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THE DESIGN AND IMPLEMENTATION OF ZTRAX: A TRAINING, READINESS AND FLIGHT HOUR RELATIONAL DATABASE MANAGEMENT TRACKING SYSTEM

by

Richard E. Hodgkins

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Thesis Advisor: Robert L. Knight, LCDR, USN

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In an era of diminishing budgets, information technology must help direct operational commanders in the maximum utilization of their available resources. The institution of a relational database management tracking system to identify and exploit an organization's strengths will aid in keeping forces combat ready at all times. The design and implementation of ZTRAX; a training, readiness and flight hour relational database tracking system. ZTRAX is expected to provide historical information of home and deployed, operational and training flight evolutions to aid in the decision making process of training and readiness planning. The ZTRAX application is a menu driven program which permits the adding, editing and querying of data contained on two source documents; the Monthly Training and Readiness Report and the Monthly Flight Hour Report. ZTRAX is run concurrently from within the main Paradox program to allow for a vast array of ad hoc queries, reports and the importation of graphical display mechanisms.

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The Design and Implementation of ZTRAX: A Training, Readiness and Flight Hour Relational Database Management Tracking System

by

Richard E. Hodgkins
Lieutenant, United States Navy
B.A., Flagler College, 1985

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Author: _____
Richard E. Hodgkins

Approved by: _____
LDCR Robert L. Knight, Thesis Advisor

_____
Balasubramaniam Ramesh, Second Reader

_____
Prof. David R. Whipple, Chairman
Department of Administrative Sciences

ABSTRACT

In an era of diminishing budgets, information technology must help direct operational commanders in the maximum utilization of their available resources. The institution of a relational database management system to identify and exploit an organization's strengths will aid in keeping forces combat ready at all times. The design and implementation of ZTRAX; a training, readiness and flight hour relational database management system. ZTRAX is expected to provide historical information of home and deployed, operational and training flight evolutions which will aid in the process of training and readiness planning. The ZTRAX application was implemented in November, 1991 and is a menu driven program which permits the addition, editing and querying of data contained on two source documents; the Monthly Training and Readiness Report and the Monthly Flight Hour Report. Ztrax is run concurrently from within the Paradox program to permit a vast array of ad hoc queries, reports and the importation of graphical display mechanisms.

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I. INTRODUCTION

The fulfillment of the information needs of the U.S. Navy is critical to attaining continued tactical superiority above, on and below the surface of the oceans. The realization of these needs constitutes a variety of scenarios ranging from the real-time update of mission critical information to the analysis of the training and readiness records of a unit. Recent and predicted future reductions in appropriated funding magnifies the need for comparative analysis of training and readiness at all levels of operational command. To effectively and efficiently prepare the Navy for future encounters with hostile forces we must employ information technology to supply the systems and software able to produce timely and accurate information.

Specific measures of unit training and readiness provide the means to evaluate a squadron, airwing or fleet's ability to complete its assigned tactical mission. The majority of minor commands, i.e., airwings, rely on manual methods to extract relevant information from a myriad of data, maintained as it is received, in hard copy message format. Answering routine queries is often time consuming and frequently unsuccessful. This situation can be remedied by the implementation of a database management system(DBMS) utilizing a user friendly, commercially available relational database

software application(RDBMS). Once the RDBMS is operational, specific local user requirements can be identified. There are typically several repetitive database queries which will aid in the construction or use of a decision support system(DSS). Of vital importance to the users is the ability to attain and interpret data and information quickly and efficiently without a tedious and time consuming process. This will be accomplished through the implementation of a DSS.

A. BACKGROUND

The mission of a Fleet Patrol Wing is to guide and direct the organization, administration, and training of all patrol squadron (VP) forces subordinate to it (COMPATWINGSPAC, 1988). Specific responsibilities include:

- Operational control functions of air Anti-submarine warfare(ASW) units assigned to a Fleet Commander.
- Supervise and coordinate patrol squadron training.
- Investigate and recommend improvement in ASW training, tactical doctrine, and equipments.
- Establish performance and readiness standards and evaluates the readiness of subordinate squadrons.
- Conducts inspections of patrol wings, stations and squadrons.
- Directs aircraft maintenance practices, procedures and doctrine in subordinate squadrons with a view of promoting maximum efficiency.
- Exercises military control of assigned forces in the execution of operational ASW and surveillance missions and tasks (COMPATWINGSPAC, 1988).

Several departments within the organizational structure of an airwing retain functional responsibility for the areas listed above. They include:

- Operations
- Tactics Development and Evaluation(Tac D&E)
- Readiness and Training Plans
- Manpower and Personnel
- Maintenance

The departments deriving the majority of the benefit from ZTRAX are Operations and Readiness and Training Plans. The requirement for timely readiness and training information presented in a desirable format is an increasingly difficult and time consuming task. Numerous man-hours are spent in daily activities to satisfy the current needs. ZTRAX will serve to meet the present needs and those of the future.

1. Readiness and Training Plans Department Operations

The readiness and training plans department of an airwing is a cornerstone to the efficient operations and readiness stature of all the squadrons over which it maintains operational control. The office serves as a collector of data and disseminator of vital information. The numerous readiness, training and flight hour concerns range from individual squadron queries for comparative mining readiness command inspection(MRCI) flight hours, parent airwing requests for

graphical portrayals of monthly aircrew manning levels and pilot training and proficiency statistics to CNO directed monitoring and maintenance of prescribed combat readiness levels. Currently, the majority of the training, readiness and specific squadron flight hour information is processed manually. Gathering pertinent data in these instances is extremely difficult and time consuming because they are stored in hard copy form and require several iterations of records search. Other departmental operations such as airwing-level flight hours and OPTAR budgets are tracked utilizing various commercial spreadsheet applications. It is essential ZTRAX have the ability to interact with those applications.

a. Structure

The readiness and training plans department is staffed by two personnel, a post-patrol squadron(VP) department head tour Commander who serves as the Readiness and Training Plans Officer and a Chief Petty Officer. In addition, two civilian administrative assistants are available for administrative functions, as required. The Readiness Officer reports directly to the Admiral's Chief of Staff on all matters concerning the department's affairs.

b. Workload

The majority of data processed by the readiness department is received via message format from the operational squadrons or parent organizations, such as COMNAVAIRPAC, where

they originate. Flight hour, OPTAR and future detachment and deployment activity data pertaining to current records on the existing hardware are transferred to the department, accordingly. These manual data transfers and subsequent queries account for approximately seventy percent of the daily departmental operations. OPTAR updates, tempo of operations and various queries demand numerous hours of attention each day, primarily due to the inability of the existing information system to maintain all of the required data. Periodic reports and miscellaneous information services and message traffic complete the required departmental activities.

2. System Evaluation and Functional Requirements

The existing hardware consists of two Z-248 processors with the standard 20 megabyte hard drive, 640Kb of RAM and a VGA monitor. These systems utilize of variety of commercially available microcomputer spreadsheet and database software applications to store and access information. Presently, hard drives of both systems are completely filled data required to effect daily operations. The constraints of the hard drives capacity have necessitated the least recent data being removed from memory to allow new data to be entered into the program. This has resulted in reports and graphical portrayals of information that are incomplete because a portion of the historical data had to be removed to accommodate the new data. The hardware currently in use would suffice with some upgrades

if the processing needs of the department were to remain constant, i.e., maintain the status quo of tracking and presenting queried readiness and training information via the manual means. The introduction of ZTRAX, a training, readiness and flight hour tracking system, has drastically increased the memory and processor speeds required to most effectively and efficiently utilize the designed system to its utmost. Several alternatives able to solve the aforementioned problems exist:

1. Upgrade the motherboard to a faster processor capable of providing less idle time during query processing.

2. Augment the existing hard drive with a larger and faster model containing a disk cache able to provide sufficient memory and fast access into the future.

3. Expand the random access memory(RAM) from the current 640Kb to at least two megabyte. This will allow the entire ZTRAX program to exist in main memory during database operations.

4. Replace the existing system with a current GSA contract model 386 machine which will provide satisfactory performance well into the future.

The most desirable solution, as shown in a comparative analysis of options contained in Chapter V, is the purchase of two Unisys 386 machines per the current GSA Desktop III contract agreement.

Functional requirements for ZTRAX were based on the need to lessen the time required to research and present information currently stored in hard copy form, the requirement to use the Monthly Training and Readiness Report

and Monthly Flight Hour Report as source documents and desired end-user functionality. They are as follows:

1. Safely, securely and reliably maintain data and records.

2. Provide pre-defined queries of frequently requested data fields, i.e. monthly status of pilot/crew training, Primary Mission Area(PMA) readiness for individual squadrons and parent airwings and comparative analysis of flight hours.

3. Provide ad hoc query capability without lengthy and cumbersome procedures.

4. Allow graphical interface portrayals with Lotus and Harvard Graphics.

5. Provide for the future capability to update records on-line with floppy disks vice the current system of manual entry.

6. Display all text and graphical information with the option to produce immediate hard copy.

B. RESEARCH QUESTIONS

This thesis will address the following questions:

1. Can a commercially available relational database software application be fully utilized to accomplish RDBMS functions, such as ad hoc queries and graphical output portrayals, in a fast and efficient manner despite the computer hardware constraints held by operational airwings?

2. What are the specific system requirements for utilizing the database management system to maximize its capabilities?

3. Can measures be implemented to enter raw training and readiness data into the database by other than the manual manipulation of the tables themselves?

4. Can justification be given to replace existing computer hardware systems with current Unisys GSA contract models in order to meet the desired performance and data storage requirements?

C. OUTLINE

Chapter II will detail the design of the RDBMS.

Chapter III discusses implementation of the RDBMS and its interaction with other commercial software applications for graphical representation purposes. The users manual is contained in Appendix E.

Chapter IV discusses the issue of computer security and its relevance to all microcomputer operations.

Chapter V provides recommendations and conclusions for the use of a relational database management system to provide accurate and timely readiness and training information.

Appendix A-E will provide the data input documents, object diagrams, object definitions, domain definitions and the users manual, respectfully.

II. DESIGN

Database design involves several significant steps which are necessary to ensure that a complete and conceptually correct model emerges. Using an object oriented design approach, the first step is to identify the database system requirements. This includes identifying the objects the users require to effectively track their data. Next, the objects identified in the requirements phase will be normalized to ensure they support the requirements of the users. The normalization process gathers data items into relations which are not redundant and can be manipulated by the users without the threat of data loss due to modification anomalies (Dolan, 1988).

The use of the relational data model for ZTRAX was predicated on the conceptual view the user has of the data objects contained within the system. The goals of the relational model are twofold; to provide data independence by identifying the separation of the physical format from the users view of the data, and to achieve data integrity by avoiding data inconsistencies and anomalies in the processing of the data itself (McClanahan, 1991).

> The view of the system that's provided by the (relational) data model describes the structure of the data in a

> natural form that the users can intuitively understand without extensive training (McClanahan, 1991).

The users in the readiness and training plans department, having little or no experience with database operations, will benefit from the architecture of this model.

A. REQUIREMENTS DEFINITION

The basis of the design of ZTRAX revolves around two monthly reports, the Monthly Training and Readiness Report message and the Monthly Flight Hour Report message, depicted in Appendix A as source documents. These reports are transmitted to the airwing by the originating squadron by no later than the fifth day of each month and provide relevant data from the previous month's operations. The standardized format and fixed field length of the reports will allow for future updates of records via floppy disk. The attributes and objects identified for ZTRAX are derived from these reports.

1. Objects

Objects are defined as a collection of properties that describe an entity in the users work environment. All objects have a name which corresponds to the entity it represents. They can represent items such as an inventory item, an operational flight hour category or a monthly readiness report. Each object property must represent specific characteristics of the real-world entity that is important to the users of the database. The object properties must provide

a sufficient description of the true entity the users need to have represented. An entity is something perceived by the user as a single independent unit capable of existing on its own. The database is a collection of instances of objects, that is a representation of one specific entity (Dolan, 1988).

The objects and their respective properties were created for ZTRAX through a hybrid design approach. Sample source documents, i.e. the Monthly Training and Readiness Report and the Monthly Flight Hour Report, and end-user requested data input and output displays justified the object oriented design by verifying the users view and perception of the data entities. End-user involvement during the design phase is expected to result in an easing of the initial training required to use the database because the users are familiar with the objects, their functions and meanings. Appendices B, C, and D provide graphical views of the objects, object definitions and domain definitions, respectively.

1. DETOPS Object represents the detachment operations during a report month and pertains to both source documents. This object provides the detachment name, site and type, dates of detachment, total flight hours, number of aircraft, aircrews and days. The objects ID and a subset of the multiple valued FLTHRS object, category, are also contained in DETOPS.

2. FLTHRS Object represents the various types of flights and flight hours performed by an operational squadron. It provides a category name, area name, type name, and specific type as they pertain to both source documents. The objects ID and MATRIX are included within FLTHRS.

3. FLTRPT Object represents the monthly flight hour report source document shown in Appendix A. It contains the ID object, the multiple valued FLTHRS object, the PILOT STATS object, the multiple valued INST PILOTS object and the multiple valued DETOPS object.

4. ID Object represents the key identifying attributes of the database. They are: squadron number which identifies a specific squadron, month which identifies the report month, year, report type which identifies the source document where the data originates and squadron status which indicates whether the squadron is home or deployed during the report month.

5. INST PILOT Object represents instructor pilot data contained only on the monthly flight hour report. It consists of rank which identifies military rank, date of designation as an instructor pilot and predicted rotation date of the instructor pilot. The ID object is included within INST PILOT.

6. MANNING Object represents designated aircrew manning levels within a squadron for a report month. It is specific to the monthly Training and Readiness report. Manning consists of: position name which identifies the aircrew position, total, gains and losses which give numeric indications of the manning levels for a specific position, cat I/II or III which categorize officer sea tours and the ID object.

7. MATRIX Object represents various entities relating to specific flights and flight hours. This object is specific to the monthly Flight Hour report and includes: sorties which indicate the number of missions flown for a particular category, area, type or specific type, onstation which indicates the flight hours onstation during a sortie, total flight hours for the mission and contingency which is a numeric count of the number of those missions flown. The FLTHRS object is included in the MATRIX object.

8. NIGHTHRS Object represents the night flight hours flown by a squadron during a report month and is specific to the Training and Readiness report. It contains night hours, night hours as a percent of total hours and the ID object.

9. PILOT STATS Object represents first tour pilot statistics and is specific to the Flight Hour report. It contains the average first pilot time for first tour pilots, number of pilots not acquiring ten hours of first pilot time and PEF pilots. The ID object is also represented.

10. RDYRPT Object represents the monthly Training and Readiness report and is comprised solely of the following objects: ID, multiple valued MANNING, multiple valued R-LEVELS, multiple valued FLTHRS, multiple valued DETOPS and NIGHTHRS.

11. R-LEVELS Object represents the combat readiness levels attained by a squadron's aircrews, in various categories, during the report month. R-LEVELS is specific to the monthly Training and Readiness report and contains primary mission area(PMA) names, C-rating which is an assigned rating for a PMA dependent upon the number of aircrews in a squadron designated as combat ready, number of aircrews designed C-1(the highest level) and the percentage of crews rated C-1 to the total number of crews in a squadron. The ID object is also contained with this object.

Each of the above objects is essential to accurately represent the users view of the data in a relational database model. It was possible in some instances however, to utilize a single object to represent duplicate data contained in both reports, thereby eliminating any data redundancy. The DETOPS Object and FLTHRS Object reflect similar data found in both source documents. An attribute of the ID Object, report type, will insure proper identification and placement of similar data elements found in these two objects.

2. Functional Components

The functional components of a database include the flow of data and information and the necessary update, display and control mechanisms which keep the database information current and accessible.

