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WHAT ARE THE BARRIERS TO
IMPLEMENTING INFORMATION SYSTEMS
AT A FLEET AVIATION SQUADRON?

by

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March 1989

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A study was made to determine what the barriers are to implementing information systems at a fleet aviation squadron. Various squadron personnel were interviewed on-site in order to find out what resources were available at the squadron, how they were being used, and what new applications were desired. Members of the information systems staff of the type commander were interviewed as well. The data were analyzed and eight major barriers were identified. Some of the barriers were under control of the squadron, some were external to the squadron, and some were a blend of both. The findings suggest that those barriers identified as squadron-controlled can be overcome through careful planning, better utilization of on-board resources, and establishment of a squadron computer training program. The primary external barrier was the uncertainty of financial resources.

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What Are the Barriers to Implementing Information Systems at a Fleet Aviation Squadron?

by

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Submitted in partial fulfillment of the requirements for the degree of

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ABSTRACT

A study was made to determine what the barriers are to implementing information systems at a fleet aviation squadron. Various squadron personnel were interviewed on-site in order to find out what resources were available at the squadron, how they were being used, and what new applications were desired. Members of the information systems staff of the type commander were interviewed as well. The data were analyzed and eight major barriers were identified. Some of the barriers were under control of the squadron, some were external to the squadron, and some were a blend of both. The findings suggest that those barriers identified as squadron-controlled can be overcome through careful planning, better utilization of on-board resources, and establishment of a squadron computer training program. The primary external barrier was the uncertainty of financial resources.

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I. INTRODUCTION

A. BACKGROUND

Fleet Air Reconnaissance Squadron Three (VQ-3) is homeported at Naval Air Station Barbers Point, Hawaii. The squadron currently flies the EC-130 and is undergoing transition to the Navy's newest aircraft, the E-6A. The transition is to be completed while maintaining 24-hour operational flights. It is the first time in the history of Naval Aviation that a squadron has been directed not to stand down from operational flights while transitioning to a new aircraft. Further, the squadron has been tasked to develop the plans and procedures for a homeport change to take place a few years hence.

In addition to having a unique mission, the size of the squadron is significant. The typical land-based, operational aviation squadron has approximately 60 officers and 250 enlisted members, while VQ-3 has approximately 110 officers and 550 enlisted members. The squadron anticipates personnel augmentation during its transition to the E-6A.

The homeport-shift and transition-related tasking imposed on the squadron, in addition to meeting its mission requirements, has resulted in increasing demands on its information processing capabilities. An examination of the information systems requirements of the squadron and an evaluation of the effectiveness of its on-board assets was thought to be needed.

B. OBJECTIVES

The goal of this thesis was to determine what is the nature of any barriers to implementing information systems at VQ-3. In an era of increasingly scarce resources, it would not be prudent to develop a plan to implement a project without first examining whether it could be implemented. Thus, early identification of barriers could enable planning around such barriers or their removal, if possible, to ensure a smooth implementation.

C. THE RESEARCH QUESTION

The question to be addressed is what are the barriers to implementing information systems in a fleet aviation squadron? It was thought initially that an information systems architecture would be made followed by an investigation of the barriers. However, to undertake the development of an information system architecture for a squadron homeported in Hawaii from Monterey was determined to be too ambitious considering the time that would be involved and the required travel expense. After some discussion of the matter, it was thought that even if a project had been undertaken to develop an information systems architecture, a more important question was what are the barriers to implementing those information systems in a fleet aviation squadron? The word "implementation" in this thesis means that the system is operational to the user.

D. SCOPE AND LIMITATIONS

The scope of the research concentrated on what Automated Data Processing (ADP) assets VQ-3 has available, how they are being used and what, if any, other applications are desired. Additionally, availability of personnel

talent, top-management support, funding, type commander support, planning, and formal procedures were investigated.

The study was limited to one squadron because there are unique features to each squadron that would make a generic study less useful than one that focused in-depth on just one squadron. Further, the author was attached to VQ-3 from July, 1982 until July, 1985 and possessed a comfortable working knowledge of the squadron and its mission.

E. METHOD

The method used to address the research question was to interview key members of the squadron and the type commander's staff about what resources were available at the squadron, how they were used, and whether new applications were desired. An informal discussion forum was adopted for the interviews.

VQ-3 has ten departments: Administrative, Command Services, Operations, Safety/NATOPS[1], Maintenance, Training, FRAMP[2] Communications, Tactics, and Special Projects. In addition to interviews with each of the department heads, the Commanding Officer (CO), the Computer Systems Manager (CSM) and other personnel from the various departments were contacted during an on-site visit. The Executive Officer (XO) was not interviewed on-site due to his absence from the squadron. He had been contacted previously by telephone. Similar telephone interviews were conducted with the Assistant Force Information Officer and the Automated Data

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[1]NATOPS (Naval Air Training and Operating Procedures Standardization)

[2]FRAMP (Fleet Readiness Aviation Maintenance Personnel)

Processing Equipment Analyst of Commander Naval Air Force U. S. Pacific Fleet (COMNAVAIRPAC), the squadron's Type Commander.

No formal questionnaire was developed for the interviews, because the author did not want to influence the respondents' comments. Discussions were loosely focused on all facets of computer usage in the squadron.

The kinds of questions that were asked followed along the lines of:

- What information processing capabilities do you have in your area?
- How are they used?
- What capabilities would you like to have?

