MICROART TRAINING GUIDE
(FOR VIZ RADIOSONDES)

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service
Office of Systems Operations/Systems Integration Division

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1. Introduction

1.1 Purpose

This training guide is designed to teach you how to take upper air observations with the Microcomputer Automatic Radiotheodolite (MicroART) system using VIZ radiosondes. In writing this guide, we assume you have a basic knowledge of taking an observation with the ART system. We do not assume you have previous experience using a microcomputer.

1.2 Organization

This training guide has 16 chapters and four appendices. Chapter 2 provides a description of the MicroART system and instruction in using the IBM XT microcomputer. Chapter 3 describes how to manipulate data on floppy diskettes with the Diskette Utilities option of MicroART. Chapters 4 and 5 show you how to use the Rework option to display and edit data using data from a pre-recorded flight. Chapter 6 describes the process of entering station data into MicroART. **These data must be entered before most MicroART functions can be used.**

Chapter 7 describes the process of checking to be sure the system is operating properly before a flight. Chapters 8 through 11 deal with the process of taking an actual MicroART observation. Chapter 12 discusses the transfer of archive files after a flight. Chapter 13 deals with the Resume and Rework options. What to do when special in-flight conditions arise is the subject of Chapter 14. Chapter 15 discusses the procedure for performing multiple releases. Chapter 16 describes the procedures used to process ranging data for a transponder flight. Appendix A describes the procedure for loading radiosonde calibration files onto the microcomputer. Appendix B provides codes for the Clouds/Weather entry in the prerelease data. Appendix C provides instructions for recreating the Ascension Log file which is critical for transferring archive files from the hard disk to an Archive Diskette. Appendix D is a glossary that defines a number of terms related to MicroART.

1.3 How to Use This Training Guide

To begin, it would be advisable to read Chapter 2 to learn some of the basic principles behind MicroART. If you have used microcomputers in the past, you might want to skip those sections discussing the operation of the IBM XT.

Chapter 3, Using Diskette Utilities, can be read after Chapter 2, or you can postpone it until you start manipulating files on diskettes.

You should work carefully through Chapters 4 through 5 which deal with the Rework command. These chapters provide hands-on experience with flight-related functions without having to release a radiosonde.

You can read Chapter 6, Entering Station Data, to familiarize yourself with the process of inputting information about the station into MicroART. These data, however, are actually entered by a designated person at your station.

When you feel comfortable with using the MicroART system, read Chapters 7 through 11 to learn about those subjects not covered by the Rework option. Training flights will be special observations taken at times other than the standard synoptic times.

You should become familiar with Chapters 12 through 16 as soon as time permits. This training guide covers most situations you will encounter in making observations. Nevertheless, unusual cases not dealt with may arise; use your judgement in deciding how to deal with such cases. Report these cases and how you handled them to your regional upper air coordinator.

1.4 VIZ and Vaisala Versions of MicroART

MicroART can be used with radiosondes manufactured by either VIZ or Vaisala. There is also three possible choices of VIZ radiosondes. (The VIZ B radiosonde, the VIZ transponder, and the VIZ B2 radiosonde. A few of the screens and prompts that appear are different for the different types of radiosondes. Overall using MicroART is very similar for all kinds of radiosondes. You tell MicroART which type of radiosonde is being used by entering the appropriate value in the Sonde Manufacturer field of the Station Data (see Section 6.2.1). This entry is made once and only has to be changed if there is a change in the type of radiosonde being used. MicroART automatically displays the proper screens for the type of radiosonde selected.

2. System Description

2.1 Introduction

This chapter provides an introduction to the MicroART system. First, there is a brief discussion of the system hardware. Then the technique for starting and stopping the MicroART program is described. Following that is a discussion of some of the types of displays you will be seeing. And last but not least is a description of the various floppy diskettes on which data are stored.

2.2 System Overview

The MicroART system collects and processes upper air data from radiosondes and allows you to interactively display, edit, and transmit these data. The system is very interactive and allows you to exercise a high degree of control over the product that is produced and transmitted.

With MicroART, you enter prerelease data such as the current weather and flight equipment information at the keyboard of the IBM XT. Radiosonde baselining is also done while at the IBM XT. Once the radiosonde is released, MicroART's interactive capabilities allow you to display data in real time and to edit data of doubtful quality. Data are stored automatically, and you can rework flights with MicroART. In case of a power failure during a flight, MicroART allows you to save and transmit the data that were collected up to the point where power was lost. If a VIZ B2 radiosonde is being used the operator has the capability to resume the flight and continue processing data. No other radiosonde type allows the operator to go beyond where the power failure occurred.

2.3 System Hardware

The MicroART system hardware consists of the following items:

a. IBM Personal Computer XT
b. IBM Personal Computer Color Display
c. IBM Personal Computer Keyboard
d. Printer
e. ART Interface Card (ARCTIC)
f. Cable to ART Equipment
g. ART Equipment
h. Modem

Exhibit 2-1 illustrates the MicroART hardware and how it connects with other upper air equipment.

The ART equipment tracks the radiosonde and collects the signals it emits. The signals are transmitted from the ART equipment through a cable to the IBM XT. The ARCTIC, which is inside the IBM XT, converts these signals to a digital (numeric) form that can be used by the MicroART computer program. The MicroART program has a user interface that allows you to display and edit upper air data during the flight. When the coded messages are ready for transmission, they are sent from the MicroART program to a modem. The modem converts the data into a form that can be transmitted over telephone lines, and then sends the data to the host computer.

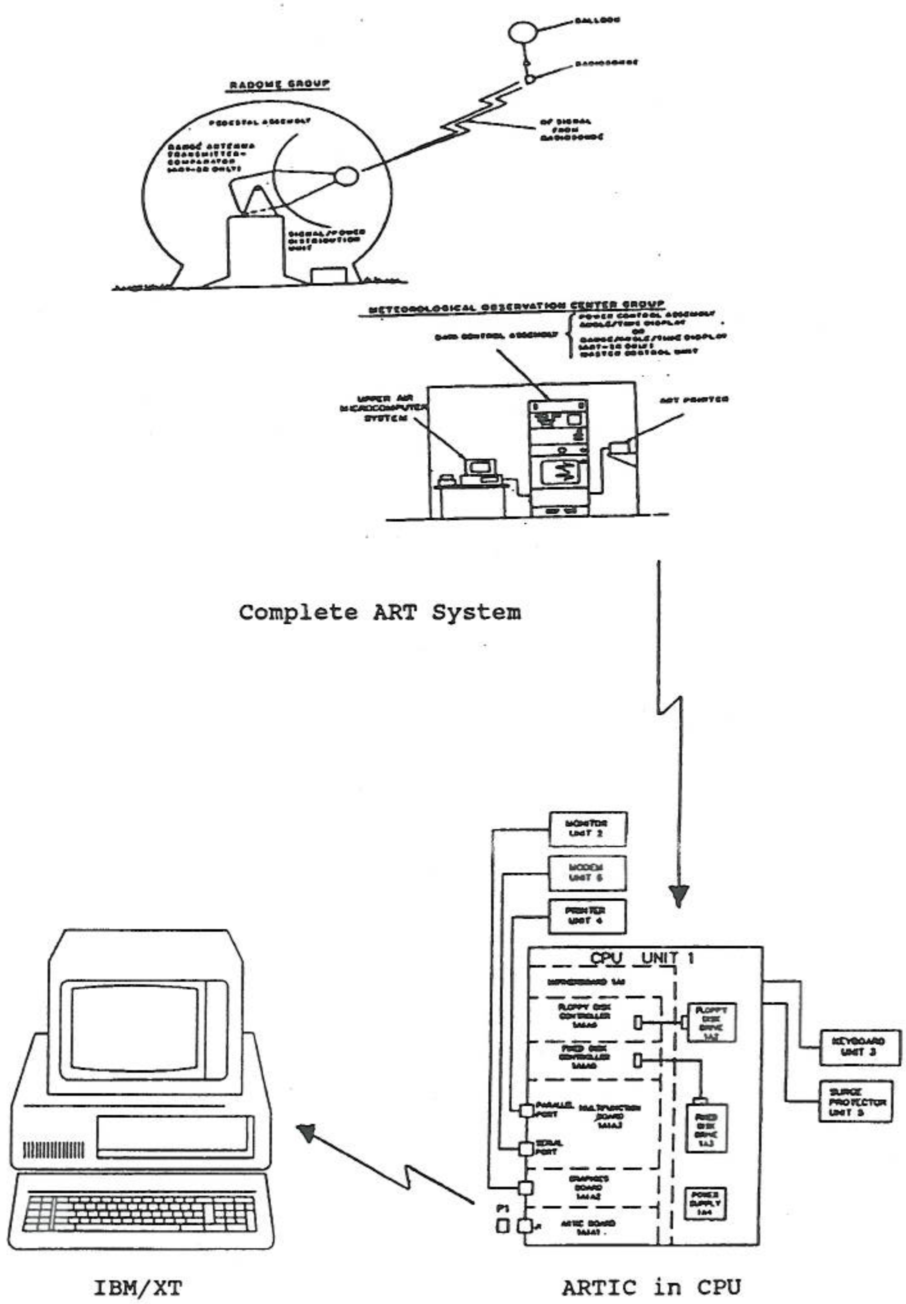

Exhibit 2-1. Micro-ART system diagram.

2.4 Keyboard

You enter commands to MicroART through the keyboard. Exhibit 2-2 shows the layout of the keyboard and indicates some of the keys that you will use frequently with MicroART.

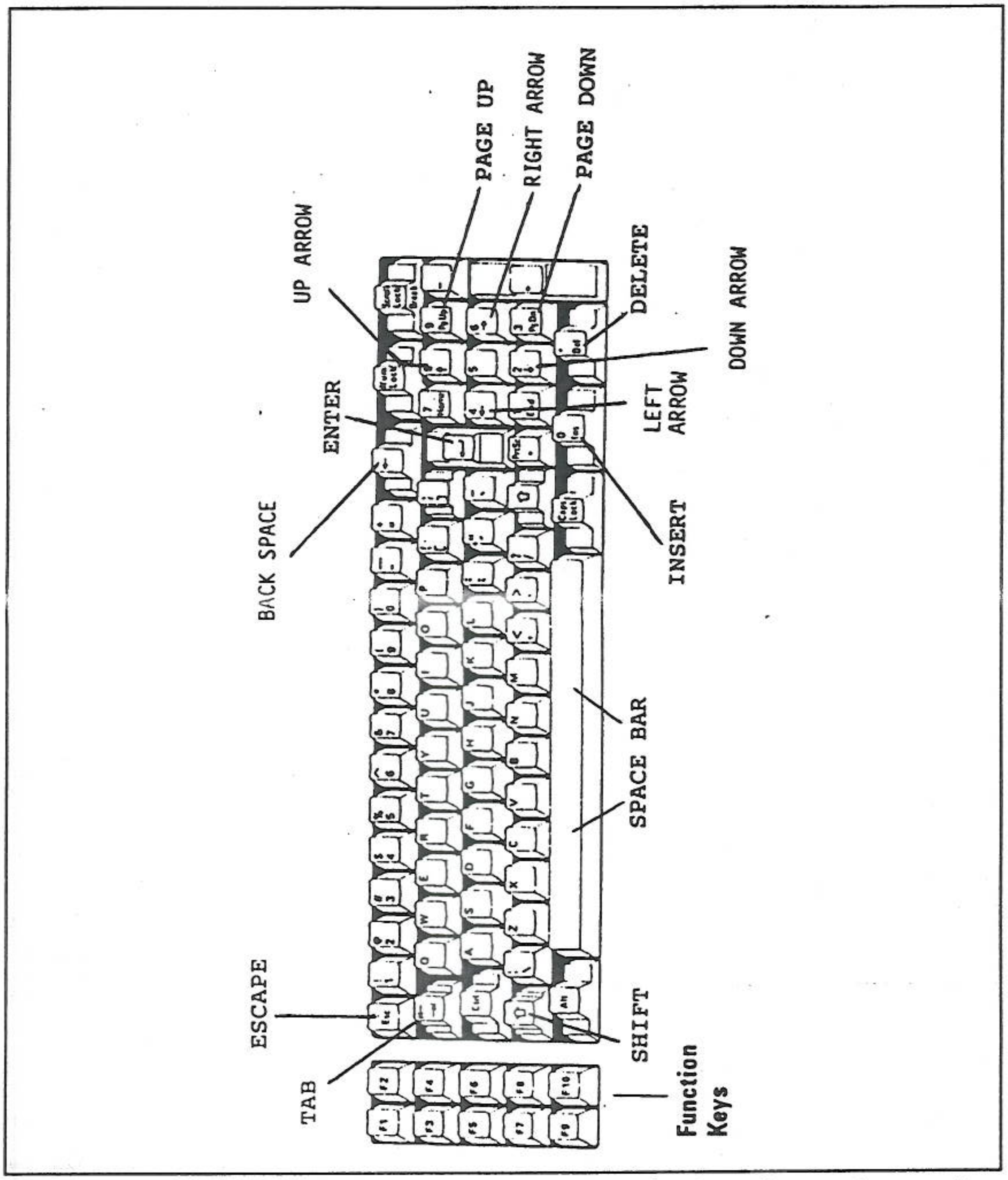

Exhibit 2-2. IBM Personal Computer keyboard showing keys that are frequently used in Micro-ART.

Some keys have specialized uses in MicroART. The following list describes these uses. The list of keys is ordered from left to right on the keyboard. Don't worry about memorizing this list! MicroART provides many on-screen prompts on the functions of keys, and later sections of this Training Guide provide guidance in using these keys.

Keys	Function
Function Keys ([F1], [F2], [F3],...[F10])	Varying functions such as deleting and restoring data, changing features of plots. (Functions are always indicated at bottom of display.)
[Esc]	Exits from current screen. Generally returns user to the previous screen or function.
[Tab]	Advances cursor one entry. Used in completing certain data screens.
[Shift]-[Tab] (pressed simultaneously)	Moves cursor to the previous entry. Used in completing certain data screens.
[Shift]	Produces an uppercase letter when pressed simultaneously with an alphabetic key. Produces symbol on upper portion of numeric key when the two keys are pressed simultaneously.
[Space Bar]	Inserts blank space in current cursor position and advances cursor one space to the right.
[Back Space]	Deletes character to the immediate left of the cursor and moves cursor one space to the left.
[Enter]	Enters data and responses to prompts.
[Ins] (Insert)	Inserts groups in coded messages.
[Del] (delete)	Deletes the character above the cursor.

[↑] (Up Arrow)	Moves cursor up one line without affecting text or data.
[↓] (Down Arrow)	Moves cursor down one line without affecting text or data.
[←] (Left Arrow)	Moves cursor one space to the left without affecting text or data.
[→] (Right Arrow)	Moves cursor one space to the right without affecting text or data.

When typing data or commands using the alphabetic keys, it doesn't matter whether you use uppercase or lowercase letters. MicroART is not case sensitive.

2.5 Diskette Drive

The diskette drive reads data from diskettes and writes data to them. This diskette drive is also referred to as the A: drive. The diskette drive is located on the front center part of the IBM XT. Diskettes are inserted into the diskette drive through the horizontal slot on the front of the drive. The drive door is the latch located just above the horizontal slot. The drive door must be closed (pushed down) in order to read or write data.

The light on the lower left part of the diskette drive turns red when the diskette drive is either reading or writing data. The drive door should not be opened when the light is on.

2.6 Inserting Diskettes

To insert a diskette into the diskette drive, follow these steps:

1. Grasp the diskette by one of its top corners with the label facing up.
2. With the label side up and the label away from the diskette drive, place the diskette into the horizontal slot on the front of the drive.
3. Push the diskette all the way into the drive.
4. Close the drive door by pressing down on the latch. (With some disk drives you must turn a handle clockwise.)

2.7 Hard Disk

The hard disk is located inside the IBM XT on the right side. The light on the front right side of the IBM XT illuminates when data are being read from or written to the hard disk. The hard disk on MicroART computers holds either 10 megabytes (Mb) or 20 Mb of data.

The MicroART program is stored on the hard disk, along with the store, archive, and station data.

2.8 Starting the MicroART Program

To start the MicroART programs, follow these steps:

1. Check to be sure the diskette drive door on the IBM XT is open and that no diskette is in the drive.

2. Turn on the IBM XT computer, display, printer, and modem. Some systems may be connected to a single power source that has one switch that activates the system. Have your Electronics Technician (ET) show you the appropriate method for activating your system.

3. When the power is switched on the IBM XT begins a power-on self test, which checks the computer's memory. The following message appears in the upper-left corner of the screen:

   XXX KB OK

   The number XXX continues to increase as the memory is checked. The self-test takes about one minute. (If the screen is still dark, be sure the screen brightness and contrast controls are not set too low.)

4. Your IBM XT contains an AST Sixpakplus card, the screen only shows a date prompt. The screen appears as shown in Exhibit 2-3.

```
AST clock   Version 1.21
© Copyright AST Research, Inc.,
          1982, 1984, 1985.

esident clock/calendar
   DATE & TIME processors loaded.

Current date is 05/21/97
Current time is 10:57:13:00
Current date is Wed  5-21-97
Enter new date (mm-dd-yy)
```

Exhibit 2-3. Date and time screen appearing when Micro-ART program starts

5. If the date and time are correct, press [Enter] twice and proceed to the Virus Check Program. If the date or time needs to be changed enter the correct information and press [Enter].

```
Virus Control: Beginning scan for viruses. Press ESC if
               you want to abort scanning.

NVCLEAN
Copyright © 1992-1196, Norman Data Defense Systems
Unauthorized use and duplication strictly prohibited

Scanning...

273 Files in 16 directories

 Files Scanned: 97
 Infected Files: 0

 Files Cleaned: 0
 Files Deleted: 0

Time Elapsed: 29 Secs
```

Exhibit 2-4. Virus Check screen.

6. The Virus Check program will automatically check all directories and scan each file. If an infected file is found the Virus Check will clean the file. The virus check usually takes approximately 30 seconds to check all files on the hard drive.

   If an infected file can not be cleaned the operator should turn off the computer and then rerun the Virus Check program. If the infected file can still not be cleaned, The operator should note what file or sector was considered infected and contact the Regional Upper Air Program Manager for further instructions.

7. The Main Menu should appear after the Virus Check program concludes. (Exhibit 2-5).

Micro-ART Version 2.90

VIZ B2 Main Menu

ART Options

Archive Flights

Load Calibration Files

Edit Station Data

Reports

Diskette Utilities

Shut Down System

Exit to DOS

Exhibit 2-5. Main Menu screen.

2.9 Restarting the MicroART Program

On rare occasion the MicroART system may "hang up." If this has happened, your entries at the keyboard have no effect. When you press a key, the computer may beep at you. When the system hangs up, follow these steps:

1. First, try pressing the [Esc] key. This may restore the system to working order.

2. If that doesn't work, perform a "warm boot" of the system. To do this, first open the diskette drive door and then press the [Ctrl]-[Alt]-[Del] keys simultaneously. This will cause the system to restart, and the date and time screen will be displayed after about 15 seconds.

3. If this fails, turn the IBM XT, display, and printer off at the power source. Then follow the directions in Section 2.8 for starting the system. Starting the system from the power-off state is called a "cold-boot."

4. If the system still hasn't responded, call an ET for assistance.

2.10 Starting MicroART From DOS

DOS stands for Disk Operating System. It is the IBM computer program that normally controls the operation of IBM microcomputers. Under certain circumstances, you may find that you are in DOS instead of the MicroART program. You will know you are in DOS if you see a C: on the screen. The C: may be followed by other characters. For example, all of these sets of characters indicate you are in DOS:

C:\>
C:\ART>
C:\ART\RESULTS>
C:\ART\STORE>
C:\ART\VIZCAL>

When you are in DOS, it is possible to start MicroART without going through the process described in Section 2.8. To start MicroART from DOS, type ARTSTART and press [Enter]. The Main Menu is displayed.

2.11 Turning the System Off

Follow these steps when you have finished a training session and wish to turn the system off:

1. Return to the Main Menu screen in the program, which is discussed in Section 2.12.1. (However, you won't hurt anything if some other MicroART screen is displayed when you go on to Step 2.)

2. Remove any diskettes in the diskette drive and leave the drive door open.

3. Turn off the printer, display, and IBM XT at the power source.

2.12 MicroART Screens

MicroART displays information to you via screens that appear on the display. The main types of screens are:

a. Menus
b. Monitors
c. Data displays
d. Plots

The following subsections describe and provide examples of each of these screens.

2.12.1 Menus

You can perform a variety of functions with MicroART. Menus are used to select functions and are the first things presented to the observer when the program is started.
Follow these steps to familiarize yourself with using menus:

1. Start the MicroART program using the instructions in Section 2.8. The Main Menu appears on the display.

2. Note the ART Options choice is in yellow letters on a red background. When a choice appears this way, it is said to be "highlighted." Only one choice can be highlighted at a time.