The ZTRAX tracking application is a simple model of data flow and retrieval. All input data is received by the

Training and Readiness Plans department via message from operational squadrons. The format and guidance for the monthly messages are two airwing originated instructions, COMPATWINGSPAC 3500.1 AND COMPATWINGSPAC 3500.27A. Upon receipt of the monthly Training and Readiness and Flight Hour messages, department personnel enter all the data contained on them into the database. Reports and graphic depictions of data are generated as required in response to ad hoc queries made by the department, squadrons, Chief of Staff or Admiral. Presently, the department is not required to submit any recurring reports that contain data which will originate from the ZTRAX database tables. The implementation of ZTRAX will provide the users the capability to do so in the future.

B. NORMALIZATION

Normalization involves the gathering of data items or properties into relations. Objects are used in the normalization process because they represent groups or related data items. The goal of normalization is to provide a representation of the user defined objects in the database by using relations that provide the necessary data to construct the user objects and are able to allow rows of data to be inserted, deleted or modified without inconsistencies or errors resulting (Dolan, 1988).

The first step in the normalization process is the elimination of modification anomalies. They can result in the

elimination of existing data in the database, a deletion anomaly. The inability to enter a fact about one entity until another entity has been entered, an insertion anomaly. ZTRAX does not contain either of these anomalies in it's design.

Relations can be classified by the types and classes of anomalies they may contain. The techniques for preventing these anomalies are called normal forms and proceed from first to fifth. Normal forms identify the relationships among attributes, functional dependencies and key fields of the relations and seek to resolve the modification anomalies. Normalization of the relations is an essential step in the logical design of a database. Capturing the user's view is essential to the successful design and implementation of a relational database management system. Object specifications for ZTRAX were defined by completing a thorough systems analysis to establish the exact requirements and constraints the database must meet. Background information identified the smallest useable data elements, known as attributes, and grouped them into entities which formed the basis for the tables in ZTRAX. This design method has insured ZTRAX will provide sharable data and information, assure integrity and evolve with the growth of the organization (Bagchi, 1987).

III. IMPLEMENTATION

Database implementation is an on-going, iterative process. It involves much more than the installation of the application and user training, rather it is the complete and thorough commitment to an adaptive maintenance plan which involves database administration guidelines, back-up and recovery procedures, database housekeeping and future enhancement considerations.

A. INSTALLATION

The installation procedures for ZTRAX are quick and simple to accomplish. Because ZTRAX runs best from within Paradox, the first step is to create a subdirectory named ZTRAX. Next make a back-up copy of each ZTRAX program disk. Store the original ZTRAX disks in a safe place and continue with the installation process using the back-up copies. To continue, insert ZTRAX disk one into the A drive and copy the entire contents into the ZTRAX subdirectory of the hard drive. Repeat this step for the remainder of the ZTRAX disks. ZTRAX is now installed on the system. To initiate ZTRAX, use normal start up procedures for Paradox. When the Paradox main menu appears, select TOOLS and change the directory to ZTRAX. This allows the standard query, report and graphic functions of Paradox to be used by the ZTRAX tables without changing

directories later. Now you can run the ZTRAX application through Paradox by selecting the SCRIPT/PLAY option of the main menu and entering ZTRAX at the prompt. At this point the ZTRAX main menu will appear and data entry, edit or view (query) are selectable. The specific use of these ZTRAX options are contained in the users manual (Appendix F). To maximize the capabilities of ZTRAX, all users of this application should be familiar with standard Paradox operations.

B. TRAINING

An operator training program for ZTRAX should accompany an on-going program designed to maximize the potential uses of Paradox. As a stand alone application ZTRAX successfully accomplishes its designed task, to provide a repository of readiness and flight hour data which is easily accessible and manipulable. However, optimizing the data contained in ZTRAX is best accomplished with ad hoc queries through the use of Paradox and its multiple functions. For users to excel at using ZTRAX, they must first feel comfortable in the Paradox operating environment. User training in Paradox can be obtained many ways. First, Paradox offers an extremely thorough and instructive help menu which is accessible from any Paradox screen at any time. These help tips and screens benefit all levels of users by explaining keystrokes, query forms, reports, etc., then showing examples of the proper format for the command in question. Second, Paradox offers an

on-line tutorial program designed to teach basic database operations to the inexperienced user. It contains a program which walks new users, step by step, through creating, editing, printing and querying tables. The use of this tutorial is essential for first time users of Paradox. It will provide the necessary baseline of knowledge required to utilize Paradox for effective database operations.

Training in the use of the ZTRAX application should occur after a working knowledge of Paradox techniques have been obtained. The ZTRAX program is completely menu driven with explanations of each screen display located below various menu choices. The most effective training method for learning ZTRAX is hands on experience with the menu system. All of the menus and screen displays are similar to the source documents they represent to ease the initial training required for first time users of the program. Although knowledge of Paradox is necessary to fully utilize ZTRAX, a user unfamiliar with Paradox or ZTRAX could enter new data with very little training. This an important future consideration for ZTRAX because its use in a squadron environment will not allow for extensive user training prior to implementation. Data add/edit procedures in their present form will allow junior enlisted squadron personnel to enter data with a small amount of training. This serves an important purpose by freeing senior personnel from the time intensive burden of data

entry/edit and allows them the freedom to query the database based on their needs.

C. DATABASE ADMINISTRATION

Administrative control of the database will be under the direction of the Readiness and Training Plans Officer. His responsibilities currently include maintaining hard copy of the data and providing information drawn from it. Therefore, as department head, he has the greatest interest in duties which would normally be performed by a database administrator (DBA) for this application. The duties of a DBA are wide and varied, dependent upon the size and type of database application that is being run. For ZTRAX, the necessary administrative tasks are very specific because it is a relatively small application.

The first priority of the DBA(department head) for ZTRAX is the security of the database and the system which contains it. The two microcomputers located in the department exist at the present time with no physical security devices to prohibit entry into the system. A security plan including physical and data security measures must be instituted to preserve the integrity of the system and database, should an intrusion occur. The plan should be clear and concise as to which users are authorized access and where they are allowed to travel once logged on to the system. Chapter IV provides a security site survey of the department and makes specific

recommendations for the initiation of a security program for the ZTRAX database and the department's Z-248 computers it is currently run on.

The second priority of the DBA is the assurance that the users are receiving the information they require. This is accomplished two ways. First, a periodic review of the source documents will identify any changes in the necessary input data. If a change does occur, it will be the responsibility of the DBA to modify the input, edit and pre-defined query screens found in ZTRAX. These procedures are given in the maintenance section of the ZTRAX users manual. Second, determining if users are receiving the information and support they require. If they are not, training with Paradox and the specific functions the users require can alleviate their dissatisfaction and provide new avenues to more effective and efficient use. In this instance the DBA must recognize the need for greater user involvement.

The third priority of the DBA is the management and allocation of disk space used by the ZTRAX database tables and related files. As it stands, the ZTRAX program accounts for 1.8 megabytes of memory usage on the hard drive. Each Monthly Training and Readiness report record takes up approximately 500 bytes of memory and a Monthly Flight Hour Report about 1500 bytes. This total of 2000 bytes, or 2Kb, accounts for one squadron's data input for a month. For the nine squadrons under the operational control of the airwing the total monthly

data input to ZTRAX and stored on the hard drive, about 18Kb. By today's standards, this is a small amount of disk space to be concerned with, however, the hardware constraints on the existing microcomputers at the airwing make this a serious problem.

The microcomputers in the department are Z-248's with 20 megabyte hard disks. When ZTRAX was installed the available hard disk capacity dropped to below one megabyte. That translates to four years of input data assuming no other data is stored from any of the various spreadsheet and word processing programs existing on the same computer.

First, how much historical data is required to provide an accurate picture of training, readiness and flight hour statistics for a squadron or airwing? At the present time, the department maintains copies of all the monthly reports from all the squadrons for a period of three years following its transmittal. With the current situation of available memory, three years of data would take approximately 650Kb of space, effectively filling the hard disk to capacity without room for any other data storage. Two years of data would, however, provide an entire 18 month operating cycle for a squadron plus six months overlap for any contingencies. This 18 month training/deployment cycle is the basis for the data analysis of the optimal training and readiness posture done in the department.

If a constant historical record of the two previous years is to be maintained on the hard disk, then older records must be archived prior to deletion. Archiving the data allows more working space on the hard disk and provides several years of historical data. If the requirement for historical data arises, the archived data can be loaded into a floppy drive and queried without reloading to the hard disk. The best way to archive is to copy specific records to floppy disk as they are entered as new data. This prevents accidental deletions two years from now when the data is to be deleted and provides an additional backup copy of the database records. The use of the Paradox copy command provides the means to copy data record by record, which is required here. The ZTRAX users manual describes the use of this command for disk backup procedures, any further reference to the copy function is contained in the Paradox users manual.

Consistent with the memory management problem experienced with ZTRAX records is the lack of archiving and backup records for the various other applications contained on the department's computers. Although beyond the scope of this thesis, an internal evaluation of the historical record storage requirements for each application should be made to identify possible solutions to this problem.

Backup and recovery procedures are an integral part of any database administration plan. The ability to recover sensitive data in the event of system failure can save

hundreds of hours attempting to manually recover lost records. The department's information system consists of two stand alone microcomputers which operate solely in a transaction processing mode. For this reason, data and record backup procedures should be instituted following every new data entry and edit. This will ensure a backup disk library which always contains newly added data and records. Procedures for backup and recovery are contained in section one of the ZTRAX users manual and make use of the Paradox copy command.

Database housekeeping is another duty of the DBA. It involves a variety of routine maintenance tasks which keep the system operational and accessible. Users in particular benefit from a housekeeping program which is attentive to their needs. Several of the activities already discussed, such as backup and archive copies of data, updating program files and persistent user training all comprise an effective data housekeeping plan. The following section describes another important DBA function, future considerations and updates for the ZTRAX application.

D. FUTURE PROGRAM CONSIDERATIONS

As essential to maintaining program integrity by making backup and archive copies of disks is the continuing program of perfective maintenance for data entry, edit and query. Perfective maintenance involves the redefinition of tables, screens, input and output displays. As the ZTRAX application becomes more familiar to users they will progressively request more from it. The manipulation of the Paradox program can answer many of these requests, primarily from the standpoint of ad hoc queries, but data add and edit is a ZTRAX function.

There are two situations where a change to the ZTRAX tables and associated input/edit screens would be necessary. First, a change to the source documents would require an amendment to the tables. Second, user requests for modified data entry screens and forms. Both instances are covered in section six of the ZTRAX users manual (Appendix F).

The largest concern relative to these two situations described above is changing the fields in a table and hence their format. If a new field is added to a table, the associated input form must also have that field added to it or there will be no way to add the data from the new field into ZTRAX. This is a simple procedure which is described, with an example, in section six of the users manual. Changing the format of the table also affects the archive procedure already discussed. To use the Paradox add command to archive records

the tables must be of compatible format. In order to preserve the older records and save the new ones it will be necessary to create a new archive file for the newly formatted table. Queries of archived historical data using the floppy drives will still be possible, only slower because Paradox will be required to search multiple files for data instead of one.

Modifying input, edit and query screens for the purpose of user satisfaction is also covered in section six of the users manual. These procedures, however, have no effect on the existing structure of the tables. Therefore, archiving can take place normally. Paradox also offers several utilities which allow the user to customize the Paradox application based on their needs. Screen colors, default directories, protected tables and several others are available for use and manipulation by the DBA. The Paradox users manual is an excellent source of knowledge for the various utilities available and their requirements.

Another future consideration for ZTRAX is the automatic update of the database tables with floppy disk file transfer, vice the current method of manual entry. Paradox offers a unique utility designed to address this situation. FLIMPORT, as Paradox refers to the it, creates or updates tables from fixed-length ASCII format records. This utility is significant because it can transfer files either singly or in a batch processing mode. The files from the floppy disk are first copied into an import specification file designed to represent

the table. Next, the specification file transfers the new data fields into the appropriate ZTRAX table. The activation of this utility would divert the time required to manually enter the new data in ZTRAX to other activities and suspend any requirement to correct errors in the database caused by human data entry error.

To take advantage of the capabilities of the FLIMPORT utility, the local communications center would be required to place a Monthly Training and Readiness Report or Flight Hour Report message for each squadron onto a floppy disk. The message would already be formatted in fixed-length ASCII characters, therefore no file conversion would be required. The communications center need only to place the two different messages in separate directories on the disk. The files for each type of message would be identified by squadron number. When the hard copy messages are delivered to the airwing the floppy disk could be delivered as well. The capability currently exists at some communications centers to deliver messages on floppy disk in a fixed field length ASCII format, unfortunately, it is not a standardized procedure and subject to special circumstances. Further information on FLIMPORT is available in the Paradox users manual and in section seven of the ZTRAX users manual.

IV. SECURITY

Microcomputer security measures are essential to control and insure the integrity of the database. From the standpoint of national security, any information system such as ZTRAX, used to store or process data that is classified presents a potential risk. There are several methods to effectively manage the security of a system and its components. Personnel, data, software, and hardware controls can all be implemented to reduce the risks associated with any operating environment.

> Regardless of any protective measures in place, the key element to security in any microcomputer environment is the user and how well the user follows the established computer security policies and guidelines. It cannot be overemphasized that users are the ones who help to ensure that the environment is as secure as necessary (NAVCOMTELSTA, 1991).

Database security violations are defined as unauthorized access, modifications, readings or destruction of data or information. Threats, either malicious or accidental, to the system can occur both overtly and covertly. The following are security threats to the various entities of a database environment (NCTAMS LANT 1991).

1. Database - Unauthorized access, Copying, Theft, Destruction

2. Hardware - Failure of protection mechanisms, Contributions to software failure

3. Systems Software - Failure of protection mechanisms, Information leakage

4. Operator - Duplication of reports, Theft of classified material, Fraudulent identification and input (NCTAMS LANT 1991).

There are no entities involving the database and system components that preclude the use of security controls to maintain system integrity.

A. BACKGROUND

SECNAVINST 5239.2 delineates the objectives for the Department of the Navy Automated Information System(AIS) security program. They include:

- Preventing fraud and abuse by implementing the necessary personnel, hardware, software and data controls
- Ensuring the availability of reliable information/ automated support
- Protecting AIS resources from damage, misuse and theft
- Accrediting and triennially reviewing all AIS through a comprehensive program supported by certification and risk management (NCTAMS LANT, 1991).

Of the above objectives, an initial assessment of the risks involved with the local operating environment are the first priority. Risk management is a process involving the identification, measurement and minimization of undesirable events which affect all AIS resources. It's purpose is the reduction of system risk to the lowest level of practicality

and cost effectiveness while consistently remaining within mission criticality requirements (NCTAMS LANT, 1991).

The DON risk management process involves several distinct elements, all of which are necessary to complete an accurate evaluation of a commands AIS risks. The elements of the risk management process are:

- AIS Security Survey - Collecting basic information to assess existing security posture
- Activity AIS Security Plan - Planning for security program implementation
- Risk Analysis - Analyzing, quantifying and counter risks which pertain to the local activity
- Contingency Plan - Planning for disaster recovery
- Security Test and Evaluation - Testing the effectiveness of an activity's security program
- Accreditation Report - Compilation of accreditation documentation in satisfaction of local and DON guidelines (NCTAMS LANT, 1991).

These elements pertain to all types of AIS and include word processors, weapon control, communications and pertinent to this thesis, microcomputers.

B. MICROCOMPUTER SECURITY

Security concerns in a non-complex microcomputer operating environment are wide and varied. Data, hardware, software and general concerns provide a combination of effectual methods to control access and insure a stable and safe AIS work space.

1. Data Concerns

Data concerns relate to data as a single entity, independent of storage media on a microcomputer. Access to the data is the single most important consideration regarding security. Data access controls are accomplished several ways, the most frequent being password protection. Within the confines of a database environment, a hierarchical structure of passwords can be used to help control authorized and prevent unauthorized access.