These questions were asked to get the interview started, with comments from the author to keep the discussion on the topic. During the course of the interviews, a number of subsidiary questions were asked as follow-on questions to comments made by the respondents. Some of these questions were:

- Do you think your microcomputers are being used effectively?
- What computer training is available?
- What are your backup/recovery procedures and contingency plans?
- What do you foresee are barriers to implementing information systems in the squadron?

The interviews ranged in length from 30 minutes to one and one-half hours. The author wrote comments of the respondents in note form. After all interviews had been completed, comments were analyzed and the findings are presented in the summary that follows.

F. SUMMARY OF FINDINGS

Evaluation of data gathered from interviews, as well as a review of various procedures, yielded the following barriers (issues, factors, problems) pertinent to VQ-3. They are listed in descending order of frequency mentioned in interviews:

- Funding constraints.
- Restrictive ADP acquisition procedures.
- Lack of support from the type commander.
- Lack of a formally trained Computer Systems Manager.
- Lack of top-management commitment.
- Lack of a formal command computer training program.
- Lack of a master information systems plan.
- Lack of a high-level planning committee.

G. ORGANIZATION OF STUDY

The second chapter in this thesis is a discussion of various methods and formal procedures in planning and designing information systems. Following that discussion, the third chapter presents the data discovered during the course of the study. The fourth chapter presents the findings, and the fifth chapter discusses the implications of the findings and gives some recommendations.

II. CONSIDERATIONS IN IMPLEMENTING INFORMATION SYSTEMS

A. INTRODUCTION

This chapter presents some considerations in implementing information systems. Included are discussions on background information of the squadron, the problem definition, information systems planning, system life cycle development, and acquisition. These topics are mentioned because careful consideration of them can make implementation of information systems smoother.

B. BACKGROUND

The author was assigned to Fleet Air Reconnaissance Squadron Three (VQ-3) from July, 1982 until July, 1985. During that time, the squadron grew from approximately 70 officers and 300 enlisted to approximately 110 officers and over 500 enlisted and became a fully operational squadron. This growth had tremendous impact on the processing and movement of information within the squadron.

Growth of the squadron meant that a larger number of messages, special requests and memoranda were processed in addition to the required reports, instructions and directives. In addition, there was a 67% increase in the number of annual enlisted evaluations which were composed and prepared as well as a 57% increase in annual officer fitness reports, not including those reports required for each officer at the change of command which occurs every 15 months.

The word processing facilities consisted of eight Wang terminals, of which five had printers. This necessitated creative alternatives since not every department had a Wang terminal. Timesharing agreements were devised among departments, but were not always successful, especially when a high priority item overrode the timeshare schedule. Added to the already over-burdened facilities was the mindset that all documents such as forms, memoranda and rough drafts of enlisted evaluations and officer fitness reports as well as other internally distributed items had to be typed.

The management oversight for the word processors fell to the squadron CSM. This officer's function consisted of ordering supplies such as diskettes, print wheels and ribbons, coordinating maintenance requests and checking the server to prevent overloading the Wang. Requests for additional ADP equipment were initiated by the requesting departments and coordinated through the CSM. Aside from ordering computer-related supplies, the function of the CSM was reactive versus proactive.

C. PROBLEM DEFINITION

The problem in the squadron is that VQ-3 has a collection of incompatible computers and faces increasing demands as it transitions to a new aircraft and prepares for a homeport shift.

Paperwork remains the number one gripe throughout the Navy. Despite passage of the Paperwork Reduction Act in 1980, there is little evidence of reduced paperwork requirements in the day-to-day operations at VQ-3. Efforts to improve the mechanics of handling paper and processing information have amounted to augmenting the Wang with a collection of stand-alone microcomputers, added incrementally to the squadron from 1985 to 1988.

The present collection of microcomputers has all but eliminated the electric typewriter, and the ease with which text can be manipulated or changed upon the drafter's whim using the word processor has contributed to the everything-must-be-typed mindset. In order to accommodate this hunger for typed documents, it would seem that a planned, carefully evaluated strategy would be undertaken to assure that adequate word processing assets would be available. Not only has this not occurred, but in addition to having microcomputers which are in some cases incompatible, there have been additional stand-alone systems introduced into the squadron to handle aviation logistics matters.

According to Liefer, in order for a computer-based information system to be effective, it must be one which fits the organization's culture and style. Using Mintzberg's organizational characterizations, one of which was called a machine bureaucracy which is "characterized by standardization, functional structural design, and large size," Liefer states that a computer-based information system in a machine bureaucracy is "...primarily concerned with computerization of the paperwork processes of the firm." [Ref. 1]

As VQ-3 would seem to fit the definition of a machine bureaucracy, it was suspected from the outset that what the squadron needed was an Office Automation System (OAS). There is a veritable plethora of plans concerning many topics within the Navy, but there seem to be no figures available to distinguish which have been implemented. In light of the recent budget curtailments, it becomes more important to plan carefully any information system, including the ability to carry out the plan once it is adopted. In actuality,

identifying the barriers to implementing such a plan might, in some ways, be akin to a feasibility study.

D. PLANNING FOR INFORMATION SYSTEMS

Just as an organization has a plan for achieving its goals, such as targeting a market area to increase sales for example, an organization must have a plan for using information systems to support the objectives of the organization. The information systems plan should detail the system to be developed and a schedule for its development [Ref. 2]. Supporting documentation might include an estimate of the effort involved in terms of personnel, financial and time.

