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LRAPP REPORT
79-029

AD 6041066

LEVEL
INTRODUCTION TO THE
LRAPP
ENVIRONMENTAL - ACOUSTIC
DATA BANK



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LONG RANGE ACOUSTIC PROPAGATION PROJECT
NAVAL OCEAN RESEARCH AND DEVELOPMENT ACTIVITY
NSTL STATION, MISSISSIPPI 39529

JUNE 1979

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DEPARTMENT OF THE NAVY
NAVAL OCEAN RESEARCH AND DEVELOPMENT ACTIVITY
NSIL STATION, MISSISSIPPI 39529

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30 August 1979

From: Manager, LRAPP Data Management Program
To: Distribution

Subj: Introduction to the LRAPP Environmental Acoustic Data Bank;
forwarding of

Encl: (1) Introduction to the LRAPP Environmental Acoustic Data Bank,
LRAPP Report 79-029 of June 1979

1. The Long Range Acoustic Propagation Project (LRAPP) of the Naval Ocean Research and Development Activity (NORDA) has sponsored development of an Environmental Acoustic Data Bank. The LRAPP Data Bank is designed to provide the data necessary for input to LRAPP modeling and analysis studies on a timely and automated basis. Development of the Data Bank has proceeded such that it now has potential application to a number of Navy activities and contractors involved in LRAPP modeling and special studies.

2. Enclosure (1) is intended to provide the investigator who may have need for use of the LRAPP Data Bank sufficient background to determine its applicability for his/her needs. The Introduction describes the scope of the data bank, access procedures, available data bank products, and an overview of the data bases. Detailed user instructions are provided in LRAPP Report C79-030, "LRAPP Environmental Acoustic Data Bank User's Guide".

A handwritten signature in black ink, appearing to read "K. E. Evans", is written over a horizontal line.

K. E. EVANS
Manager, LRAPP Data
Management Programs

FOREWORD

This document is intended to provide an overview of the analytic capabilities and data stored in the LRAPP Acoustic Data Bank. It also provides the necessary information to gain access to the system. Additional information as to the procedures to use the system's analytical and graphic capabilities as well as a more detailed listing of the Data Bank Contents are presented.

The Users Manual is a controlled circulation document which is updated as required to maintain currency. This document represents Section I, "Data Bank Description," contained in the LRAPP report C79-030, "LRAPP Environmental-Acoustic Data Bank Users Manual (U)," CONFIDENTIAL.

(6) Introduction to the LRAPP
Environmental-Acoustic Data Bank.

(14) LRAPP-79-029

(11) Jun 79

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*Head of the Long Range Acoustic
Propagation Program (LRAPP)
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1150 ... 38529*

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SECTION I
DATA BANK DESCRIPTION

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SECTION I DATA BANK DESCRIPTION

1.0 INTRODUCTION

1.1 LRAPP MISSION AND OBJECTIVES

The Long Range Acoustic Propagation Project (LRAPP) was established within the Office of Naval Research in 1966 to provide environmental acoustic support for Navy programs. The Project supports a balanced program of acoustic parameter investigations, at-sea data collection, and model development and evaluation.

Since 1967, LRAPP has sponsored more than 30 individual environmental acoustic exercises in various ocean areas of the world. During these exercises, extensive measurements have been made of oceanographic and acoustic parameters over wide geographic areas. LRAPP sponsored exercises have involved participation of the Navy Research Laboratories, universities, private institutions, and commercial contractors. Measurements have been made using ships, aircraft, and moored stable platforms. Post-exercise processing and analysis of collected data have resulted in an extensive inventory of digitized data which are used by LRAPP in supporting parametric acoustic analyses, in the evaluation of acoustic models, and as a basis for planning future measurement programs.

1.2 SCOPE OF LRAPP DATA BANK

The LRAPP Data Bank is designed to preserve the massive amounts of both environmental and acoustic data collected during LRAPP sponsored exercises, as well as to maintain, in a readily accessible manner, high quality historic and climatologic data in those ocean areas of interest to LRAPP.

LRAPP's data banking efforts began in 1973 with the CHURCH GABBRO Exercise in the Caribbean. Since that time, all LRAPP data which have been collected, processed, and edited have routinely been forwarded to the Data Bank. During this period, LRAPP has also sponsored the compilation of high quality environmental data sets (edited data from NOOC and NAVOCEANO data sets) for selected ocean areas.

The LRAPP Data Bank, which is made up of 1) the Data Bases, and 2) the Data Management Software, is currently operational on UNIVAC 1108 hardware at the NSTL, Bay St. Louis, Mississippi.

1.2.1 Data Bases

The environmental and acoustic data within the Bank are structured in Regional Data Bases where all banked data within the particular geographic area will be found, regardless of source. At present, only a limited

