

N O T I C E

THIS DOCUMENT HAS BEEN REPRODUCED FROM
MICROFICHE. ALTHOUGH IT IS RECOGNIZED THAT
CERTAIN PORTIONS ARE ILLEGIBLE, IT IS BEING RELEASED
IN THE INTEREST OF MAKING AVAILABLE AS MUCH
INFORMATION AS POSSIBLE



Technical Memorandum 83886

The Development of Selected Data Base Applications for the Crustal Dynamics Data Information System

(NASA-TM-83886) THE DEVELOPMENT OF SELECTED
DATA BASE APPLICATIONS FOR THE CRUSTAL
DYNAMICS DATA INFORMATION SYSTEM (NASA)
63 p HC A04/MF A01

N82-24758

CSSL 08G

Unclas
G3/46 21223

C. E. Noll

DECEMBER 16, 1981

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771



TM 83886

THE DEVELOPMENT OF SELECTED
DATA BASE APPLICATIONS FOR THE
CRUSTAL DYNAMICS DATA INFORMATION SYSTEM

Carey E. Noll

December 1981

GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland 20771

PRECEDING PAGE BLANK NOT FILMED

ABSTRACT

This document describes the development of a data base and its accompanying software for the Data Information System (DIS) of the National Aeronautics and Space Administration's (NASA) Crustal Dynamics Project. Background information concerning this project, and a definition of the techniques used in the implementation of an operational data base, are presented. Examples of key applications are included and interpreted.

CONTENTS

	<u>Page</u>
1. INTRODUCTION	1
2. BACKGROUND	1
2.1 PROJECT OVERVIEW	1
2.2 SCIENTIFIC OBJECTIVES	1
2.3 SCIENTIFIC TECHNIQUES	3
2.4 CRUSTAL DYNAMICS DATA INFORMATION SYSTEM	6
2.4.1 General	6
2.4.2 Contents	7
2.4.3 User Interface	7
2.4.4 Methods of Implementation	8
3. RESEARCH AND DEVELOPMENT	8
3.1 GENERAL	8
3.2 ORACLE DBMS	9
3.2.1 Query Language	9
3.2.2 Operations	11
3.2.3 Utilities	11
4. IMPLEMENTATION	13
4.1 DBMS APPLICATIONS	13
4.1.1 General	13
4.1.2 Data Catalogues	13
4.1.3 Project Evaluation Information	22
4.2 SOFTWARE PACKAGE APPLICATIONS	32
4.2.1 Analyzed Data Display	32
4.2.2 Crustal Dynamic Project Newsletter	47
5. SUMMARY	52
REFERENCES	R-1

ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
1	Plate Boundaries of the Earth	2
2	Satellite Laser Ranging Process	4
3	Very Long Baseline Interferometry Process	5
4	Examples of SQL Queries	10
5	Example of the Joining of Two Tables	12
6	Format of the Table Containing the Lageos Data Catalogue	14
7	Query to the Lageos Data Catalogue	15
8	Format of the Order File Table for the Lageos Data Catalogue . .	16
9	Insertion Procedure for the Lageos Order File	17
10	Browsing and Selection Procedure for Data in the Lageos Data Catalogue Through the DATALOOK Process	18
11	Format of the Table Containing the Summary Information for the Lageos Data Catalogue	19
12	Query to the Lageos Summary Table	20
13	Insertion Procedure for Lageos Summary Table	21
14	Queries to Coordinates and Calibration Information Tables . . .	23
15	Query Display of the Possible Baselines Between Two Plates . . .	24
16	Procedure to Update the Lageos Summary Information Table	26
17	Query Using the Point Number Indicator in the Lageos Summary Table	27
18	Report Formatting the Baseline Display Between Two Plates . . .	28
19	Calendar Report of the Monthly Lageos Data Using the 'XX' Format	29
20	Calendar Report of the Monthly Lageos Data Using the Number- of-Points Format	29
21	Calendar Report of the Monthly Lageos Data Using the Minimum- Number-of-Points Format.	30

ILLUSTRATIONS (Continued)

<u>Figure</u>	<u>Page</u>
22	Format of the Table Containing the Crustal Dynamics Library Index 31
23	Query to the Crustal Dynamics Library Index 32
24	Screen Forms for the Crustal Dynamics Library Index 33
25	Format of the Table Containing the Crustal Dynamics Action Item Index 34
26	Query to the Crustal Dynamics Action Item Index 35
27	Screen Forms for the Crustal Dynamics Action Item Index 36
28	Portion of a Report Listing all Active Action Items 37
29	Example of the Report to Personnel Responsible for the Completion of an Action Item 38
30	Sign-on and Selection Process for Viewing of the Analyzed Data 40
31	Example of Browsing Procedure for an Analyzed Data File 41
32	Selection Process for Polar Motion Data From an Analyzed Data File 43
33	Selection Process for Baseline Data From an Analyzed Data File 45
34	Creation and Display of Masking Process for Analyzed Data Viewing 48
35	Portion of the Polar Motion Data Table Before and After the Masking Process 50
36	Selection Process for the Crustal Dynamics News Exchange 51
37	Entry Process for the Crustal Dynamics News Exchange 53

ACRONYMS

DBMS Data Base Management System
DIS Data Information System

GSFC Goddard Space Flight Center

HLI Host Language Interface

IAF Interactive Applications Facility
IAG Interactive Application Facility
IAP Interactive Applications Generator

JPL Jet Propulsion Laboratory

LSG Laser Support Group

MC minimum code
MOBLAS mobile laser systems

NASA National Aeronautics and Space Administration
NGS National Geodetic Survey

RSI Relational Software, Inc.

SAO Smithsonian Astrophysical Observatory
SQL structured query language

TLRS transportable laser ranging systems

VLBI very long baseline interferometry

PRECEDING PAGE BLANK NOT FILMED

1. INTRODUCTION

This Technical Memorandum represents an outline of the development of a data base and its accompanying software for the Data Information System (DIS) of the National Aeronautics and Space Administration's (NASA) Crustal Dynamics Project. Background information concerning this project, as well as a definition of the techniques used in the implementation of an operational data base, is also presented. Examples of key applications are included and interpreted.

2. BACKGROUND

2.1 PROJECT OVERVIEW

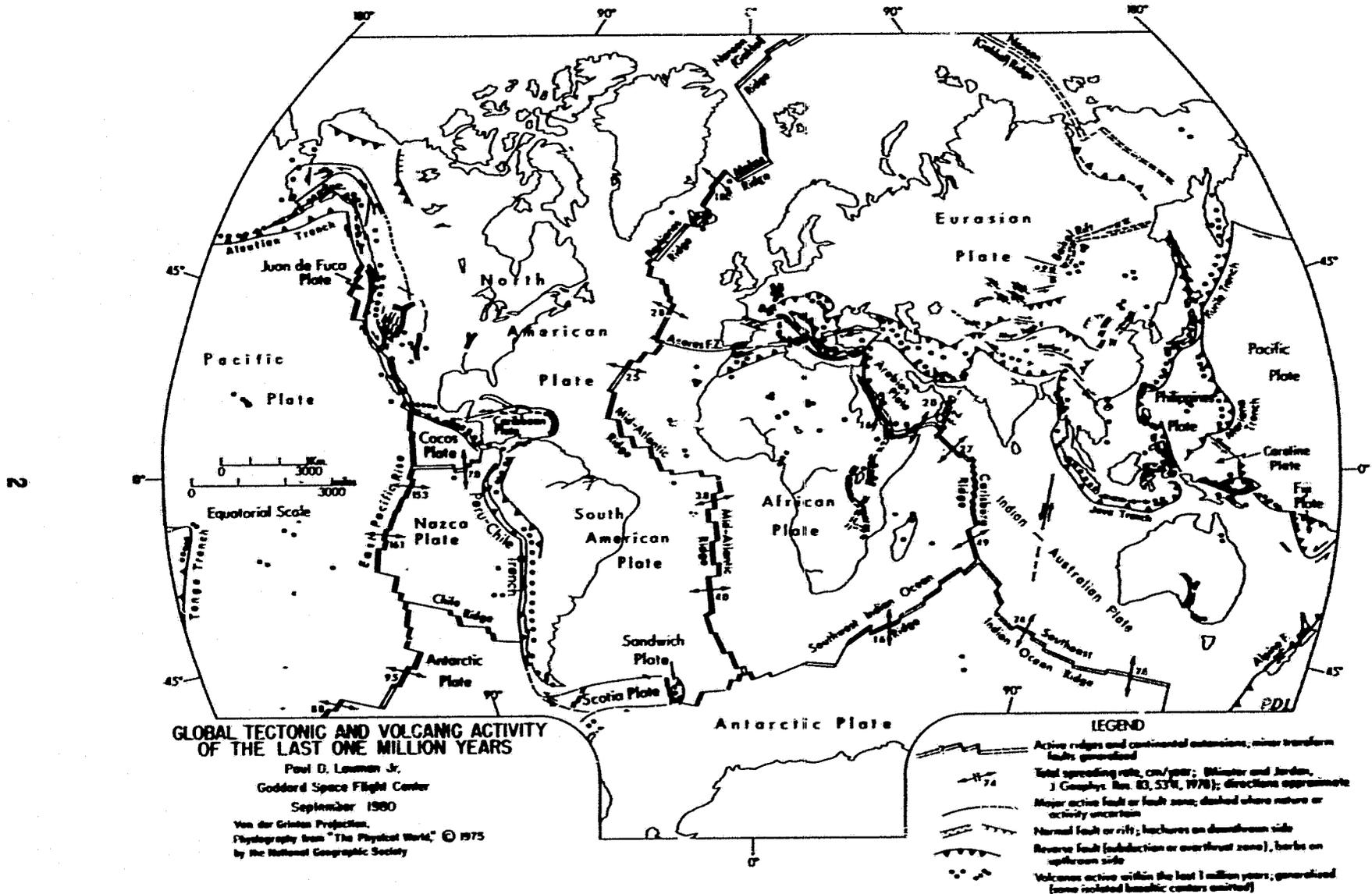
The Crustal Dynamics Project was formed by NASA in 1976 to study Earth dynamics. This function is accomplished by employing space technology to determine the motion of the Earth's outer crust and the variations in the rotation rate and position of its polar axis. By studying these phenomena, the project hopes to aid in research involving earthquake prediction and hazard reduction. The project supports this investigation program in global geodynamics on a national and international level of research. The Crustal Dynamics Project is responsible for collecting and organizing the space measurements used in this research, analyzing these data, and aiding in the interpretations of these analyses in reference to crustal movement.

2.2 SCIENTIFIC OBJECTIVES

The Earth's outer crust is composed of 12 large "tectonic" plates. These plates move relative to one another (on a several centimeter per year basis) and, as a result, earthquakes occur near the plate boundaries--the area of movement. The Crustal Dynamics Project hopes to aid in the determination of the forces that propel these plates and how the plates deform as a result of this motion. Figure 1 illustrates the plate boundaries of the Earth's crust.

The five main scientific objectives of the Crustal Dynamics Project are to improve the understanding of the following phenomena:

- a. Regional deformation and strain accumulation related to earthquakes at the plate boundary in the western United States.
- b. Contemporary relative plate tectonic motions of the North American, Pacific, Nazca, South American, Eurasian, and Australian plates.
- c. Internal deformation of the continental and oceanic lithospheric plates with particular emphasis on North America and the Pacific.
- d. Rotational dynamics of the Earth and its possible correlation to earthquakes, plate motions, and other geophysical phenomena.
- e. Motions and deformation occurring in regions of high earthquake activity.



ORIGINAL PAGE IS
 OF POOR QUALITY

Figure 1. Plate Boundaries of the Earth

By using the more precise measurements gained from the use of space technology, the necessary information concerning plate motion is expected to be obtained.

2.3 SCIENTIFIC TECHNIQUES

A major tool in the study of plate motion is the determination of a distance measurement, or "baseline," between a point located on one plate to another point on a different plate. The project plans to implement a network of 50 to 60 such locations (at least three sites located on each plate) for these baseline determinations. There are two major space technologies employed by the project for baseline calculation: laser ranging techniques, and very long baseline interferometry (VLBI).

Laser ranging requires a high altitude satellite (either an artificial satellite, such as the spherical, reflector-covered, 60 centimeters in diameter Lageos satellite, or the Moon, equipped with reflectors placed by American and Russian lunar missions) to reflect a laser beam off of in a manner similar to radar. A laser pulse is fired to the satellite from a stationary laser site and the time delay of the reflected beam back to the station is measured. Thus, the distance from station to satellite is determined. Figure 2 presents a pictorial view of the process. When several stations perform a series of these measurements over a period of 3 to 4 weeks, the precision orbit of the satellite can be calculated. Through a complex sequence of mathematical calculations, the three-dimensional Earth coordinates of the participating laser stations are determined relative to the calculated orbit of the satellite. As a result, the baseline length between any two of these stations can be calculated to a precision of better than 5 centimeters. Thus this method of distance determination is much more accurate than a ground-based, survey-type measurement.

Currently, the Crustal Dynamics Project makes use of six fixed laser stations, eight mobile laser systems (MOBLAS units), and two highly transportable laser ranging systems (TLRS units). The TLRS systems usually relocate on a monthly basis. The 10 non-fixed MOBLAS systems can be at many different stations in the United States, South America, Australia, Carribean, and the Pacific.

The second procedure employed by the project is the VLBI technique. Figure 3 shows this process. This method involves two separate radio antennas that simultaneously receive radio emissions from a distant quasar. Since the two antennas are focused on the same source, the signals received at each station are identical in "signature." This type of measurements session is performed over a 2- to 4-day time period. The recorded signals are processed through a correlator and the amount of delay necessary to bring the two signals into "time phase" is determined. The delay is dependent upon the quasar position relative to the two antennas (since the Earth is rotating as the signals are recorded). Thus, the delay is dependent upon the Vector S (which is constant in an inertial coordinate system for the particular radio source) and the Vector B (which is variant because of the motion of the sites, the Earth's rotation, and other processes). Since the ultimate result is to determine the baseline (B) vector, it can be solved for after the time delay is calculated.

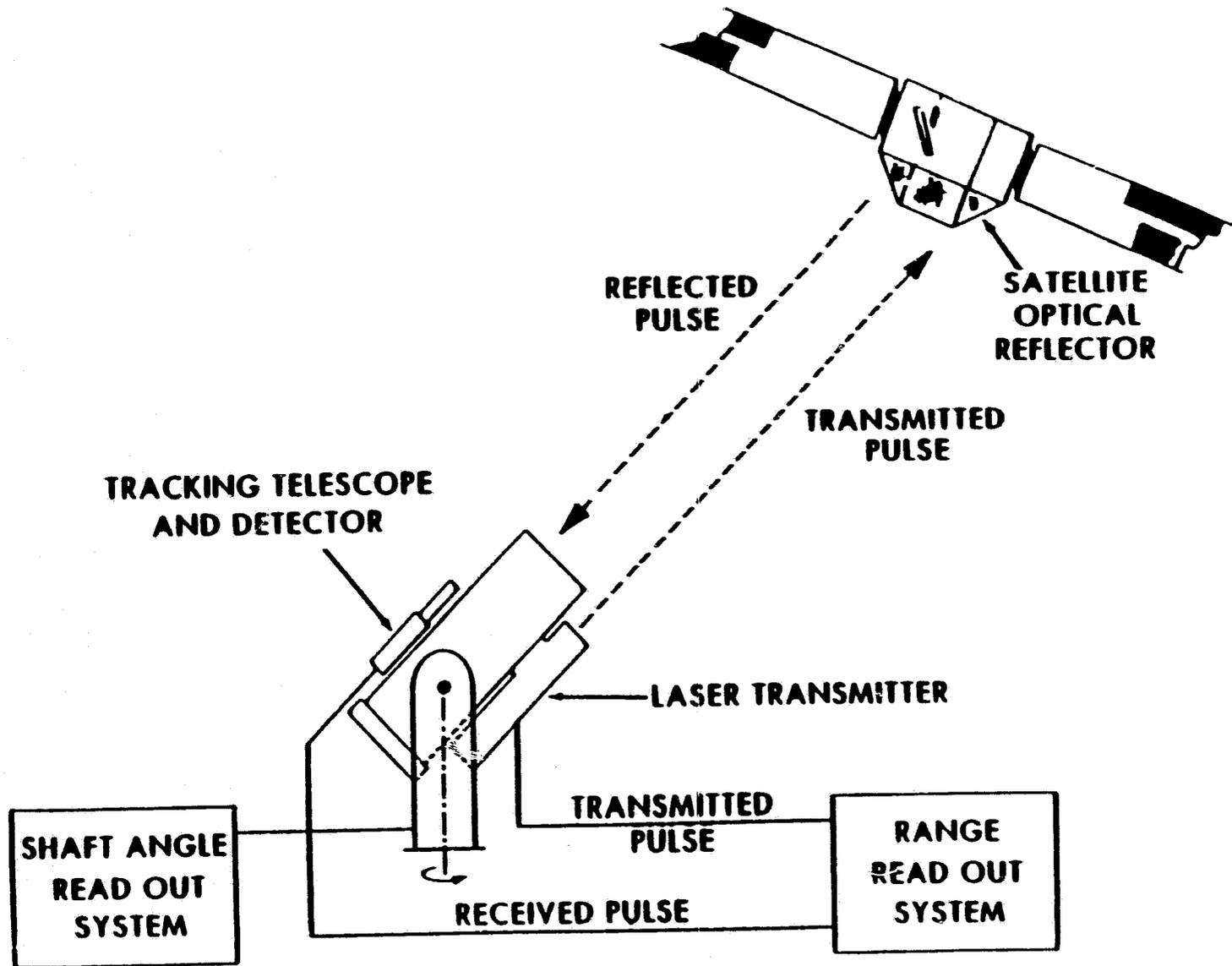
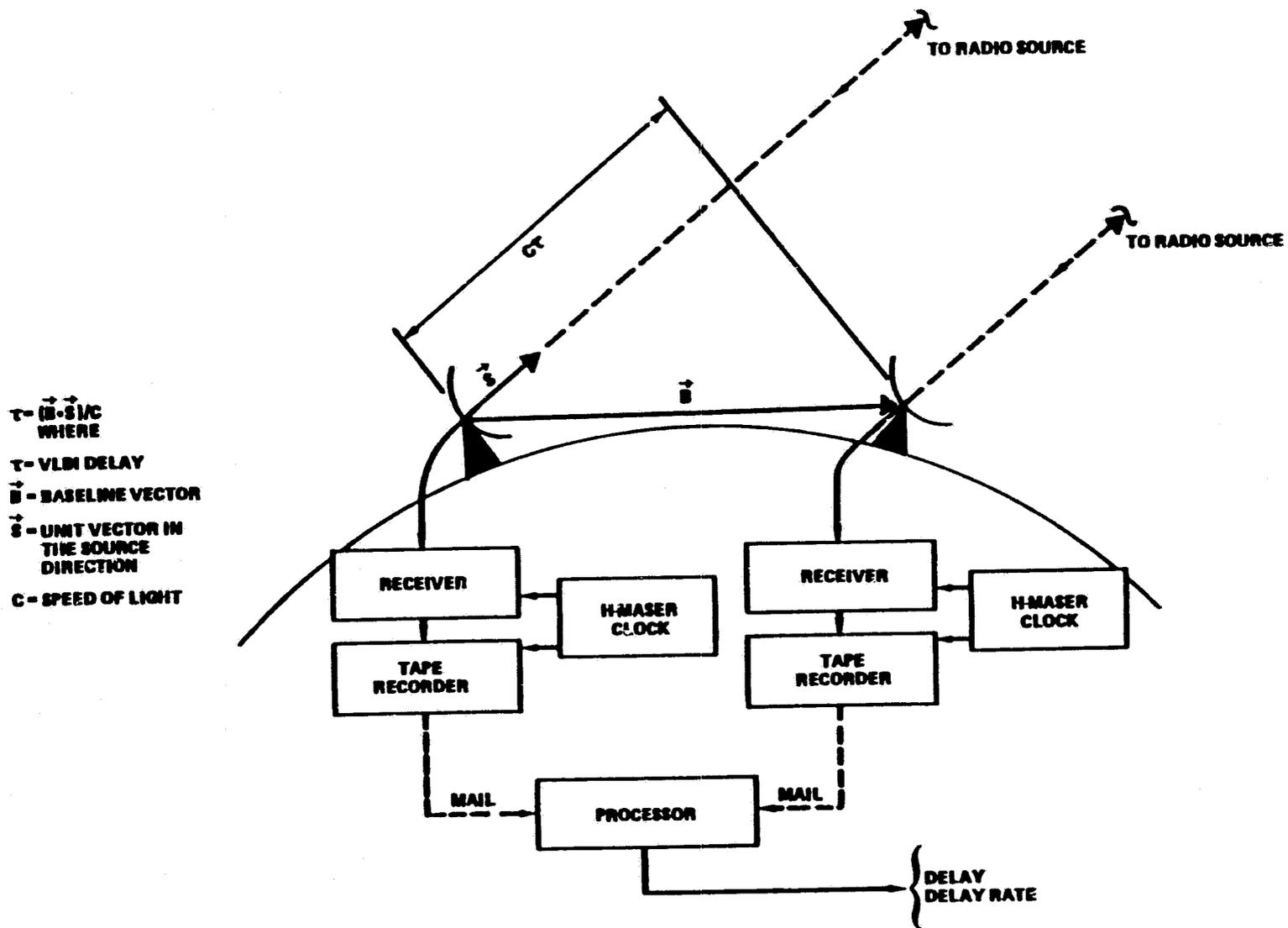