Such plans are especially important to organizations operating under tight resource constraints. They help to focus the drive of the systems toward integration of the organization's efforts to support the overall command goals. Thierauf speaks of certain elements to developing such a strategy that include a plan that supports the business goals of the organization, top management commitment to develop and to implement the recommendations of that plan, and lastly, that the end-product of the plan must be user-owned; that is, the user must recognize its responsibility and commitment both to developing the system and implementing it [Ref. 3].

According to Burch and Grudnitski, there are four phases to an information systems plan:

- **Identification of Priority Systems**

  In order to align a system plan with the command's goals, activities that are critical to the success of the command must be identified and a matching priority assigned to the system that supports that goal.

- **Information System Objectives and Capabilities**

  This phase evaluates the current information systems activities and determines future user requirements.

- **Development Assessment**

  During this phase, three components of the organization are evaluated: systems architecture, hardware and software, and systems personnel. The objective is to align what exists with what is needed.

- **Implementation Strategy**

  The last phase of the plan maps a strategy for bringing the plan from the drawing board into operation and includes a detailed description of the basic functions and features of the new system, interfaces with other systems, and a list of anticipated hardware and software requirements. [Ref. 2]

Planning, in and of itself, can be simply an exercise. To be effective in the area of information systems, Thierauf suggests some guidelines [Ref. 3]. The first guideline considers the establishment of a high-level information systems planning committee. This committee would review existing systems as well as plans for modifications and new systems to ensure that they support the objectives of the organization.

The second guideline is to communicate what strategic information system planning is. According to Thierauf, it is "...the vehicle used to arrive at concurrence with top management on IS directions and the means by which the IS organization begins to compete for scarce corporate resources...." [Ref. 3] In short, it sets the tone for the organization with regard to information systems planning.

Strategic plans, the third guideline suggests, must be proactive rather than reactive. Proactive planning means seeking out what is needed in an organization and planning for it ahead of time rather than resorting to a

knee-jerk response to a user requirement. It would serve to reduce the time and effort and sometimes resultant ill-effects of crisis-management.

Finally, the fourth guideline refers to continuity in information systems planning. It is important to review the plans continuously to ensure their support of the goals of the organization, that they are a "living plan" of the future [Ref. 3]. Use of a plan in such a fashion enforces it as a management tool rather than relegating it to a paperwork exercise.

E. SYSTEM LIFE CYCLE DEVELOPMENT

The methodical development of information systems has evolved to what has become known as a Systems Development Life Cycle (SDLC) [Ref. 4]. A key word here is "evolved" because the SDLC is still in a state of evolution. However, in the classical sense, an SDLC generally involves the following phases:

- Assess the current operation.
- Define user requirements.
- Determine alternative solutions.
- Evaluate and select hardware and software.
- Develop the system design.
- Build the system.
- Implement the system.
- Maintain the system. [Ref. 4]

There are many SDLCs, but the intent is the same, which is to approach the development of a system in a methodical, phased manner.

Assessing the current situation is the first major phase in the SDLC. In order to suggest a system to replace an existing one, a thorough understanding of the current system is in order [Ref. 4]. In addition to identifying limitations of the present system, such an assessment presents an opportunity to explore areas for improvement. But perhaps more important in this phase, and sometimes overlooked, is to take the time to study the feasibility of implementing a system in an organization, or to determine what barriers exist to its implementation. Considerations of any barriers up-front would allow the system designers to design around such barriers, or may even, if the barriers are determined to be insurmountable, end the process at that point which would save scarce resources.

The next phase in the cycle is to define the user requirements. Although requirements often continue to evolve during the life cycle, it is important to focus on the needs of the user. It is imperative that the requirements be defined as clearly and completely as possible to avoid discovering a new requirement later in the cycle that would involve costly expenditures of resources to backtrack in order to include the new requirement. Further, it is important to realize that although aviation squadrons have similar reporting requirements, there may be slight differences in mission requirements or significant differences in squadron hangar facilities that would impact a system.

Following user requirement definitions is a look at alternative solutions. There may be occasions when slight modifications to an existing system would fulfill the requirement, or it may be determined that automating a non-automated system would not yield additional benefits to the organization.

It is only after assessing the current situation, defining user requirements and evaluating alternatives that hardware and software should be selected. To select it prior to those three phases would be like buying building materials for a house without first determining a budget, buying land, drawing up plans and finding a contractor.

After an understanding of the requirements is gained, which is balanced against the current system, and after hardware and software are selected, it is time to design the information system. If a completely new system has been chosen, this is the "make or buy" decision period; that is, it is the time to decide to develop a system completely in-house, to purchase an existing system or to develop parts "in-house" supplemented by off-the-shelf products [Ref. 2].

Following the design phase, the system is built and then implemented. Some of the issues to be considered during the implementation phase are the support provided to the users of the system, education and training of users as well as planning for a smooth transition to the new system.

The last phase in the cycle concerns maintenance of the system. This is a phase which is often overlooked, but one which will endure for the life of the system. This is the phase where good documentation procedures, followed in previous phases, will pay-off in terms of easing the implementation of later changes and modifications to the system.