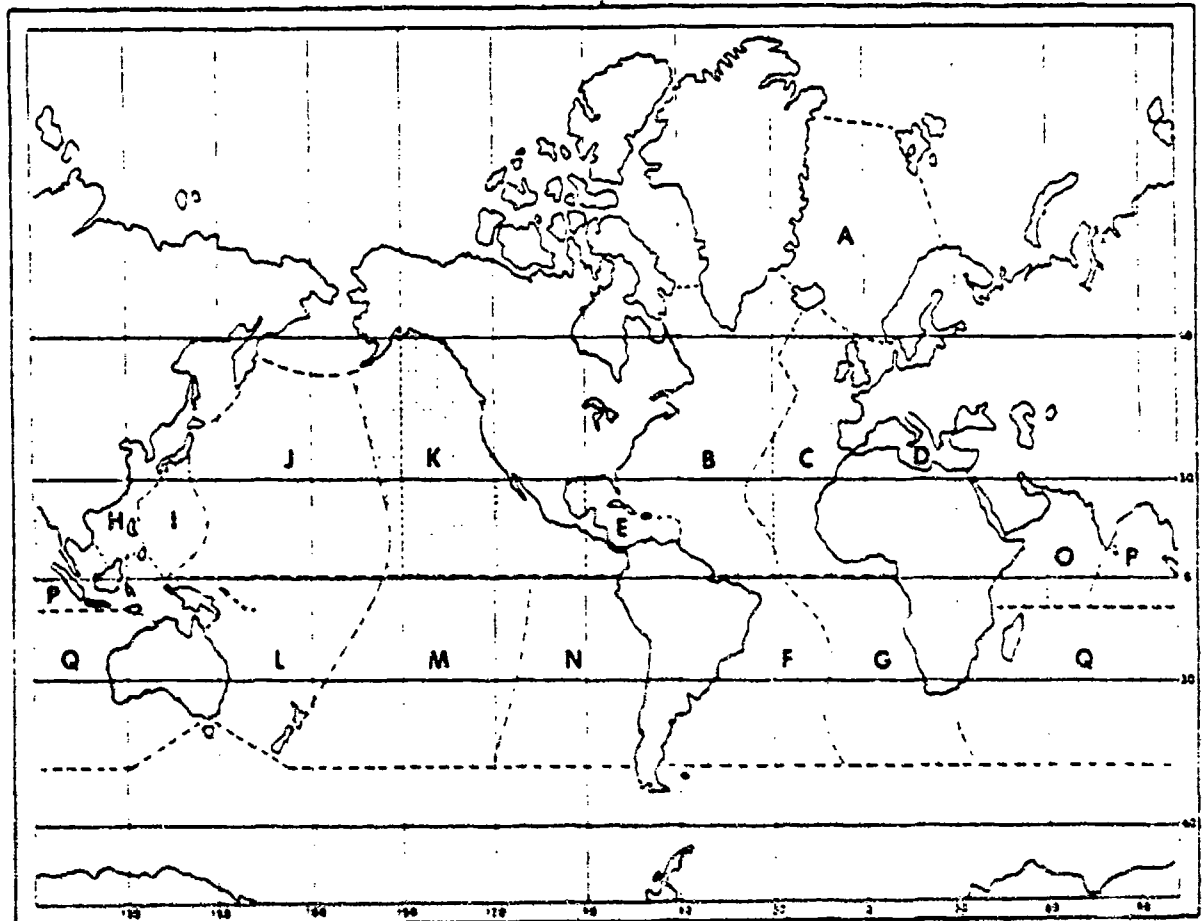
number of regional Data Bases exist in the Bank. Schedules for addition of Data Bases are based on geographic priorities of LRAPP measurement and analysis programs. Figure 1-1 delineates Data Base Region boundaries and indicates presently available Data Bases. Exceptions to the regional organization of data are made for special data sets (e.g., World Shipping Data Base) only where regional segmentation is not appropriate. More detailed information as to the scope and content of available Data Bases is provided in LRAPP report C79-030, "LRAPP Environmental-Acoustic Data Bank Users Manual (U)," CONFIDENTIAL.

1.2.2 Data Management Software

A distinctive feature of the LRAPP Data Bank is its ability to retrieve and format data with minimal user specified format control. Retrieved data can then be analyzed with the system's supplied analytical modules, again eliminating the user's need to specify data format. The storage and retrieval module, CREATABASE, enables isolation and retrieval of any data subset without programming assistance and also provides the flexibility to expand, modify, and restructure existing data files.

Additional software (CREATE module) is provided to interface user supplied subroutines with subset data files and to enable the user to choose from a variety of output forms (PRINTER-PLOTTER for character matrix display at a terminal or EGO for display outputs via graphical plotter).

An overview of presently available software capabilities is provided in LRAPP report C79-030; "LRAPP Environmental-Acoustic Data Bank Users Manual (U)," CONFIDENTIAL.



REGION	DESIGNATION	REGION	DESIGNATION
A:	Norwegian and Greenland Seas	J:	Northwest Pacific
B:	Northwest Atlantic	K:	Northeast Pacific
C:	Northeast Atlantic	L:	Southwest Pacific
D:	Mediterranean Sea	M:	South Central Pacific
E:	Caribbean Sea/Gulf of Mexico	N:	Southeast Pacific
F:	Southwest Atlantic	O:	Northwest Indian
G:	Southeast Atlantic	P:	Northeast Indian
H:	South China Sea	Q:	South Indian
I:	Philippine Sea		



Regions of currently available LRAPP Data Bases.

FIGURE 1-1

Geographic Limits of LRAPP Data Bank Regions

2.0 DATA BANK ACCESS

2.1 ADMINISTRATIVE PROCEDURES

The LRAPP Data Bank has been established primarily for the use of LRAPP sponsored Regional Assessment, model evaluation, and environmental acoustic investigations. Funding for development and operation of the Data Bank has been provided exclusively by LRAPP in support of its charter missions. As additional data from LRAPP measurement programs and other non-LRAPP sources are added to the Bank, expansion of users beyond LRAPP investigators and contractors is expected.

LRAPP sponsored investigators are supplied, upon request, with required user identification and password. At the time of issuance, an estimated level of usage is established which should not be exceeded without notification to the LRAPP Data Management Coordinator.

Authorization for access to the Data Bank by others may be granted by the Director, LRAPP, upon request, setting forth appropriate organizational sponsorship and need. Occasional usage by related Navy sponsored programs will be on a non-reimbursable basis. Extensive use requiring special data file maintenance or high hardware time charges will be negotiated on an individual basis.

2.2 FACILITIES AND ORGANIZATION

The Data Bank is presently maintained on UNIVAC 1108 hardware at the NSTL Computer Center, Bay St. Louis, Mississippi. Current component Data Files of available Data Bases are listed on the Data Base File inventory which may be displayed at the beginning of system use. This inventory listing will update (if necessary) data listings in the Users Manual. The required procedure to call the inventory and to stage specific tape reels for access is fully explained in the Data Bank Users Manual.

Overall responsibility for user service rests with the LRAPP Data Management Coordinator. A listing of functional responsibilities and responsible personnel is provided in Table 2-1.

2.3 ACCESS MODES

Access to the Data Bank may be made by any of the following modes:

- Written request
- Interactive terminal
- Batch processing.

2.3.1 Written Request

Access to the Data Bank can be achieved through written request to the LRAPP designated User Service representative (see Table 2-1). Users wishing to receive data on tape or media other than computer printouts must presently

TABLE 2-1

LRAPP Data Bank Organizational Chart

Functional Responsibility	Individual/Organization
Data Bank Program Management	LCDR K. E. Evans LRAPP Liaison Office 800 N. Quincy Street Arlington, VA 22217 (703) 696-4951
Data Bank Coordinator	J. H. Locklin Ocean Data Systems, Inc. 6000 Executive Blvd., Suite 615 Rockville, MD 20852 (301) 881-3031
User Service	J. P. Feuillet B-K Dynamics, Inc. 15825 Shady Grove Road Rockville, MD 20850 (301) 948-0650
Data Base Development and Maintenance	L. P. Solomon Planning Systems, Inc. 7900 West Park Drive, Suite 600 McLean, VA 22102 (703) 790-5950
System Software Development and Maintenance	E. W. VerHoef Ocean Data Systems, Inc. 6000 Executive Blvd., Suite 615 Rockville, MD 20852 (301) 881-3031
Hardware Interface at NSTL	NSTL Computer Center Bay St. Louis, MS 39529 (601) 688-4336

submit all requests by this mode. LRAPP will provide required interfaces to obtain the desired output from the NSTL Computer Center.

