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SYSTEM LEVEL INTEGRATION INTO THE CIDSS ENVIRONMENT (SLICE)

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13. ABSTRACT (Maximum 200 words)
The objective of this effort was to develop the PACAF Intelligence Enhancement (PIE) Subsystem to manage the intelligence portion of the HQ PACAF integrated decision support system. This system provides the analysts with an automated capability that facilitates the storage, retrieval, and dissemination of intelligence data and graphics, and streamlines the preparation and integration of intelligence presentations into the command center process.

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Introduction

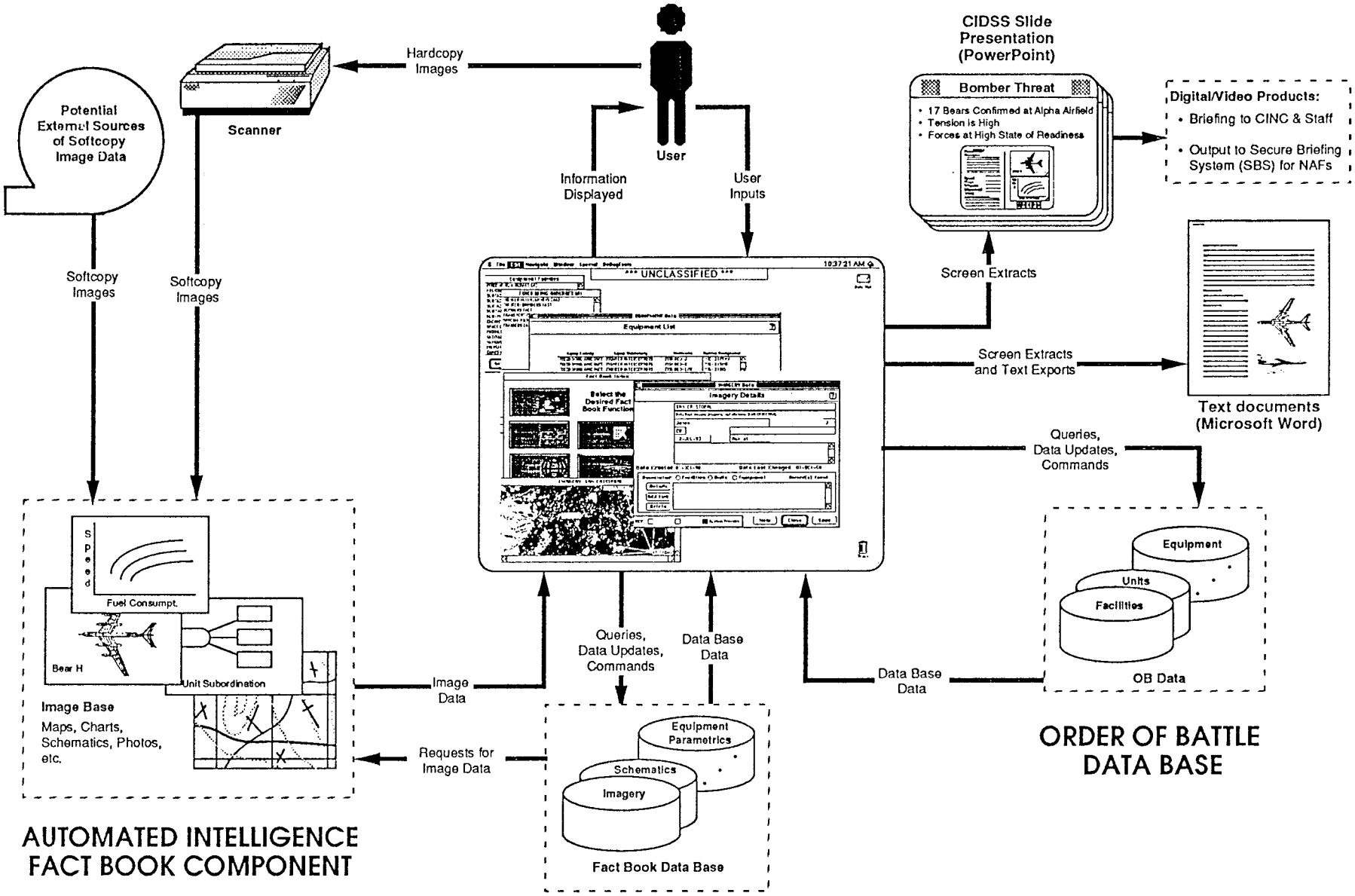
1.1 Identification

This report is entitled the "System Level Integration into the CIDSS Environment (SLICE) Final Technical Report (FTR)". It highlights the major contributions of the SLICE task and directs the reader of this report to other more detailed documentation developed during the course of the task. This report was prepared in accordance with Data Item Description DI-MISC-80711/T and fulfills CDRL numbers D008 and D010. KSC Operations of Sterling IMD, a wholly owned subsidiary of Sterling Software Inc., has prepared this Final Technical Report under USAF Rome Laboratory (RL) contract F30602-91-D-0007/0004, entitled "System Level Integration into the CIDSS Environment", for the Headquarters Pacific Air Forces directorates of Intelligence Systems (PACAF/INY) and Intelligence Applications (PACAF/INA). The RL sponsor for the SLICE effort is the Command Development Branch (RL/IRDD) of the Intelligence and Reconnaissance Directorate.

1.2 System Overview

The overall objective of the SLICE effort was to enhance the PACAF Intelligence Enhancement (PIE) Subsystem. The purpose of the PIE Subsystem is to provide automated support to PACAF/INO intelligence analysts for the preparation of presentations to the Commander-In-Chief, Pacific Air Forces (CINCPACAF) during exercise and contingency situations as well as in peacetime operations. KSC Operations of Sterling IMD, under the Rome Laboratory sponsored effort, has developed and installed the PIE Subsystem in the CINCPACAF Integrated Decision Support System (CIDSS) environment to facilitate the timely integration of intelligence information into the command decision making process, conducted locally by the Crisis Action Team (CAT). In addition, PIE products may also be transmitted digitally via the Secure Briefing System (SBS) in order to provide required intelligence support to the Numbered Air Forces (NAFs). Figure 1.2-1 graphically depicts the role of the PIE Subsystem in CIDSS.

The PIE Subsystem consists of an Automated Intelligence Fact Book component, an Order of Battle (OB) Data Base Maintenance component, and a Graphical OB Map Display component. The Automated Intelligence Fact Book component provides technical reference data such as digitized images and equipment parametrics data pertinent to associated OB



PIE Subsystem Overview
Figure 1.2-1

entities. The OB Data Base Maintenance component contains a variety of interrelated OB data base tables for representing and creating associations between entities such as facilities, units, sites, events, installations, events and location. The Graphical OB Map Display capability provide a means of graphically portraying geographically related OB entities on a map background.

1.3 Organization of the Report

This chapter identifies the task and system to which this FTR applies. **Chapter 2** contains a bibliography of all relevant documentation upon which the FTR is based. **Chapter 3** lists the hardware and software requirements of the subsystem and provides an overview of the PIE Subsystem version 3.0 capabilities. **Chapter 4** summarizes each of the activities comprising the SLICE effort by describing the objectives, technical approach and major accomplishments of each activity. **Chapter 5** summarizes the results of formal qualification tests performed upon delivery of the PIE version 3.0. **Chapter 6** provides a retrospect of the effort and presents various conclusions and recommendations regarding the future of the PIE capabilities. This document is concluded with **Appendix A** which provides a list of acronyms essential to understanding this FTR.

Chapter 2
Applicable Documentation

2.1 Government Documents

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflicts between the referenced documents and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

2.1.1 Standards

1. DI-MISC-80711/T, Data Item Description for Scientific and Technical Reports, 2 December 1988, (UNCLASSIFIED).

2.1.2 Other

1. Statement of Work for PACAF Intelligence Enhancement (PIE), 4 May 1990, (UNCLASSIFIED).
2. Statement of Work for System Level Integration into the CIDSS Environment (SLICE), 1 March 1991, (UNCLASSIFIED).
3. Joint Chiefs of Staff, Joint Pub 1-02, Department of Defense Dictionary of Military and Associated Terms, 1 December 1989, (UNCLASSIFIED).
4. Joint Tactical Command, Control and Communications Agency, Joint User Handbook for Message Text Formats, JTCAH 9000, 15 April 1986, (UNCLASSIFIED).

2.2 Non-Government Documents

1. Sterling IMD/KSC Operations, System Level Integration into the CIDSS Environment (SLICE), PIE Subsystem Version 3.0 Concept of Operations (CONOPS), August 1992, (UNCLASSIFIED).

2. Sterling IMD/KSC Operations, System Level Integration into the CIDSS Environment (SLICE), PIE Subsystem Version 3.0 Software Test Description, August 1992, (UNCLASSIFIED).

3. Sterling IMD/KSC Operations, System Level Integration into the CIDSS Environment (SLICE), PIE Subsystem Version 3.0 Software Product Specification, September 1992, (UNCLASSIFIED).

4. Sterling IMD/KSC Operations, System Level Integration into the CIDSS Environment (SLICE), PIE Subsystem Version 3.0 Computer System Operators Manual, August 1992, (UNCLASSIFIED).

5. Sterling IMD/KSC Operations, System Level Integration into the CIDSS Environment (SLICE), PIE Subsystem Version 3.0 User's Manual, August 1992, (UNCLASSIFIED).

6. PRC, Inc., eXtended Integrated Data Base (XIDB), Data Base Design Document (DBDD), June 1992, (UNCLASSIFIED).

Chapter 3
Overview of PIE Subsystem

3.1 PIE Subsystem Hardware and Software Environment

This section lists the hardware and software items required for the PIE Subsystem. The minimal hardware environment for a networked PIE Subsystem consists of a PIE workstation platform with various peripherals, a PIE host platform to provide a data base and file server functions, and an ethernet network connection between the host and the workstation platforms. At PACAF these items include:

PIE Workstation Platform	PIE Host Platform
Macintosh II (cx, ci, fx, etc.)	VAX 8650 Mainframe Computer
40 MB Hard Disk Drive or greater	High Capacity Hard Disk Drive
8 MB RAM	Ethernet Adapter
8-Bit Color Monitor with Video Card	
Ethernet Interface card	
GPIB Interface Card for Scanner (on at least one node)	
300 DPI, 8-Bit Color Scanner (on at least one node)	
Apple CD ROM Player (on at least one node),	
45 MB Removable Disk Cartridge Drive (optional)	

PIE Subsystem Hardware Configuration at PACAF
Figure 3.1-1

PIE Workstation Platform	PIE Host Platform
Macintosh OS Version 6.0.5 or higher	VMS Operating System
SuperCard Version 1.6	Oracle for the VAX
Oracle for the Macintosh (Network Station Version)	VaxShare
Scanner Driver (provided with scanner)	Ethernet Driver
VaxShare	
PowerPoint	
PixelPaint	
Canvas	
SmartScrap and The Clipper	
Ethernet Driver (provided with Ethernet board)	

PIE Subsystem Software Configuration at PACAF
Figure 3.1-2

3.2 The PIE Subsystem Applications Software

The PIE subsystem consists of two integrated software components:

1. An Automated Intelligence Fact Book
2. An Order of Battle (OB) Data Base

These components provide the capability to interact freely, via the Macintosh clipboard and scrapbook, with other PIE workstation-based COTS applications. The Automated Intelligence Fact Book component provides the capability to record technical intelligence reference data, such as digitized images and equipment parametrics information. The OB Data Base component provides the capability to record basic facility, unit, and equipment information on enemy and neutral forces.