F. ACQUISITION

COMNAVAIRPAC provides microcomputers to VQ-3 based on availability of funds[3]. Since the funds come from Operations and Maintenance, Navy (O&MN) dollars, the same pot of money that flying hours, steaming hours, ammunition, or, "beans, bullets and black oil" come from, COMNAVAIRPAC maintains control over the amount of money spent on computers so that other, presumably more important, expenditures are not skipped. No Pacific Fleet squadron has money in its own budget with which to buy a microcomputer.

Despite not having money in its own budget for microcomputers, squadrons are free to submit requests through their chain of command to COMNAVAIRPAC to request a computer. Such requests are governed by COMNAVAIRPAC Instruction 5231.1A which states that requests for data processing equipment must be accompanied by a draft of the Abbreviated System Decision Paper (ASDP) [Ref. 5]. The purpose of the ASDP is to justify the equipment and includes the following:

- **Need.** Outline the need for automation as related to specific elements of the activity's mission. Briefly summarize the functional requirement and the information dependent tasks that the information system would process. Describe the current method; quantify and evaluate the impact of maintaining current capability.

- **Proposed Solution.** Summarize the selected automatic data processing solution (including hardware and software) intended to satisfy the information processing need, and identify various assumptions and constraints considered in the selection. Indicate milestone schedule of planned events, e.g., target dates for acquiring equipment and implementing various applications.

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[3] Telephone conversation between Mr. Bill Landy, Code 242, COMNAVAIRPAC, and the author, 7 February, 1989.

- **Other Alternatives Considered.** Summarize other alternatives considered and explain why each was not selected as a proposed solution to the need for automation.

- **Cost and Benefits.** Summarize projected costs (personnel, hardware, software, and facilities) of each alternative in becoming an operational system and identify the expected benefits (improvements to functional support, cost savings, etc.) Give cost/benefit rationale for selecting the recommended alternative. Analysis should include quantitative factors as well as qualitative.

- **Interface Considerations.** Describe planned and potential interface with systems/procedures external and internal to the organization. Indicate anticipated advantages or problems associated with system interfaces. Data communication requirements should be addressed in this section.

- **Funding.** Are funds available to support the life cycle costs for the selected alternative? Identify the source and type of funding.

- **Other Comments.** Include any additional information that will facilitate understanding and evaluating this ASDP. Training, security/ privacy, maintenance, mobility and site preparation requirements should be addressed in this section. [Ref. 5]

The paragraph in the ASDP that specifies funding sources does not mention that because funds for ADP equipment come from O&MN funds, the cost/benefits must be justified over a one year period. A squadron that decides to pursue this avenue to obtain more ADP equipment must understand the one-year budget constraint under which the acquisition of microcomputers is administered.

G. SUMMARY

The goals and objectives of an organization need to be communicated to its members and information system requirements should be formulated into a plan that supports those goals and objectives. To address such a plan, a high-level information systems planning committee is needed to review

existing systems and determine the requirements for new systems to support the objectives of the command. Planning in such a manner emphasizes a proactive stance with regard to information systems and would do much to avoid a crisis management response to a valid requirement. Additionally, continuous reviews of such plans would enforce the plan as a management tool rather than a paperwork drill, and would provide credence to requests for additional ADP assets.

The planning committee should follow four phases to establish an information systems plan:

- Identify priority systems
- Determine information systems objectives and priorities
- Assess the current information systems
- Establish an implementation strategy [Ref. 2].

Once a plan has been decided upon, the SDLC provides a methodical, phased approach to developing an information system for that system which has been given the highest priority by the planning committee. Upon reaching the step of obtaining hardware and software for the new system, the ASDP should be developed and submitted to COMNAVAIRPAC for approval.

III. ACTUAL INFORMATION SYSTEMS AT THE SQUADRON

A. INTRODUCTION

This chapter describes the major elements of operation of the existing information systems at the squadron. Included are discussions on planning, hardware and software resources, information processing, personnel resources, training, systems procedures, orientation towards computer usage, acquisition, and possible enhancements to the system.

B. INFORMATION SYSTEMS PLANNING

Information systems planning consists of occasional memos from the Special Projects Officer to the XO outlining what ADP assets are at the squadron. Recommendations are included for asset distribution when the arrival of new equipment is imminent. Normally, a request is routed to all department heads for inputs for this memo, but it is drafted by one person who may or may not have an information systems background.

Knowledge of other resources in the squadron, such as personnel talent, is communicated through casual conversation. Finding out who the "hackers" are in the squadron is a function of happenstance as is finding out what the various departments are doing to use their computers.

Although department heads meet with the XO and CO at various times during the week, there is no formal meeting process to discuss specifically the planning for information systems in the squadron.

C. CURRENT HARDWARE AND SOFTWARE RESOURCES

As of November, 1988, VQ-3 possessed a total of 21 computer terminals, distributed as shown in Table 1. All of the terminals are stand-alone systems. The Zenith computers use Wordperfect software for word processing and also use Lotus 1-2-3 and D/Base II or D/Base III. In addition, the squadron uses the Wang word processing system as well as a Xerox 860 for a total of three word processing products. Furthermore, due to a difference in their operating systems versions, text files created on the Z-120 terminals cannot be used on the Z-248 terminals or vice-versa. None of the diskettes created on a Zenith can be used on a Wang, nor can a Wang diskette be used on a Zenith.