Figure 2. Satellite Laser Ranging Process

ORIGINAL PAGE IS
OF POOR QUALITY



ORIGINAL PAGE 19
 OF POOR QUALITY

Figure 3. Very Long Baseline Interferometry Process

The project employs the end-to-end VLBI Mark-III system, which includes the electronics for acquiring and recording the data, the cross-correlator system and a data base handler.

Currently, the project uses several (nine) fixed VLBI Mark-III stations (with twelve available by 1984) as well as one transportable system (with two more available by 1982) that connects to a fixed antenna, and one mobile VLBI system developed by JPL (with two more available by 1982), equipped with the antenna and that can be located on any one of seven different sites.

Although the laser ranging technique does not require the simultaneous measurements for the determination of a baseline that the VLBI process does, it is affected by other phenomena. Weather conditions (e.g., cloud cover) prevent useful operation of the laser equipment. Another restriction on laser ranging is the visibility of the individual satellites. Lageos, for example, is accessible for less than an hour during each satellite pass with approximately two visible passes per day. Also, in order to calculate a proper model for the orbit of the satellite, several parameters (which often must be updated), such as the Earth's gravitational constant, are required. Conversely, VLBI measurements are affected by water vapor present in the atmosphere that does not deter laser operation.

The common element between the laser ranging and the VLBI techniques is the ability to make a more precise three-dimensional determination of the rate of change in position between two locations separated by several hundred or several thousand kilometers. In addition to the baseline measurements that result from the use of these space techniques, estimates on the changes in the rate of rotation of the Earth as well as the location of the pole of rotation can be determined. The fluctuations in the motion of the Earth's pole of rotation are due to mass shifts resulting from earthquakes, tides, and other phenomena.

2.4 CRUSTAL DYNAMICS DATA INFORMATION SYSTEM

2.4.1 General

Because of the large amount of data that has been and will be acquired by the Crustal Dynamics Project, there is a need for a centralized data bank. Presently, data are widely distributed between project personnel at Goddard, National Geodetic Survey (NGS), Jet Propulsion Laboratory (JPL), Smithsonian Astrophysical Observatory (SAO) and elsewhere. Since investigators located worldwide have been selected to participate in the project, the data acquired, as well as their analyses, must be readily available. Therefore, the DIS for the Crustal Dynamics Project has been formed with the intent of not only providing data in a useful form to project personnel and investigators, but also to act as an archive of these data for the lifetime of the project. Hence, after project termination, the DIS archive will be preserved and available for any follow-on projects, such as the envisioned National Geodetic Data Bank. The DIS will consist of a dedicated minicomputer system equipped with dial-up facilities and an on-line data base management system. The DIS will be located at the Goddard Space Flight Center (GSFC) and will be operational in September 1982.

2.4.2 Contents

The DIS will serve project personnel and investigators by providing the following items:

- a. Catalogue of all acquired and available data
- b. Ancillary data (site surveys, station coordinates, etc.)
- c. Text data (user comments concerning data, etc.)
- d. Archive of processed laser and VLBI data
- e. Archive of analyzed laser and VLBI data
- f. Newsletter and message exchanges
- g. Laser and VLBI data requests
- h. Project management data (scheduling of sites, etc.)
- i. Graphics data
- j. Intercomparisons of analyzed laser and VLBI data

Many of the foregoing items will be provided through a data base management system, while others will be displayed via specially designed computer software packages. The large archive of processed laser and VLBI data will be kept off-line on magnetic tape. Much of the VLBI data will continue to be provided through the already developed Mark-III VLBI data base handler that will be run on the DIS minicomputer.

2.4.3 User Interface

When a potential investigator wishes to examine or obtain information concerning project acquired data, he may gain access to the DIS through an alphanumeric terminal equipped with a modem and a dial-up telephone line. Following a successful sign-on procedure, the general description of the DIS is displayed and the user is prompted to make a selection of one of the 10 previously mentioned items for viewing the interrogation. His selection will determine the need for accessing the data base management system, a particular software package, or both. After proceeding through a series of these user-oriented menus, the investigator can obtain the desired information in an efficient and timely manner. If the particular data item cannot be displayed via the alphanumeric terminal (due to volume or nature of the data), or the user wishes a copy of his display, a data tape will be prepared and delivered from the user's order, which was placed in a particular file. This order will be annotated with ancillary data where appropriate, and a record of the order will be retained for inventory and update purposes.

2.4.4 Methods of Implementation

As stated previously, two major methods will be employed to perform the functions required by the DIS. The first method is a commercially available data base management system (DBMS). The major advantage of employing a commercial DBMS package is its flexibility, because such a system eliminates the need to continually develop software packages for display of data to the user community. For example, in order to allow the user to view the catalogue of available data for the Lageos satellite during a certain month and year, a program would have to be developed that would accept input parameters from the user and display the appropriate rows and columns. This is also true when the site coordinate information for a particular station is needed. However, by carefully and efficiently loading data into a data base management system, no programming effort is necessary to display data from the catalogue or for obtaining station coordinate information. Through the use of a series of commands, known as a query, any user has direct access to the data itself and does not need to be concerned about the computer program that handles the information for him. The user can include in the query input parameters that will specify how many rows are to be listed, and what columns are outputted. In other words, his display of data is not limited to the computer programmer's concept of the strict format for the output. The scientific user no longer has to rely on a team of computer programmers; he can get the information he requires not only in a desirable format, but also in a timely manner.

Although most of the data in the DIS can be obtained through the use of a data base management system, many current DBMS packages cannot handle the display of the text data as required by the project. Therefore, additional software packages have been developed to fulfill this need in the areas of analyzed data outputs and news exchanges among investigators. The archive of analyzed data can be viewed on a monthly or yearly basis through a user-interactive selection process. The news exchange and newsletter is displayed in a similar manner and news for eventual compilation can be contributed from the investigator via this software package.

3. RESEARCH AND DEVELOPMENT

3.1 GENERAL

When the need for a data base management system was presented, ORACLE, a product of Relational Software Inc., (RSI), was chosen from several candidate systems as a final testing model and has since proven to completely fulfill the requirements. The relational model transforms a normally complex data network (or "tree" structure found in the hierarchical and network DBMS's) into a relatively simple, easy-to-use, two-dimensional relation, or in more basic terms, a table. These tables consist of a series of columns. A row of the table is unique and is composed of the entries in the columns (not necessarily all). Thus, the relational system employs the data itself to establish relationships among data items rather than series of chain pointers as found in hierarchical and network systems. Due to the tabular nature of much of the different data sets in the DIS (i.e., data catalogues, ancillary data, order files, etc.), the relational system proved to be the most feasible method of managing these types of data.

In addition to the tabular structure, the relational model also offers increased flexibility in expanding individual tables as well as the data base itself without the need for the reloading of a particular table or the entire data base. With a network or hierarchical system, these additions are difficult to make due to the complex nature of the links in the data structure. In other words, additional columns can be appended to existing tables as needed, new tables may be created, and old tables in a relational DBMS may be deleted without the need to recreate or reconfigure the entire data base.

The typical relational data base management system also possesses an online, integrated data dictionary. On the user level, this feature can be thought of as a table of contents to the data base itself. The tables comprising the data dictionary are part of the relational system and are automatically updated as new relations are created or deleted and as old ones are modified by the users. In other words, all data managed by the DBMS must possess a definition in the data dictionary that can be ascertained by any valid user of the data base.

3.2 ORACLE DBMS

3.2.1 Query Language

ORACLE employs the English-like structured query language (SQL-2) for the query, manipulation, definition, and control of the data in the data base. This language was developed and extensively documented by IBM in 1976 for use in its own relational DBMS. Through the use of this language, the user may request data from a particular table under certain parameters, insert and delete data from tables, create new tables, and grant or revoke privileges to new users.

Two illustrations of typical SQL queries are presented in Figure 4. In the first example, a selection is made from the ORACLE table TABLE_COM, a relation composed of all tables created in this particular data base, annotated with comments about their contents. The two clauses 'SELECT *' and 'FROM TABLE_COM' instruct ORACLE to output data from all (*) columns in the table TABLE_COM. The 'ORDER BY TABLE' clause specifies that the rows are to be displayed in alphabetical order according to those entries in the 'TABLE' column. In the second example, the 'SELECT *' and 'FROM COL' clauses requests all columns to be displayed from the ORACLE data dictionary table COL. The additional 'WHERE TABLE = 'OCCUPANCY'' clause specifies that only those rows in COL that have entries in the TABLE column equal to 'OCCUPANCY' should be outputted.

In the first example, since no WHERE clause accompanied the query block, all rows were listed; however, by using the WHERE clause in the second example, only the few rows possessing the restriction will be returned. In other words, a typical SQL query block consists of two or more statements: a SELECT clause listing column names to be returned, a FROM clause listing the table(s) involved in the query, and other optional clauses, such as a WHERE clause specifying any criteria (i.e., <, >, =, etc.) to select rows from the table. Thus, the SQL query language is relatively easy to master, yielding results in a meaningful manner.

```
SQL>#COMMENT
COM>
COM>***      DISPLAY A LISTING OF ALL TABLES IN THE DATA CASE
COM>
COM>#
SQL>SELECT *
SQL>FROM TABLE_CUM
SQL>ORDER BY TABLE;
SQL>/
```

TABLE	DESCRIPTION
ACTION	INDEX OF ALL ACTION ITEMS ASSIGNED TO PROJECT PERSONNEL
AP_LIBRARY	INDEX OF PUBLISHED PAPERS BY PERSONNEL IN THE APPLICATIONS DIRECTORATE
BASELINE_76	BASELINE DATA RECEIVED FROM LSG FOR 1976
BASELINE_77	BASELINE DATA RECEIVED FROM LSG FOR 1977
BASELINE_78	BASELINE DATA RECEIVED FROM LSG FOR 1978
BASELINE_79	BASELINE DATA RECEIVED FROM LSG FOR 1979
BASELINE_80	BASELINE DATA RECEIVED FROM LSG FOR 1980
CALIBRATION	CALIBRATION INFORMATION FOR EACH SYSTEM OCCUPATION EXTRACTED FROM SURVEY SHEETS
CD_LIBRARY	INDEX OF PUBLISHED PAPERS BY CRUSTAL DYNAMICS PROJECT PERSONNEL
COORDINATES	STATION COORDINATE INFORMATION COMPILED FROM SITE SURVEY SHEETS
DATA_CUM	CODE REFERENCED IN DATA CATALOGUE VERSUS COMMENTS CONCERNING VALIDITY OF DATA
FILE_INFO	FILE INFORMATION FOR EACH TAPE IN DIS ARCHIVE
LAGEOS_76	LAGEOS LASER DATA CATALOGUE FOR 1976
LAGEOS_77	LAGEOS LASER DATA CATALOGUE FOR 1977
LAGEOS_78	LAGEOS LASER DATA CATALOGUE FOR 1978
LAGEOS_79	LAGEOS LASER DATA CATALOGUE FOR 1979
LAGEOS_80	LAGEOS LASER DATA CATALOGUE FOR 1980
LUNAR_T1	LUNAR LASER CATALOGUE OF NOMINAL POINT DATA FOR 1969 THROUGH 1975
LUNAR_T2	LUNAR LASER CATALOGUE OF NOMINAL POINT DATA FOR 1976 THROUGH 1981
LUNARZ_T1	LUNAR LASER CATALOGUE OF AUXILIARY DATA FOR 1976 THROUGH 1975
LUNARZ_T2	LUNAR LASER CATALOGUE OF AUXILIARY DATA FOR 1976 THROUGH 1981
MAPS	INDEX OF MAPS AVAILABLE TO THE CRUSTAL DYNAMICS PROJECT
OCCUPANCY	LISTING OF STATIONS AND THEIR SUCCESSIVE OCCUPYING SYSTEMS
PMOTION_76	POLAR MOTION DATA RECEIVED FROM LSG FOR 1976
PMOTION_77	POLAR MOTION DATA RECEIVED FROM LSG FOR 1977
PMOTION_78	POLAR MOTION DATA RECEIVED FROM LSG FOR 1978
PMOTION_79	POLAR MOTION DATA RECEIVED FROM LSG FOR 1979
PMOTION_80	POLAR MOTION DATA RECEIVED FROM LSG FOR 1980
STATIONS	STATION NUMBERS VERSUS STATION LOCATIONS
SUMMARY_76	MONTHLY SUMMARY INFORMATION COMPILED FROM LAGEOS_76
SUMMARY_77	MONTHLY SUMMARY INFORMATION COMPILED FROM LAGEOS_77
SUMMARY_78	MONTHLY SUMMARY INFORMATION COMPILED FROM LAGEOS_78
SUMMARY_79	MONTHLY SUMMARY INFORMATION COMPILED FROM LAGEOS_79
SUMMARY_80	MONTHLY SUMMARY INFORMATION COMPILED FROM LAGEOS_80
TAPE_INFO	CATALOGUE OF TAPES IN DIS ARCHIVE

35 RECORDS SELECTED.

```
SQL>#COMMENT
COM>
COM>***      DISPLAY A LISTING OF THE COLUMNS IN THE OCCUPANCY TABLE
COM>
COM>#
SQL>SELECT *
SQL>FROM COL
SQL>WHERE TABLE='OCCUPANCY';
SQL>/
```

TABLE	COLUMN
OCCUPANCY	STATION
OCCUPANCY	NAME
OCCUPANCY	SYSTEM
OCCUPANCY	S_DATE
OCCUPANCY	E_DATE

Figure 4. Examples of SQL Queries

3.2.2 Operations

ORACLE offers four major operations for displaying data from specified tables. The first is a permutation or reordering of all the columns of a particular table. Columns are normally ordered in the manner in which the table was originally created and expanded. The second operation is a projection or selection of a subset of columns from the table. Often, all columns in a table are not needed for a particular application, so extraneous ones need not be specified. The third operation is a joining of two or more relations with the one or more columns that they have in common (i.e., these columns contain identical data elements). This join function is a powerful tool for data manipulation and it eliminates much of the redundant storage that can occur. Figure 5 depicts the joining of the LAGEOS 78 table and the STATIONS table in order to annotate the station number (in the LAGEOS 78 table) with its location (from the STATIONS table). The clause 'WHERE LAGEOS 78.STATION=STATIONS.NUMBER' instructs ORACLE that these two columns contain identical information and are to be equated. The last type of operation is called a composition. This is identical to the join but the common domains are not specified for display in the query. If the STATION column of Figure 5 were not specified in the SELECT clause, the query would then be termed a composition. The fields referenced in both the join and composition operations should be imaged (indexed) to allow for a faster query response.

3.2.3 Utilities

ORACLE offers several useful utilities for ease in display and input of data. These utilities can be used by personnel with a good knowledge of ORACLE to aid others who do not possess such training. An example of one such utility is the Interactive Applications Facility (IAF). This feature allows a user to enter, retrieve, or modify data base tables via a screen display. The display may consist of several screen pages. These pages can be enhanced with text data for readability and instructional purposes. Through the use of the terminal keypad (available on DEC VT100 and VT52 terminals), the user may view or enter data without knowledge of the SQL query language. Screen pages can be designed to reflect the formats of input documents to facilitate the entry procedure by a data clerk.

