcenters under his span of control, and to orchestrate the piecing of it back together again. In this structure, each level in the hierarchy is responsible for cementing all the tasks results together in some usable form. The simpler the tasks become, the more difficult the processes must be surrounding them.

5. Problems with Task-Based Structure

Obvious trade-offs exist in a task-based structure such as ours. Along with the advantages of better organizational control, standardization, and task simplicity, we inherit problems of complexity, inefficiency, redundancy, inflexibility, and lack of innovation. In a organization that is focused on a standardized output in a stable environment, Smith's principles still have applications. In a fluid environment with ever changing outputs, the division of labor is inefficient and outdated. Some of the problems with the naval aviation squadron's structure will now be discussed.

a. Complexity

The processes that occur in a squadron are nothing if they are not complex. Any output from a squadron demands that several tasks be performed, often across departmental borders, for the output to be realized. The individual tasks may be simple and involve little complexity, but the process of achieving the output (combining the individual tasks) will be very complex. Let's consider an example.

Every unit in the United States Navy is responsible for submitting performance evaluations on their enlisted members on a periodic basis. The process is usually initiated by the Personnel Officer for topside evaluations and the Assistant Maintenance Officer for Maintenance evaluations. Admin division Yeoman and Maintenance division Yeoman dig through service records (called screening) to find all the personnel who require an evaluation. Once the list of required evaluations is compiled, a enlisted evaluation "brag" sheet is distributed to all eligible personnel via their branch officers, work center supervisors, and direct supervisors. It is the responsibility of the individual to insure these forms are filled out and returned by the due date; however, it usually the workcenter supervisor that catches heat from above if the task is not accomplished.

When the brag sheets have been returned to either the AMO's or the Personnel office, they are transformed into rough evaluation forms and distributed to the responsible officers for their comments. In the maintenance department, the evaluation roughs go to the appropriate division officer. For topside personnel, the roughs go to the officer designated by the department head as the division officer for the department. The responsible officers send the evaluations down to the respective branch officers, who send the evaluations back to the workcenter supervisors where the forms are checked for accuracy and comments written in the "comments" section.

The rough forms come back up the chain they just went down where each person takes a "cut" at the evaluation and checks the data for completeness and accuracy. Errors are found at each level and comments are changed to reflect standardization across the level of the particular officer. A division officer may receive 10 evaluations from each of his three Branch Officers. Each branch Officer has ranked the 10 people in his/her branch and likely have differing writing styles. The division officer is required to take the three separate inputs and combine them into one standardized ranking and writing style. The evaluations are then passed to the AMO or personnel officer for the same process. In the case of the AMO, he/she receives input from five division officers and must perform the same process on them that the division officers performed when getting the evaluations from the branch officers.

Once this process has run its cycle, the rough evaluations are re-typed into smooth evaluations, redistributed back down the chain (usually only to the division officer level), and checked once again for accuracy and content. Corrections are made and the final evaluations are distributed back to the division officers for debrief and signature.

This process is run at separate times of the year for each enlisted rank and is very similar for officers. The process is usually initiated two months prior to the due date for the evaluations because of the time and coordination required at all levels. The individual tasks required at any particular time any one level are not difficult or particularly time consuming. The entire process of getting an evaluation out the door; though, can be extremely complicated and time consuming.

b. Inefficiency

The inefficiency of task-based work processes is evident from the example shown above. The amount of process "glue" that must be applied to cement the tasks together is extraordinary. A division officer in the above example may handle a single evaluation six to eight times before it out of the division for good. Evaluations are typed and re-typed numerous times. The data required for the evaluation may be physically located in several different areas and is generally looked up and checked manually at each step. Reams of paper, countless man hours, and piles of instructions are involved in each round of evaluations generated.

c. Redundancy

In many cases, redundancy is a desireable attribute for business methods. Computer data back-ups, for example, are protective measures to prevent the loss of important data. Redundancy can, however, contribute negatively to an organization as well. Identical tasks performed in numerous locations throughout an organization lead to problems with standardization, data accuracy, and coordination. In addition, time is wasted by personnel in duplicating the effort of others that could be used more effectively by producing valued work.

Revisiting the evaluation example, the task of checking a members vital data (name, social security number, date of birth, etc.) at each step of the evaluation process is redundant. It occurs because errors are still generated and found at each step. The Yeoman who types the smooth evaluation may hit the wrong key in transferring the members ssn, causing an error late in the process. This example of redundancy causes non-value added work to bog down the entire process. If a method could be created to let the computer generate the forms from a central database, the redundancy in the current process could be eliminated completely.

d. Inflexibility

Because task-based jobs are designed to be simple, the processes required to unite them and produce outputs are very complex.. Since managers in task-based organizations are responsible for the orchestration of tasks to produce a result, they are likely to demand rigidity in as much of the process as they can control. The more flexibility they allow in the process, the more complicated their already complex jobs become. As a result, processes with task-based structure tend to have reams of instructions associated with them. In naval aviation, it is very common to have a set of instructions governing a process generated at each level in the chain of command. These instructions tend to be more specific with each level travelled down the chain.

Because external controls encourage bureaucratization and centralization, the machine bureaucracy is often assumed by organizations that are tightly controlled from the outside. That is why government agencies, which are subject to many such controls, tend to be driven toward this structure regardless of their other conditions. (Mintzberg, 1981)

In the case of evaluations, instructions for their completion are generated from the bureau of Naval Personnel in Washinton, D.C. As they trravel down the chain of command, each level adds more specifics on how evaluations should be completed. At the command level, the CO will generate evaluation guidelines to be used as standardization for the entire squadron while the Administrative Officer and Assistannt Maintenance Officer publish even more specific guidelines in order to control their domains. Under the current system, this specificity is required because, without it, the evaluations generated would be completely non-standardized.

e. Lack of Innovation

An organization is a system, with a logic of its own, and all the weight of tradition and inertia. The deck is stacked in favor of the tried and proven way of doing things and against the taking of risks and striking out in new directions (Rockefeller, 1973).

Task-based organizations are well suited to achieving one specific purpose, not adapting to new ones. Workers in such organizations may see the need for changing the way their job is performed and may even pass the idea up, but in most cases that is the last they will hear of it. Managers in these situations may see the lofty vertical hierarchy and give up, or consider themselves too busy with their current workload to futily attempt to change a task or process. Be it a worker or a manager, task-based organizations tend to promote the building of ruts. The structure of the system wasn't designed to support innovation and change. When change is attempted, the resistance encountered can be similar to driving into a brick wall.

This point can be illustrated using a reletively minor change instituted by the CO of a Fleet Replacement Squadron in 1993. The CO directed the Phaseheads of the Visual Weapons (Visweps) training phase to construct a new flight syllabus for the stage to take advantage of the improved computer generated attack capabilities of the aircraft. The directed changes consisted of eliminating several student manual bombing flights (no computer aided releases) and replacing them with system bombing hops (computer aided releases). The CO felt that the increased emphasis on system deliveries was in keeping with the fleet requirements.

With the backing of the CO, the phaseheads were in charge of designing and implimenting the new syllabus. Because of "normal" workload at the time, the phaseheads had to design the new syllabus during "off" time. It took over a month to complete the details and sell the program to the CO. Among the changes was a redesignation of the Phase from Visweps to Weapons/Tactics. The new syllabus was christened on the next detachment and was received with an extraordinary amount of resistance from the instructors. The resulting friction resulted in bickering among the staff and poor performance among the students. The aircraft were not maintained in a state necessary to support the system deliveries and resultant incomplete flights further complicated the situation.

The bottom line is that in 1995, problems still exist in the same areas as were initially discovered and people still call the phase "Visweps". Even though the change was directed and supported from above and, in the author's view, was a sound idea, little has changed from prior to the change. Progress is being made but at a snails pace. Lastly, the phaseheads responsible for instituting the change underwent an extremely stressful month and their primary job performance suffered due to the added workload.

6. Squadron Personnel

The nature of the work force has changed significantly since the inception of the squadron organization. Workers (sailors) today are better educated, more highly skilled, and better motivated than in the past. No longer do all of the decisions have to be made at the top of the hierarchy. Decision making can be pushed down the chain to better informed, more capable managers and technicians. Today's sailors expect, and even demand, to make more of a contribution to the ultimate performance of the squadron.

In the past, the focus on personnel has been to train them, rather than to educate them about the processes that they are working in. Training has always been the number one issue in personnel management, and has historically been the number one indicator of a squadrons ability to perform. Training is a very important aspect in ones' ability to perform his/her job, and cannot be overlooked. A jet engine mechanic has to know how to repair an engine if he/she is to perform his/her job, however, educating him/her in the overall repair process, and how their job fits into the grand scheme is becoming increasingly important. With the knowledge of the overall process, the sailor will be better able to contribute to the improvement of the entire repair process, which can in turn lead to better squadron performance, not to mention a satisfied sailor.

With today's better educated sailors, educating and coaching them is taking on more significance. Managers, i.e. division officers and division chief petty officers, will have more of a responsibility to educate and coach, along with the more traditional task of providing specialty training.

7. Squadron Culture

The vertical structures in the divisionalized hierarchy of the squadrons are built on very narrow pieces of a process, with each department performing many of the same pieces of the same process. The people actually performing the task are looking inward to their department to complete the task, ignorant to what the rest of the organization is doing regarding the same task. Each division officer and department head is also looking inward to his/her division or department to complete the task, in order to pass it on to the next level in the chain of command. No one is in charge of the process, but everyone is working on pieces of it. What results are the consequences of the division of labor and the fragmentation of processes; inaccurate, error prone reports, redundancy of data, and products of low quality.

The divisionalized structure of a squadron promotes many cultural norms. The department heads are very parochial and are often unconcerned of how their actions/suggestions effect the other departments. This attitude permeates the ranks and often results in inter-departmental disputes. The classic departmental head-butting example is between maintenance and operations. A naturally dipolar relationship exists between these two departments. Maintenance's job is to supply the aircraft for the flight schedule generated by operations, and operations must insure that it plans for a realistic schedule. If maintenance has a hard day and can't fill the flight schedule, it makes operations look bad. If operations writes a overly ambitious flight schedule, it makes maintenance look bad. This adversarial relationship between departments is common and solidly ingrained in naval aviation squadrons.

Information is a valuable quantity in a squadron because it is held closely to the chest. Department head meetings are held behind closed doors and the information is disseminated as if it were money. The "I've got a secret game" is played often and well. Very often, important information is withheld or given late to those who require it. With the fast paced and stressful operational tempo, often people just forget to pass information. In a squadron, information is power and those who posses it are unwilling to part with it unecessarily.

Another common adversarial relationship that exists is between the junior officers (JO's) and the department heads. JO's commonly refer to the department heads as "hinge-heads" or "lick-doctors" because of the perception that they are yes men for the CO and XO. It is widely thought by many JO's that the department heads are doing anything that is required to receive a good fitness report, regardless of the consequences to those below. Overzealous commitments and impossible deadlines are made resulting in unecessarily overworking the troops - sometimes on weekends. This adversarial relationship also exists between the workcenter supervisors and their workers.

Another cultural issue worth mentioning is the stigma associated with squadron effectiveness. Squadrons are judged and compared with other squadrons three ways; two official and one unofficial. The two official methods (short of war) are through competitions and inspections. Competitions allow the squadron the opportunity to show case it's ability. The competitions allow the aircrew to simulate various missions that would be employed during an actual war time scenario. The entire squadron takes great pride in being able to make sure that all of the squadrons resources are available for the competition, as they would be during a war, and performance is a total team effort. The competitions are a time for the entire squadron to demonstrate what it has accomplished during it's training.

The inspection process, though somewhat less glamorous, is as important to a squadron as the competitions that it participates in. The inspection process is one of the major ways that a squadron can demonstrate that it is working towards and obtaining it's goals. Inspections can be performed in-house, for instance, by the maintenance departments QA division, or by a command outside the squadron. Either way, the inspections are scheduled, and what is to be inspected is known well in advance. The inspectors will use a checklist to rate every aspect of a squadrons function; for example, is the proper training being held at the required time, or are all of the work center personnels' training jackets up-to-date? The task-based work structure lends itself perfectly to this type of evaluation system since the people performing the inspections can easily review the well defined tasks and the documentation pertaining to them. The results of an inspection are then used to rate how well a squadron is performing. Unfortunately, a lot of gamesmanship is used in preparing for inspections which leads to an artificial picture of reality.

Preparing for these inspections, whether it be an inspection on a particular work center, or a command wide inspection, is a large management function. Management concentrates on making sure that their little pieces of the process are performed in order to meet the inspection requirements, rather than to ensure that the entire process is completed properly. Preparing for the next inspection is as important, if not more so, than making sure that what is completed should even be done at all, let alone whether or not it will help the squadron attain it's goals. In the absence of a better method, squadrons are evaluated on how well they perform on inspections rather than on how well they are completing their missions and goals, and satisfying the customer.

The third, and very unofficial method of squadron evaluation is informal attitudes and gossip about how squadrons are performing. Because of the close proximity and similar missions of the squadrons, the communities are very tight. It seems like everyone knows what the other squadrons are up to and everyone is quick to criticize or praise them. It would be similar to locating IBM, Apple, and Sun on the same block. Although no formal means of evaluation is presented in this situation, the grapevine has a definite effect on how squadrons are perceived on the base and within the community.

8. Level of Information Technology

The current state of information technology in the typical naval aviation squadron is primitive, and has been described by some as being in the "stone age". Other than a few of the training squadrons, which are just now beginning to develop an information infrastructure, there are no squadrons connected to an integrated local area network, either inside or outside of the squadron. A squadron will have a number of computers, however, they are isolated from one another and used for the most basic of tasks, such as word processing and limited database uses, or to run organically developed applications.

Several specialized information systems are currently making their way into aviation commands. One such system used exclusively by the squadron maintenance department is the Naval Aviation Logistic Command Information System (NALCOMIS), which used to track the status of requisitioned items, by squadron, from the supply system. It also provides the squadron maintenance departments with statistics concerning various maintenance actions, aircraft and component maintenance history, and aircraft flight summary information. This system has been in the developmental stage since the early 1980's and is scheduled to be used well into the next century.

This system, however, is not for general use. The information contained in the database that may be of importance to the operations or safety departments is not easily accessible to the people who need it. For example, the flight summary information has to be entered into two different information systems, NALCOMIS and the one in operations. This situation illustrates the problem of duplication of effort. The pilot has to enter the same flight summary information into two separate information systems. This raises problems of duplication of effort and inconsistency of data/multiple storage locations. These problems will be discussed below.

a. Information Hoarding

Information is a very important commodity within the squadron and without the ability to share the information, the squadron would not be able to complete it's mission. But rather than having a local area network to connect the various departments within a squadron, there exists an archaic method of using status boards, phone calls, memos, and paper driven requests. Information that could be used by all departments, may reside with only one of the departments, with very limited access to it. This phenomenon results from the parochial machine bureaucracy nature of the departmental structure. Countless hours of wasted time is spent tracking down information in other departments that has the ability to be shared conveniently. Information within a squadron, or any organization, should be captured once at its source and shared (Sprague & McNurlin, 1993).

b. Independent Application Development

Since the information technology infrastructure is not available/nonexistent in the squadron, computer literate members take it upon themselves to develop applications to automate their tasks. This type of haphazard software development is an immediate solution to the problem at hand, but can lead to a number of problems unforeseen by the developer. The biggest problem is the testing and validation of the program's output (or lack of). Without proper testing and validation of the developed application, the information produced will always be suspect as to accuracy and validity. Another major concern is the maintenance and documentation of the application once the original programmer has left the squadron. Many times when the original user leaves, the program is never used again. Finally, none of the software developed in-house is likely to be compatible with any other software that was developed in-house. Chances are there will be numerous programs that can share the same data, but will never be able to do so because the software is incompatible.

c. Lack of Information Technology Management and Training

The squadrons lack any kind of information technology plan. The computers are provided by people outside of the squadron, but no plan exists to train the users or provide any guidance on how to use the equipment effectively. The absence of information technology specialists leaves the squadrons up to their own devices on how to best use the computing resources that they have. This generally falls on the shoulders of the individual who makes it known (through words and action) that he/she is an expert.

The computers that the squadrons possess are isolated units used to perform departmental specific tasks. Users have very little opportunity to receive formal training on the software that is installed. In many instances, the software being used is brought in by someone from home. The programs that are organically developed are attempts to automate specific processes, but in reality what is really being automated are the existing tasks. A very minimal improvement has been made by these computers in the functioning of the squadron.

The lack of an IT professional in the squadron is a real problem and needs to be addressed if squadrons want to obtain the equipment, expertise, and ability to become more efficient in their work processes. The way that squadrons are currently structured, *each department* would have to have a dedicated information specialist assigned to coordinate and standardize just their own systems. To attempt this feat across departmental borders would likely start a mutiny. It is unlikely that a squadron could afford the personnel resources to accomplish this anyway. However, IT resources need to be managed, and their use and direction need to be planned for at the strategic level.

d. External Driver Specialization

The final structural problem that will be addressed is that of technology sponsors within DOD but outside the sphere of organizational influence. In aviation, these sponsors include NAVAIR and NAMO. These large organizations claim to know and understand what is best for the squadrons but really understand only what is best for their respective piece of the pie. They develop systems specific to certain departments within the squadron but fail to address compatibility issues between departments. NALCOMIS is a perfect example of this phenomenon. Many of the functions NALCOMIS provides to the maintenance department can also be beneficial to operations and safety. No method exists; however, to share the data so it is duplicated twice over, adding to the redundancy and inaccuracy of the process.

B. ANALYSIS OF IDEF MODELS

1. Purpose of the Models

The purpose of the Onorati/Robillard model (Appendix B) and the Naval Aviation Maintenance Office (NAMO) organizational modeling team model (Appendix C) is to model the processes of a naval aviation squadron as they apply to information flow. Although squadrons are dynamic organizations, the information processes are so rigidly controlled and standardized that they undergo little change over time, even in differing environments. In other words, the environment will change but the processes remain the same.

The models are designed to work together to give a picture of the complexity with which a squadron must operate. The NAMO model depicts the maintenance department of a squadron in great detail. Its context (highest) level represents the process of performing maintenance functions for the squadron and all that entails. The O/R model incorporates the NAMO model as its maintenance departmental view and takes the context level up one by representing the process of operating the squadron as a whole. Figure 8 illustrates how the O/R and NAMO models combine to form the whole picture of squadron operations.

The documentation and explanation for understanding the model are incorporated into Appendix A. It is not our intention to explain the models and their intricacies in the body of this thesis; rather, our intention is to draw conclusions from the models as they relate to the organization and processes present in a squadron.

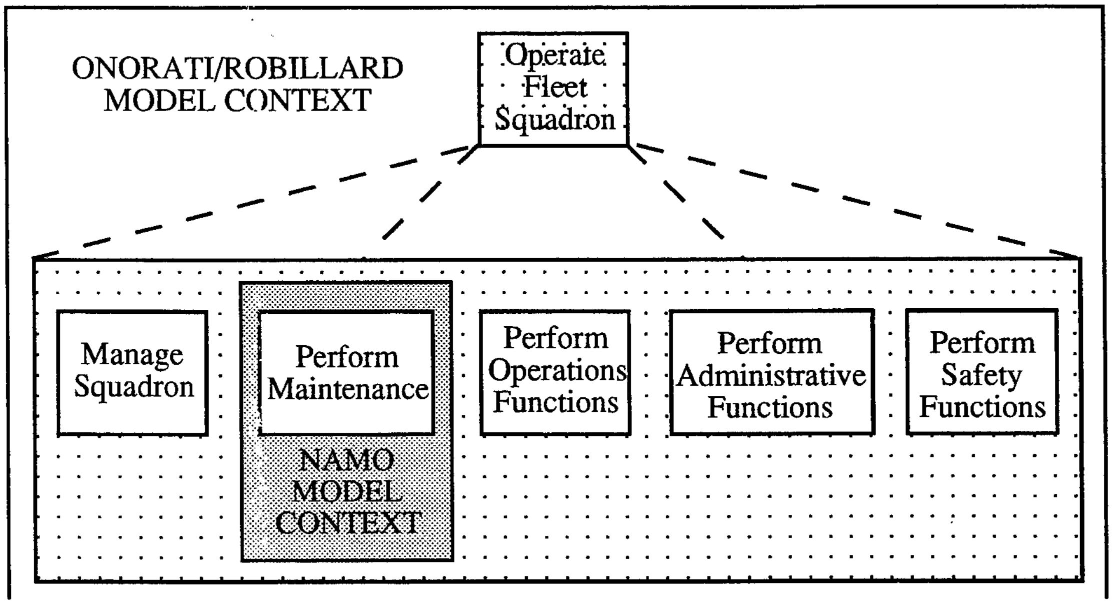


Figure 8. Onorati/Robillard and NAMO Model Context.

2. IDEF Model Analysis

a. Overview

The O/R model (Figure 9) breaks the squadron processes into four divisional processes (nodes A2-A5) and one manage process (node A1). This process model illustrates the idea of a divisionalized organizational form with departmental machine bureaucracies, as the processes fall within structural boundaries. With minor exceptions, the same controls and mechanisms are used by each of the divisional processes. Only two of the seven primary squadron process outputs relate directly to the squadron mission, with the remainder being by-products of the way business is conducted. It is evident from the model that many of the processes performed within the divisions are the same; again, showing the parochialism and poor efficiency present in the current structure.

Node Tree for Onorati/Robillard Project

[A0] OPERATE FLEET SQUADRON

- [A1] Manage Squadron
  - [A11] Assign Responsibility
  - [A12] Approve/ Dissaprove Action
  - [A13] Administer Policy/ Dicipline
  - [A14] Evaluate Performance
- [A2] Perform Maintenance
- [A3] Perform Operatons Functions
  - [A31] Manage Operations
  - [A32] Perform Tactical Training
  - [A33] Schedule Operations
  - [A34] Maintain Operational Records
  - [A35] Perform Aircrew Support Functions
- [A4] Perform Admin Functions
  - [A41] Manage Admin
  - [A42] Perform Personnel Support
  - [A43] Perform Admin Support
  - [A44] Perform Executive Support
- [A5] Perform Safety Functions
  - [A51] Conduct Safety/Natops Training
  - [A52] Maintain Safety/Natops Records
  - [A53] Uphold Safety Policy
  - [A54] Manage Safety

Figure 9. O/R Model Process Node Tree.

b. Squadron Information Flow

Information flow in our task-based organization is hampered by several factors. First, choke points exist in the system which serve to slow down the flow. Second, information flow is vertical rather than horizontal which results in duplication and standardization problems. Duplication of effort can lead to the promotion of data inconsistencies and errors. Finally, information kept by separate sources which needs to be reconciled leads to an inordinate amount of wasted time and effort.

Several choke points exist within the squadron which serve to slow the flow of information. At the squadron level, the process "Manage Squadron" represents the strategic apex and the processes they perform. They assign departmental action to the departments and receive feedback/products back from all the departments in the form of departmental reports. They act, in effect, as a filter for information entering and leaving the squadron. Internally generated information like flight schedules, instructions, and point papers are also scrutinized and subject to approval. The in and out boxes for the CO and XO are perhaps the busiest locations in the squadron.

The reason for the information glut at the "manage squadron" process results from the need to orchestrate the processes required to cement the departmental tasks together. It is the nature of the process required to combine and standardize the outputs of several machine bureaucracies. The same information choke points can be found in the four "manage department" processes for the same reasons. The difference is that the strategic apex of the department is concerned only with filtering the information in and out of their individual department rather than on a squadron level. The same phenomenon will be found at the division, branch, and workcenter levels. The bottom line is that the process responsible for the generation of an output is not the process that generates the output. Multiple levels of management exist that act as the output filters for the responsible processes. This adds complexity, inefficiency, and contributes to organizational bureaucratic paralysis.

The lack of information flow between the departments is also important to consider. It is not our intention to promote the notion that no communication exists between the departments, because that is not the case. Our model shows that no *formal* method of communication exists. What information is passed across departmental boundaries depends heavily on the personalities of the individuals involved and the leadership philosophy. Again, this can be carried down to the division, branch, and workcenter level. Formal lines of communication within a squadron are vertically oriented rather than horizontal.

The vertical communication flow results in massive duplication and standardization problems. Each department/division/branch/workcenter may have its own methods and standards for producing the same information. If the information stays within the particular center, the only problem that results is inefficiency due to duplication of effort. An example would be personnel data kept by the division officer and by the personnel office. Since personnel maintains the service records of all enlisted personnel, all personal data (full name address, date of rank, rate, wife's name, etc.) will be on file in personnel. It is also a requirement that a division officer keep personal information on all personnel in his/her division. This information will mirror much of the data kept in personnel. The information on a particular member is now available in two separate locations. When information is updated in personnel, it is not necessarily updated by the division officer and vice versa. Not only unecessary effort expended in duplicating the data but errors are likely to occur as time progresses.

A second problem emerges when the data is required to cross divisional boundaries. With data being kept in separate centers, combining it can be a complex and frustrating process. A classic example of this is flight time statistics. At the end of each month, the squadron must report its flight time and other statistics to superiors. For the sake of redundancy, these statistics are maintained by both maintenance and operations. Maintenance draws its numbers from the data entered by the pilots into the NALCOMIS system. Operations draws its numbers from the data given verbally by the pilots to the duty officer and logged on the smooth flight schedule. At the end of the month, operations and maintenance compare their numbers and, inevitably, they never match. Hours of effort by staff are then required to locate the discrepancies and reconcile the two sources.

c. Process Structure

The models illustrate the inefficiencies that exist with the squadron process structure. Many of the same processes are performed in numerous locations in the squadron, the most notable being the record maintenance functions. Processes exist in each department for the keeping of records specific to the tasks performed. Administration, Personnel, Maintenance Admin, and Operations Admin all perform identical tasks for their particular departments or divisions. This duplication of effort results in inefficiency and difficulty in integrating information systems thinking across departmental boundaries.

As previously mentioned, each department/division/branch/workcenter has its own management process. All management processes are essentially the same with the main responsibilities of filtering information, formulating policy (standardization), and orchestrating processes from the level directly below. Markedly absent in the job performance of many managers is leadership. The mid to top line managers are so saturated with task generated minutia that it is difficult for them to concentrate on providing the career training and direction to subordinates that they are tasked with providing. The current system breeds competent managers capable of mastering crisis management, but who lack in leadership qualities.

C. SYNOPSIS

This chapter has provided the background on the current structure, culture, information infrastructure, and processes found in a typical naval aviation squadron. The task-based - divisionalized structure which has been successful in the past has many shortcomings which prevent the squadron from utilizing information efficiently. The culture is resistant to change and set in its traditional ways. The information infrastructure is outdated and fragmented. The processes are duplicated and the outputs redundant. It is the central premise of this thesis that these factors will prevent the traditional military organization from the ability to form a integrated information system. In order for naval squadrons to remain competitive in the future, the traditional structure and task-based philosophy must be reengineered to revolve around the process. Only then can the organization take advantage of technology to become more efficient, productive, and competitive.

IV. THE REENGINEERED SQUADRON

This chapter reveals solutions to the problems we have outlined in the previous sections. Our framework for reengineering is presented and used to arrive at a squadron design we feel is more suitable to the "customer-oriented" unit necessary for future success and survival. Our effort focuses on the shifting of work from the current structure based job design to a process based design, eliminating checks and controls that do not contribute to the effectiveness of the organization, reducing the specialization of squadron personnel, and integrating information technology into the squadron infrastructure.

A. METHODOLOGY

The five-step framework we developed and used as a guide for our reengineering effort is outlined below. The progression used in the layout of this chapter follows this guideline.

1. **Define customer and key stakeholders.**
2. **Identify desired squadron outputs.**
3. **Identify areas of dissatisfaction with current processes.**
4. **Identify/create processes to improve areas of dissatisfaction.**
5. **Identify information technology required for reengineering.**

B. CUSTOMER AND STAKEHOLDER DEFINITION

The logical first step in our redesign is to define the squadron's customers and key stakeholders so that new processes can be designed to best satisfy them. This step is important because the purpose of the reengineering effort focuses on customer and stakeholder satisfaction. It is critical, therefore, to accurately define the individuals and groups most affected by squadron operations.

1. The Customer

Since the squadron is a military organization dependant on Congressional appropriations, defining the customer(s) is not as cut and dry as if a squadron were a civilian business with a specific target market. The determination of the customer for our organization must follow a different set of criteria entirely. For the purposes of this thesis, the customer is defined as any person or body of people who have direct input to squadron tasking and use the services in some manner to forward their particular cause. In essence, the squadron is hired by the customer to perform a service for him/her.

Because the squadron is nested in a military hierarchy, the squadron customer will likely be a more senior entity in the chain of command. Depending on the situation, the customer could be as close as the Air Wing Commander (CAG) or as high up as the President himself. Generally, while ashore, the customer will alternate between the CAG and the shore based type commander (e.g. COMMATVAQWINGPAC, COMFITPAC).

While deployed, the squadrons are tasked for missions by the Battle Group Commander through his composite warfare commanders. For example, Alpha Sierra (the surface warfare composite commander) "contracts" with the aircraft carrier for aircraft support to perform surface search contact (SSC) missions so that the surface picture surrounding the battle group can be built. Without the constant aid of aircraft identification of surface contacts, Alpha Sierra's job would be much more difficult. In this case, Alpha Sierra is the direct customer of a squadron's services. If the aircraft perform their mission correctly, Alpha Sierra is happy and will continue to use the squadron asset. If incorrect identifications are made or aircraft are unavailable for SSC on a routine basis, Alpha Sierra will seek alternate methods of getting the desired service.

The bottom line is that squadrons, like all military organizations, exist to perform services for people up the chain of command. It is important to establish that the faces will change depending on the environment but the need to satisfy these customers remains constant. In the business of national defense, the customer hierarchy demands satisfaction because other peoples' lives depend on it.

2. The Stakeholders

In his book *Strategic Management: A Stakeholder Approach* (1984), Ed Freeman defines a stakeholder as "any group or individual who can affect or is affected by the achievement of an organization's purpose". Freeman argues that the key to success in any business organization is the satisfaction of its key stakeholders. (Roberts & King, 1989)

It was concluded that three key stakeholders exist for a naval aviation squadron; the American public, other U.S. Forces and units, and the squadron personnel themselves. All benefit in some manner from the day to day operations of a squadron and all will suffer if the squadron fails to perform satisfactorily. Conversely, the squadron itself is placed in jeopardy should it fail to satisfy any one of these groups. Each group will be discussed in detail below.

a. The American Public

In order to explain why the American public are stakeholders, the reason the military exists must be understood. America uses military power to defend against the most extreme threats to national security as determined by the elected leadership of the country. These fundamental security policies, as defined by the Heritage Foundation, are:

- Protect and defend the territorial integrity of the United States of America.
- Preserve and defend the liberty, democracy, and economic system of the United States from foreign threats.
- Promote the long-term material prosperity of the American people. (Holmes, 1994)

These basic ideals demand the establishment and maintenance of a strong military to uphold them. Because the national security policy is set by elected officials, and the officials are elected to carry out public sentiment, by definition, national security policy represents a majority view of public sentiment. Because the military, and more specifically a naval air squadron, is a tool to enforce national security policy, it directly serves the interests of the public.

A strong military has become a service most Americans would not consider forfeiting. In order for the public to feel secure about national security, it needs to be confident that the military is able to handle a crisis should one arise. This is the reason Americans pay taxes and that such a large percentage of the national budget goes to the Department of Defense. It is also apparent that the inner workings of the military are of interest to the general public. Recent issues like Tailhook, women in combat, and gays in the military have captured headlines across the country and raised emotional debates nationwide. The ease of the availability of information has also contributed to feeding these debates.