3. Press [↓]. The Archive Flights choice is highlighted.

4. Press [↓] six more times. The menu choices are successively highlighted, and the Exit to DOS choice is highlighted when you finish.

5. Press [↓] once more. The ART Options choice is highlighted. Note how the highlight bar moved upward from the bottom of the menu.

6. Press [↑]. The Exit to DOS choice is again highlighted. Thus the highlight bar can also move from the top of the menu directly to the bottom.

7. Press [↓] once more. The ART Options choice is again highlighted.

8. When a choice is highlighted, the function it represents can be selected by pressing the [Enter] key. Now press the [Enter] key to select the ART Options choice. Another menu appears. This is the ART Options menu (Exhibit 2-6). This menu contains five choices of functions that are used in ART observations. Don't select any of these functions just yet.

Micro-ART Version 2.90

ART Options

Check System Status

ART Observation

Resume Observation

Rework Observation

Retransmit Messages

Exhibit 2-6. ART Options Menu.

9. To return to the Main Menu, press [Esc].

   In the MicroART program, pressing [Esc] will generally allow you to exit from a menu or function and return to where you were previously.

   There are other menus in MicroART, but they function similarly to the two you have just seen. Now you'll learn about real-time monitors in MicroART.

2.12.2 Monitors

Monitors are screens that display live data just before and during a flight. There are two monitors: the ART system status monitor and the real-time monitor. The ART system status monitor displays the operational status of the ARCTIC board, modem, and printer. Exhibit 2-7 shows how the ART system status monitor appears while the ARCTIC board test is in progress.

```
MicroART SYSTEM STATUS CHECK VERSION 2.90

        ARCTIC BOARD:
             PRINTER:
               MODEM:

Wait ...  ARCTIC Board Test in Progress
```

Exhibit 2-7 ART system status monitor.

You will perform this system status check before each flight. Chapter 7 further describes this process.

The real-time monitor displays data during a flight. Exhibit 2-8 shows an example of the real-time monitor.

```
Station: Sterling, VA          Launch Time: 11:40          Ascension: 061-1
Met Time   Dir   Press  Tempr  RH    El     Az    Range  Sync  QR  Ref    Frame
  5.0       -    844.9    6.9  68  21.80 303.71          LOCK  99 1047.0  1814

 2.6 Superadiabatic lapse rate from 0.0 to 0.1 min. of 11.9 Deg/Km.
 3.3 Successful release.
================================ COMMAND ================================
?>






H:Help
```

Exhibit 2-8. Real-time monitor example.

The real-time monitor consists of two parts. The heading displays current data for the flight. (Don't worry about the meaning of the different types of data right now.) The command area immediately below the heading is used for entering commands and message display. Note the ?> prompt at the far left side of screen below the line with the word COMMAND on it. When the ?> prompt is displayed, you can enter commands to display, delete, and transmit data.

2.12.3 Data Displays

Data can be displayed in a number of parts of the MicroART program. During a flight, you will display data most often to check its accuracy and to edit erroneous data. Figure 2-9 shows one way data may be displayed during a flight. (Don't be concerned about the details of the display right now.)

MicroART REWORK Version 2.90

Station: Sterling, VA
Ascension: 212-1 Date: 16-MAY-97 Time: 11:04 Rework No.: 1
R/S No: 840000077.CSN MDO#: 1155432

MET

Time(min)	Altitude(m)	Pressure(mb)	QP	Temp°	QT	RH(%)	QU	I/D	Dir
0.0	85	1000.1	100	23.7	100	36.0	100		
0.1	107	997.6	99	21.6	72	40.3	73		
0.2	128	995.2	99	21.3	92	41.6	91		
0.3	149	992.7	99	20.9	89	41.7	89		
0.4	169	990.4	99	20.0	99	41.8	98		
0.5	190	988.0	99	19.7	87	42.7	91		
0.6	210	985.7	98	19.4	93	43.5	91		
0.7	231	983.3	97	19.2	88	44.1	92		
0.8	252	980.9	98	19.0	97	45.0	93		
0.9	274	978.4	99	18.8	91	45.5	93		
1.0	296	975.9	99	18.7	90	46.2	91		
1.1	319	973.3	98	18.4	92	46.2	96		
1.2	341	970.8	99	18.1	94	46.7	98		
1.3	366	968.0	98	17.9	99	47.2	99		
1.4	391	965.1	99	17.7	99	47.6	99		
1.5	416	962.3	98	17.5	99	48.0	99		
1.6	442	959.4	99	17.2	99	48.3	99		

F6: Time: F7: Restore Data F8: Del Temp F9: Del RH F10: Del Pr

Exhibit 2-9. Sample data display.

2.12.4 Plots

Some data can be displayed graphically using plots. The variation during the flight of pressure, temperature, relative humidity, elevation angle, and azimuth angle can be plotted. Exhibit 2-10 is a plot of time versus pressure for an entire flight. Instructions on displaying plots are provided in Section 5.3.4.

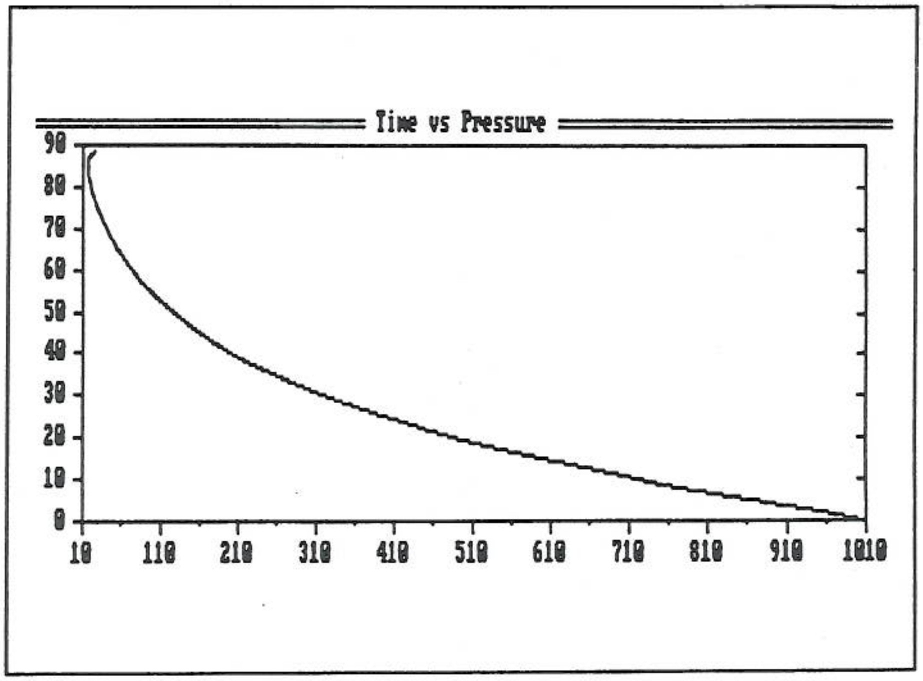

Exhibit 2-10 Sample pressure plot.

2.13 Diskettes

Floppy diskettes play an important role in data storage in MicroART. An example of one of these 5.25" diskettes is shown in Exhibit 2-11. The rectangular notch on the right side of the diskette can be covered with a write-protect tab to prevent data from being written to the diskette.

Seven different types of data are stored on diskette, and each type of data is stored on a separate diskette. The following sections describe the MicroART diskettes.

NOTE: Always use a felt-tip pen when writing on a label that is attached to a diskette. Using a ball-point pen can damage the diskette.

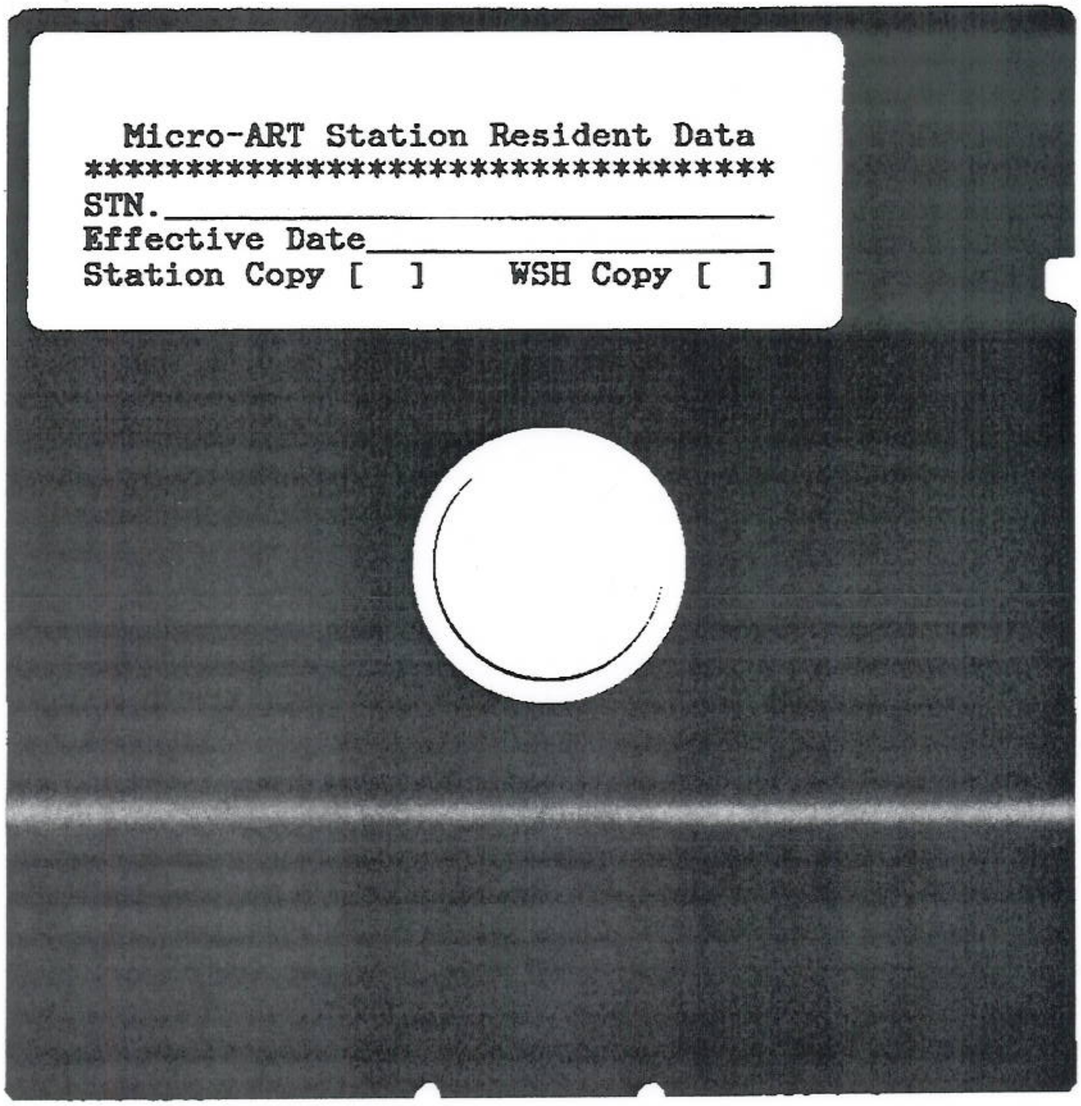

Exhibit 2-11. 5.25" Floppy Diskette

2.13.1 Training Diskette

A substantial part of your MicroART training will involve displaying and editing data from previously recorded flights using the Rework function (Chapters 4 and 5). The Training Diskette contains the data for these flights. The Training Diskette also contains some files that will be used when you learn about the Diskette Utilities option in Chapter 3. The label on the Training Diskette looks like this:

MicroART Training Diskette
****
Version 2.90 June 1, 1997
****
****

2.13.2 VIZ Calibration Diskette

The VIZ Calibration Diskette contains the VIZ radiosonde calibration data required by the MicroART program. One of these diskettes comes in each box of VIZ radiosondes and contains the calibration data for all of the radiosondes. Among the data on the diskette are the pressure calibration table, baseline sensor data, and electronic component data. The contents of this diskette are discussed further in Appendix A.

2.13.3 Log Diskette

The Log Diskette is used to store one-second meteorological and position data during a flight. The data on this diskette serve as a backup in case of a system hang-up during a flight, such as a power failure for a limited amount of time. The same Log Diskette is normally used repeatedly on station. Anytime the flight contains unusual events of a meteorological or programming nature, use the Copy Diskette option from the Diskette Utilities submenu to copy the Log and Store diskettes (see Chapter 3). Please forward these to NWS Headquarters (WSH), Observing Systems Branch, W/OSO14 Upper Air Program. Include a short narrative and any supporting printer plots/lists of the data. They have the capability to reproduce the flight at WSH and will try to determine the problem or cause of the event(s).

Just before the radiosonde baseline procedure, MicroART prompts you to insert the Log Diskette into the floppy diskette drive. During the course of the flight, MicroART stores the 1-second meteorological and position data on this diskette. The calibration data for the radiosonde are also copied onto this diskette.

If a system hang-up does occur during a flight, data on the Log Diskette are used to reprocess the flight. After flight termination, the data on the Log Diskette are no longer needed. The same diskette can be used repeatedly from flight to flight. The label on the Log Diskette looks like this:

MicroART Flight Log Diskette
****
Date Began_______________________
(STN.________________ASC NO.____)
( )= Required Only if Sent to WSH

2.13.4 Store Diskette

The Store Diskette contains 6-second meteorological and position data, as well as a copy of the radiosonde calibration and station data. This diskette is used for reworking observations **after** termination to correct a problem that was not found during a flight or to correct a problem from a previous flight.

After flight termination, these data are stored on the hard disk. MicroART then prompts you to insert the Store Diskette into the floppy diskette drive, and the data are copied from the hard disk onto the Store Diskette. Data for about 10 flights can be stored on one Store Diskette. The average size of a store file on the Store Diskette is 35,000 bytes (35K). Each station requires approximately 7 disks per month. These are for local use and a copy of each diskette is sent at the beginning of each month to the National Data Climatic Center (NCDC) in Ashville, North Carolina. The store diskettes may also be used for backup or for making copies for distribution to outside upper air users. Each Store Diskette should have a write-protect tab applied after the disk is full. The label on the Store Diskette looks like this:

MicroART Store Diskette
****
STN.______________________________
ASC NO.___________THRU___________
MO.________________YR.___________

2.13.5 Archive Diskette

The Archive Diskette contains data from the observations in the NCDC format. After flight termination, these data are stored on the hard disk in a temporary archive file. The final archive data are transferred to the Archive Diskette using the Archive Flights option of the Main Menu (see Chapter 12).

Archive Diskettes containing the data for 1 month are sent to NCDC at the beginning of the following month. Data for about 25 to 30 flights can be stored on each Archive Diskette. Each Archive Diskette should have a write-protect tab applied after the disk is full and is ready for shipment to NCDC. Thus, normally three Archive Diskettes are sent to NCDC at the beginning of each month. These diskettes will not be returned to your station from NCDC. The label on the Archive Diskette looks like this:

MicroART Archive Diskette
****
STN.______________________________
ASC NO.__________THRU_________
MO.______________YR.__________

The disk label should be completely filled out and the disks placed in a protective mailer (actual mailer or 2 pieces of cardboard will do). Place the protected disks in an envelope and mail to NCDC no later than the 5th of the month.

2.13.6 Station Data Diskette

The Station Data Diskette serves as a backup to the station data file that resides on the hard disk. The station data file contains information about the station location, upper air equipment, host computer, and the limiting angles table. After the station resident data have been entered and stored on the hard disk for the first time, these data are copied onto the Station Data Diskette. If the station data are ever inadvertently erased from the hard disk, they can be copied from the Station Data Diskette back onto the hard disk. Chapter 6 deals with creating and storing the station data. The label on the Station Data Diskette looks like this:

MicroART Station Resident Data
****
STN.______________________________
Effective Date_____________________
Station Copy [ ] WSH Copy [ ]

Table 1 presents a summary of the features of the MicroART diskettes

Diskette Name	Data on Diskette	Diskette Used For Input	Diskette Used For Output
Training	Training data	During training	Never.
VIZ Calibration	VIZ radiosonde calibration data	During prerelease sequence	After all radiosondes in box are used, diskette is recycled to station supply.
Log	1-second meteorological and position data	If the system hangs up during a flight, e.g., power failure, flight can be resumed using this diskette.	During a flight. The same diskette can be used from one flight to another. Diskette from flights with system problems can be sent to WSH.
Store	6-second meteorological and position data	Diskette used to rework flights after termination and read at NCDC	Immediately after a flight, when ART Observation is exited.
Archive	Level data in NCDC format	Data read at NCDC	When archive files are transferred from the hard disk using the Transfer Archive function.
Station Data	Station resident data	When station data file on hard disk are accidentally erased	When station data are first entered onto the hard disk or station data are changed.

3. Using Diskette Utilities

3.1 Introduction

MicroART stores several data sets on 5.25" floppy diskettes. The Diskette Utilities option allows you to perform basic operations on these diskettes, such as formatting, copying, and erasing.

Before you begin training in Diskette Utilities, you should have a basic knowledge of using a microcomputer, either from previous experience or by reading Chapter 2 of this training guide.

3.2 Diskette Utilities Tutorial

In this section you will learn to use each of the seven operations provided in Diskette Utilities. Before you begin, obtain the diskette labeled "MicroART Training Diskette" and a blank diskette. Then follow these steps to become familiar with Diskette Utilities:

1. Turn on the MicroART computer using the directions provided in Section 2-8. The Main Menu appears, with ART Options highlighted (yellow letters on a red background) (Exhibit 3-1).

MicroART Version 2.90

Main Menu

ART Options

Archive Flights

Load Calibration Files

Edit Station Data

Reports

Diskette Utilities

Shut Down System

Exit to DOS

Exhibit 3-1. Main Menu.

2. Press [↑] three times. The Diskette Utilities option is highlighted.

3. Press [Enter] to select the Diskette Utilities option. The Diskette Utilities menu appears, with the List Directory option highlighted (Exhibit 3-2).

```
                    MicroART Version 2.90

                      Diskette Utilities


                    List Directory

                     Check Diskette Format

                     Format Diskette

                     Copy Diskette

                     Erase Diskette

                     Delete File(s)

                     Virus-check DOS Diskette

Insert diskette in drive, make selection, then press Enter
```

Exhibit 3-2. Diskette Utilities Menu.

4. Be sure the "MicroART Training Diskette" has a write-protect tab covering the small rectangular notch on the right side of the diskette.

5. Insert the "MicroART Training Diskette" into the diskette drive. (The label should be up and toward you as you insert the diskette.) Close the drive door by pushing the latch down or by turning the handle clockwise, whichever is appropriate for your drive.

6. Press [Enter] to select the List Directory option. The red light on the drive lights up as the disk is read. The directory, or list of files on the diskette, appears (Exhibit 3-3). Five characteristics of each file are listed horizontally. From left to right these characteristics are the file name, the file name extension, the amount of space in bytes occupied by the file, and the date and time the file was created. (The amount of space occupied by the files on your diskette may vary slightly from that shown in Exhibit 3-3.)

```
List directory

 Volume in drive A has no label
 Directory of  A:\

 1217       S97    80824   2-27-97     3:07P
 1219       S97    80824   4-25-97     8:29P
            2 File(s)       200704  bytes  free
Press Enter to continue.
```

Exhibit 3-3. List Directory command.

NOTE: A file is usually identified by its file name followed by a period followed by its file name extension. For example, the file with the name 1217 and extension S97 would be identified as file 1217.S97.

7. Press [Enter]. The Diskette Utilities menu reappears.

8. Press [↓]. The Check Diskette Format option is highlighted.

9. Press [Enter] to select the Check Diskette Format option. Information about space on the disk is displayed (Exhibit 3-4). (Again, the figures for your diskette may vary slightly from the ones shown in this exhibit.)

10. Press [Enter]. The Diskette Utilities menu reappears.

11. **Remove the MicroART Training Diskette from the diskette drive.**

12. Press [↓] twice. The Format Diskette option is highlighted.

13. Press [Enter] to select the Format Diskette option. The screen shown in Exhibit 3-5 appears.

```
Check diskette

  362496 bytes total disk space
  161792 bytes in 1 user files
  200704 bytes available on disk

  655360 bytes total memory
  556768 bytes free

Press Enter to continue.
```

Exhibit 3-4. Check Diskette Format command.

```
Format diskette

Insert new diskette for drive A:
and strike ENTER when ready
```

Exhibit 3-5. Format Diskette command.