A second ORACLE utility is the Report Writer and Text Formatter. This feature allows personnel to use the data base information (through SQL queries imbedded in a set of instructions) to construct formatted reports. These reports can be enhanced with text information, tabular and columnar headings, summary information, et cetera, not easily acquired from a simple query in the SQL mode.

A third ORACLE utility is the Host Language Interface (HLI). Here, SQL is used as a sub-language in a host programming language, such as FORTRAN, COBOL, Language C, PL/1, or Assembly language. This interface is accomplished through a series of program calls that allow the user to make any valid SQL query. The HLI programs employ these program calls to log on to the ORACLE data base, open buffer areas to accept information from the SQL calls to the data base tables, make and execute SQL calls, obtain descriptions of the

ORIGINAL PAGE IS
OF POOR QUALITY

```

SQL>#COMMENT
COM>
COM>***      QUERY AND DISPLAY THE JOINING OF THE LAGLOS_78 TABLE WITH THE
COM>          STATIONS TABLE
COM>
COM>#
SQL>SELECT STATION, LOCATION, S_DATE, NUM_REC#
SQL>FROM LAGLOS_78, STATIONS
SQL>WHERE (LAGLOS_78.STATION=STATIONS.NUMREC#)
SQL> AND (S_DATE >= 780210 AND S_DATE <= 780220);
SQL>/

```

STATION	LOCATION	S_DATE	NUM_REC#
9921	MT. HOPKINS, ARIZONA	780210	212
9921	MT. HOPKINS, ARIZONA	780210	104
9943	ORRORAL, AUSTRALIA	780211	75
9907	AREQUIPA, PERU	780212	10
7084	QUEENS VALLEY, CALIFORNIA	780214	644
7084	QUEENS VALLEY, CALIFORNIA	780214	14
7084	QUEENS VALLEY, CALIFORNIA	780215	162
7084	QUEENS VALLEY, CALIFORNIA	780216	1008
7084	QUEENS VALLEY, CALIFORNIA	780216	232
7084	QUEENS VALLEY, CALIFORNIA	780216	204
9921	MT. HOPKINS, ARIZONA	780216	13
9929	NATAL, BRAZIL	780216	110
9921	MT. HOPKINS, ARIZONA	780217	92
9921	MT. HOPKINS, ARIZONA	780217	40
7091	HAYSTACK DR., MASS.	780218	22
9921	MT. HOPKINS, ARIZONA	780218	43
9921	MT. HOPKINS, ARIZONA	780218	12
9921	MT. HOPKINS, ARIZONA	780218	59
9921	MT. HOPKINS, ARIZONA	780219	121
9943	ORRORAL, AUSTRALIA	780219	45
9921	MT. HOPKINS, ARIZONA	780220	165
9921	MT. HOPKINS, ARIZONA	780220	46

22 RECORDS SELECTED.

Figure 5. Example of the Joining of Two Tables

fields and "bind" them from SQL statements to program variables, fetch appropriate rows after a successful SQL call, and close the buffer area and log off the ORACLE data base.

Examples of uses for each of these utilities in DIS applications follow.

4. IMPLEMENTATION

4.1 DBMS APPLICATIONS

4.1.1 General

As discussed earlier, many of the different categories to be managed by the DIS can be handled efficiently through the use of a data base management system such as ORACLE. These categories include the data catalogues, both laser and VLBI, project management data, for the use of scheduling and performance evaluation, and ancillary data concerning information about both laser and VLBI sites and systems. Examples of each of these items follow. Since the majority of the preliminary work on the DIS was conducted using data available from laser measurements, the examples will indicate applications in this area.

4.1.2 Data Catalogues

The data catalogues available in the DIS give the investigator a listing of the available laser data for each satellite used by the project. From these catalogues, an investigator can select data to be ordered that will be most useful to his particular application. For example, the laser data catalogues for the Lageos satellite are organized on a one catalogue per year basis. Because of the simple tabular format of the existing catalogues, they may be easily inputted to the ORACLE data base. Through a host language interface program each yearly catalogue was loaded into a table in the data base. For example, the Lageos catalogue for 1979 is contained in the table LAGEOS 79, and is composed of the columns presented in Figure 6. The CODE column contains a one or two character code, in reference to the quality of the data, which can be referenced in the table DATA_COM (or the tables may be joined). This column is initialized to 'A' (for 'No comments received at this time concerning this data') when the catalogue is loaded. As scientists and investigators use the data, or as new versions of the data are issued, they can inform the data manager about its quality and the code can be reset to reflect this update. In other words, the data presented in the catalogue are expected to be useful, until information returns from investigators stating otherwise. A sample query to the data catalogue (for Lageos in 1979) is presented in Figure 7. A query to the DATA_COM table is also presented to illustrate the data quality flag feature.

After an investigator views the results of a query, such as the one presented in Figure 7, he may decide to order selected passes from the list. He may do this in one of two ways. The first method is to use another SQL query that will insert lines into an order-file table (ORDER FILE) also present in the data base. A listing of the columns in the table, as well as a sample query for insertion are presented in Figures 8 and 9. In order to ensure that the

LAGEOS_79 TABLE

* STATION	* S_DATE	S_TIME	S_SEC	* E_DATE	E_TIME	E_SEC	* NUM_OBS	SAT_NO	* CODE	* TAPE_NO	FILE_NO
NUMBER	NUMBER	NUMBER	CHAR(7)	NUMBER	NUMBER	CHAR(7)	NUMBER	NUMBER	CHAR(4)	CHAR(8)	NUMBER

COLUMN

DESCRIPTION

STATION	FOUR-DIGIT STATION NUMBER
S_DATE	START DATE OF LASER OBSERVATION (YYMMDD)
S_TIME	START TIME OF OBSERVATION (HHMM)
S_SEC	STARTING SECONDS OF OBSERVATION (TEN THOUSANDTHS OF A SECOND)
E_DATE	END DATE OF LASER OBSERVATION (YYMMDD)
E_TIME	END TIME OF OBSERVATION (HHMM)
E_SEC	ENDING SECONDS OF OBSERVATION (TEN THOUSANDTHS OF A SECOND)
NUM_OBS	NUMBER OF LASER POINTS RECEIVED DURING OBSERVING SESSION
SAT_NO	SATELLITE IDENTIFICATION NUMBER (7603901 FOR LAGEOS)
CODE	DATA QUALITY CODE (EXPLANATION IN DATA COM TABLE)
TAPE_NO	TAPE IDENTIFICATION NUMBER OF ACTUAL LASER DATA
FILE_NO	FILE NUMBER ON TAPE OF DATA

*INDICATES INDEXED (OR IMAGED) FIELDS

ORIGINAL PAGE IS
OF POOR QUALITY

Figure 6. Format of the Table Containing the Lageos Data Catalogue

ORIGINAL PAGE IS
OF POOR QUALITY

```
SQL>#COMMENT
COM>
COM>***      QUERY AND DISPLAY A SELECTION FROM THE 1979 LAGEOS LASER
COM>          CATALOGUE
COM>#
SQL>SELECT STATION,S_DATE,S_TIME,S_SEC,NUM_OBS,CODE
SQL>FROM LAGEOS_79
SQL>WHERE (S_DATE >= 791001 AND S_DATE <= 791005)
SQL> AND NUM_OBS >= 100;
SQL>/
```

STATION	S_DATE	S_TIME	S_SEC	NUM_OBS	CODE
7086	791001	1057	44.0310	1170	A
7091	791003	149	16.0280	440	B
7114	791003	511	39.0294	542	A
7114	791003	1150	20.0293	1340	A
7063	791004	655	56.0371	675	B
7063	791004	1030	22.0303	276	B
7091	791004	654	46.0320	1542	B
7091	791004	1032	12.0303	985	B
7096	791004	458	29.0250	550	2
7102	791004	1038	19.0293	540	A
7114	791005	1244	40.0260	432	A

11 RECORDS SELECTED.

```
SQL>#COMMENT
COM>
COM>***      QUERY AND DISPLAY THE CODE DEFINITIONS FROM THE DATA SELECTION
COM>
COM>#
SQL>SELECT CODE,COMMENT1
SQL>FROM DATA_COM
SQL>WHERE CODE =
SQL>      SELECT UNIQUE CODE
SQL>      FROM LAGEOS_79
SQL>      WHERE (S_DATE >= 791001 AND S_DATE <= 791005)
SQL>      AND NUM_OBS >= 100;
SQL>/
```

CODE COMMENT1

```
-----
A  NO COMMENTS RECEIVED AT THIS TIME CONCERNING DATA
B  DATA CONSIDERED ACCEPTABLE
2  RANGE-DEPENDENT HAS OK JUNE THRU NOV. 1979
```

Figure 7. Query to the Lageos Data Catalogue

ORDER_FILE TABLE

TAPE_NO*	FILE_NO*	TABLE	STATION*	S_DATE*	S_TIME	NUM_OBS	USER_ID
CHAR(8)	NUMBER	CHAR(15)	NUMBER	NUMBER	NUMBER	NUMBER	CHAR(6)

COLUMN

DESCRIPTION

TAPE_NO	TAPE IDENTIFICATION OF ORDERED DATA
FILE_NO	FILE NUMBER ON TAPE OF ORDERED DATA
TABLE	TABLE NAME (CATALOGUE) WHICH DATA WAS CHOSEN FROM
STATION	STATION NUMBER WHICH GATHERED CHOSEN DATA
S_DATE	START DATE OF SELECTED OBSERVATION
S_TIME	STARTING TIME OF SELECTED OBSERVATION
NUM_OBS	NUMBER OF DATA POINTS FOR SELECTED OBSERVING SESSION
USER_ID	SIX-CHARACTER USER IDENTIFYING CODE

*INDICIATES INDEXED (OR IMAGED) FIELDS

Figure 8. Format of the Order File Table for the Lageos Data Catalogue

correct passes are chosen from the proper data tape when fulfilling the order, the station, and start date and time, as well as the table name (i.e., satellite and year) and tape and file numbers, are necessary information to be stored in the ORDER FILE relation. The user's identification code is used for accounting, shipping, and archiving purposes.

The second method for ordering data does not involve a user's direct queries to the table through the SQL mode. By invoking the host language interface program DATALOOK, the investigator can view selected records from the data catalogue with his own input parameters and order specific passes from this display. The user is prompted to submit the satellite, year, start and end dates, and a minimum number of observations. After viewing the records pertaining to these parameters (twenty lines at a time), the user is then prompted to select specific passes for an order (if he so desires). This entire process, both retrieval and insertion of data into the ORDER FILE table, is performed through the DATALOOK program thus the investigator has no need to possess a knowledge of the SQL language to query the data base. An example of the DATALOOK process is illustrated in Figure 10.

The data catalogues in the ORACLE data base serve a second useful purpose in that they can be employed to create monthly summary information for each year of data present in the DIS. For the laser catalogues reflecting data from the Lageos satellite, this summary information is calculated on a monthly basis for each catalogue table in the data base. Figure 11 illustrates the format of a typical yearly summary table. An example of a query to the LAGEOS 79 summary table (SUMMARY_79), as well as a typical query to insert a record into the table, are shown in Figures 12 and 13. A second use for these tables is presented in the next section.

```
SQL>#COMMENT
COM>
COM>***      DISPLAY THE INSERTION OF ITEMS INTO THE ORDER FILE FOR DATA IN THE
COM>          1979 LAGEOS LASER DATA CATALOGUE
COM>
COM>#
SQL>INSERT INTO ORDER_FILE(TAPE_NO,FILE_NO,STATION,S_DATE,S_TIME,NUM_ORBS):
SQL>      SELECT TAPE_NO,FILE_NO,STATION,S_DATE,S_TIME,NUM_ORBS
SQL>      FROM LAGEOS_79
SQL>      WHERE (S_DATE >= 791102 AND E_DATE <= 791107)
SQL>           AND NUM_ORBS >= 500;
SQL>/
8 RECORDS CREATED.

SQL>UPDATE ORDER_FILL
SQL>SET TABLE='LAGEOS_79' WHERE TABLE=NULL;
SQL>/
8 RECORDS UPDATED.

SQL>UPDATE ORDER_FILE
SQL>SET USER_ID='CEN123' WHERE USER_ID=NULL;
SQL>/
8 RECORDS UPDATED.
```

Figure 9. Insertion Procedure for the Lageos Order File

ORIGINAL PAGE IS
OF POOR QUALITY

ENTER USER ID USING FORMAT _____ : GEN123

ENTER SATELLITE NAME: LAGEOS

ENTER YEAR TO BE VIEWED USING FORMAT YY: 79

ENTER FIRST DATE USING FORMAT YYMMDD: 791102
ENTER SECOND DATE USING FORMAT YYMMDD: 791107

ENTER MINIMUM NUMBER OF OBSERVATIONS DESIRED: 10

LINE	SATELLITE	STATION	DATE	NUM.OBS.
1	7603901	7114	791102	381
2	7603901	7096	791102	216
3	7603901	7086	791102	31
4	7603901	7907	791102	106
5	7603901	7096	791102	169
6	7603901	7096	791103	82
7	7603901	7091	791105	710
8	7603901	7115	791105	1114
9	7603901	7096	791105	44
10	7603901	7115	791105	166
11	7603901	7091	791105	1412
12	7603901	7086	791105	385
13	7603901	7115	791105	1249
14	7603901	7091	791105	893
15	7603901	7063	791105	44
16	7603901	7091	791106	1524
17	7603901	7091	791106	1193
18	7603901	7063	791106	97
19	7603901	7907	791106	27
20	7603901	7086	791106	318

ENTER DESIRED LINE NUMBERS, "0" WHEN ORDER IS COMPLETE FOR THIS SET

ENTER LINE NUMBER: 1
ENTER LINE NUMBER: 7
ENTER LINE NUMBER: 8
ENTER LINE NUMBER: 11
ENTER LINE NUMBER: 13
ENTER LINE NUMBER: 16
ENTER LINE NUMBER: 0

LINE	SATELLITE	STATION	DATE	NUM.OBS.
21	7603901	7114	791106	43
22	7603901	7907	791107	90
23	7603901	7063	791107	68
24	7603901	7063	791107	128

ENTER DESIRED LINE NUMBERS, "0" WHEN ORDER IS COMPLETE FOR THIS SET

ENTER LINE NUMBER: 24
ENTER LINE NUMBER: 0

Figure 10. Browsing and Selection Procedure for
Data in the Lageos Data Catalogue
Through the DATALOOK Process

ORIGINAL PAGE IS
OF POOR QUALITY

SUMMARY_80 TABLE

STATION *	PASSES *	POINTS *	MO *	PC *	MC *
NUMBER	NUMBER	NUMBER	CHAR(2)	CHAR(2)	CHAR(2)

<u>COLUMN</u>	<u>DESCRIPTION</u>
STATION	FOUR-DIGIT STATION NUMBER
PASSES	NUMBER OF OBSERVED SATELLITE PASSES DURING MONTH (NUMBER OF OCCURANCES OF STATION NUMBER IN CATALOGUE FOR THE PARTICULAR MONTH)
POINTS	NUMBER OF LASER DATA POINTS RECEIVED DURING MONTH (SUM OF THE NUMBER OF OBSERVATIONS FOR A STATION IN CATALOGUE FOR THE PARTICULAR MONTH)
MO	MONTH OF STATION OPERATION (MM)
PC	PLATE CODE OF STATION (i.e. 'NA' ⇒ NORTH AMERICA)
MC	MINIMUM CODE CORRESPONDING TO NUMBER OF POINTS RECEIVED FOR PARTICULAR MONTH (i.e. 'L' ⇒ LESS THAN NUMBER REQUIRED, 'G' ⇒ SUFFICIENT NUMBER OF POINTS OBTAINED FOR MONTH)

*INDICATES INDEXED (OR IMAGED) FIELDS

Figure 11. Format of the Table Containing the
Summary Information for the Lageos
Data Catalogue

ORIGINAL PAGE IS
OF POOR QUALITY

```

SQL>#COMMENT
COM>
COM>***      QUERY AND DISPLAY INFORMATION IN THE 1979 LAGEOS SUMMARY TABLE
COM>
COM>#
SQL>SELECT *
SQL>FROM SUMMARY_79
SQL>WHERE MO='01' OR MO='02';
SQL>/

```

STATION	PASSES	POINTS	MO	PC	MC
7062	3	196	01	PC	L
7063	1	29	01	NA	L
7833	2	59	01	EU	L
7907	10	268	01	SA	L
7921	5	80	01	NA	L
7929	6	138	01	SA	L
7943	16	1215	01	AU	C
7062	10	2480	02	PC	C
7063	8	1741	02	NA	C
7101	3	469	02	NA	L
7103	3	226	02	NA	L
7104	1	698	02	NA	L
7834	3	662	02	TU	C
7907	10	602	02	SA	G
7921	8	137	02	NA	L
7929	7	252	02	SA	L
7943	24	3597	02	AU	C

17 RECORDS SELECTED.

Figure 12. Query to the Lageos Summary Table

ORIGINAL PAGE IS
OF POOR QUALITY

```
SQL>#COMMENT
COM>
COM>***      DISPLAY THE INSERTION OF ITEMS INTO THE 1979 CATALOGUE SUMMARY
COM>          TABLE FOR SEPTEMBER
COM>
COM>#
SQL>INSERT INTO SUMMARY_79(STATION,PASSEC,POINTS):
SQL>      SELECT STATION,COUNT(STATION),SUM(OBS)
SQL>      FROM LAGEOS_79
SQL>      WHERE (S_DATE >= 790901 AND S_DATE <= 790930)
SQL>      GROUP BY STATION;
SQL>/
9 RECORDS CREATED.

SQL>UPDATE SUMMARY_79
SQL>SET MO='09'
SQL>WHERE MO=NULL;
SQL>/
9 RECORDS UPDATED.

SQL>SELECT STATION,PASSEC,POINTS,MO
SQL>FROM SUMMARY_79
SQL>WHERE MO='09';
SQL>/
```

STATION	PASSEC	POINTS	MO
7063	24	10477	09
7069	2	171	09
7086	1	1061	09
7091	16	7990	09
7096	2	986	09
7114	22	9293	09
7115	1	9	09
7907	22	905	09
7943	5	350	09

```
9 RECORDS SELECTED.
```

Figure 13. Insertion Procedure for Lageos Summary Table

These laser catalogues for 1976 through 1980 for the Lageos satellite were inputted on a yearly basis and their respective summary tables were created after the tables were loaded and interrogated to ensure validity. The catalogues for 1981 and later years will be inputted each month and records will be inserted into the appropriate summary information table. Since the Lageos satellite is the prime target for the laser stations employed by the project, it was necessary to store these catalogues in yearly increments. However, other satellites (e.g., Starlette, BE-C, and GEOS-3) do not collect as much data, and thus their catalogues can span greater time intervals. This is also true of data acquired from the lunar laser observations.