3.2.1 Automated Intelligence Fact Book Component

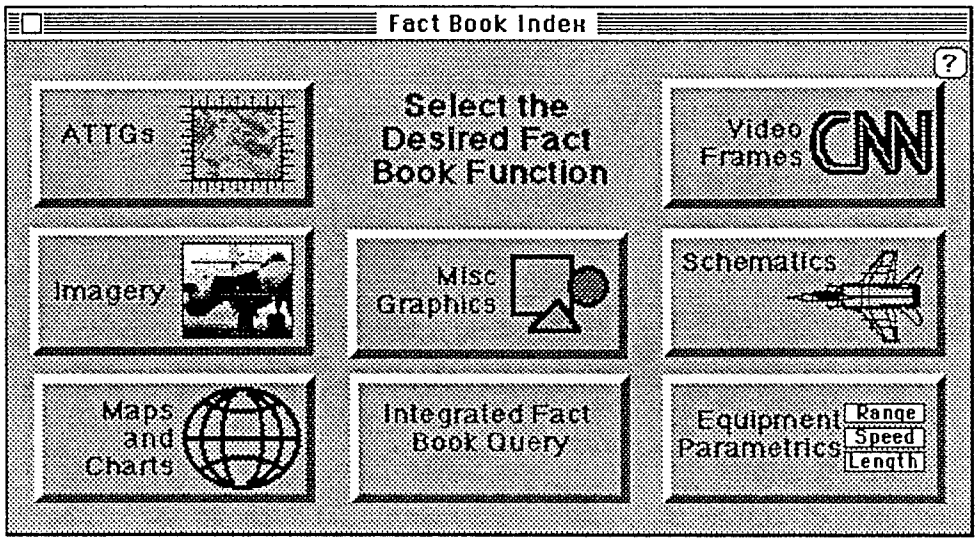
The Automated Intelligence Fact Book provides a means to store, recall, and access multimedia intelligence data that can be easily integrated into a soft or hardcopy briefing or report. The Automated Intelligence Fact Book component consists of four logical parts: Fact

Book Functions and their associated user interface, an Image data base, a Fact Book support data base, and an Equipment Characteristics data base.

3.2.1.1 Fact Book Functions and Their User Interface

The Fact Book user interface allows easy and transparent access to both the Fact Book support data base and the Image data base. The analyst access to these VAX-resident data bases is via the Macintosh user-friendly graphical "point-and-click" interface. Any information displayed on the Macintosh can easily be copied electronically, using pull down menu items and integrated into briefing slides for use on the CIDSS, or printed in hardcopy for use outside the CIDSS.

Figure 3.2-1 shows the Automated Intelligence Fact Book Index window that is displayed when the user selects the Fact Book component. Each beveled rectangle on this window is a Macintosh button that allows the user to select one of the major Fact Book functions such as ATTGs, Imagery, Maps and Charts, etc.



Automated Intelligence Fact Book Index Window
Figure 3.2-1

The following list describes the general capability provided by each function activated when the user selects the pertinent Automated Intelligence Fact Book Index Window button.

Fact Book Function	Description
ATTGs	Allows the analyst to catalog and retrieve softcopy Automated Tactical Target Graphics (ATTGs), or Basic Target Graphics (BTGs).

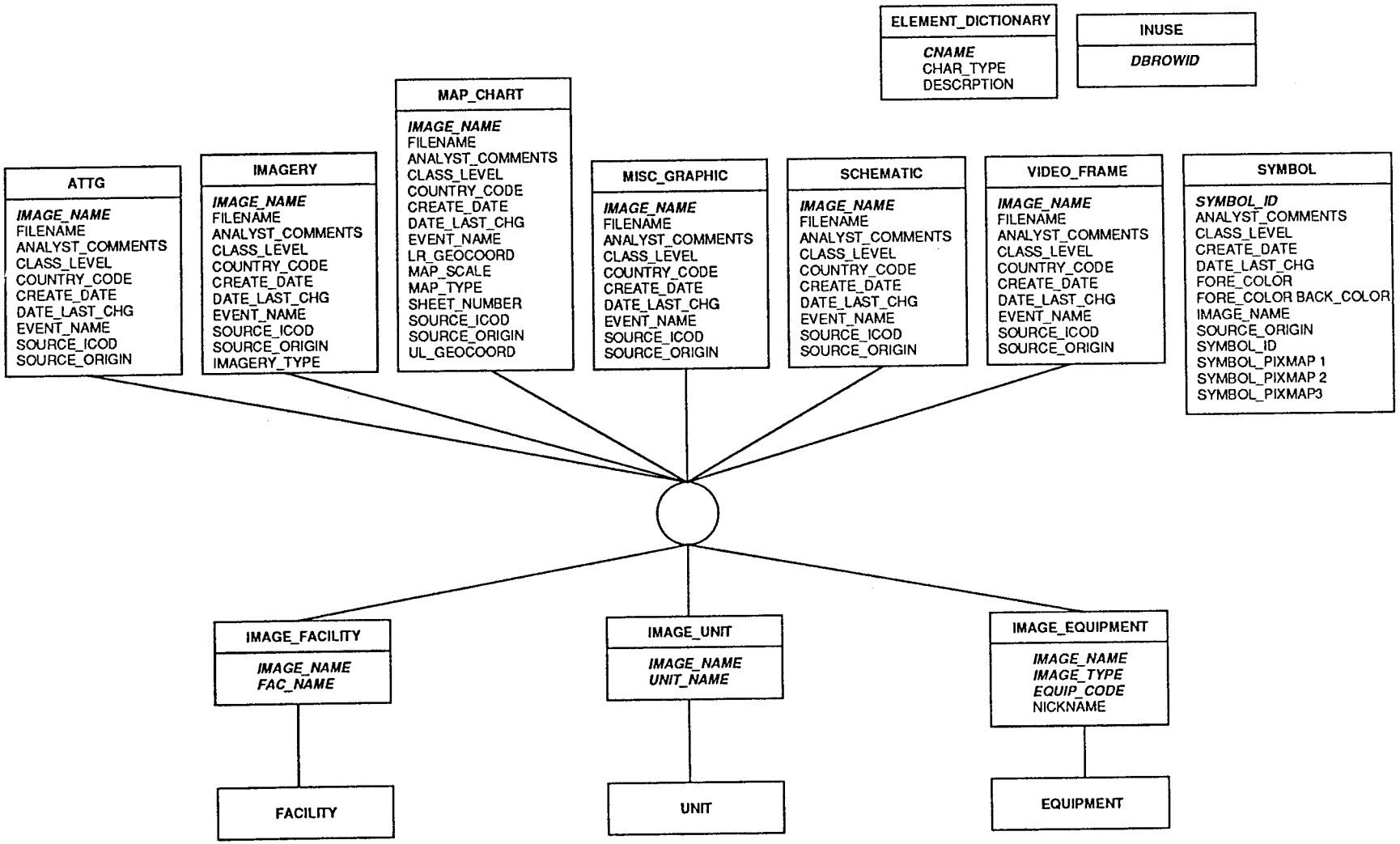
Imagery	Allows the analyst to catalog and retrieve softcopy aerial or hand-held imagery.
Maps and Charts	Allows the analyst to catalog and retrieve softcopy images of maps and charts.
Miscellaneous Graphics	Allows the analyst to catalog and retrieve miscellaneous softcopy images that cannot be associated with one of the above categories.
Integrated Fact Book Query	Allows the analyst to retrieve all Automated Intelligence Fact Book image data using attributes common to all Fact Book image types.
Video Frames	Allows the analyst to catalog and retrieve static softcopy images captured from video sources (such as television broadcasts).
Schematics	Allows the analyst to catalog and retrieve softcopy images of equipment line drawings.
Equipment Parametrics	Provides an automated format that allows the analyst to create, store, and retrieve textual data describing the capabilities of various types of equipment.

3.2.1.2 Automated Intelligence Fact Book Image Data Base

The Automated Intelligence Fact Book Image Data Base is where the softcopy images of all the ATTGs, Imagery, Maps and Charts, Equipment Schematics, Video Frames, Symbols and Miscellaneous Graphics are stored. The primary data in the Image Data Base are the softcopy images that have been digitized and stored on the CIDSS_PIE VAX 8650 file server. Currently, the intelligence analysts receive hardcopy image, map, schematic and other data from various sources for incorporation into their intelligence briefing products. The intelligence analyst then uses a commercially available desk top scanner to convert the hardcopy data into softcopy image format. In the future, softcopy image data from external sources (such as imagery or Basic Target Graphics from the Joint Intelligence Center-Pacific) may be suitable for direct incorporation into the Fact Book.

3.2.1.3 Automated Intelligence Fact Book Support Data Base

The Automated Intelligence Fact Book Support Data Base is a conventional relational data base implemented in Oracle that currently resides on the CIDSS_PIE VAX 8650 file server. The purpose of this data base is to facilitate the management and use of the softcopy images



Fact Book Support Data Base Structure Diagram
Figure 3.2-2

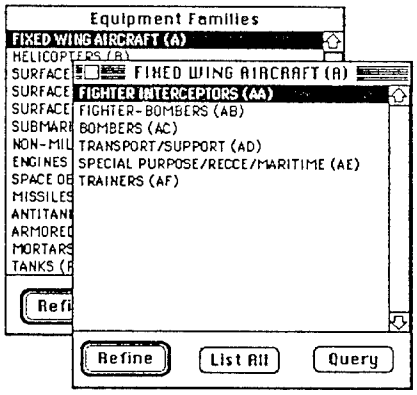
that have been stored in the Fact Book Image Data Base (see Section 3.2.1.2 above). Without the Support Data Base, the intelligence analysts would not readily know what ATTGs, Imagery, Maps, Graphics, Schematics, Video Frames and Symbols are available for retrieval in softcopy.

This data base contains those PIE Subsystem Automated Fact Book support data structures required to catalog and manage access to Fact Book softcopy data. The diagram in Figure 3.2-2 depicts the structure of this data base. Each rectangle in the figure represents a physical data base table and lists the name of the table and the data elements that comprise it. Most data element names are self explanatory such as Image_Name, File_Name, and Country_Code. A description of each is included in the PIE Subsystem Data Element Dictionary contained in the PIE Subsystem Software Product Specification and can be accessed via the Help menu item under the or by clicking the ? (Help) button.

3.2.1.4 Equipment Parametrics Data Base

The PIE Subsystem Equipment Characteristics Data Base contains intelligence information that delineates the performance and characteristics of military equipment such as aircraft and surface-to-air missiles. This parametric data includes the dimensions of the equipment, speed, range, and various other performance data. The Equipment Characteristics Data Base is stored on the CIDSS_PIE VAX 8650 file server and is managed by the Oracle relational DBMS.

The equipment parametric data organization is patterned after the general scheme developed by the Defense Intelligence Agency (DIA) for the Military Intelligence Integrated Data System (MIIDS), and the USAF implementation of MIIDS called the Extended Integrated Data Base. This scheme uses the concept of organizing equipment data into a hierarchy of equipment families and subfamilies. Figure 3.2-3 shows the Fixed Wing Aircraft family and related subfamilies.



Fixed Wing Aircraft Subfamily List
Figure 3.2-3

Each type of equipment has been given a unique equipment code. The Equipment Code data element is made up of the Equipment Family code letter, the Equipment Subfamily code letter and an Equipment Number. An Equipment Prefix data element is automatically generated from the Equipment Family and Equipment Subfamily code letters to facilitate automatic generation of sequential Equipment Numbers.