14. Insert the blank diskette into the diskette drive.

NOTE: When the Format Diskette option is performed, all data on the diskette are destroyed. Be sure the correct diskette is in the drive before this option is executed.

15. Press [Enter]. The diskette is formatted, i.e., all files and data on the diskette are removed, and the diskette is prepared to receive data. This takes about one minute. After the format is complete, the display will appear as shown in Exhibit 3-6.

```
Format diskette

Insert new diskette for drive A:
and strike ENTER when ready

Formatting...Format complete

   362496 bytes total disk space
   362496 bytes available on disk

Format another (Y/N)?
```

Exhibit 3-6. Screen appearing after FORMAT command is issued.

16. Press N in response to the prompt **Format another (Y/N)?** (either uppercase or lowercase letters can be typed). Press [Enter]. The Diskette Utilities menu reappears.

17. Press [↓] three times. The Copy Diskette option is highlighted.

18. Press [Enter]. The screen shown in Exhibit 3-7 appears.

```
Copy diskette

Insert SOURCE diskette in drive A:

Press any key when ready . . .
```

Exhibit 3-7. Copy Diskette command.

19. Remove the newly formatted diskette from the drive, and put the MicroART Training Diskette into the drive. This diskette is the source diskette, or the diskette that is to be copied from.

20. Press [Enter]. The following message appears:

    Copying 40 tracks
    9 Sectors/Track, 2 Side(s)

    The files on the diskette are being read into the computer's memory. This takes about half a minute. The following message then appears:

    Insert TARGET diskette in drive A:
    Press any key when ready . . .

21. Remove the MicroART Training Diskette from the drive. Insert the newly formatted diskette into the drive. This diskette is the target diskette, or the diskette that is copied to.

22. Press [Enter]. The files from the source diskette are copied from the computer's memory onto the target diskette. This takes about 45 seconds.

23. Press N in response to the prompt **Copy another diskette (Y/N)?**. The Diskette Utilities menu reappears.

24. Press [↑] twice. The Delete File(s) option is highlighted.

25. Press [Enter]. The screen shown in Exhibit 3-8 appears.

```
Delete file(s)

Volume in drive A has no label
Directory of  A:\

1217        S97        1219        S97
     2 File(s)                200704 bytes free

Enter name of file to delete:
```

Exhibit 3-8. Delete File command.

The file name and extension for the one file on the diskette are shown.

26. In response to the prompt **Enter name of file to delete:**, type 1219.s97 and press [Enter]. The prompt **Delete 1219.S97 (Y/N)?** appears.

27. Press Y and [Enter]. The file is deleted.

28. In response to the prompt, **Delete another file (Y/N)?**, simply press [Enter], and the predetermined response N is selected. The Diskette Utilities menu reappears.

29. Press [↑] three times. The Erase Diskette option is selected.

30. Press [Enter]. The screen shown in Exhibit 3-9 appears.

```
Erase diskette


 Volume in drive A has no label
 Directory of  A:\

1217    S97   1219        S97
      2 File(s)    200704 bytes free

WARNING: All files above are about to be erased.
Are you sure (Y/N)?
```

Exhibit 3-9. Erase Diskette command.

NOTE: When the Erase Diskette option is performed, all data on the diskette are destroyed. Be sure the correct diskette is in the drive before this option is executed.

31. In response to the prompt **WARNING: All files above are about to be erased. Are you sure (Y/N)?**, press Y and [Enter]. All of the files on the diskette are erased. The Diskette Utilities menu reappears.

32. To verify that the files were indeed erased, press [Enter] to select the List Directory option. The screen shown in Exhibit 3-10 appears.

33. Press [Enter] to return to the Diskette Utilities menu.

34. Press [↑] the Virus-check option is highlighted.

```
Virus-check DOS Diskette

NOTE:  Do not check log disks with this program.

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Scanning...

2 Files In 1 Directories

  Files Scanned: 2
  Infected Files: 0

  Files Cleaned: 0
  Files Deleted: 0

  Time Elapsed: 3 Secs

Press Enter to continue.
```

Exhibit 3-10. Virus-check for DOS Diskettes

4. Rework - Prerelease Data

4.1 Introduction

This chapter and the next provide instruction in the Rework function of MicroART. Rework is normally used to correct data after a flight has been completed. Rework contains most of the capabilities for displaying and editing data that are available in the ART Observation option of MicroART, which is used during an actual observation. Learning to use Rework with data from a stored flight will allow you to become familiar with many MicroART features before you take an actual observation.

Before you begin training in Rework, you should have a basic knowledge of using a microcomputer, either from previous experience or by reading Chapter 2 of this training guide.

4.2 Rework - Prerelease Data Tutorial

Before the radiosonde is released, information about the flight must be supplied to MicroART. In this chapter you will see an example of these prerelease data for a sample flight and get some experience in manipulating the data. The prerelease data are displayed on five separate screens. Each of the screens is dealt with in a separate section.

4.2.1 Getting Started

1. Turn on the MicroART computer following the instructions in Section 2.8. The Main Menu appears (Exhibit 4-1), and the ART Options choice is highlighted (yellow letters on a red background).

```
MicroART Version 2.90

VIZ B2 Main Menu

ART Options

Archive Flights

Load Calibration Files

Edit Station Data

Reports

Diskette Utilities

Shut Down System

Exit to DOS
```

Exhibit 4-1. Main Menu.

NOTE: If at some point you accidentally hit the wrong key and can't get back to the appropriate place in the training steps, try pressing [Esc] once or twice. If you are still having problems, you can restart the MicroART program. To do this, first open the diskette drive door by lifting the latch up. (This is done so the computer won't try to restart using the Training Diskette.) Then press [Ctrl]-[Alt]-[Del] simultaneously. The date and time prompt appears in about 15 seconds.

2. Insert the diskette labeled "MicroART Training Diskette" into the diskette drive. (If you aren't familiar with how to do this, see Section 2.6.)

3. Select the ART Options choice by pressing [Enter]. The ART Options Menu appears, with the Check System Status option highlighted (Exhibit 4-2).

MicroART Version 2.90

ART Options

Check System Status

ART Observation

Resume Observation

Rework Observation

Retransmit Messages

Exhibit 4-2. ART Options Menu.

4. Press [↑] twice to highlight the Rework Observation option.

5. Press [Enter] to select this option. The screen shown in Exhibit 4-3 appears.

```
MicroART Version 2.90          Prerelease Data

Ascension Number ?>
```

Exhibit 4-3. Ascension number prompt screen.

6. In response to the **Ascension Number ?>** prompt, type A:1217.S97. (You can use either uppercase or lowercase letters; all letters you type appear as uppercase in MicroART). This is the name of the file on the diskette in the A: drive containing data for the stored flight. Press [Enter]. The following prompt appears:

   Should current station data be used? [Y/N]:

NOTE: The ascension number is entered as a four-digit number. The first digit is the release number (1, 2, or 3) and the last three digits are the actual ascension number. For example, the second release of ascension 603 would be typed as 2603. To read the data from the Store Diskette, type A: before the ascension number (for example, A:2603). To read the data from the hard disk, just type the number (for example, 2603).

7. Press N and [Enter] so that the station data for Sterling, VA, originally stored with the flight will be used. (The **current** station data are the data for your station contained in the Station Data file on the hard disk.) The Administrative Data screen appears.

4.2.2 Administrative Data Screen

At the top of the Administrative Data screen (Exhibit 4-4) is the prerelease data heading. The data in the heading are read automatically from the Station Data file. (Because the stored flight was not compared with a previous flight, the Date Last Flight, Hour, and Prev. Asc. No. entries are blank. Normally there would be appropriate entries for these fields.)

```
MicroART Version 2.90          Prerelease Data                  Rework No.: 2

Station: Sterling, VA                Index: 72403          Pressure Corr: 0.0 mb
Orientation correction AZ: 0.00      EL:  0.00             Elevation: 85 m
Date Last Flight:                    Hour:                 Prev. Asc. No.:

*** Administrative Data ***

Observer:                    RNT
Date:                   02/12/97
Hour:                         15
Ascension Number:            217
Release Number:                1
Process Winds [Y/N]:           Y
Process Ranging Data [Y/N]:    N
Special Observation [Y/N]:     N
Termination Level         0.1 mb


                              PgDn:Next Screen
```

Exhibit 4-4. Administrative Data screen.

NOTE: The entry in the upper right-hand corner of the screen indicates this is the second rework for this flight. (The first rework created the final version of the data for the training diskette.) If the rework number on your screen is greater than two, then the original file has been overwritten. Contact the appropriate person at your station to obtain a copy of the original training diskette.

Below the heading is administrative data that the observer fills in before each flight. Since this is the Rework option, these data have already been supplied.

To the right of each field name is a data entry. Note the cursor has moved automatically to the Process Winds entry. The entries for Observer, Date, Hour, Ascension Number, and Release Number cannot be changed in Rework.

Follow these steps to get become more familiar with the administrative data:

1. At the Process Winds entry, press [Enter]. Note that the entry for Process Winds remains unchanged, and that the cursor advances to the next entry automatically.

2. At the Process Ranging Data entry, press [Enter].

3. At the Special Observation entry, press Y and [Enter].

4. The Termination Level entry applies **only** to Special Observations. If the Special Observation entry is N, the Termination Level entry is automatically skipped.

5. At the Termination Level entry press the space bar three times, type 0.5, and press [Enter]. The Flight Equipment Data screen appears.

4.2.3 Flight Equipment Data Screen

The Flight Equipment Data screen (Exhibit 4-5) shows the configuration of the flight equipment. Note the same prerelease data heading appears for this screen as for the Administrative Data screen.

Follow these steps to get some practice in manipulating the data on this screen:

1. The Radiosonde Type entry is ST, which stands for solid-state time-commutated radiosonde. Press [Enter] to keep this entry unchanged.

2. At the Balloon Size entry type 1000 and press [Enter].

3. Accept the Balloon Mfg (manufacturer) entry by pressing [Enter].

4. Type 12/31/96 at the Date Balloon Mfg (manufactured) entry and press [Enter].

5. Accept the Parachute entry by pressing [Enter].

6. Press Y and [Enter] at the Train Regulator entry.

7. Accept the Lighting Unit entry by pressing [Enter]. The VIZ Radiosonde Data screen appears.

```
MicroART Version 2.90           Prerelease Data                    Rework No.: 2

Station: Sterling, VA                Index: 72403            Pressure Corr: 0.0 mb
Orientation correction AZ: 0.00      EL:  0.00               Elevation: 85 m
Date Last Flight:                    Hour:                   Prev. Asc. No.:

*** Flight Equipment Data ***

Radiosonde Type:                  ST
Balloon Size:                    600
Balloon Mfg:                  KAYSAM
Date Balloon Mfg:           01/14/97
Parachute? [Y/N]:                  Y
Train Regulator? [Y/N]:            N
Lighting Unit? [Y/N]:              N

                 PgDn:Next Screen        PgUp:Previous Screen
```

Exhibit 4-5. Flight Equipment Data screen.

4.2.4 VIZ Radiosonde Data Screen

The VIZ Radiosonde Data screen (Exhibit 4-6) shows information about the radiosonde and its calibration parameters.

```
MicroART Version 2.90          Prerelease Data               Rework No.:  2

Station: Sterling, VA               Index: 72403        Pressure Corr: 0.0 mb
Orientation correction AZ: 0.00     EL:   0.00          Elevation: 85 m
Date Last Flight:                   Hour:               Prev. Asc. No.:

*** VIZ B2 Radiosonde Data ***

Radiosonde Serial No.: 84000077.CSN
MDO Board Serial No.:        1155432
Change Humidity Cal Data? [Y/N]:   N
Print Calibration Data? [Y/N]:     N
Humidity Lock-in (K-Ohms):   10.276    Temperature Lock-in (K-Ohms): 14.399
                      H1:    1.030
                      H2:    1.250
                      H3:    1.090
                      H4:    1.000
                      H5:    1.000
```

Exhibit 4-6. VIZ Radiosonde Data screen.

Follow these steps to learn about this screen:

1. The Radiosonde Serial No. entry is 84000077.CSN. A file with this name containing radiosonde calibration data exists on the training diskette. For operational purposes, the calibration data for all of the radiosondes in a box are stored on a diskette that comes with the box. These data are transferred to the hard disk before use. (Appendix A provides instruction on how this transfer is accomplished.)

2. Press [Enter]. The MDO Serial No. entry is highlighted.

3. Press [Enter]. The next entry is highlighted.

4. Make sure your printer is turned on and the ON LINE light is on. At the Print Calibration Data entry, press Y and [Enter]. The calibration data are printed. To remove the print-out, press the ON LINE button so the light goes out, press the FORM FEED (FF) key to advance the paper, and press the ON LINE button again.

5. Press [Enter]. The Change Humidity Cal Data entry is highlighted. This entry and the Temperature are read automatically from the calibration file, unless the observer

enters [Y]. The Humidity can be changed by the observer. This is done in cases where the Humidity value on the instrument differs from the value on the hygristor can. When this happens you should enter the value on the can into MicroART. If for any reason a hygristor other than the one provided with the radiosonde is used, you **must** manually enter the ACCULOK Humidity value from its can. The Temperature entry cannot be changed by the observer because the thermistor is not a replaceable component.

6. Press [Enter]. The Surface Data screen appears.

4.2.5 Surface Data Screen

The Surface Data screen (Exhibit 4-7) displays surface weather data valid for the time of the observation. Data on the left side of the screen were typed by the observer. The corrected pressure and relative humidity entries on the right side of the screen are computed automatically by MicroART and cannot be over typed.

```
Micro ART Version 2.90          Prerelease Data                 Rework No.: 2

Station: Sterling, VA              Index: 72403          Pressure Corr: 0.0 mb
Orientation correction AZ: 0.00    EL:  0.00             Elevation: 85 m
Date Last Flight:                  Hour:                 Prev. Asc. No.:

*** Surface Data ***

Pressure:                   1016.0 hPa        Corrected Pressure: 1016.0 hPa
Temperature 12 Hrs Ago:            C
Dry-Bulb Temperature:         15.0 C
Dew Point Temperature:         7.0 C          Relative Humidity:      59 %
Wind Direction:                230 Deg
Wind Speed:                     10 kts
Clouds/WX:                657082001

                  PgDn:Next Screen      PgUp:Previous Screen
```

Exhibit 4-7. Surface Data screen.

To learn about this screen, follow these steps:

1. The Pressure entry is 1016.0 mb. To the right is the Corrected Pressure, which is also 1016.0 mb. The Corrected Pressure is the sum of the observed pressure and the Pressure Correction. The Pressure Correction, which appears on the right side of the prerelease data heading, is the correction applied due to the difference in elevation between the point where the barometer is read and the point where the balloon is launched. In this case the pressure correction is 0.0 mb, so the observed and corrected pressure are the same. Press [Enter] to advance to the next entry.

2. When the surface pressure is less than 1000 mb, an entry for Temperature 12 Hrs Ago is required in order to estimate a 1000 mb height. (Similarly, if the surface pressure is less than 850 mb, this temperature is required to estimate a 850 mb height.) MicroART automatically supplies this entry from the previous flight. Press [Enter] to advance to the next entry.

3. The Dry-Bulb Temperature entry is 15.0. Press [Enter] to advance to the next entry.

4. The Dew Point Temperature entry is 7.0. The system has automatically computed the relative humidity to be 59%. At the Dew Point Temperature entry, press the space bar twice, type 9.8, and press [Enter]. Note the relative humidity changes from 59% to 71%.

5. Press [↑] and change the dew point temperature back to 7.0. Press [Enter]. The relative humidity returns to 59%.

6. The wind direction is reported to the nearest 5 degrees. (For calm winds, try to estimate a direction or just use 360.) Press [Enter] to advance to the next entry.

7. The wind speed is entered to the nearest knot. (For calm winds, a single zero can be entered.) Press [Enter] to advance to the next entry.

8. The Clouds/WX entry contains a nine-digit code that describes the weather at the observation time. The codes and their meanings are provided in Appendix B. Briefly, the code format is as follows:

$N_hC_LhC_MC_HWWWW$

where

N_h	-	Amount of sky covered in oktas (eighths) by low clouds, or if no low clouds are present, coverage by middle clouds
C_L	-	Type of low cloud
h	-	Height of the lowest cloud base
C_M	-	Type of middle cloud
C_H	-	Type of high cloud
WWWW	-	Present weather coded in two groups of WW. The two code groups from Appendix B with the highest numerical priority that describe the weather are entered here. (Note that some code groups refer to weather during the previous hour but not at the time of observation.) The code with the highest priority should appear first. If only one WW group is applicable to the present weather, then use that code twice.

The Clouds/WX entry for the stored flight is 657082001. This entry is decoded as follows:

6	-	6 oktas sky coverage by low clouds
5	-	Stratocumulus clouds (not formed by the spreading out of cumulus)
7	-	Cloud bases between 5000 and 6500 feet
0	-	No middle clouds
8	-	Cirrostratus clouds (not covering the whole sky and not invading the celestial dome)
20	-	Drizzle during the preceding hour, but not at the time of observation
01	-	Clouds generally dissolving or becoming less developed during the past hour.

9. Press [Enter]. The Check screen appears.

4.2.6 Check Screen

The Check screen (Exhibit 4-8) contains messages telling you if any of the prerelease data are missing or inconsistent. (There is no CHECK heading on this screen in the current version of MicroART.)

```
Micro ART Version 2.90          Prerelease Data                    Rework No.: 2

Station: Sterling, VA                 Index: 72403           Pressure Corr: 0.0 mb
Orientation correction AZ: 0.00       EL:  0.00              Elevation: 85 m
Date Last Flight:                     Hour:                  Prev. Asc. No.:

*** Cross-checks ***

No prior flight data is available for comparison.
No errors were found.









Continue with Rework? [Y/N]: N

                              PgUp:Previous Screen
```

Exhibit 4-8. Check screen.

1. In response to the **Continue with Rework? [Y/N]: N** prompt, press [Enter] to accept the predetermined entry of No.

   The following message appears at the bottom of the screen:

   Press PgUp to return to previous screen or ESC to EXIT.

2. Press [PgUp] four times to return to the Administrative Data screen.

3. Press [↓] twice to highlight the Special Observation entry.

4. Press N and [Enter]. The change is entered and the Flight Equipment Data screen appears.

5. Press [PgDn] three times. The Check Screen appears, with a message indicating no errors were found.

The **Continue with Rework? [Y/N]** prompt appears at the bottom of the screen. Depending upon what you would like to do next, choose one of the following three options:

5. Rework - Commands

5.1 Introduction

In this chapter you will continue training in the REWORK function of MicroART. You will learn to use commands for processing, displaying, and deleting data. Before beginning this training, you should have completed Chapter 4 of this Training Guide.

5.2 Getting Started

To arrive at the proper place in REWORK, follow Steps 1 through 7 of Section 4.2.1. At this point, the Administrative Data screen is displayed. To continue, follow these steps:

1. Press [PgDn] four times. The Check screen is displayed.

2. In response to the prompt, **Continue with Rework?** press Y and [Enter]. In about 10 seconds the heading **REWORK INITIALIZATION** appears along with the message **Reading STORE file....** After about another 15 seconds the **COMMAND** heading appears. At the prompt type "CO". The CODE heading appears. CODE checks the data, computes winds and a number of other meteorological variables, and generates the coded messages (TTAA, TTBB, etc.). The CODE command is discussed further in Section 5.3.1. The screen appears as shown in Exhibit 5-1.

   NOTE: At this point, remove the training diskette and return it to the diskette storage box.

```
                         MicroART REWORK  Version 2.90
Station: Sterling, VA
Ascension: 217-1        Date: 12-FEB-97     Time: 15:07          Rework No.:  2
R/S No:    84000077.CSN                   MDO#:No:  1155432
======================================== CODE ========================================
Reading STORE file...
Temporary archive file ...

?> CO
No previous flight data available for comparison
Temperature lapse rate from 0.1 to 0.5 of 9.8 Deg/Km between levels.
Temperature lapse rate from 9.3 to 10.0 of 10.8 Deg/Km betwwen levels.
Temperature lapse rate from 21.9 to 23.0 of 9.9 Deg/Km between levels.
Levels data up to 9.4 millibars have been checked.
Check elevation angles 30.55 and 43.54 for minutes 1 and 2.
Position data up to 105 minutes have been checked.
Wind direction change of 31 degrees between minutes 52 and 53.
Print the check messages? [Y/N]:
```

Exhibit 5-1. CODE Screen appearing after Command screen.

Note the check messages that appear on the screen. Messages in white are used for routine information. Yellow messages display information of a cautionary nature, while red messages indicate an important or serious situation. For this Rework example, you do not need to take any action based on these messages.