When data are to be requested from the data base for examination, it is often necessary to gather ancillary information, e.g., station coordinates, site calibrations, et cetera, in order to carry out the appropriate computations using the data. Figure 14 illustrates a query to the tables COORDINATES and CALIBRATION to gather this information for the results presented in Figure 7. This information was inputted into the system from survey sheets completed after a new laser system occupies a particular station. Although the station coordinates do not change, the calibration information must be ascertained each time a particular MOBLAS or TLRS system occupies a new site.

4.1.3 Project Evaluation Information

4.1.3.1 Baseline Results. An important function of the project is to evaluate and present information on past performance, as well as information on future scheduling of laser and VLBI sites and systems. Although many investigators may be satisfied with the knowledge of what data are available (i.e., by interrogating the data catalogues), others may be interested in viewing data availability on an "end product" level. In other words, gathering data from an analyzed point of view--determining what data can and should be used to extract a final, analyzed measurement. This would be a logical step to be performed prior to querying the data catalogues. For example, an investigator may wish to know what Lageos laser data are available to determine a baseline between two specific plates, or stations, during a particular time interval. Since the baselines from laser measurements are (or can be) calculated on a monthly basis, the data base summary tables would indicate what data are available to determine a baseline between stations. Thus, the question can be answered through a query to the data base. An example of such a query is shown in Figure 15. This query uses the ORACLE operation of a "self-join" in which one table is "divided" into two tables and a join is performed using the MO, or month column. In other words, the information that these two "tables" share is contained in the MO domain; the 2 months must be the same in order to establish a baseline.

However, not all of the prospective baselines listed here can be calculated. Due to the data requirements of much of the software that performs the data reduction, orbit determination, and final baseline calculations, a minimum number of points (values that are dependent upon the laser system pulse rates) is required for a month. This minimum number depends on the type of laser system being used at the station; i.e., whether it is an SAO, GSFC, or TLRS system, and during what time period the measurement was performed, since the systems have been upgraded over the years. More precisely, at the present

ORIGINAL PAGE IS
OF POOR QUALITY

```
SQL>#COMMENT
COM>
COM>***      DISPLAY THE STATION COORDINATES AND SYSTEM CALIBRATION INFORMATION FOR
COM>      THE DATA SELECTION
COM>
COM>#
SQL>SELECT STATION, LOCATION, LATITUDE, LONGITUDE, S_DATE
SQL>FROM COORDINATES
SQL>WHERE STATION =
SQL>      SELECT UNIQUE STATION
SQL>      FROM LAGNIS_79
SQL>      WHERE (S_DATE >= 791001 AND S_DATE <= 791005)
SQL>      AND NUM_LNS >= 100;
SQL>/
```

STATION	LOCATION	LATITUDE			LONGITUDE			S_DATE		
7086	FURT DAVIS, TEXAS	N	30	20	46.7433	E	255	59	04.3305	8/79
7091	HAYSTACK MNS., MASS.	N	42	37	21.3420	E	204	30	42.7270	11/77
7114	OWENS VALLEY, CA.	N	37	13	47.4451	E	241	42	25.7015	8/79
7063	NACA/GSFC-GORF, MD.	N	39	01	13.9517	E	203	10	18.0329	1/73
7096	AMERICAN SANDA	S	14	20	25.3652	E	109	16	34.2344	7/79
7102	NACA/GSFC-GORF, MD.	N	39	01	13.9678	E	203	10	17.0323	7/78

6 RECORDS SELECTED.

```
SQL>SELECT STATION, NAME, DIRECTION, UP
SQL>FROM CALIBRATION
SQL>WHERE STATION =
SQL>      SELECT UNIQUE STATION
SQL>      FROM LAGNIS_79
SQL>      WHERE (S_DATE >= 791001 AND S_DATE <= 791005)
SQL>      AND NUM_LNS >= 100;
SQL>/
```

STATION	NAME	DIRECTION		UP	
7086	TLC106	S	1.580	N 0.140	3.536
7086	ML0109	N	0.007	W 0.007	3.748
7091	ML0305	0.000	E 0.003	3.746	
7091	ML0702	S	0.010	W 0.003	3.341
7114	ML0211	S	0.003	W 0.008	3.022
7063	STALAS	0.000	0.000	3.046	X
7063	STALAS	0.000	0.000	3.640	Y
7096	ML0602	0.000	0.000	3.140	

8 RECORDS SELECTED.

Figure 14. Queries to Coordinates and Calibration Information Tables

ORIGINAL PAGE IS
OF POOR QUALITY

```
SQL>#COMMENT
COM>
COM>*** QUERY AND DISPLAY THE POSSIBLE BASELINES IN 1979 FOR STATIONS IN THE
COM> PACIFIC TO STATIONS IN AUSTRALIA
COM>
COM>#
SQL>SELECT PACIF.STATION,P.LOCATION,PACIF.POINTS,AUS.STATION,A.LOCATION,
SQL> AUS.POINTS,PACIF.NO
SQL>FROM SUMMARY_73 PACIF,SUMMARY_74 AUS,STATIONS P,STATIONS A
SQL>WHERE (PACIF.STATION=P.NUMBER AND AUS.STATION=A.NUMBER)
SQL> AND (PACIF.PC='PC' AND AUS.PC='AU')
SQL> AND PACIF.NO=AUS.NO
SQL>ORDER BY PACIF.NO;
SQL>/
```

STATION	LOCATION	POINTS	STATION	LOCATION	POINTS	NO
7062	SAI DIEGO, CALIFORNIA	196	7943	ORROKAL, AUSTRALIA	1215	01
7062	SAI DIEGO, CALIFORNIA	2480	7943	ORROKAL, AUSTRALIA	3597	02
7062	SAI DIEGO, CALIFORNIA	765	7943	ORROKAL, AUSTRALIA	3296	03
7062	SAI DIEGO, CALIFORNIA	7051	7943	ORROKAL, AUSTRALIA	1099	04
7210	MAUI, HAWAII	54	7943	ORROKAL, AUSTRALIA	1099	04
7062	SAI DIEGO, CALIFORNIA	1201	7943	ORROKAL, AUSTRALIA	2060	05
7210	MAUI, HAWAII	285	7943	ORROKAL, AUSTRALIA	2060	05
7210	MAUI, HAWAII	78	7943	ORROKAL, AUSTRALIA	1610	06
7210	MAUI, HAWAII	791	7943	ORROKAL, AUSTRALIA	2432	07
7096	AMERICAN SAMOA	1966	7943	ORROKAL, AUSTRALIA	2604	08
7210	MAUI, HAWAII	814	7943	ORROKAL, AUSTRALIA	2604	08
7096	AMERICAN SAMOA	966	7943	ORROKAL, AUSTRALIA	350	09
7096	AMERICAN SAMOA	1463	7090	YARRAGADCE, AUSTRALIA	3115	10
7210	MAUI, HAWAII	125	7090	YARRAGADCE, AUSTRALIA	3115	10
7096	AMERICAN SAMOA	1463	7943	ORROKAL, AUSTRALIA	164	10
7210	MAUI, HAWAII	125	7943	ORROKAL, AUSTRALIA	164	10
7096	AMERICAN SAMOA	1228	7943	ORROKAL, AUSTRALIA	233	11
7210	MAUI, HAWAII	1009	7943	ORROKAL, AUSTRALIA	233	11
7096	AMERICAN SAMOA	3403	7090	YARRAGADCE, AUSTRALIA	4715	12
7210	MAUI, HAWAII	3341	7090	YARRAGADCE, AUSTRALIA	4715	12
7096	AMERICAN SAMOA	3403	7943	ORROKAL, AUSTRALIA	963	12
7210	MAUI, HAWAII	3341	7943	ORROKAL, AUSTRALIA	963	12

22 RECORDS SELECTED.

Figure 15. Query Display of the Possible Baselines Between Two Plates

time at least 1000 points are required from GSFC systems, 600 points from TLRS systems, and 400 points from SAO systems. The column MC (minimum code) contains values of 'L' (less than) or 'G' (greater than or equal to) to indicate whether the conditions were satisfied for the respective system. A sequence of SQL queries (Figure 16) is used to update this column in the summary tables. A query employing this indicator is illustrated in Figure 17. Here only those baselines in which both stations have the required minimum number of observations (i.e., MC column values equal to 'G') are selected.

In addition to the SQL queries, the ORACLE Report Writer has been used to format these results into a concise, informative report. A set of SQL queries similar to those discussed previously were imbedded into a set of instructions to create the more visually appealing report shown in Figure 18. Through the Report Writer, the basic queries were annotated with titles and columnar headings and sub-headings. As in the SQL query, this report presents the number, location, and number of points taken for each station during the specified month. By once again using the MC field, the stations not having the required number of points to compute a baseline were excluded. An additional query was added to Report Writer instructions to provide summing information on the outputted table. Although all of the information presented in this dual-table report can be extracted from queries while in the SQL mode, they can be displayed in a more informative fashion through the use of this utility. Also, these reports can be generated for subsequent years as well as between varying plates and stored in separate fields. In other words, the report need not be "generated" every time an investigator wishes to view data on baselines between two plates during a particular year; he need only list the contents of a specified file.

A third mode for presenting information on available data for baseline and other analyzed data applications is the calendar-type formats presented in Figures 19, 20, and 21. These tables were constructed from the ORACLE summary table SUMMARY 79 through the use of the Host Language Interface programs CALENX, CALENDAR, and CALENED. Figure 19 represents all monthly data available for 1979 by a series of XX's in the appropriate station and month cross-location as well as a total column for listing number of months a particular station was operational. Figure 20 represents the data in a similar manner but lists the actual number of points taken from a particular station during its respective months of operation. Figure 21 also uses this format, but the minimum-number-of-points requirement was appended to the SQL statement in the program call. Charts such as these give the project scientist and investigators an overall view of the laser network observations during a particular year. After generating calendars such as these over a several year period, patterns of non-operation may be detected for certain stations during specific months of the year. This type of information would probably indicate periods of inclement weather for laser operation. Hence, TLRS and MOBLAS units should not be scheduled for visitation to the sites displaying such patterns during those months. Also, charts like Figure 21 give the investigator another method of determining what data are available to compute baselines. For example, by scanning the month of October (10) column, seven stations with the appropriate number of points for baseline calculation are located. In addition, these charts present the possible baselines for the entire network,

ORIGINAL PAGE IS
OF POOR QUALITY

```
SQL>#COMMENT
COM>
COM>***      DISPLAY THE UPDATE TO THE MINIMUM NUMBER OF POINTS COLUMN
COM>          (IC) FOR THE 1979 LAGEOS SUMMARY TABLE
COM>
COM>#
SQL>UPDATE SUMMARY_79
SQL>SET IC='L'
SQL>WHERE (POINTS < 400 AND STATION >= 7900)
SQL>      OR (POINTS < 1000 AND STATION < 7900);
SQL>/
47 RECORDS UPDATED.

SQL>UPDATE SUMMARY_79
SQL>SET IC='G'
SQL>WHERE IC=NULL;
SQL>/
70 RECORDS UPDATED.

SQL>SELECT *
SQL>FROM SUMMARY_79
SQL>WHERE MO='09';
SQL>/
```

STATION	PASSES	POINTS	IC	PC	IC
7063	24	10477	09	NA	G
7069	2	171	09	NA	L
7086	1	1061	09	NA	G
7091	16	7990	09	NA	G
7096	2	986	09	PC	L
7114	22	9293	09	NA	G
7115	1	9	09	NA	L
7907	22	905	09	SA	G
7943	5	350	09	AU	L

9 RECORDS SELECTED.

Figure 16. Procedure to Update the Lageos Summary Information Table

ORIGINAL PAGE IS
OF POOR QUALITY

```
SQL>#COMMENT
COM>
COM>*** QUERY AND DISPLAY THE POSSIBLE BASELINES IN 1979 FOR STATIONS IN THE
COM> PACIFIC TO STATIONS IN AUSTRALIA WHICH HAVE ENOUGH POINTS FOR COMPUTATION
COM>
COM>#
SQL>SELECT PACIF.STATION,P.LOCATION,PACIF.POINTS,AUS.STATION,A.LOCATION,
SQL> AUS.POINTS,PACIF.IID
SQL>FROM SUMMARY_79 PACIF,SUMMARY_79 AUS,STATIONS P,STATIONS A
SQL>#WHERE (PACIF.STATION=P.NUMBER AND AUS.STATION=A.NUMBER)
SQL> AND (PACIF.PC='PC' AND AUS.PC='AU')
SQL> AND PACIF.IID=AUS.IID
SQL> AND (PACIF.NC='G' AND AUS.NC='G')
SQL>ORDER BY PACIF.IID;
SQL>/
```

STATION	LOCATION	POINTS	STATION	LOCATION	POINTS	IID
7062	SAN DIEGO, CALIFORNIA	2400	7903	BRUNAL, AUSTRALIA	3507	02
7062	SAN DIEGO, CALIFORNIA	2051	7903	BRUNAL, AUSTRALIA	1009	04
7062	SAN DIEGO, CALIFORNIA	1201	7903	BRUNAL, AUSTRALIA	2000	05
7096	AMERICAN SAMOA	1906	7903	BRUNAL, AUSTRALIA	2604	08
7096	AMERICAN SAMOA	4403	7090	YARRAGADCE, AUSTRALIA	3115	10
7096	AMERICAN SAMOA	7403	7090	YARRAGADCE, AUSTRALIA	4715	12
7210	HAUI, HAWAII	1341	7090	YARRAGADCE, AUSTRALIA	4715	12
7096	AMERICAN SAMOA	3403	7903	BRUNAL, AUSTRALIA	963	12
7210	HAUI, HAWAII	1341	7903	BRUNAL, AUSTRALIA	963	12

9 RECORDS SELECTED.

Figure 17. Query Using the Point Number Indicator in the Lageos Summary Table

whereas the tables generated from the Report Writer utility were constructed to provide information on only those baselines available between two specified plates.

4.1.3.2 Project Management Data

4.1.3.2.1 Crustal Dynamics Library Index. There are several other areas in which the ORACLE data base can serve the project. An example is in the area of project management. Since many scientists are involved with the Crustal Dynamics Project, a library of all published papers is being maintained by administrative personnel. In addition to scientific papers, this library also includes any other papers and memoranda relative to project management. After discussion with the personnel involved in the maintenance of this library, it was felt that a table in the ORACLE data base could easily and efficiently house an index of items contained in the Crustal Dynamics Project Library. A listing of the columns in the table CD LIBRARY is presented in Figure 22. Each item is uniquely identified by a control number, which has the format 'CD####'. Thus, this column was a logical choice for a primary key, or rather, the first indexed field. Since the title of the library item can tend to be rather lengthy, it was split into three separate, fifty-character fields; the later two may be null (empty). A sample query to the library index is illustrated in Figure 23.

Since the entries in the library index tend to consist of relatively lengthy character fields, inserting data to the table through the SQL query language can be rather tedious. Therefore, a screen form was created through the use of ORACLE's Interactive Application Facility (IAF). The creator of the application form invokes the Interactive Applications Generator (IAG) and responds to a series of questions for each field that is present in the data base table

ORIGINAL PAGE IS
OF POOR QUALITY

GLOBAL PLATE BATHY THERM 1979

BASELINES FROM STATIONS IN THE PACIFIC TO STATIONS IN AUSTRALIA
DERIVABLE FROM OUR MEASUREMENTS

FROM PACIFIC		TO AUSTRALIAN		DEPTH
STATION	LOCATION	STATION	LOCATION	METERS
7062	SAN DIEGO, CALIFORNIA	7943	CEPURAL, AUSTRALIA	02
7062	SAN DIEGO, CALIFORNIA	7943	CEPURAL, AUSTRALIA	04
7062	SAN DIEGO, CALIFORNIA	7943	CEPURAL, AUSTRALIA	05
7096	AMERICAN SAMOA	7990	YAPAGALLI, AUSTRALIA	10
7096	AMERICAN SAMOA	7990	YAPAGALLI, AUSTRALIA	12
7096	AMERICAN SAMOA	7943	CEPURAL, AUSTRALIA	08
7096	AMERICAN SAMOA	7943	CEPURAL, AUSTRALIA	12
7210	HAUI, HAWAII	7990	YAPAGALLI, AUSTRALIA	12
7210	HAUI, HAWAII	7943	CEPURAL, AUSTRALIA	12

TOTALS

FROM PACIFIC STATION	TO AUSTRALIAN STATION	NUMBER OF MONTHS OF MEASUREMENTS
7062	7943	3
7096	7990	2
7096	7943	2
7210	7990	1
7210	7943	1
TOTAL NUMBER OF MONTHLY MEASUREMENTS PERFORMED:		9
TOTAL NUMBER OF POSSIBLE BASELINES:		5

Figure 18. Report Formatting the Baseline Display
Between Two Plates

ORIGINAL PAGE IS
OF POOR QUALITY

MONTHS OF OPERATION FOR LAGEOS STATIONS IN 1979

STATION NUMBER	LOCATION	MONTHS OF OPERATION												NO. OF MONTHS
		01	02	03	04	05	06	07	08	09	10	11	12	
7051	QUINCY, CALIFORNIA			XX	XX	XX								3
7062	SAN DIEGO, CALIFORNIA	XX	XX	XX	XX	XX								5
7063	GREENBELT, MARYLAND	XX	XX	XX	XX	XX				XX	XX	XX	XX	9
7069	PATRICK AFB, FLORIDA			XX	XX	XX				XX	XX			5
7082	BEAR LAKE, UTAH			XX	XX	XX		XX	XX					5
7086	FORT DAVIS, TEXAS									XX	XX	XX	XX	4
7090	YARRAGADCE, AUSTRALIA										XX	XX	XX	2
7091	HAYSTACK OB., MASS.								XX	XX	XX	XX	XX	5
7096	AMERICAN SANDA								XX	XX	XX	XX	XX	5
7101	GREENBELT, MARYLAND		XX	XX	XX									3
7102	GREENBELT, MARYLAND			XX	XX						XX	XX	XX	3
7103	GREENBELT, MARYLAND		XX	XX	XX									3
7104	GREENBELT, MARYLAND		XX		XX	XX								3
7114	OWENS VALLEY, CALIFORNIA									XX	XX	XX	XX	4
7115	GOLDSTONE, CALIFORNIA									XX	XX	XX	XX	4
7210	HAWAII				XX	XX	XX	XX	XX		XX	XX	XX	7
7833	KOOTHJICK, NETHERLANDS	XX		XX	XX									3
7834	WETTZELL, WEST GERMANY		XX	XX	XX									2
7907	AREQUIPA, PERU	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	12
7921	HIT. HOPKINS, ARIZONA	XX	XX	XX	XX	XX								5
7929	ATAT, BRAZIL	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	10
7943	URRORAL, AUSTRALIA	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	12