There is some variance between XIDB and the PIE Subsystem in the area of parametric data organization and in specific equipment codes due to the fact that PIE was implemented over a year before the XIDB data base design was finalized. However, the general XIDB/MIIDS scheme of families and subfamilies has been retained.

Where appropriate, the Equipment Characteristics Data Base design distinguishes between equipment and related systems. For example, a surface-to-air missile proper has size, range and other specific performance characteristics. The associated surface-to-air missile system has different features such as reaction and reload times, tables of organization, and features not directly related to the performance of the missile proper. Therefore, there are missile tables and missile system tables. In addition, because some equipment can be carried by other equipment, special tables such as EQUIP_ASSOCIATED_PLATFORM were created to reflect this equipment-to-equipment relationship.

The primary equipment data elements were extracted from the PACAF/INAO equipment card file and expanded to include elements from MIIDS/XIDB, MCM 3-1, and the Foreign Technology Division (FTD) Electronic Combat Threat Environment Description. Primary data element definition sources were MIIDS/XIDB, the JINTACCS Message Element Dictionary, and Joint Pub 1-02. Data elements have been defined in an automated data element dictionary that has been incorporated into the PIE Subsystem. This dictionary can be accessed via the PIE Subsystem Help menu item under the or by clicking the ? (Help) button.

Equipment data elements have been organized into tables and relationships among the tables have been defined. A common table has been established that is applicable to all equipment types. This table provides basic equipment identification information, plus security and administrative information for each equipment record. Equipment Code is the unique identifier for a piece of equipment and is used to relate to equipment information in other data base tables. Data elements for this universal table are as follows.

- Equipment Code
- Nickname
- Native Designator
- Country Produced
- IOC (Initial Operational Capability date)

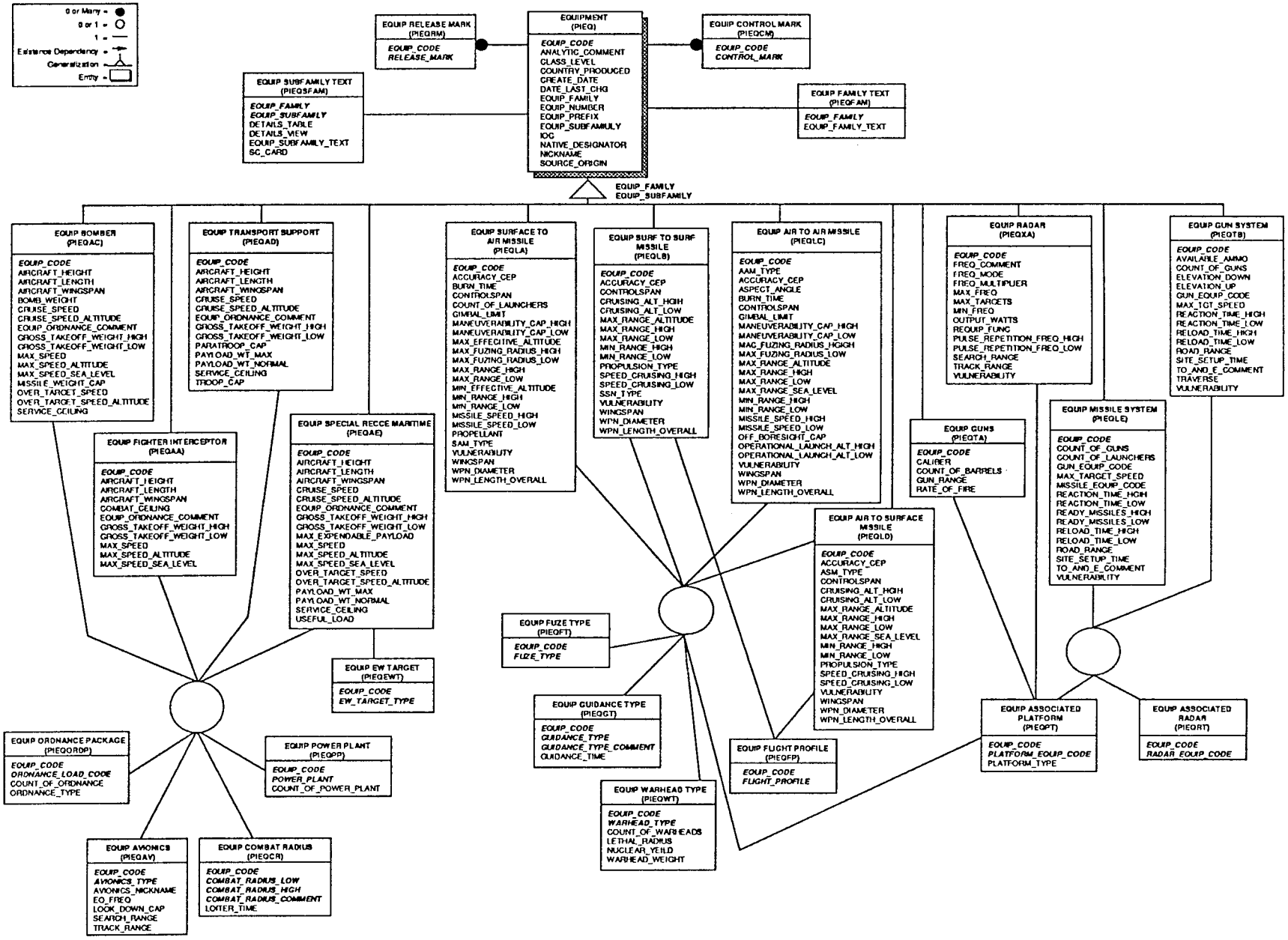
- Analyst Comment
- Several administrative and security elements

Expanded data structures have been provided for key air force and air defense related equipment and their primary characteristics. These tables provide detailed information on those equipment types and systems that PACAF is most interested in and for which PACAF has monitoring responsibilities. The tables also provide the capability to associate equipment to equipment. The following is a listing of the major tables that have been included in the PIE Subsystem Equipment Characteristics Data Base.

- Bomber Aircraft
- Fighter Interceptor Aircraft
- Transport/Support Aircraft
- Special/Reconnaissance/Maritime Aircraft
- Surface-to-Air Missiles
- Surface to Surface Missiles
- Air-to-Air Missiles
- Air-to-Surface Missiles
- Guns
- Radars
- Missile Systems
- Gun Systems

Figure 3.2-4 is a structure diagram that shows the Equipment Characteristics Data Base tables. At the top are the common tables mentioned above that are used to describe every type of equipment in the data base. The remainder of the figure contains the unique table structures for the Air Force interest equipment, plus the lines showing the relationships among tables.

The PIE User's Manual details the computer system procedures the user should follow to operate the Equipment Parametrics function.

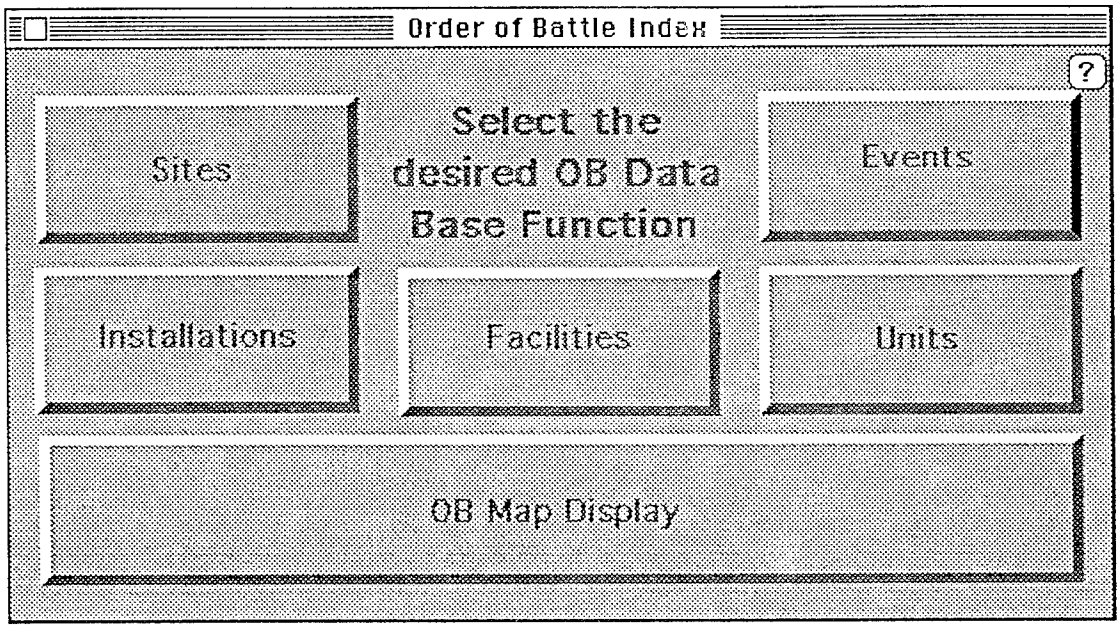


PIE Equipment Characteristics Structure Diagram
Figure 3.2-4

3.2.2 Order of Battle (OB) Data Base Component

The PIE Subsystem Order of Battle Data Base component provides the intelligence analyst with the capability to store, recall, and access basic order of battle data. This information can be subsequently integrated into a softcopy briefing or other analytical products. The Order of Battle Data Base component consists of two logical parts: the OB Data Base maintenance part and the OB Data Base map display. The OB Data Base maintenance part consists of a set of relational tables (entities) and elements (attributes) implemented in the Oracle Data Base Management System (DBMS) on the VAX 8650. The intelligence analysts access the OB Data Base via the graphical "point-and-click" user interface within the Macintosh environment. This interface provides an easy to use mechanism for adding and modifying basic order of battle data as well as flexible tools for formulating queries and displaying query results. It operates very similar to the PIE Subsystem Automated Intelligence Fact Book outlined in Section 3.2.1 above.

Figure 3.2-5 shows the PIE Order of Battle Index Window that is displayed when the user selects the PIE OB component. The window lists the major functions of the OB component: maintenance of sites, installations, facilities, units, and events, plus the OB map display. Each beveled rectangle on this window is a computer button that enables access to the specified areas within the Order of Battle Data Base window.



PIE Order of Battle Index Window

Figure 3.2-5

The following list describes the general capability provided by each Order of Battle function button.

OB Data Type	Description
Sites	Allows the analyst to store and retrieve data that documents activity at a location when that activity cannot be clearly associated with a unit, an installation, or a facility.
Installations	Allows the analyst to store and retrieve information about an installation. An installation is a facility or group of facilities, located in a specific geographic area, which support a particular function or associated functional purposes.
Facilities	Allows the analyst to store and retrieve information about a facility. A facility is a real property performing a unique function.
Units	Allows the analyst to store and retrieve basic identification information about a force or organizational entity.
Events	Allows the analyst to store and retrieve data pertinent to an event.
OB Map Display	Allows the analyst to select a geographic area of interest (AOI) and to display selected order of battle information pertinent to the AOI on an outline map background.

3.2.2.1 Data Content and Organization

The PIE Order of Battle Data Base will accommodate Air OB, Ground OB and Defensive Missile OB for the PACAF area of interest. In general, the PIE OB design is based on the OB related tables and data elements planned for incorporation in the USAF Extended Integrated Data Base as outlined in the August 1991 XIDB Data Base Design Document. This includes those tables and elements that show identification, strength, command structure and disposition of units, equipment and facilities. These tables provide a storage location in the PIE Subsystem for official DIA OB data. Also included in the design is the capability to establish relationships such as UNIT_EQUIPMENT_LOCATION, FACILITY_EQUIPMENT_LOCATION, and SITE_EQUIPMENT_LOCATION. It is in these relationships that items like equipment quantity are maintained. The XIDB EVENT table has been included because OB dispositions are often event driven. The use of the EVENT

table should also enhance PACAF/INAO situation monitoring activities. Figure 3.2-6 provides an overview of the PIE OB data base schema. The complete PIE OB physical design charts showing the tables and data elements are provided in Appendix E of the PIE Subsystem Version 3.0 Concept of Operations.