The popularity of information technology has, in effect, served to lessen the gap between public policy and public opinion on the policy. The government is constantly under the microscope and the public able to respond instantaneously when dissatisfied. The proliferation of the home personal computer and the popularity of the internet have allowed a new and virtually instant method of communication via electronic mail. Feedback from policy announced on the evening news can be forwarded directly to a person's Senator or Congressman without delay. The President even has an electronic mail address for public feedback. The popularity of network news magazine shows and their option for electronic feedback gives the public another outlet for expressing opinion on current affairs. Cable television networks also serve to increase public policy awareness with programming like Cspan and CNN.

Many of the problems the military is experiencing in the public eye can be directly attributed to this boom of information technology. Incidents that would have once been confined to local coverage have gained nationwide exposure as various media organizations discover and promote them. It has become much more important than in the past for every member of the military to perform his/her job in a professional and efficient manner and for every organization to do its job as the public thinks it should, for the country is watching closely.

If Naval Aviation is to survive in today's climate, it must appeal to the American public for support. The current environment of defense cutbacks and downsizing won't allow weak or publicly inept organizations to survive. The public has indirect control of the purse strings and will yell loudly when upset. As with any business organization, the stakeholder must feel as if he/she is getting his/her money's worth or another alternative will be found. In the case of Naval Aviation, the alternatives are the Air Force with its strategic bomber force and the Navy's cruise missiles. The mission and value of the aircraft carrier and its squadrons must be justified in the public eye or a branch of the service who has justified their mission may assume the role.

b. Other U.S. Forces and Units

When a squadron is called upon to perform its primary mission, it is the enemy who is on the receiving end of the squadrons "product". If a squadron performs its assigned tasks correctly, the enemy loses a portion of its combat effectiveness. If a squadron fails to complete its mission, the enemy gains the upper hand, whether it be continued capability of a missed target or the loss of an American aircraft. In either case the other forces and units involved in the conflict are directly affected by the squadron's performance.

Our point is best illustrated by an example.

- Scenario one - Success:

As part of a coordinated air-strike against an enemy, several aircraft are assigned the task of rendering inoperable a surface-to-air missile (SAM) site. The site is part of the enemy's air defense system and must be eliminated so that air superiority can be achieved. Your assigned task as part of the strike is to destroy the control van for the SAM missiles. Because subsequent air strikes have been planned for the area, it is imperative that the site be destroyed.

You are successful in your mission and completely destroy the target with a couple of laser guided bombs. It is confirmed that the missile control van has been destroyed because you got the entire evolution on video tape. The subsequent missions can now be executed with a high assurance that the SAM threat from that particular site has been eliminated - a big boost in the goal of air superiority. The customer in this case, the warfare commander (Alpha Papa [CAG]) is satisfied that the service has been provided, and the stakeholder (the other strike squadrons) are satisfied that the SAM site is no longer a threat to their strike groups.

- Scenario two - Partial success:

As in scenario one, you destroy the target, but your video tape recorder malfunctions and you do not get confirmation of the hits. In this case another airwing asset must be dedicated to capturing the damage on film. This involves the extra cost of launching a dedicated photo recce mission and placing another aircraft and aircrew at risk. The subsequent strikes must also plan as if the SAM site is still operational until confirmation can be gained, adding complexity and increased effort to their strikes. In this case, CAG will be partially satisfied because he will not lose any of his assets to the site but not completely satisfied. The other strike squadrons will also suffer from the added inefficiency dealt to the strike planning effort.

- Scenario three - mission failure:

In this scenario, the bombs fail to come off your aircraft and the target remains fully operational. On your egress, you are hit by a SAM from the site and your aircraft is destroyed. You eject over enemy territory and become a prisoner of war (POW). In this case, another dedicated strike must be launched to neutralize the SAM site. A search and rescue (SAR) effort must be planned and executed to locate and pick you up (if possible). The training and effort it has taken to prepare you for combat must now be expended on another aircrew to replace you. An aircraft has been destroyed and must be replaced. Diplomatic and public relations efforts must be expended to counter your POW status and counter the negative propaganda. The stakeholders are worse off than before the strike and the customer is left completely dissatisfied.

The point of this example is to show that when a squadron aircraft/aircrew does not perform as planned, the cost of the war effort to other units and involved parties increases exponentially with each scenario. In scenario one, the squadron has performed its task as planned and no additional expense or effort is required. Scenario two shows that even a minor malfunction in a key piece of equipment can lead to a great increase in risk, money, and effort, even though the primary goal was achieved. The third scenario shows how an equipment malfunction can negatively impact the effectiveness of the other air-wing and national assets.

When a squadron performs its mission as planned, the enemy suffers and the overall war effort is simplified. When a squadron makes mistakes, the squadron suffers aircraft/aircrew losses, a decrease in moral and effectiveness, an increase in expense, and a loss of confidence in the eyes of the stakeholders. Going back to our squadron stakeholder definition, the other U.S. Forces and units benefit from proper squadron performance because their overall combat effectiveness is increased, and the squadron is placed in jeopardy if it does not perform adequately.

c. Squadron Personnel

The third set of key squadron stakeholders are the personnel assigned to the squadron. In order for a squadron to achieve acceptable states of readiness and response, the squadron personnel must be well trained and motivated to do their best job. Pilots must have the knowledge and experience necessary to correctly put their ordnance on target and make it back to the carrier. Maintenance personnel must be able to correctly diagnose and repair aircraft VTR and ordnance release systems so that problems like those described in the above scenarios do not occur. Administrative personnel must adequately receive, disseminate, and reply to the large quantities of information a squadron receives on a daily basis. More importantly, the squadron personnel must have the internal motivation and drive necessary to do their jobs correctly and the communication means required for the squadron to function as a team. These qualities allow the squadron to achieve the high levels of readiness and response required to satisfy their customers.

C. DESIRED SQUADRON OUTPUTS

The key to the successful reengineering of squadron processes is to identify outputs which will best satisfy the customers and stakeholders, then focus on the processes which maximize their satisfaction. Figure 10 illustrates the squadron outputs necessary to satisfy the key stakeholders and customers.

1. Four Key Squadron Outputs

Processes internal to the squadron needed to meet taxpayer, U.S. Force, and squadron personnel expectations must be focused toward achieving high levels of *readiness*, *performance*, and *internal satisfaction* respectively. In addition, the squadron must implement processes necessary to *respond* adequately to customer requests. It is our contention that three of these outputs; readiness, internal satisfaction, and response, are actually intermediate outputs. These are the outputs the squadron reengineering effort must focus on in order to achieve success. The fourth output, performance, is actually derived from the other three outputs and is not directly controllable through process reengineering. If high levels of readiness, internal satisfaction, and response can be achieved through reengineering, high levels of performance will follow naturally.,

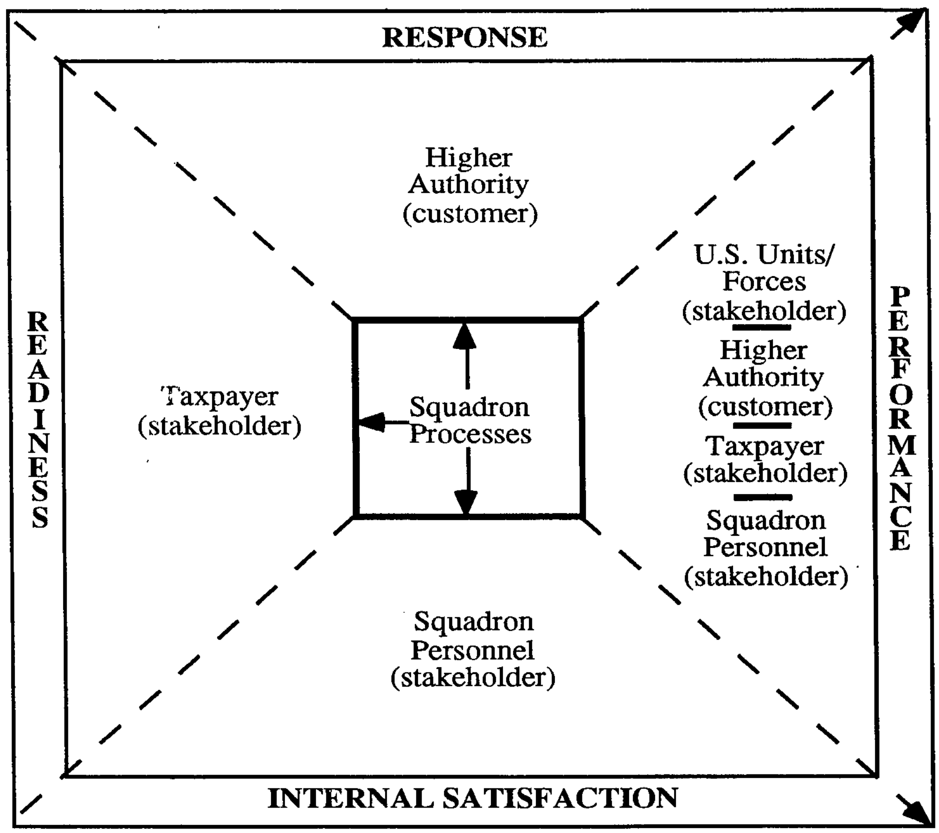


Figure 10. Customer/Stakeholder Output Diagram.

a. Readiness

Readiness is a term used by military organizations to connote a certain level of preparedness to perform a mission. Most often, the term refers to measurable quantities of assets within an organization. Examples of readiness output factors for a squadron include manning levels, number and status of aircraft assigned, parts inventory, and even the dental status of assigned personnel. A unit in a high state of readiness is thought to be better prepared for combat than a unit in a lower state because it has the assets in a state determined necessary for success. One output goal of commanders is to maintain their unit in the highest possible state of readiness throughout the operating cycle.

Readiness figures provide comparative indications of how well a unit is prepared to perform its mission. The numbers are (or should be) an indication of how well a unit stacks up against similar units. In addition, readiness levels can serve as vessels with which to increase public awareness. Units that consistently maintain high readiness levels promote public confidence and will likely remain funded, as long as the public is made aware. Units who struggle with readiness will highlight themselves unfavorably and may jeopardize their existence. The public needs to know that they are getting what they think they are paying for, which is a sound national defense. Readiness figures provide a simple barometer for this purpose.

b. Internal Satisfaction

This output stems from the belief that people are an organization's most precious asset. In order for a unit to function effectively, the people who perform the work must have their basic needs satisfied. A good fit between an individual and an organization benefits both parties: the worker finds meaningful and satisfying work, and the organization gets the human talent and energy that it requires (Bolman & Deal, 1991). If a worker believes that the organization is supporting him/her, he/she will generally support the organization. The output of "internal satisfaction" is the result of the squadron's attempt at providing the services and support required to keep its personnel satisfied.

Processes which currently fall in this area include service record maintenance; morale, welfare, and recreation (MWR) activities; administrative support, dispersing services; and first lieutenant (janitorial) services. The atmosphere and support services provided must be focus on the squadron personnel so that they can be motivated to give their all to the squadron.

c. Responsiveness

Responsiveness refers to the ability of a squadron to react to a customer "order". While readiness refers to levels of a squadron's physical assets, responsiveness refers to the skill with which the squadron puts them to use. Responsiveness brings to light somewhat more ambiguous issues such as flexibility, timeliness, communication, and feedback. The output will be harder to quantify but its importance to the customer can't be ignored.

A highly responsive squadron will have the ability to roll with the punches in a timely manner. When tasked by a higher authority, it will have the means necessary to insure that the mission is carried out correctly at the specified time. Channels will exist to resolve conflicts and problems that arise, and provide the required feedback. If additional requirements or unexpected changes occur, the responsive squadron will adapt easily. The customer's satisfaction is paramount.

d. Performance

The concept of performance as it relates to a squadron refers to the level of effectiveness with which assigned tasks are performed; how well the squadron performs its missions. It is important, at this point, to distinguish between performance and the other three key outputs already discussed because fundamental differences exist. Performance can be considered a "derived" output because no processes exist which can be directly controlled by the squadron. It is a result, rather, of how effective a squadron has been in its readiness, internal satisfaction, and response processes. Areas such as training, manning, personnel motivation, scheduling, and cohesiveness all contribute to how well a unit performs, but in an indirect manner through the intermediate output processes. Figure 11 illustrates this concept.

Where the stakeholders and customers are concerned, performance is *the* ultimate output of a squadron. As the SAM site example illustrates earlier in this chapter, the better a unit's performance, the worse off the enemy is. The nature of war is such that if a unit or community fails to perform missions competently, they will be replaced by one that can. Processes must be redesigned to focus on maximizing performance through the intermediate outputs if naval aviation is to continue to function.

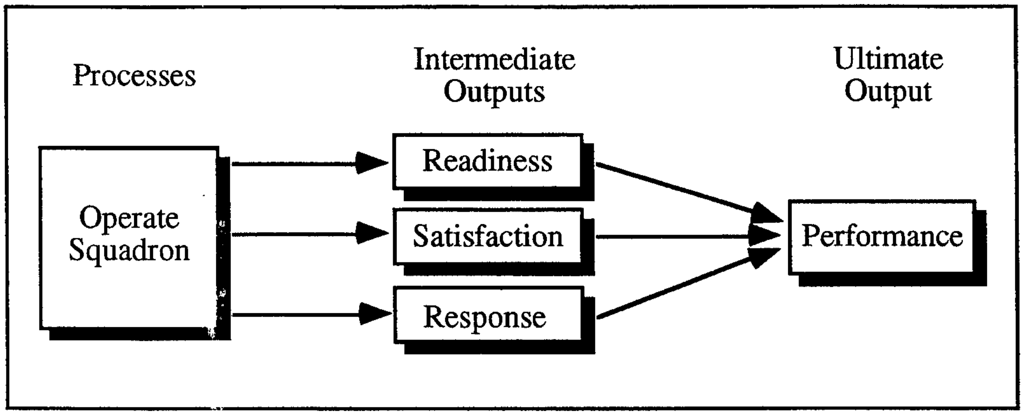


Figure 11. Squadron Output Chain.

In wartime, a squadron's performance can be measured by effectiveness indicators such as ordnance delivered on target or numbers of enemy aircraft shot down. Peacetime indicators include inspection results, derby competition results, and sortie completion rate. These factors indicate the level of proficiency a squadron has achieved in the mission areas it was assigned. Note that these indicators can't be attributed directly to internal processes but result from a squadron's level of readiness, satisfaction, and response.

Performance represents the ultimate output of a squadron. The other three key outputs can be considered intermediate in the sense that they cater to only a portion of the customers/stakeholders. Performance, on the other hand, is critical to all customers and stakeholders. In addition, readiness, internal satisfaction, and response all effect performance. It is logical that a highly responsive squadron with a high readiness state and motivated personnel is likely to outperform an unresponsive squadron with low morale and low readiness.

D. AREAS OF DISSATISFACTION

For change to take place, key organization members must be dissatisfied with the status quo and lack of confidence in themselves and their organization. This dissatisfaction is the source of energy or motivation for the change. That energy is essential because change demands extraordinary commitment. (Beer, 1988)

This statement can certainly be applied to naval aviation squadrons. The inefficiencies inherent in the way business is conducted has led to numerous problems or dissatisfactions throughout the organization. This section will focus on identifying these areas as they relate to the desired outputs of the squadron.

1. Readiness

In Naval Aviation, a unit's readiness is generally cyclic in nature. A unit is expected to be at its highest state of readiness just prior to a deployment. The unit generally hits its lowest state just after returning from deployment and just prior to its work-up for the next deployment. This "readiness cycle" is common to most naval squadrons and results from inadequate community assets, money shortages, and the need to rotate key personnel out of the squadron. Assets and money are taken from returning squadrons and shifted to squadrons who are close to deployment because there is simply not enough for everyone. "Feast or famine" is the catch phrase for the cycle.

The outcome of doing business this way is squadrons at various stages of readiness at any one given time. Within a two-week period, a squadron may go from the highest state of readiness to the lowest as its aircraft are taken and flight hours cut drastically. Experienced personnel are transferred out and inexperienced personnel received to take their places. A well trained fighting force is reduced to a unit capable of sustaining only limited combat operations. This is a very inefficient way to do business.

The inefficiency of the readiness cycle is by no means its only shortcoming. The current method of measuring readiness is cumbersome and deceitful. Levels of training, aircraft status, aircrew, and personnel are documented internally and sent out on a periodic basis. If readiness numbers are grossly inflated, the state of the squadrons is perceived to be better that it actually is, resulting in a false sense of security. Badly needed aircraft parts support is slowed due to the perception that the aircraft are faring better than they really are.

The final area of dissatisfaction as it relates to readiness that will be mentioned is that of public relations. Because the public is a key stakeholder in a squadron, it is imperative they are aware of squadron readiness states. If squadrons are to continue to receive tax dollars, the American public must be made aware of the successes. The object is to create a taxpayer uproar should it ever be suggested that naval aviation be cut.

2. Internal Satisfaction

The major area of dissatisfaction surrounding this output is the perception by some that very little internal satisfaction exists, especially among junior enlisted personnel. The task-based jobs they are required to perform offer little challenge or opportunity for motivation. Major challenges exist for shop supervisors and division officers to try and motivate their personnel to perform. Prevalent in daily operations is the "KITA" (Kick in the Rear) method of "motivation" where supervisors administer threats to induce motivation (Herzberg, 1987). What this accomplishes is movement and humiliation rather than motivation and tends to degrade, rather than enhance, squadron effectiveness. It is the structure and task base in a squadron that is most responsible for this general lack of motivation.

Another area of dissatisfaction is that of personnel service. The perception among many people is that Admin and Personnel do not provide the level of service they require. In reality, both offices are so busy with day to day tasks that they can't possibly serve the squadron personnel as they should. Unfortunately, it is the personnel service that drops out at the expense of the paperwork, which has to get done. Both offices usually set service hours during the working day which may be inconvenient for many personnel, and shut their doors for a period of time so they can catch up on required paperwork. This is unacceptable in a customer service department where service should be the number one priority. A squadron member should have the opportunity to take care of a problem or get a question answered at any time during the day he/she has a break from work.

This leads to the third area of dissatisfaction in the internal satisfaction area - that of overwork. As has been stated many times in this thesis, the workload in a squadron has become extremely complicated for supervisors because the processes have become so complex. The Admin and Personnel staff want to help out the squadron personnel but can't physically complete all the work they need to accomplish. The system design has produced this dilemma and the only solution is to reengineer the processes themselves.

3. Response

Dissatisfaction is this area stems from customer (higher authority) dissatisfaction in the output. In the military, when the battle group commander isn't happy, no one is happy! Customer dissatisfaction stems from poorly performed or delayed missions, which in turn result from poor communication, lack of timely information, and unplanned changes. The levels of bureaucracy which exist act to filter and dilute information and increase the time it takes for a mission request to reach the squadron. If the process could be reengineered to facilitate better communications and lessen the delay time, the customer will likely be more pleased with the resulting mission.

Another problem is that of the squadron's scheduling process. The flight schedule takes so long to create that squadron aircrews and maintenance planners often do not know what they will be doing the next day until after midnight the night prior. This leaves little mission planning time available for other than standard missions and results in a "spool-ex". Operations officers spend a good portion of their time trying to alert aircrews about possible upcoming missions in order to avoid this problem, but this takes away from his/her primary duties. The result can be poorly planned, off-the-cuff missions being performed. The system is very time consuming, inefficient, and reactionary.

4. Performance

The major problem in the area of performance lies in the fact that the three outputs previously discussed all effect performance. Since the outputs directly effect performance, the problems associated with them will also effect a squadron's ability to perform. The key to increasing a squadron's level of performance is to drastically improve the processes that lead to the intermediate outputs. A dramatic increase in performance will naturally follow.

E. NEW PROCESS DESIGN

Thus far, an analysis has been presented on the problems that exist in a naval aviation squadron which lead to dissatisfaction among its customers and key stakeholders. The next step in the reengineering effort is designing new processes which dramatically reduce the problems presented and lead to customer/stakeholder satisfaction. It is beyond the scope of this thesis to reengineer every specific process necessary for success. Instead, the focus will be placed on the process framework, infrastructure, and identification.

1. Strategy

It is the contention of the authors that all the dissatisfaction associated with the current method of operating a squadron stems from the inherent inefficiency of the system as a whole. Previously discussed problems of duplication of effort, poor interdepartmental communication, lack of standardization, poor reconciliation, and information choke points can all be traced directly to the lack of a centralized information infrastructure and to the Task-based job design. These problems lead to process complexity and, in turn, to the areas of dissatisfaction presented previously in this chapter (Figure 12). The strategy adopted in this thesis is to directly attack the core problems of the task-based structure and the lack of a squadron information infrastructure.

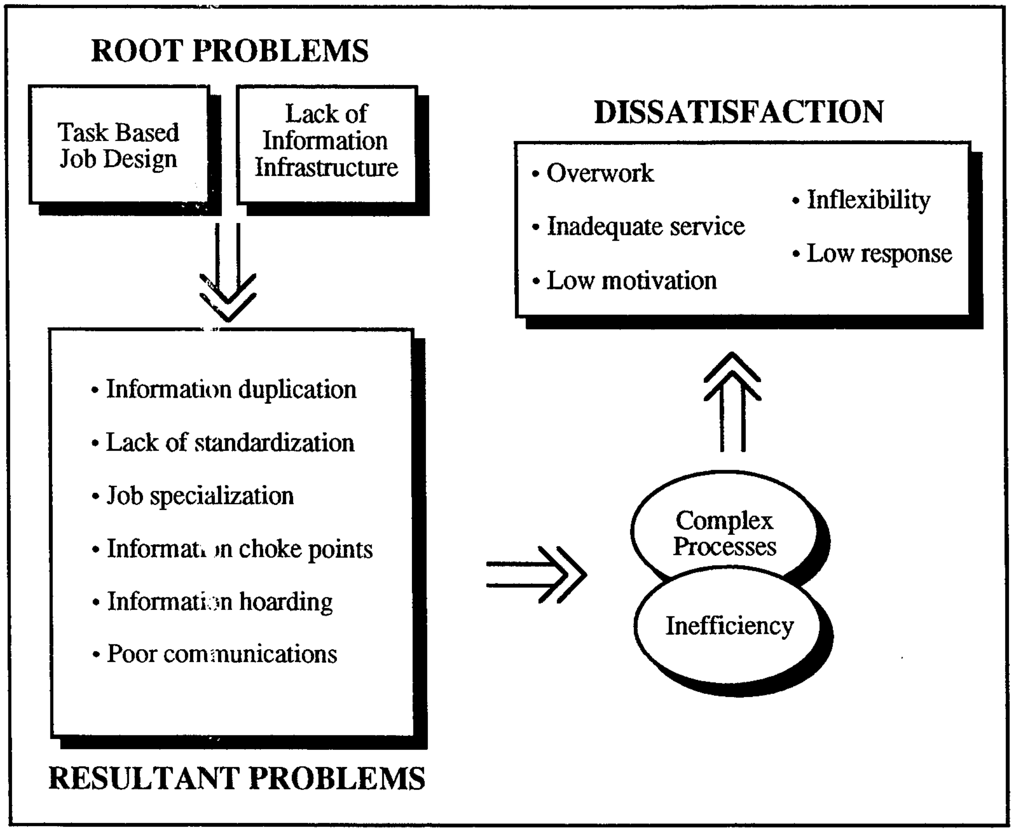


Figure 12. Root Problems Through Dissatisfaction.

2. A New Structure

The first order of business is to eliminate the traditional functional departments in a squadron and restructure around the processes that lead to the highest level of desired output. The goal for this process framework is to eliminate the problems associated with the functional departments and allow technology to play a role in the reengineering effort. Our framework groups processes into the three intermediate output areas defined (readiness, internal satisfaction, response) and one output support group called *Information Central*. Each of these process groups will be discussed below.

a. Information Central

Information Central is the nerve-center of our redesigned squadron. As would be expected from the name, it serves as a central point of flow and storage for information on both a intersquadron and intrasquadron basis. All processes dealing with information record keeping, storage, reference, maintenance, reporting, and dissemination will be housed in Information Central. The idea is to remove the burden of these tasks from the output focused processes and centralize them so that information management is not the primary focus of their job. In addition, with a centralized information infrastructure, the problems associated with multiple data storage areas and information hoarding are eliminated.

The implementation of a centralized information infrastructure (Information Central) is the "enabler" for the entire reengineering effort. A reengineering undertaking of this size could not be attempted without the ability to centralize around modern information technology breakthroughs. The specific technology requirements for Information Central will be discussed in the next section but it is worth mentioning at this point that the required technology was not available a few short years ago. Some of the processes associated with Information Central are listed in Figure13.

b. Output Process Areas

The grouping of readiness, internal satisfaction, and response processes allows a squadron to focus directly on the satisfaction of the customers and key stakeholders through a dramatic increase in efficiency. Much of the administrative burden associated with the old way of doing business has shifted to information central, leaving more time for personnel to concentrate directly on the squadron outputs. The redundancy, lack of communication, departmental parochialism, and task specificity once present dissolves into a better understanding by all personnel of overall process and output goals. Figure 14 illustrates some of the process groupings we envision for the reengineered squadron. Note that the list is not all inclusive but provides a solid generalization of process areas.

INFORMATION CENTRAL
PROCESS EXAMPLES

- Logs & records upkeep and maintenance
  - NATOPS qualification jackets
  - Flight log books
  - Service records
  - Aircraft logbooks
- Central publication library maintenance
  - Directives and instructions
  - Standard operating proceedures
  - Maintenance publications
  - NATOPS publications
- Message tracking and dispersion
- Electronic mail services
- Telephone/computer switchboard
- External Information services
- Supply ordering/tracking
- Information system management
- Report generation (internal & external)

Figure 13. Information Central Process Examples.

The restructuring of work around output focused processes combined with the efficiency of a central information infrastructure will revolutionize the way a squadron does business. An example may help provide insight into understanding the matter.

a. An Example - The NATOPS Officer

In an aviation squadron, the NATOPS Officer works under the Safety Officer in the Safety Department. His primary duties involve the training and evaluation of squadron's aircrew in the safe operation of the aircraft. The guidance for the training is provided by the NATOPS flight manual for the specific aircraft involved. Currently, NATOPS training is provided through lectures and discussions focused on aircraft procedures, flight characteristics, emergency procedures, aircraft systems, and operating conditions. This training is usually provided at the rate of one to two briefs per week at squadron all-officer meetings (AOM's).

OUTPUT PROCESS FRAMEWORK

READINESS	INTERNAL SATISFACTION	RESPONSE
• Manning	• MWR	• Scheduling
• Public affairs	• Pay support	• Strategic planning
• Currency	• Health support	• Fix aircraft
• Aircraft maintenance	• Service support	• Tactical planning
• Supply	• Carreer guidance	• Emergency planning
• Training	• Legal support	• Intelligence
	• Awards/incentives	
	• Transition support	

Figure 14. Squadron Output Process Framework.

In addition to weekly training, all squadron aircrew are required to maintain a NATOPS qualification annually. The requalification effort involves the successful completion of an open book examination, an closed book examination, and a qualification simulator or flight. It is the NATOPS officer's job to oversee these training and evaluation processes in the squadron.

Unfortunately, the NATOPS officer is also responsible for many other areas not directly related the his primary duties. One of these additional duties includes being the NATOPS Flight Manual (NFM) custodian for the squadron. This time consuming process involves the following tasks:

- Assignment and recording of NATOPS Flight Manuals and NATOPS Pocket Checklists (PCL's) to all squadron aircrew.
- Collecting NFM's and PCL's from aircrew when they detach from the squadron
- Acting as central point of contact for the drafting and CO's approval of proposed

changes to the NFM and PCL.

- Generation of change notices to all aircrew when a change has been directed.
- Tracking and recording changes as they are entered into various aircrew NFM's and PCL's.
- Entering changes into all NFM's not specifically assigned to aircrew.

These tasks are extremely time consuming and offer no true value to the NATOPS Officer toward his primary responsibilities, which are aircrew training and evaluation. The duties as NFM custodian stem from the requirement that all NATOPS related publications be kept up to date and that every aircrew have a NFM and PCL assigned. The ultimate repercussion from this situation is that squadron performance suffers through reduced readiness because the NATOPS Officer must spend a large portion of his time on administrivia rather than on training and educating the squadron's aircrew.

This problem can be easily dealt with through the aid of the centralized squadron information infrastructure. If the entire NATOPS publication library is put on CD ROM and loaded into the squadron's centralized local area network publication library, all members of the squadron who wish to review the NFM can simply call it up on their computer. The manual is available in one location where all personnel can access it. If a change to the manual comes out, a new CD is sent out to the squadron to replace the old CD and changes are implemented squadron-wide instantly. If a squadron member has an idea for a change to the NFM, a template can be called up, filled out, and routed electronically through the proper channels.

The repercussions for a simple idea such as this are far-reaching. The time involved in tracking, distributing, and changing NATOPS manuals is eliminated. No longer is it possible to have out of date publications floating around. The time and money invested in hard copy NATOPS manuals and changes can be used more effectively elsewhere. The logistics of carrying NFM's on detachments and deployments and their added weight can be eliminated. The periodic inspections of a squadrons NATOPS libraries can be eliminated. Most importantly, the NATOPS Officer can use the added time to train and evaluate the squadron's aircrew. This directly impacts readiness, and ultimately, performance.

This example is but one of hundreds in a squadron that could be reengineered through the use of a centralized information infrastructure and a focus on output processes. Through the use of modern information technology, these "overhead" baggage processes can be centralized and dealt with in a more efficient manner, allowing personnel to concentrate their efforts where they benefit the organization the most; in making the squadron a more effective producer of services.

3. Process Integration

A framework has been provided in Figure 14 for the grouping of output focused sub-processes, but some elaboration on how this will improve the current situation is needed. Because the sub-processes are "redesigned" to focus on output goals rather than departmental outputs, they can be considered to act on the behalf of the squadron rather than the departments. This leads to a far greater efficiency than in the past and allows personnel to understand and adapt to the squadron's goals.

For example, a way for a squadron to improve it's readiness level (output goal) is to concentrate on improving it's manning efficiency. Currently, manning decisions are fragmented within the squadron, with the responsibility spread on a departmental level. The Assistant Maintenance Officer deals directly with NMPC on manning issues involving Maintenance, as does the personnel officer with Administration. The XO deals with NMPC on behalf of the squadron's officers. At least three separate sources of communication with the Bureau are occurring daily within a squadron, with virtually no lateral communication occurring.

Under the new framework, manning is taken out of the departments and placed in a process all it's own. Personnel work, with the aid of a decision support system (DSS), to take care of the needs of all squadron personnel and consider manning as a squadron entity rather than a departmental one. Conflicts that used to occur between decision makers are resolved by generalists who act in the interest of the squadron. Through the use of the DSS, these manning personnel can benefit from the automation of certain redundant, cyclical tasks, allowing them to concentrate on improving the manning dilemma.

F. REQUIRED INFORMATION TECHNOLOGY

It has been said many times in this thesis that information technology in an enabler in the reengineering process. In a nutshell, this means that new ways of designing work are now possible due to recent technological advancements. No longer is it necessary to centralize information infrastructures around expensive mainframe computer systems. The ability to store, transfer, and secure digital information has grown by leaps and bounds and become less costly. Systems that were once to large and expensive have become portable and affordable through advances in technology. The technology required for a centralized squadron infrastructure, as we have developed it, will be presented in this section.

1. Local Area Networks (LAN's)

In order for a squadron to centralize its information services, a medium must exist through which information transfer, storage, and access can occur. Current client-server LAN technology allows for this medium at a reasonable cost. A LAN of this type allows for the squadron to be "wired" into a central database designed to accommodate the squadron's information needs. Specific computers called servers provide applications and data access that is centralized. For instance, flight time statistics are entered and stored in one location so that they can be accessed by all personnel and applications that need the data. Duplication and reconciliation problems are eliminated and the processes which use the information are made more efficient. The single storage area for data also eliminates errors associated with updates. If an officer is promoted, the rank needs to be updated in only one location rather than in multiple locations throughout the squadron.