Figure 19. Calendar Report of the Monthly Lageos Data Using The 'XX' Format

MONTHS OF OPERATION FOR LAGEOS STATIONS IN 1979

STATION NUMBER	LOCATION	MONTHS OF OPERATION												
		01	02	03	04	05	06	07	08	09	10	11	12	
7051	QUINCY, CALIFORNIA			171	2008	2490								
7062	SAN DIEGO, CALIFORNIA	196	2400	765	7051	1291								
7063	GREENBELT, MARYLAND	20	1741	8182	14561	3962				10477	16043	6076	12747	
7069	PATRICK AFB, FLORIDA			468	304					171	125			
7082	BEAR LAKE, UTAH			359	2620	2966		6931	7790					
7086	FORT DAVIS, TEXAS									1061	8461	6407	6199	
7090	YARRAGADCE, AUSTRALIA										3115		4715	
7091	HAYSTACK OB., MASS.									1238	7490	22610	23935	
7096	AMERICAN SANDA									1966	486	4463	1228	
7101	GREENBELT, MARYLAND		469	1045	821								6199	
7102	GREENBELT, MARYLAND				2509	1018							4715	
7103	GREENBELT, MARYLAND		226	2408	3275								20280	
7104	GREENBELT, MARYLAND		698		7416	639							5403	
7114	OWENS VALLEY, CALIFORNIA													
7115	GOLDSTONE, CALIFORNIA													
7210	HAWAII				54	285	76	791	614					
7833	KOOTHJICK, NETHERLANDS	59		667	64									
7834	WETTZELL, WEST GERMANY		662	830										
7907	AREQUIPA, PERU	260	602	202	1304	1317	3001	675	1459	905	162	754	893	
7921	HIT. HOPKINS, ARIZONA	80	137	107	184	109								
7929	ATAT, BRAZIL	130	252	39	65	22	33		55		21	41	88	
7943	URRORAL, AUSTRALIA	1215	3597	3296	1099	2060	1610	2432	2684	350	164	233	963	

Figure 20. Calendar Report of the Monthly Lageos Data Using the Number-of-Points Format

ORIGINAL PAGE IS
OF POOR QUALITY

MONTHLY REPORT OF OPERATION FOR LASER STATIONS IN 1979

STATION NUMBER	LOCATION	MONTHS OF OPERATION											
		01	02	03	04	05	06	07	08	09	10	11	12
7051	QUINCY, CALIFORNIA				3808	2490							
7062	SAN DIEGO, CALIFORNIA		2480		7821	5201							
7063	GREENBELT, MARYLAND		1741	0182	17501	5967				10477	16003	6078	12707
7069	PATRICK AFB, FLORIDA												
7082	BEAR LAKE, UTAH				3620	2466		6931	7794				
7086	FORT DAVIS, TEXAS									1061	5461	6407	6199
7090	YARRAGALL, AUSTRALIA										3115		4715
7091	HAYSTACK OB., MASS.								1238	7990	22010	23935	20280
7096	AIRCRAFT SAHJA								1966		4463	1228	5403
7101	GREENBELT, MARYLAND			1045									
7102	GREENBELT, MARYLAND			2509	1016								
7103	GREENBELT, MARYLAND			2408	5275								
7104	GREENBELT, MARYLAND				7416								
7114	OWENS VALLEY, CALIFORNIA									9293	26516	17262	15641
7115	GOLDSTONE, CALIFORNIA										11914	30882	18957
7210	HAUI, HAWAII											1099	3341
7833	KOUTRIJCK, NETHERLANDS			667									
7834	NETZELL, WEST GERMANY		662	830									
7907	ARQUIPA, PERU		602		1304	1317	3001	675	1459	985		754	893
7921	Mt. Hopkins, Arizona												
7929	NATAL, BRAZIL												
7944	URRORAL, AUSTRALIA	1215	3597	3276	1079	2060	1610	2432	2684				963

Figure 21. Calendar Report of the Monthly Lageos Data Using the Minimum Number-or-Points Format

is to be displayed on the screen. After a screen form was created in this manner, any valid user can invoke the Interactive Applications Processor (IAP) and display the form. If desired, this user may also query the data base by using this utility. An illustration of the form used for the library index table as well as a sample of data to be inserted is shown in Figure 24. In addition to the appealing format of an IAF screen, this utility can be used by personnel who have little or no knowledge of the ORACLE data base or the data that is to be inserted. This is due to the fact that one is not entering a series of commands, but rather the data itself. The IAF has a useful help function mode in which the user can inquire as to the function of the keypad keys, the attributes of a particular enterable field, or a creator-supplied message pertinent to any field. When the form has been filled out and inserted, a check is made to ensure proper data types, lengths and completion of all appropriate fields.

4.1.3.2.2 Crustal Dynamics Action Item Index. In addition to the library index, a second project application was introduced to the ORACLE data base--an archive of past and present action items assigned by project personnel during status meetings. An illustration of the fields of the table ACTION is shown in Figure 25. Once again, the action item description, as well as the comment entry, were divided into several fields to facilitate both entry and display of the data. A typical query to this table would ask for all "open" action items for one person, ordered by due date. An illustration of a query of this type is presented in Figure 26.

The action item table was also loaded via an IAF screen form. Figure 27 depicts a blank form as well as a completed form, ready for insertion.

Two types of reports were created to display the information contained in the ACTION table. The first type, shown in Figure 28, is a useful summary of all personnel responsible for action items, listed with the appropriate information about each item. This type of report was designed to be generated prior

CD_LIBRARY TABLE

NUMBER	SUBJECT	REFERENCE	CR_REF	TITLE1	TITLE2	TITLE3	AUTHOR	ACTIVITY	WBS NUM	DATE	LOCATION
CHAR(6)	CHAR(20)	CHAR(15)	CHAR(6)	CHAR(50)	CHAR(50)	CHAR(50)	CHAR(30)	CHAR(10)	CHAR(10)	NUMBER	CHAR(15)

COLUMN

DESCRIPTION

NUMBER	IDENTIFICATION NUMBER OF LIBRARY ITEM (CD####)
SUBJECT	SUBJECT OF LIBRARY ITEM
REFERENCE	REFERENCE NUMBER/CODE OF ITEM
CR_REF	CROSS REFERENCE NUMBER (IN APPLICATIONS DIRECTORATE LIBRARY INDEX) OF ITEM (AD####)
TITLE1	FIRST FIFTY CHARACTERS OF TITLE OF ITEM
TITLE2	SECOND FIFTY CHARACTERS IN TITLE (IF NEEDED)
TITLE3	THIRD FIFTY CHARACTERS IN TITLE (IF NEEDED)
AUTHOR	AUTHOR(S) OF LIBRARY ITEM
ACTIVITY	ORGANIZATION RESPONSIBLE FOR AUTHOR(S) AND/OR PUBLICATION OF ITEM
WBS NUM	WORK BREAKDOWN STRUCTURE ELEMENT IN REFERENCE TO THE AUTHOR(S) OF ITEM
DATE	DATE OF PUBLICATION OF ITEM
LOCATION	PHYSICAL STORAGE LOCATION OF DOCUMENT

*INDICATES INDEXED (OR IMAGED) FIELDS

Figure 22. Format of the Table Containing the Crustal Dynamics Library Index

ORIGINAL PAGE IS
OF POOR QUALITY

```
SQL>#COMMENT
CDM>
CDM>*** QUERY AND DISPLAY INFORMATION IN THE CRUSTAL DYNAMICS LIBRARY INDEX
CDM>
CDM>#
SQL>SELECT NUMBER, SUBJECT, AUTHOR, TITLE;
SQL>FROM CGLIBRARY;
SQL>/
```

NUMBER	SUBJECT	AUTHOR	TITLE
CD0002	VLBI	LAWRENCE, ALLEHRY, FREY	PROPOSED SATELLITE LASER RANGING AND VLBI SITES
CD0003	MORLAS	FREY	COP OBSERVING PLAN FOR HIGHLY MOBILE SYSTEMS
CD0004	MORLAS	KAHN, YONBUR, SMITH, ENGLAN, GIBBS	PERFORMANCE ANALYSIS OF THE SPACE BORNE LASER
CD0017	VLBI	CLARK	TECHNICAL PERFORMANCE SPECIFICATIONS FOR THE DATA
CD0018	MOU, MOA, PP, AU	GSFC/NASA	EXECUTION PHASE PROJECT PLAN FOR CRUSTAL DYNAMICS
CD0019	MISCELLANEOUS	ALLEHRY, WECSTLY, PAINTER	SATELLITE RELAYING OF GEOPHYSICAL DATA
CD0020	MISCELLANEOUS	GEODYNAMICS BRANCH	LASER SYSTEM DEVELOPMENT PLAN
CD0021	MISCELLANEOUS	WEBSTER	MODERN RADIO ASTRONOMY IN GEOPHYSICS
CD0024	MISCELLANEOUS	AMERICAN GEOPHYSICAL UNION	REVIEW OF GEOPHYSICS AND SPACE PHYSICS
CD0026	SITE MEETING	FLOYD	GENETIC BEACH MARKS

10 RECORDS SELECTED.

Figure 23. Query to the Crustal Dynamics Library Index

to the biweekly project status meeting so that the project manager can view the current state of business for key personnel. The second report, a segment of which is presented in Figure 29, prints all action items for each person on a separate page. This concept allows each responsible party to view the action items that he is currently assigned.

4.2 SOFTWARE PACKAGE APPLICATIONS

4.2.1 Analyzed Data Display

Although many of the requirements of the DIS can be fulfilled via a data base management system such as ORACLE, there are still some additional services that must be performed through the use of the conventional software package. An example of such a need is the display of the analyzed laser data, i.e., polar motion and baseline distance tables. These tables are present in large listings (usually generated on a monthly basis) that result from a series of mathematically complicated computer runs. Although these tables can be extracted from the outputs and eventually stored separately in tables in the data base, many other useful items present in the listing, such as parameters for the Earth's gravity field, et cetera, that were incorporated to yield those particular results, could not be extracted for use with the data tables. Therefore, a method that would read these multi-page, 132-character per line reports and display them to a typical user via an average eighty-character per line terminal was needed. Since the ORACLE data base cannot handle text data in such a form at the present time, a FORTRAN software package was developed to fulfill the requirement. The ORACLE DBMS will be enhanced with text processing capabilities in the future and these additions should perform the required services.

The first problem addressed and resolved was that of a search function that would locate a particular user-specified table. It was assumed that the typical viewer of analyzed data would have some familiarity with the data and

ORIGINAL PAGE IS
OF POOR QUALITY

CRYSTAL DYNAMICS PROJECT LIBRARY INDEX

NUMBER: CD_____

REFERENCE: _____ CROSS-REFERENCE: AD_____

SUBJECT: _____ DATE: MM/DD/YY

TITLE: _____

AUTHOR(S): _____
ACTIVITY: _____ WGS NUMBER: _____

LOCATION OF LIBRARY ITEM: _____

PREVIOUS PAGE: APPLICATIONS DIRECTORATE LIBRARY INDEX

CHAR MODE: REPLACE PAGE 2 MODE: INSERT COUNT: *0

CRYSTAL DYNAMICS PROJECT LIBRARY INDEX

NUMBER: CD7004

REFERENCE: TH 80330 CROSS-REFERENCE: _____

SUBJECT: MOELAS DATE: 10/01/79

TITLE: PERFORMANCE ANALYSIS OF THE SPACE BORNE LASER
RANGING SYSTEM

AUTHOR(S): KAIN, VANDON, SMITH, EIGLAR, CIBBS
ACTIVITY: CSFC/NASA WGS NUMBER: 21-04

LOCATION OF LIBRARY ITEM: BLDG. 16, RM 206

PREVIOUS PAGE: APPLICATIONS DIRECTORATE LIBRARY INDEX

CHAR MODE: REPLACE PAGE 2 MODE: INSERT STORED COUNT: 3

Figure 24. Screen Forms for the Crystal
Dynamics Library Index

ACTION TABLE

* NUMBER	* RESP_OF	RESP_TO	* D_DATE	* C_DATE	DESCR1	DESCR2	DESCR3	DESCR4	COMMENT1	COMMENT2	COMMENT3	COMMENT4	COMMENT5	COMMENT6
NUMBER	CHAR(20)	CHAR(20)	NUMBER	NUMBER	CHAR(50)									

COLUMN

DESCRIPTION

NUMBER

SIX-DIGIT IDENTIFICATION NUMBER OF ACTION ITEM (YYMM##)

RESP_OF

PARTY RESPONSIBLE FOR COMPLETION OF ACTION ITEM

RESP_TO

PARTY TO BE REPORTED TO CONCERNING ACTION ITEM UPON ITS COMPLETION

D_DATE

DUE DATE OF ACTION ITEM

C_DATE

COMPLETION DATE OF ACTION ITEM

DESCR1

FIRST FIFTY CHARACTERS OF A DESCRIPTION OF ACTION ITEM

DESCR2, 3, 4

FIFTY-CHARACTER CONTINUATION COLUMNS FOR ACTION ITEM DESCRIPTION
(IF NEEDED)

COMMENT1

FIRST FIFTY CHARACTERS OF ANY COMMENTS CONCERNING ACTION ITEM

COMMENT2, 3, 4, 5, 6

FIFTY-CHARACTER CONTINUATION COLUMNS FOR COMMENTS ON ACTION ITEM
(IF NEEDED)

*INDICATES INDEXED (OR IMAGED) FIELDS

ORIGINAL PAGE IS
OF POOR QUALITY

Figure 25. Format of the Table Containing the Crustal Dynamics Action Item Index

ORIGINAL PAGE IS
OF POOR QUALITY

```
SQL>#CLIENT
COM>
COM>*** QUERY AND DISPLAY INFORMATION IN THE CRUSTAL DYNAMICS ACTION ITEM INDEX
COM>
COM>#
SQL>SELECT NUMBER,RESP_OF,C_DATE,DESCR1
SQL>FROM ACTION
SQL>WHERE C_DATE=NULL
SQL>ORDER BY RESP_OF;
SQL>/
```

NUMBER	RESP_OF	C_DATE	DESCR1
104010	ALLENBY	11/30/81	IDENTIFY WHAT ADDITIONAL SITES ARE RECOMMENDED FOR
110003	ALLENBY	10/29/81	ARRANGE MEETINGS WITH JPL AND HGS TO REVIEW THE
110001	BOSWORTH	11/04/81	PREPARE WITH C. STRANGE A PLAN ON THE TLRS/MOBLAS
108009	CLARK	10/20/81	DETERMINE WHEN THE NOAA CONTRACT TO NASA FOR THE
108009	CLARK	10/30/81	PREPARE MEMO TO HGS STATING THE STATUS OF THE
109009	CLARK	12/09/81	SET UP WITH D. ROGSTAD THE CORRELATOR DESIGN
109004	CLARK	10/01/81	MEET WITH C. VEGOS ON THE M7-3 RECEIVER AND THE
109008	CLARK	10/21/81	INITIATE WITH E. COHEN THE COORDINATION ON THE
109012	CLARK	11/01/81	DEVELOP A PLAN FOR MARK-III TAPE RECORDER
110004	CLARK	10/28/81	DISCUSS WITH C. TRASK THE DETAILS OF WHAT JPL IS
110006	CLARK	10/01/81	CONDUCT DISCUSSION WITH VANDENBERG, DAVIDSON,
108012	COATES	10/28/81	MEET WITH J. MURPHY ON PLANS FOR THE ANNUAL REVIEW
108007	FREY	10/28/81	GENERATE A DETAILED PLAN WHICH PROVIDES ESTIMATED
108010	LIEBRECHT	01/01/82	REPORT ON THE FINAL RESULTS OF THE SESSION V
110007	LIEBRECHT	10/01/81	COORDINATE WITH FLIEGEL THE REQUIRED INFORMATION
110008	LIEBRECHT	11/01/81	COORDINATE WITH J. PETTY AND FLIEGEL THE
108013	LINDER	10/28/81	PROVIDE A SUMMARY OF THE DATA HANDLING FACILITIES
105002	LINDER	11/15/81	GET THE EUROPEAN LASER DATA PLAN IN OPERATION
108011	NEAD	10/28/81	PROVIDE SCHEDULES FOR PI CONTRACTS AND AGREEMENTS
110009	RENZETTI	11/01/81	PROVIDE COMMENTS ON THE BERKELEY GET'S PROPOSAL.
109013	ROGSTAD	12/01/81	SET-UP REVIEW MEETING WITH T. CLARK ON HIGH
108014	STEPHANIDES	10/28/81	STATUS OF LASER AND VLBI FACILITIES IN OTHER
109011	STEPHANIDES	10/28/81	RESOLVE THE M7 AND STALAG COLLOCATION PROBLEM.
110002	STEPHANIDES	11/01/81	VERIFY THAT THE MOBLAS RANGE GATE CAN ACCOMMODATE
109001	TRASK	10/01/81	CONTACT C. ALLENBY CONCERNING THE VAPP SITE
110005	TRASK	10/01/81	CONTACT V. REINHARDT FOR ADDITIONAL INFORMATION