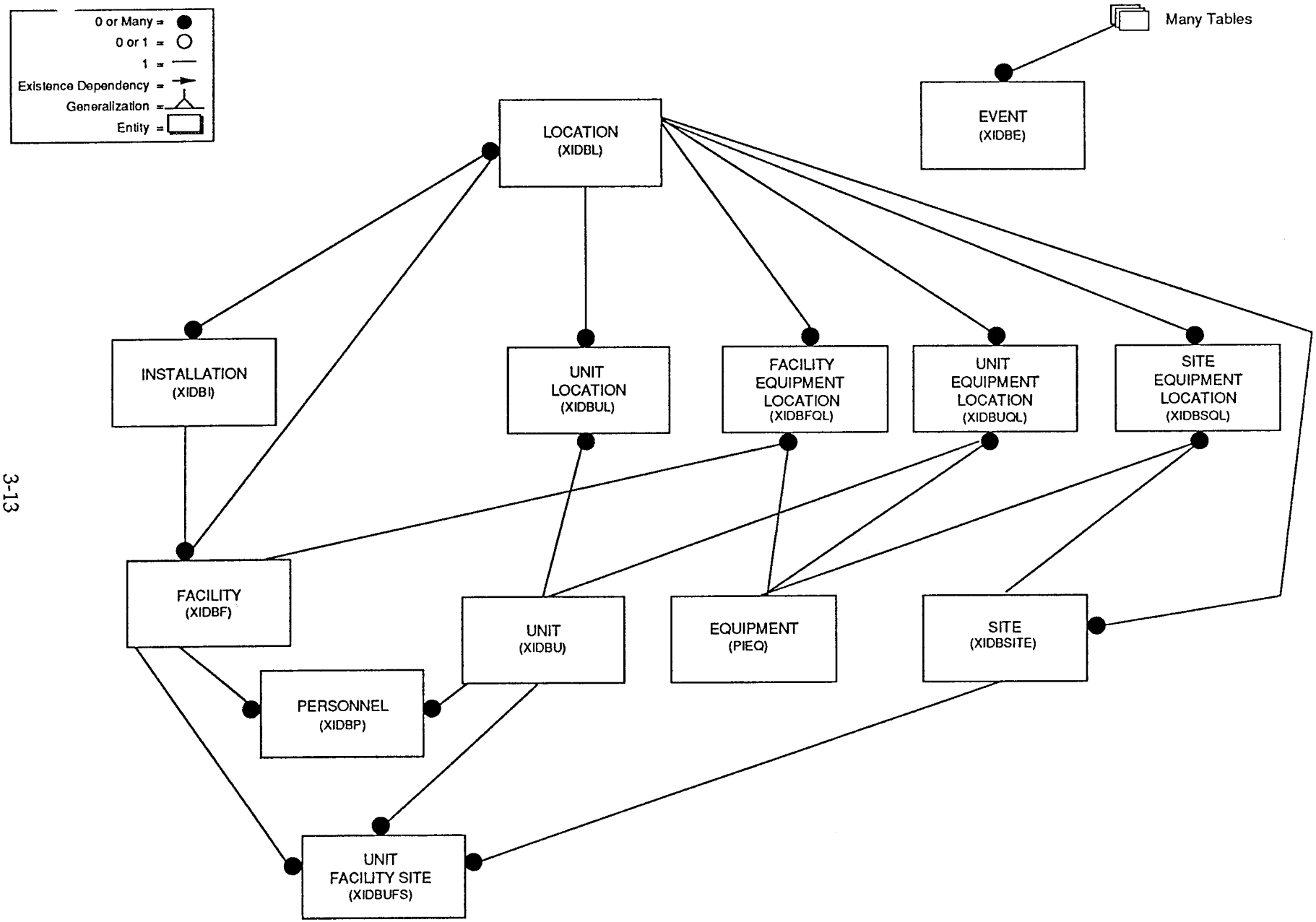
3.2.2.2 OB Maintenance

There are a series of data screens that allow analysts to update and maintain the OB data base. These screens work the same way for all OB entities such as Sites, Installations, Facilities, Units, and Events. Moreover, they are very similar to the screens available in the Fact Book component of the PIE Subsystem. The screen sequencing includes a screen where the user can identify the items they wish to view or maintain. This is done by listing all items or restricting the list by using the PIE Subsystem query editor. Specific information on a selected item is then presented in a "Details" screen. The data elements on the screens vary among the OB entities based on the entity. For example, the attributes for a facility are different from those of a unit since they represent different things. As indicated above, the specific data elements are based on the planned XIDB tables. Since XIDB has not yet been implemented in PACAF, many of the data elements and tables will be new to PACAF analysts. Therefore, PIE will act as a advance learning mechanism for the future XIDB.

Each individual record can be related to other records via the "Details" screen. This feature is useful to associate things like equipment and its location to a facility or one unit to another unit to establish a command subordination. Other editing capabilities such as Add, Modify and Delete are available via the Details screen. The names of the data elements are color coded to indicate which are required, optional or system generated. The OB maintenance process is essential to provide information to the OB map displays.

3.2.2.3 OB Map Displays

OB data is especially useful when it is displayed on a map background. Using the OB Map Display capability in PIE, the analyst may define a geographic area of interest for a map background in one of three ways: by country code; by identifying the four corner geographic coordinates of a box; or by identifying the center geographic coordinates and nautical mile radius of a circle. Once the AOI is defined, the analyst may manipulate the background map display (e.g., zoom in or out, and add boundaries) by using the Map Control menu items. The Overlay menu allows the analyst to display the symbol of seven different entities on the selected AOI map: air order of battle (AOB); defensive missile order of battle (DMOB); ground order of battle (GOB); facilities, installations, sites and units.



PIE OB Physical Data Base Design Overview
Figure 3.2-6

3.3 Commercial Desk Top Publishing/Briefing Software

In addition to the PIE Subsystem applications developed by KSC Operations, HQ PACAF/INY has purchased several Commercial-Off-The-Shelf Software (COTS) software packages that have been installed on the PIE Subsystem Workstations. These software packages possess many capabilities that will help the intelligence analysts to develop better softcopy intelligence briefing slides and related items. Although these software packages are not directly integrated into the PIE software, they are readily accessible from the PIE Subsystem via the Macintosh system software. For example, the Macintosh System 6 MultiFinder software allows the user to view PIE data windows and the COTS software windows at the same time. The user can then copy and paste among the windows when building briefing items by using the Macintosh's Clipboard or Scrapbook. The following is a short summary of the primary capabilities of the available COTS software packages.

1. **Microsoft Word**. This is a full feature word processing package for the Macintosh. It allows the user to set writing styles, insert tables and graphics and has a powerful spelling utility. This is the primary program to use when preparing intelligence documents such as the collateral portion of the CINCPACAF Red Book.

2. **Microsoft Excel**. This is a standard spreadsheet for the Macintosh. It gives the user a theoretical worksheet of 256 columns and 16,384 rows and its macro feature allows the user to automate just about any procedure. Its comprehensive graphing capabilities can be used to develop chart portrayals of objects such as order of battle counts.

3. **Canvas**. A graphics and image generation program that allows the user to combine bit-mapped and object-oriented graphics in the same document.

4. **PixelPaint Professional**. A program for creating and editing color bitmapped pictures. Pixel Paint allows the user to embellish those color presentation graphics that the user scanned into the PIE Subsystem.

5. **SmartScrap and the Clipper**. These programs provide the capability to trim, scale and manipulate graphics. The user can also create multiple Macintosh scrapbooks to better organize those briefing images the user wishes to store and reuse.

6. **Microsoft Power Point**. This is the program to used to generate the softcopy slides for the PACAF Command Center presentations. The PIE Subsystem is used to store and manage various pictures of imagery, maps, drawings, and text. This information is then retrieved and integrated into the PowerPoint briefing

environment. It also allows the user to standardize formats with briefers from Operations, Plans, Weather and the other staff organizations.

Chapter 4
SLICE Development Activities

The task requirements for the SLICE effort consisted of seven activities.

Activity 1: Enhancement of the Automated Intelligence Fact Book

Activity 2: Development of PIE Concept of Operations

Activity 3: Acquisition and Integration of a Video Frame Capture Capability

Activity 4: Design and Development of PIE OB Data Base

Activity 5: Design and Development of Geographical OB Display

Activity 6: Perform On-Site Installation, Testing, and Familiarization

Activity 7: Provide On-Site Engineering Assistance

The following sections summarize the objectives, technical approach and results of each of these activities.

4.1 Activity 1: Enhancement of the Automated Intelligence Fact Book

The objective of this activity was to design and implement various enhancements to the PIE Automated Intelligence Fact Book. These included numerous analyst-specified enhancements which were described in the SLICE Statement of Work Annex I.

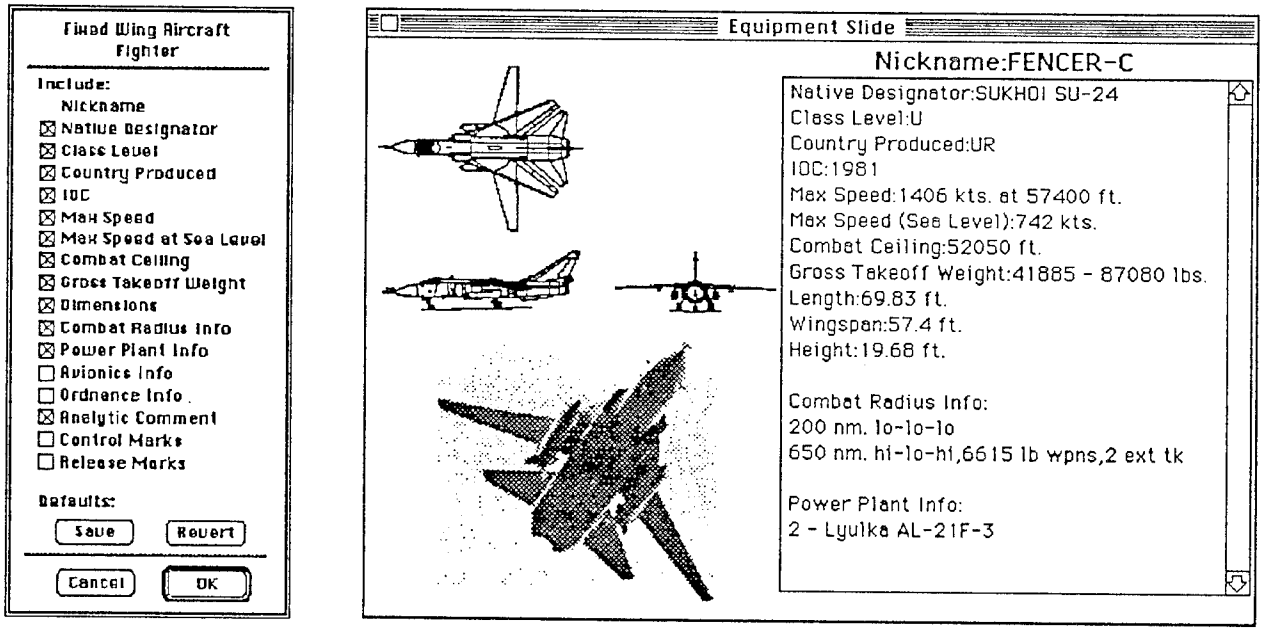
The approach to this activity involved first analyzing each recommended enhancement and assessing its impact and implications of the existing Fact Book application. Once analysis was completed, the Fact Book developers designed the enhancement, performed the required code modifications, and tested and tuned the resulting capability to optimize its performance.