2.3.2 Interactive Terminal

Interactive access to the Data Bank is available via telephone to the NSTL Computer Center using standard keyboard printer or CRT terminal. Job Control Language (JCL) for the interactive terminal mode is described fully in the Users Manual.

2.3.3 Batch Processing

Batch processing requires communication of all requests to the computer via card images. Batch mode access is only available at the NSTL Computer Center. Access to the Data Bank by means of batch processing is limited and requires prior arrangement between the user and the Computer Center.

3.0 DATA MANAGEMENT SYSTEM CAPABILITIES

The data management software modules of the Data Bank are designed both to efficiently "compress" data for storage and to facilitate isolation, retrieval, and display of data subsets by users with a minimum of specialized system knowledge. Additionally, the capability is provided for users to interface their own special purpose, analytic, or data transform routines to operate on the isolated data subsets.

The system presently consists of four individual software modules. The functional relationships of the four modules (CREATABASE, CREATE, EGO, and PRINTER-PLOTTER) are presented in Figure 3-1.

3.1 DATA ISOLATION AND RETRIEVAL

All communication between the user and the compressed source Data Files is through the CREATABASE module. English language Boolean expressions (queries) using "and," "or," "with," and "from" serve to isolate data. Interactive communications with the user, providing information as to total number of data records isolated by serial Boolean expressions, guides the user to desired data records and provides qualitative information on data concentrations/distributions.

Records may be isolated by specification of limits on any parameter of the record (e.g., latitude, longitude, time, depth, temperature, etc.). Serial expressions specifying limits on two or more parameters may be ordered in any sequence. During the isolation process, individual data records may be retrieved for examinations at any point.

At the completion of the query process, the user can produce a binary subset file from the compressed source data files. The subset file is structured and sorted according to user specification and may be tabularly printed or it may be used as input to display modules or analysis routines.

More detailed information on the capabilities of the CREATABASE module together with functional commands and user instructions are presented in the Users Manual.

3.2 ANALYSIS

Statistical and numerical analyses may be performed on isolated binary subset data files with individual user supplied routines by interfacing these routines through the CREATE module (see Figure 3-1). Routines designed to compute derived data (e.g., sound velocity via Wilson's Equation from temperature, salinity, and depth) or to transform data (e.g., feet to meters) may operate on the data subset. The resultant data parameters may replace or be combined with existing parameters in the binary subset file for display. Specialized user output formats beyond the scope of those provided by the Data Bank are also possible via the CREATE module.

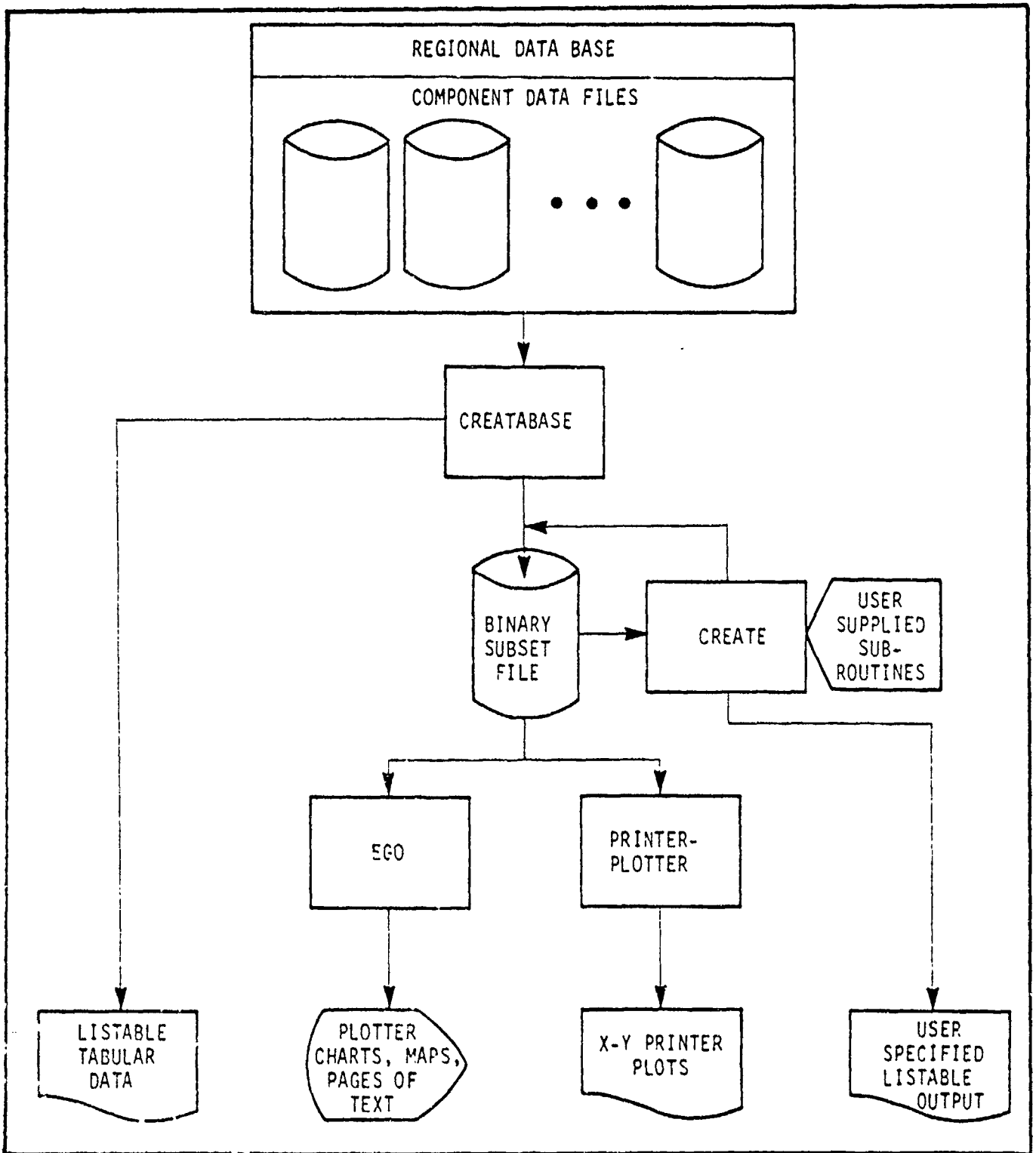


FIGURE 3-1

Functional Organization of Data Bank Modules

3.3 DATA OUTPUT AND DISPLAY

Tabular output of retrieved data subsets are available by direct instruction within the CREATABASE module. More sophisticated graphic output requires the generation of the binary subset file and use of one of the two graphic modules: EGO or PRINTER-PLOTTER.

3.3.1 EGO

The EGO module is a general purpose graphics package designed to generate plot tapes for CalComp compatible plotters. At present, arrangements have not been made to generate plots at the NSTL Computer Center and detailed instructions for generation of plot tapes are beyond the present scope of the Users Manual. Interested users may obtain required information upon request to the LRAPP Data Bank Coordinator (see Table 1-1).