The implementation of a squadron LAN is a large undertaking but also a necessary one. Many theses have been written in this area, so guidance is available. Some specific application development will undoubtedly be necessary but commercial off-the-shelf software can be utilized for many of the required portions. The squadron LAN will provide the skeleton on which the Information Central processes will be built.

2. Internet Access

Recent initiatives such as the Naval Aviation Wide Area Network (NAVWAN) are making it possible for squadrons and support units to connect to the Internet with very little effort. NAVWAN provides the information superhighway "offramp" to naval bases so that units can gain access. The advantages of being "connected" include worldwide electronic mail capabilities, instant access to volumes of previously inaccessible information, and the ability to inform millions of people of a squadrons accomplishments. The public affairs aspect of the internet can't be overemphasized. The internet provides a cheap and effective means to increase public awareness of a squadron through home pages, electronic bulletin boards, and electronic mail capability. It can also provide a low cost and instantaneous method of communicating with superiors (customers) and project sponsors.

3. Electronic Mail

The ability to send electronic messages to anyone in the squadron is a service that is hard to live without. Inefficient communications methods such as phone messages, phone calls, message boards, and beepers can become a thing of the past with e-mail. Every member of the squadron will have an electronic mailbox where messages can be sent and stored. When logging on to the system, a message will alert a person if he/she has messages. Messages can be sent to groups of people or everyone at once, eliminating the need for reams of paper and copy machines. If a member gets a telephone call, the duty officer can type out the message on the computer and send it directly to the members e-mail. Date and time stamps are automatically attached and the message is waiting at the next log on. The member can even log on remotely from a home computer to receive messages.

4. Expert Systems

Expert systems attempt to emulate the decisions an expert would make in some particular problem domain and include ways to automate decisions in repetitive environments (Olson & Courtney, 1992). Expert systems exist to make specialists out of generalists. For instance, if a squadron pilot wants to introduce a NATOPS change request into the system, he goes to the NATOPS Officer and asks him/her how to do it. The NATOPS Officer has to take the time to explain the form and the process to the pilot and then route the request once it is completed. If an expert system existed to capture the knowledge of the NATOPS Officer, the pilot could log on to the LAN, follow the instructions provided for the completion of the form, and send it to the next destination electronically. Systems such as these to relieve individual "experts" from the responsibility of repetitive tasks dramatically improve the efficiency of the system as a whole. Our system will take advantage of this technology to capture many of the repetitive tasks performed within a squadron and dramatically improve the processes associated with them.

5. CD ROM

The use of CD ROM technology has been mentioned previously as a method to centralize the NATOPS publication library. The same principles and applications can be applied to the countless number of publications, instructions, and regulations a squadron is required to maintain and follow. The monetary savings in paper alone is enough to justify the switch. It is the increased ability to access the data via the LAN that makes this option possible. This is one step in the direction of a paperless unit.

6. Graphical User Interfaces

Computer systems do no good if people aren't willing to use them. Systems of the past have been so difficult to use that it was impractical to train everyone in their use. Thus, pockets of experts existed who performed their magic and seemed to get results. With the relatively recent introduction of graphical user interfaces (GUI's), the term user friendly has taken on a whole new meaning. Apple's Macintosh System and Microsoft's Windows are but two examples of operating systems or applications which take advantage of this "point and shoot" technology. With GUI's, the interface between person and machine has become a much less intimidating area and the idea of training everyone on computer use has become more realistic.

V. CHANGE STRATEGY

The material presented thus far in this thesis deals with making radical changes to a naval aviation squadron; an organization that has remained virtually unchanged for decades. Unfortunately, developing a new design for a squadron is only the tip of the iceberg. What remains to be discussed is arguably one of the most important topics to be covered - developing a change strategy to get from point A to point B.

The topic of managing planned change is a highly specialized and complex field. The experts and consultants can't even agree on the best strategies for implementing organizational change, as evidenced by the volumes of textbooks and periodicals written on the subject. One thing that the experts can agree on, however, is that any change effort entered blindly is likely to fail. Without a well thought out and consciously executed implementation strategy, any attempted organizational change effort will encounter barriers likely to prevent success.

Half the battle in the implementation effort is an awareness of these barriers. Once they are understood, tactics can be planned to overcome them. Fortunately, it is possible to learn from the mistakes made in past failures, as well as from strategies which have resulted in success. This chapter presents the various "lessons learned" as they relate to the reengineering change process. In addition, a general guideline is presented that may aid in the design of a migration path for naval aviation squadrons to follow.

A. THE CHALLENGE OF REENGINEERING

When engaged in organizational change, it is important to realize that the organization is a system all its own. If even a small portion of it is changed, it will have secondary effects on other parts. With a major reengineering effort like the one presented in this thesis, major repercussions can and should be expected. People's roles within the organization will change, along with their beliefs and values. The specific jobs that they once performed will most definitely change, as will the skills required to perform the new work. The role of management within the organization will also change, leading to further changes in the organization's interpersonal relationships. This point is well illustrated by what Hammer & Champy (1993) call the "business system diamond". The business system diamond is shown graphically in figure 15.

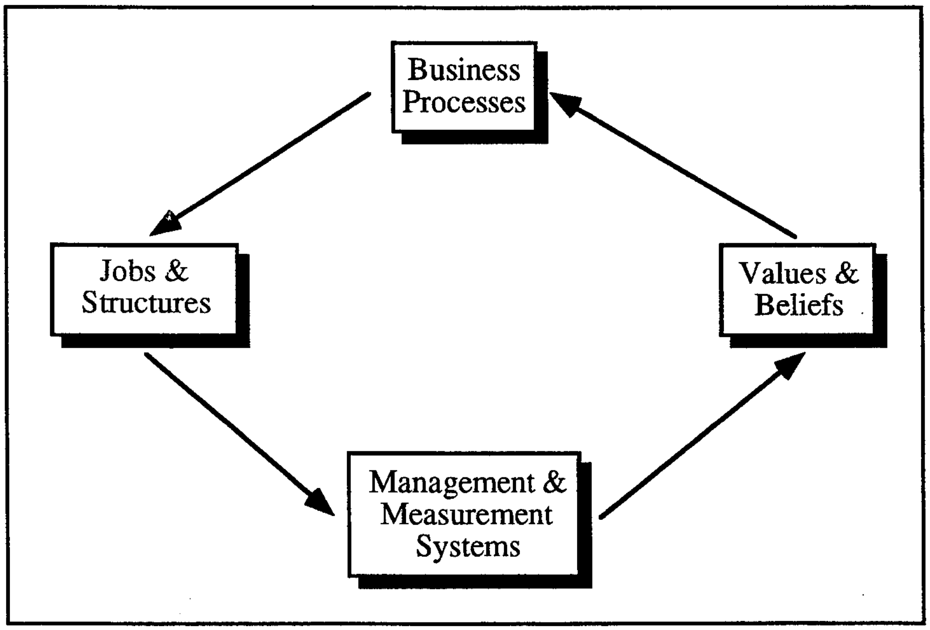


Figure 15. Hammer and Champy's Business System Diamond.

The central premiss behind the business system diamond is that an organization can be broken down into four distinct, interrelated areas of focus. If a change is implemented, for instance, to the business processes, it will have an effect on the jobs and structure systems of the organization. This will illicit change in that area, which in turn, will effect the organizational management and measurement systems. The point is that a change can't be made that does not result in further change to other focus areas. As long as this is understood, change strategists can anticipate, rather than react, to the effects of their actions on the organization as a whole.

In addition to these areas of focus, the change engineer must be aware of the general nature of human beings to resist change of any kind. Even with the most logical reasons to reengineer and a well thought out implementation plan, the change will be resisted by the people in the organization. The following sections present the focus area and resistance considerations every change engineer should be aware of when attempting to reengineer.

1. Focus Area Considerations

Reengineering will raise many questions on the effects changes will have on the organization as a whole. As discussed in Chapter II, reengineering poses questions about the hierarchical structure, reasons for existence, work processes, values and beliefs, and type of people employed by an organization. The following are elements, or points of focus, that the change engineer must consider when proposing changes to an organization.

a. Employee Characteristics

A successfully reengineered organization requires a different type of employee than was needed prior to reengineering. Because reengineering focuses on changing task-based work design to process based work, the people involved must shift from specialists to generalists. Rather than being held responsible for performing specific tasks which are combined to form a process, the worker will be responsible for the knowledge and completion of the entire process. A new awareness of how his/her process adds value to the output goals of the organization is also required. The employee will be a visible, accountable member of the team and will be empowered with responsibility not previously needed or desired.

It is important to understand that not all personnel will be capable of making the transition. Those content with simple, repetitive tasks and who thrive under direction will find it very hard to adjust to the new work environment where they must make decisions and actually produce multiple products. Unfortunately for these workers, this is a fact of reengineering.

b. Organizational Change Attitude

An organization that accepts the challenge of process reengineering must be willing to continually evaluate it's areas of focus. As was eluded to when discussing the business system diamond, reengineering is not a one time shot. Because the organization is a system, it will be constantly reacting in some areas to changes made in others. It may take years to work out all the bugs in a reengineered organization. If the prevailing attitude of personnel in the organization will not tolerate this fact, the change effort will likely fail.

c. Performance Metrics

Two major dilemmas exist which are inherent in virtually every mission-driven reengineering effort (Hammer, 1994). The first is the ability to accurately identify and define the customers and stakeholders of the organization. The second is finding some measure of determining whether or not the reengineering effort is successful. An organization in business to make money has the "luxury" of determining how well it is doing by it's "bottom line". This bottom line can be expressed in a number of different ways, i.e. NPV, profit, price/earnings ratio, etc. If metrics are not already in place to measure a organization's goal achievement, they must be installed to do so. The people in the organization must be made aware of the successes and the only way to do this is to have metrics at the start.

d. Compensation

If reengineering is to succeed, employee compensation must reflect the importance of the change effort to the leaders and managers of the organization. It should be based on how well an employee contributes to the organization's goals and not merely the ability to show up for work. The focus of compensation must shift from activity to results. In reengineering, value is no longer placed on the fragmented tasks that are used to make up the process of producing a finished product or service but has been shifted to the completed product or service itself. Employee compensation should reflect this fact.

When employees are performing process work, companies should measure their performance and pay them on the basis of the value they create (Hammer & Champy, 1993). The basic compensation plan for a reengineered company consists of a base salary plus a annual bonus for value added performance throughout the year. Unfortunately, federal organizations, including naval aviation squadrons, have a difficult time customizing compensation plans because of the strict categories that people are placed in.

e. Values and Beliefs

In order for anything to work in a reengineered organization, the values and beliefs of the employees must change from a task-based "please the boss" mentality, to a more customer-oriented outlook. A person's job is a very important aspect of life and in many cases defines the person. People can and often do become identified with their job, so it becomes very difficult to change the values and beliefs they hold.

In order to change their values, beliefs, and attitudes, management must demonstrate just how important the reengineering effort is to them and the organization. Organizational leaders must make reengineering the number one priority and not just another item on a "to do" list. The employees must see that management is serious and that resources, top people, and long term commitment are devoted to the reengineering effort. Leaders and management have the responsibility to communicate their beliefs and values to the employees and to demonstrate that a change is necessary. Without demonstrated total commitment from above, the changes in employee attitudes will never materialize.

2. Resistance To Change

People are the most important resource in any organization and drastically changing their work environment will lead to feelings of anxiety and resistance towards the change effort. People will feel threatened, and unless the proper preparation has been conducted prior to the implementation of the change effort, it will be resisted to the point of failure. The reasons for resistance can vary but resistance will be present. Some people will not be able to adapt because their routine has changed. Other people may resist simply because they feel that they have too much to lose if things are changed. They have spent years learning and working within the current system and feel threatened by new jobs and responsibilities. The greater threat to the control over his/her environment, the greater the resistance (Jick,1989).

3. Overcoming Resistance

Hammer and Champy (1993) propose five key mechanisms for aiding organizations in helping employees overcome resistance and share in the vision of the organization's leadership. The five key elements are:

- Incentives
- Information
- Intervention
- Indoctrination
- Involvement

a. Incentives

Incentives are inducements to get people to jump on the reengineering bandwagon. They can be both positive and negative, but positive incentives are much more likely to promote the spirit of the reengineering effort. Incentives, however, are very limited in there effectiveness. For instance, the threat of terminating somebody's employment (negative incentive) is only valid if you can actually get rid of the individual. In the military, a CO's ability to summarily get rid of people is severely limited. Incentives are best used and truly effective when they are used on people whose resistance is motivated by a perception of tangible loss. (Hammer, 1994).

People in the military may not be good candidates for the use of incentives because the tangible loss factor is present in only very few cases, such as department heads vying for particularly sought after jobs within the squadron. The incentive of a particularly good fitness report, or evaluation may be what is required to get a particular individual to perform as required by the reengineering effort. Overall, the use of incentives is probably not a good method for getting the required behavior for reengineering in a military environment.

b. Information

In many cases people will resist change out of ignorance. One way to eliminate ignorance is to freely communicate with the employees the information dealing with the reengineering effort. Informing people means supplying people with details of what is happening and when it will happen. It is the best tool for managers to use to get the message of reengineering across. The goal of information flow is to ease the employees frustration and anxiety stemming from confusion. Even if people are opposed to the change, they will be better informed and therefore will be able to cope with the changes that are taking place. Nothing can do more damage to a change effort than rumors which run rampant. The free flow of information can alleviate this harmful situation.

Information about the purpose and goals of the reengineering effort and how it will effect the organization can be effectively taught at training seminars. This is one method of providing the required information to the people who need it. Squadron newsletters and gatherings, such as quarters or AOM's, are other avenues to disseminate information concerning reengineering.

c. Intervention

Intervention is a way of offering reassurance and support to personnel so that they may overcome their fears and apprehensions about the reengineering process. It is normally conducted individually or in small groups of people. Intervention personnel require skill to be able to deal with the wide range of anxieties that will be present. This duty may be conducted by organizational leaders but may be best left to professional counselors hired to aid the reengineering effort. The intervention service is one way that the organization can communicate directly with those individuals having the most trouble with the change process.

d. Indoctrination

Indoctrination is the process of convincing people that reengineering is inevitable and that it is the only way to make the organization more effective. It is about introducing the need for change so that people can sympathize with the effort. People must be aware that a change is necessary and not merely something management would like to do. Once people understand that reengineering is mandatory, then they will be much more open to the prospects that reengineering has to offer, and less likely to reject the effort.

e. Involvement

By helping people develop a shared diagnosis of what is wrong in an organization and what can and must be improved, a manager mobilizes the initial commitment that is necessary to begin the change process (Beer, Eisenstat, & Spector, 1990). Involvement means allowing the employees to participate in the change process. This will produce a feeling of control rather than the feeling of having something forced upon them. By participating in the change process, the employees will have a self-interest and develop a pride of ownership in the outcome of the reengineering effort. It is no longer "their reengineering effort" but "our reengineering effort". Involvement is all about teamwork, motivation, and the achievement of organizational goals as a unit rather than as a dictatorship.

Resistance to change is a serious problem that must be dealt with effectively if organization wide change is to be successful. The five mechanisms mentioned above are only the tip of the iceberg when it comes to overcoming resistance. How they are used depends on the organization and it's circumstances. It is up to the change engineer to design the right balance of the five "I's" which will be most effective for that particular organization. They do offer a good point at which to begin to consider how the problem of resistance to reengineering will be dealt with.

4. The Role of Leadership

The role that top management plays in the change effort can make or break the effort's success. In order to gain the required commitment from the employees, management must effectively sell the vision that guides the change process. If the employees share the projected vision for the organization, the implementation of the change process will proceed much smoother and with less resistance than if the employees perceive change has been thrust upon them. The level of enthusiasm, participation, and involvement by top leaders in the organization will determine the success of the reengineering effort. It is essential to have commitment from the top or the effort will fail.

The first step is for organizational leaders to arrive at a shared vision for the future of the organization. By including the employees in this process, they can mobilize the initial support base necessary to begin the change process. Top management forcing its vision on the employees is not a shared vision, and is the wrong way to begin the effort. The employees must buy into the shared vision for any real benefits to be realized. Employee involvement is crucial to establishing a common vision throughout the organization.

Very often, organizational leaders will have a vision of where the organization stands and where they want it to go. The key is that the vision must be presented to the rest of the organization in a plausible fashion. Hammer and Champy (1993), call this vision a "case for action." The case for action offers the reasoning for the reengineering effort. In order for a case for action to work, it has to be clear, concise and most of all believable. The employees must believe that this is not just another management ploy to get more out of the current structure. The case for action has to be backed up by evidence, and spell out the consequences of trying anything less than the changes that management has proposed. In summary, a case for action must spell out what the organization stands to gain by "changing" and what it stands to lose by not doing so. It must be truthful, not exaggerated, and most of all it must be believable if the employees are to share the vision.

The organizational leaders are the catalysts of the reengineering effort. By fashioning and articulating a vision of the kind of organization they want to create, the leaders instill everyone in the company with a purpose and sense of mission. The leaders must make clear to everyone that reengineering involves serious effort that will be seen through to its end (Hammer & Champy, 1993).

It is up to the leader to create an environment that is conducive to reengineering. It is not enough for him/her to merely urge people on. The leader must be out in front of the organization defining the path. Leaders can demonstrate their personal dedication to the reengineering effort through what Hammer and Champy (1993) call the three S's; signals, symbols and systems.

a. Signals

Signals are the messages leaders send to the organization about the reengineering effort; why it is being done, how it is to be accomplished, what it is, and what it will take to succeed. The main tool for getting the message across is through communication. To people unfamiliar with the concept of reengineering, it is a difficult idea to grasp. Simply giving a speech or two, or producing a couple of memorandums, will not get the message across. In order to introduce and reinforce the message of reengineering, the leader will have to communicate the message repeatedly. At every opportunity, organizational leaders will have to take the time to communicate the message to the people. Only through constant communication will the message of reengineering be spread throughout the organization.

b. Symbols

Symbols are the actions of the leader. The "do as I say, not as I do" message will not cut it in reengineering. In order to demonstrate that the leaders and management of the organization are serious, the leaders need to back up what they say with action. Training and education need to be performed in the aspects of reengineering. Resources, money, personnel, and time must be devoted to the change effort, along with the total support from management. If the organization is to succeed, a total commitment from organization's leadership is required.

c. Systems

The leader must use management systems to reinforce the reengineering message. As discussed earlier, management systems are those tools management can use to show the organization that reengineering is a serious commitment. Examples are performance measurement systems, compensation, and rewards. Management must be willing to measure and reward people's performance in ways that will encourage them to attempt major change (Hammer & Champy, 1993).

The goal is to highlight people who attempt to restructure their work processes in innovative ways. Punishing someone who fails is definitely not sending the right signals about management's commitment to reengineering. Management systems should reward people attempting to change in a positive way, not punish them. Management has to reward and measure people's performance using reengineering criteria in order to get people to attempt change, because if you motivate people in the old way, they will behave in the old way.

B. REENGINEERING IMPLIMENTATION GUIDELINES

Thus far in this chapter, generic principles and considerations have been presented to make the change engineer aware of potential problems. It is now time to present a more specific guideline for implementing a change to a naval aviation squadron.

The need to reengineer springs from some sort of crises, either real or perceived, on the part of organizational leaders. Naval aviation is currently in the midst of such a crisis. Budgets and personnel are being reduced and other branches of the service are competing for the missions that once belonged exclusively to naval aviation. Naval aviation must change the way it operates if it is to remain an effective and viable force in the future. The squadron's leadership has to be totally committed to the need for change and believe that reengineering is the only way to achieve it's goals. The CO and strategic apex have to develop a vision of where the squadron is, where it should be and how to get there. The reengineering change must be planned if it is to have any chance of succeeding. What follows is a set of considerations that Commanding Officers and other leaders in the strategic apex of a squadron can use to help with the implementation of such an enormous change as reengineering.

1. Naval Leadership Considerations

Unlike the leadership of a civilian corporation, the leadership in a squadron does not have total control over the destiny of the squadron. Success in reengineering is not as simple as having a CO that is a visionary. Without support from the very top of the naval organization, there is no way that a CO can make reengineering work. A squadron is a small piece of a big puzzle, one that is fully integrated into an overall system. Currently, all squadrons operate in more or less the same manner. To alter a squadron in the manner that is presented in this thesis, the CO and personnel involved would be putting their careers on the line. A perceived failure would likely prevent any further "experiments" from occurring and the change effort could end before it even had a chance.

Special concessions will have to be made for the initial squadron(s) undergoing the reengineering process. Perhaps an entire carrier airwing could undergo the transformation at once. Traditional performance measures would have to be relaxed in order to compensate for the expected struggle reengineering will present. In essence, the test squadrons must be taken out of the loop for a period of time and allowed to undergo the transformation. Most importantly, the squadron must have the support of the Navy's leadership in the effort. The Admirals in Washington must be willing to offer the same amount of commitment as the squadron CO. If this level of support from the top can't be achieved, the effort will fail. Reengineering has to be the top priority of CNO on down.

Other organization wide support considerations include:

- Providing the dollars necessary to support the reengineering effort. Initial monetary requirements will likely surpass those of present-day squadrons. The goal is that it will drastically reduce spending in the long run.
- Providing support material, commitment, and change consultants to act in the intervention and indoctrination process of squadron personnel.
- Providing at least a level opportunity for the normal advancement of squadron personnel.
- Consider the possibility of restructuring the Navy pay system, advancement criteria, and time requirements of key personnel to reflect the goals of the reengineered organization.
- Providing an active public affairs effort aimed at publicizing the successes of the reengineered squadrons.
- Restructuring of the training and educational facilities to focus more on the outputs and processes than on individual specialization.
- Providing the dedication and expertise in creating and maintaining a centralized squadron information infrastructure.

2. Squadron Leadership Considerations

Assuming support from the top, the squadron leadership must commit to the reengineering effort. The following paragraphs introduce some of the ways a squadron can accomplish their reengineering goals.

a. Develop a Vision

A squadron that is going to reengineer is one that is going to be led by a visionary. The CO must have a complete understanding of reengineering and what is required to bring about change. The strategic apex, led by the CO, will have to develop a vision of where the squadron could be, given the current and projected state of resources and, where it currently stands in relation to the vision.

b. Sell the Vision

In order for reengineering to occur, the entire squadron must share the vision of the organization's leadership, i.e. strategic apex and CO. This is likely to be the biggest challenge facing the leadership given the tradition of the squadron as an organization. If they can't sell the vision, then the reengineering effort is likely to fail. Selling reengineering can be helped in part by creating a reengineering atmosphere using the three S's and the methods discussed for overcoming resistance. As mentioned earlier, not all of the methods mentioned will work in every circumstance. The CO will have to have a good feel for the people in his/her organization in order to apply the methods that will work best.

c. Appoint Process Owners and Reengineering Teams

Involving the sailors and officers in the reengineering process is essential to the successful squadron reengineering effort. Identifying processes that need immediate attention and are good candidates for success is a must. Squadron members can then be assigned to reengineering teams to design a better method of completing the process. By involving squadron members early in the process and on successful projects, they can demonstrate the affects of reengineering to the rest of the squadron, and simultaneously build confidence in the change effort. A good starting point for reengineering teams would be to focus on processes that are geared toward satisfying squadron personnel; in other words, processes geared toward the internal satisfaction output. If squadron personnel are beneficiaries of a reengineered process, then the benefits of reengineering may become apparent.

d. Focus on the Customer

Properly identifying the customers is a very difficult thing to do. Chapter IV presents a discussion on possible solution to this dilemma. Conducting internal surveys and holding focus groups can help squadron personnel reach a similar conclusion. It is very important that the customer is identified and the team stays focused on what it is that the customer requires. Once this is accomplished, the squadron managers must continually focus reengineering teams on designing processes which contribute to the satisfaction of the customers.

e. Benchmark and Set Stretch Goals

A snapshot of the squadron should be taken prior to the reengineering effort. The squadron outputs and effort required to produce them must be highlighted for future comparison. From that point, a baseline can be established and goals can be set that will challenge the organization into trying to met the newly set goals. These goals should prompt the teams into trying innovative methods of designing the process so that the goals can be met. Emphasis should be placed on increasing internal efficiency, using the squadron information system to its full advantage, and producing higher levels of output.

f. Move Fast

Reengineering is not adaptable to a piecemeal type of change. It is about radical change that attempts to completely modify people's values, beliefs, and attitudes about their work environment. This needs to be done as quickly as possible in order to combat resistance and complacency about change. The longer it takes to achieve results, the less interest people outside the organization will have. In addition, the energy levels required to effect reengineering can't be sustained indefinitely.

g. Accept Risk & Imperfection

Not everything attempted in the reengineering effort is going to work the very first time. Management must be willing to accept failure as part of the change to reengineered work environment. Failure means that people are trying to innovate and trying different ways of performing work. Management should not punish people for trying something new that does not work out. Encouragement and patience must be exercised or the signals sent by leadership will not be compatible with the symbols sent. Lessons should be learned form every attempted reengineering effort so that they can be applied to other reengineering efforts.

h. Don't Stop Too Soon

A reengineering effort requires a long term commitment from everybody involved, especially the CO and senior leadership in the squadron. Continuity in CO's is extremely important for the long term success of the organization. If the employees see leadership's faith and determination beginning to waiver, theirs will also. Leadership has to commit for the long haul and not quit when the going gets rough. Because squadron personnel also rotate in and out of the squadron, usually on a three year cycle, continuous training and education must be provided in order to keep the continuity of the reengineering mind set in the squadron.

C. SUMMARY

A process of change is undertaken in response to many different stimuli. An organization may want to change in response to competition, or because the leadership of the organization feels that it is no longer productive and needs to change the way that it does business. In the case of a naval aviation squadron, it is the pressures of having to perform the same missions with fewer resources, personnel and money, combined with a change in environmental factors, that is driving the perceived need for change.

The change effort will have far reaching consequences and cause changes to other elements throughout the organization. The characteristics that employees once displayed will no longer fit into the new way of working. The employees will have to change their work habits or perhaps jeopardize the entire change process. Performance measurements and compensation methods will also have to be reexamined, due to the new work processes. Most importantly, the values and beliefs of the employees will have to change to reflect the values and beliefs of the new organization.

The change process won't be easy. It is a long arduous process that requires an inordinate amount of planning and patience. The employees will not want to change because they are comfortable with the old way of doing business. Management will have to do a skillful job of imparting their vision on the employees. If resistance is not expected and a plan for overcoming it is not made, then the change effort is likely to fail. However there are a number of ways to overcome resistance. Leaders and managers can use combinations of the five I's: incentives, information, intervention, indoctrination and involvement, to overcome resistance. This is by no means the only method of dealing with resistance, but it is a good place to begin to look for answers.

A reengineering effort needs someone from high in the organization to champion the reengineering cause. It can not happen from below. The CO of a squadron has to lead the reengineering effort because it is he or she who has the vantage point necessary to see how the squadron's processes relate to proposed output goals. It is the CO as leader who has the position to be able to develop a vision for the squadron and then share that vision with the rest of the organization. But, that person has to be out in front of the organization leading the way, not merely supporting it while working on other more important things.

Reengineering has to be the most important thing the organization is doing if it is to be successful. How the leaders act, their values and beliefs, and how they support the reengineering effort will be severely scrutinized by the employees and if any lack of faith is detected, then the employees will begin to question not only their commitment, but also the commitment of the squadron's leadership to the reengineering effort.

There are a number of guidelines that are very helpful when trying to implement a change such as reengineering. Among them are developing a vision about the organization and sharing it with the rest of the organization. Involving the employees in the change process and focusing on the customer are two very important elements of reengineering. Without the customer, the organization has no reason for being in business. Management has to be willing to accept imperfection and even failure. People should not be punished because they are trying to innovate. Finally, the reengineering effort should not be abandoned too early in the effort. Reengineering is an iterative process that will take a very long time to implement.

VI. CONCLUSION AND RECOMMENDATIONS

A. SUMMARY

The motivation for this thesis lies in the hope that a design can be formulated for a naval aviation squadron that will improve both the efficiency and output focus of present-day squadrons. The keys to this end involve the incorporation of modern information technology systems and a change strategy capable of producing the desired results. The following questions were proposed as a guideline to achieve success in this project:

- How does information flow within a typical squadron?
- How can the information flows be modeled?
- What factors are responsible for the problems identified in this thesis?
- How can the current system be improved?
- What barriers would be encountered in attempting the required organizational change?

Chapter I introduced the information required to understand why a change is needed. Environmental circumstances have forced organizations within the Department of Defense to do more with less. Drastic defense spending cuts coupled with the proliferation of defense related information have contributed to the highlighting of military inefficiency. In order to remain competitive, DOD organizations must take advantage of available technology in information systems to reduce the areas of inefficiency. Unfortunately, the automation of current work processes is not enough to dramatically improve current methods. In order to reap the maximum benefits available through the use of information technology, the work processes themselves need to be scrutinized and redesigned.

One change strategy which has merit in the goal of achieving work redesign is process reengineering. Chapter II presents an overview of reengineering as it deals with the squadron, and presents the reasons why reengineering is a good option for a change strategy. The reengineering effort focuses on rethinking the way processes are performed in an organization. With the aid of technology, these processes can be analyzed and redesigned around output goals to greatly improve efficiency and customer/stakeholder satisfaction. Reengineering offers alternatives to the drawbacks commonly found in task-based organizations, such as a naval air squadron.

Although not unique as a change strategy, reengineering does offer many advantages over other methods. Because it focuses on the work processes themselves, it is easier to adopt information technology into the work design. In addition, reengineering puts the output process focus where it belongs, on the customer. The implementation of information technology in the process will allow information systems to pick up the role of performing the routine, cyclical tasks which were so time consuming in the past. This fact allows personnel to devote more time to performing their primary duties and contributing more to the squadron's goals.

In Chapter III, an analysis of the current naval air squadron is conducted in an attempt to answer the first three research questions presented. It includes a generic look and analysis of the hierarchical structure, task specialization, culture, and use of information technology common to today's squadrons. Problems with the current organization are also presented; specifically, the problems associated with information flow within a squadron. To illustrate these problems, a high level view of squadron information flow using the IDEF-0 modeling tool was developed. The Naval Aviation Maintenance Office IDEF-0 model was also incorporated as an analysis tool. These models are presented in Appendix B and C. Though not the only modeling tool available, IDEF-0 provides a solid base for modeling static processes within an organization.

In Chapter IV, the common principles of reengineering are discussed and used to devise an answer to the question of how the problems outlined in Chapter III can be improved (research question # four). The chapter begins by defining the squadron's customers and key stakeholders. Specific output measures are then linked to each for the purpose of focusing processes on them. Specific areas of dissatisfaction related to the four output measures are then introduced so they can be analyzed and improved. An example of a reengineered process structure is proposed which groups the processes into output-based categories. Examples are also presented to illustrate the benefits of restructuring in this manner. Lastly, examples of the information technology required for the reengineering effort are discussed.

Chapter V presents considerations for answering the final research question. In it, the process of organizational change is discussed and some of the lessons learned from the past are provided for consideration. These "barriers" to change can be planned for in implementing change within a squadron and overcome if armed with the right set of tools.

If naval aviation is to remain a viable competitor for military missions in the future, something must be done to increase it's competitive advantage. Navy air must do more with less and focus it's assets on the satisfaction of the customers and key stakeholders. The path to this goal is twofold. First, a reengineering, or similar type of effort, must be conducted to improve the efficiency and focus of internal squadron processes. Second, a centralized squadron information infrastructure must be formed to enable the change effort. These steps will allow Navy squadrons to rid themselves of work methodology appropriate for a paper-based world, and replace them with work modes that leverage the attributes of information technology.