As a result of this activity all Fact Book enhancements specified in the SLICE Statement of Work Annex I were completed, successfully tested, and installed. In addition to those specified at the onset of the effort, significant Fact Book enhancements were performed near the conclusion of the effort. These included porting the Fact Book from the Supercard 1.5 development environment to SuperCard 1.6, and implementation of an image thumbnail

viewing capability. Enhancements accomplished under this activity resulted in the following significant new capabilities:

1. **Compatibility with SuperCard 1.6 and Macintosh System 7:** As part of this activity, the Automated Intelligence Fact Book was upgraded to be compatible with SuperCard 1.6 and Macintosh System 7. This upgrade allowed the Fact Book to take full advantage of advanced SuperCard capabilities which increased performance of the Fact Book overall and allowed the Fact Book to utilize memory, and retrieve images from the file server more efficiently.

2. **Equipment Characteristics Slide:** This capability allows the analyst to prepare a briefing slide that contains a schematic, imagery and basic characteristics data for a specific piece of equipment. This is done by selecting the desired equipment on the Equipment List window and clicking the Slide button. The analyst is then provided a screen that gives them the option of selecting a slide with a default list of normally used characteristics, or the option to customize the list of characteristics they want. Both choices include a schematic and an image of the pertinent equipment. Selecting the custom display provides a window with "check boxes" that contain all the characteristics pertinent to that specific equipment subfamily; the user merely puts a "check" in the box opposite the desired characteristics and they will be displayed on the "slide". The "slide" includes a scroll bar so the user can view all the characteristics. Figure 4.1-1 shows a sample equipment characteristics screen with the custom slide "check box" options.



Sample Equipment Characteristics Screen
Figure 4.1-1

3. **Image Thumbnail Capability:** Many times analysts may need to browse through the images stored in the Fact Book to locate the desired image. The Image Thumbnail Capability shown in Figure 4.1-2, allows this. When the Show Thumbnail checkbox in a data list window is checked, image thumbnails (i.e., miniature versions of the actual image) of the selected Fact Book entry are automatically displayed in the lower left corner of the window. When the desired image is located, the user can click the display button to display a full scale view of the selected entry.

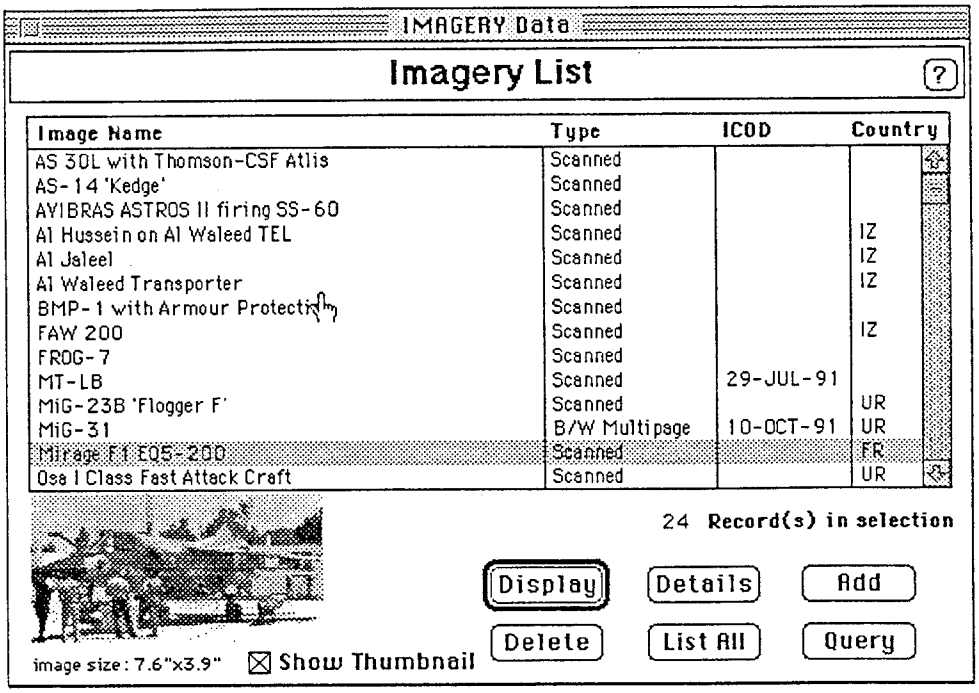
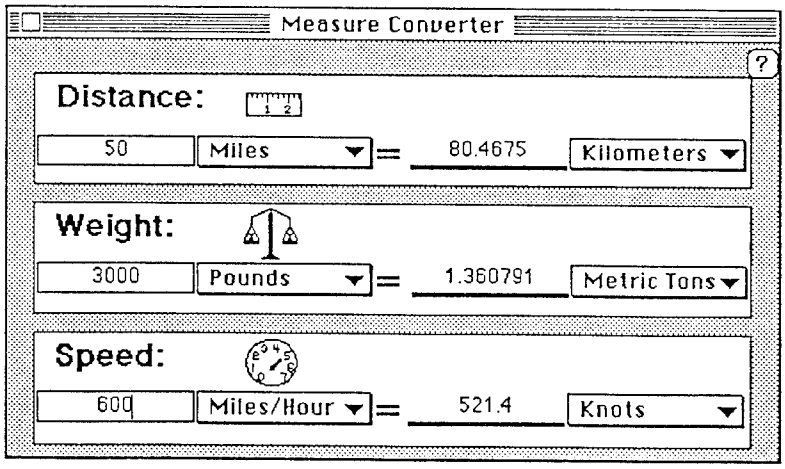


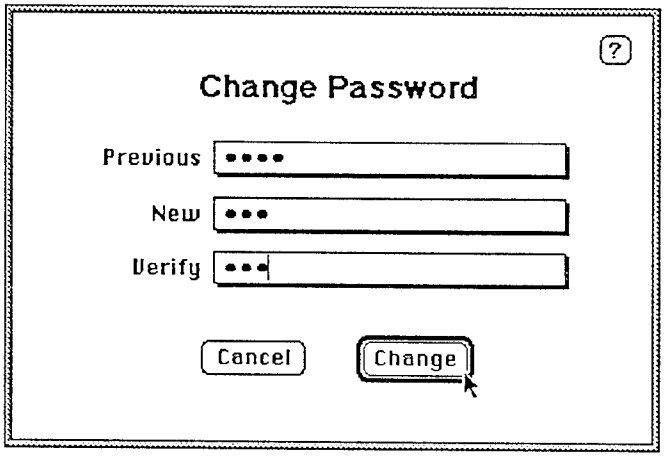
Image Thumbnail Capability
Figure 4.1-2

4. **Measurement Conversion Utility:** Standards of measurement have been applied to the data in the Equipment Characteristics Data Base records based on PACAF/INAO analysts' recommendations. To facilitate conversion of data to the PIE standard, KSC Operations has incorporated an automated Measurement Conversion Utility within the Fact Book under the Special Menu. For example, if the source documentation lists an aircraft speed in miles per hour, and the organization's standard is knots for briefing purposes, the user simply enters the miles per hour figure in the appropriate area of the Measurement Conversion screen and the utility converts the speed into knots. The designated specialist can then enter the appropriate figure into the data base. Figure 4.1-3 is a sample of a representative units of measure conversion screen that shows the speed conversion feature. There are also distance and weight conversion features in the utility which work in the same manner.



Measurement Conversion Utility
Figure 4.1-3

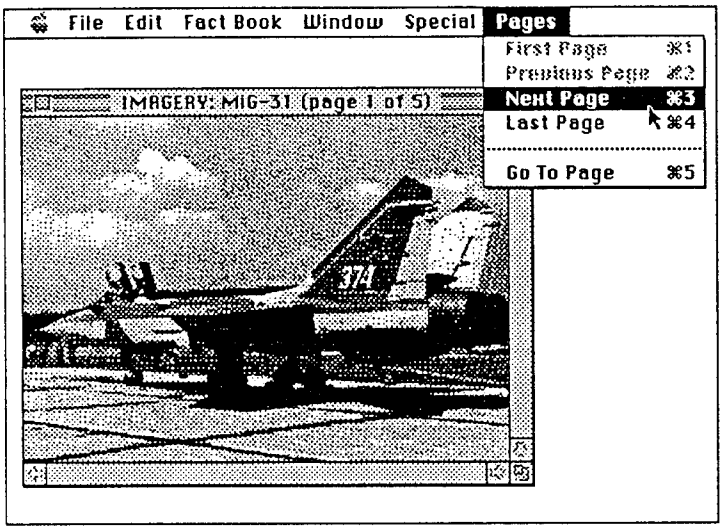
5. **Change Password:** Periodically, users may need to change their password to the PIE Subsystem. The Change Password ... function under the Special Menu allows users of the Fact Book this ability. When activated, a dialog will appear which requires the user to enter their old password, prompts the user for the new password, and confirms the entry of the new password by requiring the user to retype the password.



Change Password Utility
Figure 4.1-4

6. **Multi-page images:** Images stored in the Fact Book may consist of multiple pages. This is supported by the ability of the Fact Book to store and manage access to multi-page images. A multi-page Image is stored on the file server as multiple files which adhere to a specific naming convention (i.e., MiG-31 page 1, MiG-31 page 2, MiG-31 page 3, etc.). When displayed, this group of files is recognized by the Fact Book as a multi-page image. When this image is displayed, the first page of the image will be initially displayed and the Pages Menu will be enabled as shown in

Figure 4.1-5. The user can then view other pages of the same logical image by using the functions under the pages menu.



Multi-Page Images
Figure 4.1-5

4.2 Activity 2: Development of PIE CONOPS

The objective of this activity was to develop a Concept of Operations for the operational use of the PIE Subsystem within the PACAF/IN and PACAF/DO environments. The result of this activity was the detailed PIE Subsystem Concept of Operations document which highlights the capabilities of the subsystem, and describes how these capabilities should be utilized by intelligence analysts. Development of this document involved various revisions, and was particularly challenging due to the extensive organizational changes occurring at PACAF/IN during the performance period of the SLICE effort. For more information on the PIE CONOPS the reader is referred to the PIE Subsystem Version 3.0 Concept of Operations document.

4.3 Activity 3: Acquisition and Integration of Video Frame Capture Capability

The objective of the activity was to acquire and install the necessary hardware and software required to digitize video frames and integrate them into the PIE Subsystem. Based on communications with PACAF and Rome Laboratory representatives, it was discovered the requirement for this capability no longer exists at PACAF/IN, and thus was not performed. In lieu of performing this activity, modifications/enhancements to the PIE Automated Intelligence Fact Book were performed as requested by PACAF/IN and Rome Laboratory.