TABLE 1. CURRENT COMPUTER RESOURCES AT VQ-3

COMPUTER	DEPARTMENT	NUMBER	USE
Z-120	Tactics	1	Word processing
Z-120	Administration	2	Word processing
Z-120	CO's yeoman	1	Word processing
Z-150	Communications	1	Server
Z-248	Administration	1	Word processing, spreadsheet
Z-248	Operations	2	Word processing, database
Z-248	Maintenance	2	Word processing, spreadsheet
Z-248	Training	1	Word processing, graphics
Z-248	FRAMP	1	Word processing, spreadsheet, database
Wang w/printer	Safety/NATOPS	1	Word processing
Wang w/printer	Maintenance	3	Word processing
Wang w/printer	Administration	1	Word processing
Wang terminal	Special Projects	1	Word processing
Wang terminal	Communications	1	Word processing
Wang terminal	Maintenance	1	Word processing
Xerox 860	Administration	1	Word processing

D. INFORMATION PROCESSING

Initial drafts of most documents are prepared manually; that is, with pencil or pen and paper. Most documents that are routed up the chain of command are typed on a word processor. However, because the terminals are stand-alone, any changes made by a department necessitate that the document be retyped on that department's word processor, if it was originated on an incompatible computer, before being forwarded to its next destination. All of the documents that are routed around the squadron are tracked as they enter and leave each department by making manual entries in a department correspondence logbook. In addition, a department that prepares follow-on documents to the original must cull appropriate information from accompanying documents to enter into its own computer.

Take, for example, a request from the Special Projects Department for one of its members to attend a meeting in Washington. The individual drafts a memo to the Temporary Additional Duty (TAD) Officer via the CO, the XO and the Administrative Officer. After typing the memo on its Wang terminal, the Special Projects Yeoman, located on the east side of the hangar, calls the Administrative Department to see if that department's Wang printer is in use because the printer has no buffer. If the printer is free, the yeoman will print the memo and then walk across the hangar to the Administrative Department on the the second floor of the hanger to retrieve it. After proofreading the memo and if there are no changes, the memo is manually logged out of Special Projects in the correspondence log and hand-carried to the XO on the west side of the hangar.

Following his review, the XO forwards the request to the CO for approval. From the CO, the memo is routed to the TAD Branch located on the east side of the hangar where information from the memo concerning the individual's travel requirements is entered into the TAD Branch database. From that information, supporting travel documents will be prepared to include orders, a per diem request, and any necessary outgoing messages. Upon completion of the TAD request, the package is manually logged out of the TAD Branch and hand-carried back to the Administrative Department for review before being hand-carried to the Personnel Support Detachment (PSD) on base for processing.

Notification of approval of the travel request is usually made by telephone to the individual who made the request. It then is incumbent on the individual to notify, either via memo, telephone or personal visit, any other department in the squadron that needs to know of the absence, such as Training, Safety/NATOPS or Operations.

Most of the documents in the squadron are routed to at least one other department, requiring an entry in a manually kept logbook. Since diskettes do not accompany a document, any changes made by the receiving department must be reentered into its terminal for a smooth copy for forwarding. In the event that no changes are made, if the gaining department needs information from the document in its database, it must be input at that point.

A large number of routed documents are accompanied by supporting documents such as exhibits, photocopies of appropriate references, messages or previous memos on the topic. The squadron also routes a large number of personal requests which use a specific form and are often hand-written. Many

of these requests (leave, advancement, crew changes, special programs or school) are also accompanied by supporting documents. It is the desire of the CO that such documents remain in their present form to preserve the personal touch.

E. PERSONNEL RESOURCES

Each squadron has an officer assigned to the ADP function, and VQ-3 is no exception. Referred to as the Computer Systems Manager, that officer is responsible for ADP security, the hardware, software and accompanying documentation, ordering and distributing all ADP-associated consumables such as ribbons, print-wheels and diskettes as well as computer training and acquisition. There are no enlisted personnel assigned to the ADP function. As is the norm for a Navy squadron, the CSM is assigned to an aircrew, regularly stands watches and performs any other duty he is assigned. Because he is away from the squadron for a period of two weeks in a recurring five-week cycle, any ADP-related issue, except those pertaining to consumables, must wait for his return for resolution.

The CSM reports to the Special Projects Officer, usually a Lieutenant Commander, in the Special Projects Department. The CSM assignment is regarded as a junior officer billet and is normally held by a junior Lieutenant.

The current CSM, by his own admission, has no formal training in the use of computers, nor does the Special Projects department head. He is, in essence, "self-taught." By the time he gains sufficient knowledge to feel comfortable in the job, he will be rotated to another billet, as it is not career-enhancing to remain in that job for more than a year.

There are at least four officers in the squadron who have formal information systems training, two are graduates of the Computer Systems Management curriculum at the Naval Postgraduate School, one has an undergraduate degree in computer science and one worked as a programmer for NASA for four years before entering the Navy. To date, only two of the officers are working with a computer, one is writing a program to generate a daily flight schedule using the programming language of Pascal, and the other is writing programs to track TAD funding using Lotus 1-2-3. Any other individuals in the squadron with formal information system training are unknown to the CSM.

F. INFORMATION SYSTEMS TRAINING

The Training Department is responsible for EC-130 aircrew training, the Maintenance Department is responsible for EC-130 maintenance training and the newest department, FRAMP, has been assigned the duty of training for the E-6A. There is no training department for computer systems. However, the Navy Regional Data Automation Center (NARDAC) at Pearl Harbor offers training in the use of microcomputers. Table 2 lists some of the courses offered, their length, and their cost.