As with most change efforts, reengineering takes time. The information technology to enable the change effort is now available and affordable. Effort must be taken soon to begin this process of squadron change or it may be too late. It is too hard to ignore the ramifications of failure to do so. This strategy promises a squadron that is better prepared to perform it's missions, more efficient, less costly, and more motivated than units of today.

B. LIMITATIONS

The problems associated with Navy squadrons which are presented in this thesis represent a conglomeration of viewpoints collected over a number of years by the authors. They are derived from a perceived consensus and personal experience. No attempt was made to conduct a scientific survey of the naval aviation community to validate these viewpoints. It is hoped that the arguments for process reengineering are taken as they were intended - to serve as a methodology for solving problems within the naval aviation community.

Unfortunately, this thesis has only scratched the surface in the amount of research necessary for the reengineering process. Though possible, the amount of coordinated effort and man-hours required to actually reengineer a squadron's processes far exceed the time allotted for this project. In addition to the reengineering effort, the resultant centralized information infrastructure would likely have to be developed and coded professionally. Though limited in scope, this thesis provides one method of integrating a squadron's information systems.

C. RECOMMENDATIONS

Because this thesis covers the reengineering effort on a high level, many opportunities for continued research exist in this area. Armed with the background and guidance presented in this thesis, the following areas need to be examined in order to continue the reengineering effort:

- The lower level IDEF-0 models of each department must be completed so that a more thorough understanding of existing squadron processes can be gleaned.

- The specific processes necessary for the achievement of intermediate squadron output goals (Readiness, Internal Satisfaction, and Response) must be identified and reengineered.
- The standards and architecture necessary for the implementation of the squadron's centralized information infrastructure need to be identified.
- The integration issues expected when introducing a reengineered squadron into the current military hierarchy need to be examined.
- Once the central information infrastructure has been identified and the required processes redesigned, the migration path for implementation must be identified.

LIST OF REFERENCES

Beer, Michael, *Leading Change*, 1988. Appeared in *Managing People and Organizations*, Harvard Business School Publications, edited by John J. Gabarro.

Beer, Michael, Russell A. Eisenstat, and Bert Spector, *Why Change Programs Don't Produce Change*, Harvard Business Review, November-December 1990.

Bolman, Lee G. and Terrence E. Deal, *Reframing Organizations*, Jossey-Bass, 1991.

Drucker, Peter E., *The Coming of the New Organization*, 1988.

Freeman, Ed, *Strategic Management: A Stakeholder Approach*, Pitman, 1984.

Gore, Al, National Performence Review,http://www.npr.gov, 1993.

Gurbaxani, Vijay and Seungjin Whang, *The Impact of Information Systems on Organizations and Markets*, Communications of the ACM, Volume 14, number 1, January, 1991.

Hammer, Michael, *The Reengineering Revolution*, Harper Business, 1994.

Hammer, Michael, Videocassette *Succeeding at Reengineering - Managing the Journey*, Hammer Videos, 1994.

Hammer, Michael and James Champy, *Reengineering the Corporation, a Manifesto for Business Revolution*, Harper Collins Publishing, 1993.

Herzberg, Frederick, *One More Time: How Do You Motivate Employees?*, 1987. Appeared in *Managing People and Organizations*, Harvard Business School Publications, edited by John J. Gabarro.

Jick, Todd, *The Challenge of Change*, HBS, 1989.

Long, Larry and Nancy Long, *Computers*, Prentice Hall, 1993.

Mandel, Michael J., *The Digital Juggernaut*, Business Week, The Information Revolution, 1994.

Mintzberg, Henry, *Organization Design: Fashon or Fit ?*, 1981. Appeared in *Managing People and Organizations*, Harvard Business School Publications, edited by John J. Gabarro.

Olson, David L. and James F. Courtney, *Decision Support Models and Expert Systems*, Macmillan Publishing Company, 1992.

Roberts, Nancy C. and Paula J. King, *The Stakeholder Audit Goes Public*, American Management Association, 1989.

Rockefeller, John D. 3rd, *The Second American Revolution*, Harper and Row, 1973.

Smith, Adam, *The Wealth of Nations*, 1776.

Verity, John W., *The Information Revolution - How Digital Technology is Changing the Way We Work and Live*, Business Week, The Information Revolution, 1994.

APPENDIX A: UNDERSTANDING IDEF-0

This appendix outlines the basic IDEF-0 background and concepts necessary to understand the models presented in Appendixes B and C. This information is a condensed version of the information presented in the IDEF/Design 2.5 Tutorial manual.

MODELS

A model is a symbolic representation of a system, where the model can be used to derive information about the system that it represents. The system in this case is a set of interacting components and the relationships among them. Models can be based upon a couple of different modeling paradigms and the choice depends upon the type of system being studied and the purpose of the model. A static model paradigm is one that is used to represent the structure of a system, but not it's behavior over time. A dynamic model paradigm, commonly called a simulation, is one that is used to represent both the structure of a system, and it's behavior over time. What type is chosen depends on what is required of the model and what is being studied. A static model is less powerful than a dynamic model, but will provide all of the information that is required if all that is being studied is the structure of the system, and that can be achieved for a fraction of the cost and overhead associated with a dynamic model.

Since there is no clear cut dividing line between a system and it's surrounding environment, a model has to restrict what is included to only parts that are of interest. The model of the squadron is no different. The only factors included in the model are those that are of interest in the modeling of the squadrons processes, what each process does, and how the information flows from one process to the next.

IDEF-0 defined.

IDEF stands for ICAM Definition, and ICAM stands for Integrated Computer Aided Manufacturing, and is one of many types of modeling systems. IDEF-0 happens to be a static modeling paradigm intended for modeling systems that consist of discrete activities that transform inputs into outputs. It is particularly well suited for modeling the data processing and information flow and also the actual daily operations in a naval aviation squadron. The IDEF model is composed of activities that use mechanisms and controls to turn inputs into outputs. The inputs, controls, outputs and mechanisms are referred to a ICOM's.

An activity is a component of a system that performs a specific action. The action is always the transformation of one or more inputs into one or more outputs, using the mechanisms and controls. The IDEF model is then a hierarchy of the activities in the system. The top most activity is a single activity that represents the system as a whole, depicting all of the inputs from the outside environment, into the system and what is eventually produced by the system, or the outputs to the environment that contains the system. All of the controls and mechanisms used to convert the inputs into outputs are shown acting on the upper most activity.

The top most activity can be decomposed into lower level activities, that represent the processes of the system that is being modeled. These lower level activities represent the processes themselves and graphically show how each activity relates to other activities in the system. Each lower level activity may then be decomposed even further, until the desired level of refinement is obtained. The ICOM's that are associated with the top level of the structure can also be decomposed, allowing their components to be dealt with at lower levels in the model. The ICOM's not only link each of the levels together, they also link the activities to each other at each level.

IDEF components:

Activity - An activity is a system component that transforms an input from the outside environment into an output, that is either passed on to another activity, or is a finished product that is passed on to the environment outside the system. An activity uses mechanisms and controls to accomplish the transformation. Activities are represented as boxes in the model diagram, and are labeled with the name of the activity.

ICOM - ICOM stands for inputs, controls, outputs and mechanisms. Inputs are something that are consumed by an activity in the process of transforming inputs into outputs. Controls are things that direct or regulate how an activity is to perform the transformation. An output is the result of or produced by the activity, based on the inputs, controls and mechanisms. Finally, a mechanism is something that facilitates the actual accomplishment of the transformation. A mechanism could be a person, facility, machine or other agency that performs the activity.

In general, an ICOM can be anything that is used by an activity to produce outputs. They can be physical objects, rules and regulations, information, people, or any other object that is relevant to the purpose of the model. In the model, ICOM's are represented by arrows that are entering the activity boxes, and are classified as either an input, control, output, or mechanism by the side of the box in which they enter.

Purpose of the Models

The purpose of the models, the Onorati/Robillard and Naval Aviation Maintenance Office (NAMO) organizational modeling team, are to model the squadron as it is currently organized. The modeling paradigm employed for the models is from a static viewpoint, because how the organization operates over time is not important for the purposes of the study. The squadron is a dynamic organization, however, the processes are so rigidly controlled and regulated, that no matter what environment the squadron is operating in, the manner in which the processes are carried out will remain pretty much the same. In other words, the processes don't change, but the environment in which the organization is operating will.

Onorati/Robillard model

The purpose of the model is to illustrate the information flows required for the decision making process, and the complexity of the design of the organization required to produce the information. The Onorati/Robillard model is based on a combined 16 years of squadron level experience. It is a static model of how the overall squadron is organized and the hierarchy of the processes involved with decision making. The model also illustrates extremely well how the degree to which the squadron structure fragment the processes. Each department in the squadron performs many of the same core processes, and those processes are broken down into many individual tasks. These tasks have to be managed, and coordinated in order to produce any worthwhile information.

Core processes are what really make the squadron operate and able to fulfill is mission. Processes such as manning, which ensures that the squadron is manned with the right amount of people, and those people are in the right ratings, training, administrative functions, and personnel support functions are some of the processes that are common to all of the departments and therefore could be considered "core processes". The model shows that these processes are not only fragmented into each of the departments, but upon further inspection, are even further fragmented down to various divisions within each department.

The context diagram, or the top page in the model hierarchy, depicts what is to be modeled. It shows the squadron as a whole, with all of the inputs to the squadron from the outside environment, and all of the outputs of the squadron back to the outside environment. It also shows the things that control the transformation process and what mechanisms are used to help in the transformation process. The structure of the squadron is also readily apparent from the model.

APPENDIX B: THE ONORATI/ROBILLARD MODEL

This appendix contains the Onorati/Robillard model - a high level IDEF-0 model of a squadron's information processes.

USED AT:	AUTHOR: Onorati & Robillard	DATE: 04-4-95	X	WORKING	READER	DATE	CONTEXT:
Naval Postgraduate School	PROJECT: Naval Aviation Squadron IDEF-0 Model	REV: 1.0		DRAFT			Top
				RECOMMENDED			
	NOTES: (1) (2) 3 4 5 6 7 8 9 10			PUBLICATION			

Purpose: To model how a generic naval aviation squadron presently processes information so that weaknesses and duplications may be highlighted and improvements suggested.

Viewpoint: Personnel assigned to a Naval Aviation Squadron.

Scope: All areas of a squadron, from an information flow perspective, that impact operational decisions and combat readiness. These include but are not limited to Management, Operations, Maintenance, Administration, and Safety information flows, and exclude many intangible aspects of squadron operations like tactical & strategic planning, management techniques, and command atmosphere.

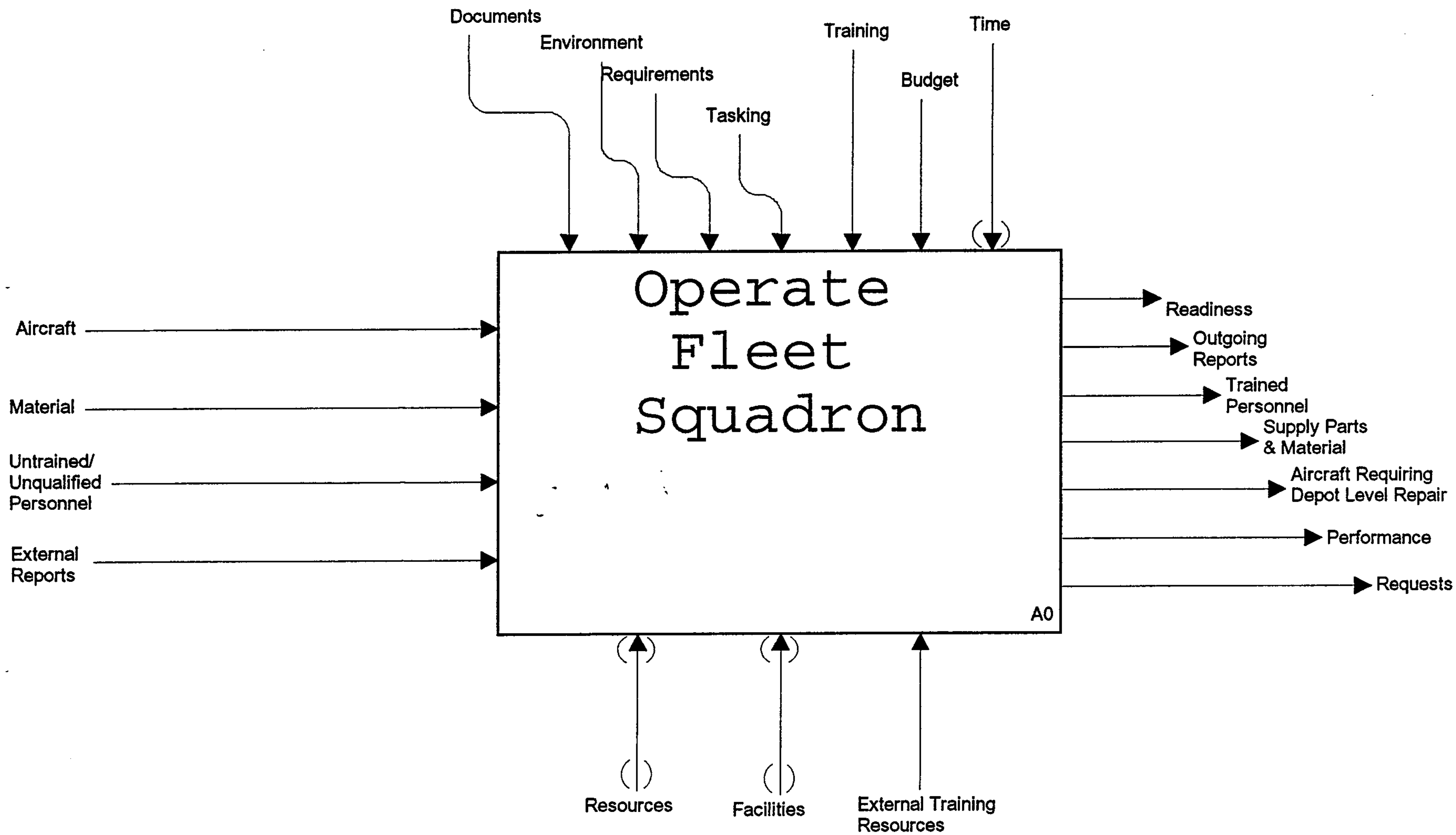
Note:

1. Facilities, Resources, Time; These mechanism arrows are tunneled at the A-0 node. They are required by every function in this model and will not be shown as the model is decomposed (in the interest of tidiness).

2. The A2 activity (titled "perform maintenance") is not included in the NASIM model. This process has been modeled by NAMO seperately and has been incorporated into this model.

NODE: Text	TITLE: PERFORM SQUADRON OPERATIONS	NUMBER: M-1

USED AT: Naval Postgraduate School	AUTHOR: Onorati & Robillard DATE: 04/14/95 PROJECT: Naval Aviation Squadron IDEF-0 Model REV: NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT: Top



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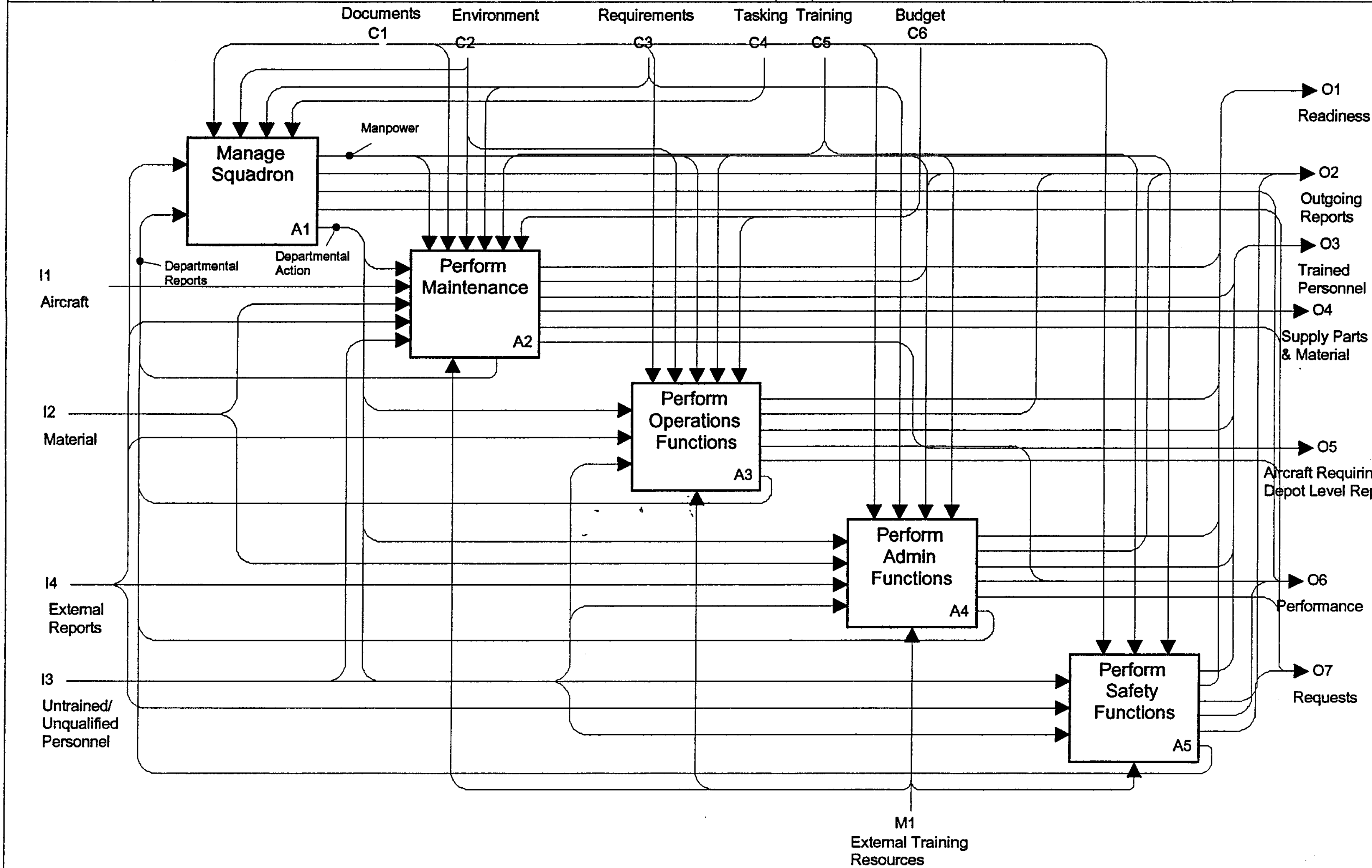

NODE: A0	TITLE: Operate Fleet Squadron	NUMBER:

USED AT:	AUTHOR: Onorati & Robillard	DATE: 04/24/95	WORKING	READER	DATE	CONTEXT:
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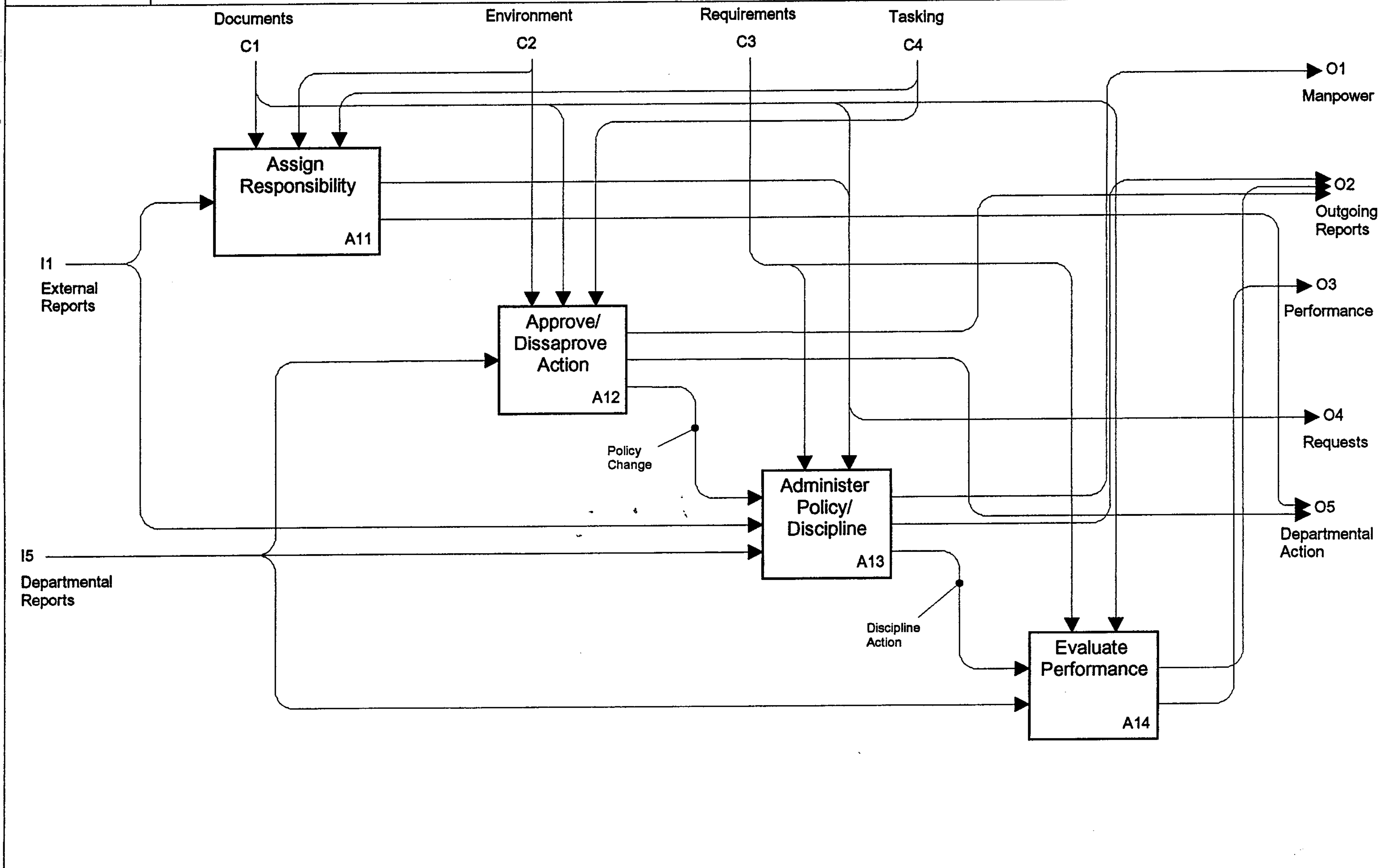
			PUBLICATION			



NODE: A1	TITLE: Manage Squadron	NUMBER:

USED AT: Naval Postgraduate School

AUTHOR: Onorati & Robillard | DATE: 04/22/95

PROJECT: Naval Aviation Squadron IDEF-0 Model | REV:

NOTES: 1 2 3 4 5 6 7 8 9 10

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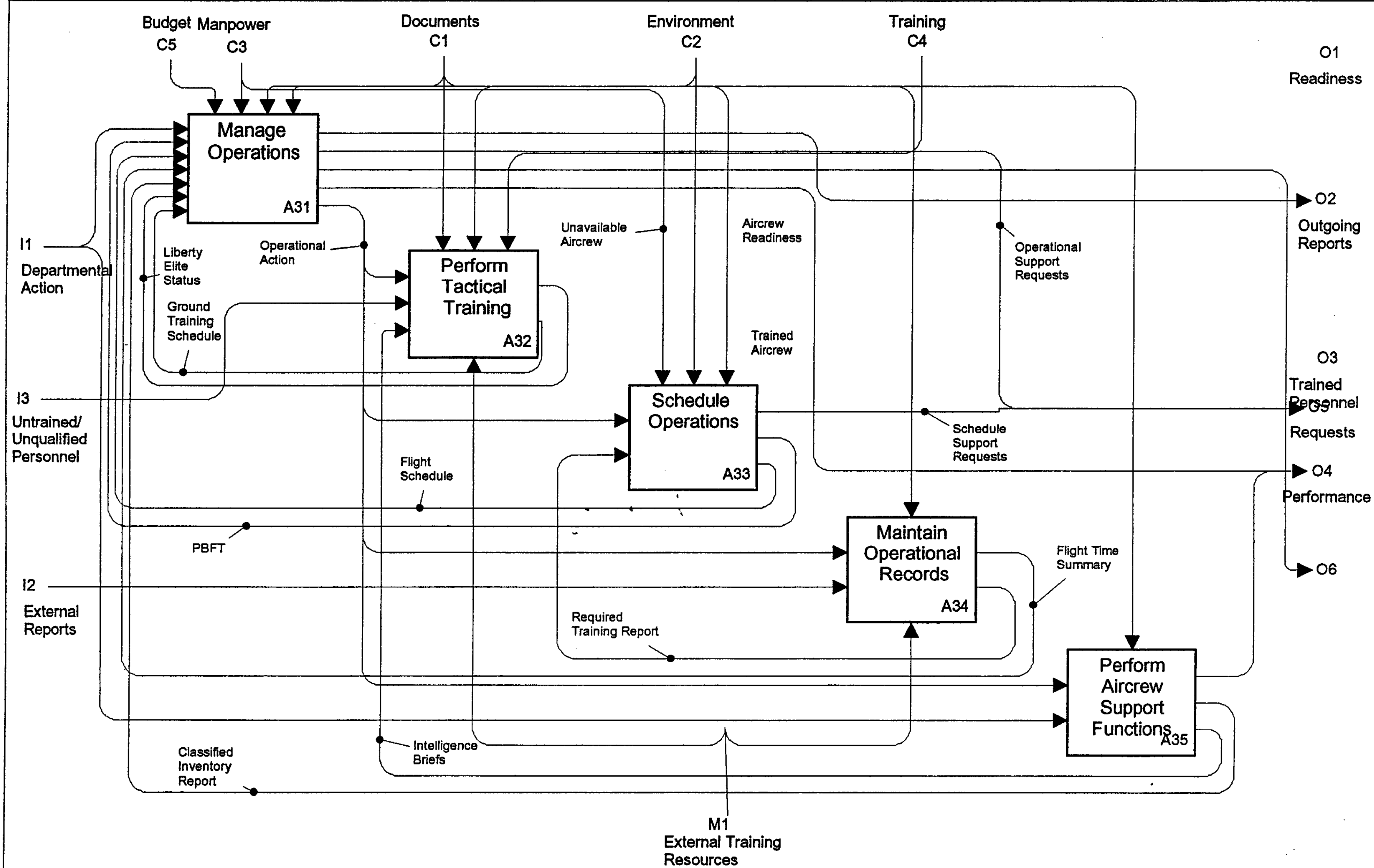
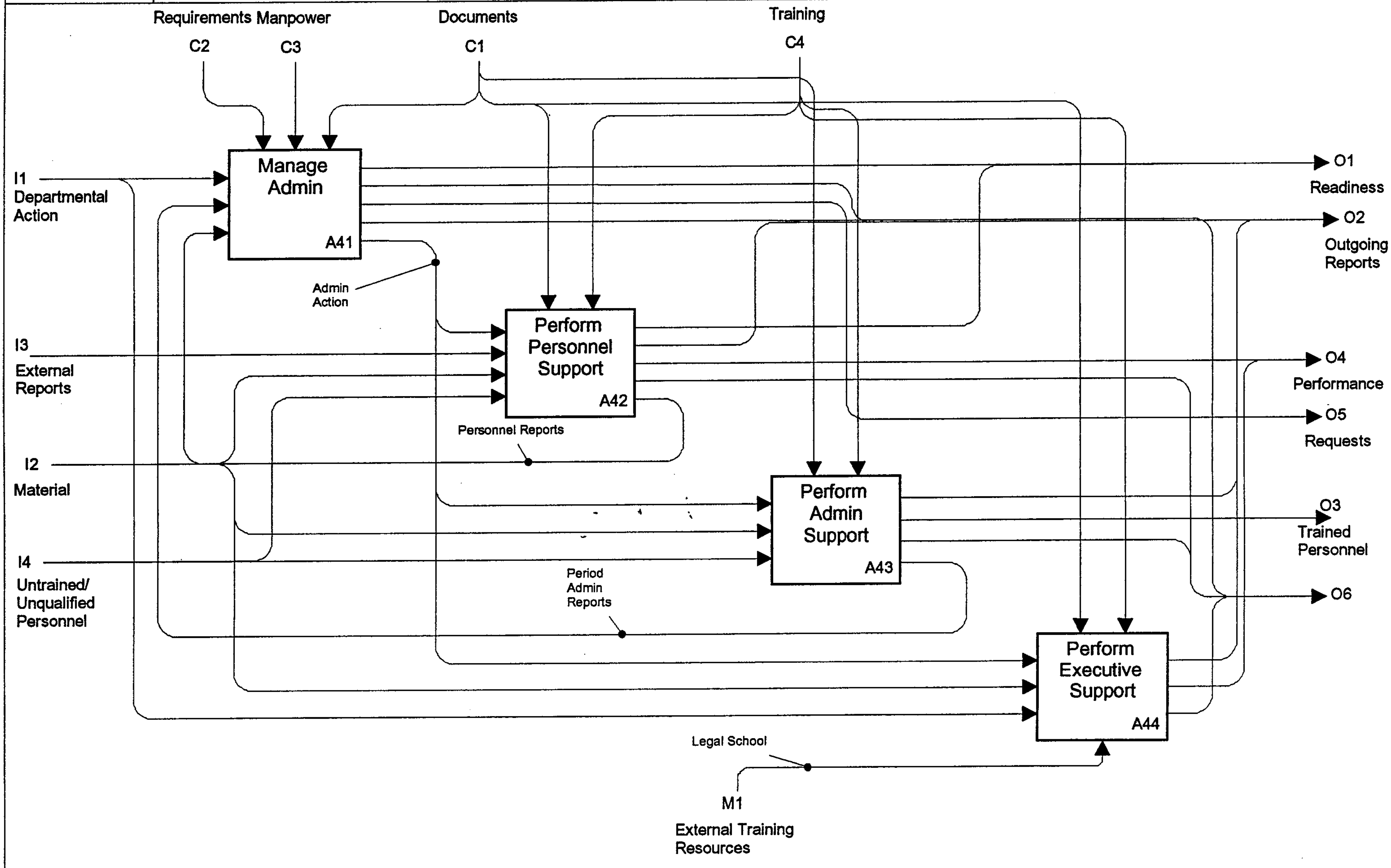


NODE: A3 | TITLE: Perform Operations Functions | NUMBER:

USED AT: Naval Postgraduate School	AUTHOR: Onorati & Robillard DATE: 05/01/95 PROJECT: Naval Aviation Squadron IDEF-0 Model REV: NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING DRAFT RECOMMENDED PUBLICATION	READER DATE	CONTEXT:



NODE: A4	TITLE: Perform Admin Functions	NUMBER:

USED AT: Naval Postgraduate School	AUTHOR: Onorati & Robillard PROJECT: Naval Aviation Squadron IDEF-0 Model NOTES: 1 2 3 4 5 6 7 8 9 10	DATE: 04/2[illegible]/95 REV:	WORKING DRAFT RECOMMENDED PUBLICATION
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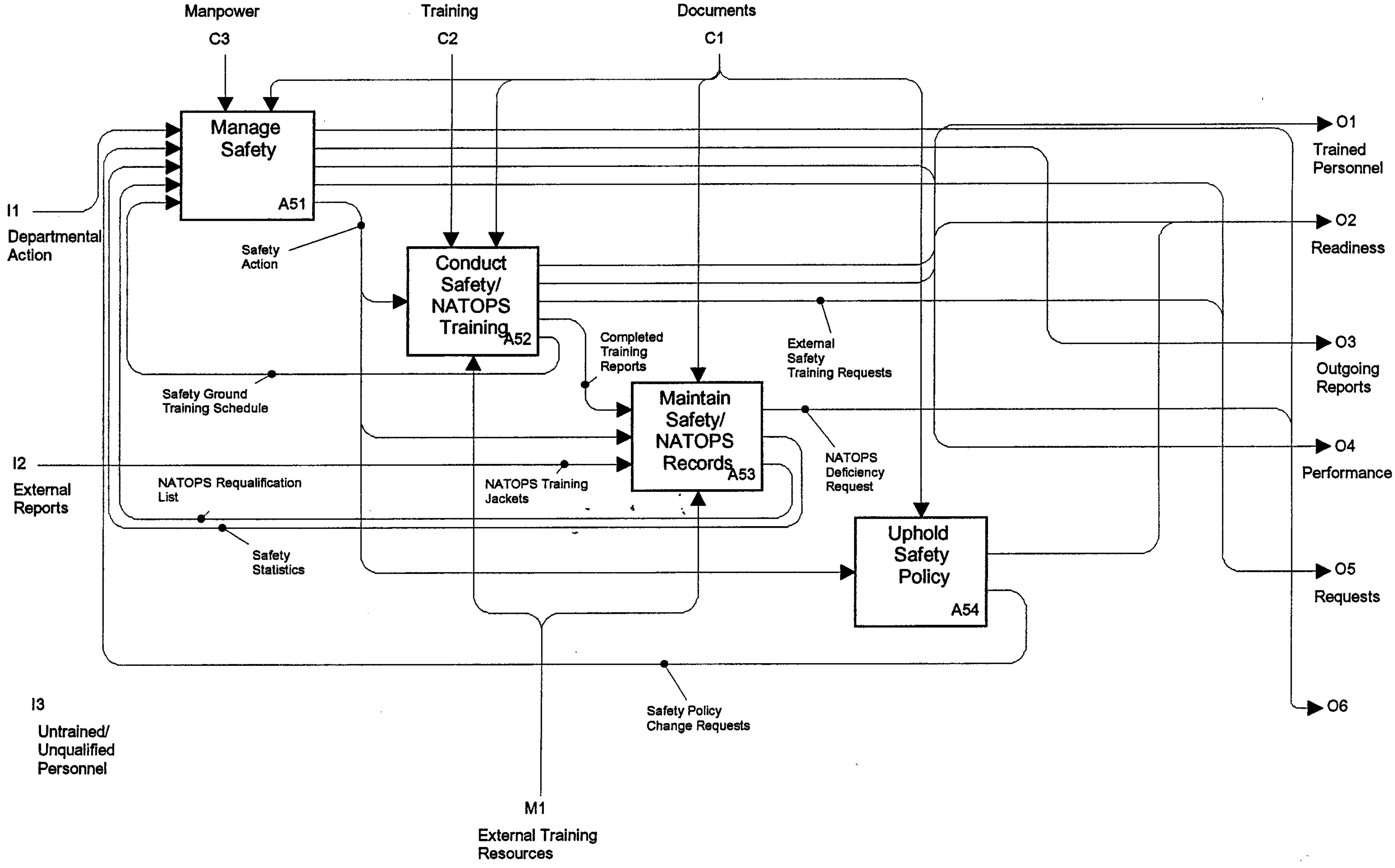

NODE: A5	TITLE: Perform Safety Functions	NUMBER:

Node Tree for NASIM Project

[A0] OPERATE FLEET SQUADRON

- [A1] Manage Squadron
  - [A11] Assign Responsibility
  - [A12] Approve/Dissaprove Action
  - [A13] Administer Policy/Dicipline
  - [A14] Evaluate Performance
- [A2] Perform Maintenance
- [A3] Perform Operatons Functions
  - [A31] Manage Operations
  - [A32] Perform Tactical Training
  - [A33] Schedule Operations
  - [A34] Maintain Operational Records
  - [A35] Perform Aircrew Support Functions
- [A4] Perform Admin Functions
  - [A41] Manage Admin
  - [A42] Perform Personnel Support
  - [A43] Perform Admin Support
  - [A44] Perform Executive Support
- [A5] Perform Safety Functions
  - [A51] Conduct Safety/Natops Training
  - [A52] Maintain Safety/Natops Records
  - [A53] Uphold Safety Policy
  - [A54] Manage Safety

APPENDIX C: THE NAMO MAINTENANCE MODEL

This appendix contains the Naval Aviation Maintenance Office model - an IDEF-0 model of a squadron's Maintenance Department processes.