4.4 Activity 4: Design and Development of PIE OB Data Base

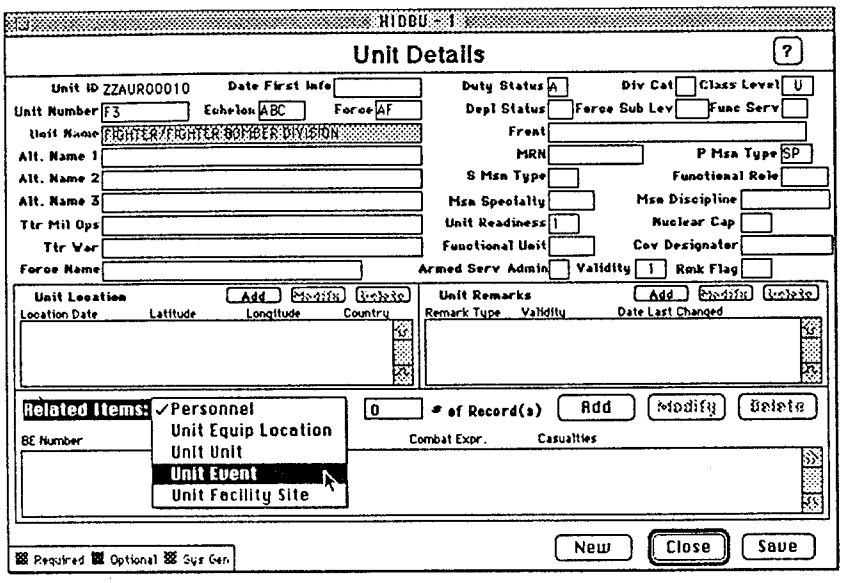
The objective of this activity was to enhance the current PIE Subsystem through the design and development of an OB data base capability. The approach employed to achieve this objective consisted of: 1) selection and design of the OB Data Base, 2) implementation of the OB Data Base design in the Oracle Relational Data Base Management System, and 3) design and development of the Order of Battle data base maintenance capability in MacApp/C++.

The Air Force's Extended Integrated Data Base currently under development was selected as the baseline for the selection of the PIE OB Data Base. Thus the tables, elements, and relationships comprising the PIE OB Data Base are a subset of those tables, elements and relationships specified in the August 1991, XIDB Data Base Design Document. For additional information on the PIE OB Data Base design, the reader is referred to the PIE Software Product Specification which presents detailed information on the tables, elements, and relationships comprising the PIE OB Data Base. Once design was complete, the design was implemented using the Oracle Relational Data Base Management System. This resulting OB Data base consists of 37 tables, with 202 unique elements.

In parallel with the data base development, development of the Macintosh capability to facilitate access, creation, modification and deletion of data within the data base was performed using the MacApp/MPW C++ development environment. The resulting OB data base maintenance capability is a major component of the PIE OB Version 1.0 Application. It allows full query, creation, update, and deletion over the entire data base structure. In addition to basic data base maintenance capabilities, a number of enhanced features are provided to simplify data entry and modification, and maintain data base consistency. The following paragraphs highlight some of these enhanced data base capabilities which were implemented.

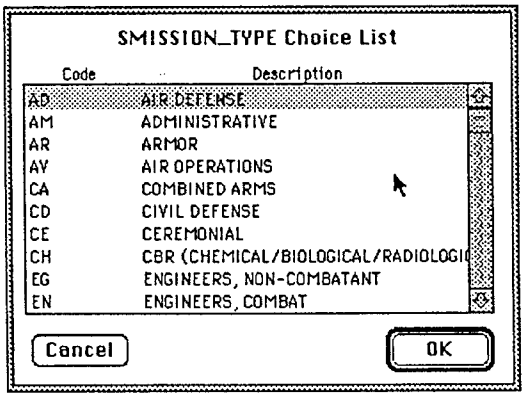
1. **Easy Access to Basic Repeating and Associated Attributes:** The OB Data Base schema is comprised of OB entities (i.e., units, facilities, sites, events, etc.) and a network of relationships among entities. To present these complex relationships to the user in an easy to understand manner, developers of the OB Data Base Maintenance chose to represent basic repeating attributes and associated attributes within the details windows. Figure 4.4-1 depicts the unit details window, which contains specific areas allowing access to related attributes. The two rectangular regions located in the center section of the window are used to access the Unit Location and Unit Remarks Basic Repeating Attributes. These attributes, which are contained in other OB data base tables, represent data closely related to the current Unit. The Related Items pop-up menu and the long rectangular scrolling text region located in the lower section of the window allow access to data describing other OB

entities which are related to the current unit. By selecting an item from the pop-up menu (such as Unit Event) a list of all Unit Event entities related to the current unit record will be displayed within scrolling text region.



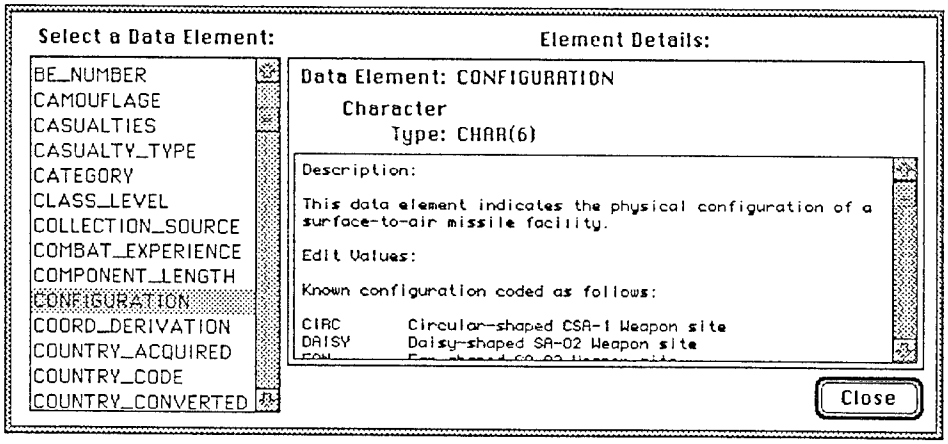
Basic and Associated Attributes
Figure 4.4-1

2. **Data Element Choices Lists:** Many of the elements selected for inclusion in the PIE OB Data Base from XIDB had lists of allowable values associated with them. To assist the user in data entry and modification, the PIE developers implemented extensive choices list capability. As shown in Figure 4.4-2, this capability presents the user with a window containing the allowable values for the field whenever the field (i.e., SMISSION_TYPE) is accessed. To enter data from this list, the user needs to only locate the desired value from the scrolling list, highlight it, and click on the OK button. This capability speeds entry of data, and ensures that correct, allowable values are entered into many OB data base fields.



Sample Data Element Choices List
Figure 4.4-2

3. **On-line Data Base Element Help:** All of the elements selected for inclusion in the PIE OB Data Base from XIDB possess guidelines describing what the element is used for and how it should be entered. To allow PIE users access to this valuable information, the PIE developers implemented an extensive Data Element Help capability. This capability is accessed by clicking the help button ([?]) located in the upper right hand corner of all OB data base list and details windows. As shown in Figure 4.4-3, this capability presents the user with a window containing a list of all elements in the OB Data Base. To view detailed data describing a specific element, the user locates and selects the desired element from the scrolling list along the left. This capability speeds the entry of data, and helps the inexperienced user learn about the elements comprising the OB Data Base.



Data Element Help
Figure 4.4-3

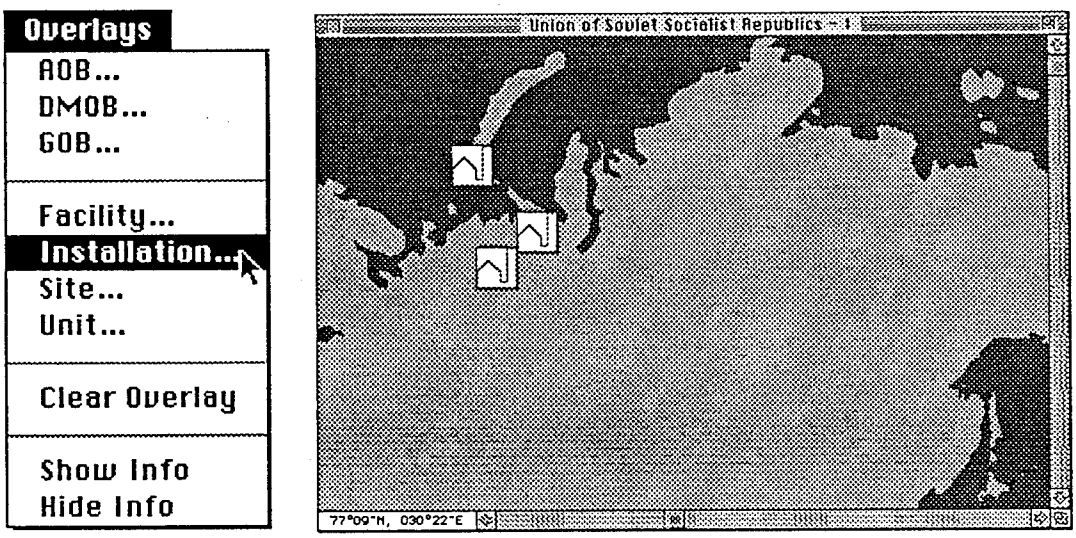
4. **Automatic data propagation:** To create relationships among OB Data Base entities (such as Units and Personnel), key data elements must have the same values in the two related entity records. To assist in the creation and maintenance of these relationships, the PIE developers implemented a data propagation mechanism which automatically propagates data from a given entity (such as a Unit) into a related entity record (such as Personnel) when the related record is created. Once the record is saved, these linking fields are locked so that the data linking the entity to another entity cannot be accidentally corrupted. This propagation ensures that the data element values defining the linkage between two entities are correctly entered and maintained.

4.5 Activity 5: Design and Development of Geographical OB Display

The objective of this activity was to design, develop and implement a geographical OB display capability. MacApp/MPW C++ was the development environment selected for this

activity. To obtain a degree of similarity with the MacCIDSS application utilized at PACAF, KSC Operations chose to utilize FGM Inc. (the developers of MacCIDSS) as a subcontractor for this activity. Functionality for selected portions of MacCIDSS was provided by FGM and integrated by KSC Operations into the PIE Geographical OB Display capability.

This activity culminated in the development of the OB Map Display capability, a major component of the PIE OB Version 1.0 Macintosh application. This capability allows plotting of various geographically located OB entities such as Units, Facilities Installations, Sites, etc., as well as more complex entities such as AOB Units, GOB Units, and DMOB Units. As shown in Figure 4.5-1, icons corresponding to OB entities stored in the OB Data Base (such as Installations) are plotted on an outline map background. The map is scrollable and zoomable within a designated area of interest. The geographic coordinate of the cursor is continuously monitored, and is shown in the lower left corner of the window. *(Note: Actual displays are presented in color not depicted in the figure.)*

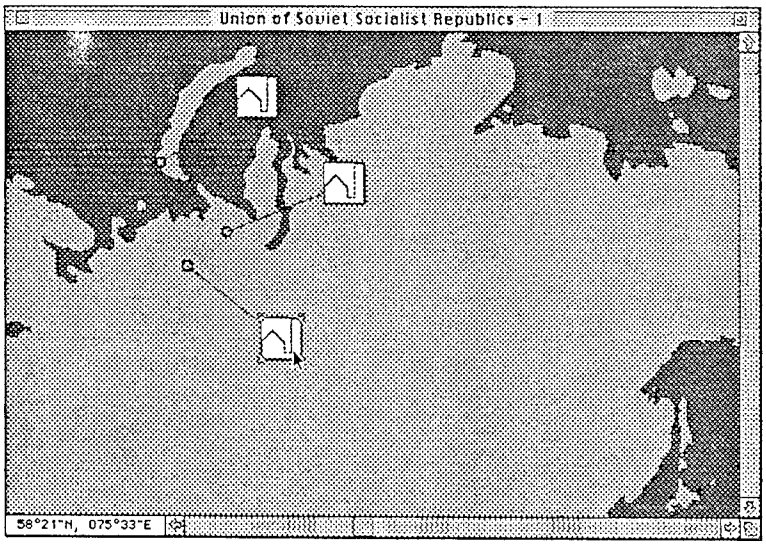


OB Map Display
Figure 4.5-1

In addition to these basic map display capabilities, a number of enhanced capabilities were developed which make the OB Map Display more flexible and easy to use. The following paragraphs describe these notable enhancements.