26 RECORDS SELECTED.

Figure 26. Query to the Crustal Dynamics Action Item Index

CRUSTAL DYNAMICS PROJECT ACTION ITEMS

NUMBER: _____ DATES: DUE: MM/DD/YY
COMPLETED: MM/DD/YY

RESPONSIBILITY OF: _____
RESPONSIBILITY TO: _____

DESCRIPTION: _____

COMMENTS: _____

CHAR MODE: REPLACE PAGE 1 MODE: INSERT COUNT: *0

CRUSTAL DYNAMICS PROJECT ACTION ITEMS

NUMBER: 107607 DATES: DUE: 10/27/81
COMPLETED: _____

RESPONSIBILITY OF: FRY
RESPONSIBILITY TO: QUATES

DESCRIPTION: GENERATE A DETAILED PLAN WHICH PROVIDES ESTIMATED
DATES AND PRECISION LEVELS FOR RELATIVE PLATE
MOTION

COMMENTS: NONE

CHAR MODE: REPLACE PAGE 1 MODE: INSERT STORED COUNT: 2

Figure 27. Screen Forms for the Crustal Dynamics
Action Item Index

ORIGINAL PAGE IS
OF POOR QUALITY

CRUSTAL DYNAMICS PROJECT ACTION ITEM LISTING
AS OF 10/17/81

RESPONSIBILITY OF	ITLH NUMBER	RESPONSIBILITY TO	DATE DUE	DATE COMPLETED	DESCRIPTION AND COMMENTS
ALLENBY	110003	COATES	10/29/81		ARRANGE MEETINGS WITH JPL AND NGS TO REVIEW THE NYLAR OVERLAY AND DEVELOP A PLAN TO IMPLEMENT THEM INTO THE ARIES SYSTEM MET AT NGS 10/29/81
ALLENBY	104010	COATES	11/30/81		IDENTIFY WHAT ADDITIONAL SITES ARE RECOMMENDED FOR OCCUPATION NEXT YEAR AND GET RECORDING AND MONITORING INTO FIELD PLANS MEMO TO NGS REQUIRED
WOSWORTH	110001	COATES	11/04/81		PREPARE WITH H. STRANGE A PLAN ON THE TLR5/MOBLAS HORIZONTAL RANGING CAMPAIGN AT OTAY Mtn/MONUMENT PEAK NONE
CLARK	109009	VEGOS	10/01/81		MEET WITH C. VEGOS ON THE MV-3 RECEIVER AND THE NEW GSFC RECEIVER DESIGN (9/16/81-4) NONE
CLARK	110006	TRASK	10/01/81		CONDUCT DISCUSSION WITH VANDERBERG, DAVIDSON, AND TRASK TO RESOLVE PROBLEMS CONNECTED WITH THE NOV. BURST HELD TELECONS AND MEETINGS
CLARK	110004	TRASK	10/28/81		DISCUSS WITH D. TRASK THE DETAILS OF WHAT JPL IS RECOMMENDING FOR THE NOVEMBER BURST AT DVRO HELD DISCUSSIONS AT GSFC ON 10/28/81
CLARK	108009	COATES	10/30/81		PREPARE MEMO TO HQ STATING THE STATUS OF THE CONTRACT AND THE WORK UNDER THE HQ (RICHMOND) NONE
CLARK	109012	COATES	11/01/81		DEVELOP A PLAN FOR MARK-III TAPE RECORDER IMPLEMENTATION NONE

Figure 28. Portion of a Report Listing all Active Action Items

ORIGINAL PAGE IS
OF POOR QUALITY

CRYSTAL DYNAMICS PROJECT ACTION ITEMS AS OF 10/19/81

RESPONSIBILITY OF: CLARK

-- ITEM 1 --

NUMBER: 109004

DATE DUE: 10/01/81

RESPONSIBLE TO: VLGDS

DATE COMPLETED:

DESCRIPTION

MEET WITH C. VEGOS ON THE MP-3 RECEIVER AND THE NEW
GSFC RECEIVER DESIGN (9/16/81-4)

COMMENTS

NONE

-- ITEM 2 --

NUMBER: 110006

DATE DUE: 10/01/81

RESPONSIBLE TO: TRASK

DATE COMPLETED:

DESCRIPTION

CONDUCT DISCUSSION WITH VANDENBERG, DAVIDSON, AND
TRASK TO RESOLVE PROBLEMS CONNECTED WITH THE NOV.
BURST

COMMENTS

HELD TELECONS AND MEETINGS

-- ITEM 3 --

NUMBER: 110004

DATE DUE: 10/28/81

RESPONSIBLE TO: TRASK

DATE COMPLETED:

DESCRIPTION

DISCUSS WITH D. TRASK THE DETAILS OF WHAT JPL IS
RECOMMENDING FOR THE NOVEMBER BURST AT OVRO

COMMENTS

HELD DISCUSSIONS AT GSFC ON 10/28/81

Figure 29. Example of a Report to Personnel Responsible for
the Completion of an Action Item

parameters that are available in these computer runs, i.e., the general format of these listings. Typically, two types of listings having the same general format will be received from the Laser Support Group (LSG) and stored on disk in the DIS. The first type includes computed baselines and station positions, the second contains the polar motion data, each spanning monthly intervals. Figure 30 illustrates the sign-on and selection process for the analyzed data viewing. After the user has chosen a particular table (options one or two) the search function locates the first page in which the title (or other keyword associated with the data table) occurs, and scans for any additional occurrences on subsequent pages. After the last page of the table is detected, the beginning and ending locations (line numbers) of each page of the table are stored. Then, all lines between these locations are outputted via a display function that will be described later. However, if the user has viewed enough of the data in a multi-page table, he may terminate the display of the pages that follow. He then has the option to scan the table again or view another table. If he does not wish to re-examine data in this particular listing, he may select another to interrogate.

Another option open to the user is to examine the entire computer run (option three), one page at a time. This feature is especially useful if the viewer does not know which data table to select for interrogation. Under this option, the user views the first few lines of a page (starting with page one) and then types in one of the codes illustrated in Figure 31. This way, he can quickly scan through the entire file if desired.

Since polar motion and baseline data tables are likely to be those most accessed, separate routines were developed that select particular entries in these tables and allow the viewing of the entire table. For a typical polar motion table, data can be chosen for a particular date or range of dates. For a baseline distance table, data can be selected for a specific station or pair of stations. Examples of these selections are presented in Figures 32 and 33. Once the proper selection (whether only a few lines or the entire table) has been made, the appropriate internal line locations are transferred to the display function created for proper terminal formatting of the analyzed data.

This terminal size constraint was a second problem addressed. Four methods were designed, tested, and implemented in the software to display the information contained in the 132-character lines on an eighty character per line basis. When the user invokes the software on a particular analyzed data run and selects his desired table, he views the leftmost 79 characters of the first twenty lines of the table's first page. He then has the option to view the rightmost 53 columns (i.e., the remainder of this particular portion of the table). After completing this sampling exercise, he is prompted to choose one of four different viewing methods. One method is to continue to examine the table by only viewing the leftmost 79 columns, as first displayed. A second method is to view only the rightmost 53 columns for the entire table. A third option is to examine first the left side of the table-page (first 79 columns) then the right side (last 53 columns), alternately, for all of the pages comprising the selected table. The fourth viewing method is to span the entire page in one display by "deleting" or masking out unnecessary columns or fields (as deemed by the user) within the page itself. This is accomplished by creating a series of user-specific, table-specific mask lines. These lines

**ORIGINAL PAGE IS
OF POOR QUALITY**

USER WISHES TO VIEW ANALYZED LASER DATA VIA A SOLVE RUN:
DO YOU WISH TO VIEW DATA ON A MONTHLY BASIS? (YES/NO): YES

ENTER YEAR FOR DATA: 1961
ENTER MONTH FOR DATA (USING FORMAT MM): 05

DO YOU WISH TO VIEW POLAR POSITION OR BASELINE DATA? (P/B): B

SELECT FROM THE FOLLOWING OPTIONS:

- OPTION 1--EXAMINE BASELINE DATA
- OPTION 2--EXAMINE OTHER DATA (BY TABLE TITLE)
- OPTION 3--EXAMINE THE ENTIRE SOLVE RUN, PAGE BY PAGE

ENTER OPTION NUMBER: 1

USER WISHES TO VIEW BASELINE DATA
THERE ARE 11 PAGES IN THIS TABLE

SELECT FROM THE FOLLOWING OPTIONS:

- OPTION 1--DISPLAY ENTIRE BASELINE TABLE
- OPTION 2--DISPLAY BASELINE DATA FOR A PARTICULAR STATION NUMBER
- OPTION 3--DISPLAY BASELINE DATA FOR A PAIR OF STATION NUMBERS

ENTER OPTION NUMBER: 1

LAGERS MAY 1961 (310428 - 810528) BASELINES GEN10

STATION BASELINE CONFIGURATION

STATIONS		BASELINE COMPONENTS (METERS)		
FIRST	SECOND	X	Y	Z
7063	7064	24.30904	-25.90290	-35.34594
7063	7065	21.99977	-16.51059	-24.21047
7063	7069	212753.58057	717003.47044	995313.49526
7063	7092	7274159.06632	-6196078.24643	2959924.66703
7063	7100	-641.99052	-199.43033	-23.77850
7063	7101	-526.83001	-187.61740	-60.74950
7063	7102	26.91200	-14.66634	-22.93272
7063	7103	27.88282	-19.00464	-28.38015
7063	7104	-342.28214	-170.80249	-82.71840
7063	7105	-6.17726	-17.25031	-18.43073

DO YOU WISH TO VIEW THE RIGHT SIDE OF THE TABLE AT THIS TIME? (YES/NO)
(IF NO, USER FORMS A SERIES OF MASK LINES.): YES

PAGE 13

SOLV0101

BASELINE DISTANCE	BASELINE SIGMAS			TOTAL SIGMA
	X	Y	Z	
50.11213				
36.64337				
1244992.78231				
10003295.94650				
673.67716				
562.53058				
33.27885				
44.09155				
426.79674				
25.98891				

Figure 30. Sign-on and Selection Process for Viewing of the Analyzed Data

ORIGINAL PAGE IS
OF POOR QUALITY

USER WISHES TO VIEW ANALYZED LASER DATA VIA A SOLVE RUN;
DO YOU WISH TO VIEW DATA ON A MONTHLY BASIS? (YES/NO): YES

ENTER YEAR FOR DATA: 1981
ENTER MONTH FOR DATA (USING FORMAT MM): 05

DO YOU WISH TO VIEW PLAN OPTION OR BASELINE DATA? (P/B): B

SELECT FROM THE FOLLOWING OPTIONS:

- OPTION 1--EXAMINE BASELINE DATA
- OPTION 2--EXAMINE OTHER DATA (BY TABLE TITLE)
- OPTION 3--EXAMINE THE ENTIRE SOLVE RUN, PAGE BY PAGE

ENTER OPTION NUMBER: 3

USER WISHES TO PAGE THRU THE ENTIRE ANALYZED DATA FILE
THERE ARE 28 PAGES IN THE FILE

*** PAGE 1 ***

SOLVE PROGRAM INPUT DATA(UNITS)

```

COLUMNS(RIGHT) 0000000001111111112222222223333333334444444445555555556666
CARDS (UNDER) 123456789012345678901234567890123456789012345678901234567890123
1 TITLE 2 LAGEOS MAY 1981 (010420 - 810520) BASELINE
2
3 CPRINT 1
4 CSTAT 1 1
5 CBIT 1
6 GEOD 6370144.11
7 PROCES 11 1 5 5
8 DATA
9 CHATRIX 10001605 111
10 CHAT9UP 276034016 30070 700000000 630100002 600300002100
11 CHATRIX 3900105
12 END
    
```

END OF UNIT 5 INPUT

ENTER RESPONSE CODE (ENTER "L" TO VIEW LIST OF CODES): L

ENTER ONE OF THE FOLLOWING RESPONSES:

- <CR> (RETURN) TO CONTINUE TO VIEW FIRST 79 COLUMNS OF THIS PAGE
- "R" TO VIEW THE "RIGHT" 53 COLUMNS OF THIS PAGE
- "N" TO VIEW THE "NEXT" PAGE
- "S" TO "STOP" VIEWING THE ENTIRE RUN

ENTER RESPONSE CODE: N

*** PAGE 2 ***

```

PARAMETER SIGMAS
P042801 0.0 P042802 0.0 P042803 1.000000-10 P050301 0.0
P050801 0.0 P050802 0.0 P050803 0.0 P051301 0.0
P051801 0.0 P051802 0.0 P051803 0.0 P052301 0.0
    
```

COVARIANCE CONSTRAINED MATRICES FOR STATION

NO.	ID	COORDINATE	A * A	A * B	A * C	
1	7063	GEODETIC	1.000000 14	0.0	0.0	1.00
2	7064	GEODETIC	1.000000 14	0.0	0.0	1.00
3	7065	GEODETIC	1.000000 14	0.0	0.0	1.00
4	7069	GEODETIC	1.000000 14	0.0	0.0	1.00
5	7092	GEODETIC	1.000000 14	0.0	0.0	1.00
6	7100	GEODETIC	1.000000 14	0.0	0.0	1.00
7	7101	GEODETIC	1.000000 14	0.0	0.0	1.00
8	7102	GEODETIC	1.000000 14	0.0	0.0	1.00
9	7103	GEODETIC	1.000000 14	0.0	0.0	1.00
10	7104	GEODETIC	1.000000 14	0.0	0.0	1.00

Figure 31. Example of Browsing Procedure for an Analyzed Data File

ORIGINAL PAGE IS
OF POOR QUALITY

ENTER RESPONSE CODE (ENTER "L" TO VIEW LIST OF CODES): 1

P050302	0.0	P050302	0.0
P051302	0.0	P051302	0.0
P052302	0.0	P052302	0.0

D**2		L * C		L**2
0000	14	0.0		1.000000 14
0000	14	0.0		1.000000 14
0000	14	0.0		1.000000 14
0000	14	0.0		1.000000 14
0000	14	0.0		1.000000 14
0000	14	0.0		1.000000 14
0000	14	0.0		1.000000 14
0000	14	0.0		1.000000 14
0000	14	0.0		1.000000 14
0000	14	0.0		1.000000 14
0000	14	0.0		1.000000 14

ENTER RESPONSE CODE (ENTER "L" TO VIEW LIST OF CODES): 11

*** PAGE 3 ***

 ***** EDIT OF CE MATRIX *****
 ***** DIMENSION - 134 *****

10001605 CE MATRIX A'PHIGI PARM (DIMENSION - 134)									
LABEL	PRNTR	LABEL	PRNTR	LABEL	PRNTR	LABEL	PRNTR	LABEL	PRNTR
P042801	4.21520-07	P042802	1.27820-00	P042803	1.95290 01	P050301	4.16720-		
P050801	4.16940-07	P050802	1.24400-00	P050803	1.95500 01	P051301	4.16740-		
P051801	4.16940-07	P051802	1.20500-00	P051803	1.95200 01	P052301	4.16670-		
LA07063	6.81030-01	LU07065	4.24230 00	HT37063	1.52000 01	LA07067	6.81940-		
LA07065	6.81040-01	LU07065	4.24230 00	HT37065	1.43430 01	LA07067	4.92670-		
LA07092	1.63950-01	LU07092	2.22300 00	HT37092	2.87930 01	LA07100	6.81540-		
LA07101	6.81050-01	LU07101	4.24240 00	HT37101	5.10000 00	LA07102	6.81540-		

ENTER RESPONSE CODE (ENTER "L" TO VIEW LIST OF CODES): 5

DO YOU WISH TO EXAMINE THIS SOLVE LISTING AGAIN? (YES/NO): NO

DO YOU WISH TO EXAMINE POLAR MOTION DATA FOR THIS TIME PERIOD? (YES/NO): NO

DO YOU WISH TO VIEW DATA FOR ANOTHER MONTH AND/OR YEAR? (YES/NO): NO

DO YOU WISH TO VIEW DATA FOR A ONE OR FIVE PERIOD NOW? (YES/NO): NO

Figure 31. (Continued)

ORIGINAL PAGE IS
OF POOR QUALITY

PAGE 1 OF TABLE

***** POLAR MOTION (IN ALGOL) *****

PART.	YYMMDD.HH(S)	YYMMDD.HH(C)	ORIGINAL	DELTA
X	01050300	01050300	3.5954250070000000-02	3.18490200505310-02
Y	01050300	01050300	2.6064450070000000-01	1.113602720023730-02
A1-UT1	01050300	01050300	1.9544207070000000-01	3.290823039960010-04
X	01050800	01050800	3.6000003070000000-02	5.733075505011540-03
Y	01050800	01050800	2.5652254070000000-01	-1.277315904050900-03
A1-UT1	01050800	01050800	1.9556354070000000-01	-4.125704705927940-04
X	01051300	01051300	3.6000003070000000-02	2.773002614097820-02
Y	01051300	01051300	2.5252254070000000-01	2.251000705751680-03
A1-UT1	01051300	01051300	1.9560010070000000-01	-1.080452705147070-03

UPDATE

COND. NO. STD. DELV.