USED AT: NAVAL AVIATION MAINTENANCE OFFICE	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12 PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3 NOTES: 1 2 3 4 5 6 7 8 9 10		WORKING	READER	DATE	CONTEXT:
		XX	DRAFT			Top
			RECOMMENDED			
			PUBLICATION			

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[ ] AUTHOR

DOCUMENT NUMBER

Received ____________

Completed ____________

COPYING INSTRUCTIONS: Copies of ____ pages = ____ total

READERS	New Kit To Reader	Due Back	Comments To Author	Due Back	Response To Reader
1. CAPTAIN HANCOCK, N881					

RESPONSE REQUIRED: [ ] Fast [ ] Normal [ ] Slow [ ] None

CONTENTS:

Pg.	Node Title	C Number Status
2	A-0 PERFORM ORGANIZATIONAL LEVEL MAINTENANCE	
4	A0 PERFORM ORGANIZATIONAL LEVEL MAINTENANCE	
6	A1 MANAGE O LEVEL MAINTENANCE	
22	A2 PERFORM O LEVEL WORK CENTER FUNCTIONS	
38	A3 PERFORM O LEVEL MATERIAL CONTROL FUNCTIONS	
44	A4 PERFROM QA FUNCTIONS	
54	A5 PERFORM LOGS AND RECORDS FUNCTIONS	

COMMENTS:

[ ] Update
[ ] Replace } Model File: ____________ with this kit

NAVAL AVIATION MAINTENANCE OFFICE — NAMO

SPECIAL INSTRUCTIONS:

[ ] No author copy

____ Extra author copies

NODE: FEO	TITLE: PERFORM ORGANIZATIONAL LEVEL MAINTENANCE	NUMBER: Kit Cover

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			Top
	NOTES: (1) 2 3 4 5 6 7 8 9 10		RECOMMENDED			
			PUBLICATION			

Purpose: To Model how the Naval Aviation community presently performs Organizational Level Aircraft Maintenance processes (AS-IS).

Viewpoint: Maintenance personnel assigned to an Organizational Level Aviation Activity.

Scope: All area's of Organizational level maintenance activities that impact maintenance decisions and weapons systems reliability. These include but are not limited to Maintenance Control, Material Control, Production Work Centers, Logs and Records, and Quality Assurance.

Note:

1. Facilities; The mechanism arrow Facilities is tunneled at the A-0 node. This Mechanism is needed by each and every function in this model. Therefore it will not be shown anywhere else.

NODE: Text	TITLE: PERFORM ORGANIZATIONAL LEVEL MAINTENANCE	NUMBER: O - 1

USED AT: NAVAL AVIATION MAINTENANCE OFFICE	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12 PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3 NOTES: 1 2 3 4 5 6 7 8 9 10		WORKING	READER DATE	XT: Top
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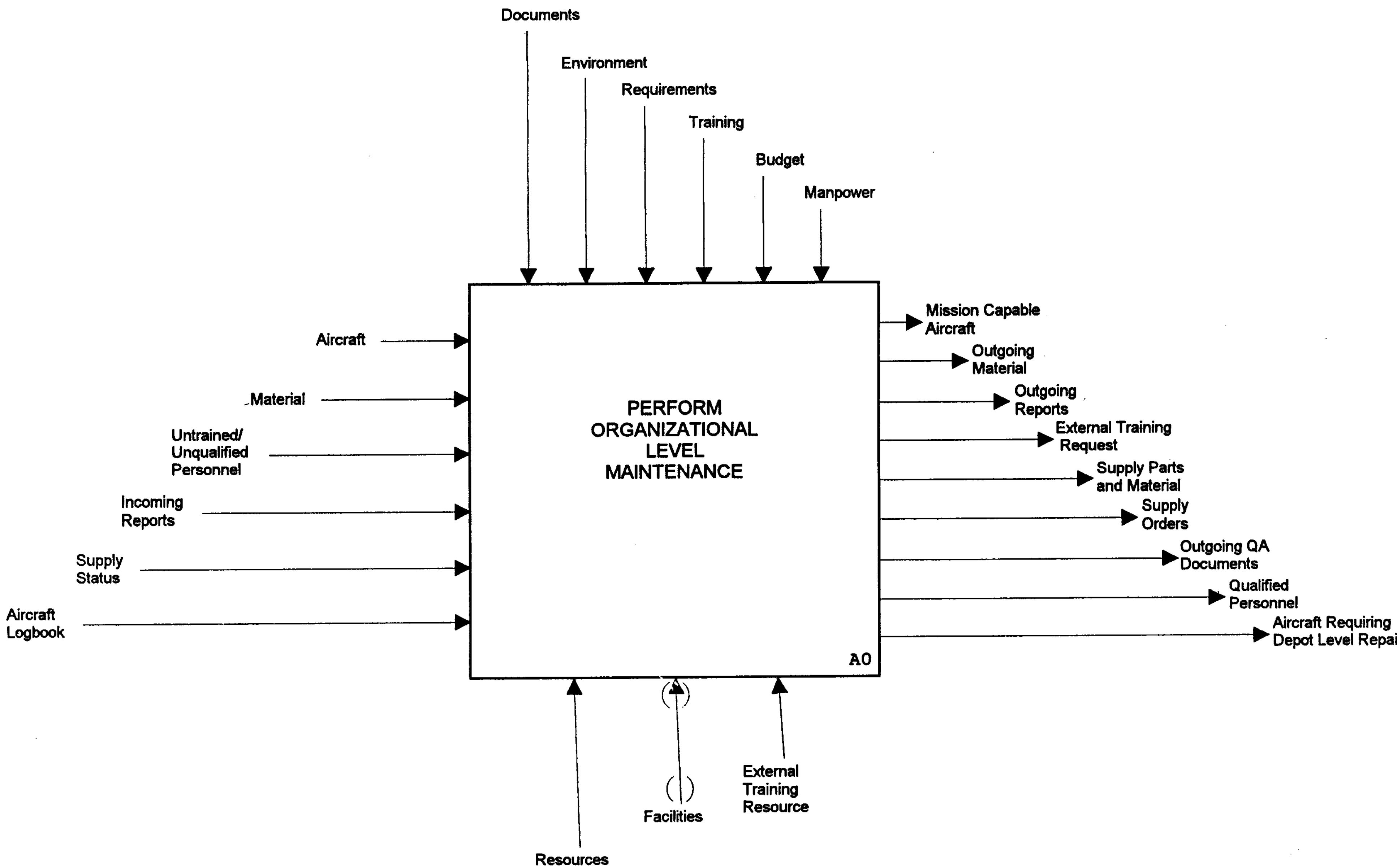

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USED AT: NAVAL AVIATION MAINTENANCE OFFICE	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12.		WORKING	READER DATE	C XT: Top
	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT		
			RECOMMENDED		
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1. Any Publication, Change to Publication, or Technical Directive issued to a work center will be accompanied by a Change Entry Certification Record (CECR).

NODE: Text	TITLE: PERFORM ORGANIZATIONAL LEVEL MAINTENANCE	NUMBER: O - 3

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM	DATE: 11/12		WORKING	READER	DATE	CONTEXT:
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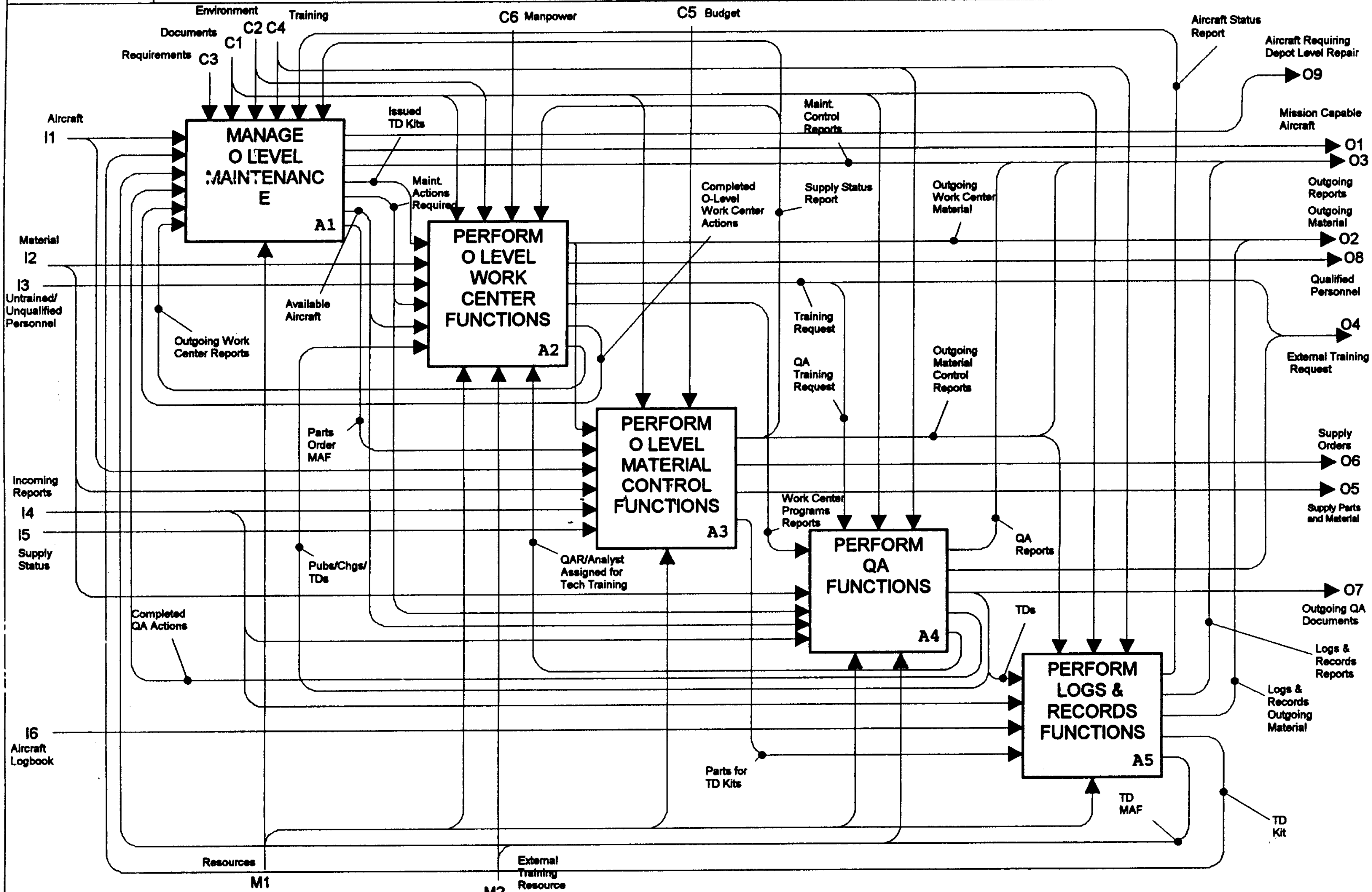


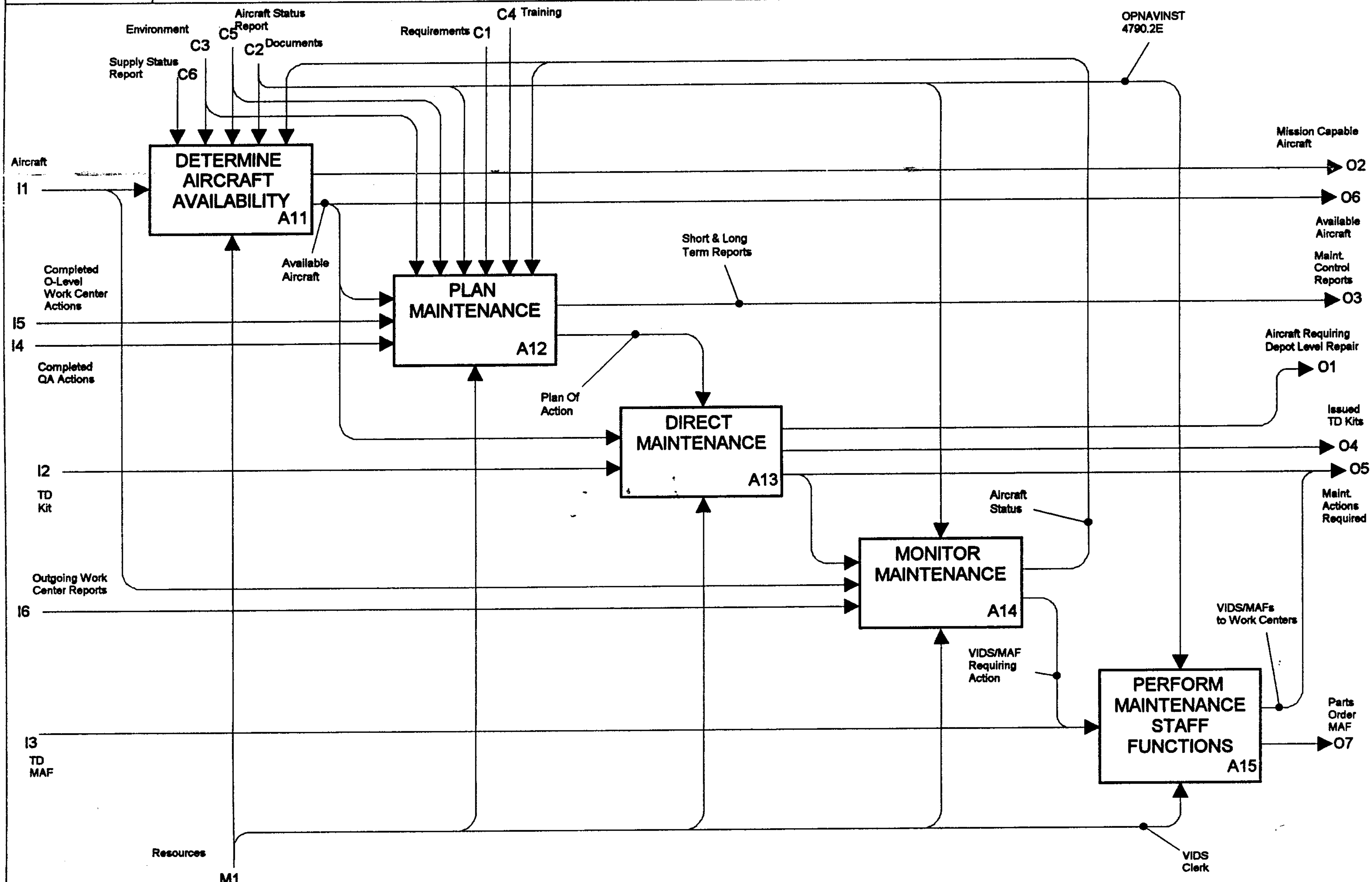
NODE: A0	TITLE: PERFORM ORGANIZATIONAL LEVEL MAINTENANCE	NUMBER: O-4

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT		Top
	NOTES: (1) 2 3 4 5 6 7 8 9 10		RECOMMENDED		
			PUBLICATION		

Monitor Maintenance; This function is an ongoing process where the maintenance cheif interacts with work centers to ensure that they have the most up to date information regarding tasks assigned to the work centers. Up to date status is critical to ensurethat maximum efficiency is maintained. This interaction allows the coordination that is required when several work centers must work in the same areas of the aircraft.

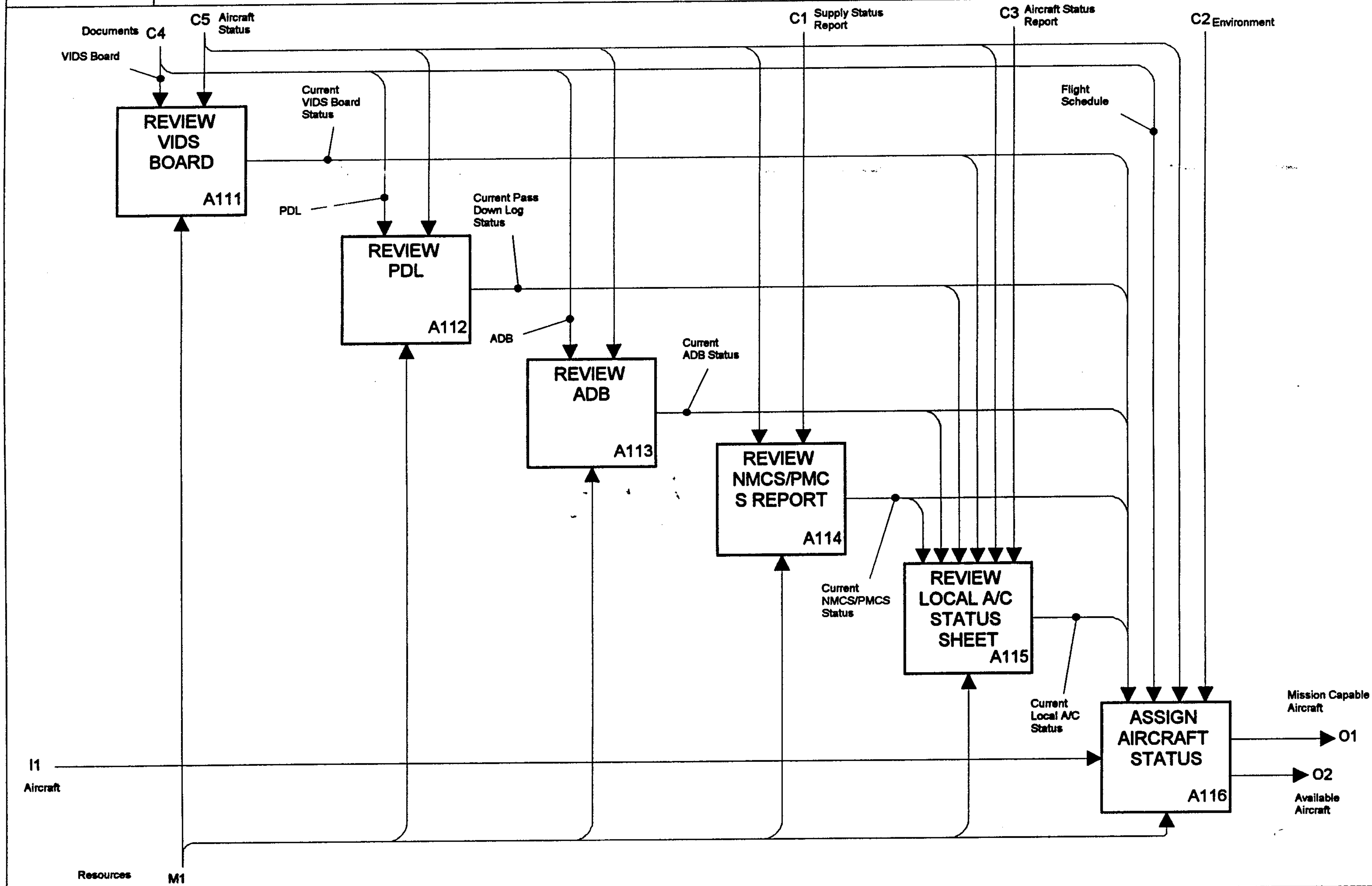
NODE: Text	TITLE: MANAGE O LEVEL MAINTENANCE	NUMBER: O - 5

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
			RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION			



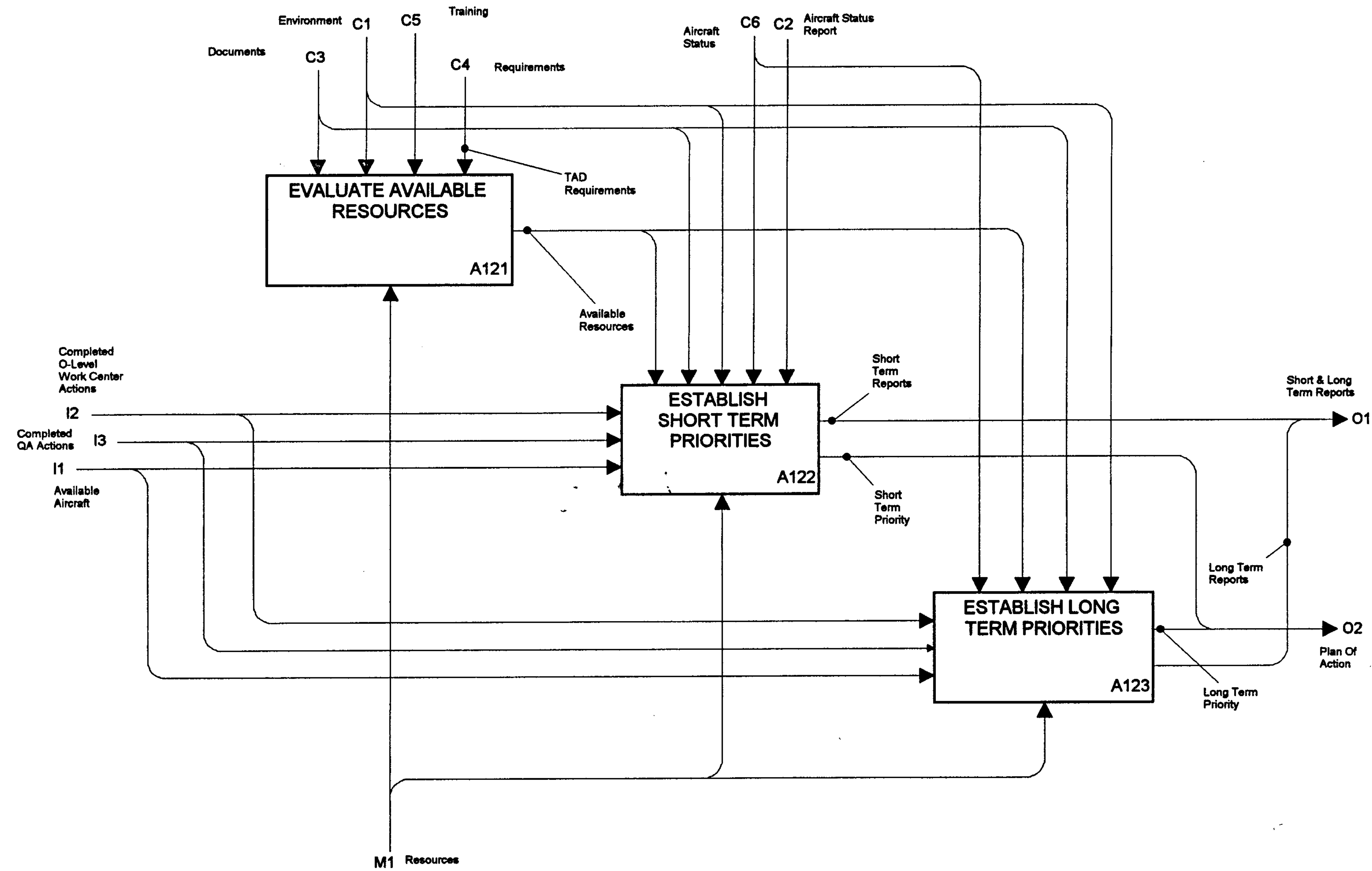
NODE: A1 TITLE: MANAGE O LEVEL MAINTENANCE NUMBER: O - 6

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
			RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION			



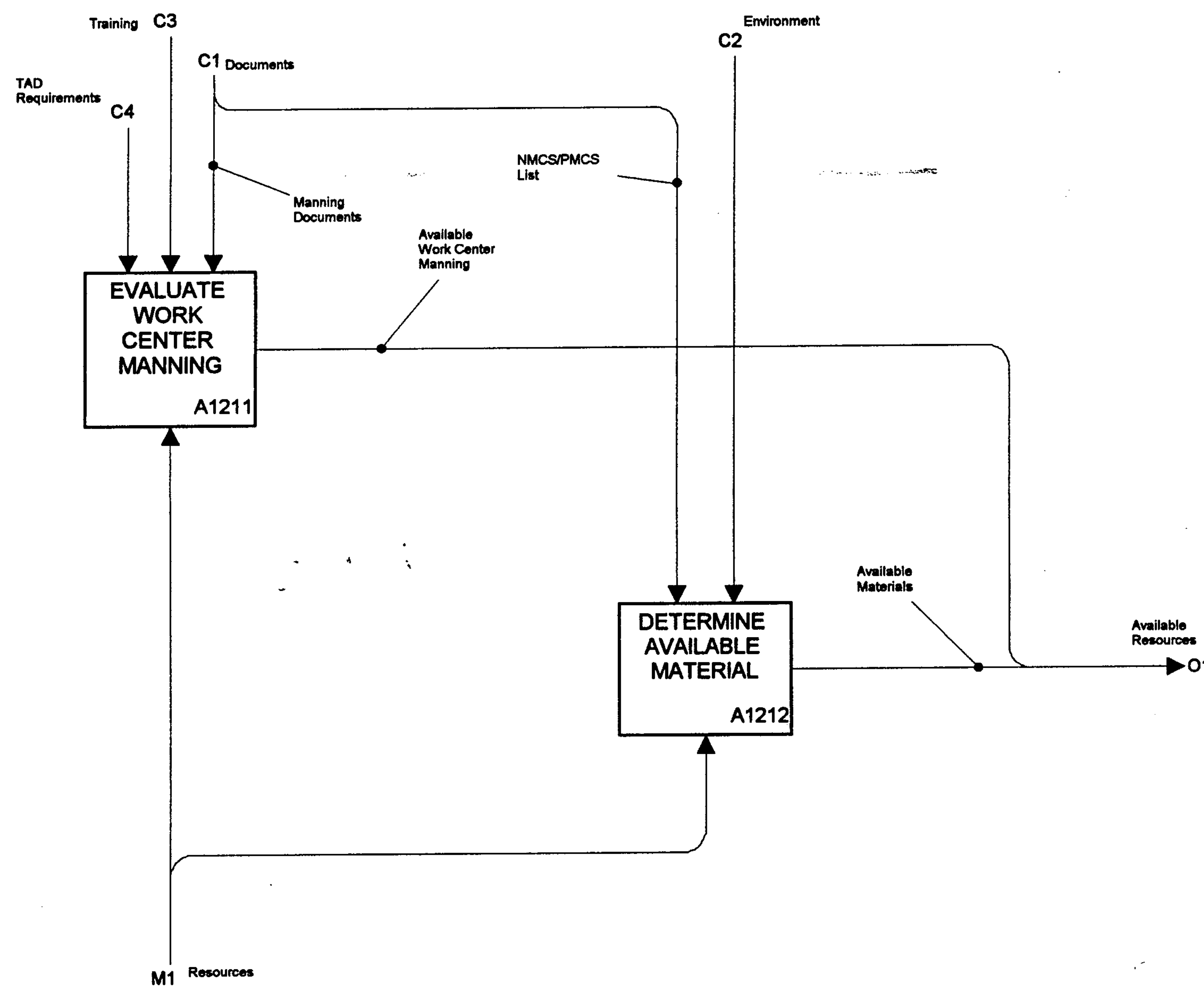
NODE: A11	TITLE: DETERMINE AIRCRAFT AVAILABILITY	NUMBER: O - 8

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM	DATE: 11/12		WORKING	READER	DATE	XT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL	REV: 3	XX	DRAFT			
				RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10			PUBLICATION			