3. Make sure the printer is turned on and the ON LINE button is lit. In response to the prompt **Print the check messages? [Y/N]:** type Y and press [Enter]. The check messages are printed and the following messages appear:

   Calculations have been completed.
   Coded messages have been generated.

   The ?> prompt appears below these messages. (To advance the paper, press the ON LINE button so that the light goes out and the printer is off line. Then press the FORM FEED button to advance the paper, and press the ON LINE button again.)

4. From the ?> prompt you can enter commands to process, display, and delete data. To issue these commands, the ?> prompt **must** be displayed. To see a list of the commands, press H (for HELP) and [Enter]. The HELP screen shown in Exhibit 5-2 appears. Take a look at the commands displayed on the screen.

```
                         MicroART REWORK  Version 2.90
Station: Sterling, VA
Ascension: 217-1        Date: 12-FEB-97     Time: 15:07          Rework No.:  2
R/S No:     84000077.CSN                  MDO#:       1155432

=============================== HELP ===================================
Command              Function
CALC            Display Calculated Parameters
CODE            Generate Coded Messages
EXIT            Save files and exit to command menu
LEVELS          Display/Add/Delete Levels
MESSAGE         Display/Edit/Xmit Coded Messages
MET             Display/Delete 6-Second Met data
PLOT            Plot data on display (and printer)
POSITION        Display/Change 6-Second Position data
PRINT           Print data
RADAT           Code/Display Freezing Levels
SUMMARY         Display Flight Summary
SURFACE         Display/Change Surface Observation
WINDS           Display/Delete 1 Minute Winds

SOUNDS          Display/Test various alarms            DEBUG command


Line:  1              PgDn: Next Page  PgUp: Previous Page          Esc: Exit
```

Exhibit 5-2. HELP screen.

5. Press [Esc]. The ?> prompt returns. In general, when you have issued a command and are finished looking at the results, pressing [Esc] will take you back to the ?> prompt.

5.3 Command Training

This section consists of tutorials for each of the REWORK commands. The command name in each of the tutorial titles is followed by letters in parentheses. These letters are abbreviations for the commands. A command can be issued using its abbreviation, the full command name, or a set of letters between the abbreviation and the full name.

If you need to stop your training session before you reach the end of this chapter, follow the directions in Section 5.3.13 for using the EXIT command.

5.3.1 CODE (CO)

CODE computes values for a number of meteorological variables, checks the data, and generates the coded messages (TTAA, TTBB, etc.). During an observation, MicroART issues the CODE command automatically when the flight reaches 70 mb. You can, however, issue CODE manually anytime during a flight. The coded messages are not updated continuously as the flight progresses. To generate the most current version of the coded messages, the CODE command should be issued manually. Use the MESSAGE command to view the coded messages (Section 5.3.2) **If you delete data, it is necessary to issue the CODE command to recompute the coded messages, winds, and other meteorological parameters.**

To get some practice with CODE, follow these steps:

1. From the ?> prompt, type CO and press [Enter]. Data check messages appear on the screen (Exhibit 5-3).

```
                                MicroART REWORK  Version 2.90
Station: Sterling, VA
Ascension: 217-1        Date: 12-FEB-97      Time: 15:07           Rework No.:  2
R/S No:     84000077.CSN                   MDO#:       1155432
================================ CODE ================================
?> CODE
No previous flight data available for comparison
Temperature lapse rate from 0.1 to 0.5 of 9.8 Deg/Km between levels.
Temperature lapse rate from 9.3 to 10.0 of 10.8 Deg/Km between levels.
Temperature lapse rate from 21.9 to 23.0 of 9.9 Deg/Km between levels.
Levels data up to 9.4 millibars have been checked.
Check elevation angles 30.55 and 43.54 for minutes 1 and 2.
Position data up to 105 minutes have been checked.
Wind direction change of 31 degrees between minutes 52 and 53.
Print the check messages? [Y/N]:
```

Exhibit 5-3. CODE screen.

2. In response to the prompt **Print the check messages? [Y/N]:** press N and [Enter]. The following messages appear:

Calculations have been completed.
Coded messages have been generated.

The ?> prompt appears.

5.3.2 MESSAGE (MES)

MESSAGE is used to display and edit the coded messages and transmit them to a host computer.

NOTE: The CODE command actually generates the coded messages. The coded messages are **not** updated continuously as the flight progresses. To generate the most current version of the coded messages, the CODE command should be issued manually. As indicated in Chapter 9, the system automatically issues the CODE command at 70 mb and flight termination.

To learn about MESSAGE, do the following:

1. From the ?> prompt, type MES and press [Enter]. The screen showing the TTAA coded message appears (Exhibit 5-4). Note that the station identifier group (72403) group is highlighted.

```
                         MicroART REWORK  Version 2.90
Station: Sterling, VA
Ascension: 217-1        Date: 12-FEB-97      Time: 15:07          Rework No.:  2
R/S No:     84000077.CSN                    MDO#:     1155432

================================ MESSAGE ================================

72403 TTAA  62151 72403 99016 15058 23010 00220 14848 22011
 92876 11449 18518 85577 07804 22022 70168 02056 26022 50581
 14158 26533 40747 23163 29026 30951 40380 31030 25072 50177
 33552 20215 59769 32100 15392 63773 29038 10645 61774 27037
 88167 66166 33072 77198 32102 42927 51515 10164 00005 10194
 19517 25023=

INS:        DEL:        A:Part A  B:Part B  C:Part C/D     X:Xmit
```

Exhibit 5-4. Message screen.

2. Press B. The screen containing the TTBB and PPBB messages appears.

3. Press C. The TTCC, TTDD, and PPDD messages appear.

4. Press A to return to the TTAA screen.

5. Now you will get some practice in editing a coded message. You will insert a group to indicate that the flight terminated due to flight equipment failure. To begin, press [↓] four times. The 88167 group is highlighted.

6. Press [→] seven times. The 10164 group is highlighted.

7. Press [Ins]. A blank group appears next to the **INS:** prompt in the lower left hand corner of the screen.

8. Type 10158 and press [Enter]. The 10158 group is inserted to the left of the 10164 group.

9. To delete the 10158 group, just press [Del]. The 10158 group disappears.

10. Press [Esc] to return to the ?> prompt.

5.3.3 RADAT (R)

RADAT computes, codes, and displays the freezing level data. MicroART issues the RADAT command automatically when the flight reaches 400 mb, although you can issue this command manually at any time during the flight. To issue this command, from the ?> prompt type RAD and press [Enter]. The RADAT message shown in Exhibit 5-5 appears. The ?> prompt is displayed after the freezing level data.

```
                          MicroART REWORK  Version 2.90
Station: Sterling, VA
Ascension: 217-1       Date: 12-FEB-97     Time: 15:07         Rework No.:  2
R/S No:     84000077.CSN                   MDO#:      1155432
==================================== COMMAND ====================================

?> RADAT
RADAT 44118=
?>


H:Help
```

Exhibit 5-5. RADAT screen.

5.3.4 PLOT (PL)

PLOT displays plots of meteorological and position data. To become familiar with the PLOT command, follow these steps:

1. First you will display a pressure plot for the stored flight. At the ?> prompt, type PL PR (for PLOT PRESSURE) and press [Enter]. You are prompted for the start and end times to plot.

2. In response to the **Enter start time [0.0]:** prompt, press [Enter] to accept the predetermined value of minute 0.0, which appears in brackets.

3. In response to the **Enter end time [105.2]:** prompt, press [Enter] to accept the predetermined value of minute 105.2. (MicroART sets the initial predetermined end time to the end of the flight.) A plot of pressure (horizontal axis) versus time (vertical axis) appears (Exhibit 5-6). (The exhibit does not show the heading at the top of your screen or the function key reminders at the bottom.)

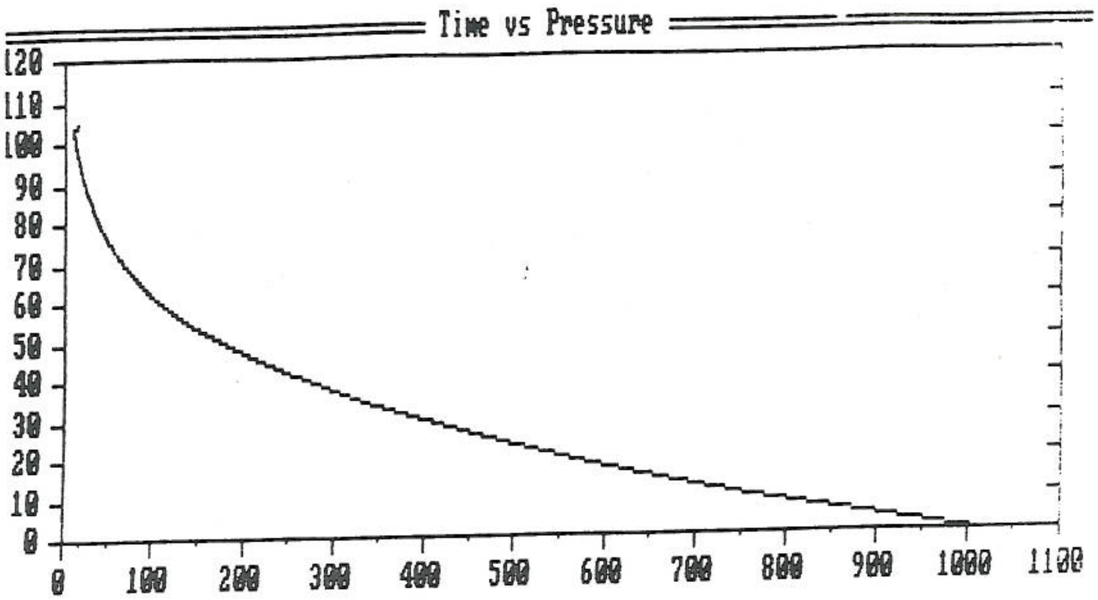

Exhibit 5-6. Pressure plot produced with PLOT.

4. Press the [F5] key. The plot color changes from yellow to white.

5. Press the [F5] key 6 more times. The plot changes color each time, and returns to the original yellow.

6. Press [Esc]. The ?> prompt returns.

7. Type PL PR and press [Enter].

8. At the **Enter start time [0.0]:** prompt, press [Enter].

9. At the **Enter end time [120.0]:** prompt, type 20 and press [Enter]. The pressure plot for the first 20 minutes of the flight is displayed (Exhibit 5-7).

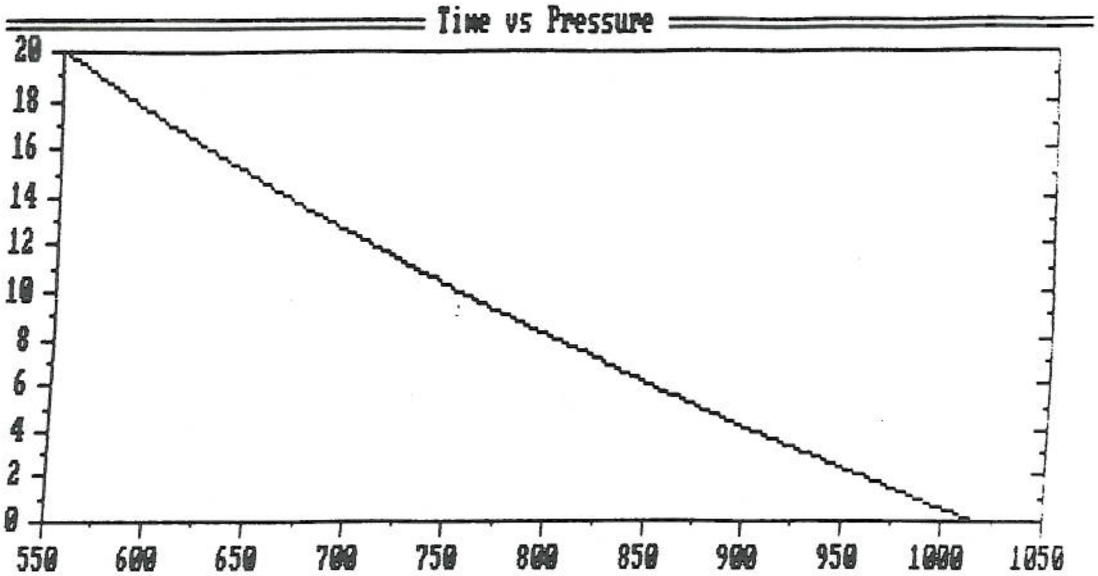

Exhibit 5-7. First 20 minutes of the pressure plot produced with PLOT.

10. Press [F4]. The plot is re-displayed as a point plot, where the pressure at 6-second intervals is plotted without having a line connecting the points. Point plots can be useful in determining if questionable data are for just a single time or for a number of points.

11. Press [F3]. The line plot is displayed again.

12. Press [Esc]. The ?> prompt is displayed.

13. Type PL ME (for PLOT MET) and press [Enter]. The start time prompt is displayed.

14. Press [Enter] to use the predetermined value of 0.0.

15. Note the predetermined end time (in brackets) has now changed to 20.0 (it changes to the last time that was used). Type 105 and press [Enter]. Plots of the temperature and relative humidity appear (Exhibit 5-8). The scale on the horizontal axis is the same for both variables, but the units are different. Temperature is in degrees Celsius, and relative humidity is in percent. Thus, most if not all of the temperature plot will usually be to the left of the relative humidity plot. The vertical axis is time in minutes.

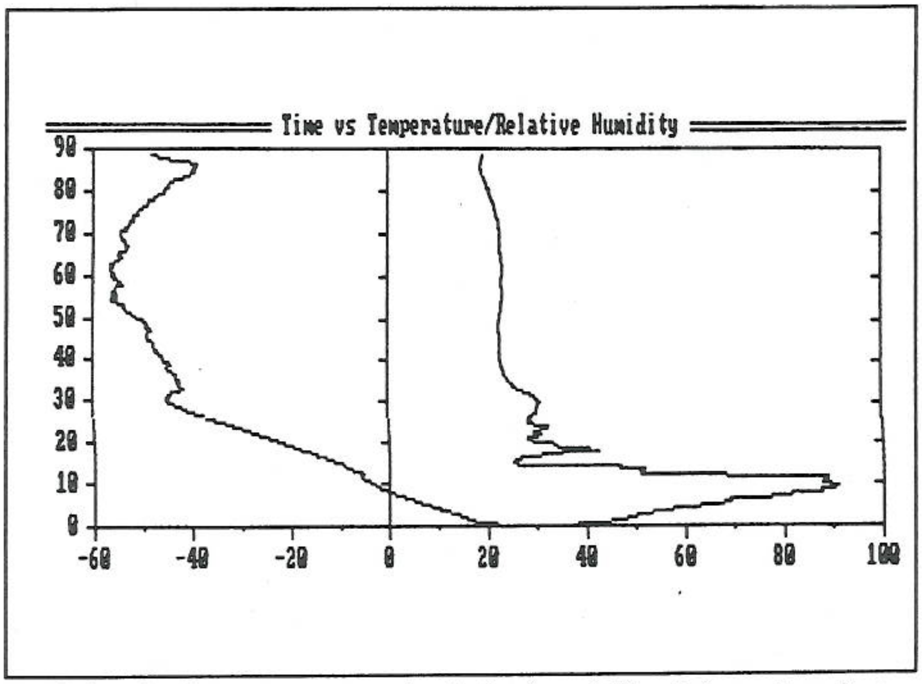

Exhibit 5-8. Temperature and relative humidity plot produced with PLOT.

16. Press [F2]. Horizontal lines are plotted showing where levels have been selected for the sounding. (These are the high-resolution levels described in Section 5.3.7.)

17. Press [Esc] to return to the ?> prompt.

18. Now you'll plot the position data. Type PL AZ (for PLOT AZIMUTH) and press [Enter].

19. Press [Enter] twice to use the predetermined time values. A plot of time (horizontal axis) versus azimuth angles (vertical axis) is displayed (Exhibit 5-9). Note that for position data plots the time scale is on the **horizontal** axis whereas for other plots time is on the **vertical** axis.

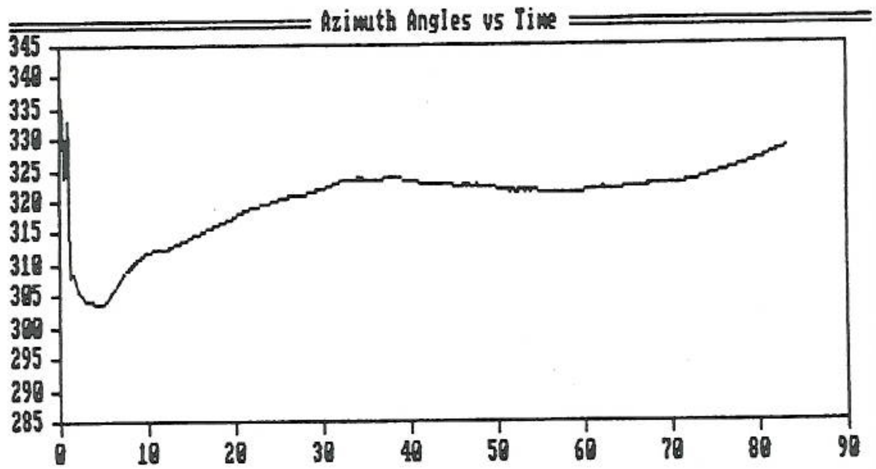

Exhibit 5-9. Plot of azimuth angles produced with PLOT.

20. Press [Esc] to return to the ?> prompt.

21. Type PL EL (for PLOT ELEVATION) and press [Enter].

22. Press [Enter] twice to use the predetermined time values. A plot of time (horizontal axis) versus elevation angles (vertical axis) is displayed (Exhibit 5-10).

23. Press [Esc] to return to the ?> prompt.

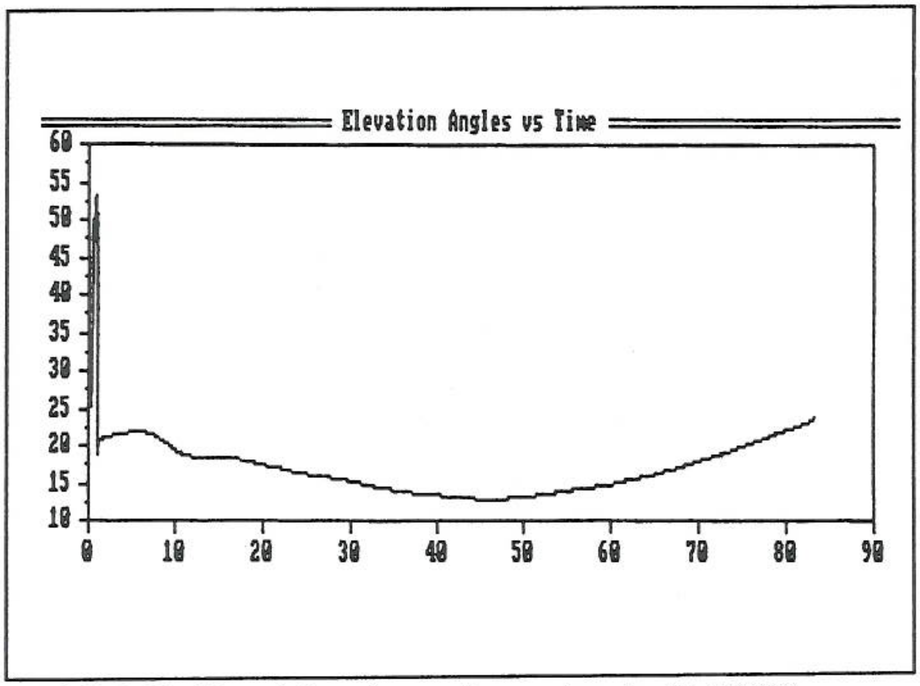

Exhibit 5-10. Plot of elevation angles produced with PLOT.

5.3.5 MET

MET is used to display and edit the meteorological data stored every 6 seconds by MicroART. These steps show you how to use MET:

1. From the ?> prompt, type MET and press [Enter]. The screen shown in Exhibit 5-11 is displayed. The QP, QT, and QU columns refer to the quality of the signals for pressure, temperature, and relative humidity, respectively. (The QP is present only for the surface pressure.) These Q values range from 100 (strongest signal) to 0 (no signal). Any data with a Q value of less than 30 is unreliable and is assigned the value 99999, which stands for missing data.

   The I/D (Interpolated/Doubtful) column indicates data that either have been interpolated or are of doubtful quality. The Dir column indicates the vertical direction in which the balloon is traveling: A blank entry indicates the balloon is ascending; D/R indicates either a descending balloon or a descending/reascending balloon.