1.177999843585530-01	2.0	0.13030-02
2.718806072662370-01	1.3	0.68860-03
1.954453606234400-01	3.2	0.19280-03
9.173307858501050-02	1.0	0.12330-02
2.553222240350400-01	1.4	0.61400-03
1.955594142952140-01	3.2	0.98190-04
1.137300394499700-01	2.4	0.12760-02
2.548505487457520-01	1.3	0.63020-03
1.956664754727000-01	3.0	0.11460-03

Figure 32. (Continued)

DO YOU WISH TO VIEW POLAR POSITION OR BASELINE DATA? (P/D): D

SELECT FROM THE FOLLOWING OPTIONS:

- OPTION 1--EXAMINE BASELINE DATA
- OPTION 2--EXAMINE OTHER DATA (BY TABLE TITLE)
- OPTION 3--EXAMINE THE ENTIRE SOLVE JOB, PAGE BY PAGE

ENTER OPTION NUMBER: 1

USER WISHES TO VIEW BASELINE DATA
THERE ARE 11 PAGES IN THIS TABLE

SELECT FROM THE FOLLOWING OPTIONS:

- OPTION 1--DISPLAY ENTIRE BASELINE TABLE
- OPTION 2--DISPLAY BASELINE DATA FOR A PARTICULAR STATION NUMBER
- OPTION 3--DISPLAY BASELINE DATA FOR A PAIR OF STATION NUMBERS

ENTER OPTION NUMBER: 2

ENTER STATION NUMBER USING FORMAT "####": 7063
STATION BASELINE CONFIGURATION

STATIONS		BASELINE COMPONENTS (METERS)		
FIRST	SECOND	X	Y	Z
7063	7064	24.30904	-25.90290	-35.34594
7063	7065	21.99977	-16.51059	-24.21047
7063	7069	212753.58059	717003.47044	495313.49526
7063	7092	7274159.06633	-6195078.24040	2459924.66793
7063	7100	-641.99055	-199.43033	-43.77850
7063	7101	-526.83001	-187.61740	-60.74950
7063	7102	26.71206	-14.66634	-22.93272
7063	7103	27.68285	-19.00464	-26.38015
7063	7104	-382.28214	-170.80249	-82.71840
7063	7105	-6.17728	-17.25031	-10.43073
7063	7112	2371393.64876	-117906.38626	-100393.33745
7063	7120	6596713.75362	-2446965.35590	1751860.27312
7063	7210	6597140.88602	-2427270.72217	1752526.02944
7063	7805	-1761887.94742	-6147179.11080	-1518519.03271
7063	7833	-2768511.95052	-5221112.03352	-1020984.96958

DO YOU WISH TO VIEW THE RIGHT SIDE OF THE TABLE AT THIS TIME? (YES/NO)
(IF NO, USER FURNISH A SERIES OF MARK LINES.): YES

BASELINE DISTANCE	BASELINE SIGMAS			TOTAL SIGMA
	X	Y	Z	
50.11213				
36.64337				
1244992.78231				
10003295.94650				
672.67716				
562.53058				
38.27885				
44.09155				
426.79674				
25.98091				
2376107.50727				
7244018.75159				
7244673.78932				
6568774.53805				
6003351.07730				

ENTER DISPLAY METHOD NUMBER (ENTER "0" TO VIEW A LIST OF DISPLAY METHODS): 0

CHOOSE FROM THE FOLLOWING DISPLAY METHODS:

- METHOD 1--VIEW ENTIRE TABLE USING A SERIES OF "MARK" LINES
- METHOD 2--VIEW ONLY FIRST 79 COLUMNS OF ENTIRE TABLE
- METHOD 3--VIEW ONLY LAST 53 COLUMNS OF ENTIRE TABLE
- METHOD 4--VIEW FIRST 79 COLUMNS THEN LAST 53 COLUMNS, ETC.

ENTER METHOD NUMBER: 2

Figure 33. Selection Process for Baseline Data From an Analyzed Data File

ORIGINAL PAGE IS
OF POOR QUALITY

PAGE 1 OF TABLE

STATION BASELINE CONFIGURATION

STATIONS		BASELINE COMPONENTS (METERS)		
FIRST	SECOND	X	Y	Z
7063	7064	24.30900	-29.90290	-35.34574
7063	7065	21.99977	-10.51059	-24.21017
7063	7069	212753.58052	717003.47844	995313.49526
7063	7092	7274159.06632	49195078.26618	2959924.66703
7063	7100	-641.99090	-199.43033	-43.77850
7063	7101	-526.85001	-187.61740	-60.71870
7063	7102	26.91200	-14.66634	-22.93272
7063	7103	27.88283	-19.00464	-20.30015
7063	7104	-382.28214	-170.80249	-22.71810
7063	7105	-6.17728	-17.25031	-18.43073
7063	7112	2371393.64870	-117906.30626	-100393.33745
7063	7120	6596713.75367	-2426965.35590	1751060.29312
7063	7210	6597140.88607	-2427278.92217	1752526.02944
7063	7805	-1761887.94742	-6147179.11080	-1518319.08271
7063	7833	-2768511.95052	-5221112.03392	-1020964.96958
7063	7834	-2744370.09983	-5761127.59452	-807509.05946
7063	7835	-3450985.92852	-5387527.41942	-395273.93600
7063	7892	2762198.40171	-242236.09550	-112662.17471
7063	7896	3623926.97642	-176141.95213	428512.26747
7063	7907	-312076.78680	773707.64760	5791007.96348
7063	7921	3067473.98143	245334.14704	662167.46832
7063	7929	-4055754.31147	-1177511.84644	4648411.23919
7063	7943	5578256.13382	-7507508.30111	7609006.62313
7063	97051	3647697.00482	-632528.40301	-22321.41039
7063	97062	3559539.56850	-31621.92223	576017.53619
7063	97067	-1177024.39743	42710.37357	600460.94913
7063	97068	-709768.01286	784108.39330	1675175.39211
7063	97082	2066711.44241	-403324.51140	-247340.88471
7063	97084	3541303.84004	-357627.41345	155441.56506
7063	97085	3484107.66860	-187843.47185	317191.04255
7063	97086	2460039.99604	497154.05271	757929.27153
7063	97090	3519712.27844	-9871702.21183	7072614.64329
7063	97091	-361739.65602	-374092.00925	-302729.26713
7063	97096	7230757.32624	-3837172.90062	5563005.77139
7063	97114	3541136.30810	-357570.55192	155402.70741
7063	97115	3401575.80690	-173826.49763	333071.25872
7063	97890	1004876.66011	627688.49681	793345.01272
7063	97897	-650.48532	-200.51446	-37.57031

Figure 33. (Continued)

consist of a string of blanks, indicating unwanted columns, and other characters (e.g., dashes), indicating columns to be retained and displayed. Figure 34 illustrates this creation process of the series of mask lines.

After enough columns have been deleted or the user indicates the table is in a suitable form (by typing "@STOP" instead of a mask line) the entire table will be displayed in the user's chosen format. Figure 35 shows a portion of the polar motion table before and after this editing process. If desired, the user has the option to save this series of lines in a designated file and recall it by name the next time he wishes to view a table having this identical structure.

4.2.2 Crustal Dynamics Project Newsletter

A second area to be managed by a specially constructed software package is the news exchange process for the DIS. It was determined that the scientists, investigators, and other personnel need to be updated on the status of the project and other information pertinent to their respective endeavors. The concept of a news exchange that would accept news from any authorized user and upon clearance (to validate its accuracy and appropriateness) assemble these news items into a newsletter was devised. This restriction ensures that only scientifically valid information is disseminated to the investigator public. The document would be available on-line to the DIS user and could also be used as input to the Crustal Dynamics Newsletter published by project personnel and distributed to the investigators on a quarterly basis.

Once again, this application required the handling of text data, a feature not currently supported by the ORACLE data base management system. Therefore, a FORTRAN software package was designed that allows the user to browse the inputs to the newsletter, both final and preliminary, and contribute his own news for eventual inclusion.

If the user chooses to browse the news exchange, he may do this in one of two ways: first, by viewing the entire newsletter, or second, by selecting one of the six subjects of which it is composed. If he chooses the first method, the complete news exchange is presented, one subject at a time. If the second method is chosen, the user selects a subject to be viewed and then has the option of viewing the entire contents of this subject, or searching it for particular news items containing the keywords and/or keydates. An example of this menu selection is shown in Figure 36. This figure also illustrates the four search methods open to the user. After the user has completed this browsing exercise, he may then view any other recently-inputted news items, which have not yet been examined by the appropriate project personnel, under the same subject.

After viewing the selected news items, the user may view another (or all) subject(s) or he may contribute information of his own. If he decides to input his own information, he selects an appropriate news subject, inputs his name and location, and a pair of dates referring to his news, and then follows with the text itself. When he has completed his input, his entry of "@RETURN" signals this fact. The news text is annotated with the date and time of

**ORIGINAL PAGE IS
OF POOR QUALITY**

USER WISHES TO VIEW ANALYZED LASER DATA VIA A SOLVE RUN
DO YOU WISH TO VIEW DATA ON A MONTHLY BASIS? (YES/NO): YES

ENTER YEAR FOR DATA: 1981
ENTER MONTH FOR DATA (USING FORMAT MM): 05

DO YOU WISH TO VIEW POLAR MOTION OR BASELINE DATA? (P/D): P

SELECT FROM THE FOLLOWING OPTIONS:

- OPTION 1--EXAMINE POLAR MOTION DATA
- OPTION 2--EXAMINE OTHER DATA (BY TABLE TITLE)
- OPTION 3--EXAMINE THE ENTIRE SOLVE RUN, PAGE BY PAGE

ENTER OPTION NUMBER: 1

USER WISHES TO VIEW POLAR MOTION DATA
THERE ARE 1 PAGES IN THIS TABLE

SELECT FROM THE FOLLOWING OPTIONS:

- OPTION 1--DISPLAY ENTIRE POLAR MOTION TABLE
- OPTION 2--DISPLAY POLAR MOTION DATA FOR A PARTICULAR DATE
- OPTION 3--DISPLAY POLAR MOTION DATA FOR A RANGE OF DATES

ENTER OPTION NUMBER: 1

***** POLAR MOTION (IN ARCS/SECOND) *****

PARAM	YMHDDHH(S)	YMHDDHH(E)	ORIGINAL	DELTA
X	81042800	81042800	5.694293200000000-02	1.092371156824650-02
Y	81042800	81042800	2.636546107000000-01	1.287420200042580-02
A1-UT1	81042800	81042800	1.752738607000000 01	-9.551441004927800-15
X	81050300	81050300	8.595475600000000-02	3.184502835853350-02
Y	81050300	81050300	2.606445807000000-01	1.123602728623730-02
A1-UT1	81050300	81050300	1.954420700000000 01	3.290823439960010-04
X	81050800	81050800	8.600000300000000-02	5.733075505018540-03
Y	81050800	81050800	2.565995407000000-01	-1.277315964959900-03
A1-UT1	81050800	81050800	1.955635400000000 01	-4.125704705927940-04
X	81051300	81051300	8.600000300000000-02	2.77300364497820-02
Y	81051300	81051300	2.525995400000000-01	2.251008745751680-03
A1-UT1	81051300	81051300	1.956851600000000 01	-1.868452703445870-03
X	81051800	81051800	8.600000300000000-02	3.453399003346220-02
Y	81051800	81051800	2.485444600000000-01	-9.110680267416080-03
A1-UT1	81051800	81051800	1.957972400000000 01	-1.882502442827090-03

DO YOU WISH TO VIEW THE RIGHT SIDE OF THE TABLE AT THIS TIME? (YES/NO)
(IF NO, USER FORMS A SERIES OF "MASK" LINES.): NO

THE USER HAS CHOSEN TO INPUT A SERIES OF "MASK" LINES IN ORDER TO VIEW
THE ENTIRE TABLE.

THESE LINES CONSIST OF A STRING OF DASHES (" ") AND BLANKS (" ").
DASHES DEFINE DESIRED COLUMNS, BLANKS DEFINE UNWANTED COLUMNS.

DO YOU HAVE A MASK FOR THIS TABLE? (YES/NO): NO

Figure 34. Creation and Display of Masking Process for Analyzed Data Viewing

ORIGINAL PAGE IS
OF POOR QUALITY

***** POLAR MOTION (IN ARCSECONDS) *****

PARM.	YYMMDD(S)	YYMMDD(FC)	ORIGINAL	DELTA
X	31042300	31042800	8.674493200000000-02	1.092371156025650-02
Y	31042800	31042800	2.636546100000000-01	1.287426230082550-02
A1-JT1	31042800	31042800	1.952936600000000 01	-9.551441304724800-17
X	31050300	31050300	8.575492600000000-02	2.1844562825054350-02
Y	31050300	31050300	2.606445800000000-01	1.123662738623730-02
A1-JT1	31050300	31050300	1.954420700000000 01	3.2408232439764610-04
X	31050800	31050800	3.600000000000000-02	5.733075335014540-03
Y	31050800	31050800	2.565775400000000-01	-1.277312904959900-03
A1-UT1	31050800	31050800	1.955635400000000 01	-4.125704735927940-04
X	31051300	31051300	3.600000000000000-02	2.773003614997820-02
Y	31051300	31051300	2.525775400000000-01	2.251500735751630-03
A1-UT1	31051300	31051300	1.954631600000000 01	-1.868452733447870-03
X	31051800	31051800	8.600000000000000-02	3.453499033346820-02
Y	31051800	31051800	2.425444600000000-01	-9.110600267116080-03
A1-UT1	31051800	31051800	1.957972400000000 01	-1.882502432827090-03

ENTER MASK LINE (TYPE 'JSTCP' TO TERMINATE EDITING PROCESS)

***** POLAR MOTION (IN ARCSECONDS) *****

PARM.	YYMMDD	ORIGINAL	UPDATE	COND. NO.	ST
X	310428	8.674493200000000-02	9.700864356025650-02		6.0
Y	310428	2.636546100000000-01	2.765486720003260-01		1.0
A1-UT1	310428	1.952936600000000 01	1.752938000000000 01		1.0
X	310503	8.575492600000000-02	1.177999043585530-01		2.2
Y	310503	2.606445800000000-01	2.71806072862370-01		1.3
A1-JT1	310503	1.954420700000000 01	1.754453608234400 01		3.9
X	310508	3.600000000000000-02	9.17330758501850-02		1.9
Y	310508	2.565775400000000-01	2.75322240350400-01		1.4
A1-JT1	310508	1.955635400000000 01	1.755594142952140 01		3.9
X	310513	3.600000000000000-02	1.137330394499780-01		2.4
Y	310513	2.525775400000000-01	2.548595407457520-01		1.5
A1-UT1	310513	1.954631600000000 01	1.75664754729660 01		3.6
X	310518	8.600000000000000-02	1.205339938324620-01		2.4
Y	310518	2.425444600000000-01	2.794347791329640-01		1.6
A1-UT1	310518	1.957972400000000 01	1.75778414135720 01		3.6

ENTER MASK LINE (TYPE 'JSTCP' TO TERMINATE EDITING PROCESS)

***** POLAR MOTION (IN ARCSECONDS) *****

PARM.	YYMMDD	ORIGINAL	UPDATE	ST N. DEV.
X	310428	8.674493200000000-02	9.706844356825650-02	0.13490-02
Y	310428	2.636546100000000-01	2.765478928008260-01	0.71130-03
A1-UT1	310428	1.952936600000000 01	1.752938000000000 01	0.10000-07
X	310503	8.575492600000000-02	1.177979043585530-01	0.13030-02
Y	310503	2.606445800000000-01	2.718076072862370-01	0.60060-03
A1-UT1	310503	1.954420700000000 01	1.754453608234400 01	0.10280-03
X	310508	3.600000000000000-02	9.17331708501850-02	0.12330-02
Y	310508	2.565775400000000-01	2.75322240350400-01	0.61400-03
A1-UT1	310508	1.955635400000000 01	1.755594142952140 01	0.98190-04
X	310513	3.600000000000000-02	1.137330394499780-01	0.12760-02
Y	310513	2.525775400000000-01	2.548595407457520-01	0.63020-03
A1-JT1	310513	1.954631600000000 01	1.75664754729660 01	0.11460-03
X	310518	8.600000000000000-02	1.205339938324620-01	0.16750-02
Y	310518	2.425444600000000-01	2.794347791329640-01	0.76090-03
A1-UT1	310518	1.957972400000000 01	1.75778414135720 01	0.11330-03
X	310523	8.574493200000000-02	9.723577128602590-02	0.90340-02
Y	310523	2.434974200000000-01	2.564475095309500-01	0.36000-02
A1-UT1	310523	1.958970900000000 01	1.750974792636520 01	0.20310-03

DO YOU WISH TO SAVE THIS SERIES OF MASK LINES FOR FUTURE USE? (YES/NO): YES

ENTER USER ID: CEN
ENTER A NAME FOR THIS SERIES OF MASK LINES (UP TO 10 CHARACTERS IN LENGTH)
PIMASK6

DO YOU WISH TO VIEW THE POLAR MOTION DATA AGAIN? (YES/NO): NO

DO YOU WISH TO EXAMINE THIS SOLVE LISTING AGAIN? (YES/NO): NO

DO YOU WISH TO EXAMINE BASELINE DATA FOR THIS TIME PERIOD? (YES/NO): NO

DO YOU WISH TO VIEW DATA FOR ANOTHER MONTH AND/OR YEAR? (YES/NO): NO

DO YOU WISH TO VIEW DATA FOR A ONE OR FIVE PERIOD NOW? (YES/NO): NO

Figure 34. (Continued)

ORIGINAL PAGE IS
OF POOR QUALITY

PART.	YH IDI... (S)	YH IDI... (C)	ORIGINAL	FLTA	UPDATE	COU. NO.	STD. DEV.
X	78090100	78090100	1.77150330 000000-01	-2.38691180020124E-02	1.534912110179180-01	1.1	0.4814E-02
Y	78090100	78090100	4.198527207000000E-01	1.28732796348149E-02	4.327309996348440-01	4.0	0.5194E-02
X	78090600	78090600	1.892564407000000E-01	6.44638473585958E-02	1.593209038473590-01	2.5	0.5488E-02
Y	78090600	78090600	4.008907007000000E-01	1.037101435149319E-02	4.197705743549220-01	5.0	0.4178E-02
AI-UT1	78090600	78090600	1.709709207000000E-01	2.340940717451640-04	1.709709209007470-01	1.5	0.1877E-03
X	78091100	78091100	2.021913507000000E-01	-1.34617013557050E-02	1.587296486440350-01	2.0	0.5217E-02
Y	78091100	78091100	3.978436907000000E-01	-2.44363251320773E-02	3.924000574864740-01	3.0	0.3811E-02
AI-JT1	78091100	78091100	1.711030707000000E-01	0.29081964974494E-04	1.711113608196500-01	2.0	0.1967E-03
X	78091600	78091600	2.130401707000000E-01	-0.14547992136732E-02	2.0494007100706350-01	4.7	0.4904E-02
Y	78091600	78091600	3.857432507000000E-01	1.56312685739612E-02	4.013748485739610-01	4.0	0.3540E-02
AI-UT1	78091600	78091600	1.712464407000000E-01	1.31082200264437E-02	1.712595482206260-01	2.5	0.1900E-03
X	78092100	78092100	2.229400007000000E-01	-7.78787030203055E-02	2.181261876371610-01	7.0	0.4403E-02
Y	78092100	78092100	3.726055307000000E-01	2.64143310726274E-02	3.726128610726270-01	3.7	0.3762E-02
AI-UT1	78092100	78092100	1.713020007000000E-01	1.04917507680074E-02	1.714004919564680-01	3.0	0.1942E-03
X	78092600	78092600	2.318439707000000E-01	1.00202003748474E-02	2.336479965948470-01	6.0	0.4838E-02
Y	78092600	78092600	3.596955307000000E-01	9.6548322173463E-02	3.693533652517390-01	4.0	0.3132E-02
AI-UT1	78092600	78092600	1.715070407000000E-01	3.19312520903014E-02	1.715409717526400-01	3.0	0.1987E-03

PART.	YH IDI...	ORIGINAL	UPDATE	STD. DEV.
X	780901	1.771563300000000E-01	1.533912110179180-01	0.4814E-02
Y	780901	4.198527200000000E-01	4.327309996348440-01	0.5194E-02
X	780906	1.892564400000000E-01	1.593209038473590-01	0.5488E-02
Y	780906	4.008907000000000E-01	4.197705743549220-01	0.4178E-02
AI-UT1	780906	1.709709200000000E-01	1.709709209007470-01	0.1877E-03
X	780911	2.021913500000000E-01	1.587296486440350-01	0.5217E-02
Y	780911	3.978436900000000E-01	3.924000574864740-01	0.3811E-02
AI-UT1	780911	1.711030700000000E-01	1.711113608196500-01	0.1967E-03
X	780916	2.130401700000000E-01	2.0494007100706350-01	0.4904E-02
Y	780916	3.857432500000000E-01	4.013748485739610-01	0.3540E-02
AI-UT1	780916	1.712464400000000E-01	1.712595482206260-01	0.1900E-03
X	780921	2.229400000000000E-01	2.181261876371610-01	0.4403E-02
Y	780921	3.726055300000000E-01	3.726128610726270-01	0.3762E-02
AI-UT1	780921	1.713020000000000E-01	1.714004919564680-01	0.1942E-03
X	780926	2.318439700000000E-01	2.336479965948470-01	0.4838E-02
Y	780926	3.596955300000000E-01	3.693533652517390-01	0.3132E-02
AI-UT1	780926	1.715070400000000E-01	1.715409717526400-01	0.1987E-03

Figure 35. Portion of the Polar Motion Data Table Before and After the Masking Process

ORIGINAL PAGE IS
OF POOR QUALITY

THIS IS THE NEWS EXCHANGE OF THE CRUSTAL DYNAMICS PROJECT,
THIS NEWS EXCHANGE GIVES THE USER THE OPPORTUNITY TO BROWSE IN THE EXISTING
NEWS OR TO CONTRIBUTE HIS OWN NEWS FOR INCLUSION IN THE NEWS EXCHANGE.