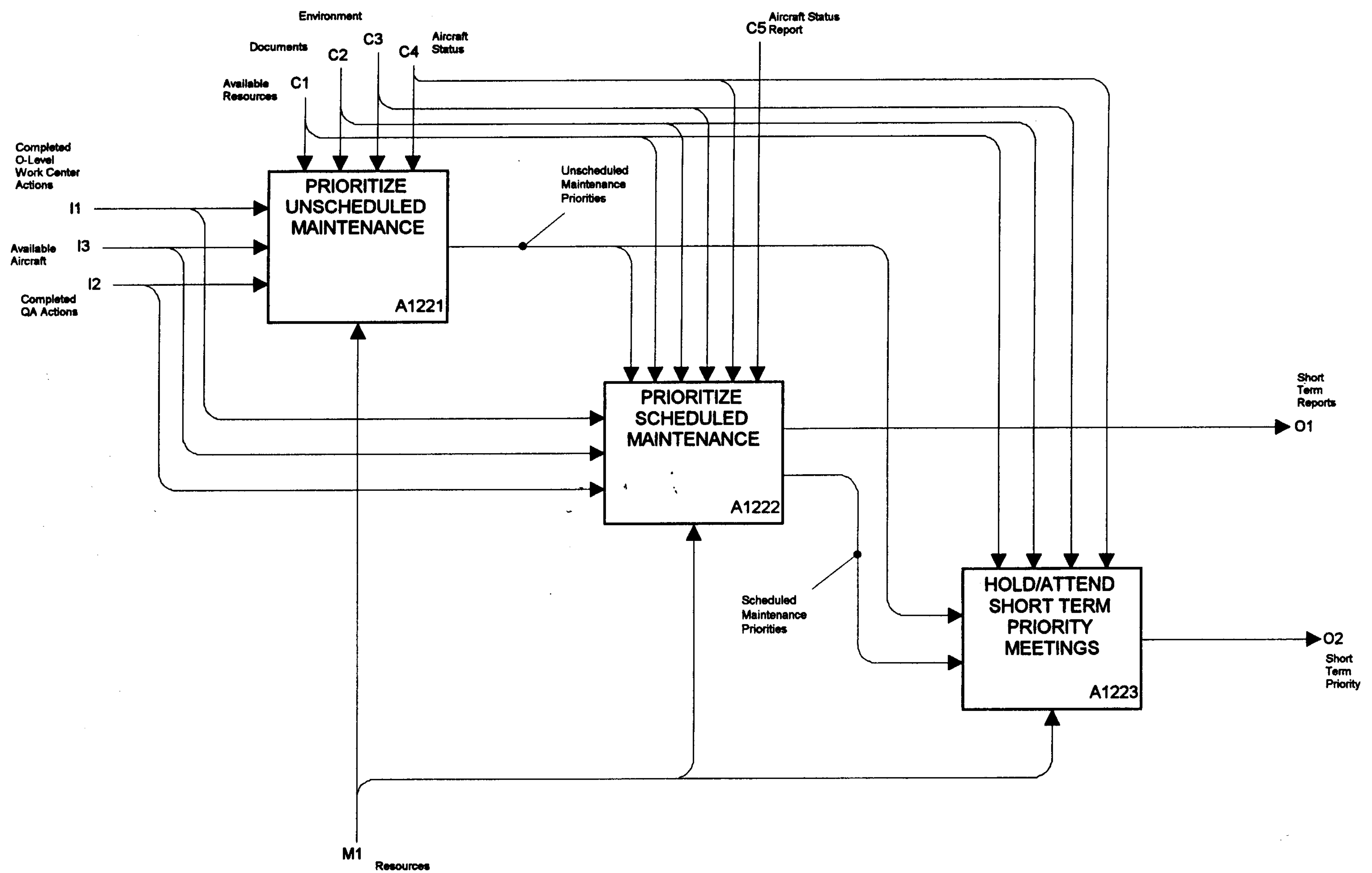
NODE: A12	TITLE: PLAN MAINTENANCE	NUMBER: O - 10

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
			RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION			



NODE: A121	TITLE: EVALUATE AVAILABLE RESOURCES	NUMBER: O - 12

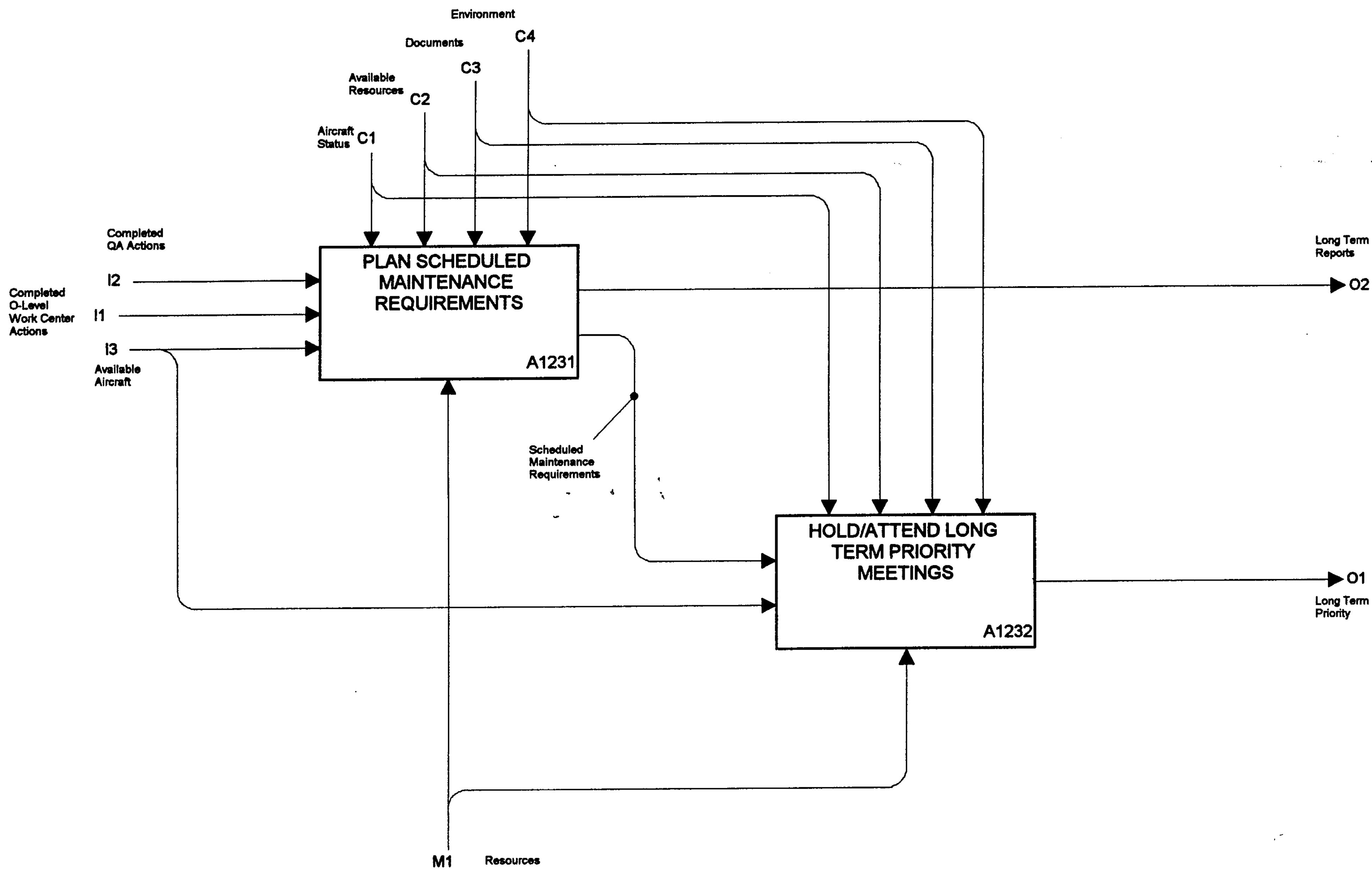
USED AT: NAVAL AVIATION MAINTENANCE OFFICE	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12 PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE REV: 3 (AS-IS) MODEL NOTES: 1 2 3 4 5 6 7 8 9 10	WORKING XX DRAFT RECOMMENDED PUBLICATION	READER DATE



A 122

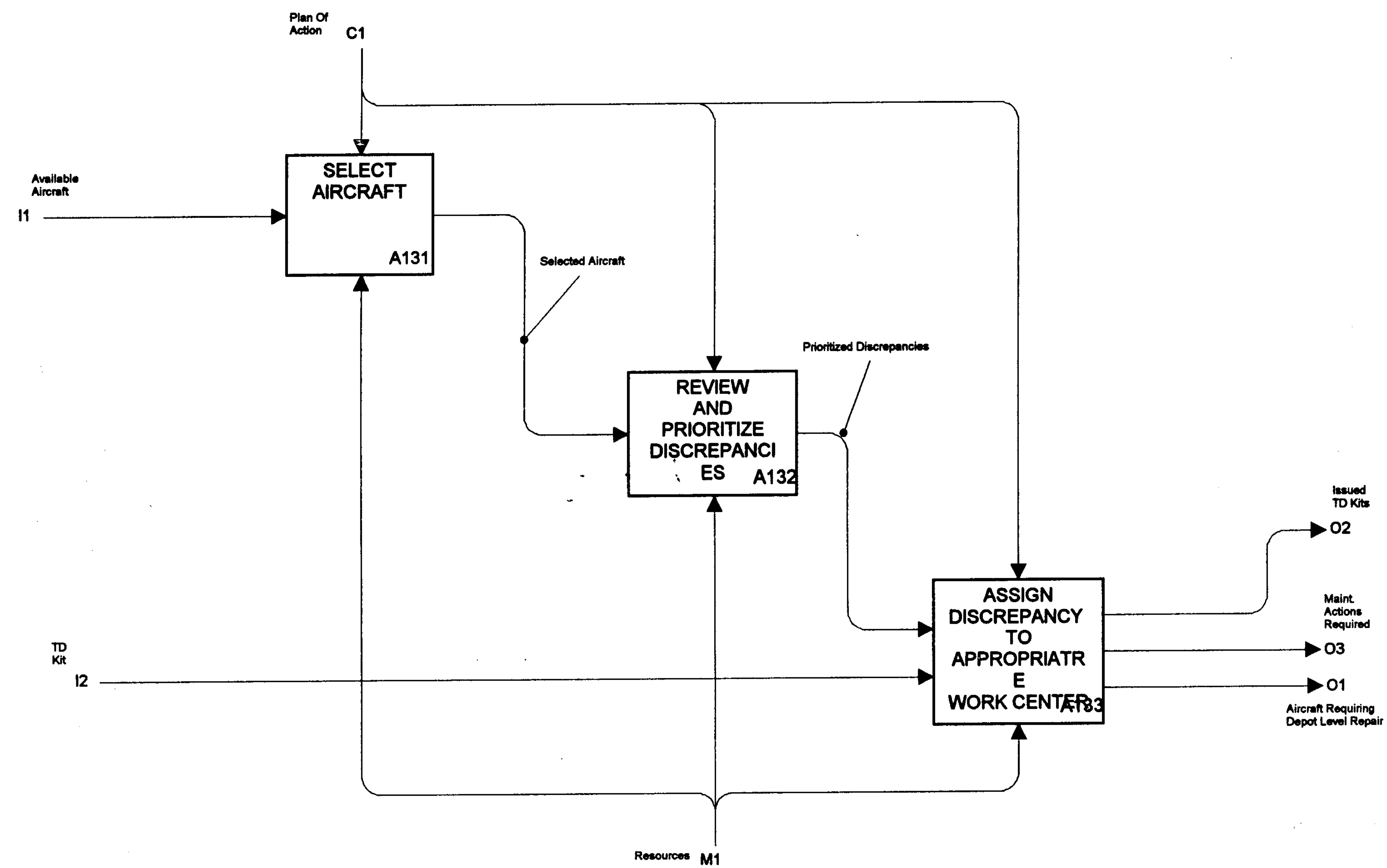
NODE: A122	TITLE: ESTABLISH SHORT TERM PRIORITIES	NUMBER: O - 14

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER	DATE	XT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10		RECOMMENDED			
			PUBLICATION			



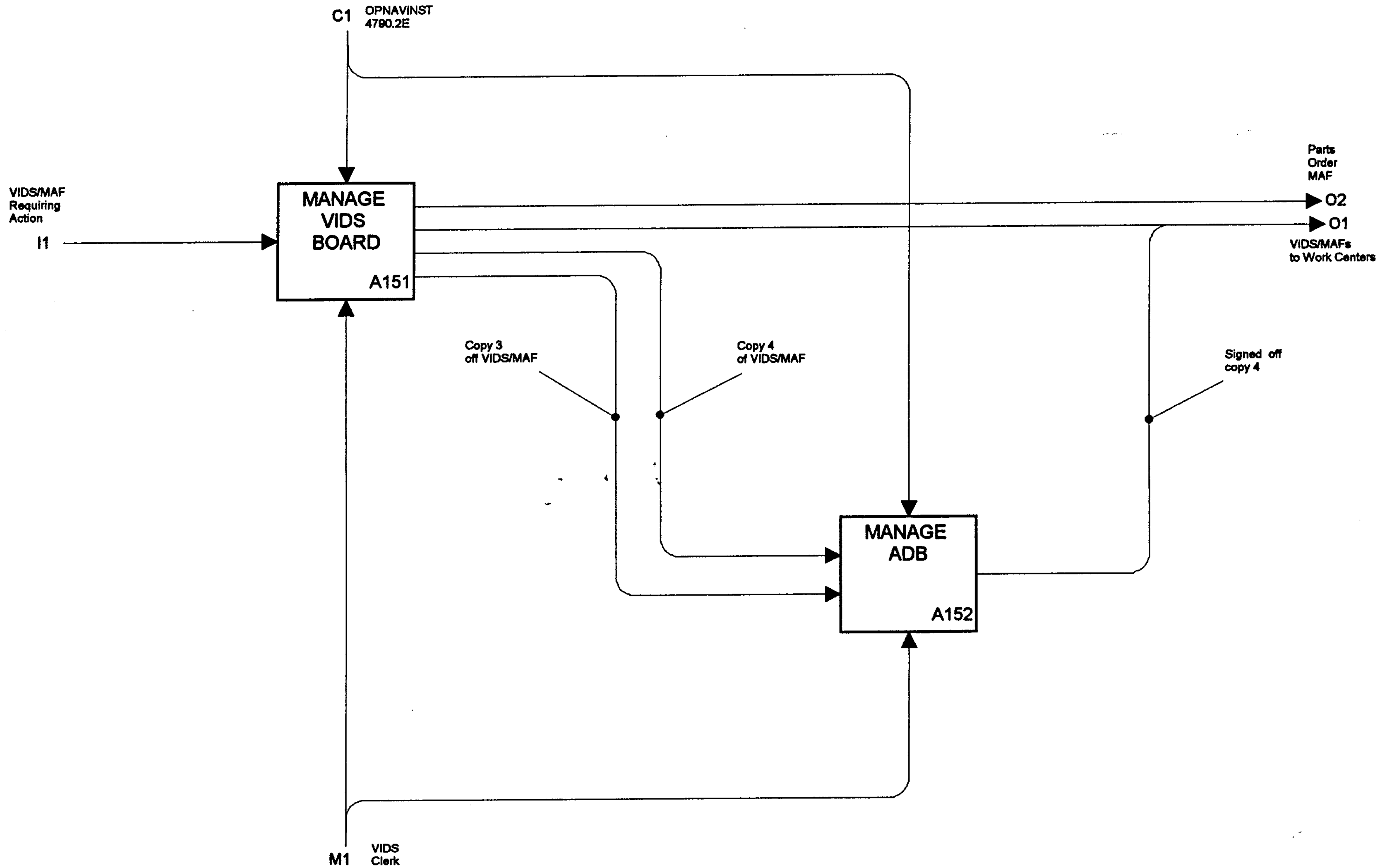
NODE: A123	TITLE: ESTABLISH LONG TERM PRIORITIES	NUMBER: O - 16

USED AT: NAVAL AVIATION MAINTENANCE OFFICE	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12/		WORKING	READER DATE
	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT	
			RECOMMENDED	
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION	



NODE: A13	TITLE: DIRECT MAINTENANCE	NUMBER: O - 18

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12/		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
			RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION			



NODE: A15	TITLE: PERFORM MAINTENANCE STAFF FUNCTIONS	NUMBER: O - 20

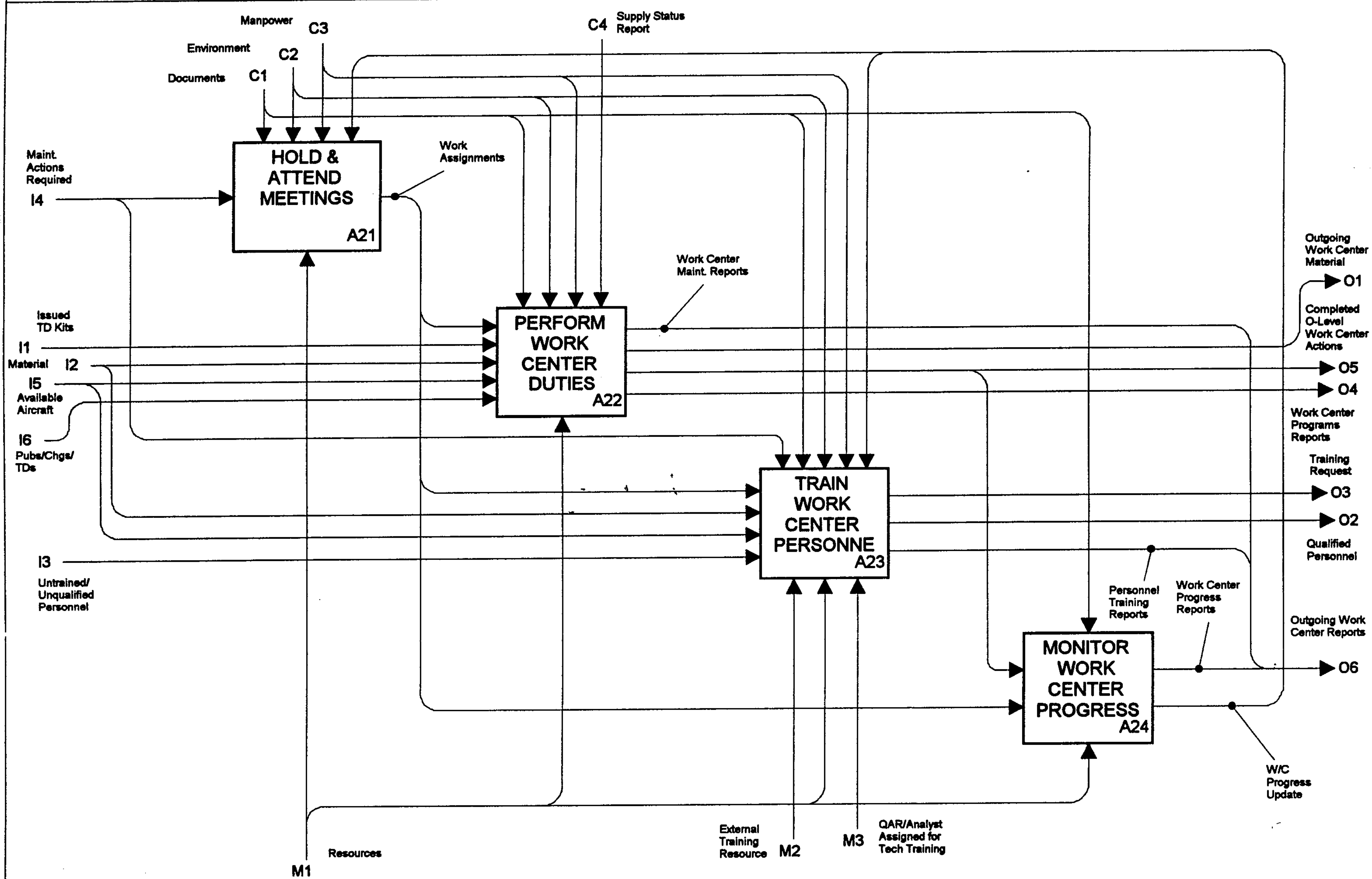
USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM	DATE: 11/12		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL	REV: 3	XX	DRAFT			Top
				RECOMMENDED			
	NOTES: (1) (2) 3 4 5 6 7 8 9 10			PUBLICATION			

1. HOLD AND ATTEND MEETINGS; Work Center Supervisors attend maintenance meetings at various times, but usually at the beginning of each shift. At these meetings the update Maintenance Control and recieve priorities from Maintenance Control. They return to respective work centers and pass information and priorities to the personnel in the work center.

2. MONITOR WORK CENTER PROGRESS; The Work Center Supervisor continiously monitors the tasks in progress by his workcenter. This is done so that the supervisor can keep Maintenance Control informed, ensure that required inspections are performed and that tasks are performed in a timely and correct manner.

NODE: Text	TITLE: PERFORM O-LEVEL WORK CENTER FUNCTIONS	NUMBER: O - 21

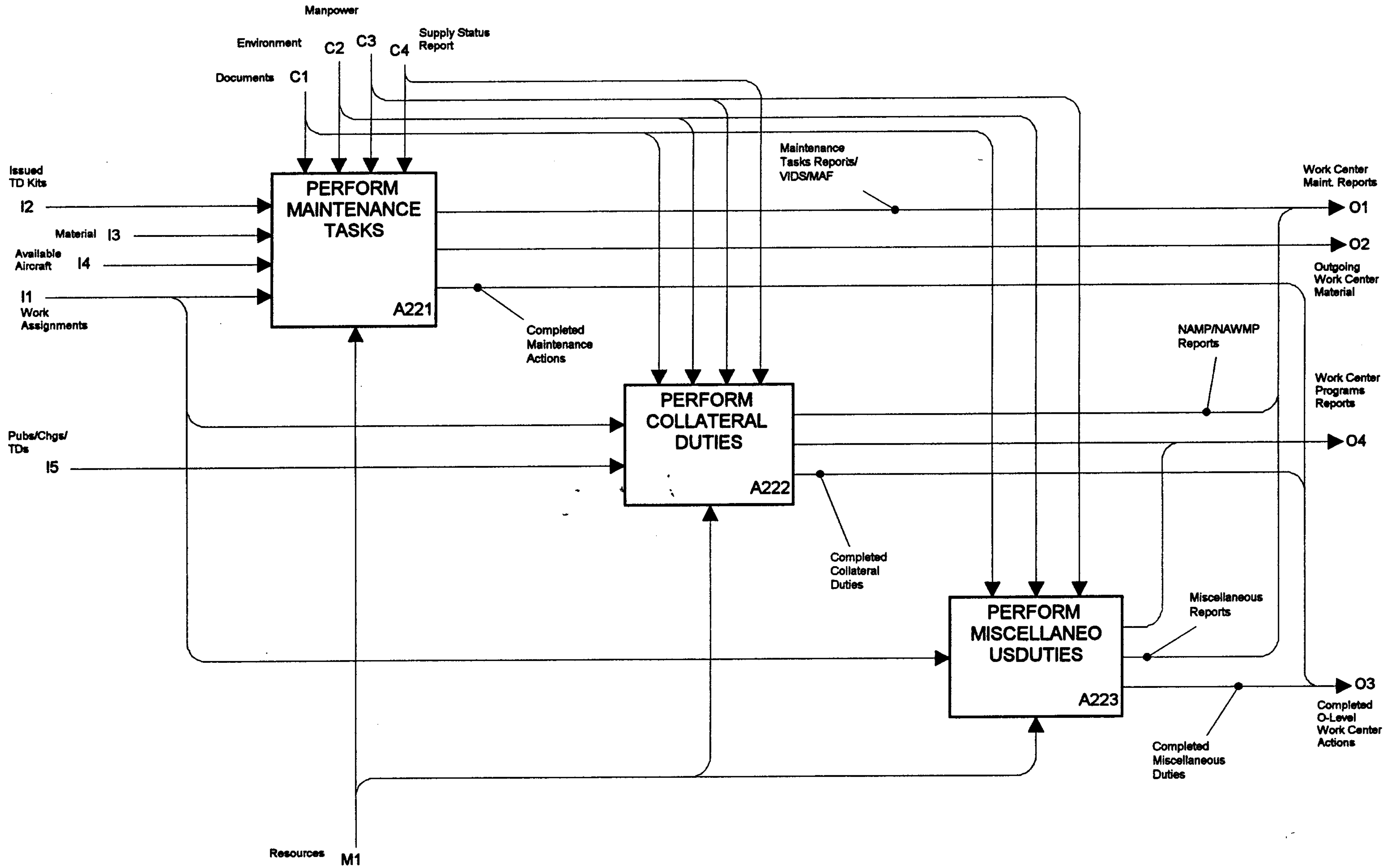
USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12/		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10		RECOMMENDED			
			PUBLICATION			



NODE: A2	TITLE: PERFORM O LEVEL WORK CENTER FUNCTIONS	NUMBER: O - 22

USED AT: NAVAL AVIATION MAINTENANCE OFFICE	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12 PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3 NOTES: 1 2 3 4 5 6 7 8 9 10		WORKING
		XX	DRAFT
			RECOMMENDED
			PUBLICATION

READER DATE CONTEXT:



NODE: A22 | TITLE: PERFORM WORK CENTER DUTIES | NUMBER: O-24

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT		Top
	NOTES: (1) (2) 3 4 5 6 7 8 9 10		RECOMMENDED		
			PUBLICATION		

1. THIS FEO IS ILLUSTRATIVE OF THE HANDLING OF HAZARDOUS MATERIAL AT THE ORGANIZATIONAL LEVEL. IT DOES NOT SHOW HOW EACH AND EVERY ACTIVITY ACCOMPLISHES THIS, BUT SHOWS THE GENERAL MANNER IN WHICH HAZMAT/HAZWASTE IS HANDLED.

2. THE FOLLOWING IS A LIST OF TERMS USED ON THE MANAGEMENT OF HAZMAT FEO PAGE:

HAZARDOUS MATERIALS - ANY MATERIAL THAT COULD CAUSE HARM TO THE ENVIRONMENT.

LOCAL BASE INSTRUCTIONS - LOCALLY GENERATED INSTRUCTIONS GOVERNING THE MANAGE OF HAZMAT.

LOCAL HAZMAT SPILL REPORT - A REPORT TO LOCAL AUTHORITIES OUTLINING SPILLS OF HAZMAT, ACTIONS TAKEN AND IMPACT TO THE ENVIRONMENT.

HAZMAT INVENTORY - THE CURRENT INVENTORY OF HAZMAT HELD BY AN ORGANIZATION.

RECEIVED HAZMAT - HAZMAT RECEIVED FROM THE HAZMART.

W/C HAZWASTE - HAZARDOUS WASTE PLACED IN THE HAZWASTE SITE AWAITING PROCESSING BY PUBLIC WORKS.

HAZMAT COORDINATOR - THE INDIVIDUAL ASSIGNED TO ENSURE PROPER OPERATION OF THE HAZMAT PROGRAM.

FACILITY - THE DEDICATED HAZWASTE SITE. AN AREA SET ASIDE FOR TEMPORARY STORAGE OF HAZWASTE, ALSO THIS INCLUDES APPROVED LOCKERS USED TO STORE HAZARDOUS MATERIALS PRIOR TO USE.

HAZMAT ORDER REQUISITION - THE DEMAND FROM AN ACTIVITY TO THE HAZMART FOR HAZARDOUS MATERIALS.

DISPOSED WASTE INVENTORY - A LISTING OF HAZWASTE THAT HAS BEEN PLACED IN THE HAZWASTE SITE FOR PROCESSING.

LOG SHEET (1348) - THE METHOD OF TRACKING HAZWASTE THAT HAS BEEN DISPOSED OF.

W/C DAILY HAZMAT ISSUE - A WORK CENTER IS ISSUED 1 DAYS SUPPLY OF THE HAZARDOUS MATERIALS REQUIRED FOR ASSIGNED TASKS.

HAZWASTE - WASTE MATERIALS WHICH IF NOT DISPOSED OF PROPERLY WILL HARM THE ENVIRONMENT.

STORED HAZMAT - HAZMAT THAT IS AWAITING USE AND STORED IN APPROVED STORAGE AREAS.

ORDER & RECEIVE HAZARDOUS MATERIAL - HAZMAT IS ORDERED ON AN AS NEEDED BASIS AND RECEIVED BY A SINGLE POINT OF CONTACT WITHIN AN ACTIVITY.

LOG HAZARDOUS MATERIALS - A TRACKING LOG IS MAINTAINED TO ENSURE EACH COMMAND KNOWS EXACTLY WHAT MATERIALS IT HAS ON HAND.

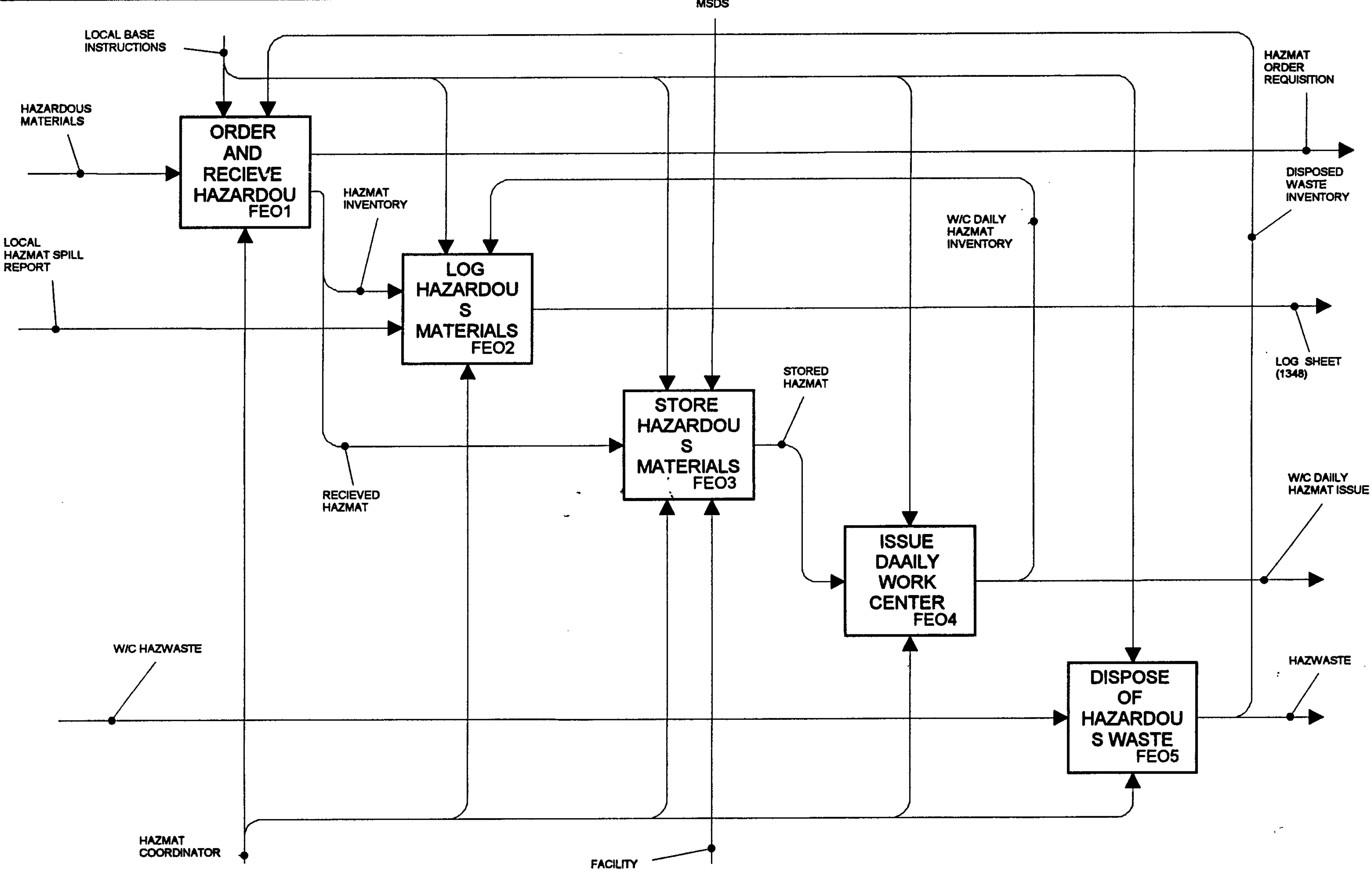
STORE HAZARDOUS MATERIALS - HAZARDOUS MATERIALS MUST BE STORED IN APPROVED STORAGE AREAS TO PREVENT INADVERTANT RELEASE INTO THE ENVIRONMENT.