MicroART REWORK Version 2.90

Station: Sterling, VA
Ascension: 217-1 Date: 12-FEB-97 Time: 15:07 Rework No.: 2
R/S No: 84000077.CSN MDO#: 1155432

MET

Time(min)	Altitude(m)	Pressure(mb)	QP	Temp°	QT	RH(%)	QU	I/D	Dir
0.0	85	1000.1	100	15.0	100	59.0	100		
0.1	108	1016.0	99	16.0	99	66.0	98		
0.2	138	1009.7	99	15.7	98	68.5	98		
0.3	160	1007.1	99	15.5	99	69.1	98		
0.4	184	1004.2	99	15.2	98	70.6	98		
0.5	210	1001.2	98	15.0	97	72.1	98		
0.6	231	998.7	97	14.7	97	73.3	97		
0.7	257	995.6	98	14.5	98	74.8	98		
0.8	284	992.4	99	14.2	99	76.3	99		
0.9	308	989.6	99	14.0	98	77.4	99		
1.0	335	986.5	98	13.8	100	78.3	97		
1.1	359	983.6	98	13.6	99	79.3	98		
1.2	381	981.1	99	13.4	98	80.2	98		
1.3	402	978.6	98	13.3	98	80.5	98		
1.4	428	975.6	99	13.2	98	80.6	98		
1.5	453	972.7	98	13.1	98	80.6	98		
1.6	473	970.4	99	13.0	99	80.9	99		

F6: Time: F7: Restore Data F8: Del Temp F9: Del RH F10: Del Pr

Exhibit 5-11. First MET screen.

2. Next you'll learn how to display meteorological data for other times. Press [PgDn]. The next screen of data is displayed.

3. Press [F6]. A gray highlight bar appears next to the **Time:** prompt in the lower left hand corner.

4. Type 18.9 and press [Enter]. The data beginning with minute 18.9 are displayed.

5. Press [F6], type 999, and press [Enter]. The data at the end of the flight are displayed (Exhibit 5-12). (Typing any number greater than the flight termination time will cause the last screen of data to be displayed.)

MicroART REWORK Version 2.90

Station: Sterling, VA
Ascension: 217-1 Date: 12-FEB-97 Time: 15:07 Rework No.: 2
R/S No: 84000077.CSN MDO#: 1155432

MET

Time(min)	Altitude(m)	Pressure(mb)	QP	Temp°	QT	RH(%)	QU	I/D	Dir
103.6	31217	10.2	95	-40.9	99	1.0	99		D/R
103.7	31020	10.5	97	-41.6	96	1.0	99		D/R
103.8	30829	10.8	99	-41.9	99	1.0	99		D/R
103.9	30644	11.1	97	-42.0	98	1.0	99		D/R
104.0	30464	11.4	89	-42.3	97	1.0	98		D/R
104.1	30288	11.7	99	-42.7	98	1.0	99		D/R
104.2	30117	12.0	99	-43.0	98	1.0	99		D/R
104.3	29951	12.3	98	-43.2	97	1.0	99		D/R
104.4	29789	12.6	94	-43.3	95	1.0	97		D/R
104.5	29631	12.9	97	-43.3	95	1.0	91		D/R
104.6	29476	13.2	91	-43.4	99	1.0	99		D/R
104.7	29325	13.5	98	-43.5	97	1.0	96		D/R
104.8	29129	13.9	96	-43.7	99	1.0	99		D/R
104.9	28985	14.2	99	-43.9	99	1.0	99		D/R
105.0	28799	14.6	99	-44.1	99	1.0	98		D/R
105.1	28618	15.0	99	-44.0	88	1.0	97		D/R
105.2	28441	15.4	99	-43.9	97	1.0	99		D/R

F6: Time: F7: Restore Data F8: Del Temp F9: Del RH F10: Del Pr

Exhibit 5-12. Last MET screen.

6. Next you'll get some experience in deleting and restoring data. Press [F6], type 11, and press [Enter]. The MET data beginning with minute 11.0 are displayed. (Another way to get this data would be to type MET 11 from the ?> prompt.)

7. Press [↓] four times. The data for minute 11.4 are highlighted.

8. Press [F8]. The temperature for minute 11.4 changes from 3.4 to 3.5, the QT entry becomes blank, and an I appears in the I/D column. The original temperature has been deleted and replaced by an interpolated value.

9. Press [F7]. The original entries reappear.

10. Press [F9]. The relative humidity changes from 72.3 to 72.4, the QU entry becomes blank, and an I appears in the I/D column.

11. Press [F7]. The original entries reappear.

12. Next you'll delete the temperature data for minutes 11.4 through 12.3. Press the [Ctrl] and [F8] keys at the same time to delete at 11.4. Notice that when you first strike the [Ctrl] and [F8] keys the pressure, temp and RH headers blink on and off. Use the [↓] key to move to 12.3 again press the [Ctrl] and [F8] keys at the same

time. When you have deleted the temperatures through minute 12.3, the screen appears as shown in Exhibit 5-13.

MicroART REWORK Version 2.90

Station: Sterling, VA
Ascension: 217-1 Date: 12-FEB-97 Time: 15:07 Rework No.: 2
R/S No: 84000077.CSN MDO#: 1155432

MET

Time(min)	Altitude(m)	Pressure(mb)	QP	Temp°	QT	RH(%)	QU	I/D	Dir
11.0	2818	730.9	99	3.9	99	63.6	99		D/R
11.1	2844	728.6	98	3.7	100	63.8	99		D/R
11.2	2866	726.6	99	3.6	100	67.7	98		D/R
11.3	2893	724.2	99	3.6	99	70.5	98		D/R
11.4	2919	721.9	99	3.5		72.3	98	I	D/R
11.5	2941	719.9	99	3.3		74.3	99	I	D/R
11.6	2966	717.7	98	3.2		73.3	98	I	D/R
11.7	2992	715.4	99	3.1		71.7	99	I	D/R
11.8	3014	713.5	99	3.0		72.1	99	I	D/R
11.9	3035	711.6	99	2.8		71.7	99	I	D/R
12.0	3060	709.4	99	2.7		71.5	99	I	D/R
12.1	3085	707.2	98	2.6		70.2	97	I	D/R
12.2	3108	705.2	99	2.4		66.2	99	I	D/R
12.3	3135	702.9	99	2.3	99	65.2	99		D/R
12.4	3160	700.7	99	2.1	99	65.2	99		D/R
12.5	3182	698.8	99	2.0	99	69.3	97		D/R
12.6	3207	696.6	98	1.9	99	69.3	98		D/R

F6: Time: F7: Restore Data F8: Del Temp F9: Del RH F10: Del Pr

Exhibit 5-13. MET screen with deleted and interpolated temperatures.

13. Now use [F8] to delete the temperature for minute 12.4. The interpolated data are replaced by missing values (99999) and the I's in the I/D column disappear. This occurs because data cannot be interpolated for a period of 1 minute or longer.

14. Press [F7]. The temperature for minute 12.4 is restored, and the interpolated values return because the deleted temperatures now occur for a period of less than 1 minute.

15. Use the [Ctrl][F7] keys at the same time at 12.3. Then use [↑] key to return to 11.4. Again press the [Ctrl] and [F7] at the same time to restore all of the data.

16. Press [Esc] to exit the screen. The following messages appear:

Levels erased.
Winds, calculated parameters and coded messages erased.

Because you deleted temperature data (even though it was later restored), the observation was changed significantly. The levels, winds, calculated parameters, and coded messages were erased automatically.

17. To recompute the data that were erased, it is necessary to run the CODE command. From the ?> prompt, type CODE and press [Enter]. The messages previously shown in Exhibit 5-3 are displayed.

18. In response to the prompt **Print the check messages? [Y/N]:** press N and [Enter]. The following messages appear:

Calculations have been completed.
Coded messages have been generated.

The ?> prompt returns.

5.3.6 POSITION (PO)

POSITION is used to display and edit the 6-second elevation and azimuth angle and slant range data. To learn about POSITION, do this:

1. At the ?> prompt, type PO and press [Enter]. The screen shown in Exhibit 5-14 appears.

```
                              MicorART REWORK  Version 2.90
Station: Sterling, VA
Ascension: 217-1          Date: 12-FEB-97     Time: 15:07            Rework No.:  2
R/S No:     84000077.CSN                      MDO#:      1155432

==================================== POSITION ====================================
 Time(min)  El. Angle    Az. Angle  Slant Range           Flags
     0.0       99.99       273.41         20
     0.1       99.99       273.78      999999       LIM
     0.2       99.99       272.36      999999       LIM
     0.3        7.99       272.20      999999       LIM
     0.4       10.95       270.53      999999
     0.5       14.31       269.39      999999
     0.6       17.17       267.22      999999
     0.7       20.75       265.29      999999
     0.8       24.34       263.06      999999
     0.9       27.64       259.89      999999
     1.0       30.84       256.80      999999
     1.1       33.19       253.75      999999
     1.2       36.04       250.66      999999
     1.3       38.34       246.45      999999
     1.4       40.86       243.12      999999
     1.5       43.08       238.41      999999
     1.6       43.99       233.04      999999
 F6: Time:          F7: Restore Data     F8: Delete Data
```

Exhibit 5-14. First POSITION screen.

The position data for minute 0.0 to 0.2 of the flight were limiting angles. (Note the LIM abbreviation in the Flags column). There was no transponder on the stored flight, so the slant range data are not valid.

2. Press [F6]. The time prompt appears in the lower left corner of the screen.

3. Type 42.3 and press [Enter]. The data for minute 42.3 appear at the top of the screen. (Another way to get this data is to type PO 42.3 from the ?> prompt.)

4. Press [F8]. The observed elevation angle (21.25) is replaced by an interpolated value (21.26), and the observed azimuth angle (276.13) is replaced by an interpolated value (276.14). The INTRP (interpolated) and OPDEL (operator-deleted) flags appear in the FLAGS column.

5. Press [F7]. The observed position data replace the interpolated values.

6. Press [Esc] to exit the screen. The following message appears:

   Winds, calculated parameters and coded messages erased.

7. Because you deleted position data (even though it was restored), the winds, calculated parameters, and coded messages were erased automatically.

8. To recompute the erased data, type CO and press [Enter]. The messages previously shown in Exhibit 5-3 appear.

9. Press N and [Enter] so the messages are not printed. The following messages appear:

   Calculations have been completed.
   Coded messages have been generated.

   The ?> prompt returns.

5.3.7 LEVELS (L)

The LEVELS command is used to display and edit mandatory and significant meteorological level data. The significant levels displayed with this command include those that appear in the coded messages. The criteria for levels in the coded messages is a 1 degree Celsius departure from linearity for temperature and a 10% departure for relative humidity. The LEVELS command, however, displays levels using criteria of 0.5 degrees Celsius for temperature and 5% for relative humidity. Thus due to these higher resolution criteria, more levels usually appear in the LEVELS display than in the coded messages. To learn about LEVELS, follow these steps:

1. From the ?> prompt, press L and [Enter]. The screen shown in Exhibit 5-15 appears. Note that data for the surface are highlighted by the gray bar.

MicroART REWORK Version 2.90

Station: Sterling, VA
Ascension: 217-1 Date: 12-FEB-97 Time: 15:07 Rework No.: 2
R/S No: 84000077.CSN MDO#: 1155432

LEVELS

Time (min)	Pressure (mb)	Tempr °	RH (%)	Reason
0.0	1016.0	15.0	59	SFC
0.1	1013.2	16.0	66	TEMP
0.5	1000.0	14.9	73	MAND
1.2	981.1	13.4	80	TEMP
2.1	956.5	13.3	77	TEMP
3.2	925.0	11.4	72	MAND
4.6	888.0	8.9	68	RH
5.1	875.1	8.1	91	RH
5.6	861.5	6.9	97	TEMP
6.1	850.0	7.8	97	MAND
7.4	816.1	8.3	97	TEMP
8.8	781.7	7.0	97	TEMP
9.3	769.5	6.2	96	RH
10.0	753.2	4.3	74	TEMP
10.4	744.4	4.4	68	TEMP
11.1	728.6	3.7	64	RH
11.5	719.9	3.3	74	RH

F6: Insert F7: Restore F8: Delete

Exhibit 5-15. LEVELS Screen.

In addition to the time and meteorological data for each level, the reason for the level selection is indicated. Common reasons for level selection are as follows:

- FRZ - Freezing level.
- MAND - Mandatory level.
- OP_AL - Operator added level.
- OP_DL - Operator deleted level.

RH - Significant relative humidity level.
RHCUT - Relative humidity cutoff.
SFC - Surface level.
TEMP - Significant temperature level.
TERM - Termination level.

2. Press [PgDn]. The next screen of levels data is displayed.

3. Press [PgDn]. The next screen of levels data appears.

4. Press [PgDn] twice more. The last screen of levels data appears. Ten levels appear on this screen.

5. Press [PgUp] four times to return to the first levels screen.

6. Next you'll delete a level. Press [↓] seven times. The significant temperature level for minute 5.1 (875.1 hPa) is highlighted.

7. Press [F8]. The entry in the Reason column changes from RH to OP_DL (operator deleted). After a level is deleted, it will not be included in any coded messages generated by subsequent issuances of the CODE command. However, the level data are still stored in the Archive file that is sent to NCDC.

8. Press [F7]. The level is restored and the reason returns to RH.

9. Now you'll add a level. Press [F6]. The **Time:** prompt appears in the lower left-hand corner of the screen.

10. Type 4 and press [Enter]. The screen shown in Exhibit 5-16 appears. Note that meteorological data for minute 4 have been inserted and that the reason for the level is OP_AL (operator added level).

```
                    MicroART REWORK  Version 2.90
Station: Sterling, VA
Ascension: 217-1          Date: 12-FEB-97     Time: 15:07          Rework No.:  2
R/S No:     84000077.CSN                      MDO#:      1155432

════════════════════════════════ LEVELS ═══════════════════════════════════
```

Time (min)	Pressure (mb)	Tempr °	RH (%)	Reason
4.0	903.6	9.9	74	OP_AL
4.6	888.0	8.9	68	RH
5.1	875.1	8.1	91	RH
5.6	861.5	6.9	97	TEMP
6.1	850.0	7.8	97	MAND
7.4	816.1	8.3	97	TEMP
8.8	781.7	7.0	97	TEMP
9.3	769.5	6.2	96	RH
10.0	753.2	4.3	74	TEMP
10.4	744.4	4.4	68	TEMP
11.1	728.6	3.7	64	RH
11.5	719.9	3.3	74	RH
12.4	700.0	2.1	67	MAND
13.0	688.1	1.7	69	RH
13.4	679.2	1.6	41	RH
13.5	677.3	1.5	43	TEMP
14.4	659.0	0.0	44	FRZ

```
                                   F6: Insert    F7: Restore    F8: Delete
```

Exhibit 5-16. LEVELS screen with level added at 4 minutes.

11. Now delete the level you just added. Press [F8]. The entry in the Reason column for minute 4 changes from OP_AL to OP_DL.

12. Press [Esc] to exit the screen. The following message appears:

    Winds, calculated parameters, and coded messages erased.

    Because the observation was significantly changed when you deleted and added a level, the winds, calculated parameters and coded messages are erased automatically. It is necessary to recompute these data with the CODE command.

13. Type CO and press [Enter]. The messages shown previously in Exhibit 5-3 appear.

14. In response to the prompt **Print the check messages. [Y/N]:** press N and [Enter]. The following messages appear:

    Calculations have been completed.
    Coded messages have been generated.

    The ?> prompt appears.

5.3.8 WINDS (WI)

One-minute wind data are displayed and edited with the WINDS command. These steps illustrate the use of WINDS:

1. From the ?> prompt, type WI and press [Enter]. The screen shown in Exhibit 5-17 appears.

```
                          MicroART REWORK  Version 2.90
Station: Sterling, VA
Ascension: 217-1        Date: 12-FEB-97     Time: 15:07             Rework No.:  2
R/S No:     84000077.CSN                    MDO#:      1155432

================================ WINDS ========================================
   Time(min)  Height(M-AGL)  Dir     Speed      Alt(FT-MSL)     Edited
         0              0    230        10            278
         1            250    215        11           1099
         2            486    172        14           1873
         3            740    182        18           2706
         4            985    185        20           3510
         5           1228    194        21           4307
         6           1470    216        22           5101
         7           1725    238        26           5938
         8           1981    251        27           6778
         9           2236    258        23           7615
        10           2489    263        20           8445
        11           2734    266        21           9249
        12           2982    266        23          10062
        13           3222    257        20          10850
        14           3471    250        17          11667
        15           3717    257        18          12474
        16           3968    256        20          13297
 F6: Time:          F7: Restore Data     F8: Delete Data
```

Exhibit 5-17. WINDS screen.

2. Press [PgDn] six times. The remainder of the wind data screens are displayed.

3. The [F6] key can be used to display data for a particular time, just as it could with the MET and POSITION commands. Press [F6]. The highlight bar appears next to the right of the **Time:** prompt.

4. Type 17 and press [Enter]. The wind data beginning with minute 17 are displayed.

5. You can also delete and restore wind data. Press the ↓ key four times. The wind data for minute 21 are highlighted.

6. Press [F8]. The wind direction and speed are both changed to 0, which implies missing wind data. The abbreviation OP-ED (operator edited) appears in the Edited column.

7. Press [F7]. The original wind data reappear.

8. Press [Esc]. The following message appears:

   Calculated parameters and coded messages erased.

   The ?> prompt is displayed once again.

9. Issue the CODE command to recompute the calculated parameters and coded messages.

10. In response to the prompt **Print the check messages. [Y/N]:** press N and [Enter]. The following messages appear:

    Calculations have been completed.
    Coded messages have been generated.

    The ?> prompt appears.

5.3.9 CALC (CA)

CALC displays a number of calculated meteorological and flight-related parameters. Use the information obtained from using this command in order to fill out the B-29 form. Follow these steps to use the CALC command:

1. From the ?> prompt, type CA and press [Enter]. The Calculated Parameters screen appears (Exhibit 5-18).

```
                          MicroART REWORK  Version 2.90
Station: Sterling, VA
Ascension: 217-1        Date: 12-FEB-97     Time: 15:07          Rework No.:  2
R/S No:     84000077.CSN                    MDO#:      1155432

=========================== Calculated Parameters ===========================

RADAT              : RADAT 44118=

Heights  1000 hPa:     220 m MSL    925 hPa:    876 m MSL    850 hPa: 1577 m MSL
Stability   Index:       5
Temperature               Min: -66.1 C           Max: 16.0 C
Rel Humidity              Min:      1 %           Max:    97 %
Mean Wind      Sfc to 5k ft: 195 17 kts      5k to 10k ft: 252 23 kts

Primary Max Wind   :  318 102 kts  Shear 3k ft below: 29    3k ft above: 27
Secondary Max Wind :  ___ ___ kts  Shear 3k ft below: ___   3k ft above: ___

Tropopause     Press: 166.8 hPa Height: 43254 ft  Temp: -66.1 C  Wind: 329 72 kts
Average Ascension Rates Sfc to 400 mb: 250 m/min       400 mb to term: 330 m/min


Fallout Wind              Dir:      0   Distance:     0 mi.
Termination Altitude      Met: 31770 m     Wind: 31676 m
Reason for Termination       :  BALLOON BURST

Line:   1            PgDn: Next Page      PgUp: Previous Page       Esc: Exit
```

Exhibit 5-18. CALC Screen.

2. Use [↓] to move the highlight bar to the line that begins with the word Tropopause. This feature allows the data to stand out on the display.

3. Press [Esc] to return to the ?> prompt.

NOTE: If you ever issue the CALC command and find the entries are blank, press [Esc] to exit the screen. Then issue the CODE command, which actually calculates the parameters. Then reissue the CALC command. Similarly, if the RADAT entry in the Calculated Parameters is missing, issue the RADAT command to compute the RADAT.

5.3.10 SUMMARY (SUM)

SUMMARY displays the flight summary data. These steps will provide you practice with SUMMARY:

1. From the ?> prompt, type SUM and press [Enter]. The screen shown in Exhibit 5-19 appears. Station and flight data appear below the flight summary heading, and the level data are displayed below that. The DP© column contains the dew point temperature in degrees Celsius.