In addition to X-Y functional plots (Figure 3-2), EGO can produce scatter diagrams (Figure 3-3), pages of text (Figure 3-4), and map projections. Map projections currently available include Mercator (Figure 3-5), Lambert Conformal (Figure 3-6), and Polar Stereographic (Figure 3-7). Routines are also available for generation of coastline on standard projections.

3.3.2 PRINTER-PLOTTER

The PRINTER-PLOTTER module is designed primarily for on-line operation. It produces rapid graphical representation of two or more variables directly from the interactive terminal or line printer.

Plots generated by PRINTER-PLOTTER are produced using printer characters as the plotting medium. Plot size, and vertical and horizontal scaling are selected by the user. A detailed explanation of the control language necessary to execute the PRINTER-PLOTTER module is provided in the Users Manual. Figure 3-8 provides an example of the PRINTER-PLOTTER module output.

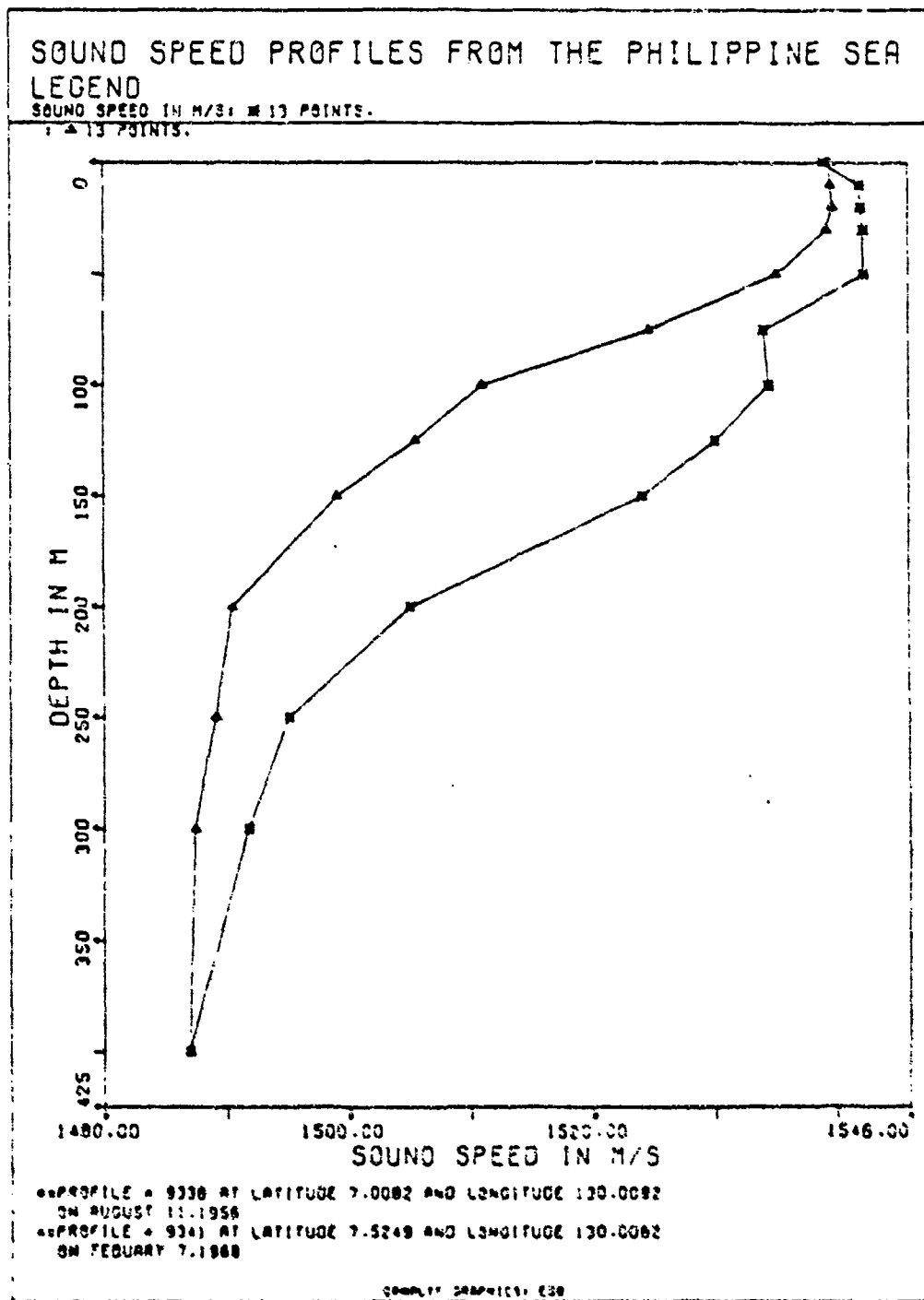


FIGURE 3-2
Example of X-Y Functional Plot

OBSERVATIONS IN THE WESTERN CARIBBEAN SEA (CHURCH GABBRO)

LEGEND

SCALE: 100 KM. AT LATITUDE 21N. STANDARD MERCATOR PROJECTION.

HYDROCASTS: ● 592 POINTS.