ISSUE DAILY WORK CENTER HAZARDOUS MATERIAL - WORK CENTERS ARE ISSUED ONE DAYS SUPPLY OF REQUIRED HAZARDOUS MATERIALS.

DISPOSE OF HAZARDOUS WASTE - HAZARDOUS WASTE IS STORED AT A LOCAL SITE UNTIL BASE HAZMAT PERSONNEL CAN PROCESS IT FOR ACTUAL DISPOSAL.

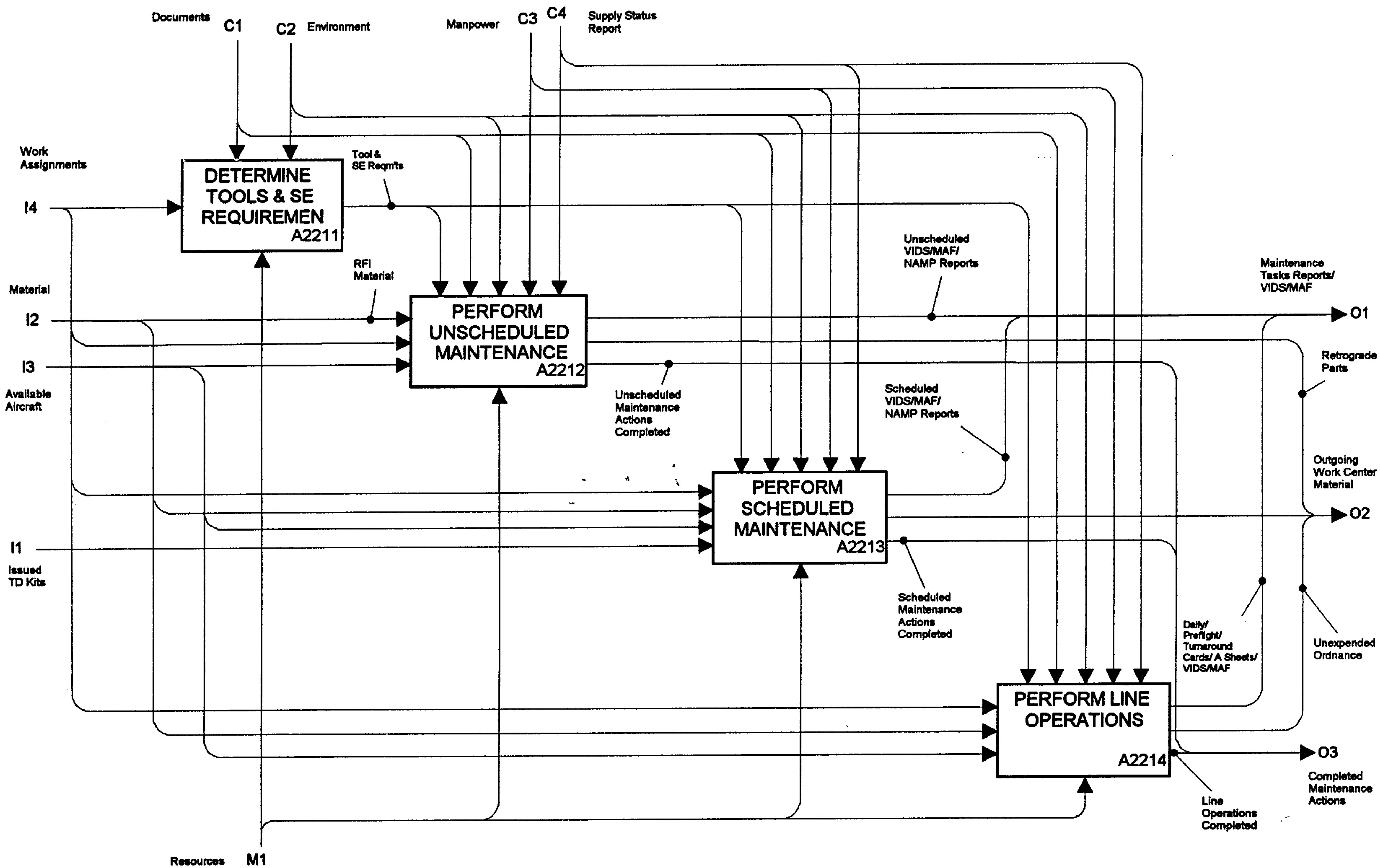
NODE: Text	TITLE: MANAGEMENT OF HAZARDOUS MATERIALS	NUMBER: O - 25

USED AT: NAVAL AVIATION MAINTENANCE OFFICE	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12/		WORKING	READER DATE	CONTEXT:
	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT		Top
	NOTES: 1 2 3 4 5 6 7 8 9 10		RECOMMENDED		
			PUBLICATION		



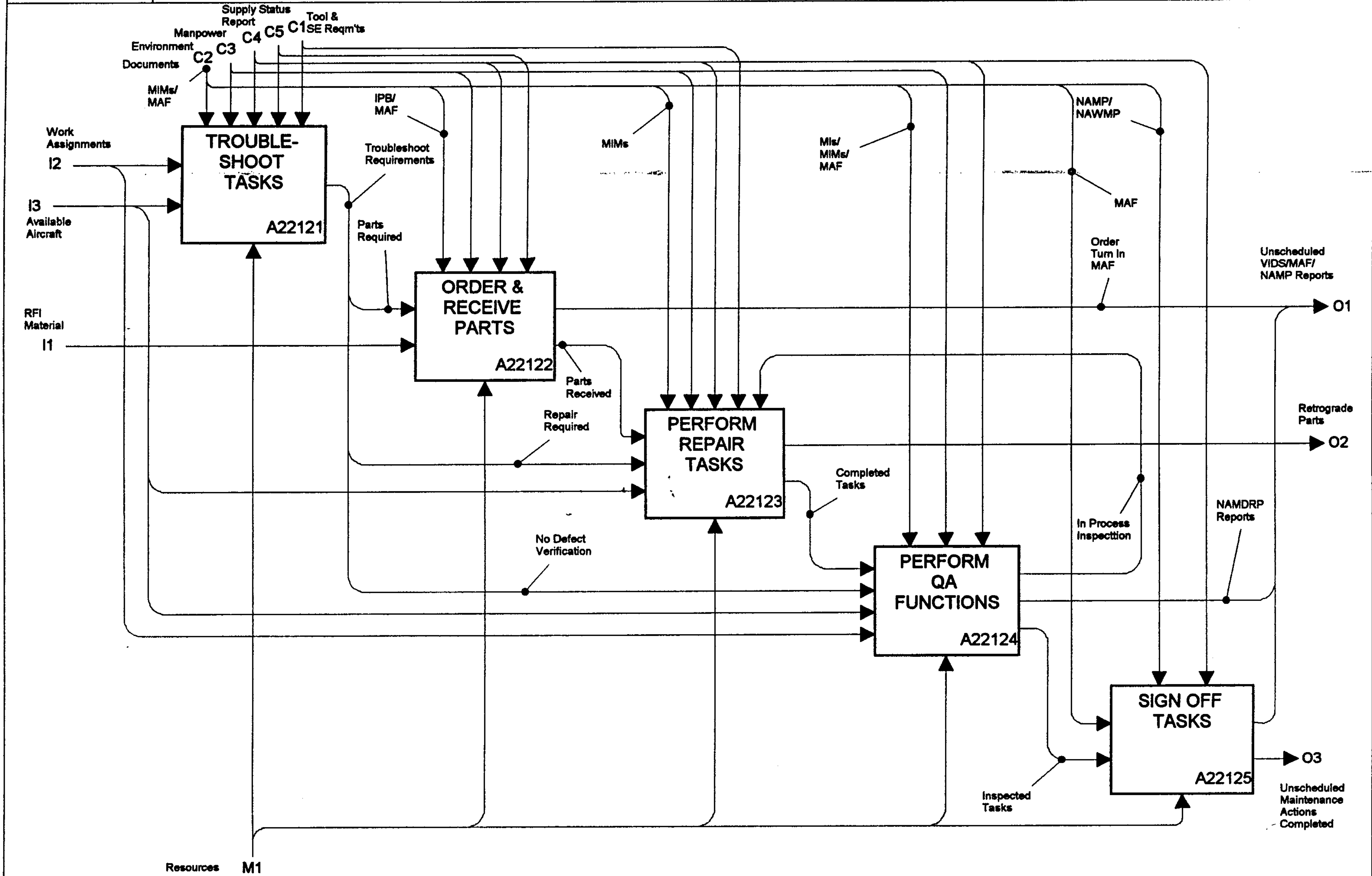
NODE: FEO	TITLE: MANAGEMENT OF HAZARDOUS MATERIALS	NUMBER: O - 26

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12.		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10		RECOMMENDED			
			PUBLICATION			



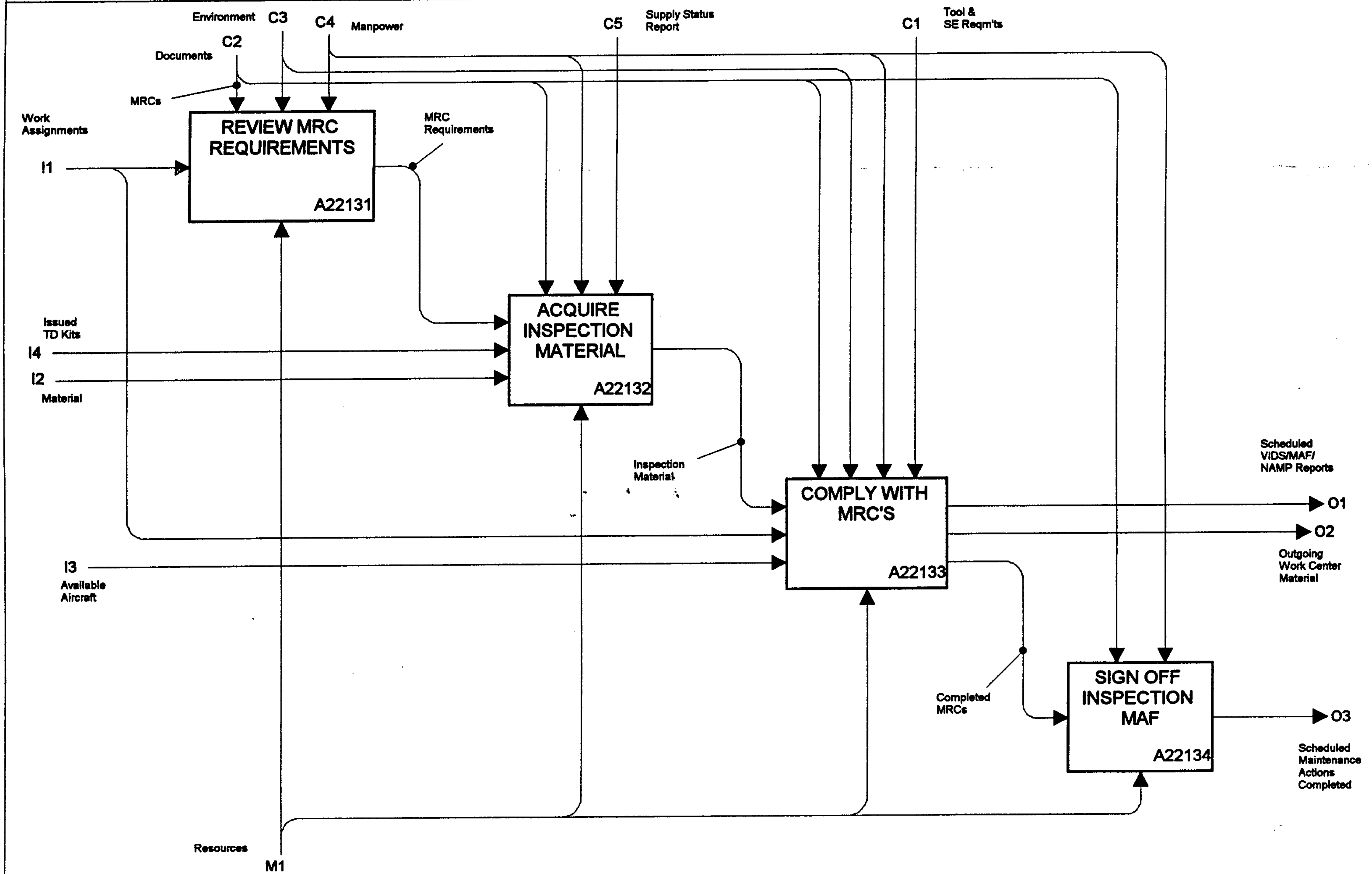
NODE: A221	TITLE: PERFORM MAINTENANCE TASKS	NUMBER: O - 28

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM	DATE: 11/12		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL	REV: 3	XX	DRAFT			
				RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10			PUBLICATION			



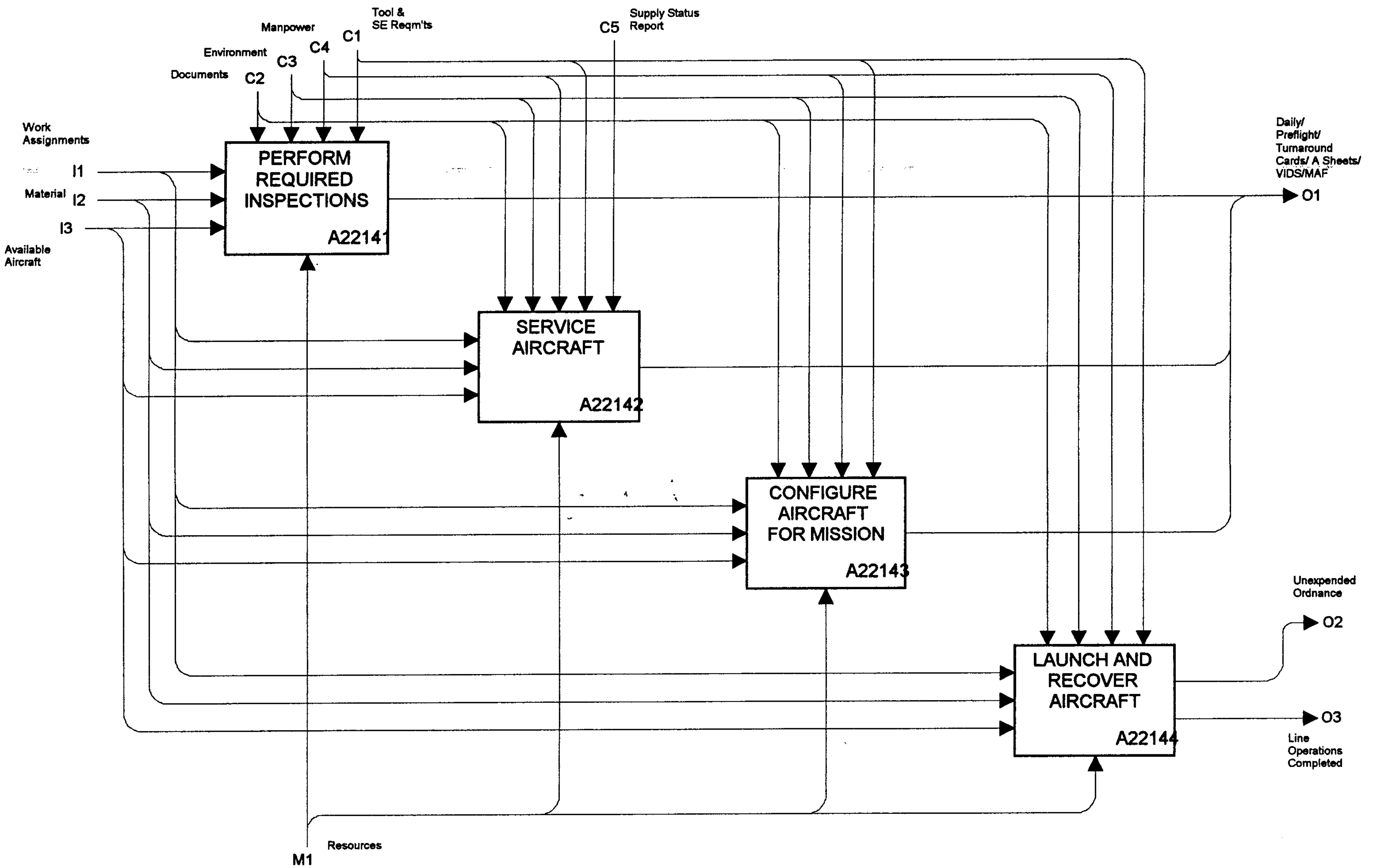
NODE: A2212	TITLE: PERFORM UNSCHEDULED MAINTENANCE	NUMBER: O - 30

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
			RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION			



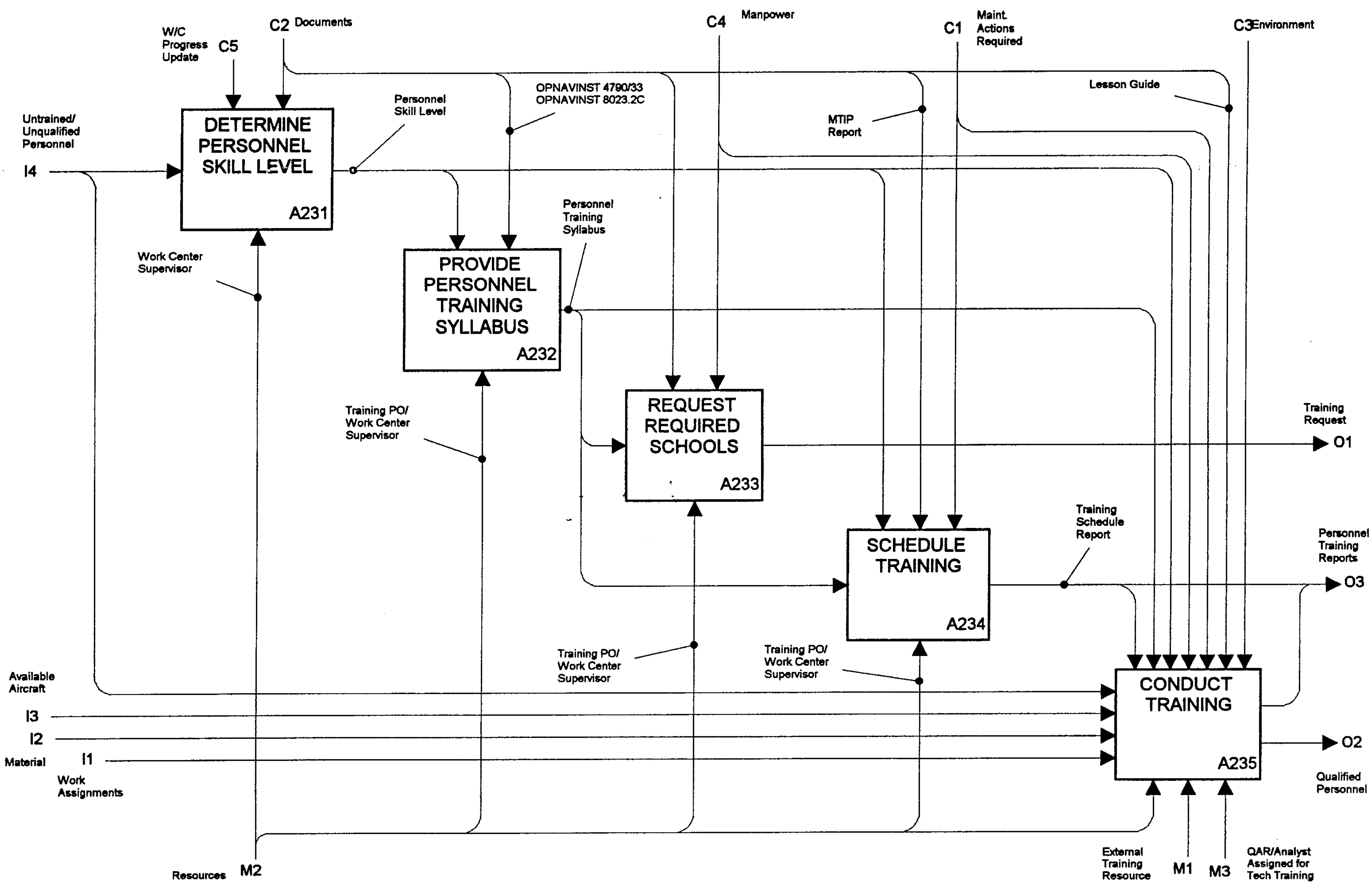
NODE: A2213	TITLE: PERFORM SCHEDULED MAINTENANCE	NUMBER: O - 32

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
			RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION			



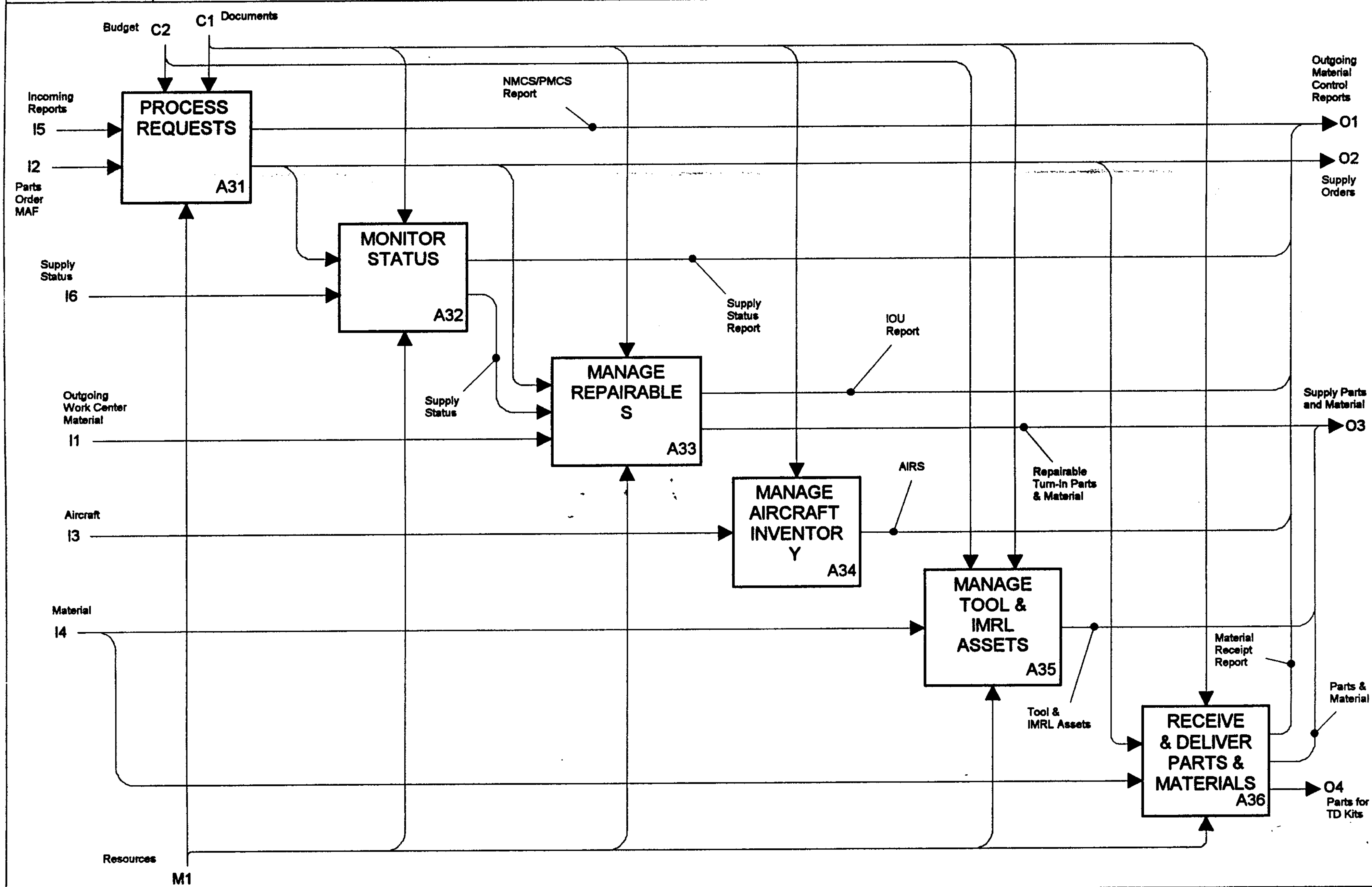
NODE: A2214	TITLE: PERFORM LINE OPERATIONS	NUMBER: O - 34

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12.		WORKING	READER DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT		
			RECOMMENDED		
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION		



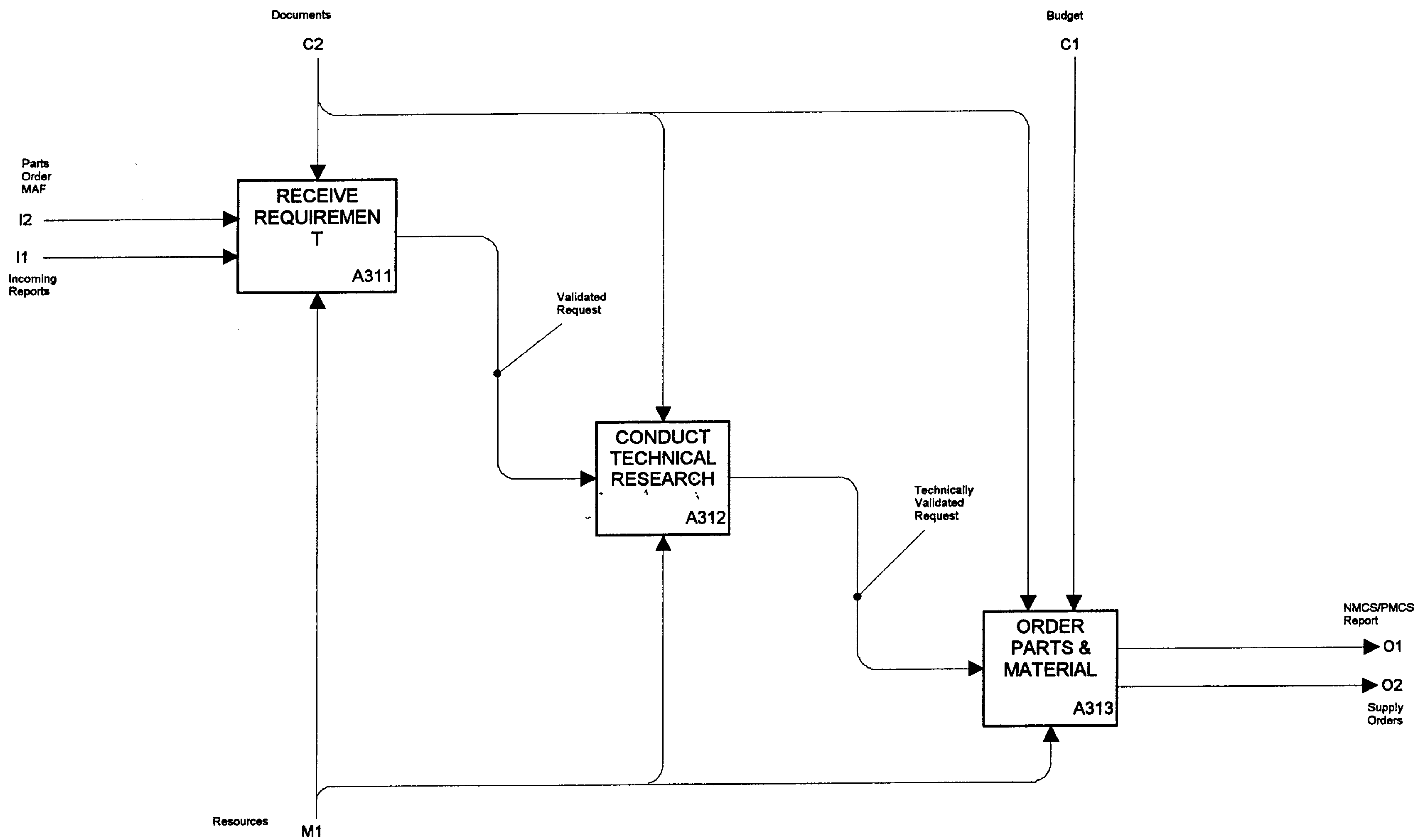
NODE: A23	TITLE: TRAIN WORK CENTER PERSONNEL	NUMBER: O - 36

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12	WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10	RECOMMENDED			
		PUBLICATION			



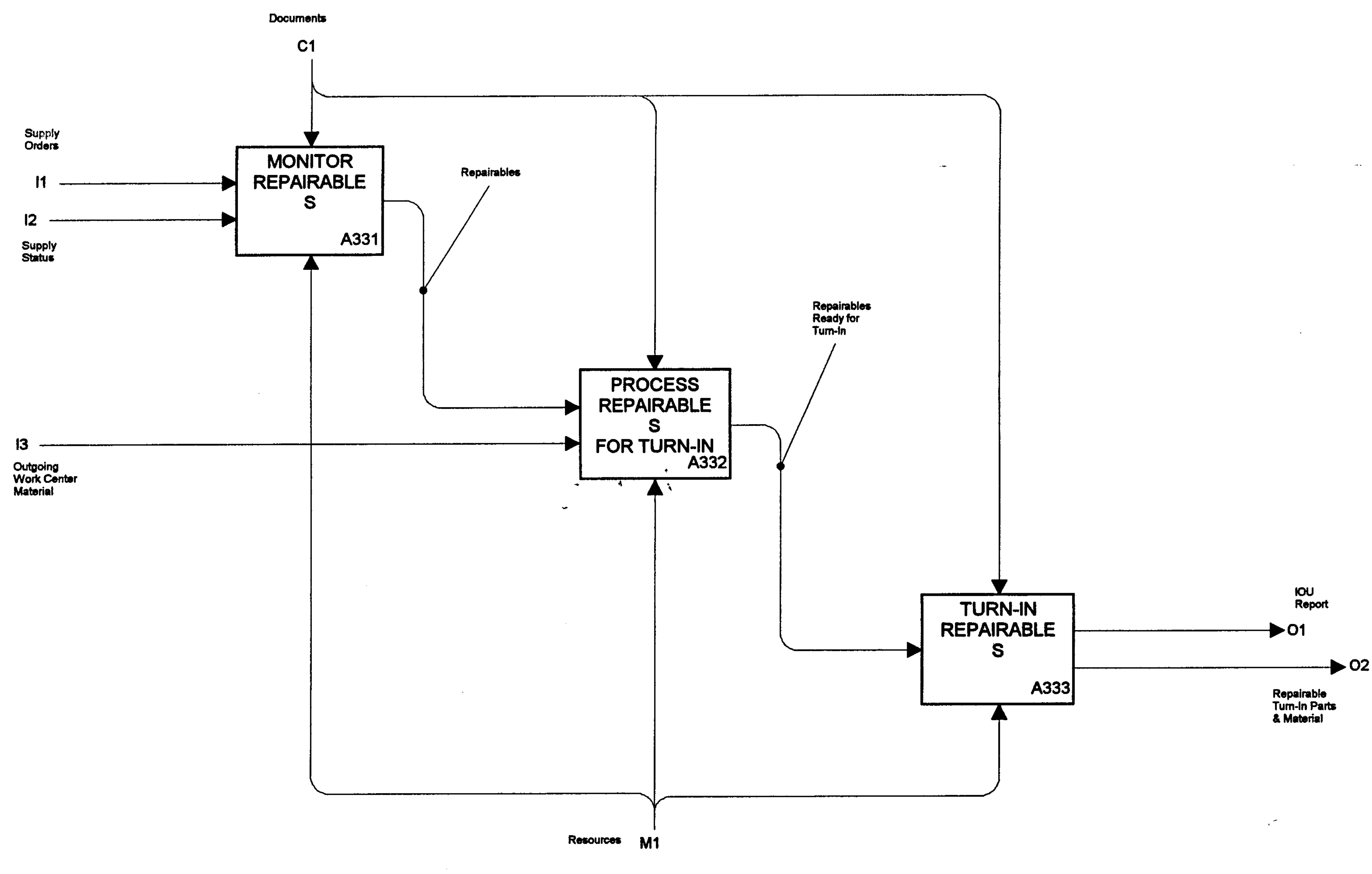
NODE: A3	TITLE: PERFORM O LEVEL MATERIAL CONTROL FUNCTIONS	NUMBER: O - 38

USED AT: NAVAL AVIATION MAINTENANCE OFFICE	AUTHOR: ORGANIZATIONAL MODELING TEAM	DATE: 11/12.	WORKING	READER DATE
	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL	REV: 3	XX DRAFT	
	NOTES: 1 2 3 4 5 6 7 8 9 10		RECOMMENDED	
			PUBLICATION	