MicroART REWORK Version 2.90
Station: Sterling, VA
Ascension: 217-1 Date: 12-FEB-97 Time: 15:07 Rework No.: 2
R/S No: 84000077.CSN MDO#: 1155432

FLIGHT SUMMARY

STATION: Sterling, VA INDEX: 72403 WBAN: 93734
DATE: 12-FEB-97 HOUR: 15 ASC. NO: 217-1
R/S No.: 84000077.CSN LAUNCH TIME: 15:07
TERM: BALLOON BURST TERM PRESS: 9.4 TERM HT: 31770

						WINDS		
TIME(min)	PRESS(mb)	HT(M-MSL)	TEMP°	RH(%)	DP°	DIR	SPEED	REASON
0.0	1016.0	85	15.0	59	7.1	230	10	SFC
0.1	1013.2	108	16.0	66	9.7	229	10	TEMP
0.5	1000.0	220	14.9	73	10.1	222	11	MAND
1.2	981.1	381	13.4	80	10.1	207	12	TEMP
2.1	956.5	595	13.3	77	9.4	173	14	TEMP
3.2	925.0	876	11.4	72	6.5	183	18	MAND
4.0	903.6	0	9.9	74	999.9	185	20	OP_AL
4.6	888.0	1216	8.9	68	3.4	190	21	RH
5.1	875.1	1337	8.1	91	6.7	196	21	RH
5.6	861.5	1466	6.9	97	6.4	208	22	TEMP
6.1	850.0	1577	7.8	97	7.4	218	22	MAND

Line: 1 PgDn: Next Page PgUp: Previous Page Esc: Exit

Exhibit 5-19. First SUMMARY screen.

2. Press [PgDn]. The second screen of levels data is displayed.

3. Press [PgDn]. The third screen of levels data is displayed.

4. Press [PgDn] three times. The beginning of the fixed-height wind data appears.
5. Press [PgDn] once more. The remainder of the fixed-height wind data appears.

6. Press [Esc] to return to the ?> prompt.

5.3.11 SURFACE (SUR)

SURFACE is used to display and edit the surface observation data. Follow these steps to learn about SURFACE:

1. With the ?> prompt displayed, type SUR and press [Enter]. The screen shown in Exhibit 5-20 appears. This screen is very similar to the Surface Data prerelease screen. The main difference is that the pressure discrepancy (in millibars and contacts) is displayed. The pressure discrepancy is the difference between the observed surface pressure and the surface pressure estimated from the radiosonde.

```
                        MicroART REWORK  Version 2.90
Station: Sterling, VA
Ascension: 217-1        Date: 12-FEB-97     Time: 15:07          Rework No.:  2
R/S No:     84000077.CSN                    MDO#:      1155432
==================================== SURFACE ====================================

Pressure:                   1016.0 hPa          Corrected Pressure: 1016.0 hPa
Temperature 12 Hrs Ago:          C              Pressure Discrepancy:   0.1 hPa
Dry-Bulb Temperature:         15.0 C
Dew Point Temperature:         7.0 C            Relative Humidity:       59 %
Wind Direction:                230 Deg
Wind Speed:                     10 kts
Clouds/WX:               657082001
```

Exhibit 5-20. SURFACE screen.

2. Press [Enter] one more time. The ?> prompt appears.

5.3.12 PRINT (PR)

PRINT is used to print data. To learn about PRINT, follow these steps:

1. From the ?> prompt, type PR and press [Enter]. The screen appears as shown in Exhibit 5-21 appears. As you can see, PRINT can be used to print seven outputs that are displayed with the commands shown.

2. Make sure your printer is turned on and the ON LINE button is lit. Type SU (for SUMMARY) and press [Enter]. The flight summary data are printed, and the ?> prompt returns.

3. Data can also be printed directly from the ?> prompt. Type PR LE (for PRINT LEVELS) and press [Enter]. The levels data are printed, and the ?> prompt appears.

```
                           MicroART REWORK  Version 2.90
Station: Sterling, VA
Ascension: 217-1         Date: 12-FEB-97     Time: 15:07          Rework No.:  2
R/S No:     84000077.CSN                     MDO#:      1155432
=================================== PRINT ===================================

?> PRINT
Enter CALC, LEVELS, MESSAGE, MET, POSITION, SUMMARY, OR WINDS.
Press ESC to return to command prompt.
Print what?
```

Exhibit 5-21. PRINT screen.

4. Print the other six outputs to see what they look like. Note that when you issue the PRINT MET and PRINT POSITION commands you are prompted for the beginning and ending times to print. To avoid printing a large amount of data, try using a time period of less than 10 minutes.

5.3.13 EXIT (EX)

The EXIT command ends Rework (and a live flight) and returns you to the ART Options menu. To execute EXIT, follow these steps:

1. From the ?> prompt, type EX and press [Enter]. The following prompt appears:

   Do you want to save the reworked flight? [Y/N]:

2. For training purposes, you don't want to save the reworked flight, so press N and [Enter]. The ART Options menu appears.

3. Press [Esc] to return to the Main Menu.

NOTE: If you had answered yes to the prompt in Step 1 above, the following messages would have appeared:

Writing STORE file to hard disk ...

Insert diskette for STORE file backup. Press ENTER when ready.

The Store file and a Temporary Archive File would be written to the hard disk. Then a backup copy of the Store file would be written to a diskette.

6. Entering Station Data

6.1 Introduction

The station resident data must be entered before the ART Observation function of MicroART can be used. These data are to be entered by a designated person using the instructions in Section 6.2. Only exception will be to change radiosonde types. Once the data have been entered, updates should be infrequent. Section 6.3 describes the updating process. Section 6.4 discusses what to do when the station data are inadvertently erased from the hard disk.
If you have **not** been designated to enter the station data, continue with Chapter 7.

6.2 Completing Station Data Screens

The station resident data has two parts. The first part contains information about the station location, index numbers, and upper air equipment. How these data are entered is described in Section 6.2.1 The second part contains the limiting angles table. Entering these data is discussed in Section 6.2.2.

6.2.1 Entering Station Data

To enter the station data, follow these steps:

1. Turn on the MicroART computer following the instructions in Section 2.8. The Main Menu appears with the ART Options choice highlighted (yellow letters on a red background) (Exhibit 6-1).

```
MicroART Version 2.90

VIZ B2 Main Menu


ART Options

Archive Flights

Load Calibration Files

Edit Station Data

Reports

Diskette Utilities

Shut Down System

Exit to DOS
```

Exhibit 6-1. Main Menu.

2. Press [↓] three times. The Edit Station Data option is highlighted.

3. Select this option by pressing [Enter].

4. Your Station Data Entry screen should appear. An example is shown in Exhibit 6-2.

```
                         Station Data Entry              Version 2.90

Station Index: 99999   WBAN: 99999    Name: TesTesTesTesTesTesTesT!

Latitude:  0:00 N    Longitude:   0:00 W    WMO Region: 4

Elevation(m):    0    Base Pressure(mb): 850    Base Range(m):   0

Target Antenna: (El. Angle)  0.00    (Az. Angle) 360.00

Orientation Correction:  (El. Angle)   0.00    (Az. Angle)    0.00

Release Point Pressure Correction(mb):  0.0    Host Computer: AFOS

Sonde Manufacturer: VB2    Tracking Equipment: ART-1     Baud Rate: 110

Local Station ID: XXX    Parent WSFO ID: CCC             Dial Method: Pulse


Telephone Numbers:    (Primary)     None
                      (Secondary)   None
                      (Central)     None

         PgDn - Limiting Angles,  Esc - Exit
```

Exhibit 6-2. Station Data Entry screen.

Your site's entries should be supplied for each of the fields. The Station Index entry is highlighted. The highlight bar can be advanced to the next entry by pressing [Enter] or [Tab]. Pressing [Shift] and [Tab] simultaneously moves the highlight bar to the previous entry. The [→] and [←] keys move the cursor one character at a time, while the [↑] and [↓] keys move the cursor up and down one entry, respectively. Use [Del] to remove any unwanted characters from an entry.

5. Type your five-digit station index number. Press [Enter]. The WBAN number and station name are entered automatically. Also, the Local Station ID and Parent WSFO ID entries, which appear in the lower middle portion of the screen, are entered automatically.

6. Press [Enter]. The highlight bar moves to the Latitude entry.

7. Type the latitude in degrees and minutes, using [Enter] or [Tab] to advance the highlight bar within the latitude entries.

8. Enter the longitude in the same manner.

9. The predetermined WMO Region number entry is 4. (Region 4 includes the

continental United States, Alaska, the Bahamas, the Caribbean, Mexico, and Central America.) To accept this entry, press [Enter]. If you are in Region 5, you can type 5, or you can press the space bar to toggle back and forth between the entries 4 and 5. (Region 5 includes Pacific stations.) This toggling function will also be used with some later entries.

10. Enter the station elevation to the nearest meter. The base pressure, which is used in computing the stability index, is supplied automatically.

11. Enter the base range in meters. If your station has no transponder equipment, press [Enter].

12. Enter the target antenna elevation and azimuth angles to the nearest hundredth.

13. The Orientation Correction Elevation and Azimuth Angles are set in the Check System Status portion of the ART Observation option and should not be changed here.

14. Enter the Release Point Pressure Correction to the nearest tenth of a millibar.

15. The Host Computer, Sonde Manufacturer, Tracking Equipment, Baud Rate, and Dial Method entries are selected by using the space bar to toggle through the possible choices. Continue pressing the space bar until the appropriate selection is displayed.

    NOTE: The choices for the host computer are AFOS, Alaska, Pacific, GTS, International, and None.

16. Telephone numbers for the host computers are required. Commas create a 2 second pause in the dialing which can help ensure that a connection is made. For example, if a 9 must be dialed to get an outside line, a comma can be inserted after the 9 (see Exhibit 6-3). Dashes can be used to separate groups, **but do not include any parentheses.** For stations whose host computer is AFOS, the Central number refers to the Central Region Headquarters AFOS (816-842-0814).

17. An example of a completed Station Data Entry screen is shown in Exhibit 6-3.

```
                          Station Data Entry                Version 2.90

Station Index: 72403    WBAN: 93734    Name: Sterling, VA

Latitude: 39:59 N    Longitude:  77:28 W    WMO Region: 4

Elevation(m):   85    Base Pressure(mb): 850   Base Range(m):   0

Target Antenna: (El. Angle)  8.80    (Az. Angle) 185.10

Orientation Correction:  (El. Angle)   0.00    (Az. Angle)    0.00

Release Point Pressure Correction(mb):  0.0     Host Computer: AFOS

Sonde Manufacturer: VB2    Tracking Equipment: ART-1     Baud Rate: 110

Local Station ID: IAD    Parent WSFO ID: WBC    Dial Method:  Pulse


Telephone Numbers:    (Primary)     9,565-5969
                      (Secondary)   9,565-5970
                      (Central)     9,816-842-0814

         PgDn - Limiting Angles,  Esc - Exit
```

Exhibit 6-3. Sample completed Station Data Entry screen.

6.2.2 Limiting Angles

1. From the Station Data Entry screen, press [PgDn] to advance to the first of four limiting angles screens (Exhibit 6-4).

Limiting Angles Station Data Entry Version 2.90

	0	1	2	3	4	5	6	7	8	9
0		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
10	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
20	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
30	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
40	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
50	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
60	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
70	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
80	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0

PgDn - Next Screen, PgUp - Previous Screen, Esc - Exit

Exhibit 6-4. First Limiting Angles screen.

Extending vertically along the left side of this screen are the tens digits of the station azimuth angles. Extending across the top of the screen are the units digits. The entries within this table are the limiting angles for the azimuth angles from 1 to 89 degrees. All of the limiting angles have a predetermined value of 6.0 degrees. (The entry for the azimuth of 00 degrees is blank because 360 is used instead.)

2. When entering limiting angles, type the tens digit of the angle (or press the space bar if there is none), the units digit, and a decimal point. Then type the tenths digit of the angle, or zero if the angle is a whole number. Press [Enter]. Doing this will minimize the chance of any spurious digits being included in the limiting angles table. Use [Del] to remove any unwanted characters.
Fill in the limiting angles for this screen. The highlight bar can be moved using the same keys as for the Station Data Entry screen.

All limiting angles must be greater than or equal to 6.0 degrees. An example of a completed limiting angles table is shown in Exhibit 6-5.

Limiting Angles Station Data Entry Version 2.90

	0	1	2	3	4	5	6	7	8	9
0		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
10	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
20	6.0	6.0	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
30	8.3	8.3	8.3	8.3	8.3	8.3	6.0	6.0	6.0	6.0
40	6.0	6.0	6.0	6.0	8.0	8.0	8.0	8.0	8.0	8.0
50	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.4	7.4
60	6.0	6.0	6.0	6.4	6.4	6.4	6.4	6.4	6.4	6.4
70	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.0
80	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0

PgDn - Next Screen, PgUp - Previous Screen, Esc - Exit

Exhibit 6-5. Sample Limiting Angles table.

As an example, to read the limiting angle at an azimuth of 67 degrees, first find the "60" on the left side of the screen. Follow this row to the right until the column labeled "7" is found. The limiting angle shown is 6.4 degrees.

3. When the table is complete, press [PgDn] to advance to the second limiting angles screen. Complete this screen and, in a similar fashion, the third and fourth limiting angles screens.

4. When the limiting angles tables are complete, press [Esc]. The file is stored automatically on the hard disk under the name STATION.DAT. The following prompt appears on the screen:

   Save Station Data to Floppy Disk (Y/N): [Y]

5. Press [Enter] to accept the predetermined response of Yes. The following prompt appears on the screen:

Insert Station Resident Data diskette in drive.
Press Enter when ready.

Insert a formatted diskette with the proper label into the diskette drive and press [Enter]. The station resident data are stored on the diskette under the file STATION.DAT and the Main Menu appears. Remove the diskette from the drive and apply a write-protect tab on the slot on the diskette.

6. In case the STATION.DAT file is erased from the hard disk, the data can be restored using this diskette (Section 6.4 deals with this predicament). Put this backup diskette in a safe place. No one wants to type a limiting angles table more than once!

6.3 Updating the Station Data

Once in a while it may be necessary to update the station data. To do this, follow these steps:

1. From the Main Menu, select the Edit Station Data option. The Station Data Entry screen appears.

2. If only the limiting angles table needs to be changed, press [PgDn] and proceed to Step 6.

3. Use [Enter] or [Tab] to advance the cursor to the entry that is to be changed.

4. Type the necessary change. Use [Del] to remove any extra characters in the entry.

   Entries for the following fields are selected using the space bar to toggle through the possible choices: WMO Region, Host Computer, Sonde Manufacturer, Tracking Equipment, and Dial Method.

   Entries for the following fields are determined by the Station Index number and cannot be changed: WBAN number, Local Station ID, and Parent WSFO ID.

   The entries for Orientation Correction cannot be changed in the Station Data Entry screen. These are changed using the System Status Check of the ART Observation option.

5. If no change in the limiting angles table is necessary, proceed to Step 8.

6. Use [PgDn], the arrow keys, and [Enter] to advance the cursor to the limiting angle to be changed.

7. Type the necessary change. Use [Del] to remove any extra characters.

8. Press [Esc]. **The data are automatically stored on the hard disk under the filename STATION.DAT.** The following prompt appears on the screen:

   Save Station Data to Floppy Disk (Y/N)?: [Y]

9. Press [Enter] to accept the predetermined response of Yes. The following prompt appears on the screen:

   Insert Station Resident Data diskette in drive.
   Press Enter when ready.

   Insert the diskette that contains the original version of the station data into the disk drive and press [Enter]. The updated station resident data are stored on the diskette under the file STATION.DAT. The Main Menu appears.

10. Take the diskette out of the drive and place a write-protect tab on it to ensure that it doesn't get overwritten. (This tab must be temporarily removed anytime you wish to update the station data file.)

6.4 Restoring the Station Data

Accidents do happen, and the file STATION.DAT, which contains the station resident data, may be erased accidentally from the hard disk. If this file is not on the hard disk, the following message appears when MicroART attempts to read it:

Cannot read file STATION.DAT !

A floppy diskette containing a backup copy of STATION.DAT should be kept on station. If no backup is available, you will have to re-enter the data manually using the instructions in Section 6.2. If a backup copy is available, follow these instructions to restore the station data to the hard disk:

1. From the Main Menu, select the Edit Station Data option.

2 The following messages appear:

Cannot read STATION.DAT from hard disk.

Restore Station Data from Floppy Disk (Y/N)?: [Y]

3. Press [Enter] to select the predetermined response of Y. The following message appears:

   Insert diskette. Press <Enter> when ready.

4. Insert the floppy diskette containing the backup copy of STATION.DAT. Press [Enter].

5. The Station Data Entry screen appears with the station data entered. Check to be sure the data (including the limiting angles) are correct.

7. Press [Esc]. **The data are automatically stored on the hard disk under the filename STATION.DAT.** The following message appears:

   Save Station Data to Floppy Disk (Y/N)?: [Y]

8. Type N and press [Enter]. (Since the data are already on the floppy disk, there is no need to save them.) The Main Menu appears.

7. Checking the System Status

7.1 Introduction

This chapter trains you to perform the system status check. This check **must** be performed before every flight, although it is not necessary for second and third releases. The check ensures the ART Interface Card (ARCTIC), the printer, and the modem are functioning properly.

7.2 Getting Started

To start the system status check, follow these steps:

1. Turn on the ART equipment and target antenna. **Both must be turned on before the MicroART computer is turned on in order for the system status check to work properly.**

2. With the ART antenna at the posted position of the target antenna, tune the target antenna signal to maximum strength (low sensitivity OFF).

3. Press the FAR AUTO button and allow the antenna to lock onto the target antenna.

4. Make sure the printer and modem are connected to the MicroART computer. Turn on the printer and modem.

5. Turn on the MicroART computer following the instructions in Section 2.8. Provide appropriate responses to the date and time prompts. The Main Menu appears and the ART Options choice is highlighted.

6. Select the ART Options choice by pressing [Enter]. The ART Options Menu appears with the Check System Status choice highlighted.

7. Press [Enter]. The ART System Status Monitor appears (Exhibit 7-1) and the ARCTIC board test starts automatically.

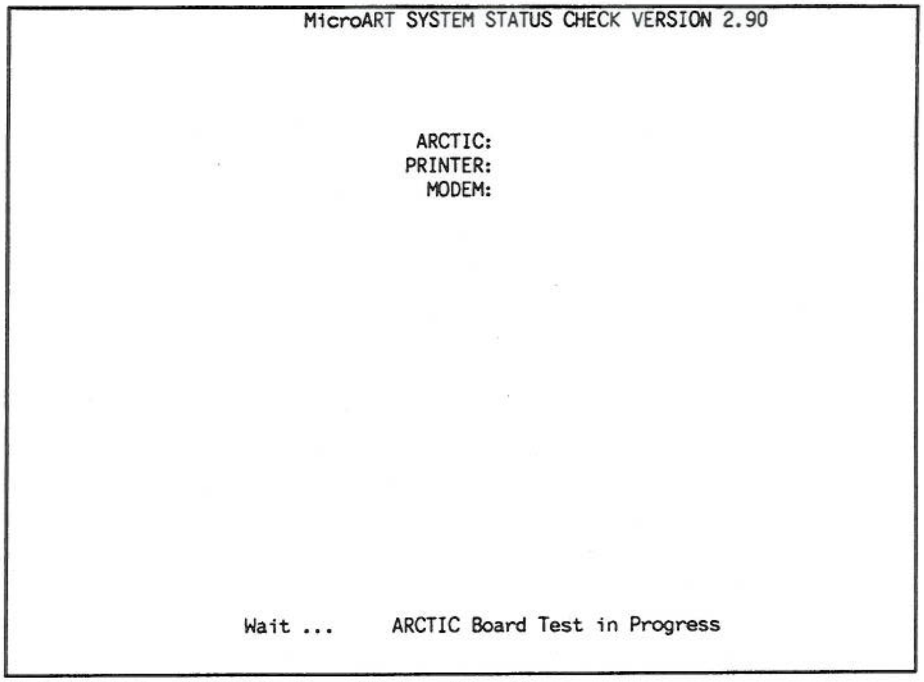

Exhibit 7-1. ART System Status Monitor.

7.3 ARCTIC Board Test

These steps constitute the ARCTIC board test:

1. The word **Wait** blinks in red at the bottom of the screen during the ARCTIC board test. This test normally takes about 1 minute. If the ARCTIC board is working properly, the word **FUNCTIONAL** appears next to **ARCTIC.** If this happens, go on to Section 7.4.

2. If after 2 minutes **Wait** is still flashing, perform a warm boot of MicroART. To do this, open the diskette drive door and press [Ctrl]-[Alt]-[Del] simultaneously. The Main Menu appears. Return to Step 4 in Section 7.2 and repeat the test.

3. If the ARCTIC Board is not functioning properly, the word **NONFUNCTIONAL** flashes next to **ARCTIC.** In general, a diagnostic message will appear at the bottom of the screen along with the following message:

   ***** Make note of above diagnostic and Press <Esc>**

Write down the diagnostic message for future reference. Press [Esc]. The ART Options Menu appears with the Check System Status option highlighted. Return to Step 5 of Section 7.2 and repeat the test once.