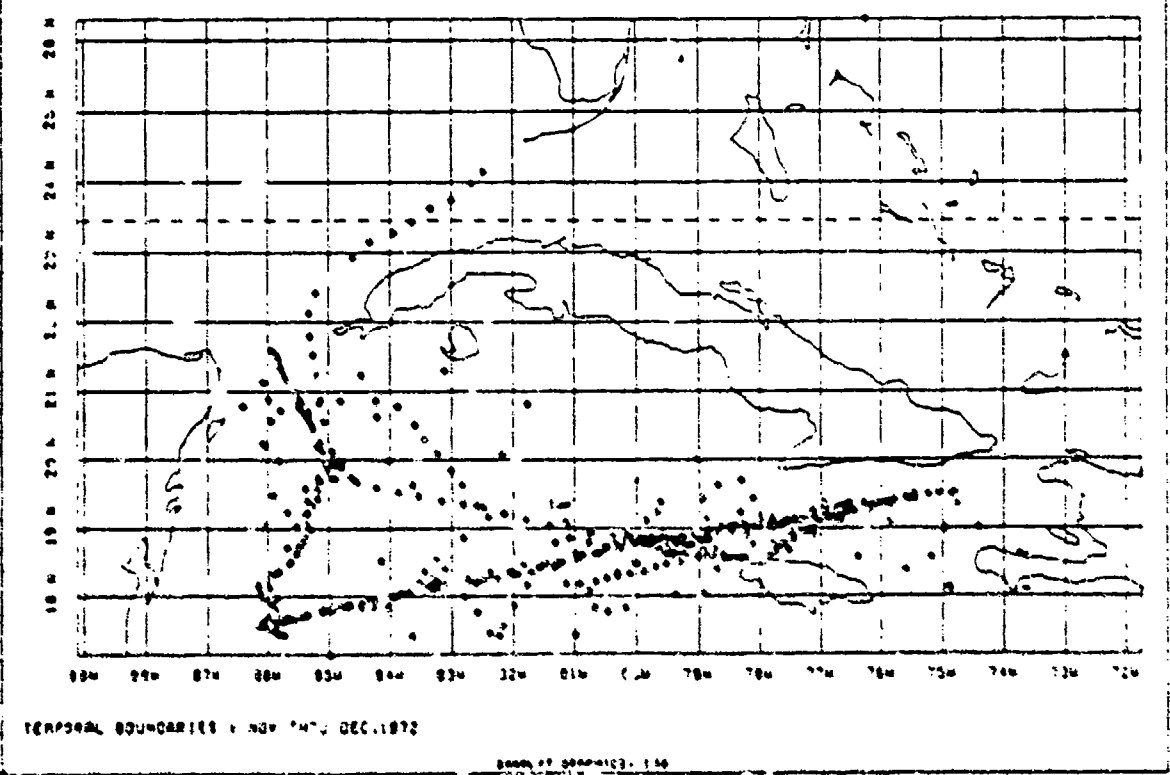


FIGURE 3-3
Example of Scatter Diagram

THIS IS AN EXAMPLE OF A PAGE OF TEXT
AS PROVIDED THRU THE EGO GRAPHICS MODULE.
FOR FURTHER INSTRUCTIONS REFER TO
SECTION II OF THE LRAPP ENVIRONMENTAL-
ACOUSTIC DATA BANK USERS MANUAL.