To send an individual to NARDAC for training, the squadron must take the funds from its O&MN account. To date, the squadron has not budgeted for such training courses nor is there a desire to spend money for such training.[4] Any training an individual obtains is the result of asking whoever held the

[4] Interview between E. Perini, Lieutenant, USN, VQ-3, and the author, 21 November 1988.

TABLE 2. MICROCOMPUTER TRAINING

Navy Regional Data Automation Center
Pearl Harbor, Hawaii

COURSE TITLE	LENGTH	COST
Introduction to Microcomputers:		
Beginner	1/2 day	$50
Advanced	1/2 day	$50
Introduction to DOS:		
Beginner	1 day	$95
Advanced	1 day	$95
Wordstar	2 days	$155
dBASE III Plus:		
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job previously, or seeking out someone in the squadron who might know something about the terminal in question. Although qualifications and their attendant training are required by Navy directives for aircrew and aircraft maintainers, there are no formal qualifications attached to computer usage.

Within the squadron, the CSM is charged with many computer-related responsibilities among which is training. To his knowledge, there are no training materials available within the Navy, such as a self-paced program, to import to the squadron so that individuals could receive training. The only materials available for instruction are the vendor's documentation manuals

and help from another member of the squadron who learned the system from another member of the squadron, and so forth.

G. COMPUTER SYSTEMS PROCEDURES

In addition to not having a formal information systems training plan, there is no squadron instruction for the standardization of computer control procedures such as backup/recovery, contingency plans, end-user computing or documentation. Security procedures, addressed in a squadron instruction which outlines access control, are being enforced. The CSM does, however, maintain procedures over the procurement and disbursement of diskettes, print-wheels and ribbons. However, the information collected in the logbook used to account for such consumables is not used for any purpose other than for re-order determination.

There are no formal procedures that require backup of either diskettes or hard disks. Individuals who use the computers have either not thought of backup or have thought of it but have not bothered, adopting the "it can't happen to me" attitude concerning disk failure.

The squadron, located on a tropical island, is sometimes threatened by hurricanes or tropical storms and their accompanying hazards such as power outages and flooding within the hangar. There are no contingency plans to safeguard either the computers or the data which they contain against freaks of nature, fire or other natural or man-made disaster.

End-user computing is encouraged only by its lack of prohibition. The officer who is writing the Pascal program to generate a flight schedule has been given use of a Z-248 and a free reign over the program. However, when asked about his documentation procedures, he indicated that he had done no

documentation thus far but would do it all at the end. The Operations Officer has not expressed concern about the lack of documentation for a program which is to generate the flight schedule for which he is responsible, and the CSM (who is one paygrade junior to the Operations Officer) feels helpless to force documentation completion concurrent with the program development. As a general rule, officers in the squadron can expect three job assignments during a three-year tour. The officer writing the program can expect to rotate out of his current assignment in Operations within a few months to take his second or third assignment before leaving the squadron altogether[5] .

H. ORIENTATION TOWARDS COMPUTER USAGE

The smoothness with which new technology is accepted is heavily dependent on the attitudes of the people, organizations and institutions involved. There is a variety of attitudes present at VQ-3 and, as would be expected, at the type commander level, COMNAVAIRPAC, who controls computer acquisition for Pacific Fleet squadrons.

Although COMNAVAIRPAC would like each squadron to have a minimum of four microprocessors, it doesn't believe that a squadron has an infrastructure to support information systems. Further, it believes that 70% of any squadron's work is generic, with the remaining amount dependent on the personality of the commanding officer. Funding is not made available to a squadron that wants NARDAC to perform a system requirements survey

[5] Telephone conversation between S. Call, Lieutenant, USN, VQ-3, and the author, 7 March 1989 revealed that the author of the computer program had been sent to Texas for a four-month temporary assignment leaving no documentation to the program. Personnel in the squadron are unable to run the program and have reverted to a manual system.

because COMNAVAIRPAC believes that NARDAC does not produce a timely, quality product. In addition, no such studies are funded because COMNAVAIRPAC already knows that squadrons need more computers but because it doesn't have funding to acquire them, it feels that such a study would be a waste of money[6] .

Within the squadron, both the CO and XO are regarded as supportive of the use of computers. However, aside from a recent request to COMNAVAIRPAC for twelve more microprocessors, there is little evidence to support this. Indeed, the CSM has no formal training, nor does he anticipate receiving any. There is no long-term plan for information systems. There is no formal training plan for computer usage. There are no standard backup/recovery plans, contingency plans or documentation procedures. Lastly, the CSM billet is not regarded as being "career-enhancing."

The "what if . . .?" syndrome is prominent in the squadron and colors the way in which computers are regarded. For example, there is a reluctance to let go of paper copies of documents and reports. It is not enough to have information on a diskette, but paper copies must be kept, not only because of the lack of terminals on which to display the data (neither the CO nor XO have terminals, for example), but because of the fear that the computer might dump or that the data, once changed, might need to be changed back to its original form. Additionally, there is a great fear of computer viruses, of unauthorized access, of circumvention of the chain of command if a network were to be installed, and of problems if "the system goes down."

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[6] Telephone conversation between CDR Stansel, USN, COMNAVAIRPAC, and the author, 9 February 1989.

As a follow-on to the reluctance of eliminating paper documents, there is the dilemma of how to handle correspondence that has accompanying messages, memos, photocopies of references or other exhibits. This produces an attitude that that particular problem falls into the "too hard" category and thus the utilization of computers in the squadron is questioned.