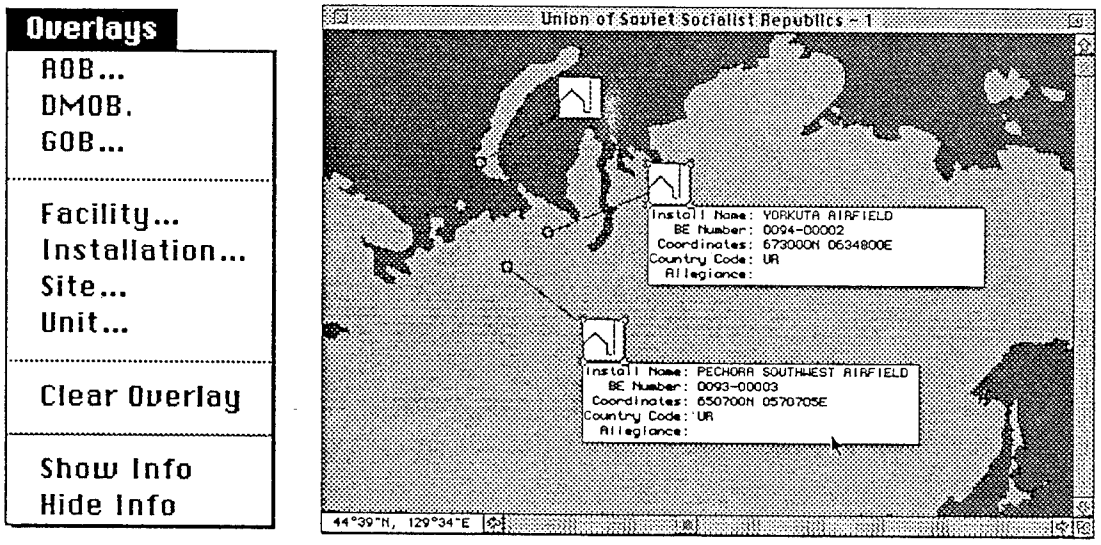
1. **Dragging of OB Icons:** Sometimes, due to the close proximity of OB entities, icons representing those entities may overlay and obscure each other. To overcome this limitation the PIE developers provided the ability to drag OB Icons. As shown in Figure 4.5-2 the user can select an icon by clicking on it and dragging the icon to a new location. A small circle representing the geographic position of the entity and a tie-line to the OB Icon is drawn. This capability is a valuable tool for preparing

briefing slides when a large number of OB entities are crowded into a small map area.



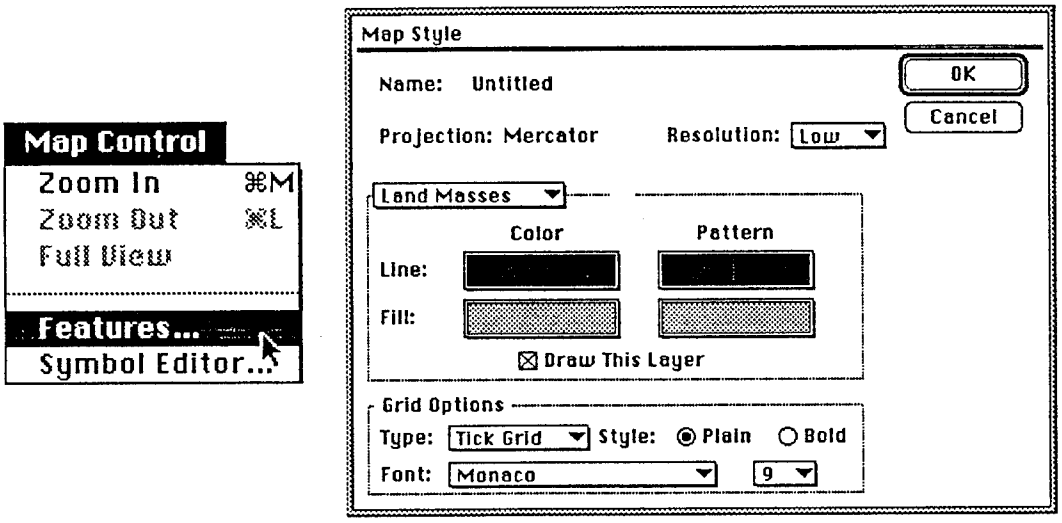
Dragging of OB Icons
Figure 4.5-2

2. **Show Info Capability:** Many times users may desire more information about graphically portrayed OB entities. Additional information describing selected OB entities can be manipulated using the Show Info and Hide Info menu items as shown in Figure 4.5-3. A rectangle containing information describing the selected entity can be displayed by selecting an icon and choosing the Show Info menu item. In turn, this information can be hidden by selecting the icon and choosing the Hide Info menu command.



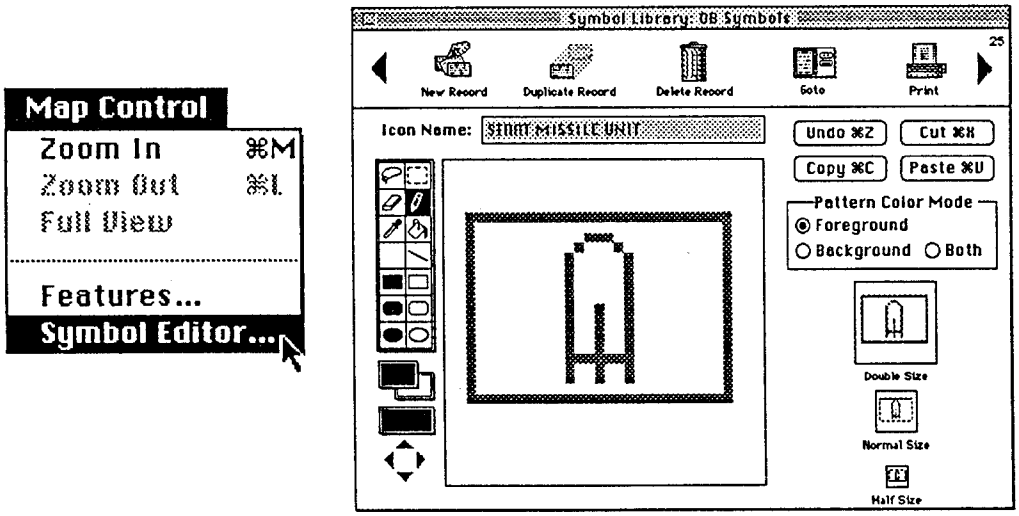
Show Info Capability
Figure 4.5-3

3. Map Features: Control over the outline map background is provided via the Features... menu item shown in Figure 4.5-4. This command displays a dialog which allows the user to change various attributes of the outline map background. Specifically the user may define the color and fill pattern of the various features (such as Land Masses, Oceans, Lakes, etc.), the resolution (low or high) of the map data, and various latitude and longitude grid styles and options.



Map Features
Figure 4.5-4

4. Symbol Editor: Access to the library of symbols representing OB entities is provided via the Symbol Editor menu item shown in Figure 4.5-5. This command displays a dialog which allows the user to view and modify all of the icons used in the plotting of OB entities.



Symbol Editor/Library
Figure 4.5-5

4.6 Activity 6: Perform On-Site Installation, Testing, and Familiarization

The objective of this activity was to install PIE Subsystem software, develop test procedures and test the installed software, and familiarize analysts with new intelligence support capabilities.

In support of this activity, three KSC Operations personnel provided on-site Installation, Testing, and Familiarization during the period of 1 June 92 through 12 June 92. During this period they installed and tested the PIE Fact Book and OB Data Base Capabilities in INY, INA, 15 TIS, Ball Room, and 15 AIS (approximately 10 Macintoshes). Fact Book and OB Data Base Familiarization Sessions were conducted for 24 PACAF individuals. The formal test of the OB Data Base Component was successfully completed in accordance with the Software Test Description on 5 June 92 . Participants included: Capt. B. Gregory, J. Marcinkowski, and J. Kearney. The formal test of the Fact Book Component was successfully completed in accordance with the Software Test Description on 11 June 92 . Participants included Capt. G. Shoaf and J. Marcinkowski. The specific results of this PIE testing activity are discussed in Chapter 5 of this report entitled Software Test Results.

4.7 Activity 7: Provide On-Site Engineering Assistance

The objective of this activity was to provide two (2) months of on-site engineering assistance following delivery of the PIE Subsystem. Based on communications with PACAF and RL representatives, the requirement for two (2) months of on-site engineering assistance was deemed unnecessary and was subsequently scaled back to consist of two (2) weeks of on-site engineering assistance. In lieu of performing this activity for its original duration, additional modifications/enhancements to the PIE Automated Intelligence Fact Book were performed as requested by PACAF/IN and RL.

In support of this activity, three KSC Operations personnel provided on site engineering assistance during the period of 1 June 92 through 12 June 92. During this period they provided on-site engineering assistance regarding the operation of the PIE Fact Book and OB Data Base Capabilities, Macintosh and Vax File Server and Oracle environments. Also during this period, review of the CIDSS PIE file server revealed file corruption due to the transition from PacerShare to VAXShare on the Collateral LAN. This problem was brought to the attention of PACAF/INY and PACAF/DO personnel and will be remedied by PACAF/DO personnel in the near future.

Also, KSC Operations personnel assisted in populating a limited set of basic OB Data (Installations, Units, Facilities, Unit Equipment, etc.) from government-provided sources. In response to analyst recommendations received during familiarization, the following software changes/enhancements were successfully implemented and tested while on-site:

- Implemented the display of coordinate data when showing information for an OB Data Base Symbol .
- Changed the shade of green used to denote mandatory data fields in the OB Maintenance Capability to be more legible .
- Implemented modifications to PIE software to automatically adapt to either a remote or local data base host; however, software and procedures to produce Fact Book and OB Data Base extracts from the Vax are still required.

Chapter 5
Software Test Results

5.1 Introduction

This chapter provides a record of the formal qualification testing performed on the PACAF Intelligence Enhancement (PIE) Subsystem as of June 1992, and fulfills the requirements of CLIN 0002AD, CDRL D008.

The hardware configuration for the tests consisted of a Macintosh IIci configuration located in PACAF/INY networked via ethernet to the PACAF/DO VAX 8650. The software configuration for the tests consisted of PIE OB Data Base version 1.0 and PIE Fact Book version 3.0.

5.2 Test Summary

The test results are summarized in Figure 5.1-1 and Figure 5.1-2. These figures list each test, indicates whether the test succeeded or failed, and detail any remarks, problems or errors occurring during the performance of the test. Except where noted, all tests were completed successfully without comment. Tests listed in Figure 5.1-1 correspond to the Fact Book Component. These tests were successfully completed at PACAF/INY on 11 June 92 in accordance with the Software Test Description. Participants included: Capt. G. Shoaf, J. Marcinkowski. Tests listed in Figure 5.1-1 correspond to the OB Data Base Component. These tests were successfully completed at PACAF/INY on 5 June 92 in accordance with the Software Test Description. Participants included: Capt. B. Gregory, J. Marcinkowski, J. Kearney.