FIGURE 3-4

Example of Page of Text

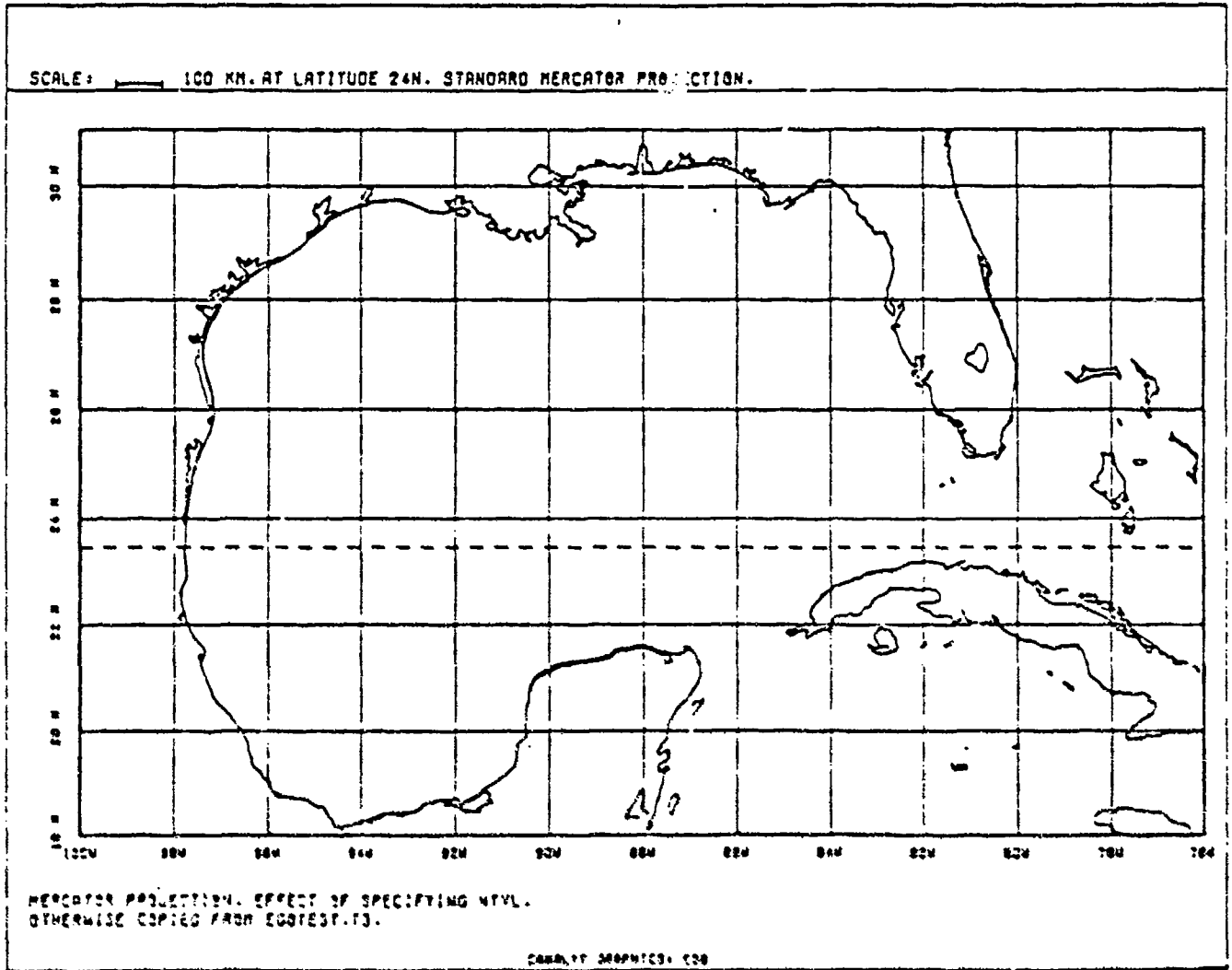


FIGURE 3-5

Example of Standard Mercator Map

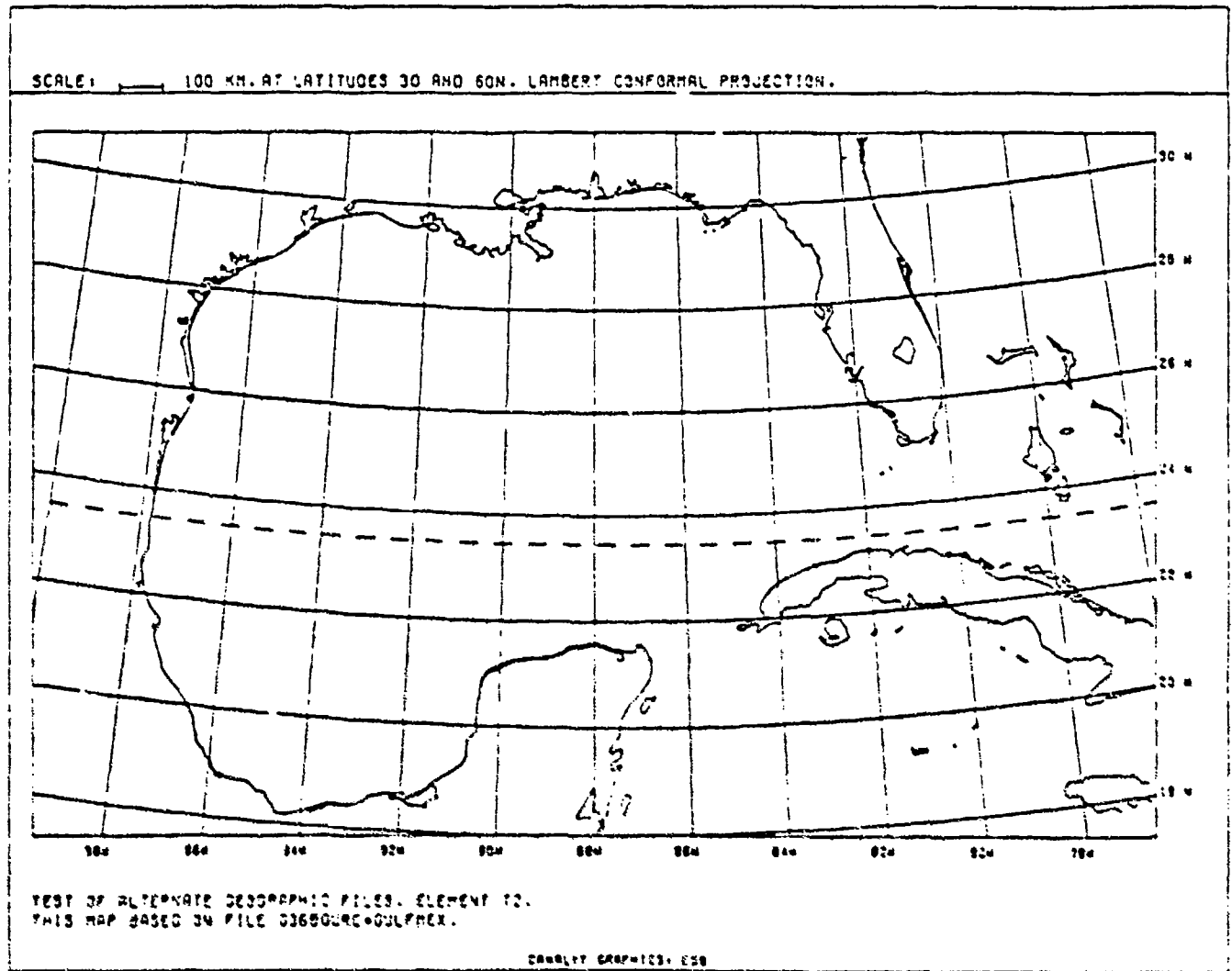


FIGURE 3-6
Example of Lambert Conformal Map

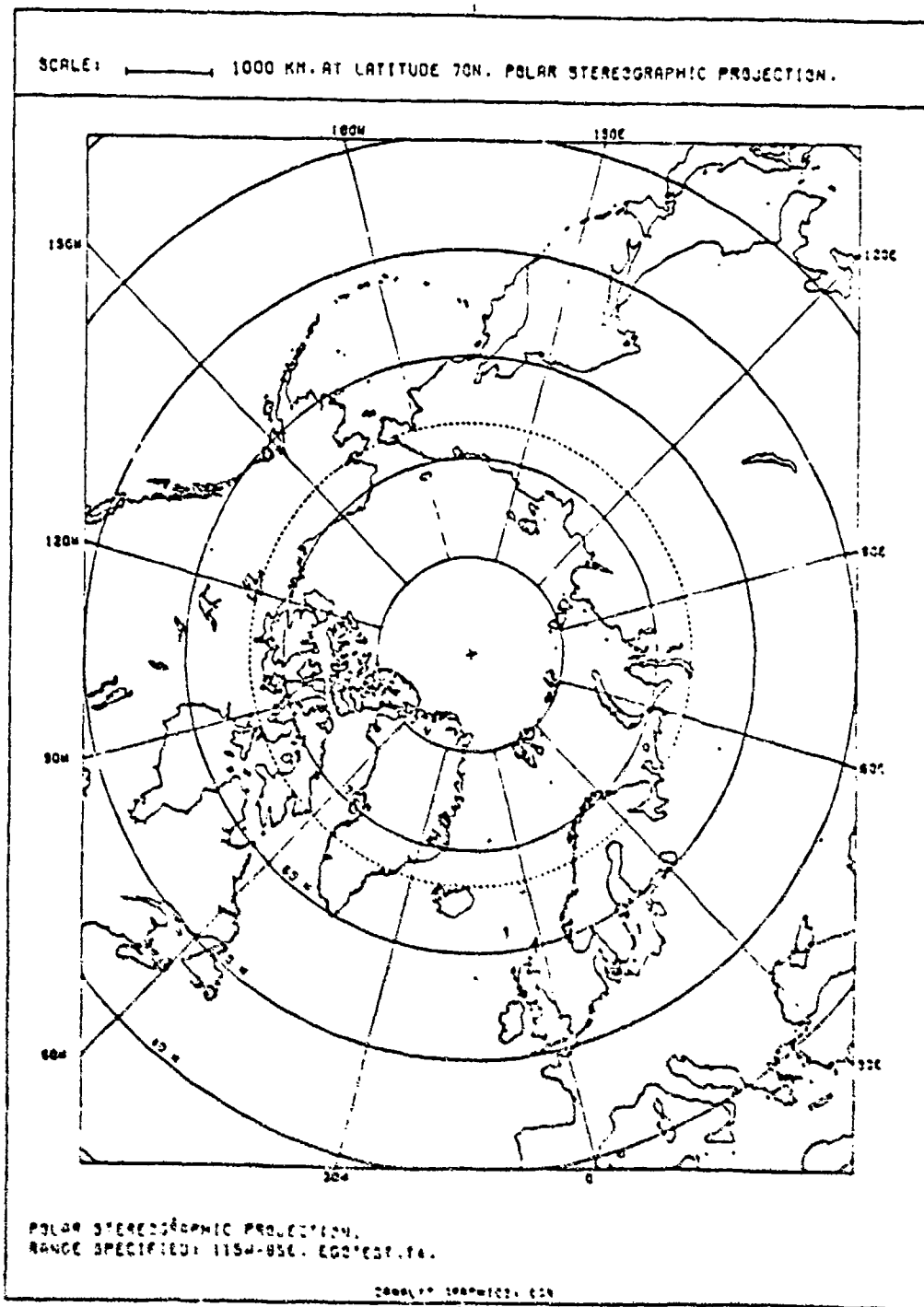


FIGURE 3-7

Example of Polar Stereographic Plot

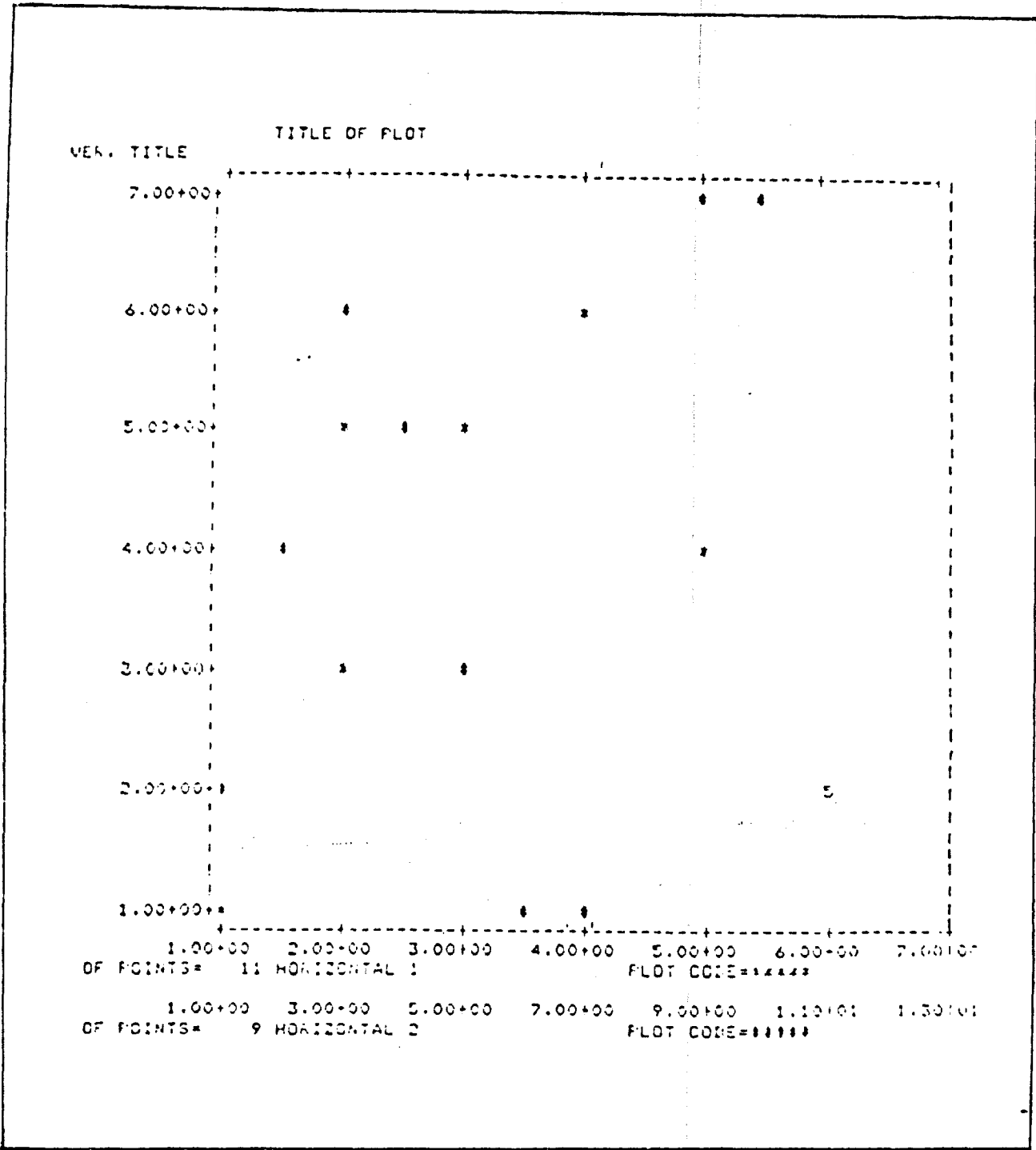


FIGURE 3-8

Example of PRINTER-PLOTTER Plot

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4.0 OVERVIEW OF DATA BASES

Data Bases listed below are currently available for user access.

- Indian Ocean
- Northeast Pacific
- Northwest Pacific
- North Atlantic
- Gulf of Mexico/Caribbean
- World Shipping

Each Data Base may contain a number of component Data Files, each of which is generally restricted to a particular type of data or to data from a particular source.

The following listings (Tables 4-1 through 4-6) describe the Data Bases and their component Data Files. A detailed listing of each Data File is provided in the Users Manual. These formatted listings are intended to provide a quick reference to the data presently stored in the LRAPP Data Bank.

TABLE 4-1

Indian Ocean Data Base

- I. DATA BASE: Indian Ocean
- II. DATA SOURCE: AESD, NOSC
- II. GEOGRAPHIC COVERAGE: Indian Ocean
- IV. TEMPORAL COVERAGE: 1900 to 1975
- V. DATA TYPE: Environmental
- VI. COMPONENT DATA BASE FILES:
 - A. Indian Ocean-Historical Hydrocast Data
 - B. Indian Ocean-Seasonal Wave Heights
 - C. Indian Ocean-Province Seasonal Sound Speed Data
- VII. DOCUMENTATION:

Spofford, C. W., Cavanaugh, R. C., and Hanna, J. S., "Indian Ocean Assessment" (U), Maury Center for Ocean Science (No Report Number), May 1975, SECRET.