I. ACQUISITION

The Comptroller at COMNAVAIRPAC retains control of funding for all computer acquisitions for the squadrons. The Functional Wing Commander remains within the chain of command, but only to recommend or not recommend approval of each request. Funding for computers comes out of the O&MN account. Dollars from that account also pay for flying hours, ship steaming hours, ammunition and spare parts. Since the business of COMNAVAIRPAC is not computers, computers are low on its list of priorities. Despite scarce funding, COMNAVAIRPAC would like each squadron to have a minimum of four microprocessors. Any attempt by one squadron to obtain more than four computers is regarded by COMNAVAIRPAC as a loss of a computer for another squadron.

Umbrella contracts have been the mainstay of computer acquisition for squadrons in the COMNAVAIRPAC claimancy. Unique applications for a computer must be well documented as COMNAVAIRPAC prefers a generic approach to information systems. Coupled with the long lead-time involved with buying a system, changing contracts from time to time results in different microprocessors being purchased for the same squadron which leads to the inevitable problem of incompatibility.

Like the rest of the Federal Government, COMNAVAIRPAC operates with a one year budget. Even though the squadron submits a request for new computers that, over a period of years, saves money as compared to continuing the use of an existing system, COMNAVAIRPAC must consider the cost/benefit analysis in light of one year funding. Because of the competition for O&MN dollars, often the funding isn't available.

Once a computer is purchased and delivered to the squadron, COMNAVAIRPAC ceases all support. There are no training visits, no assistance to set up the system and no additional funding to obtain any training. There is no attempt by COMNAVAIRPAC to establish an infrastructure within the squadron to support information systems.

J. POSSIBLE ENHANCEMENTS OF INFORMATION SYSTEMS

All of the department heads would like a better way to process correspondence. A document is input into several different computers, depending on the routing of it. This has fostered the feeling that computers don't save time at the squadron, but instead, they create work due to the multiple handling of a document.

There are mixed feelings about a network at the department head level. Although the CO expresses interest in it, there is concern by some that the integrity of the chain of command could be compromised. Some individuals, those who have used networks at other commands, recognize the benefits of a network and are of the opinion that the benefits far outweigh any disadvantages.

The most prevalent sentiment is a desire to improve paperwork processing. Ideas include electronic mail, databases for tracking aircrew qualifications and flight hours as well as one-time input to a computer of enlisted evaluations and officer fitness reports.

Nearly everyone interviewed mentioned the first two barriers in their comments. The problem of incompatible computers is an outgrowth of the funding problem and so was thought of as going hand-in-hand with funding.

The next two barriers, the lack of infrastructure to support computer usage and the attitude that the CSM billet is not career-enhancing was mentioned by less than one-half of the squadron personnel interviewed, but was remarked upon by both individuals on the type commander's staff.

Top-management support and computer training were commented on by two individuals at the squadron, one of whom was the Computer Systems Manager. The last two items, lack of a master plan and lack of a planning committee were mentioned by the XO and the Computer Systems Manager, respectively.

Those barriers that are internal to the squadron can be controlled; that is, the squadron can influence change to overcome them. External barriers can be influenced by the squadron to the extent that the squadron can work through the system to attempt changes; however, the final outcome on those rests beyond the squadron. Those barriers that are a blend require that the squadron work for change within its organization as well as work though the system to strive for changes beyond its organizational level.

V. CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

The study was undertaken to determine what barriers exist to implementing information systems at VQ-3. An on-site visit to the squadron to interview the CO and all of the department heads was made. Discussions focused on what information system assets were currently on-board, how they were being used and what capabilities were desired. Additionally, discussions included supporting assets such as personnel talent, access to training and budget considerations. Finally, approving authorities at the type commander level were interviewed to determine how decisions were made in the acquisition of ADP equipment.

There are barriers to the implementing information systems at VQ-3. They are a mixture of some that are under the control of the squadron, some that are external to the squadron, and others that are a blend of both. The barriers are:

- Limited, uncertain financial resources.
- Lack of compatible ADP equipment.
- Lack of infrastructure to support computer usage.
- Attitude that the CSM billet is not career-enhancing.
- Lack of top-management support of computer systems procedures.
- Lack of a formal computer training program.
- Lack of a master information systems plan.
- Lack of a high-level information systems planning committee.

B. IMPLICATIONS

VQ-3 has no master plan for information systems. Planning traditionally has consisted of memoranda describing the change of placement of a micro-computer within the squadron spaces. There has been no broad brush look at identifying those areas critical to the running of the squadron with an effort to match computing power with those areas. Planning is characterized as "reactive" as opposed to "proactive."

It is not surprising, therefore, when there is no master plan, to find that there is no high-level information systems planning committee. There are weekly department head meetings with the XO and daily operational briefings with the CO, XO and department heads, but information systems planning is not addressed through its own formal process. Such matters as may arise are treated on a case basis thus reinforcing a reactive planning mode.

The lack of compatible equipment at VQ-3 is not unique within the Navy. Due to budgetary constraints and acquisition procedures, which are a matter of public law, a variety of stand-alone systems exist at the squadron. This results in wasting valuable man-hours in a time when the squadron faces major transitions.