4. If you have attempted the ARCTIC board test twice and the equipment is still not indicated as being **FUNCTIONAL**, turn off the MicroART and ART equipment. Then return to Step 1 of Section 7.2 and repeat the test once again. If the ARCTIC board is again **NONFUNCTIONAL**, fill out an A-26 Equipment Outage Log and follow your regional policy for notifying an Electronics Technician. Give the ET the diagnostic messages you have written down.

7.4 Printer Test

The following steps describe the printer test:

1. The printer test normally takes no more than a few seconds. If the printer is in working order, the word **FUNCTIONAL** appears next to **PRINTER**. In this case, proceed to Section 7.5.

2. If the printer is not ready for use, the word **NONFUNCTIONAL** flashes next to **PRINTER** and a message appears at the bottom of the screen. The modem check is then performed (see Section 7.5). The diagnostic message will generally indicate what is wrong with the printer. The two most likely problems are that the printer has not been turned on or that it is not on line.

3. The system may not be able to determine the problem with the printer. The following diagnostic message may appear:

   Printer: Unknown Failure

   One possible cause for this message is a loose cable connection between the printer and the IBM XT. Another possibility is a printer malfunction. If the printer is not functional, the MicroART observation can still be performed, although no data can be printed or plotted on the printer.

7.5 Modem Test

The following steps describe the modem test:

1. When the modem test begins (make sure it is powered on), the following message appears at the bottom of the screen:

   Wait ... Modem Check in Progress

   with **Wait ...** blinking. If the modem is working, **FUNCTIONAL** appears next to **MODEM**. In this case, proceed to Step 4.

2. The modem test should take no more than a few seconds. If the **Wait ...** message continues to blink for more than 30 seconds, it will be necessary to perform a warm boot of MicroART. To do this, open the diskette drive door and press [Ctrl]-[Alt]-[Del] simultaneously. (One problem that can cause the **Wait ...** message to continue flashing is that the cable between the microcomputer and the modem is not properly connected.) Proceed to Step 4 of Section 7.2.

3. If the modem is not working, **NONFUNCTIONAL** appears next to **MODEM** and a diagnostic message will appear. Attempt corrective action based on the diagnostic message and proceed to Step 6. If the system cannot diagnose the problem, the following message appears:

   Modem: Unknown Failure

   (One reason for this message can be that the modem is not turned on.) Proceed to Step 6.

4. The following message appears at the bottom of the screen:

   ***** Want to Try Dialing at 300 Baud, Y/N? [N]**

5. Normally you should press [Enter] to accept the predetermined response of No. If both the printer and modem are functional, proceed to the Orientation Check (Section 7.6). Respond Yes to this prompt only if you want to dial a local number as a test. Do this only if it is absolutely necessary.

6. If either the printer or modem were not functional, the following message appears at the bottom of the screen:

***** Try the hardware check again, Y/N? [Y]**

7. Normally you should press [Enter] to accept the predetermined response of Yes. The printer and modem will both be retested. If corrective action has restored the equipment to working order, **FUNCTIONAL** will appear next to the name of the equipment. If the equipment is still not working, **NONFUNCTIONAL** will continue to appear.

8. The MicroART observation can be conducted without the printer and modem. If the printer is not functional, no printouts can be made. If the modem is not functional, the coded messages **cannot** be transmitted.

7.6 Orientation Check

Once the hardware status check has been completed, the orientation check section appears just below the MicroART hardware status section (Exhibit 7-2).

```
Micro ART SYSTEM STATUS Check  VERSION 2.90

             MicroART HARDWARE STATUS

              ARCTIC: (FUNCTIONAL)
             PRINTER: (FUNCTIONAL)
               MODEM: (FUNCTIONAL)


              ORIENTATION CHECK

                      EL. ANGLE      AZ. ANGLE
                      ---------      ---------
 TARGET ANTENNA:      ( 5.25)        ( 325.40)
 OLD  CORRECTION:     ( -0.03)       (    0.02)

      ART SYSTEM:     ( 5.29)        ( 325.39)
 NEW CORRECTION:      ( -0.04)       (    0.01)

***Press any key to continue
```

Exhibit 7-2. Orientation Check screen.

Proper orientation of the ART system with respect to true north is essential to obtain accurate wind data. The orientation check screen shows the elevation and azimuth angles of the target

antenna and the ART system. Also displayed are the old (previous) correction and new correction that must be applied to the ART position angles to obtain true readings. In general, corrections more than 0.05° indicate an equipment problem.
To perform the orientation check, follow these steps:

1. The ART system angles and new corrections displayed on the screen may change slightly due to antenna movement.

2. Press a key in response to the following prompt:

   ***** Press any key to continue**

   This prompt appears at the bottom of the screen:

   ***** Save new corrections, Y/N? [Y]**

3. Wait a few seconds until the angle readings stabilize. If both of the new corrections are less than or equal to 0.05°, press [Enter] to save them and complete the orientation check.

4. If either of the new corrections is greater than 0.05°, the orientation check should be repeated. To do this, in response to the prompt

   ***** Save new corrections, Y/N? [Y]**

   press N and [Enter]. The following prompt appears:

   ***** Reset corrections to zeros, Y/N? [N]**

   Press [Enter] to accept the predetermined response of No. The ART Options menu appears. Press [Esc] to return to the Main Menu. Turn off the power to the MicroART and ART equipment and begin the system status check again (Section 7.2, Step 1). If one or both of the orientation check corrections is still greater than 0.05°, there is probably an equipment problem. Turn off power to the target antenna. Fill out an A-26 Equipment Outage Log and follow your regional policy for notifying an ET. If the problem cannot be remedied before the flight, save the new corrections as they are and continue with the observation.

8. ART Observation - Prerelease Sequence

8.1 Introduction

This chapter trains you to perform the prerelease sequence of a MicroART upper air observation. Before you begin this chapter, you should have learned to perform the system status check (Chapter 7).

The prerelease sequence consists of four steps:

a. Completing the prerelease data

b. Inserting the Log Diskette for backup

c. Baselining the radiosonde

d. Launching the balloon.

The following sections deal with these steps.

8.2 Completing the Prerelease Data

Completing the prerelease data is the first step in the prerelease sequence. These data provide information about the time, flight equipment, radiosonde, and surface weather. (Chapter 5 provides an introduction to completing these data using the Rework option.)

NOTE: Before beginning this procedure, someone from your station must have entered the station resident data onto the hard disk. If this has not been done, the following message will appear after Step 1 below is attempted:

Cannot read file STATION.DAT!

Check with the appropriate person to have the station resident data entered. (Chapter 6 provides instructions for entering the station resident data.)

Follow these steps to complete the prerelease data:

1. From the Main Menu, select ART Options. The ART Options Menu appears.

2. From the ART Options Menu select ART Observation. The Administrative Data screen appears.

   NOTE: If the MicroART software was just installed, the following prompt appears on the screen:

   No previous ascension.
   Continue? [Y/N]:

   To continue, press Y and [Enter]. The Administrative Data screen appears.

3. Complete the Administrative Data screen. After the entry on each line is typed, press [Enter] to advance to the next line. (If the entry that is already present is valid, press [Enter] to accept that entry and advance to the next line.) Use the arrow keys to move the cursor around. Use [Del] to delete characters. An example of a completed Administrative Data screen is shown in Exhibit 8-1.

```
MicroART Version 2.90          Prerelease Data

Station: Sterling, VA              Index: 72403        Pressure Corr: 0.0 mb
Orientation correction AZ: 0.00    EL: 0.00            Elevation: 85 m
Date Last Flight: 02/12/97         Hour: 12            Prev. Asc. No.: 216-1

*** Administrative Data ***

Observer:                     RNT
Date:                    02/12/97
Hour:                          15
Ascension Number:             217
Release Number:                 1
Process Winds [Y/N]:            Y
Process Ranging Data [Y/N]:     N
Special Observation [Y/N]:      N
Termination Level             0.1 mb

                               PgDn:Next Screen
```

Exhibit 8-1. Sample Administrative Data screen.

4. Complete the Flight Equipment Data screen. An example of a completed screen is shown in Exhibit 8-2.

```
MicroART Version 2.90         Prerelease Data

Station: Sterling, VA                 Index: 72403        Pressure Corr: 0.0 mb
Orientation correction AZ: 0.00       EL: 0.00            Elevation: 85 m
Date Last Flight: 02/12/97            Hour: 12            Prev. Asc. No.: 216-1

*** Flight Equipment Data ***

Radiosonde Type:                  ST
Balloon Size:                    600
Balloon Mfg:                  KAYSAM
Date Balloon Mfg:           01/14/97
Parachute? [Y/N]:                  Y
Train Regulator? [Y/N]:            N
Lighting Unit? [Y/N]:              N


          PgDn:Next Screen        PgUp:Previous Screen
```

Exhibit 8-2. Sample Flight Equipment Data screen.

5. Complete the VIZ Radiosonde Data Screen. Enter the serial number in the following format: NNNNNNNN.CSN. Use a period before the CSN and do not use spaces or dashes. An example of a completed VIZ Radiosonde Data screen is shown in Exhibit 8-3.

   After the MDO board serial number is entered, you will be asked "Change Humidity Cal Data? If the response is "NO", the calibration data are read automatically from the hard disk. (Appendix A provides instructions on how to load the calibration data onto the hard disk from the calibration diskette that comes in the box of radiosondes.)

   NOTE: The Humidity and Temperature entries are read automatically from the calibration file. The Humidity can be changed by the observer. This is done in cases where the Humidity value on the screen differs from the value on the outside of the radiosonde. When this happens you should enter the value on the radiosonde into

MicroART. If for any reason a hygristor other than the one provided with the radiosonde is used, you **must** manually enter the Humidity value from its can.

Note: The hygristor can has no humidity values on it. The humidity data is now on the radiosonde label affixed to the outside of the VIZ B2 radiosonde. If a radiosonde is rejected, the hygristor can be used with another flight. The radiosonde label may be peel off the rejected radiosonde or the humidity values copied on a small slip of paper and taped to the hygristor can. Without this information the hygristor is of no use.

Humidity information Required: Humid: HR (The H1-H5 values are not needed)

The Temperature entry cannot be changed by the observer because the thermistor is not a replaceable component.

```
MicroART Version 2.90         Prerelease Data

Station: Sterling, VA               Index: 72403        Pressure Corr: 0.0 mb
Orientation correction AZ: 0.00     EL: 0.00            Elevation: 85 m
Date Last Flight: 02/12/97          Hour: 12            Prev. Asc. No.: 216-1

*** VIZ B2 Radiosonde Data ***

Radiosonde Serial No.: 84000077.CSN
MDO Board Serial No.:        1155432
Change Humidity Cal Data? [Y/N]:   N
Print Calibration Data? [Y/N]:     N
Humidity Lock-in (K-Ohms):     10.276      Temperature Lock-in (K-Ohms): 14.399

                      H1:      1.030
                      H2:      1.250
                      H3:      1.090
                      H4:      1.000
                      H5:      1.000
```

Exhibit 8-3. Sample VIZ Radiosonde Data screen.

If the calibration data for the radiosonde are not on the hard disk, the following prompt appears:

Insert calibration diskette - Press ENTER

Insert the calibration diskette that came with the box of radiosondes into the disk drive ("A" drive) and press [Enter]. The calibration data are read from the diskette.

6. If the calibration data for the radiosonde are not present, the following message appears:

Calibration file ########.## not found

Check to be sure you entered the radiosonde serial number correctly. If you did, you have two choices: 1) Supply the system with the calibration data for the radiosonde, or 2) Obtain another radiosonde for which calibration data are available.

7. If the MDO Board serial number you entered does not match the MDO Board serial number on the calibration data, the following message appears:

MDO Board serial No. entered doesn't match MDO Board serial No. in file Accept? [Y/N]

You should always respond No to this prompt. There are two situations that can cause this prompt to appear. One possibility is that the MDO Board serial number was typed incorrectly. If this is the case, retype the serial number. The other possibility is that the numbers actually do not match. In this case, the radiosonde should be rejected. You should obtain another radiosonde and complete the VIZ B2 Radiosonde Data screen.

8. If there is no MDO Board serial number on the radiosonde, the operator may enter any 7 digit number. The software will flag the number as being incorrect, but the software will allow the operator to continue. The operator should respond "YES" when asked if a printout of the calibration information is desired. The printout should provide the correct MDO Board serial number to use. The operator should then restart the observation and enter the correct MDO Board serial number at the VIZ B2 Radiosonde Data screen .

9. If you wish to print the calibration data, press Y in response to the prompt **Print Calibration Data? [Y/N]**. (Make sure the printer is turned on and the ON LINE light is on.) Otherwise, press N.

10. Fill out the Surface Data Screen using the most recent surface observation. Codes for the Clouds/WX entry are provided in Appendix B. A sample Surface Data Screen is shown in Exhibit 8-4.

NOTE: MicroART bases its calculations on the values you enter. If you later discover an erroneous value was entered, it can be changed with the SURFACE command (see Section 5.3.11). The software cannot determine if a value is erroneous by itself.

```
MicroART Version 2.90          Prerelease Data

Station: Sterling, VA             Index: 72403          Pressure Corr: 0.0 mb
Orientation correction AZ: 0.00   EL: 0.00              Elevation: 85 m
Date Last Flight: 02/12/97        Hour: 12              Prev. Asc. No.: 216-1

*** Surface Data ***

Pressure:              .   1016.0 hPa       Corrected Pressure: 1016.0 hPa
Temperature 12 Hrs Ago:          C
Dry-Bulb Temperature:      15.0 C
Dew Point Temperature:      7.0 C           Relative Humidity:     59 %
Wind Direction:             230 Deg
Wind Speed:                  10 kts
Clouds/WX:             657082001

                 PgDn:Next Screen       PgUp:Previous Screen
```

Exhibit 8-4. Sample surface data screen.

11. After the surface data entries are complete, a screen appears that displays cross-check messages if there are inconsistencies in the prerelease data. If there are messages, use [PgUp] to return to the screen(s) that require changes. After the changes have been made, use [PgDn] to return to the Check screen. If there are no inconsistencies, a message indicating this appears. A Check screen showing no error messages appears in Exhibit 8-5.

```
MicroART Version 2.90          Prerelease Data

Station: Sterling, VA               Index: 72403          Pressure Corr: 0.0 mb
Orientation correction AZ:  0.00   EL:  0.00             Elevation: 85 m
Date Last Flight:  02/12/97         Hour: 12              Prev. Asc. No.: 216-1

*** Cross-checks ***

No errors were found

Continue with Observation? [Y/N]: Y                       [Y]
                              PgUp:Previous Screen
```

Exhibit 8-5. Check screen with no error messages.

12. When the Check screen indicates no inconsistencies (or if you wish to override any check messages), press Y and [Enter] in response to the prompt

    Continue with Observation? [Y/N]:

    After a few seconds, the following message appears:

    Insert Log Diskette into drive. Press ENTER when ready.

    After a few seconds, the following message appears:

    Press any key to begin baselining sonde.

8.3 The Log Diskette

The Log Diskette is used to log or record the 1-second meteorological and position data for backup purposes. A Log Diskette must be inserted before each flight. The same Log Diskette can be used for a number of flights until one of three situations occurs:

1. Multiple releases are required (see Chapter 15)

2. The diskette becomes bad as a result of overuse, at which point you should discard it and replace it with a new **formatted** one

3. The current one has been requested by WSH for evaluation as a result of an unusual event during the observation.

   NOTE: MicroART does not prevent you from completing an observation because of an A: drive failure. If the A: drive is inoperative before the system asks for insertion of the Log Diskette, the system warns you of this and lets you continue on to the baseline. (If the Log Diskette is not available and a power failure occurs, the Resume option cannot be used to recover the flight data.) If the A: drive stops working during an observation, the following real-time system status message is issued:

   Error writing log diskette. Log terminated.

   The rest of the functions, including archiving and storing of data, should work alright.

To complete this screen, do the following:

1. Insert the Log Diskette (see Chapter 2) into the diskette drive and press [Enter].

2. A message about the contents of the diskette appears. If the diskette contains log data from a previous flight, the following message appears:

   Floppy contains log information from (date) ascension number (no.)
   Continue: [Y/N]:

   Press Y and [Enter]. Proceed to Section 8.4.

3. If it is not a log diskette, the following message appears if it has been previously formatted:

   Floppy is MS-DOS format; volume has no label; (##) files in root directory.
   Continue? [Y/N]:

   Press N and [Enter]. The prompt appearing in Step 6 of Section 8.2 appears. Return to Step 1 of Section 8.3.

If the diskette is not formatted, the following message appears:

ERROR: Floppy has not been formatted
Would you like it to be formatted? [Y/N]:

Press Y and [Enter]. The diskette will be formatted.

8.4 Baselining the Radiosonde

After the system recognizes the log diskette, the next step is the baseline procedure. This procedure provides information about the radiosonde and checks the radiosonde parameters against established limits. The following sections describe the baseline procedure.

2. Before continuing with the baseline procedure, ensure that the following conditions exist:

   a. Battery is up to full voltage and placed in radiosonde. The radiosonde is placed on a styrofoam block or suspended to eliminate antenna loading that may cause frequency shifts.

   b. ART equipment is tuned to receive maximum radiosonde signal (low sensitivity OFF and motors in STANDBY).

   c. The QR value displayed on the real-time monitor is at least 90 and LOCK appears under the Sync heading.

3. When you are satisfied that the above conditions have been met and there is a satisfactory signal, proceed to Section 8.4.1.

8.4.1 Baselining - The Normal Case

This section describes the normal baselining procedure, which should occur the vast majority of the time.

1. Press [Enter] to begin the baseline check.

2. After about 30 seconds, or when the readings seem to be stable, compare the instruments readings against the surface conditions entered.

Press the F10 key to initiate baseline.

8.4.2 Radiosonde Problems

During the baselining procedure, radiosonde problems are most likely to appear in messages indicating that parameters are out of tolerance. The screen shown in Exhibit 8-6 is an example of the type of message that appears.

Note: The only tolerance that should be checked currently is pressure the maximum allowable tolerance is 5 hPa.

SONDE BASELINE (VIZ B2) Ver 2.90

Data Display -> Circuit -> Validity -> Stability -> Discrepancy SYNC:LOCK

FRAME	FRAME	REF		CLOW			CHIGH			TEMP			PRESS		RH	
TIME	LENG	PRD	Q	DRF	PRD	Q	DRF	PRD	Q	DRF	PRD	Q	PRD	Q	PRD	Q
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99
4.0	1840	1056	100	0	2346	99	0	5020	100	0	1402	99	2982	100	1296	99

	Pres(hPa)	Temp(°C)	RH(%)
Surface:	1013.0	23.0	50.0
Sonde:	1004.2	26.4	35.7
Discrepancy:	8.8	-3.4	14.3

Accept Pressure Discrepancy, Y or N? [N] Esc: Quit

Exhibit 8-6. Radiosonde Baseline screen.

If the parameters are out of tolerance. A message will ask if you want to accept the discrepancy, answer "NO". After answering "NO", a prompt at the bottom of the screen provides three options: Quit, Continue, and Retry. Here is how to decide which response to use:

Retry - Choose Retry after the **first** time a test shows parameters out of tolerance. (Retrying after the baseline check is completed will repeat the sensor test.)

Continue - Choose Continue to ignore the discrepancy. This is not under normal conditions.

Quit - Choose Quit when a radiosonde has failed the baseline check twice. In this case, the radiosonde should be rejected and returned for warranty. The baselining process should be restarted with a new radiosonde. **Don't reboot the system if the radiosonde is bad!** Choosing Quit returns you to the Administrative Data screen. From there you can press [PgDn] twice and complete the data for the new radiosonde.

8.5 Radiosonde Ready for Release

After the radiosonde baselining tests are complete, the screen shown in Exhibit 8-7 appears.

```
Station: Sterling, VA          Launch Time:                        Ascension: 217-1
Time  Contact Dir   Press  Tempr  RH    El      Az     Range  Sync  QR  Ref     Frame
000.0  ODD                  15.1  57   -----  -----           LOCK 100 1049.6    856

=============================== ANTENNA LOCK ===============================

*** RADIOSONDE READY FOR RELEASE ***
```

Exhibit 8-7. Radiosonde prior to Release screen.

8.6 Launch

Once the baselining procedure is complete, the radiosonde is ready for launch. Scheduled synoptic observations are taken at 0000 UTC and 1200 UTC. The actual release window is 2300-0100 UTC (for 0000 UTC) and 1100-1300 UTC (for 1200 UTC). Actual releases outside these windows are strictly prohibited. The only exception to this rule are special observations, which may be taken at any time. However, if a special observation coincides with the scheduled observation release window, the flight is considered "scheduled."