Other data concerns are the nature of the data and the media protection afforded that data. Obviously, classified data should only be accessible to those authorized users with the proper security clearance and the need to know. Ensuring the proper marking, declassification and destruction of magnetic storage media will prevent any security violations from occurring.

2. Hardware Concerns

In the microcomputer operating arena, the hardware in existence today does not contain the built-in capability to provide internal security mechanisms. The theft of microcomputers, with the data on the hard disks still intact, is a burgeoning criminal activity in both civilian businesses and government agencies. Denying the physical access to microcomputers to anyone except authorized users can help prevent this crime from occurring. Measures to secure the machines in

place also provide a high degree of protection. Using locking cables to attach microcomputer bodies to desks or walls, storing all removable magnetic media devices, such as external hard drives, in safes or locked cabinets and locking all offices where microcomputers are contained can all deter an attempted theft or system violation.

3. Software Concerns

Operating system and software application controls are the best way to deter physical access to restricted data. Several threats exist that can destroy the operating environment. Software attacks by hackers and intruders installing virus infections, software piracy and modifications to existing systems and data can all suspend your ability to operate until the system is purged of any foreign material.

Password protection is a viable, yet partial solution to the software security dilemma. It is available on DOS version 5.0, Wordperfect, Paradox and several other commercially available microcomputer software applications which are used by various agencies and commands in the Navy. Passwords, if used only at the entry level of the operating system, can help provide the necessary means to help prevent software security incidents and accidents from occurring. Encryption of data and files is another effective method to prevent unauthorized access. When used in conjunction with password protected files, data encryption provides a higher level of

security and access restriction to the operating environment.

4. General Concerns

Microcomputer use is expanding at an exponential rate. More users, more applications, more chances for fraud, theft, damage and loss to occur. One of the most serious problems facing the micro environment is the lack of control and policy regarding security and risk management. Continuous user and administrator education and training must be implemented at all levels of concern. The cost is inconsequential when compared to the loss of classified or sensitive data relevant to national security.

C. SITE SECURITY ISSUES

The ZTRAX tables will contain CONFIDENTIAL data once the application has been implemented at the site. It is primarily for this reason, the classified nature of the data, that security measures must be taken to avoid any undue risks of compromising the integrity of the database. Contained on the same microcomputer are various other spreadsheet and word processing applications that may, at times, contain documents or files at various levels of classifications ranging from UNCLASSIFIED to SECRET. The intention of this section is to expose any possible database and microcomputer security risks and prescribe recommendations to solve the problems at hand.

Physical access to the microcomputers in the Readiness and Training Plans Department are limited only by the access to

the building which it occupies. However, uniformed and civilian personnel unfamiliar to the airwing staff and employees are challenged upon entering any office or work space. The building is manned twenty-four hours a day and access is restricted during off-duty hours. While the access to hardware and equipment appears difficult for intruders, many instances of theft, destruction or tampering often involve personnel familiar to the command. For this reason, averting the physical access risks must not be ignored.

A survey of the current situation would show that few physical security measures are in place. During off-duty hours the micro-computers in the department are particularly vulnerable to intrusion and theft. The introduction of a risk counter-measures program should begin with acknowledgement that nothing in the department is safe until it is secured. The first step of the risk counter-measures plan should be to physically secure all hardware and peripheral equipment to something either stationary or requiring great difficulty to move. For instance, the monitors can be secured with locking stranded cables to the computer case, the desk or a wall fitted with a cable locking device. This will significantly reduce the threat of theft in the department.

The second step of reducing physical risk involves access to the operating system and applications contained on the computer. Password protection is a necessary element of any file management or program application when it involves

classified data. The current operating system, DOS ver. 5.0, allows for the use of password protected files, however it cannot prevent the use and manipulation of the operating system. Other applications found on the computers in the department all possess some sort of password protection for their files. Paradox can password protect the tables that contain the data and ZTRAX can prevent access to the application by preventing data entry or edit without a proper password.

It is obvious there is a problem with so many password protected files and applications. How many files should you protect? To correctly, i.e., change passwords every 90 days, maintain a system with this many required passwords would be a huge undertaking and administrative nightmare. It is therefore recommended that a security software package be purchased for the existing system. Most microcomputer security software can provide the same functionality as passwords can with the benefit of only one password per user. A security system of this sort also provides many benefits beyond multi-level access protection. Reports of user log-on and log-off times and discrete audit trails are two major benefits. Perhaps the greatest benefit is the sole responsibility for appropriate access to files and applications rests wi the system administrator(SA). In reality, access responsibility is already a function of the

SA, in this case the department head, but now access to the system is steadfast and controllable.

The third step of any security program is data protection. This is a twofold problem. First, data on the computer must be protected, and second, backup data on floppy disk must be protected. The relative risks in this department situation involve data stored on the computer. Backup disks are all secured in a combination locked filing cabinet which is accessible only by the department head. Several software applications provide functions which prohibit the editing of data without proper access or display warnings explaining the consequences of such edits. A software security package can also provide some measures of control in regards to data edits by restricting users to certain functions of file and database operations that can prevent unauthorized edits from occurring. Another function of security software is the encryption of data files. This is an enormous benefit to the security of the data because if a user or intruder was somehow able to get through the password protection and into the file manager of the operating system the files would all be encrypted and thus useless as a source of information.

The above illustrate several elements of risk found in the Readiness and Training Plans department. These risks occur in a wide range of commands within the Navy and must be recognized in order to be dealt with in an appropriate manner. Aside from physically restraining hardware and peripherals,

the single most effective security measure available is the institution of a microcomputer security software application which provides password protection, audit trails, file management tools and data encryption capability.

D. RECOMMENDATIONS

Safeguarding non-complex microcomputer environments involves a variety of measures which can be easily initiated and maintained. The first step is completing a security survey and risk analysis profile of the organization. Available from the NAVTELCOMSTA Jacksonville, Florida is the "Microcomputer Security Survey and Microcomputer Baseline Security Controls Risk Analysis Alternative". This document is a tool to gather various system information and address any risk associated with the current operating environment. Divided into two parts, part one is a survey form which gathers the necessary system information. Part two describes the "baseline approach" used to identify and manage associated risks. Upon completion of the survey, several controls may be recommended to minimize, counter or prevent the threat of accidents, human errors, physical and environmental controls (NAVCOMTELSTA, 1991).

1. Safeguarding Data

Implementing data protection safeguards are an essential element of a total security plan. Administrative

items, such as periodically reviewing the list of authorized users, the microcomputers and applications they are cleared on and changing passwords regularly can prevent data loss. Several software vendors offer a variety of inexpensive programs which can provide password protection and encryption for files, audit trails and operating system level data and access controls. Several other suggestions are obvious but often ignored. Keeping unneeded sensitive data off the machines and disguising the names of those files that are present lessens the possibility of an incident or accident. Encryption and periodic purge of outdated files is another method providing good security. Access controls for software applications provide an outstanding means to not only deter intruders but can also provide audit trails of attempted unauthorized access. While all methods are not appropriate for all operating environments it is essential that some sort of data controls be implemented (NCTAMS LANT, 1991).

2. Physical Access Protection

Physical access protection means providing a secure area in which to operate and store microcomputer devices, data and peripheral equipment. Securing an area through the use of combination cipher locks on doors or by restricting access to certain areas of the building are reliable methods of access denial. Equipment safeguards such as a lock down apparatus and power switch protectors can also deter intruders from

gaining any valuable material from the work space. Physical access protection is the most visible and overt deterrent to attempted security ministrations. They should be implemented in all microcomputer environments (NCTAMS LANT, 1991).

In this information age of escalating computer fraud and theft, system integrity and security should not be sacrificed for any reason. Inexpensive, reliable software protection is readily available from a multitude of vendors. Several DOD, SECNAV and OPNAV instructions relating to the operational security of AIS elements prove it is an issue worthy of vital concern.

V. CONCLUSIONS and RECOMMENDATIONS

The installation and use of the ZTRAX relational database tracking system has made a significant positive impact on the daily operations of the Readiness and Training Plans Department since its inception in November 1991. The ability to query information through the use of an RDBMS, vice the previous method of manually researching and preparing data, is providing the users a greater understanding of training and readiness trends for individual squadrons and the entire organization. Information such as this will lead to the eventual development of optimal training and deployment cycles for operational squadrons and airwings.

ZTRAX is providing a vast array of information which was previously difficult to obtain. However, there are several drawbacks to using the department's Z-248 microcomputers. The first and most noticeable is the speed at which the processor operates. Benchmark times of an 80286 processor running at 8MHz for single queries exceed 1 minute and multiple queries exceed 1 minute 45 seconds as compared to an 80386 running at 20 MHZ which was below 20 seconds for single queries and below 30 seconds for multiple queries. Several factors contribute to the query benchmarks shown above. The 80286 chip is by no means state of the art and the majority of todays leading edge software applications, such as Paradox, are designed to run on

faster machines. The RAM available on a Z-284 is 640Kb. Because ZTRAX is most effectively run through Paradox to utilize many of its local functions, the program has to continually access the hard disk for data. This hard disk is currently 95 percent filled with various records of historical flight hour and readiness data not related to ZTRAX or Paradox, thereby making access times extremely slow.

There are three alternatives to this situation:

1. Maintain the status quo. This alternative is not recommended based on the expected growth of the use of the ZTRAX application and the current idle time experienced by users waiting for query results and report displays.

2. Upgrade the existing system with a new processor, hard disk and expanded RAM. GSA Companion Contract N66032-91-D-002 provides for Z-248 upgrades that are offered by Zenith. The cost of an upgrade to an 80386DX processor running at 25MHz with 4 megabytes of RAM on the motherboard and a 44 megabyte hard disk is $1663, plus labor to install. This alternative is not recommended because this option is essentially replacing 70 percent of the component parts of a Z-248 for 80 percent of the cost of a completely new system. The departments Z-248's have been in operation over six years and the parts that are replaced with this upgrade must be considered for replacement in the near future.

3. The purchase of a new 80386 machine with a 168 megabyte hard disk, 4 megabytes of RAM, VGA monitor and associated software and components per the current GSA Desktop III contract, number F01620-90-D-0001. This system not only solves existing problems with processor speeds and hard disk capacity but will meet the future needs of establishing a Decision Support System with the ZTRAX database tables. This desktop model, SLIN 0034AB, is priced at $2103. Considering the anticipated problems with extending the useful life through upgrades of the Z-284's, this is the most viable solution.

The purchase of two new microcomputers for the department will significantly increase the speed and quality of output.

Although the new machines will not affect input methods for data entry, the ability to install the complete Paradox program on the hard disk will enable the use of the FLIMPORT utility. This utility imports data from fixed-length ASCII formatted files into the ZTRAX database tables through a named specification file. If the ability to receive the monthly Training and Readiness and Flight Hour messages from the local communications center on floppy disk in the required ASCII format were present, FLIMPORT would eliminate all the time currently required for data entry.

The success of ZTRAX operations within the department is overshadowed by the lack of security for the integrity of the database program, its data and the data of associated applications contained on the same microcomputer. Both machines in the department have been TEMPOS approved for classified information, yet neither use any of the available security measures recommended in Chapter IV. WATCHDOG Version 6.0 is a security system that provides access control, data and file protection, transparent data encryption, virus protection, audit trail facilities, system administration and a fixed disk management system. All of these features are necessary components of a thorough and complete microcomputer security system which will help to guarantee system integrity. This software is available under GSA contract number GS00K91AGS5038 from Government Technology Services, Inc. under GTSI Part Number 298-001-019.

This thesis has presented the functional requirements, design and implementation of ZTRAX: an RDBMS for tracking and evaluating squadron training, readiness and flight hour data. An evaluation of the existing information system and its ability to fully utilize the functions of ZTRAX and Paradox was also discussed. Recommendations were made as to the most beneficial steps to take to ensure the maximum capabilities of the RDBMS are met and the integrity of the data remains secure. The need for this application is the requirement for the maximum utilization of training combat ready aircrews in an era of diminishing appropriated funding for that purpose.

APPENDIX A. SOURCE DOCUMENTS

COMPATWINGSPACINSTR 3500.1

SAMPLE MONTHLY TRAINING AND READINESS REPORT MESSAGE

EXAMPLE - CLASSIFICATION MARKS ARE FOR FORMAT ONLY

FM: PATRON XX
TO: COMNAVAIRPAC SAN DIEGO CA//3121//
INFO: COMPATWINGSPAC MOFFETT FIELD CA//50//
COMPATWING XXX//50//

C O N F I D E N T I A L //NO3500//

SUBJ: MONTHLY TRAINING AND READINESS REPORT (U)

1. (C) A. PATRON XX
B. MARCH 90
C. N/A

2. (C) A. 33 B. 1 C. 1 D. 29/3/1
E. 24 F. 0 G. 1 H. 21/2/1
I. 75 J. 3 K. 2

3. (C)

A.	B.	C.	D.
ASU	C-3	7	64
ASW	C-1	11	100
CCC	C-1	10	90
ELW	C-1	11	100
INT	C-1	11	100
LOG	C-1	11	100
MIW	C-4	4	36
MOB	C-1	10	90
FHR	C-3	34	68

4. (C) 70.2/19

5. (C) A. 1. 23.0 2. 98.6 3. 30.0 4. 16.0 5. 167.6
6. 0
B. 1. 121.0 2. 0 3. 35.4 4. 29.0 5. 185.4
6. 0

6. (C) A. ICEX 90 A2. PACEX 90
B. 8-17 MAR 90 B2. 20-25 MAR 90
C. 40.2 C2. 20.5

7. (U) N/A

8. (C) 6 DAYS
MIDWAY ISLAND 1-6 MAR 90 PONY EXPRESS

9. (U) N/A

10. (C) 1. SQUADRON SCHEDULED FOR MRCI IN APRIL. EXPECT C-2 IN MIW FOLLOWING MRCI.
2. 4 CREWS NOT OP READY IN ASU AWAITING REQUAL (A-39) OPPORTUNITY WITH BG FOXTROT ON APR 9.
3. FLIGHT HOURS LOW DUE TO POST DEPLOYMENT LEAVE.