That there is no formal computer training program at a command that puts such a strong emphasis on training is remarkable. No department is tasked with the responsibility for providing computer training. The Training Department is charged with the task of aircrew training, the Maintenance Department has responsibility for aircraft maintenance training, and the Administrative Department concentrates on administrative training procedures. The importance of computer training is not recognized. The CSM has

no resources with which to train nor does he have personnel assigned to him for assistance. The training of personnel at NARDAC Pearl Harbor has not been pursued because of budget constraints. Because of this lack of training, personnel cannot effectively use the microcomputers in the squadron.

The CSM billet is not regarded as career-enhancing. Traditionally, assignments in an aviation squadron that are considered ticket-punchers are those in the Operations and Maintenance Departments. Since the ADP function falls in neither, it is not highly regarded either within the squadron nor, more importantly, by a promotion selection board. It stands to reason, then, that the squadron would assign a very junior officer to such a billet, one who would have time left in the squadron for a tour in either operations or maintenance.

The current Squadron Manpower Document (SQMD), which lists the personnel that are required for assignment to the squadron, does not require the assignment of an officer with formal computer training, such as a graduate of the Naval Postgraduate School Computer Systems Management Curriculum. Such officers are designated, upon graduation, with a 0095P subspecialty code. In order for a squadron to guarantee obtaining a "p-code" officer, another COMNAVAIRPAC activity would have to give up a "p-coded" officer to provide compensation and the squadron's SQMD would have to be formally modified, requiring approval from the Chief of Naval Operations to reflect that requirement. Thus, there is no guarantee that VQ-3 would have the infrastructure available to support information systems. However, there is considerable talent within the squadron, admittedly assigned by chance, that is vastly underutilized. There are two officers currently assigned who

have formal training from the Naval Postgraduate School. Regrettably, their expertise is limited for use within the departments to which they are assigned.

Along with the lack of a high-level information systems planning committee, there is a lack of top-management support for formal computer systems procedures. There is a squadron instruction that addresses ADP security; however, there is no formal instruction establishing procedures for backup/recovery, contingency planning, or documentation requirements. Each department is free to use its microcomputer as it desires.

The lack of financial resources, a barrier that is external to the squadron, is perhaps the most significant. For not only is there a lack of funds to procure new equipment, there is a lack of funds available for outside assistance to enable the squadron to get a handle on its current resources. The type commander's adamant refusal to approve funding to allow an outside organization such as NARDAC to lend systems analysis assistance can only be interpreted as a lack of top-management support to the squadron for information system planning support.

C. RECOMMENDATIONS

Some of the barriers outlined above are outside the purview of the squadron, notably the attitude that the CSM billet is not career-enhancing, the lack of support from the type commander for outside assistance and acquisition and budget procedures. However VQ-3 can take charge of the following:

- Establish a high-level information systems planning committee.
- Develop a master information systems plan.

- Establish a formal computer training program within the squadron.
- Examine ways to strengthen the CSM billet.
- Emphasize top-management support of information systems.
- Submit well-researched, thoroughly evaluated ADP-related requests to COMNAVAIRPAC using the ASDP format.

A planning committee consisting of all of the department heads as well as the squadron CSM and headed by the XO should be established. Additionally, any officer reporting to the squadron for duty who has a 0095P subspecialty code or other formal computer training should automatically be a member of the committee for the duration of his or her tour. This committee would provide a forum within which to trade ideas, discuss on-going departmental efforts of computer use and determine priority of system projects. This forum could also be used to find out where the personnel talent is in the squadron to make more effective use of it. Questions such as who will administer squadron databases, who will own them, and who will be responsible for maintaining them must be addressed. Having the CSM as a member of this committee will serve to empower him so that he can coordinate and carry-out the actions that the committee directs.

An output of the planning committee should be a master plan for the squadron. Currently, each department does what it desires with its microprocessor; there is no oversight or coordination among departments. In addition to addressing what systems and assets the squadron has, the plan should consider what future enhancements would involve.

A training program must be established to train personnel to use more effectively the microprocessors that are currently on-board. It would be

inconceivable to put untrained individuals on an airplane with "how-to" manuals to teach themselves how to fly. So, too, it is unthinkable to give people microprocessors and a few manuals and expect them to teach themselves while simultaneously doing their job with no loss in productivity.

With more microcomputers available than the average Pacific Fleet aviation squadron, VQ-3 must submit carefully researched, well thought-out requests for additional computer resources. The establishment of a planning committee and development of an information systems plan by the squadron would significantly contribute to the validity of any additional requests. However, in consideration of increasingly scarce resources, VQ-3 must get a handle on the resources it currently has before requesting more.

It is understandable that with the upcoming transition to a new model aircraft and downstream change of homeport the CO and XO have higher priorities than microcomputers. However, it is well-documented that systems projects do not succeed without top management support [Ref. 6]. Since type commander information systems plans do not include plans at the squadron level, it is imperative that the squadron take the initiative to establish such a plan which necessitates the commitment of the CO and XO if it is to be a useful management tool rather than a paperwork drill.

As for those barriers that are a blend of external and internal to the squadron, a follow-on study could be undertaken to determine the feasibility of establishing an infrastructure within aviation squadrons to support computer use.

The barriers that address funding and incompatibility are beyond the squadron to overcome. However, a follow-on study could be performed to

discover the impact of uncertain, limited funding on computer systems and the resultant mix of incompatible computers that are acquired as a result.

Finally, it would appear advisable for the squadron to take seriously the issues and recommendations raised in this thesis.

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