TABLE 4-2

Northeast Pacific Data Base

- I. DATA BASE: Northeast Pacific
- II. DATA SOURCE: NOSC, NOO, NORDA, TI, UT-ARL, UM, NUC, PSI, DREP
- III. GEOGRAPHIC COVERAGE: 15°N-61°N, 105°W-179°W
- IV. TEMPORAL COVERAGE: 1927-1975
- V. DATA TYPE: Acoustic
Environmental
- VI. COMPONENT DATA FILES:
 - A. Northeast Pacific-Church Anchor-Ambient Noise Data-1 of 4
 - B. Northeast Pacific-Church Anchor-Ambient Noise Data-2 of 4
 - C. Northeast Pacific-Church Anchor-Ambient Noise Data-3 of 4
 - D. Northeast Pacific-Church Anchor-Ambient Noise Data-4 of 4
 - E. Northeast Pacific-Church Anchor-Baseline Sound Speed Profiles
 - F. Northeast Pacific-Church Anchor-Shipping Density Data
 - G. Northeast Pacific-Church Anchor-10 Sec. Ambient Noise Data
 - H. Northeast Pacific-Church Anchor-10 Min. Ambient Noise Data
 - I. Northeast Pacific-Church Anchor-Current Profiles
 - J. Northeast Pacific-Church Anchor-CW Data
 - K. Northeast Pacific-Church Anchor-SUS Data
 - L. Northeast Pacific-Church Anchor-OMNI Noise Level Data
 - M. Northeast Pacific-Church Anchor-Beam Noise Level Data
 - N. Northeast Pacific-Church Anchor-CW Propagation Loss
 - C. Northeast Pacific-Church Anchor-SUS Propagation Loss
 - P. Northeast Pacific-Church Anchor-Physical Obs. and Analyses for
9/15 and 10/1
 - O. Northeast Pacific-Church Anchor/Opal-Hydrocast Data
 - R. Northeast Pacific-Historical Hydrocast Data

VII. DOCUMENTATION:

Anderson, V. C., "Vertical Directionality of Noise and Signal Transmission During Operation CHURCH ANCHOR," Marine Physical Laboratory, Scripps Institute of Oceanography, University of California, San Diego, SIO Reference 75-1, 15 November 1974, UNCLASSIFIED.