THIS PAGE UNCLASSIFIED
CLASSIFICATION MARKS ARE FOR FORMAT ONLY

Encl (3)

CONFIDENTIAL when filled in
COMPATWINGSPACINST 3500.27A

FM: PATRON XXX

TO: COMPATWINGSPAC MOFFETT FIELD CA//51//

INFO: COMASWFORPAC PEARL HARBOR HI//ASW3//

COMPATWING TEN MOFFETT FIELD CA//30//

COMPATWING TWO BARBERS POINT HI//30//

COMPATWING ONE KAMI SEYA JA//30//

C O N F I D E N T I A L //NO3500//

SUBJ: MONTHLY FLIGHT HOUR REPORT FOR MONTH/YEAR (U)

REF/A/COMPATWINGSPACINST 3500.27A/1 AUG 91//

1. IN ACCORDANCE WITH REF A, THE FOLLOWING REPORT IS SUBMITTED:

	H/D	# SOR	ONSTA	TOTAL	CONT
I. TASKED OPERATIONAL HRS					
A. INDEP ASW (1) Type	____	___	_____	_____	__
B. COORD ASW (1) Type	____	___	_____	_____	__
C. COMBINED ASW (1) Type	____	___	_____	_____	__
D. INDEP INT/SUR	____	___	_____	_____	__
E. COORD INT/SUR	____	___	_____	_____	__
F. COMBINED INT/SUR	____	___	_____	_____	__
G. CCC	____	___	_____	_____	__
H. COMBINED CCC	____	___	_____	_____	__
I. ELW	____	___	_____	_____	__

CONFIDENTIAL when filled in

CONFIDENTIAL when filled in
COMPATWINGSPACINST 3500.27A

PATROL SQUADRON FLIGHT HOUR REPORT CON'T

	H / D	# SOR	ONSTA	TOTAL	CONT
J. COORD ELW					
K. COMBINED ELW					
L. ASU					
M. COORD ASU					
N. COMBINED ASU					
O. DEPL. TRANSIT	D				
P. DET TRANSIT					
Q. PONY EXPRESS					
R. LOGISTICS SUPPORT (1) Specify					
S. OTHER (1) Specify					
T. TOTAL CONTINGENCY					
U. TOTAL OPERATIONAL					
II. INDEPENDENT TRAINING HOURS					
A. ASW					
(1) CAST					
(2) A-37					
(3) NIB					
(4) OTHER (A) Specify					
(5) TOTAL INDEP ASW					

CONFIDENTIAL when filled in

PATROL SQUADRON FLIGHT HOUR REPORT CON'T

	H / D	# SOR	ONSTA	TOTAL
B. INT/SUR				
(1) A-30	____	____	____	____
(2) OTHER				
(A) Specify	____	____	____	____
(3) TOTAL INT/SUR	____	____	____	____
C. MIW				
(1) A-38	____	____	____	____
(2) MRCI/WKUP	____	____	____	____
(3) OTHER				
(A) Specify	____	____	____	____
(4) TOTAL MIW	____	____	____	____
D. ELW				
(1) Specify	____	____	____	____
E. ASU				
(1) Specify	____	____	____	____
F. BOMBEX				
(1) Specify	____	____	____	____
G. TOTAL INDEP TRNG	____	____	____	____
III. PILOT/CREW TRAINING HOURS				
A. PILOT TRNG				
(1) SYLLABUS	____	____		____
(2) PPT	____	____		____
(3) INSTRUMENT	____	____		____
(4) AIRWAYS	____	____		____
(5) NATOPS	____	____		____

PATROL SQUADRON FLIGHT HOUR REPORT CONT

	H / D	# SOR	ONSTA	TOTAL
(6) TOTAL PILOT TRNG	____	___		_____
B. CREW TRNG				
(1) SYLLABUS	____	___		_____
(2) OVR WTR NAV	____	___		_____
(3) NATOPS	____	___		_____
(4) TOTAL CREW TRNG	____	___		_____
C. TOTAL P/C TRNG	____	___		_____
IV. MISCELLANEOUS TRAINING HOURS				
A. MAINT CHECK	____	___		_____
B. MAD COMP	____	___		_____
C. WST TRANS	____	___		_____
D. SCHOOL FLTS	____	___		_____
E. FERRY	____	___		_____
F. OTHER (1) Specify	____	___	_____	_____
G. TOTAL MISC	____	___	_____	_____
V. TOTAL TRAINING	____	___	_____	_____
VI. COORDINATED/COMBINED EXERCISE HOURS				
A. COORD ASW (1) Specify	____	___	_____	_____
B. COORD INT/SUR (1) Specify	____	___	_____	_____

PATROL SQUADRON FLIGHT HOUR REPORT CON'T

	H / D	# SOR	ONSTA	TOTAL
C. CCC				
(1) Specify	____	___	_____	_____
D. COORD ASU				
(1) Specify	____	___	_____	_____
E. COORD MIW				
(1) Specify	____	___	_____	_____
F. TOTAL COORD EXERCISE	____	___	_____	_____
G. COMBINED ASW				
(1) Specify	____	___	_____	_____
H. COMBINED INT/SUR				
(1) Specify	____	___	_____	_____
I. COMBINED CCC				
(1) Specify	____	___	_____	_____
J. COMBINED ASU				
(1) Specify	____	___	_____	_____
K. COMBINED MIW				
(1) Specify	____	___	_____	_____
L. TOTAL COMBINED EXER	____	___	_____	_____
M. TOTAL EXERCISE HOURS	____	___	_____	_____
VII. SERVICE HOURS				
A. C/N	____	___	_____	_____
B. ACFT SVCS				
(1) Specify	____	___	_____	_____
C. SAR	____	___	_____	_____
D. CNO PROJECTS				
(1) Proj #	____	___	_____	_____

PATROL SQUADRON FLIGHT HOUR REPORT CON'T

	H / D	# SOR	ONSTA	TOTAL
E. TAC D&E (1) Proj name				
F. RECRUITING				
G. STATIC DISP				
H. ORIENT/DEMO				
I. STAFF SUPPORT				
J. OTHER (1) Specify				
K. TOTAL TASKED SERVICES				
VIII. TOTALS				
A. TOTAL MONTHLY HRS	H			
B. TOTAL MONTHLY HRS	D			
C. TOTAL HOURS	H/D			

IX. MONTHLY PILOT ANALYSIS

A. MONTHLY AVERAGE 1ST TOUR, 1ST PILOT TIME: _____

B. NUMBER OF 1ST TOUR PILOTS NOT ACQUIRING 10 HOURS OF 1ST PILOT TIME: _____

C. NUMBER OF 1ST TOUR PILOTS BEHIND IN PEF: _____

D. IP STATUS

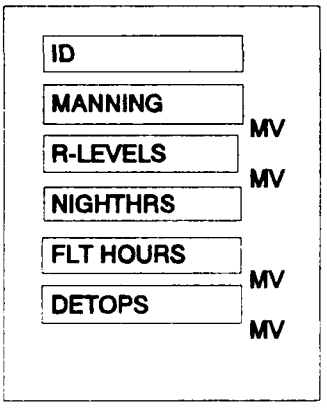
RANK	MONTH/YR DESIG	PRD

PATROL SQUADRON FLIGHT HOUR REPORT CON'T

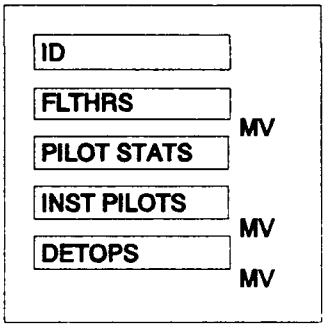
X. MONTHLY DETACHMENT OPERATIONS

	SITE	#ACFT	#CREWS	#DAYS	OPS HRS	TRNG HRS	EXER HRS	SVCS HRS	PILOT/CREW POSITIONING
1)	_____	____	____	____	___	___	___	___	_____

APPENDIX B. OBJECT DIAGRAMS

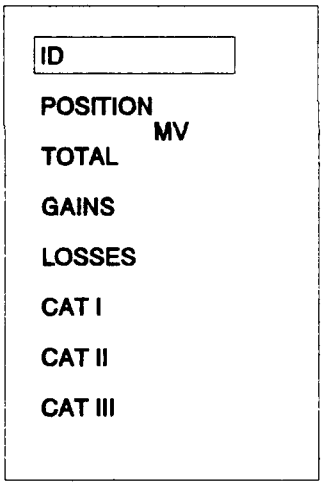


RDYRPT Object

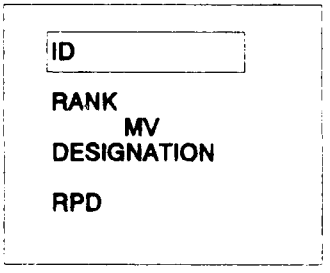


FLTRPT Object

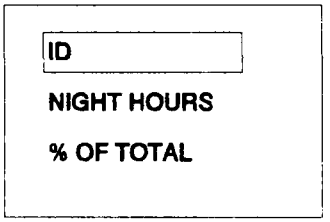
ID Object



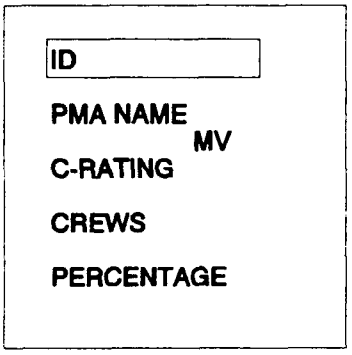
MANNING Object



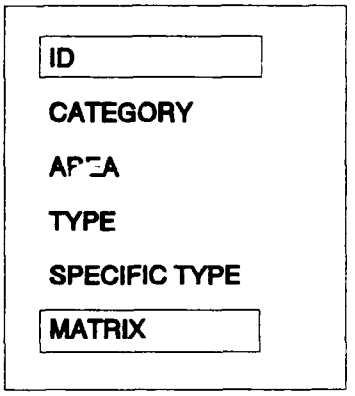
INST PILOTS Object



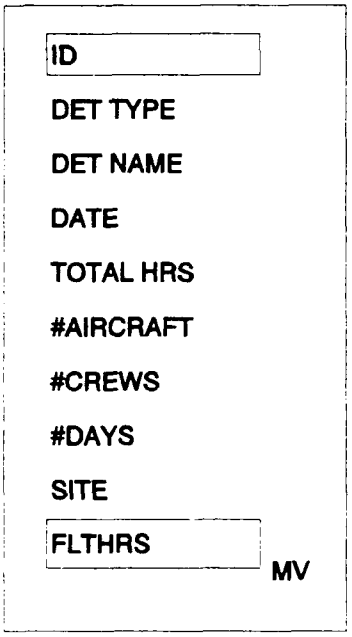
NIGHTHRS Object



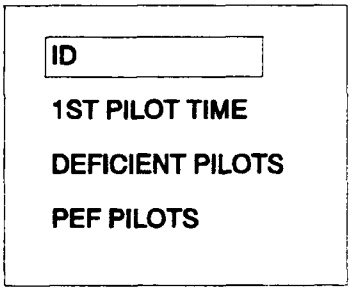
R-LEVELS Object



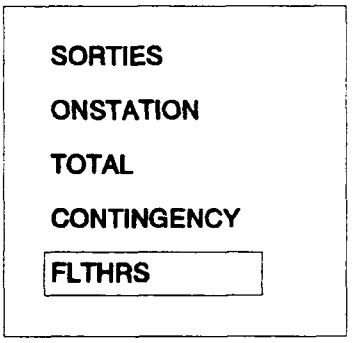
FLT HOURS Object



DETOPS Object



PILOT STATS Object



MATRIX Object

APPENDIX C. OBJECT DEFINITIONS

DETOPS OBJECT

ID; ID Object
Det Type; Det_Type
Det Name; Det_Name
Date; Date
Total Hrs; Hrs
#Acft; Acft
#Crews; Crews
#Days; Days
Site; Site
FLTHRS; FLTHRS Object; MV; SUBSET[Category]

FLTHRS OBJECT

ID; ID Object
Category; Category_Name
Area; Area_Name
Type; Type_Name
Specific Type; Specific_Name
MATRIX; MATRIX Object

FLTRPT OBJECT

ID; ID Object
FLTHRS; FLTHRS Object;MV
PILOT STATS; PILOT STATS Object;
INST PILOTS; INST PILOTS Object; MV
DETOPS; DETOPS Object; MV

ID OBJECT

Squadron; Squadron_Number
Month; Month
Year; Year
Report; Report_Type; MV
Status; Squadron_Status; MV

INST PILOT OBJECT

ID; ID Object
Rank; Rank; MV
Desig; Date
PRD; Date

MANNING OBJECT

ID; ID Object
Position; Position_Name; MV
Total; Position_Total
Gains; Position_Gains
Losses; Position_Losses
Cat I; Cat I
Cat II; Cat II
Cat III; Cat III

MATRIX OBJECT

FLTHRS; FLTHRS Object
Sorties; Sorties
Onstation; Onsta
Total; Hrs
Contingency; Cont

NIGHTHRS OBJECT

ID; ID Object
Night Hours; Hrs
% of Total; Percent

PILOT STATS OBJECT

ID; ID Object
1st Pilot Time; 1PT
Deficient Pilots; DPT
PEF Pilots; PEF

RDYRPT OBJECT

ID; ID Object; SUBSET[Squadron, Month, Year, Report]
MANNING; MANNING Object; MV
R-LEVELS; R-LEVELS Object; MV
NIGHTHRS; NIGHTHRS Object
FLTHRS; FLTHRS Object; MV
DETOPS; DETOPS Object; MV

R-LEVELS OBJECT

ID; ID Object
PMA; PMA_Name; MV
C-rating; C-rating
Crews; Crews
Percentage; Percent

APPENDIX D. DOMAIN DEFINITIONS

1PT:
Numeric 999.9
Average number of 1st pilot time flight hours for report month

Acft:
Numeric 99
Number of individual aircraft at a detachment site

Area_Name:
Text 25
Indicates second-level categorization of flight hours

CAT I:
Numeric 99
Number of Category I Cfficers in a squadron during report month

CAT II:
Numeric 99
Number of Category II Officers in a squadron during report month

CAT III:
Numeric 9
Number of Category III Officers in a squadron during report month

Category_Name:
Text 25
Indicates first-level categorization of flight hours

Cont:
Numeric 99
Number of contingency events for a specific category

C-rating:
Numeric N
Rating factor of 1 to 4 assigned to a Primary Mission Area

Crews:
Numeric 99
Specific number of individual crews

Date:
Text 6, Mask MMM YY,
where MMM is the three letter abbreviation for any month, YY is the last two digits of any year
Indicates a month/yr combination

Days:
Numeric 999
Specific number of days at a detachment site

Det_Name:
Text 25
Name of an operation, perstempo, exercise or contingency detachment

Det_Type;
Text 25
Categorizes detachments as one of the following(Exercise, Contingency or Perstempo)

DPT
Numeric 99
Numeric measure of the number of pilots in a squadron not acquiring 10 hours of first pilot time during the reporting month

Hrs:
Numeric 9999.9
Indicates total number of flight hours for a specific category for report month

Month:
Text 3
Three letter abbreviation for any month

Onsta:
Numeric 999.9
Number of flight hours onstation associated with one or a series of related events

PEF:
Numeric 99
Numeric measure of the number of first tour pilots behind in PEF for the reporting month

Percent:
Numeric 99
Percentage ratio of one event or category to another

PMA_Name:
Text 3
Specifies Primary Mission Area(PMA) for R-Levels object

Position_gains:
Numeric 99
Identifies total number of entity gains for a given position

Position_losses:
Numeric 99
Identifies total number of entity losses for a given position

Position_Name:
Text 7
Describes position for Manning information(limited to Pilots, Nfos or Aircrew)

Position_total:
Numeric 99
Identifies total number of entities for a given position

Rank:
Text 4
Abbreviation for Officer rank in U.S. Naval Service

Report_Type:
Text 3
Identifies type of report where data originated(limited to TRR-Training and Readiness Report and FHR-Flight Hour Report)

Site:
Text 25
Names for detachment locations

Sorties:
Numeric 999
Number of sorties involved with a specific event or series of related events

Specific_Name:
Text 15
Indicates fourth-level categorization of flight hours

Squadron_number:
Numeric 99
Numeric identifier for a Patrol Squadron

Squadron_status:
Text 8
Identifies Home or Deployed status of squadron during report month

Type_name:
Text 10
Indicates third-level categorization of flight hours

Year:
Numeric 2
Identifies any year by the last two digits

APPENDIX E. USERS MANUAL

Table of Contents

I. INTRODUCTION

ZTRAX is a readiness and flight hour relational database management system designed to store squadron training, readiness and flight hour data from monthly reports and provide information in graphic or tabular form. Specific data and information are retrieved using PARADOX query by example (QBE) techniques. A working knowledge, i.e completing the Paradox tutorial which accompanies the program, of Paradox functions is required to fully utilize this application. ZTRAX is run through PARADOX by:

1. Selecting the **S**cript option of the PARADOX main menu

View **A**sk **R**eport **C**reate **M**odify **I**mage **F**orms **T**ools **S**cripts Play or record a script.

PARADOX Main Menu

2. Selecting the **P**lay option from the **S**cripts menu

Play **B**egin **Q**uery **S**how **R**epeat **E**ditor
Record Save Play Play
Play a script.