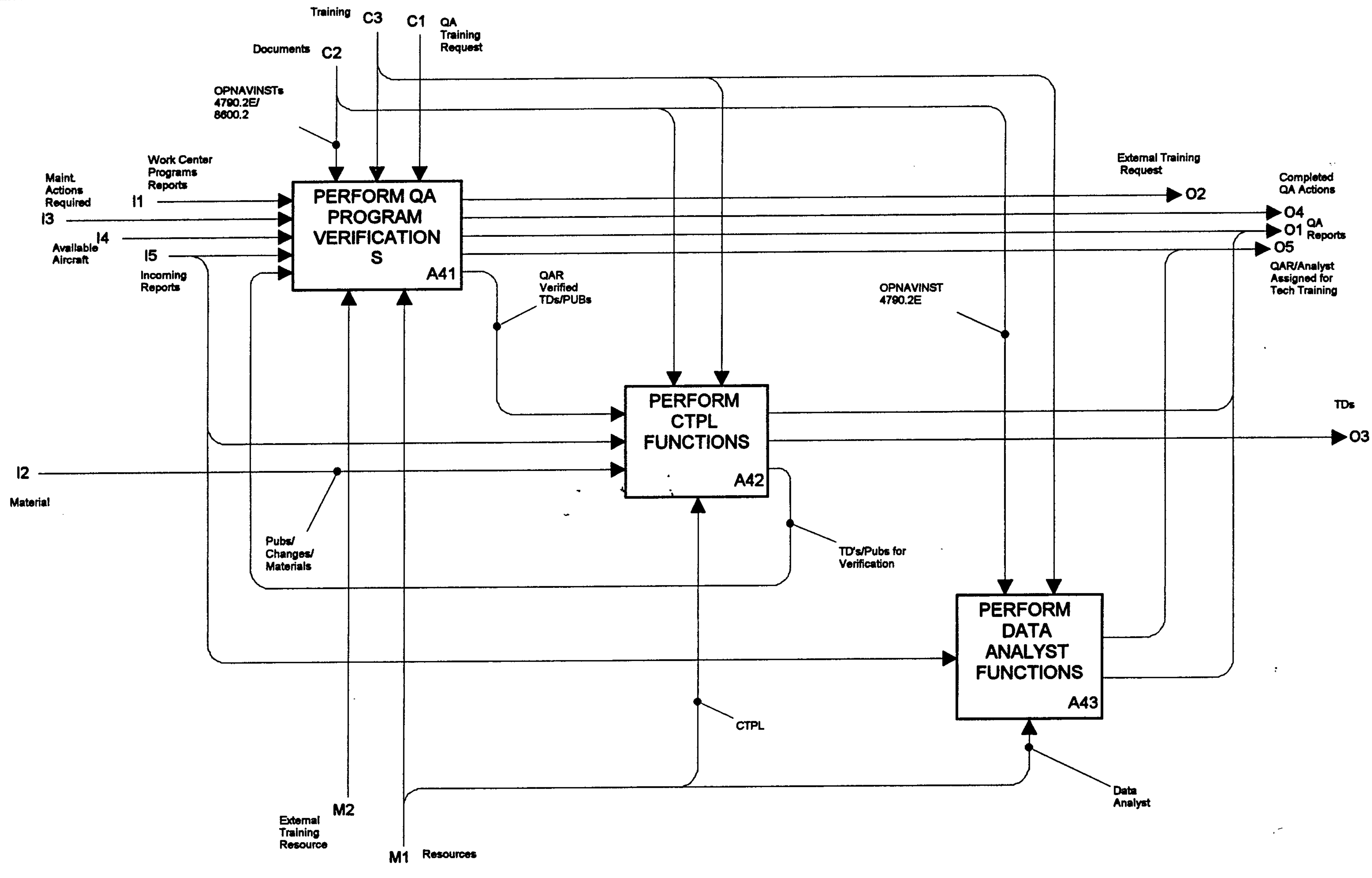
NODE: A31	TITLE: PROCESS REQUESTS	NUMBER: O - 40

USED AT: NAVAL AVIATION MAINTENANCE OFFICE	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12.		WORKING	READER	DATE
	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT		
			RECOMMENDED		
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION		



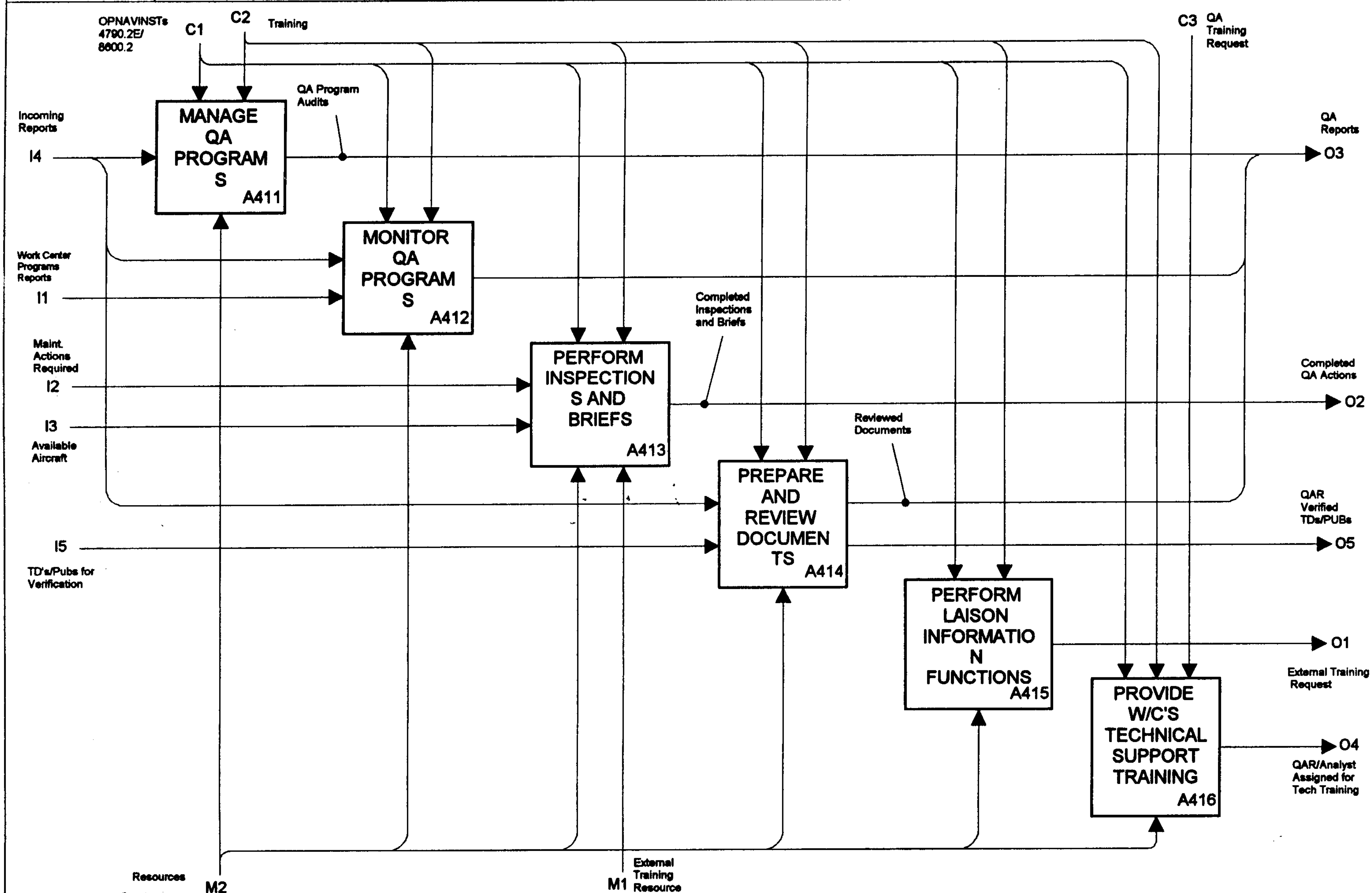
NODE: A33	TITLE: MANAGE REPAIRABLES	NUMBER: O - 42

USED AT: NAVAL AVIATION MAINTENANCE OFFICE	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12 PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3 NOTES: 1 2 3 4 5 6 7 8 9 10		WORKING	READER DATE
		XX	DRAFT	
			RECOMMENDED	
			PUBLICATION	



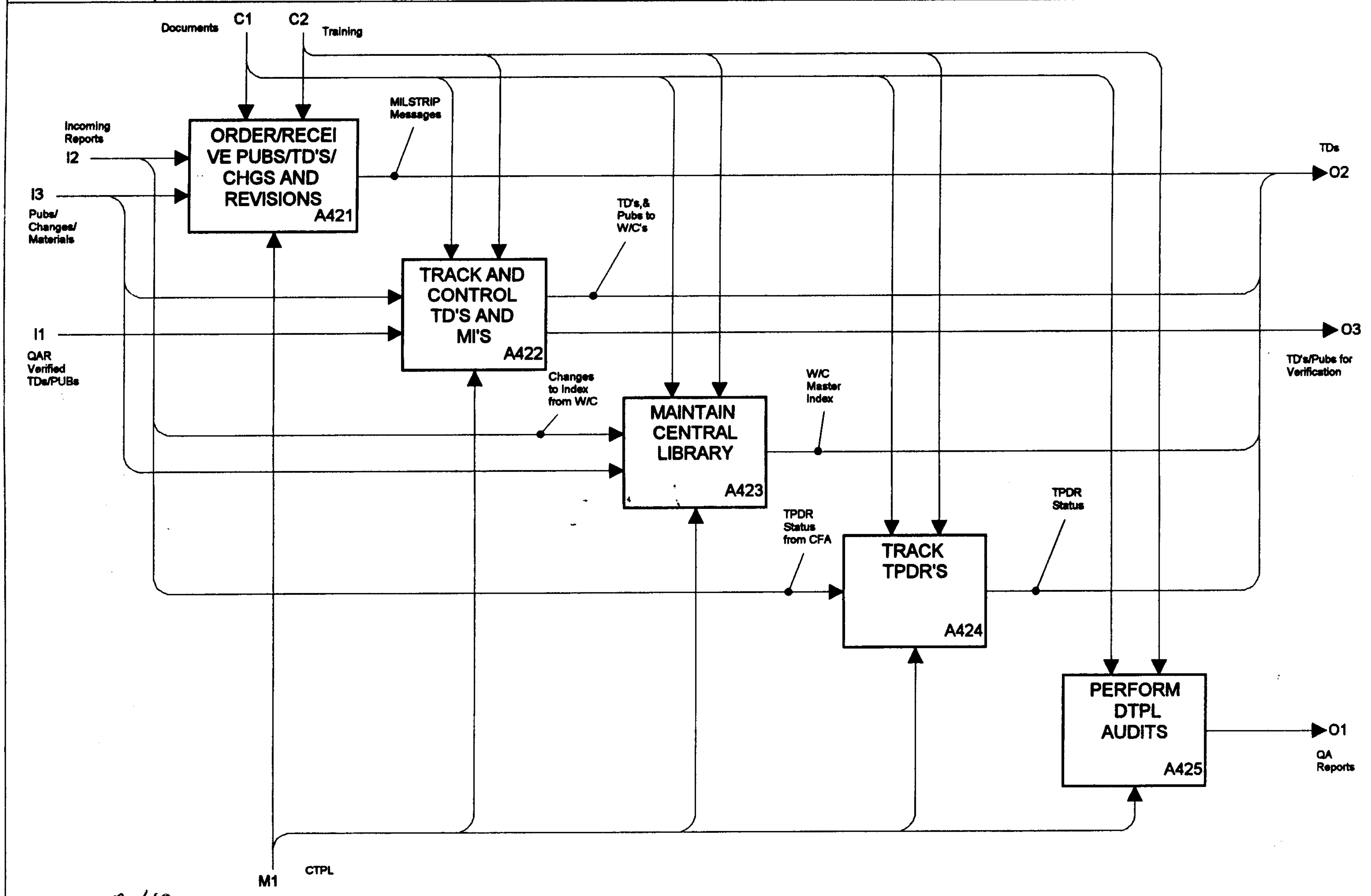
NODE: A4	TITLE: PERFORM QA FUNCTIONS	NUMBER: O - 44

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER	DATE	XT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
			RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION			



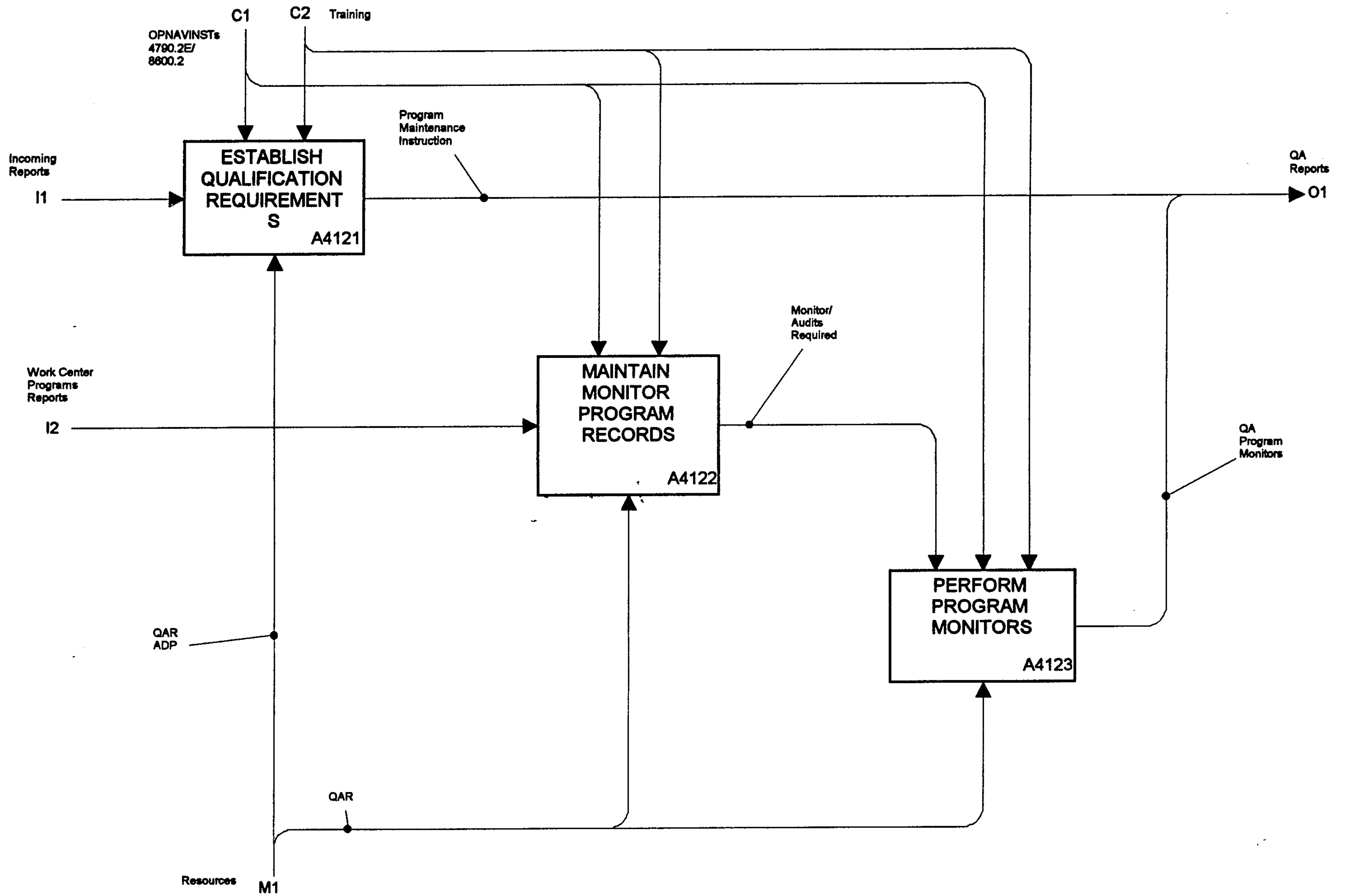
NODE: A-41	TITLE: PERFORM QA PROGRAM VERIFICATIONS	NUMBER: O - 46

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
			RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION			



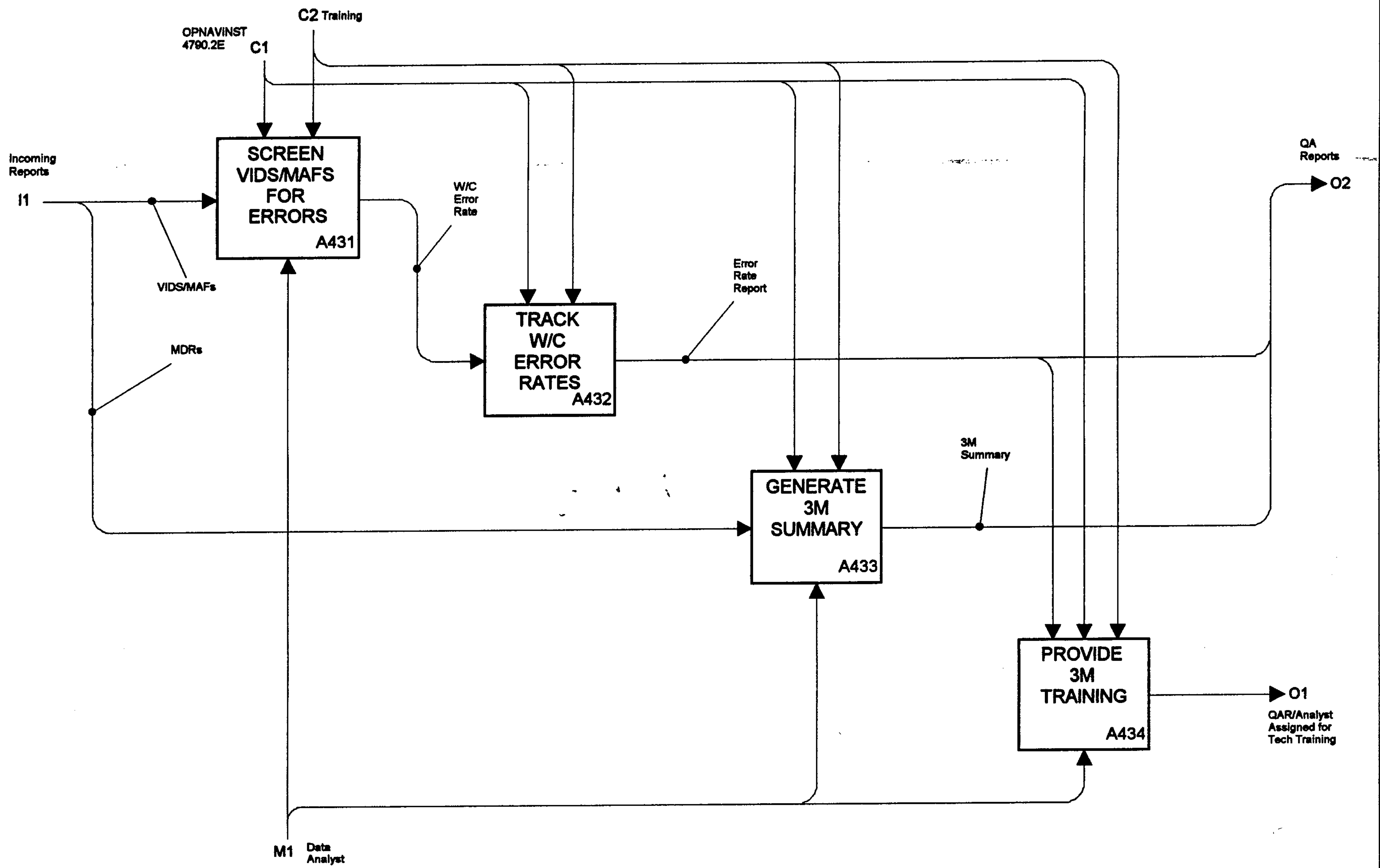
NODE: A42 | TITLE: PERFORM CTPL FUNCTIONS | NUMBER: O - 50

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12.		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10		RECOMMENDED			
			PUBLICATION			



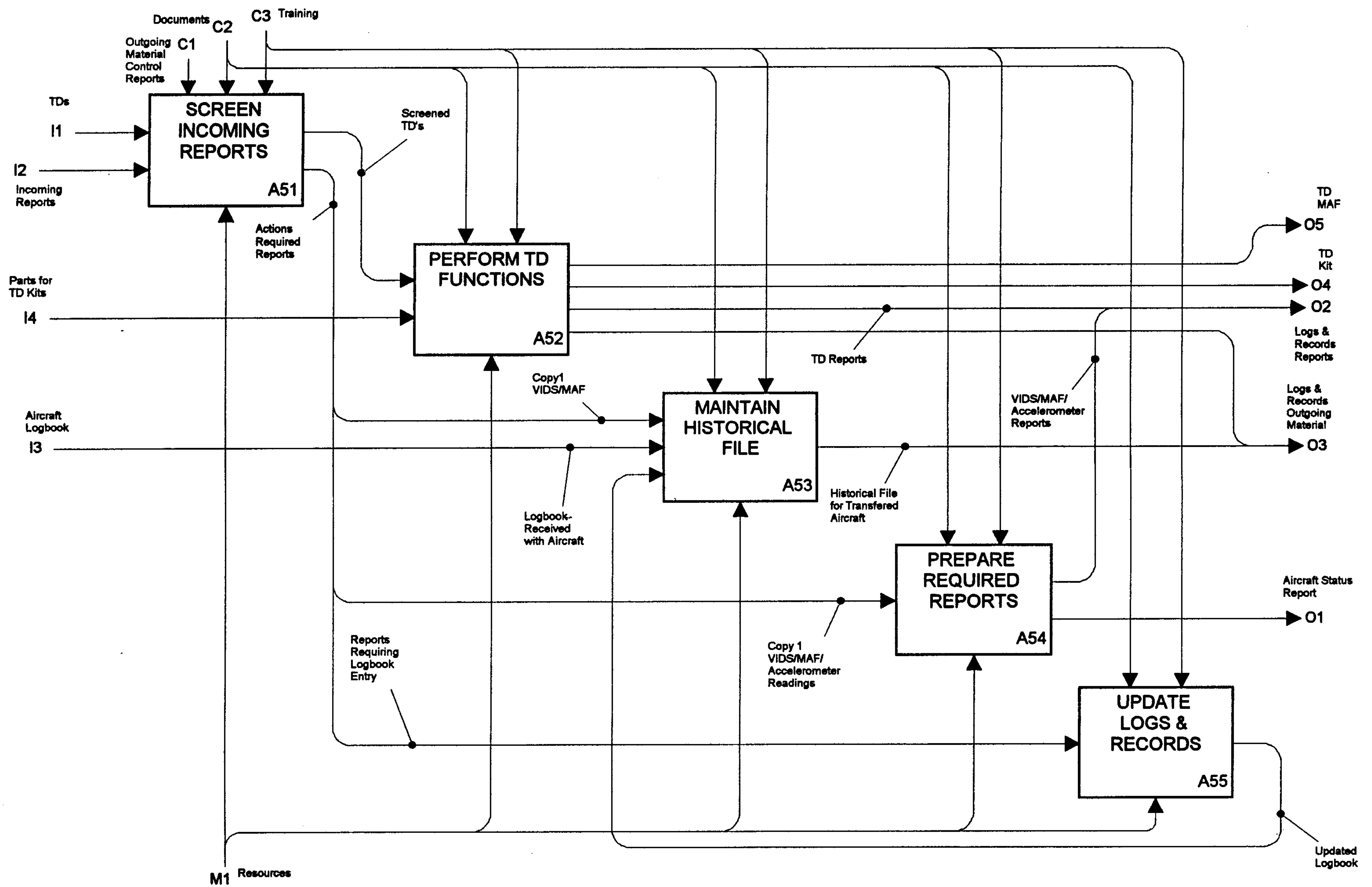
NODE: A412	TITLE: MONITOR QA PROGRAMS	NUMBER: O - 48

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
	NOTES: 1 2 3 4 5 6 7 8 9 10		RECOMMENDED			
			PUBLICATION			



NODE: A43	TITLE: PERFORM DATA ANALYST FUNCTIONS	NUMBER: O - 52

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAM DATE: 11/12		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL REV: 3	XX	DRAFT			
			RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10		PUBLICATION			



NODE: A5	TITLE: PERFORM LOGS AND RECORDS FUNCTIONS	NUMBER: O - 54

[A2] PERF) LEVEL WORK CENTER FUNCTIONS

[A21] HOLD & ATTEND MEETINGS
[A22] PERFORM WORK CENTER DUTIES
  [A221] PERFORM MAINTENANCE TASKS
    [A2211] DETERMINE TOOLS & SE REQUIREMENTS
    [A2212] PERFORM UNSCHEDULED MAINTENANCE
      [A22121] TROUBLE- SHOOT TASKS
      [A22122] ORDER & RECEIVE PARTS
      [A22123] PERFORM REPAIR TASKS
      [A22124] PERFORM QA FUNCTIONS
      [A22125] SIGN OFF TASKS
    [A2213] PERFORM SCHEDULED MAINTENANCE
      [A22131] REVIEW MRC REQUIREMENTS
      [A22132] ACQUIRE INSPECTION MATERIAL
      [A22133] COMPLY WITH MRC'S
      [A22134] SIGN OFF INSPECTION MAF
    [A2214] PERFORM LINE OPERATIONS
      [A22141] PERFORM REQUIRED INSPECTIONS
      [A22142] SERVICE AIRCRAFT
      [A22143] CONFIGURE AIRCRAFT FOR MISSION
      [A22144] LAUNCH AND RECOVER AIRCRAFT
  [A222] PERFORM COLLATERAL DUTIES
  [A223] PERFORM MISCELLANEOUSDUTIES
[A23] TRAIN WORK CENTER PERSONNEL
  [A231] DETERMINE PERSONNEL SKILL LEVEL
  [A232] PROVIDE PERSONNEL TRAINING SYLLABUS
  [A233] REQUEST REQUIRED SCHOOLS
  [A234] SCHEDULE TRAINING
  [A235] CONDUCT TRAINING
[A24] MONITOR WORK CENTER PROGRESS

[A3] PERF) LEVEL MATERIAL CONTROL FUNCTIONS

[A31] PROCESS REQUESTS
  [A311] RECEIVE REQUIREMENT
  [A312] CONDUCT TECHNICAL RESEARCH
  [A313] ORDER PARTS & MATERIAL
[A32] MONITOR STATUS
[A33] MANAGE REPAIRABLES
  [A331] MONITOR REPAIRABLES
  [A332] PROCESS REPAIRABLES FOR TURN-IN
  [A333] TURN-IN REPAIRABLES
[A34] MANAGE AIRCRAFT INVENTORY RECORDS
[A35] MANAGE TOOL & IMRL ASSETS
[A36] RECEIVE & DELIVER PARTS & MATERIALS

[A4] PERFORM Q/ :TIONS

[A41] PERFORM QA PROGRAM VERI
  [A411] MANAGE QA PROGRAMS
  [A412] MONITOR QA PROGRAMS
    [A4121] ESTABLISH QUALIFICA
    [A4122] MAINTAIN MONITOR PR
    [A4123] PERFORM PROGRAM
  [A413] PERFORM INSPECTIONS A
  [A414] PREPARE AND REVIEW DO
  [A415] PERFORM LAISON INFORM
  [A416] PROVIDE W/C'S TECHNICA
[A42] PERFORM CTPL FUNCTIONS
  [A421] ORDER/RECEIVE PUBS/TD'
  [A422] TRACK AND CONTROL TD'
  [A423] MAINTAIN CENTRAL LIBRA
  [A424] TRACK TPDR'S
  [A425] PERFORM DTPL AUDITS
[A43] PERFORM DATA ANALYST FU
  [A431] SCREEN VIDS/MAFS FOR E
  [A432] TRACK W/C ERROR RATES
  [A433] GENERATE 3M SUMMARY
  [A434] PROVIDE 3M TRAINING

USED AT:	AUTHOR: ORGANIZATIONAL MODELING TEAMS	DATE: 11/12/		WORKING	READER	DATE	CONTEXT:
NAVAL AVIATION MAINTENANCE OFFICE	PROJECT: ORGANIZATIONAL LEVEL MAINTENANCE (AS-IS) MODEL	REV: 3	XX	DRAFT			Top
				RECOMMENDED			
	NOTES: 1 2 3 4 5 6 7 8 9 10			PUBLICATION			

- [A224] PERFORM MAINT TASKS
  - [A2211] DETERMINE TOOLS & SE REQUIREMENTS
  - [A2212] PERFORM UNSCHEDULED MAINTENANCE
    - [A22121] TROUBLE- SHOOT TASKS
    - [A22122] ORDER & RECEIVE PARTS
    - [A22123] PERFORM REPAIR TASKS
    - [A22124] PERFORM QA FUNCTIONS
    - [A22125] SIGN OFF TASKS
  - [A2213] PERFORM SCHEDULED MAINTENANCE
    - [A22131] REVIEW MRC REQUIREMENTS
    - [A22132] ACQUIRE INSPECTION MATERIAL
    - [A22133] COMPLY WITH MRC'S
    - [A22134] SIGN OFF INSPECTION MAF
  - [A2214] PERFORM LINE OPERATIONS
    - [A22141] PERFORM REQUIRED INSPECTIONS
    - [A22142] SERVICE AIRCRAFT
    - [A22143] CONFIGURE AIRCRAFT FOR MISSION
    - [A22144] LAUNCH AND RECOVER AIRCRAFT
- [A222] PERFORM COLLATERAL DUTIES
- [A223] PERFORM MISC DUTIES
- [A23] TRAIN WORK CENTER PERSONNEL
  - [A231] DETERMINE PERSONNEL SKILL LEVEL
  - [A232] PROVIDE PERSONNEL TRAINING SYLLABUS
  - [A233] REQUEST REQUIRED SCHOOLS
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  - [A33] MANAGE REPAIRABLES
    - [A331] MONITOR REPAIRABLES

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