SELECT FROM THE FOLLOWING CATEGORIES:

CATEGORY 1--BROWSE THE NEWSLETTER
CATEGORY 2--CONTRIBUTE TO THE NEWSLETTER

ENTER CATEGORY NUMBER: 1

USER WISHED TO BROWSE THE NEWS EXCHANGE
SELECT FROM THE FOLLOWING BROWSE METHODS:

METHOD 1--BROWSE THE ENTIRE NEWS EXCHANGE
METHOD 2--BROWSE A PARTICULAR NEWS SUBJECT OF THE NEWS EXCHANGE

ENTER METHOD NUMBER: 2

USER WISHED TO BROWSE A PARTICULAR NEWS SUBJECT
SELECT FROM THE FOLLOWING OPTIONS:

OPTION 1--BROWSE THE ENTIRE NEWS SUBJECT
OPTION 2--SEARCH THE NEWS SUBJECT FOR A PARTICULAR WORD OR
DATE

ENTER OPTION NUMBER: 2

SELECT SUBJECT OF NEWS FROM THE FOLLOWING LIST

POSSIBLE SUBJECTS:

SUBJECT 1--NEWS ABOUT PROCESSED LASER DATA
SUBJECT 2--NEWS ABOUT PROCESSED VLBI DATA
SUBJECT 3--NEWS ABOUT ANALYZED LASER DATA
(E.G., BASELINES, ETC.)
SUBJECT 4--NEWS ABOUT ANALYZED VLBI DATA
(E.G., BASELINES, POLAR MOTION, ETC.)
SUBJECT 5--TLRB SCHEDULE, NEWS RELATED TO OCCUPANCY OF SCHEDULED SITES
SUBJECT 6--OTHER GENERAL NEWS
(NEWS THAT DOES NOT EXPLICITLY FIT INTO ABOVE
NAMED SUBJECTS) E.G., NEWS ABOUT MEETINGS INTER-
COMPARISONS, ETC. ALSO, ANY SUGGESTIONS FROM
USERS FOR IMPROVING THE NEWS EXCHANGE.)

END OF LIST

ENTER SUBJECT NUMBER: 1

THIS IS THE SEARCH FUNCTION FOR THE NEWS EXCHANGE OF THE CRUSTAL
DYNAMICS PROJECT. THE SELECTED NEWS SUBJECT WILL NOW BE SEARCHED FOR
A PARTICULAR KEYWORD, KEYDATE, OR KEYWORD IN A RANGE OF DATES, DEPENDING
ON THE PREFERENCE OF THE USER.

SELECT FROM THE FOLLOWING OPTIONS:

OPTION 1--SEARCH TEXT FOR KEYWORD
OPTION 2--SEARCH TEXT FOR DATE
OPTION 3--SEARCH TEXT FOR KEYWORD IN A RANGE OF INPUT DATES
OPTION 4--SEARCH TEXT FOR KEYWORD IN A RANGE OF DATA-REFERENCE
DATES

ENTER OPTION NUMBER: 4

SELECT FIRST DATE USING THE FORMAT MM/DD/YY: 06/01/80

SELECT SECOND DATE USING THE FORMAT MM/DD/YY: 12/31/80

TYPE KEYWORD TO SEARCH TEXT FOR (UP TO 20 CHARACTERS IN LENGTH)
KEYWORD MAY BE EXPRESSIONS SUCH AS: LASER DATA, VLBI, JULY 1982, ETC.
THE ENTIRE KEYWORD SHOULD BE TYPED IN UPPER CASE LETTERS.

MORLAS

THE DATE AND TIME COMMENTS WERE RECEIVED: 3 12 81 10:51:34
COMMENTS SENT BY USER D. SMITH

AT LOCATION OSFC
COMMENTS IN REFERENCE TO START DATE 10 1 80
AND END DATE 10 30 80

MODIFICATIONS CURRENTLY UNDER TEST AT OSFC ARE EXPECTED TO PROVIDE A
SIGNIFICANT IMPROVEMENT TO DATA FROM MORLAS UNITS 4 THROUGH 8. MORLAS 4
IS UNDERGOING FINAL CHECK-OUT ON A CAVITY DUMP MODIFICATION WH. 4 IS
EXPECTED TO REDUCE BIAS TO LESS THAN 10 CM. IF SUCCESSFUL, THE SAME
MODIFICATION WILL BE EMPLOYED ON MORLAS UNITS 5-8.

Figure 36. Selection Process for the Crustal Dynamics
News Exchange

input, the data reference dates and investigator's information, and then stored in the appropriate subject file. Figure 37 illustrates the entry process as well as a listing of the stored news item.

5. SUMMARY

This work has discussed several aspects of the Data Information System that will be incorporated into NASA's Crustal Dynamics Project. It was intended to serve as an illustration of the methods of implementation of such a system, not as a final draft of the resulting applications. Although the majority of the formats presented here will be employed in the final, operational DIS, several will be updated to reflect new features, as they are presented to project personnel for review, and enhancements to the current technology (such as the text processing capabilities in the next version of the ORACLE DBMS) as they become available.

ORIGINAL PAGE IS
OF POOR QUALITY

THIS IS THE NEWS EXCHANGE OF THE CRUSTAL DYNAMICS PROJECT.
THIS NEWS EXCHANGE GIVES THE USER THE OPPORTUNITY TO BROWSE IN THE EXISTING
NEWS OR TO CONTRIBUTE HIS OWN NEWS FOR PUBLICATION IN THE NEWS EXCHANGE.

SELECT FROM THE FOLLOWING CATEGORIES:

- CATEGORY 1--BROWSE THE NEWSLETTER
- CATEGORY 2--CONTRIBUTE TO THE NEWSLETTER

ENTER CATEGORY NUMBER: 1

SELECT SUBJECT OF NEWS FROM THE FOLLOWING LIST

POSSIBLE SUBJECTS:

- SUBJECT 1--NEWS ABOUT PROCESSED LASER DATA
- SUBJECT 2--NEWS ABOUT PROCESSED VLBI DATA
- SUBJECT 3--NEWS ABOUT ANALYZED LASER DATA
(L.O., BASELINES, ETC.)
- SUBJECT 4--NEWS ABOUT ANALYZED VLBI DATA
(C.O., BASELINES, POLARIZATION, ETC.)
- SUBJECT 5--NEWS SCHEDULES, NEWS RELATED TO OCCUPANCY OF SCHEDULED SITES
- SUBJECT 6--OTHER GENERAL NEWS
(NEWS THAT DOES NOT EXPLICITLY FIT INTO ABOVE
NAMED SUBJECTS; I.E., NEWS ABOUT MEETING INTER-
COMPARISONS, ETC. ALSO, ANY SUGGESTIONS FROM
USERS FOR IMPROVING THE NEWS EXCHANGE.)

END OF LIST

ENTER SUBJECT NUMBER: 6

YOUR USER ID: ULS
YOUR NAME: G. L. SMITH
YOUR LOCATION: CODE 921, GSFC

INDICATE THE RANGE OF DATES FOR WHICH YOUR FOLLOWING COMMENTS WILL APPLY
START DATE (USING FORMAT MM/DD/YY): 07/01/81
END DATE (USING FORMAT MM/DD/YY): 07/02/81

TYPE COMMENTS TO BE USED IN THE NEWS EXCHANGE.
EACH LINE MAY BE UP TO 79 CHARACTERS IN LENGTH.
IT IS RECOMMENDED (FOR PROPER FUNCTIONING OF THE SEARCH ROUTINE) THAT WORDS
NOT BE HYPHENATED AT THE END OF A LINE.
SIGNIFY THE END OF THE NEWS TEXT BY TYPING THE EXACT EXPRESSION "RETURN".

THE 55 TENTATIVELY SELECTED CRUSTAL DYNAMICS PROJECT INVESTIGATORS WILL JOIN
WITH THE LASPOS INVESTIGATORS FOR A 3-DAY WORKING SESSION SEPTEMBER 1 THROUGH
3 AT GSFC.
THIS WILL BE THE FIRST MEETING OF THE NEWLY FORMED CRUSTAL DYNAMICS WORKING
GROUP. NASA HEADQUARTERS HAS TENTATIVELY SELECTED THE DOMESTIC AND FOREIGN
INVESTIGATORS FROM APPROXIMATELY 90 PROPOSALS SUBMITTED IN RESPONSE TO THE
CRUSTAL DYNAMICS ANNOUNCEMENT OF OPPORTUNITY.
THE FIRST DAY AND A HALF OF THE MEETING WILL BE DEVOTED TO REPORTS FROM LASPOS
INVESTIGATORS ON THE PROGRESS OF THEIR RESEARCH.

THE AFTERNOON OF THE SECOND AND ALL DAY OF THE THIRD HAVE BEEN SCHEDULED
TENTATIVELY FOR DISCUSSION OF THE PROJECT'S STATUS, OBSERVING PROGRAM, DATA
AVAILABILITY, CONTRACT ARRANGEMENTS AND A REVIEW OF THE ACCEPTED PROPOSALS.
RETURN

NEWS SUCCESSFULLY INPUT UNDER SUBJECT 6

DO YOU WISH TO CONTINUE TO BROWSE OR CONTRIBUTE TO NEWS EXCHANGE? (YES/NO): YES
SELECT FROM THE FOLLOWING CATEGORIES:

- CATEGORY 1--BROWSE THE NEWSLETTER
- CATEGORY 2--CONTRIBUTE TO THE NEWSLETTER

ENTER CATEGORY NUMBER: 1

USER WISHES TO BROWSE THE NEWS EXCHANGE
SELECT FROM THE FOLLOWING BROWSE METHODS:

- METHOD 1--BROWSE THE ENTIRE NEWS EXCHANGE
- METHOD 2--BROWSE A PARTICULAR NEWS SUBJECT OF THE NEWS EXCHANGE

ENTER METHOD NUMBER: 2

USER WISHES TO BROWSE A PARTICULAR NEWS SUBJECT
SELECT FROM THE FOLLOWING OPTIONS:

- OPTION 1--BROWSE THE ENTIRE NEWS SUBJECT
- OPTION 2--SEARCH THE NEWS SUBJECT FOR A PARTICULAR WORD OR
DATE

ENTER OPTION NUMBER: 1

Figure 37. Entry Process for the Crustal Dynamics News Exchange

ORIGINAL PAGE IS
OF POOR QUALITY

SELECT SUBJECT OF NEWS FROM THE FOLLOWING LIST

POSSIBLE SUBJECTS:

SUBJECT 1--NEWS ABOUT PROCESSED LASER DATA
SUBJECT 2--NEWS ABOUT PROCESSED VLBI DATA
SUBJECT 3--NEWS ABOUT ANALYZED LASER DATA
(L.A.S., WAVELENGTHS, ETC.)
SUBJECT 4--NEWS ABOUT ANALYZED VLBI DATA
(L.A.S., WAVELENGTHS, PHASE LOCKING, ETC.)
SUBJECT 5--LASER SCHEDULE, NEWS RELATED TO OCCUPANCY OF SCHEDULED CITY
SUBJECT 6--OTHER GENERAL NEWS
(NEWS THAT DOES NOT EXPLICITLY FIT INTO ABOVE
CATEGORIES) (E.G., NEWS ABOUT MEETINGS, INTER-
COMPARISONS, ETC. ALSO), ANY SUGGESTIONS FROM
USERS FOR IMPROVING THE NEWS EXCHANGE.)

END OF LIST

ENTER SUBJECT NUMBER: 6

THE DATE AND TIME COMMENTS WERE RECEIVED: 7 21 81 13:01:16
COMMENTS SENT BY USER D. SMITH

AT LOCATION: OSFC
COMMENTS IN REFERENCE TO START DATE 12 1 80
AND END DATE 12 31 80

THE "LAGOS TECHNICAL COLLECTIVE" WILL PROVIDE NEWS OF INTEREST TO LAGOS

INVESTIGATORS: INFORMATION ABOUT THE AVAILABILITY, QUALITY, AND QUANTITY
OF DATA, SUMMARIES OF IMPORTANT RESULTS FROM PAST INVESTIGATIONS, AND
ANNOUNCEMENTS OF RELEVANT MEETINGS AND RESEARCH. THE EDITORS EXPECT TO
PUBLISH THE ISSUES OF A QUARTERLY BASIS.
THE NEWS TEXT CONSISTS OF 5 LINES

THE DATE AND TIME COMMENTS WERE RECEIVED: 7 23 81 13:03:23
COMMENTS SENT BY USER D. SMITH

AT LOCATION: OSFC
COMMENTS IN REFERENCE TO START DATE 12 1 80
AND END DATE 12 2 80

THE THIRD LAGOS WORKING GROUP SESSION WILL BE HELD AT OSFC ON WEDNESDAY
AND THURSDAY, OCTOBER 1 AND 2, 1980.
MAJOR SUBJECTS TO ADDRESS AT THE SESSION INCLUDE THE MOST RECENT STATUS
OF THE CRUSTAL DYNAMICS PROJECT, DATA AVAILABILITY AND NETWORK STATUS FOR
OSFC AND SAU LASER NETWORKS, AS WELL AS DETAILED DISCUSSION ON THE
EUROPEAN LASER NETWORK IN THE U.S., FRANCE, THE NETHERLANDS AND GERMANY.
THE NEWS TEXT CONSISTS OF 6 LINES

END OF NEWS TEXT FOR SUBJECT 6

DO YOU WISH TO SEARCH NEWS SUBJECT 6 NOW? (YES/NO): NO

DO YOU WISH TO VIEW UN-EDITED NEWS FOR SUBJECT 6? (YES/NO): YES

THE DATE AND TIME COMMENTS WERE RECEIVED: 07 5 81 09:13:32
COMMENTS SENT BY USER D. E. SMITH

AT LOCATION: CODE 921, OSFC
COMMENTS IN REFERENCE TO START DATE 7 1 81
AND END DATE 7 3 81

THE 55 TENTATIVELY SELECTED CRUSTAL DYNAMICS PROJECT INVESTIGATORS WILL JOIN
WITH THE LAGOS INVESTIGATORS FOR A 3-DAY WORKING SESSION SEPTEMBER 1 THROUGH
3 AT OSFC.

THIS WILL BE THE FIRST MEETING OF THE NEWLY FORMED CRUSTAL DYNAMICS WORKING
GROUP. NASA HEADQUARTERS HAS TENTATIVELY SELECTED THE DOMESTIC AND FOREIGN
INVESTIGATORS FROM APPROXIMATELY 90 PROPOSALS SUBMITTED IN RESPONSE TO THE
CRUSTAL DYNAMICS ANNOUNCEMENT OF OPPORTUNITY.

THE FIRST DAY AND A HALF OF THE MEETING WILL BE DEVOTED TO REPORTS FROM LAGOS
INVESTIGATORS ON THE PROGRESS OF THEIR RESEARCH.

THE AFTERNOON OF THE SECOND AND ALL DAY ON THE THIRD HAVE BEEN SCHEDULED
TENTATIVELY FOR DISCUSSION OF THE PROJECT'S STATUS, OBSERVING PROGRAM, DATA
AVAILABILITY, CONTRACT ARRANGEMENTS AND A REVIEW OF THE ACCEPTED PROPOSALS.
THE NEWS TEXT CONSISTS OF 14 LINES

END OF UN-EDITED NEWS FOR SUBJECT 6

DO YOU WISH TO BROWSE ANOTHER NEWS SUBJECT? (YES/NO): NO

DO YOU WISH TO CONTINUE TO BROWSE OR CONTRIBUTE TO NEWS EXCHANGE? (YES/NO): NO

Figure 37. (Continued)

REFERENCES

1. "Studying Tectonics With Quasar VLBI." Physics Today. April 1981.
2. "VLBI: Extragalactic Radio Sources Used To Measure Crustal Dynamics." LAGEOS Technical Bulletin. Vol. 1, No. 4. NASA/GSFC. Sept. 1981.
3. Lowman, P. D. Jr. "A Global Tectonic Activity Map." Bulletin of The International Association Of Engineering Geology No. 23. Krefeld, 1981.
4. NASA Execution Phase Project Plan for Crustal Dynamics. NASA/GSFC. September 1981.
5. Linder, H. G. Data Management Plan for Crustal Dynamics Project. NASA/GSFC X-931-81-81. July 1981.
6. ORACLE User's Guide Version 2.3. Relational Software Inc.. April 1981.