PARADOX Scripts Menu

3. Entering "ZTRAX" at the **S**cript prompt.

Script: ZTRAX
Enter name of script to play.

PARADOX Scripts/Play Menu

Upon program execution the "ZTRAX" main menu will appear at the top of the screen. Selection of all menu items in ZTRAX is accomplished by using the left/right arrow keys to highlight the selection and the enter/return key to select the menu item. The escape key may be used at any time to move up one menu level.

Readiness **Flt Hrs** **Leave**

ZTRAX Main Menu

An essential note; after all database operations remember to save the updated ZTRAX tables to a backup floppy disk. This will insure data integrity in case of system crash. The backup procedure is simple. First, because ZTRAX automatically saves the new/updated data to the tables on the hard drive you must only save that data for a backup copy. After exiting ZTRAX you remain in the main Paradox program with the main menu displayed on the screen. From here:

1. Select Tools from the main menu.

View **Ask** **Report** **Create** **Modify** **Image** **Forms** **TOOLS** **Scripts** Exit
Rename, Copy, Delete or View Objects

PARADOX Main Menu

2. Select Copy from the Tools menu.

Rename **QuerrySpeed** **ExportImport** **Copy** **Delete** **Info**
Make a copy of a Table, Custom Form, Report or Script

TOOLS Menu

3. Select Table from the Copy menu.

Table Form Report Script JustFamily Graph
Copy a table and its family of forms, reports and indexes

Table Menu

4. At the Table prompt select the table to copy, in this example we will use the FLTHRS table.

```
Table: FLTHRS
Enter name of table to copy or <RETURN> to see a list.
PARADOX Tools/Table Menu
```

5. After you enter the table name and press return Paradox will request a new name to copy the table to. Because this is a backup copy we use the same name for the table but specify a new drive and directory. In this case, we use the A drive, ZTRAX subdirectory and the FLTHRS table name.

```
Table: A:\ZTRAX\FLTHRS
Enter new name of table.
PARADOX Tools/Table Menu
```

Backup copies of tables and data are a standard procedure for all database operations, regardless of their size or scope. It is a safeguard against processor or hard disk failure and is most highly recommended for use with ZTRAX.

II. ADDING NEW DATA

There are two distinct ways to enter new data into the tables which comprise ZTRAX. The first, and most efficient, is the use of the ZTRAX menu structure. The second, used to accomplish any phase of database operations, is the manipulation of the PARADOX program. This option is not advised for data entry and edit due to the size of the tables and the large number of fields contained within them.

Data entry is accomplished with the keyboard. Incorrectly formatted fields, i.e. putting an alphabetic character in a numeric field, is met with a beep from the program and a blinking cursor in that particular field. The majority of the data entry fields are numeric and they follow the format of the source documents, the Training and Readiness and Monthly Flight Hour reports. Therefore, if a field is numeric on the source document, it is numeric in the database.

A. Readiness Report

1. Selecting READINESS from the main ZTRAX menu will display the following menu:

ADD EDIT VIEW
ADD NEW MONTHLY READINESS REPORT DATA

Readiness Main Menu

2. Highlighting Add, as shown above, and pressing the enter/return key will display a data entry form duplicating a readiness message. This form consists of three pages which are maneuvered between by using the page or arrow up/down keys. Page one of the form is the initial screen and the blinking cursor, to the right of SQUADRON, indicates the first point of data entry (Fig.1).

3. To enter data just type it as it appears on the readiness message into the desired field and press Enter. ZTRAX will advance to the next available field automatically. Fields can be skipped

by using the arrow keys to select another field. It is recommended all fields be entered in **CAPITAL LETTERS** because PARADOX is case sensitive and this will effect later queries.

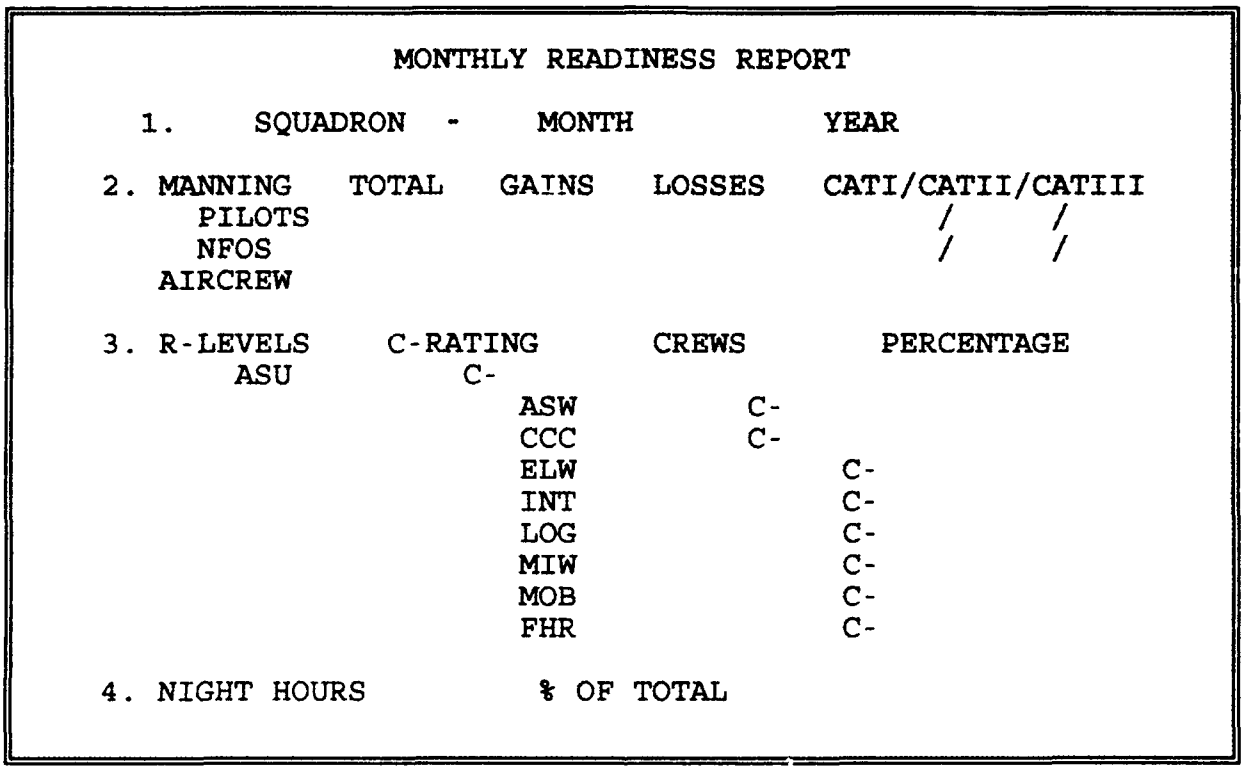


Figure 1

4. After all fields have been entered press the [F2] key to save the new data. The [F1] Help key is the only other operational function key available while using ZTRAX. Selecting [F1] will retrieve the standard PARADOX Help Screen.

5. In order to create the proper representation of a readiness report for a squadron, it is essential the three key fields; Squadron, Month and Year are entered correctly. If any of these fields are incorrect, proper queries of data will be impossible.

B. Flight Hour Report

1. All of the procedures and keystrokes used to enter new FLT HRS Report data are identical to a READINESS Report. There is, however, a more diverse menu structure required to enter all the data contained within it. The size of the FLT HRS Report itself prohibits PARADOX from allowing data entry on one form. Therefore, the menu structure is broken down into five functional categories which serve as data entry forms.

1. Selecting FLT HRS from the main ZTRAX menu will display:

ADD EDIT DEPLOYED HOME
ADD NEW MONTHLY FLIGHT HOUR REPORT DATA

Flt Hrs Main Menu

2. Highlighting ADD, as shown above, and pressing the enter/return key will display the following menu:

OPHRS TRNGHRS EXHRS SVCHRS TOTALS
ADD NEW OPERATIONAL FLIGHT HOUR DATA

FLT HRS ADD Menu

3. At this point, data can be entered in any one of the five displayed categories. It is recommended you follow the menu sequence which is representative of the FLT HRS Report message.

4. Selection of any highlighted category will display the designated report form. The cursor is positioned to the right of SQUADRON and data entry is accomplished as previously described. Figure 2 on the following page displays the first page of the OPHRS entry form.

5. The difference between the Training and Readiness and Flight Hours report header is the addition of a HOME/DEPLOYED field on the FLT HRS Report. This key field is adjacent to YEAR and requires precise entry, either "H" for HOME or "D" for DEPLOYED.

6. Of extreme importance is the consistency with which data is entered. For example, in Figure 2 there is a category field for Operational Flight Hours, an Area field for ASW, a type field for Indep ASW and a specific type field. In this instance, the first three fields are automatically entered in the database by entering data in the fourth field, specific type. It is essential the specific type be entered exactly the same, including upper or lower case, for all squadrons in all instances of a report. Any deviation will prohibit effective queries because the data will be acknowledged by Paradox as being a different.

OPERATIONAL FLIGHT HOURS

SQUADRON - MONTH YEAR HOME/DEPLOYED

A.	INDEP ASW	SORTIES	ONSTA	TOTAL	CONT
	1.				
	2.				
	3.				
	4.				
	5.				
	TOTAL				
	SUM TOTAL				
B.	COORD ASW				
	1.				
	2.				
	3.				
	4.				
	5.				
	TOTAL				
	SUM TOTAL				

Figure

III. EDITING EXISTING DATA

ZTRAX allows users to edit data existing in the database tables by selecting the edit function contained in both the Readiness and Flight Hour menus.

A. Readiness Report

The selection process for EDIT is similar to ADD. The first step is to select Readiness from the main ZTRAX menu.

Readiness Main Menu

After selecting EDIT from the menu, the following three-step, three-screen query will request the squadron, month and year of the Readiness Report you want to edit.

ENTER THE SQUADRON NUMBER: __
ENTER THE MONTH: __
ENTER THE YEAR: __

Answering the three requests will then take you to the edit screen. It is exactly the same screen display as the ADD data entry form except the data is already there. Any field can be edited, including the three key fields squadron, month and year. For that reason, extreme care must be exercised when editing any report. To complete the edit press the [F2] key to save the new data and exit to the main menu.

B. Flight Hour Report

Editing an instance of a Flight Hour report involves similar key strokes as those required by the ADD function. The first step is to select Flt Hrs from the main menu then EDIT from the Flt Hrs main menu.

ADD EDIT DEPLOYED HOME
ADD EXISTING MONTHLY FLIGHT HOUR DATA

Flt Hrs Main Menu

After selecting EDIT, a menu similar to the ADD menu appears. At this point you have the option to choose the specific category which requires editing.

OPHRS TRNGHRS EXHRS SVCHRS TOTALS
ADD NEW OPERATIONAL FLIGHT HOUR DATA

FLT HRS ADD Menu

After one of the above categories is selected, the program will request the following four identifying items to determine which record to retrieve from the database.

ENTER THE SQUADRON NUMBER: __
ENTER THE MONTH: __
ENTER THE YEAR: __
ENTER "H" FOR HOME/"D" FOR DEPLOYED __

An EDIT screen is exactly the same as the ADD screen for any specific category. Again, all fields are able to be modified so use exercise caution. After the EDIT is complete, press the [F2] key to save the new data and return to the ZTRAX main menu.

IV. QUERY OPERATIONS

Query functions, both pre-defined and ad hoc, are the heart of database operations. The ability to easily retrieve required data and information is the goal of any application. ZTRAX provides several pre-defined queries which provide information on specific categories for single Readiness or Flight Hour report records. By exiting ZTRAX and manipulating the Paradox query functions, multiple records can be queried to provide the requested information. Part A outlines the pre-defined queries, Part B outlines and demonstrates some of the Paradox query functions.

A. Pre-Defined Queries

ZTRAX offers several pre-defined queries which can readily supply information on individual categories for specific instances of a Flight Hours or Readiness report. To initiate the query function:

1. From the ZTRAX main menu select either Readiness or Flt Hrs, depending upon the origin of the data you want to obtain.

Readiness Queries

2. If Readiness is chosen, select VIEW from the main menu.

ADD EDIT **VIEW**
VIEW SPECIFIC MONTHLY READINESS REPORT INFORMATION

Readiness Main Menu

3. The Readiness VIEW menu displays six different options.

MANNING R-LEVELS FLT ACT EXHRS CONT PERSTEMPO
VIEW MONTHLY SQUADRON MANNING INFORMATION

Readiness View Menu

4. Following the selection of a category to view, ZTRAX will request the following information to determine the specific data to retrieve.

ENTER THE SQUADRON NUMBER: __
ENTER THE MONTH: __
ENTER THE YEAR: __

5. Completing the above query after selecting MANNING from the Readiness VIEW menu will display the following screen (Figure 3). Similar screens are displayed for all menu selections. It is essential to note that due to the level of classification of this users manual (UNCLASSIFIED), none of the fields in any screen displays in this manual will contain data.

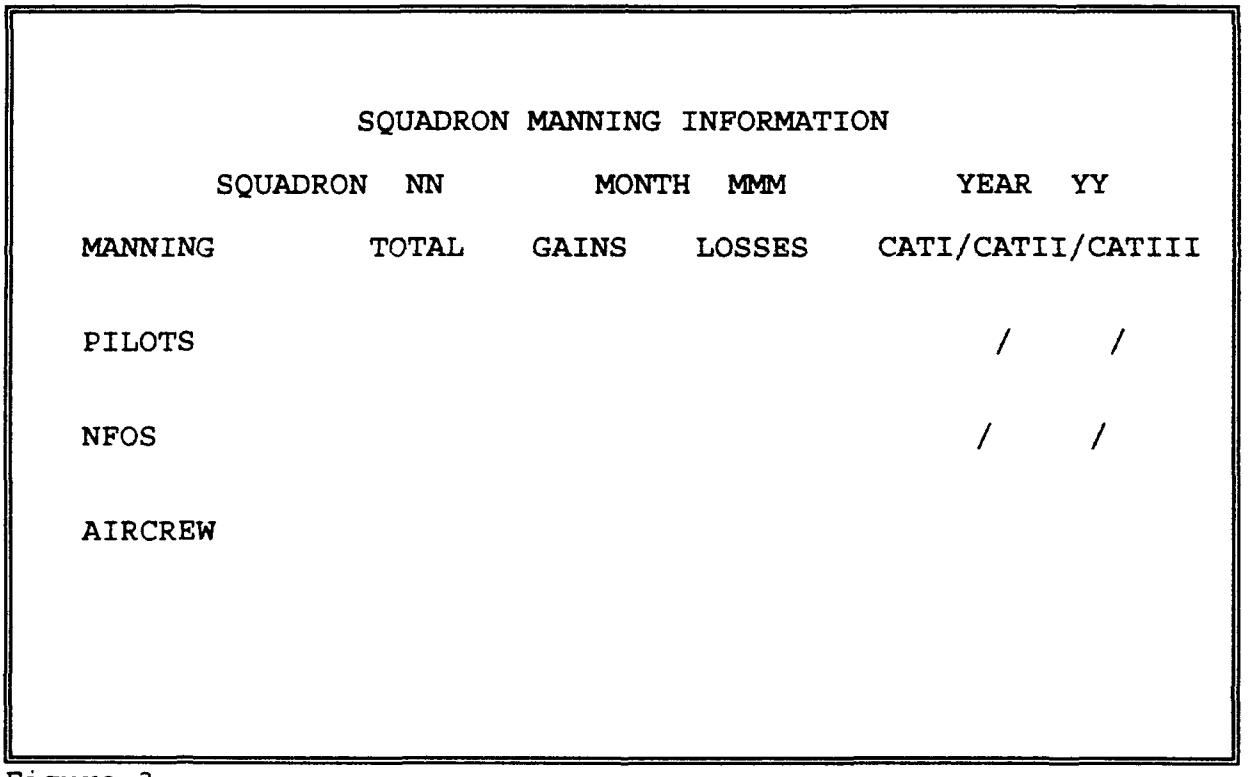


Figure 3

6. To exit the query screen, press the [F2] key to return to the main ZTRAX menu.

Flt Hrs Queries

1. Selecting Flt Hrs from the main ZTRAX menu will display the familiar Flt Hrs main menu. Here, to view any of the predefined queries you must first select Deployed or Home from this menu. This helps Paradox better define and retrieve the request for information.