STD Section	Title	Pass	Fail	Comments
4.1.1	PIE Subsystem Log On	√		
4.1.2	Window Navigation	√		
4.1.3	Printing	√		Disabled buttons appear gray when printed.
4.1.4	Screen Clip	√		
4.2.1	Schematic Record Addition	√		Option-Tab into country code as is provided in OB Data Base Application is desirable
4.2.2	Schematic Record Modification	√		
4.2.3	Schematic Record Display	√		
4.2.4	Schematic Record Query	√		
4.2.5	Schematic Record List All	√		
4.2.6	Schematic Record Deletion	√		
4.3.1	Save/Load	√		
4.3.2	Image Search	√		
4.4.1	Equipment List	√		
4.4.2	Equipment Record Addition	√		
4.4.3	Image Linking	√		
4.5.1	Export Text	√		
4.5.2	Center Windows	√		
4.5.3	Measure Converter	√		
4.5.4	Change Password	√		
4.6.1	General Help	√		
4.6.2	Data Base Help	√		

Summary of PIE Fact Book Version 3.0 Test Results
Figure 5.1-1

STD Section	Title	Pass	Fail	Comments
5.1.1	Unit Record Addition	√		
5.1.2	Unit Record Modification	√		
5.1.3	Unit Record Deletion	√		
6.1.1	Map Feature Settings	√		Erroneous red line appears when border/grids are displayed.
6.1.2	AOI Selection	√		
6.1.3	Zoom and Scroll Feature	√		
6.2.1	Symbol Editor Manipulation	√		
6.3.2	OB Symbol Display	√		
6.4.1	Text OB Info from Symbol Display	√		

Summary of PIE OB Data Base Version 1.0 Test Results
Figure 5.1-2

5.3 Test Comments

Comments were noted for three of the above tests.

Upon completion of test 4.1.3 it was noted that disabled buttons which appear on screen in a gray colored font appear as gray filled buttons in which the name of the button is obscured when printed. This PIE Fact Book printing function uses the printing capability inherent in the SuperCard development environment and was therefore not readily changeable.

During performance of test 4.2.1 it was noted that an Option-Tab capability in the country code field would be desirable in the Fact Book. This capability in the OB Data Base allows the user to hold down the Option key while tabbing into a field containing a choices list (such as the country code field). Doing so, bypasses the display of the choices list window allowing the user to type in the country code directly. The desire for such a capability was noted and could be addressed in a future PIE Fact Book version.

During performance of test 6.1.1 it was noted that an erroneous red line appears when the border/grids are displayed. This discrepancy was the result of erroneous data in the IntBnds.dir data file. To resolve the discrepancy a new IntBnds.dir data file was provided to PACAF/INY.

Chapter 6
Conclusions & Recommendations

6.1 Conclusions

The combination of applications software, documentation, and on-site presence provided by KSC Operations under the SLICE effort provides PACAF/IN with an automated intelligence materials management capability which is powerful, flexible, and easy to use. Many notable accomplishments resulted from the SLICE effort :

- Version 3.0 of the Automated Intelligence Fact Book is faster, more powerful, and more flexible, than previous versions. Specifically, the equipment slide capability, measurement converter, image thumbnail views, and support for multi-page images are enhanced features which resulted from analyst-specified enhancements.
- Version 1.0 of the OB Data Base capability utilizes a data base structure in-line with current Air Force OB data base standards. The PIE OB data base physical design is a subset of the XIDB. Use of this new standard gives PACAF personnel an advance look at XIDB's terminology and organization, and postures the PIE OB data base for automated population when XIDB is fielded.
- Version 1.0 of the OB Data Base Maintenance capability provides tools for the creation, update, and deletion of OB data. The OB data base maintenance capability is accessed and maintained via an easy to use Macintosh interface. Many features are included in this initial version of software which allow easy access to basic repeating and associated attributes, data element choices lists, and on-line data base element help.
- Version 1.0 of the OB Data Base provides tools for the graphic portrayal of OB data. Geographically relevant OB entities can be plotted as icons on an outline map background. Features in this initial version of the OB map display software include support for the dragging of OB Icons, the Show Info capability, and allowing analyst control over map features and OB symbology.
- The PIE Concept of Operations Document was developed. This document describes the mission of the PIE Subsystem, and its operational and support environments. It also describes the use of the PIE Subsystem within the overall PACAF Command Center Environment. The document identifies procedural guidelines for the input,

processing and output of intelligence information to be used in PACAF Command Center presentations. It includes recommended methods for the management of selected intelligence information that are used in the PIE developed intelligence documents and presentations, and provides suggestions for PIE Subsystem configuration management.

- On-site installation, testing, familiarization, and engineering support was provided. This hands-on interaction between the software developers and end users proved invaluable for gaining user acceptance of the delivered capability, and provided time for on-site customization of the application prior to final delivery.

This latest version of the PIE subsystem was delivered during a period of profound change within PACAF, and the Air Force as a whole. PACAF/IN's mission is being redefined, while the number of personnel available to perform the mission is shrinking. Though this makes the future of the PIE Subsystem at PACAF uncertain, tools like the PIE subsystem become especially important in these changing times for a number of reasons:

1. **Automated data bases provide continuity.** As personnel are shifted and re-tasked, it is especially important that a central repository for information exists which captures the core knowledge of the personnel. Information within this central repository can be passed along from analyst to analyst to provide continuity during personnel changes and reorganization.

2. **Automated tools are needed to "do more with less".** Commands are being asked to do more with fewer people and less money. One way to achieve this objective is through the prudent use of automated intelligence tools. Specialized tools such as the PIE subsystem can relieve analysts of the burden of mundane tasks, allowing them to concentrate their expertise on meeting mission critical objectives.

3. **Centralized information repositories and networks reduce duplication of effort.** One way to "do more with less" is to reduce duplication of effort. The PIE Subsystem made important strides in reducing duplication of effort by providing a central repository for OB data and Fact Book data. This repository is shared among analysts via a network allowing information maintained by one analyst to be rapidly disseminated to other analyst via the network.

4. **Easy to use workstations and tools are critical.** As the number of personnel available to perform a task is reduced, it becomes increasingly important to have easy to use workstations and tools. This ease of use allows analysts to concentrate on solving problems, rather than on operating and understanding the tools used in problem solving. The PIE Subsystem capabilities developed under the SLICE effort performed up to expectations and were found to be relatively easy to use by analysts of various skill levels and operational backgrounds. This was the result of

using the non-imposing Macintosh workstation. The user friendliness of the Macintosh helped non-computer people become familiar with the Macintosh and COTS software such as PowerPoint. This, combined with the developers adherence to Macintosh Standard User Interface Guidelines whenever possible, allowed intelligence analysts familiar with commercially available Macintosh applications to rapidly assimilate the skills needed to utilize PIE capabilities.

5. **Integration of custom applications with COTS application is necessary.** Due to funding constraints, systems comprised of commercially available hardware and software components integrated with custom hardware and software are increasingly necessary. Future systems will likely utilize high quality commercially available software applications for routine workstation tasks. Custom software will then focus on performing those critical portions of the analyst's task which cannot be performed using COTS software. The PIE Subsystem is based on this premise. It strives to efficiently manage intelligence material and OB data base information, while integrating with high quality COTS applications such as Microsoft Word and PowerPoint to produce reports and briefings.

6.2 Recommendations

Though much has been accomplished during the SLICE effort, some recommendations for future PIE enhancement remain. First and foremost, an automated load of the OB data base capability is essential. Though the OB Data Base capability now exists, to be useful it needs to be populated. The most cost effective method to achieve this end is to implement a facility for loading the PIE OB data base from data bases like the MIIDS IDB, and (in the future) XIDB. This task, though nontrivial, should be made easier by our adherence to the XIDB physical design while designing the PIE OB Data Base.

Second, the requirement to migrate PIE capabilities to an open system server and workstation configuration are too compelling to resist. Migration of PIE capabilities to this environment is necessary to keep pace with current DoD trends in workstation selection and interoperability. For this phase of PIE development, Atlantic intelligence Command is taking the lead. An effort will soon be initiated for AIC aimed at the porting the data base and file server to a Sybase/Sun workstation configuration, and interest has already been expressed in a future effort aimed at porting the PIE Macintosh workstation capability to the Sun workstation.

Finally, during our period of on-site engineering assistance a number of analyst recommendations and comments were noted which represent possible future enhancements to the PIE Subsystem. Such comments, expressed at the conclusion of the initial PIE

development effort, formed the basis for enhancements accomplished during the SLICE effort.

- "The text displayed when an OB symbol is clicked on should be tailorable by the user." This enhanced mapping feature would significantly increase the flexibility of the OB Map Display and is desirable.
- "The saving and loading of analyst-specified Areas of Interest for OB Map Displays is desirable." This enhanced mapping feature, though needed, was not provided in this initial release of the OB Map Display capability.
- "The OB Map Display should incorporate display of maps based on other criteria such as Military Area or Air Defense District." Currently the OB Map display supports the definition of areas of interest by: 1) country code, 2) geographic rectangle, and 3) geographic circle.
- "Improvement of the Map Feature dialog to automatically select 'Draw this Layer' when the feature is selected via the pop-up menu is needed." This user interface improvement was recognized only after extensive use by analysts during familiarization and should be included in a future version of the PIE OB Data Base application.
- "A desirable feature would allow filling the region of a selected country with a different color to highlight a specific country in a briefing slide." The PIE developers were careful not to duplicate functionality, such as this, which is already provided in commercially available drawing and painting applications. In this case, a slight degree of duplication of functionality may be justified to support generation of high quality map graphics directly from the PIE Subsystem.
- "Given that ATTGs are no longer being produced, use of a more generic term such as Target Materials is recommended within the Fact Book." Early versions of the PIE subsystem were developed while the term Automated Tactical Target Graphic (ATTG) was still in use. Certainly, future PIE versions need to keep pace with new terminology, the use of Target Materials instead of ATTGs is one example.
- "The windows displayed by the Fact Book and OB Data Base should be better able to adapt to screen sizes of less than 19 inches." Though originally designed for operation on 19 inch color displays, future PIE versions need to account for the fact that many screens now in use are smaller than the 19" displays originally installed within PACAF/IN.
- "PIE developers should make provisions to help support deployment of a stand-alone PIE capability." Because of the smaller scale, regional nature of today's conflicts, the requirement for a deployable stand-alone PIE subsystem exists. To support this, utility software is needed to first extract information from the networked PIE

Subsystem data base and image server. This information can then be loaded onto a deployable PIE workstation for use in stand-alone mode.

Appendix A
List of Acronyms

AOB	Air Order of Battle
AOI	Area of Interest
ATTGs	Automated Tactical Target Graphics
BTGs	Basic Target Graphics
CAT	Crisis Action Team
CIDSS	CINCPACAF Integrated Decision Support System
CINCPACAF	Commander-In-Chief, Pacific Air Forces
CONOPS	Concept of Operations
COTS	Commercial-off-the-Shelf
DBDD	Data Base Design Document
DBMS	Data Base Management System
DIA	Defense Intelligence Agency
DMOB	Defensive Missile Order of Battle
FTD	Foreign Technology Division
FTR	Final Technical Report
GOB	Ground Order of Battle
IRDD	Rome Laboratory's Intelligence and Reconnaissance Directorate

MIIDS	Military Intelligence Integrated Data System
NAFs	Numbered Air Forces
OB	Order of Battle
PACAF	Pacific Air Forces
PACAF/INA	Pacific Air Forces Intelligence Applications
PACAF/INY	Pacific Air Forces Intelligence Systems
PIE	PACAF Intelligence Enhancement Subsystem
RL	Rome Laboratory
SBS	Secure Briefing System
SLICE	System Level Integration into the CIDSS Environment
USAF	United States Air Force

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