Hecht, R. J., "Estimated Accuracy for Acoustic Data from R/V FLIP-CHURCH ANCHOR," Underwater Systems, Inc. (Draft Copy), (No Report Number), 8 March 1974, UNCLASSIFIED.

Hoffman, J. and Kirst, A., "CHURCH ANCHOR Ambient Noise Final Report" (U), Texas Instruments, Inc., TI Report No. CI-87196-F, September 1975, CONFIDENTIAL.

Maury Center for Ocean Science, "CHURCH ANCHOR Synopsis Report" (U), MC Report 0012, December 1973, SECRET.

TABLE 4-2 (continued)

Maury Center for Ocean Science, "CHURCH ANCHOR Environmental Acoustics Summary" (U), MC Report 108, September 1974, SECRET.

Daniel Analytical Services Corporation, "An Objective Analysis of CHURCH ANCHOR," Final Draft Report, (No Report Number), November 1975, UNCLASSIFIED.

VIII. REMARKS:

TABLE 4-3

Northwest Pacific Data Base

- I. DATA BASE: Northwest Pacific
- II. DATA SOURCE: NOSC
- III. GEOGRAPHIC COVERAGE: 0°N-30°N, 120°E-150°E
- IV. TEMPORAL COVERAGE: 1907-1972
- V. DATA TYPE: Environmental
- VI. COMPONENT DATA FILES: A. Northwestern Pacific-Philippine Sea Historical Hydrocast Data
- VII. DOCUMENTATION:

- VIII. REMARKS:

TABLE 4-4

North Atlantic Data Base

- I. DATA BASE: North Atlantic
- II. DATA SOURCE: NOO, UT-ARL, NRL
- III. GEOGRAPHIC COVERAGE: 46°N-65°N, 0°W-36°W
- IV. TEMPORAL COVERAGE: 1973
- V. DATA TYPE: Environmental
Acoustic
- VI. COMPONENT DATA FILES:
 - A. North Atlantic-Square Deal-Hydrocast Data
 - B. North Atlantic-Square Deal-SUS Data/3 Hydrophones
 - C. North Atlantic-Square Deal-SUS Data/1 Hydrophone
 - D. North Atlantic-Square Deal-CW Data
- VII. DOCUMENTATION:

Maury Center for Ocean Science, "SQUARE DEAL Environmental Acoustic Summary" (U), MC Report 111, October 1975, SECRET.
- VIII. REMARKS:

TABLE 4-5

Gulf Of Mexico/Caribbean Data Base

- I. DATA BASE: Gulf of Mexico/Caribbean
- II. DATA SOURCE: NOSC, NOO
- III. GEOGRAPHIC COVERAGE: 10°N-30°N, 60°W-98°W
- IV. TEMPORAL COVERAGE: 1913-1974
- V. DATA TYPE: Environmental
Acoustic
- VI. COMPONENT DATA FILES:
 - A. Gulf of Mexico/Caribbean-Observed Hydrocast Data
 - B. Gulf of Mexico/Caribbean-Standard Depth Hydrocast Data
 - C. Gulf of Mexico/Caribbean-Church Gabbro-Hydrocast Data
in W. Caribbean
 - D. Gulf of Mexico/Caribbean-Church Gabbro-Current Profiles
in W. Caribbean
- VII. DOCUMENTATION:

Fenner, D. F. and Burca, P. J., "CHURCH GABBRO Sound Velocity Analysis and Environmental Data Summary," Naval Oceanographic Office, NAVOCEANO Technical Note No. 7005-3-73, May 1973, UNCLASSIFIED.

Naval Oceanographic Office, "Environmental Acoustic Atlas of the Caribbean Sea and Gulf of Mexico, Volume II, The Marine Environment," NAVOCEANO SP-189-11, August 1972, UNCLASSIFIED.
- VIII. REMARKS:

TABLE 4-6

World Shipping Data Base

- I. DATA BASE: World Shipping Distribution
- II. DATA SOURCE: Planning Systems, Inc. (Louis Solomon)
- III. GEOGRAPHIC COVERAGE: World
- IV. TEMPORAL COVERAGE: N/A
- V. DATA TYPE: Environmental
- VI. DOCUMENTATION:

Ross, D., Mahler, J., and Solomon, L. P., "Navy Interim Shipping Distribution," Planning Systems, Inc. (No Report Number), December 1974, UNCLASSIFIED.

Shooter, J. A. and Peterman, K. R., "Merchant Ship Signatures" (U), Applied Research Laboratories, The University of Texas, ARL-TR-77-47, 18 August 1977, CONFIDENTIAL.

Solomon, L. P., Barnes, A. E., and Lunsford, C. R., "Ocean Route Envelopes (ORE)," Planning Systems, Inc., Report No. TR-036049, 19 April 1977, UNCLASSIFIED.

Solomon, L. P., Barnes, A. E., Alessi, T., and Draper, P. G., "Historical Temporal Shipping (HITS)," Planning Systems, Inc. (No Report Number), 28 June 1978, UNCLASSIFIED.

VII. COMPONENT DATA FILES:

- A. World Shipping Distribution-TAU1/Merchant Vessels -- Monthly Averages
- B. World Shipping Distribution-TAU2/Tankers -- Monthly Averages
- C. World Shipping Distribution-TAU3/Large Tankers -- Monthly Averages
- D. World Shipping Distribution-Seasonal Averages
- E. World Shipping Distribution-Annual Averages

VIII. REMARKS:

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ARLTR7924	Mitchell, S. K., et al.	VOLUME IVB. DATA POINTS 10, 11 AND 12 RAW DATA ANALYSIS OF ACOUSTIC BOTTOM INTERACTION IN BEARING STAKE (U)	University of Texas, Applied Research Laboratories	790223	ADE001369; NS; ND	U
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