ADD EDIT **DEPLOYED** HOME
SELECTS DEPLOYED FLIGHT HOUR PATH

Flt Hrs Main Menu

2. Choosing Deployed or Home displays essentially the same menu and options with the word Deployed substituted for Home in each specific case.

OPHRS TRNGHRS EXHRS SVCHRS TOTALS
VIEW SPECIFIC DEPLOYED OPERATIONAL FLIGHT HOUR INFORMATION

FLT HRS DEPLOYED Menu

3.After category selection is complete, type selections are made dependent upon the requirements. For OPHRS, there are six possible type selections.

ASW INT/SUR CCC ELW ASU MISC
DEPLOYED OPERATIONAL ASW FLIGHT HOUR INFORMATION

DEPLOYED OPHRS Menu

4. As displayed above, Deployed Operational ASW Flight Hours have been selected. This selection will activate the built-in query function designed to identify the desired information in the ZTRAX tables.

ENTER THE SQUADRON NUMBER: __
ENTER THE MONTH: __
ENTER THE YEAR: __

5. After entering the squadron, month and year of the desired report ZTRAX will display the following screen (Figure 4) for Deployed Operational ASW Flight Hours.

```
                    DEPLOYED ASW FLIGHT HOURS

        SQUADRON  NN          MONTH  MMM            YEAR  YY


      INDEP ASW         SORTIES        ONSTA      TOTAL      CONT
      1.
      2.
      3.
      4.
      5.
      TOTAL


      COORD ASW
      1.
      2.
      3.
      4.
      5.
      TOTAL
```

Figure 4

B. Ad Hoc Queries

Ad hoc queries are those that manipulate the actual tables of the ZTRAX database to retrieve information. Knowledge of using Paradox Query by Example(QBE) techniques is required to perform these operations. Training in these procedures is available through an on-line tutorial program provided with the complete version of Paradox 3.5. Additional help with ad hoc queries can be received by depressing the [F1] Help key at any time during a query operation.

To perform a query, you must first tell Paradox which tables the data is represented in. ZTRAX is comprised of eleven tables which retain all of the data. The following is a list of the tables and the data represented within them.

RDYRPT Table - represents a Training and Readiness report for a single squadron, month and year. This table would be selected to query an entire report for comparative purposes.

FLTRPT Table - represents a Flight Hour report for a single squadron, month and year. As above, this table would be selected to query an entire report for comparative purposes.

ID Table - represents the identifying information of a Training and Readiness or Flight Hour report. This table is contained in all other tables to differentiate the data.

MANNING Table - represents squadron manning levels for officer and enlisted aircrew. It is derived from the Training and Readiness report. A query of this table might compare pilot manning levels between two squadrons for the same month and year.

INST PILOTS Table - represents data on number of instructor pilots a squadron has, their rank, qualification and rotation dates. A sample query for this table might ask for all the pilots with rotation dates after a specific date. This table is derived from the monthly Flight our report.

NIGHTHRS Table - represents the number of right flight hours a squadron completed for a month and year and the percentage of their total flight hours were night hours. This table is derived from the Training and Readiness report. A sample query might ask for the average number of night flight hours for all the squadron over a period of time.

R-LEVELS Table - is derived from the Training and Readiness report. It represents tactical aircrew readiness levels(C-ratings) in Primary Mission Areas (PMA) and the number and percentage of crews rated C-1 for a squadron during a report month. A sample query might ask for the number of C-1 rated aircrews a squadron has maintained in a particular PMA over the last year.

DETOPS Table - represents various data related to detachment operations. This table is familiar to both source documents with each using a portion of the fields in the table. Sample queries can display multiple squadron/aircraft/site detachment information.

PILOT STATS Table - represents specific facts able first tour junior officer pilot statistics. It is familiar to the Flight Hour report and can provide comparative analysis of squadrons and their pilot training programs, if queried.

FLTHRS and MATRIX Tables - these table represent the majority of the monthly Flight Hour report. FLTHRS breaks down individual sorties or groups of sorties into categories, areas, types and specific types. Matrix then assigns the number of sorties, onstation hours, total hours and contingency count for each entity in the FLTHRS table. To query any information about flight hours the first step is to determine which category you need. Because ZTRAX automatically enters several of these fields during the initial data entry process the names used for category, area, type and specific type must be precisely the same when queried. The following pages contain the names ZTRAX uses for these fields. The only field entered by the user during data entry is specific type. This must be entered consistently every time or the resulting queries will be incorrect.

The first example is the body of a Training and Readiness report. This is where all the raw data is contained. The identifying numbers and letters correspond exactly to those on an actual report. Beside each number is a brief explanation of which table the data is located in and the recommended field and record names to use for queries. Familiarity with the Paradox query by example techniques are required to complete an query operation. The first section of the Training and Readiness report below will briefly describe the necessary procedures to use QBE. Two complete query screen examples will follow the Flight Hour report fields example.

1. MONTHLY TRAINING and READINESS REPORT

1. This is the header of the report. The ID table represents this data and will be required for all queries of this report. To query this section of the report place check marks on the Paradox query screen under SQUADRON, MONTH and YEAR. Below the check marks in each field place an example of the data you want to retrieve, for example; if you want information about Patrol Squadron Nineteen for the month of January, 1990 you would place a 19 underneath the check mark for SQUADRON, a JAN underneath the check mark for MONTH and a 90 underneath the check mark for YEAR.

2. This section concerns squadron manning. Data is found in the MANNING table. To query, under the position field place either PILOT, NFO or AIRCREW and check either GAINS, LOSSES, TOTAL, CAT I, CAT II or CAT III.

3. This section concerns squadron readiness levels by PMA. Data is found in the R-LEVELS table. To query, under the PMA field place any one of the nine PMA's then place check marks under C-RATING, CREWS and PERCENTAGE, as required for your query.

4. This sections contains night flight hour data and is found in the NIGHTHRS table. To query, place checks under both NIGHT HOURS and % OF TOTAL.

5. This section contain data about the breakdown of flight hours for the report period. The data is found in two tables, the FLTHOURS table and MATRIX table. To query, first retrieve the FLTHOURS table. Place checks under CATEGORY and use the following as examples of the query, depending on your requirements, TRNGHRS for Training Hours, OPHRS for Operational Hours, SVCHRS for Service Hours, EXHRS for Exercise Hours, CONHRS for Contingency Hours and TOTALHRS for Total Flight Hours. Then select the MATRIX table and place a check under TOTAL for total hours.

6, 7, 8. Data for these three area are all obtained from the same table, DETOPS. To query these, place check marks under the required fields and then place examples, as required by your query. The following fields correspond to the various items of items 6, 7, and 8. DET TYPE represents an Exercise or Contingency(items 6 and 7). DET NAME is the detachment name and is used for all three items. DATE is the date of detachment and used by all three items. TOTAL HRS is only used by item 6, Exercise, and represents the total flight hours involved with the detachment. #DAYS is only used by item 8, Perstempo, to indicate length of detachment.

2. MONTHLY FLIGHT HOUR REPORT

The monthly Flight Hour report differs somewhat from the Training and Readiness report because the majority of the data is stored in two tables, FLTHRS and MATRIX. This results from the fact that the majority of data in this report involves flight hours. It is essential to indicate precisely the data you want to obtain in the query. Correct and consistent usage of field names during the data entry stage will result in the ability to effectively query this data. The following provides, in a sequence relative to the Flight Hour report source document, the field names used by ZTRAX and the recommended record entries for various flight hour categories, areas, types and specific types.

I. TASKED OPERATIONAL HOURS

To query all the information in this category, on the FLTHRS table query form check the CATEGORY field and place the example OPHRS below the check mark.

A. Independent ASW is queried by placing a check under AREA and placing ASW below it, then checking TYPE and placing INDEP below the check. Because there are many types of Independent ASW, the SPECIFIC TYPE field will separate them. Place a check under SPECIFIC TYPE and place the name of the SPECIFIC TYPE you want to query. Of great importance here is the consistent use of the same manes for SPECIFIC TYPES over the course of using this program. It is recommended they be documented in the space provided at the end of this chapter of the manual.

After completing the FLTHRS portion of the query retrieve the MATRIX table. Here you can place check marks in any of the desired fields you require. There are no examples required for the MATRIX table.

B. Coordinated ASW works exactly like the above example. Place ASW under the AREA check mark and COORD under the TYPE field check mark. SPECIFIC TYPE is as previously outlined. After this is completed, again go to the MATRIX table to select your query choices.

C. Combined ASW uses COMB in the TYPE field. The rest remains as previously described.

D. Independent INT/SUR uses INT/SUR in the AREA field and INDEP in the TYPE field. No SPECIFIC TYPE is available.

E. Coordinated INT/SUR uses INT/SUR in the AREA field and COORD in the TYPE field. No SPECIFIC TYPE is available.

F. Combined INT/SUR uses INT/SUR for the AREA field and COMB in the TYPE field. No SPECIFIC TYPE is available.

G. CCC is used in the AREA field. No TYPE or SPECIFIC TYPE are required.

H. Combined CCC uses CCC in the AREA field and COMB in the TYPE field. No SPECIFIC TYPE is available.

I. ELW is used in the AREA field. No TYPE or SPECIFIC TYPE are required.

J. Coordinated ELW uses ELW in the AREA field and COORD in the TYPE field. SPECIFIC TYPE is not available.

K. Combined ELW uses ELW in the AREA field and COMB in the TYPE field. SPECIFIC TYPE is not available.

L. ASU is used for the AREA field. TYPE and SPECIFIC TYPE are not available.

M. Coordinated ASU uses ASU for the AREA field and COORD in the TYPE field. SPECIFIC TYPE is not available.

N. Combined ASU uses ASU for the AREA field and COMB for the TYPE field. SPECIFIC TYPE is not available.

O. Deployment Transit uses DEPXSIT for the AREA field. No other fields are available.

P. Detachment Transit uses DETXSIT for the AREA field. No other fields are available.

Q. Pony Express is used in the AREA field. No other fields are used.

R. Log Support is used in the AREA field and the names of various Log Support events are contained in SPECIFIC TYPE. There is no entry for TYPE.

S. Other is used in the AREA field and the various Other names are contained in SPECIFIC TYPE. There is no entry for TYPE.

T. Total Contingency uses TOTAL CONT in the AREA field. There is no use of TYPE or SPECIFIC TYPE for this area.

U. Total Operational uses TOTAL OP in the AREA field. There is no use of TYPE or SPECIFIC TYPE for this area.

II. INDEPENDENT TRAINING HOURS

To query the data in this category use INDEP TRNGHRS for the CATEGORY in the FLTHRS table. As above, after filling the appropriate blocks in FLTHRS, retrieve MATRIX and checks the necessary blocks as required.

A. ASW is the AREA field and is used in the following 1-5.

1. CAST is the TYPE field.
2. A-37 is the TYPE field.
3. NIB is the TYPE field.
4. OTHER is the TYPE field. Use SPECIFIC TYPE to specify the event you require.
5. TOTAL ASW is the TYPE field.

B. INT/SUR is the AREA field for the following 1-3.
1. A-30 is the TYPE field.
2. OTHER is the TYPE field. Use SPECIFIC TYPE for the event you require.
3. TOTAL INT/SUR is the TYPE field.

C. MIW is the AREA field and used in the following 1-4.
1. A-38 is the TYPE field.
2. MRCI/WKUP is the TYPE field.
3. OTHER is the TYPE field. Use SPECIFIC TYPE for the event you require.
4. TOTAL MIW is the TYPE field.

D. ELW is the AREA field, SPECIFIC TYPE lists specific events.

E. ASU is the AREA field, SPECIFIC TYPE lists specific events.

F. BOMBEX is the AREA field, SPECIFIC TYPE lists specific events.

G. TOTAL TRAINING is the AREA field. No TYPE or SPECIFIC TYPE is required.

III. PILOT/CREW TRAINING HOURS

To query data in this category use PCTRNG for CATEGORY in the FLTHRS table. After filling in the appropriate fields, use the MATRIX table to specify the information you need.

A. PILOT TRAINING is the AREA field. Use it for the following 1-6 items.
1. SYLLABUS is the TYPE field.
2. PPT is the TYPE field.
3. INSTRUMENT is the TYPE field.
4. AIRWAYS is the TYPE field.

5. NATOPS is the TYPE field.
6. TOTAL is the TYPE field.

B. CREW TRAINING is the AREA field. Use it for the following 1-4 items.

1. SYLLABUS is the TYPE field.
2. OVRWTRNAV is the TYPE field.
3. NATOPS is the TYPE field.
4. TOTAL is the TYPE field.

C. TOTAL is the AREA field. This retrieves total figures for Pilot Crew training.

IV. MISCELLANEOUS TRAINING HOURS

To query data form this category use MISCTRNG in the CATEGORY field of FLTHRS. The use of the MATRIX table is the same as previously described.

A. MAINT CHECK is the AREA field.
B. MAD COMP is the AREA field.
C. WST TRANSIT is the AREA field.
D. SCHOOL FLTS is the AREA field.
E. FERRY is the AREA field.
F. OTHER is the AREA field. SPECIFIC TYPE is used to specify each named event.
G. TOTAL is the AREA field.

V. TOTAL TRAINING is the CATEGORY. There are no AREA or TYPE fields relative to this category.

VI. COORD/COMBINED EXERCISES

Exercise is the CATEGORY name for this field. There are two TYPE fields associated with this section, COORD for Coordinated and COMB for Combined.

A. COORD is the TYPE field, ASW is the AREA field. SPECIFIC TYPE lists the various events for the category. It is essential all SPECIFIC TYPE names coincide with the terms used during data entry.

B. COORD is the TYPE field, INT/SUR is the AREA field. SPECIFIC TYPE lists the various events in this area.

C. COORD is the TYPE field, CCC is the AREA field. SPECIFIC TYPE lists the various events in this area.

D. COORD is the TYPE field, ASU is the AREA field. SPECIFIC TYPE lists the various events in the area.

E. COORD is the TYPE field, MIW is the AREA field. SPECIFIC TYPE lists the various events in the area.

F. COORD is the TYPE field, TOTAL is the AREA field.

G. COMB is the TYPE field, ASW is the AREA field. SPECIFIC TYPE lists the various events in the area.

H. COMB is the TYPE field, INT/SUR is the AREA field. SPECIFIC TYPE lists the various events in the area.

I. COMB is the TYPE field, CCC is the AREA field. SPECIFIC TYPE lists the various events in the area.

J. COMB is the TYPE field, ASU is the AREA field. SPECIFIC TYPE lists the various events in the area.

K. COMB is the TYPE field, MIW is the AREA field. SPECIFIC TYPE lists various events in the area.

L. COMB is the TYPE field, TOTAL is the AREA field.

M. TOTAL is the TYPE field.

VII. SERVICES

To query this category use SVCS in the field for CATEGORY. After all other query information for FLTHRS is complete, then USE the MATRIX table to identify the data you need.

A. C/N is the AREA field.

B. ACFT SVCS is the AREA field.

C. SAR is the AREA field.

D. CNO PROJECTS is the AREA field, SPECIFIC TYPE lists the various projects in this area.

E. TAC D&E is the AREA field, SPECIFIC TYPE lists the various Tac D&E projects in this area.

F. RECRUITING is the AREA field.

G. STATIC DISPLAY is the AREA field.

H. ORIENT/DEMO is the AREA field.

I. STAFF SUPPORT is the AREA field.

J. OTHER is the AREA field, SPECIFIC TYPE identifies the various entries for this area.

K. TOTAL is the AREA field.

VIII. TOTAL FLIGHT HOURS

TOTALS is the CATEGORY field for this section of the report. The data is found in the FLTHRS and MATRIX tables.

A. HOME is the AREA field.

B. DEPLOYED is the AREA field.

C. TOTAL is the AREA field.

IX. MONTHLY PILOT ANALYSIS

To query this section use the PILOT STATS table.

A. 1ST PILOT TIME. Place a check under this field to query 1st Pilot Time.

B. DEFICIENT PILOTS. Place a check under this field to query 1st Tour Pilots < 10 Hours 1st Pilot Time.

C. PEF. Place a check mark under this field to query 1st Tour PEF Pilots.

D. IP STATUS uses the INST PILOTS table to maintain its data. To query this data:

1. Place a check mark under RANK and enter the rank of the instructor pilots you want to search.
2. Place a check mark under DESIGNATION.
3. Place a check mark under PRD.

X. MONTHLY DETACHMENT OPERATIONS

To query this section use the DETOPS table(items 1-4,9) and the FLTHRS and MATRIX tables(items 5-8). As explained before, place check marks below the fields you desire then place examples underneath the checks. Imperative here is that data entry names exactly coincide with query example names.

1. SITE is an alphabetic name for the detachment site.
2. #A/C is a numeric entry for the number of aircraft present at the site.
3. #CREWS is a numeric entry for the number of aircrew present at the detachment site.
4. #DAYS is a numeric entry for the number of days a detachment has been operational.

5. OPHRS is a numeric entry of flight hours. Use OPHRS for the CATEGORY field of FLTHRS, TOTAL from the MATRIX table.

6. TRNGHRS in the CATEGORY field, TOTAL from the MATRIX table.

7. EXHRS in the CATEGORY field, TOTAL from the MATRIX table.

8. SVCHRS in the CATEGORY field, TOTAL from the MATRIX table.

9. P/C POSIT is the TOTALHRS field in DETOPS. This gives the transit time to the detachment.

The use and manipulation of Paradox query by example techniques are profiled extensively in the Paradox Users Manual that accompanies the program documentation. The following examples are based directly from that manual and reflect the operation of the Paradox program, not ZTRAX. Therefore, familiarity with Paradox query operations is essential prior to attempting any queries with ZTRAX.

The query charts on the previous pages specified the various tables to query for information in a particular case. It also provided the field names ZTRAX uses in very specific instances. Now, two examples of ZTRAX ad hoc queries will be shown. The first is a single query, the second is a multiple query. Both will follow the same format, first will be a description of the requested information, next the tables and required fields for the query will be identified using the query charts, and last, query screen displays, with explanations, will be provided.

3. SINGLE QUERY

This first example will be a relatively simple query to reinforce the Paradox query by example techniques and allow you to get a feel for finding field names in the query charts.

Problem: You want to find out the total number of sorties for tasked operational flight hours for independent ASW during the home cycle for Patrol Squadron 1, for the month of JAN 1991.

STEP 1 - From the PARADOX main menu select ASK.

View ASK Report Create Modify Image Forms Tools Scripts Help
Get a query form to ask questions about a table.

PARADOX Main Menu

STEP 2 - From the Ask menu, enter the table name which you wish to query, in this case FLTHRS.

```
Table: FLTHRS                                                    Main
Enter name of table to ask about, or press enter to see a list.
```

ASK Menu

```
*[F6] to include a field in the ANSWER; [F5] to give an example

=================================================================
=FLTHRS=====SQUADRON=======MONTH=======YEAR======STATUS=====
         =      * 1      =     * JAN  =    * 91    =   * HOME
=================================================================
=================================================================
FLTHRS===CATEGORY===AREA======TYPE===SPECIFIC TYPE===SORTIES
        = * OPHRS   = * ASW = * INDEP=(NO ENTRY REQD)=    *
=================================================================
```

Paradox Query Form

STEP 3 - The display above is the Paradox query form. It is reproduction of the FLTHRS table in tabular format. An asterisk has been substituted for the check mark normally found in Paradox. You can run the entire length of the table by using the right arrow key. The first step in this query is to identify the key fields squadron, month, year and status. This has been done as shown in the top portion of the form. Next, identify the CATEGORY, AREA and TYPE and place the examples as shown. Notice SPECIFIC TYPE is not required by this query. After all entries are complete press the [F2] to activate the query. Paradox will then display the output screen shown below. At this point you also have the option of printing the screen display. Those procedures are outlined in the Paradox manual.

ANSWER	SQUADRON	MONTH	YEAR	STATUS	CATEGORY	AREA	TYPE	SORTIES
1	1	JAN	91	HOME	OPHRS	ASW	INDEP	20

4. MULTIPLE QUERY

This example will show a typical multiple query ZTRAX might be asked to provide. The format will be the same as Example 1.

Problem: You want to compare Pilot manning statistics for two different squadrons for the month/year JAN 91.

Step 1 - From the Paradox main menu select the ASK option.

Step 2 - From the ASK main menu enter the table to be used for the query. In this case the data comes from the monthly Training and Readiness report. You determine the MANNING table holds the information you desire so enter Manning at the prompt.

Table: MANNING Main
Enter name of table to ask about, or press enter to see a list.
ASK Menu

Step 3 - Knowing the query function requires the key fields to be entered, do that first for both squadrons. Next, the data about Pilot manning is in the POSITION field, put a check under POSITION and the example PILOT beside it. All pilot statistics are desired so place check marks in GAINS, LOSSES, TOTAL, CAT I, CAT II and CAT III. Do this twice, once for each squadron. Press [F2] when the form is completed and receive the answer.

```
*[F6] to include a field in the ANSWER; [F5] to give an example

=========================================================
=MANNING===SQUADRON=======MONTH=======YEAR======STATUS=====
         =   * 17      =  * JAN    =  * 91    = * HOME
         =   *  1      =  * JAN    =  * 91    = * HOME
=========================================================
=========================================================
=POSITION===TOTAL===GAINS===LOSSES===CATI===CATII===CATIII==
  *PILOT  =   *   =   *   =   *   =   *  =   *   =    *
  *       =   *   =   *   =   *   =   *  =   *   =    *
  ========================================================
```

Paradox Query Form

The answer to the above query looks like this. After you have completed this query press the [F8] key to clear the screen and return to the main Paradox menu.

```
ANSWER  SQUADRON MONTH YEAR STATUS POSITION TOTAL GAINS LOSSES
=============================================================
  1   =   17   = JAN = 91 = HOME = PILOT   = 33  =  3  =  5
  2   =    1   = JAN = 91 = HOME = PILOT   = 32  =  4  =  3
=============================================================
```

Notice the entire query does not fit on the page. Using the left/right arrow keys you can view the remainder of the query. This is a screen limitation imposed by Paradox.

Two sample queries have provided some insight into effectively utilizing the Paradox ASK function. Further reference can be obtained in the Paradox Users Manual.

V. GRAPHICAL OUTPUTS

Paradox allows a users to display any data from Paradox and ZTRAX tables on a variety of business style graphs, such as pie, bar, area, line and mixed charts. Procedures for defining and using graphs are found in the Paradox users manual. This chapter will provide a brief overview of integrating Lotus 1-2-3, Quattro Pro and dBase II, III or IV and Ascii formatted files into or from a Paradox database table.

The Tools selection found in the Paradox main menu contains an Export/Import option. This allows you to transfer data to and from other software systems. After selecting the Import/Export option you have the two following choices:

EXPORT IMPORT

Selecting either of these options displays the following submenu:

QUATTRO PRO 1-2-3 SYMPHONY dBASE PFS REFLEX VISICALC ASCII

An important point here is that Paradox always converts the data to Paradox format through copying the entire file, that way the data is left unchanged, an allowing you to rename the file for Paradox's purposes.

The selection Quattro Pro allows you to import data from a spreadsheet into a Paradox table, or export a Paradox table into a Quattro spreadsheet. When importing spreadsheet data into Paradox, remember Paradox stores information in even row and columns whereas a spreadsheet lets you arrange the text, numbers and formulas in any manner you desire.

Selecting 1-2-3 from the above submenu and you receive these options:

1) 1-2-3-RELEASE 1A 2) 1-2-3-RELEASE 2

Here you select the appropriate option for the version of 1-2-3 you will use. Paradox allows you to import and export data as described above. Be sure to specify the correct directories when copying to and from a hard drive to avoid confusing your files. As before, Paradox cannot import randomly place data in a spreadsheet.

It must import by columns and rows, where the top row contains field names for the database table. If your spreadsheet contains labels or formulas outside of a column/row orientation, you should use the File Xtract option discussed in the Paradox users manual.

Transferring to and from dBase applications is a simple process because both programs store data in rows and columns (records and fields). Selecting dBase from the options menu will display the following:

dBASE II **dBASE III**

Paradox will copy the data to the file name you have provided with a DBF extension. Importing dBase files are just a simple, however dBase logical fields will be converted to Paradox alphanumeric fields with a length of one character and memo fields will be trimmed to a maximum of 255 characters and stored as alphanumeric data.

Paradox also allows the Import/Export of ascii coded files. Selecting the Ascii option of the Import/Export menu, then selecting Export displays the following:

DELIMITED **TEXT**

Selecting the Import option of the Ascii menu displays the following:

DELIMITED **APPEND/DELIMITED** **TEXT**

Delimited import/export of text is used for software applications that can only import/export ascii formatted files. To use this option you would first create a delimited export file, then import it into the other software application you want to use. The Paradox users manual specifically outlines these procedures.

VI. PROGRAM MAINTENANCE

Program maintenance of ZTRAX was designed to be as easy as possible. To change any tables, scripts or input/output screen displays you will use Paradox Personal Programmer (PPROG).

A. Perfective Maintenance

To start PPROG; from the DOS prompt change directories to ZTRAX. This will place all the ZTRAX tables in the current directory.

C:\ZTRAX

Then type a path statement, as follows:

C:\ZTRAX > PATH=C:\PDOX35;C:\PDOX35\PPROG;

This will load PPROG in RAM along with ZTRAX. Start PPROG by typing "PPROG" at the DOS prompt.

The initial PPROG screen will allow the follow options:

CREATE MODIFY SUMMARIZE REVIEW PLAY TOOLS QUIT

Select the Modify option and type ZTRAX at the prompt. PPROG will load the ZTRAX menu structure and display the ZTRAX main menu on the screen with several edit options. Prior to initializing PPROG you should have determined exactly what you want to modify in ZTRAX. The entire program is able to be modified through PPROG so exercise caution when doing so.

Guidance on using PPROG is contained in the Paradox users manual however it is not the only way to modify ZTRAX. For instance, to add a new field to a ZTRAX table you must retrieve the table from the Paradox main menu and modify it but then you will have to modify the input and edit screens for the new field , this is more difficult to accomplish in Paradox than in PPROG. It is recommended PPROG be used for all program modifications except modifying the tables. Below, for reference purposes, is a sample ZTRAX program modification.

Problem: Adding a new numerical field called AVERAGE in the MANNING table. This field will be a required entry on the data input form and represents the average number of aircrew personnel in a specific position for the previous twelve months.

STEP 1 - Adding the new field to the MANNING table is simple. From the Paradox main menu you retrieve the MANNING table, select edit, and add the new field where it is required. In this case, we would add the new field, AVERAGE, immediately before the TOTALS field. Because this new field is numeric, simply enter an N in the field type column, shown below. Press the [F2] key when complete.

```
Modify MANNING Table
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
STRUCT==========FIELD NAME==============FIELD TYPE========
   4       =        POSITION          =          A7             =
   5       =        AVERAGE           =          N              =
   6       =          TOTAL           =          N              =
   7       =          GAINS           =          N              =
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

MANNING Table

STEP 2 - Now that the table has been modified, start the PPROG application as shown above. Next, select modify and type ZTRAX at the prompt. You will be presented with the following PPROG Modify edit screen:

```
Tables MenuAction NotDefined SplashScreen DO-IT Cancel
Modify a menu selection of an action associated with a menu

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
==============The Paradox Personal Programmer==============
Modifying ZTRAX Application
============================================================
TABLES allows you to add or remove one or more tables

MENUACTION allows you to modify the selection/actions in menu

NOTDEFINED takes you to the first undefined menu selection

SPLASHSCREEN allows you to modify an application's first screen

DO-IT! saves all changes you have made to the application
```

PPROG Modify Menu

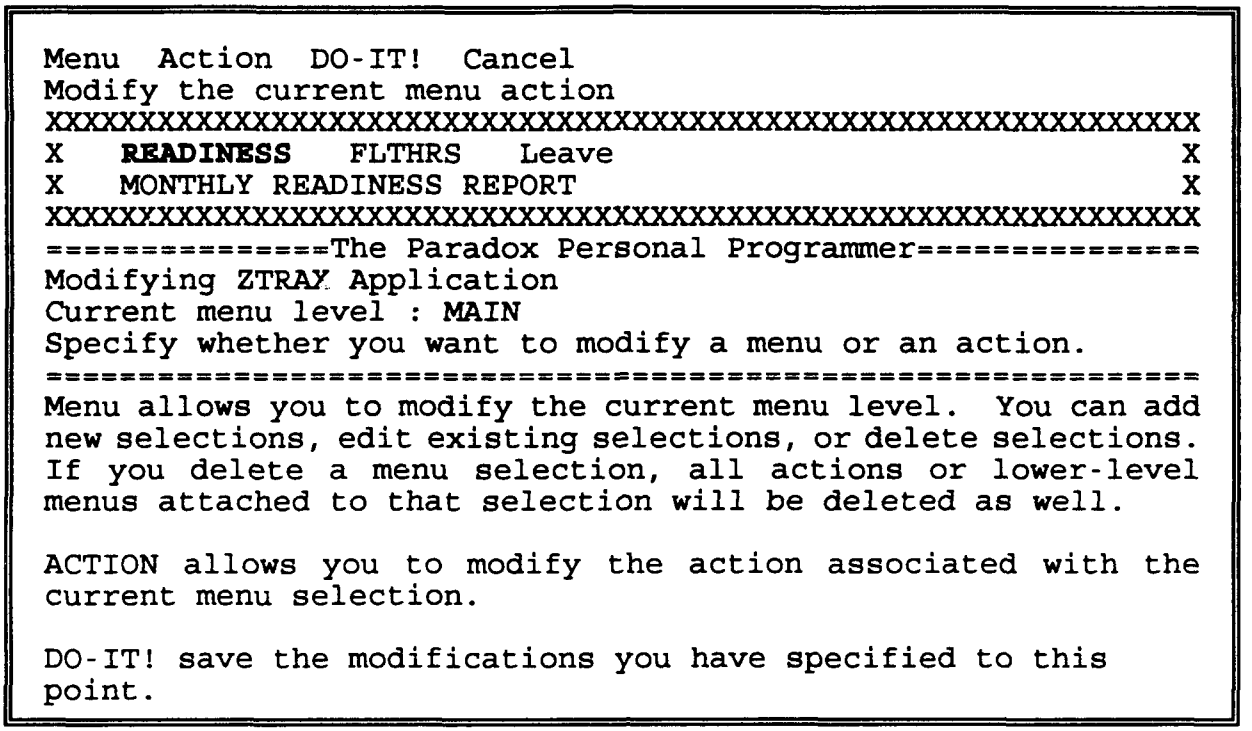
STEP 3 - Select MENUACTION from the screen above, this will display the screen shown below.

```
READINESS   FLTHRS   Leave
MONTHLY READINESS REPORT
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
==============The Paradox Personal Programmer==============
Modifying ZTRAX Application
Pick the menu selection you want to modify.
============================================================
Use the <- -> keys to move around the display
Press |(ENTER) to move down a menu level, [ESC] to move up

When the menu selection you want to modify is highlighted,
press [F10] to display the action menu, then select the type
of modification you want to make.
```

PPROG MenuAction Menu

STEP 4 - The next step is to press the [F10] key to retrieve the action menu as shown below.



PPROG MenuAction Menu

STEP 5 - Next, select ACTION from the previous menu and the following menu appears. From this next menu you will select Revise with the cursor highlighting ADD.

STEP 6 - Selecting REVISE will place another screen display from which you will have two options: keep or modify the existing table or view. By selecting modify you can select the MANNING table and make the new field entry, as we have already done in Paradox, or select keep the current table and then move to the next menu selection screen.

STEP 7 - The next screen involves the existing input form for the ADD option of the menu. The following page is a reproduction, as all of these screens in this section are, of the next PPROG screen. In this screen you select modify because you need to add the new field you entered in the table.

```
Define  Revise  Borrow  MoveDown
Modify the existing definitio..
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X   ADD  EDIT  VIEW                                                   X
X   ADD NEW MONTHLY READINESS REPORT DATA                             X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
==============The Paradox Personal Programmer==============
Modifying ZTRAX Application
Modifying ADD selection in MAIN/READINESS menu.
Specify the kind of modification to make.
============================================================
DEFINE allows you to redefine the current menu selection if it
is already defined, or to define it for the first time if it
is currently NotDefined.

REVISE lets you modify the components of the current selections
definition.

BORROW lets you copy the definition of an already-defined
selection to the current selection

MOVEDOWN lets you push the current selection down to a lower
menu level and create a new menu selection in its place on the
current level.
```

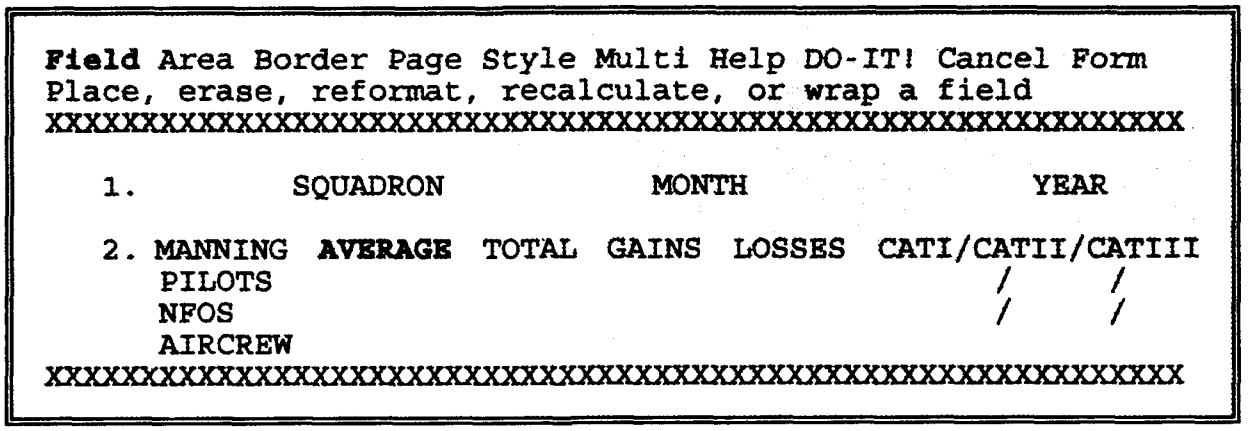
PPROG MenuAction Menu

```
Keep  Modify  FormView  TableView  FormToggle
Modify the existing form
==============The Paradox Personal Programmer==============
Modifying ZTRAX Application
Modifying ADD selection in MAIN/READINESS menu.
Indicate whether you want to keep or modify the existing form
============================================================
KEEP retains the existing form specification.
MODIFY changes the existing form.
FORMVIEW displays the information in form view.
TABLEVIEW displays the information in table view.
FORMTOGGLE lets the user switch between form and table view.
```

PPROG MenuAction Menu

STEP 8 - This last menu screen lets you modify the existing form based on the modification requirements. In this case you would select Field from the menu across the top of the form and insert

the new field where you desire. After this action is complete select DO-IT! from the menu bar or press the [F2] key.



Modify Form View

After completing the screen modification you then repeat the same procedure for the EDIT menu and the VIEW/MANNING information. They are the same steps just different forms. When all of the forms have been modified select DO-IT! form the current menu or press the [F2] key. PPROG will save the changes you made and regenerate the scripts using the modified table and screens. For any additional help with PPROG consult the Paradox users manual.

B. Data Archiving

The difference between an archive and backup copy is the archive is a historical record of all of the data entered into, and possibly deleted from, the database. A backup copy is an exact reproduction of the records contained in the database at the present time. Archiving is an essential procedure of database operations. It is useful for providing several iterations of historical records that have been deleted from the existing database and to provide a secondary backup copy of current application records.

Data archiving is accomplished in a similar manner as data backup, presented in section one of this manual. Archiving should be done simultaneously, during data backup, to prevent deleting any data without a floppy disk copy and to provide more available space

on the hard disk. Given the lack of available hard disk space on the current Z-284 system's, archiving is a necessity in the department. It is recommended only two years of current Training, Readiness and Flight Hour
data be kept on the system. This will provide enough data to encompass an entire training/deployment cycle for a squadron (18 months) and leave six months for contingency purposes. This two years of data will require approximately 650Kb of memory to store. If current hard disk limitations remain in effect, this will still leave about 300Kb for other documents and files. It is strongly recommended that the remaining applications in use be purged of their outdated data to free up more memory.

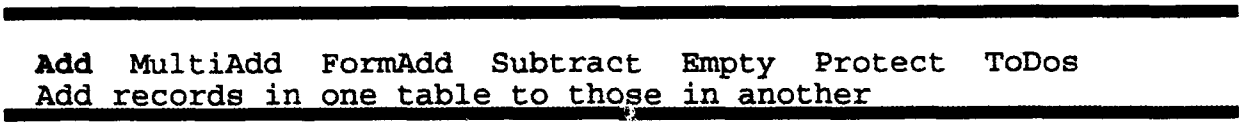
Data archiving makes use of the Paradox copy command, however there are some differences between archiving and making backup copies. To begin, archiving is a dynamic record of all data ever stored in the ZTRAX database. Backup copies are just a copy of the current records in use on ZTRAX. The difference in the copy commands is subtle, but important. To make archive copies you should first make backup copies as described in section one. Next, using the same copy command, copy **INDIVIDUAL** records for the newest files in the database (they should be ones you just entered into ZTRAX) onto the archive disk. If you copy the entire table you will delete the existing table on the archive disk. This will destroy all historical data on the disk and replace it with another table. Every month you should archive, then delete, 18 records from the database. That is one Training and Readiness Report and one Flight Hour Report for each squadron.

To archive records follow these procedures:

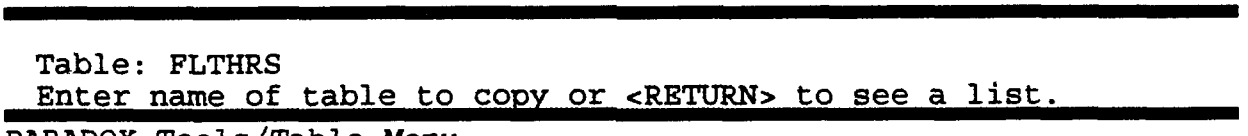
1. Select Tools from the main menu.

2. Select More from the Tools menu.

3. Select Add from the Tools/More menu.



4. At the Table prompt *select the table to copy, in* this example we will use the FLTHRS table.



5. After you enter the table name and press return Paradox will request a new name to copy the table to. Because this is an archive copy we use the same name for the table but specify a new drive and directory. In this case, we use the A drive, ZTRAX subdirectory and the FLTHRS table name.

```
Table: A:\ZTRAX\FLTHRS
Enter new name of table.
```
PARADOX Tools/Table Menu

6. Next, Paradox will display the following screen. Select Update with the cursor and press the return key. Paradox will automatically update the records in the destination file. It is essential archiving be done AFTER new data entries for the month are completed. This will ensure the archive copy is correct and complete.

```
NewEntries Update
Use records in the source table to update target table
```
Add Menu

Archiving is another essential procedure which will insure the integrity of ZTRAX. It makes use of another simple Paradox utility, Tools/Add/Update.

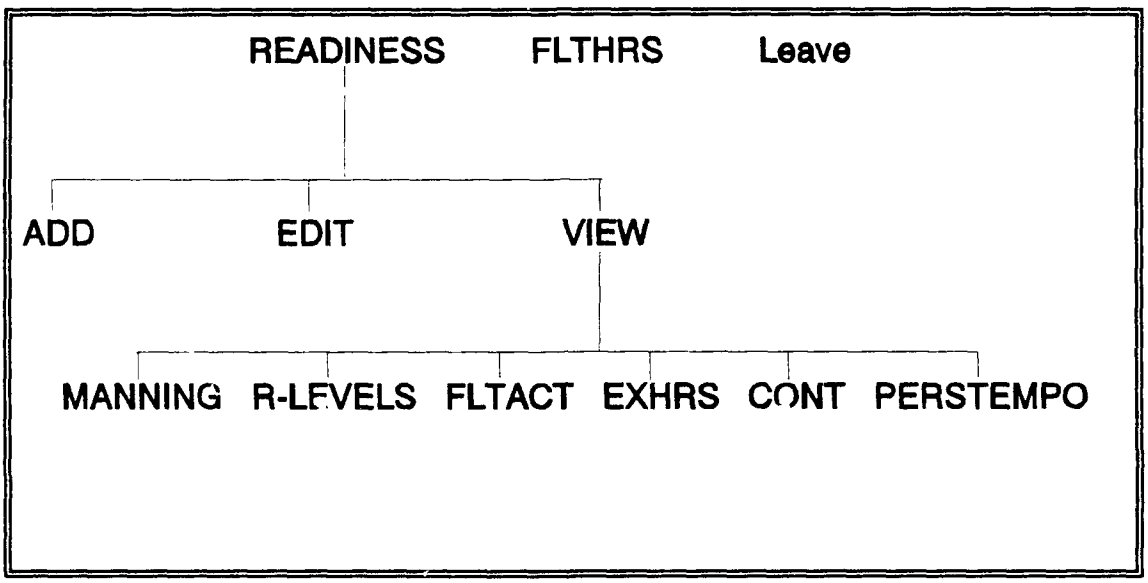
C. FLIMPORT

FLIMPORT is a Paradox utility designed to allow direct data transfer from floppy disks into Paradox database tables. Either individual files or an entire disk can be updated by using a batch processing option within FLIMPORT. The activation of this utility will eliminate all the manual data entry currently required to update the ZTRAX database. Also, the time required for edits of data entry errors will be reduced to a nominal amount.

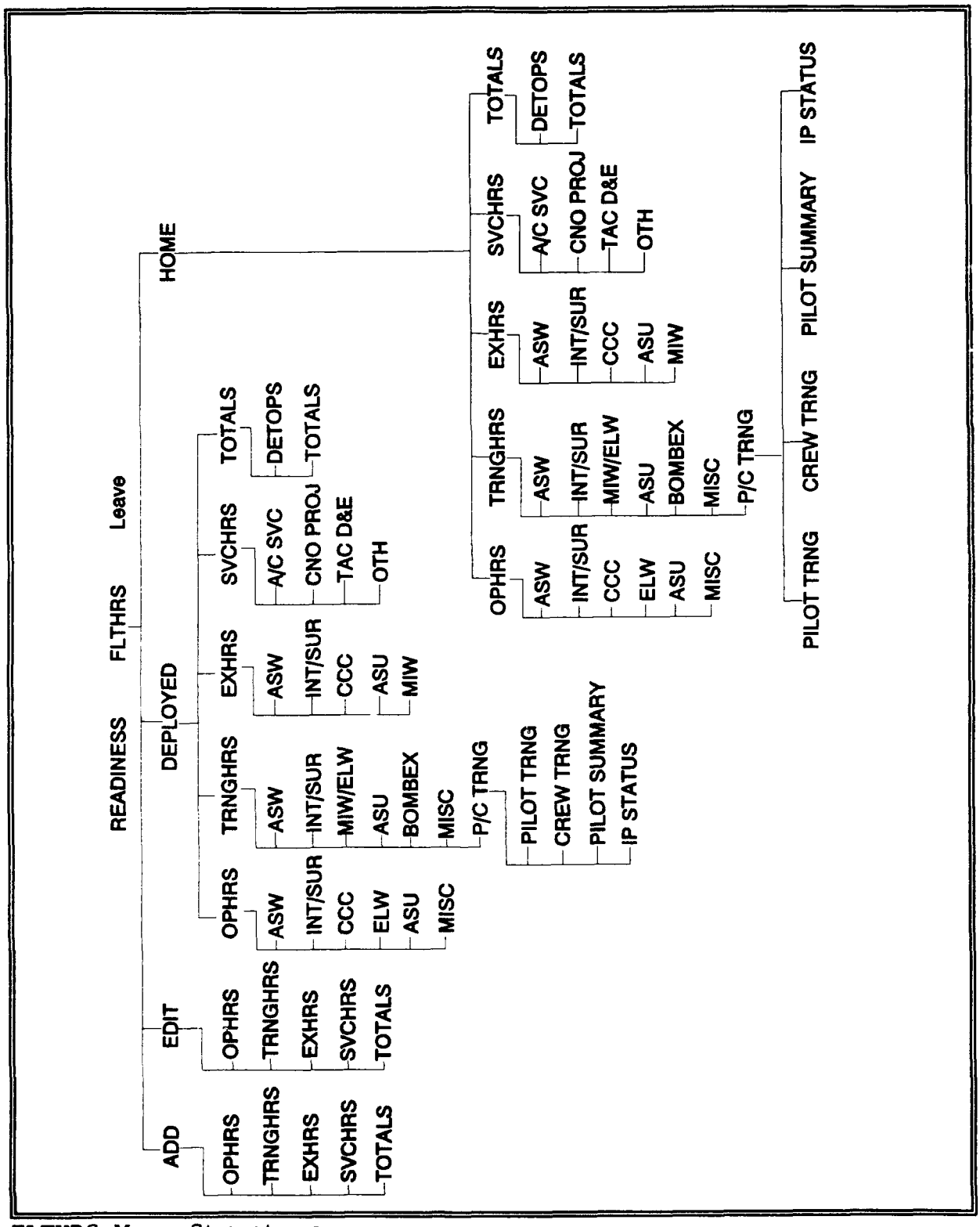
To effectively use this utility the files on the floppy disk must be in a fixed-length ASCII format. This capability is available from some Navy communications centers however, it is not currently a standardized practice. Once the floppy disks containing the monthly reports are received from the communications center, they can be readily transferred to the ZTRAX database tables through a specification file. To use this specification file you must first identify all of the fields contained in the monthly messages. These are the fields names used in the ZTRAX tables. You then assign a field length for each field. These are also identified in the ZTRAX tables as either A for ASCII character, N for numeric or D for date. Once these have been identified in the specification file the data transfer can begin. The FLIMPORT process is an extremely useful tools which saves hours of data entry and edit time. Paradox provides documentation in the users manual and a FLIMPORT.README file in the main program. Both of these sources aid in the construction of a specification file and the implementation requirements necessary to run FLIMPORT in the desired batch processing mode.

VII. MENU HIERARCHY

The following diagrams of the menu hierarchy will help new users to the ZTRAX application navigate their way around the program's menu structure. An important note about any menu in ZTRAX or Paradox, use the escape key anytime to back up one menu level. If you are lost continue to back up the menu chain until you find a menu you are familiar with.



READINESS Menu Structure



FLTHRS Menu Structure

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