MicroART automatically "time stamps" the flight data when the actual release is detected. During the prerelease sequence, the program notes the time that the message

***** RADIOSONDE READY FOR RELEASE *****

is displayed on the ANTENNA LOCK screen. If the time is earlier than 2300 UTC or 1100 UTC, a prompt is displayed indicating that it is too early for the scheduled release.

NOTE: The early transmission prompt is displayed in red until the internal clock reads either 2300 or 1100 UTC. When one of these times is detected, the prompt disappears and is replaced with *** RADIOSONDE READY FOR RELEASE ***. The early transmission prompt is for information only and does not prohibit MicroART from functioning. If you leave the office to release the balloon at 1057 UTC, the early release prompt would disappear at 1100 UTC and the actual release time would be "stamped" internally when the release signal was detected.

Follow these steps during the launch:

1. Take the radiosonde to the release point and perform your normal procedure for releasing it. When the release signal is triggered, the MicroART system is activated and the elapsed time begins on the real-time monitor. The Antenna Lock screen will appear as shown in Exhibit 8-8.

```
Station: Sterling, VA          Launch Time:                    Ascension: 217-1
Time      Dir   Press  Tempr  RH    El      Az     Range  Sync  QR  Ref     Frame
000.3      ^      -     17.7   44   41.59  324.09         LOCK  96  1047.4   851
 0.0 Missing position data.
 0.0 Balloon release detected.
================================ANTENNA LOCK=====================================

Enter time antenna locked on radiosonde [mm.t]: 0.0





*INITIAL DATA PROCESSING IN PROGRESS** Expect met data several minutes after *
                                     * you verify the Surface Observation.   *




Press ENTER when ready to verify Surface Observation:
```

Exhibit 8-8. Antenna Lock screen.

The entries in the heading that are not self-explanatory include:

DIR - Direction balloon is traveling (∧ for ascending, - for floating, and∨ for descending)

Sync - Synchronization of the radiosonde signal:

- LOCK - MicroART is locked onto the radiosonde signal (appears in black).
- REFE - MicroART is attempting to receive a good reference signal (appears in yellow).
- CHCK - MicroART is verifying that it is synchronized with the radiosonde signal (appears in yellow).
- FRAM - MicroART is looking for the beginning of a frame of data from the radiosonde signal (appears in yellow).
- LOS - MicroART detects no signal from the radiosonde (appears in red).

QR - Quality of the reference signal (100 highest, 0 lowest)

Ref - Reference frequency of the radiosonde signal in hertz.

Frame - Frame length of radiosonde signal in milliseconds.

NOTE: The elevation and azimuth angle entries under El and Az will not be in exact agreement with the corresponding angles as shown on the ART Master Control Unit (MCU). This is because the entries on the screen are 6-second average values, whereas the MCU values are updated every 0.5 second. Furthermore, the entries on the screen have the orientation corrections applied.

2. The following message appears:

   Enter time antenna locked on radiosonde [mm.t]:

3. Enter the approximate time in minutes and tenths. Press [Enter].

Note: The most effective technique is to enter 0.0 initially. Then go into the Position Data and look for where the discontinuities in the elevation and azmuith data stop. You may also look at the Elevation and Azmuith plots, but it is not quite as accurate as looking at the 6-second position data.

4. Press [Enter] is pressed, the following message appears:

   Position data for minutes 0.0 through mmm.t have been deleted

5. After [Enter] is pressed, the following message will appear:

   Position data for minutes 0.0 through mm.t have been deleted

6. The ?> prompt appears, from which MicroART commands can be issued. An explanation of the available commands to use while the flight is in progress is given in Chapter 5 of this Training Guide.

1. If you would like to review the prerelease screens, press [PgUp] until you come to the screen(s) you want to look at. You can then press [PgDn] until you return to the Check Screen.

2. If you would like to stop training for a while, press N and [Enter]. The following prompt appears:

   Press PgUp to return to previous screen or ESC to EXIT

   Press [Esc]. The following prompt appears:

   Terminate Prerelease Data Entry? [Y/N]:

   Press Y and [Enter]. The ART Options menu appears. Press [Esc] to return to the Main Menu.

3. If you would like to continue training in Rework, proceed to Step 2 in Section 5.2.

9. ART Observation - Checking and Editing Data

9.1 Introduction

This chapter describes the procedures for checking data quality and editing of erroneous flight data during a typical MicroART observation. Included are data editing commands and techniques for dealing with some of the more common problems that arise during a flight. Refer to Chapter 14 for handling significant, but less common data problems that may be encountered

MICROART DOES NOT AUTOMATICALLY EDIT OR DELETE ERRONEOUS DATA. It only alerts you of questionable or erroneous data. If you do not edit the sounding data as required, erroneous data will appear in the coded messages for transmission to data users.

9.2 Data Editing Commands

The MicroART commands that can be used to view and edit data during a flight are fully described in Chapter 5 and can be entered any time during the observation from the ?> prompt. (To see the list of commands, press H (for help) and [Enter].) Remember that the CODE command must be issued before using either the CALC, MESSAGE, SUMMARY, or WINDS command.

9.3 MicroART Data Checks

MicroART will automatically flag errors in the meteorological and position data in the following ways:

a. STATUS messages (viewed in the real-time monitor message window and through the STATUS command)

b. Check messages (viewed through the CODE command).

9.3.1 STATUS Messages

STATUS messages displayed in the message window of the real-time monitor will indicate numerous events or data problems that may occur during a flight. They include the following:

o Beginning and ending of missing data

- o Excessive missing data - flight termination
- o Missing or invalid position data
- o Possible transponder failure
- o Floating balloon
- o Descending and reascending balloon
- o Large super-adiabatic lapse rate exceeding 75°C/km
- o Temperature sensor failure - very erratic temperatures
- o Relative humidity sensor failure

You can investigate data problems by using commands such as PLOT, MET, and POSITION. Exhibit 9-6 shows status messages indicating that some of the data may be invalid.

During the course of the flight, system status messages appear in the message window of the real-time monitor, but are displayed only two at a time. The STATUS command allows you to view a listing of all of the system status messages of the flight. This command allows you to monitor and review the status of the flight and when significant events occurred. Exhibit 9-1 provides an example of messages displayed with the STATUS command.

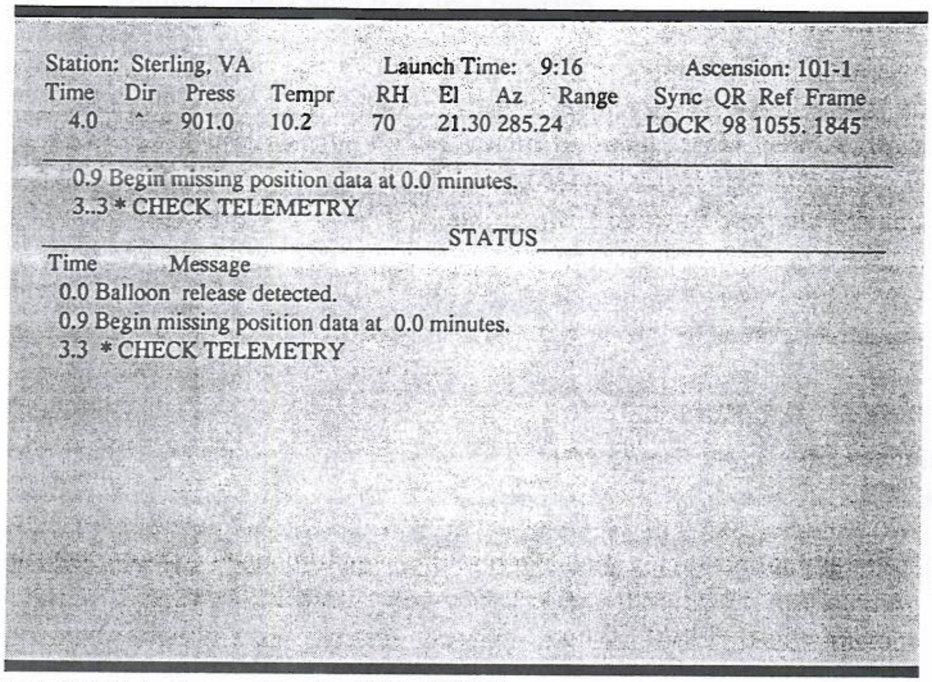

Exhibit 9-1. Example of a STATUS Screen

Super-adiabatic lapse rates occur frequently within 20 hPa (mb) of the surface (Super-adiabats occurring higher aloft are discuss in Chapter 14, Section 14.2.1). Many low-level super-adiabatic lapse rates are legitimate meteorological events that result from solar heating of the ground. However, if a layer exists with a super-adiabatic lapse rate exceeding 13°C per kilometer, it may be due to a radiosonde problem or an error in the surface temperature observation (i.e., entered incorrectly, the surface temperature equipment is out of calibration, or the observation was taken too far from the release point).

On the MicroART PLOT MET plots, a near surface super-adiabatic lapse rate appears as a line that has more of a slope than the rest of the sounding. Exhibit 9-4 shows an example of a super-adiabatic lapse rate near the surface.

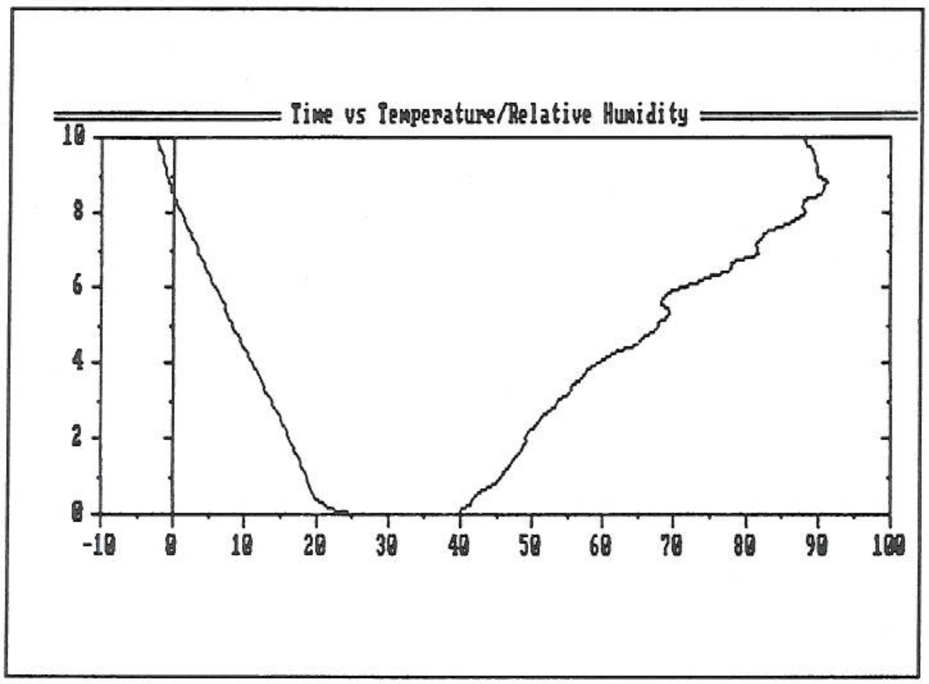

Exhibit 9-4. Example of a super-adiabatic lapse rate near the surface.

If MicroART detects a super-adiabatic lapse rate near the surface, follow these steps:

1. Issue the SURFACE command to display the surface data. If the surface temperature is correct, proceed to Step 2. Otherwise, correct the surface temperature while the SURFACE screen is displayed. Then issue the CODE command and see if a message indicating the super-adiabatic lapse rate still exists. If it does not, no further data editing is required. If it does, proceed to step 2

2 If the super-adiabatic layer has a lapse rate of 13°C per kilometer or less, no data editing is required.

3. If the super-adiabatic layer has a lapse rate of more than 13°C per kilometer, use the PLOT MET command to display the meteorological data. The start time for the plot should be 0.0 and the end time should be between 2.0 and 10.0. Examine the plot to determine the vertical extent of the super-adiabatic layer. Issue the MET command to check the temperatures just above the surface. Delete the temperature data in the super-adiabatic layer.

4. Enter the CODE command and if MicroART still indicates a super-adiabatic lapse rate near the surface, but is less than 13°C per kilometer, accept the lapse rate as valid. If the super-adiabatic lapse rate is still greater than 13°C per kilometer, you must check the validity of the temperature data. Let the sounding continue, but compare the temperature and mandatory pressure height data with the previous sounding. If there are significant temperature changes and/or height changes (MicroART will alert you of significant height changes with the CODE command) from the previous sounding that cannot be attributed to changing atmospheric conditions, terminate the sounding.

9.5.3 Checking the Position Data

After release, MicroART will prompt you to enter the time when the Automatic Radio-theodolite (ART) antenna was locked onto the radiosonde. In many cases, it will be difficult to determine the exact time of lock, so at the prompt enter "0.0". Next, use the PLOT ELEVATION and PLOT AZIMUTH commands to plot the elevation and azimuth angles. If ART lock occurred at minute 0.0, the angle plots should appear smooth without abrupt changes or spikes. If lock occurred later in the flight, you will likely see abrupt changes in the data up to the point when lock was finally achieved. Issue the POSITION command and delete all the angle data up to the point where you determined that lock occurred. To verify if the data editing was sufficient, issue the CODE command followed by the WINDS command. If data editing was sufficient, the first wind observation aloft should not deviate too much from what was observed at the surface. Chapter 14, Section xx.xx, provides additional information on detecting erroneous position data and winds aloft

As an example, Exhibit 9-5 shows a typical elevation angle profile, while Exhibit 9-6 illustrates a common azimuth angle profile. Note the abrupt changes in angle data, especially in azimuth angles near minute 0.5. In this case, all the angle data from minute 0.1 to 0.5 should be deleted.

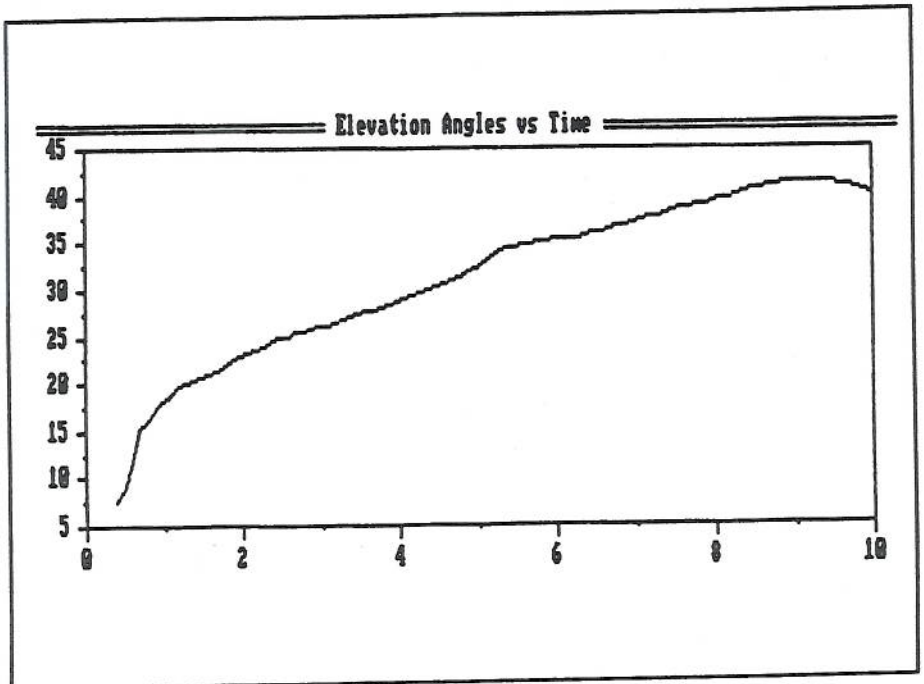

Exhibit 9-5. Typical elevation angle profile.

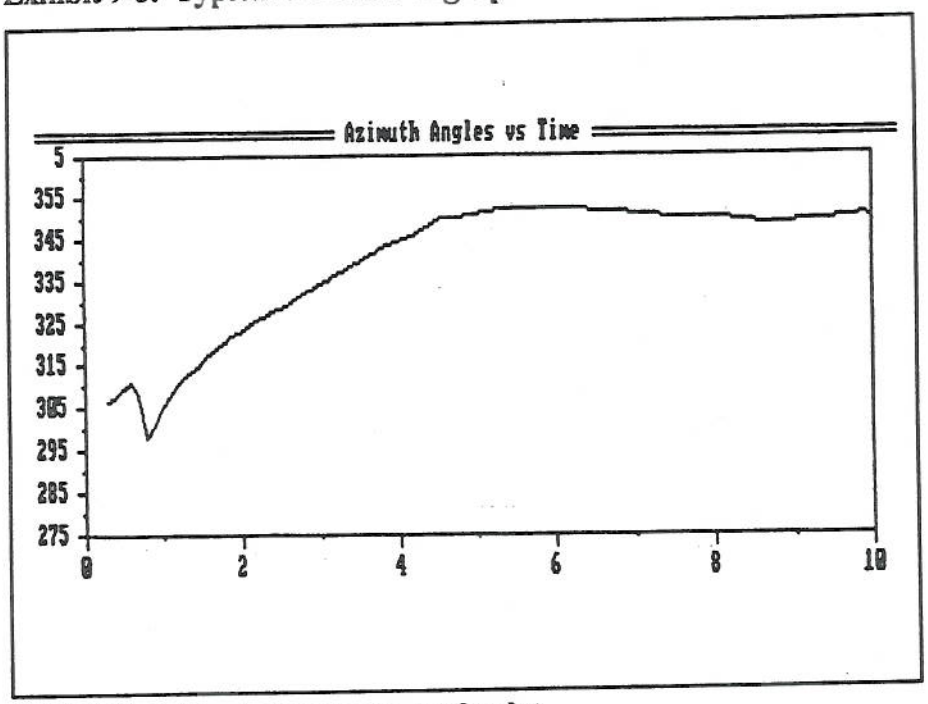

Exhibit 9-6. Typical azimuth angle plot.

9.5.4 Losing Track of the Radiosonde

The radiosonde signal may be lost right off the surface due to a variety of reasons. If the signal is lost, an audible alarm will notify you. Check to see that the ART system is locked onto the radiosonde. The antenna may not be pointed correctly and may need to be repositioned. If the radiosonde signal returns, examine the POSITION data and delete all erroneous angles (see Section 9.5.3). If the period between signal loss and reacquisition is too long, then the amount of missing data may result in flight termination. Chapter 11 describes how to process an aborted flight.

9.6 Typical Meteorological Features Observed Aloft

Most observations will contain one or more of the following features, which you should be proficient in identifying:

a. Freezing levels

b. Missing data

c. Jet Stream winds

c. Tropopause

d. Balloon burst (Discussed in Chapter 11) .

9.6.1 Identifying Freezing Levels

Freezing levels are points where the temperature falls below 0°C. Exhibit 9-7 illustrates a freezing level plotted on the temperature and RH profile. Some flights have multiple freezing levels. MicroART automatically records the freezing level(s) and reports it in the RADAT message (see Section 9.6.1 for more information on the RADAT message).

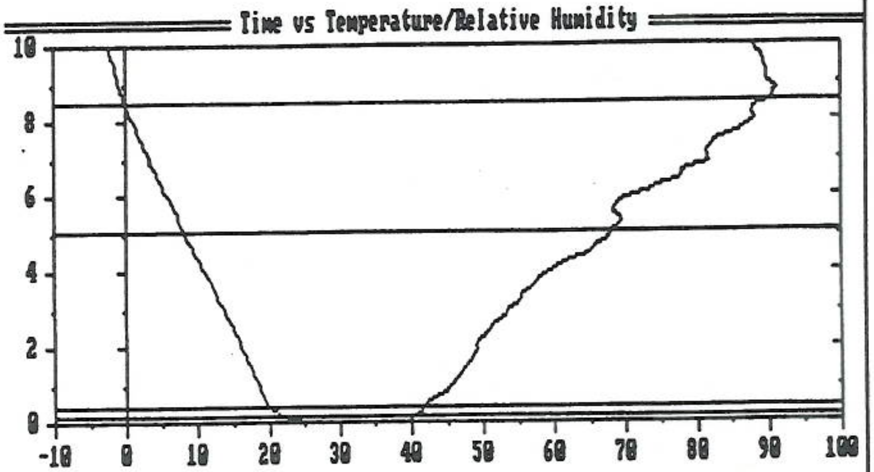

Exhibit 9-7. Example of a freezing level at minute 8.5.

9.6.2 Missing Data

Meteorological data received with a poor signal may be considered invalid by MicroART and automatically set to missing. Data may also be set to missing by using the data delete commands with MET and POSITION data. Exhibit 9-8 shows layers of missing temperatures and relative humidities which appear as blank spaces in the profiles. The LEVELS command will have BMD and EMD under the Reason Column indicating the beginning and ending levels of missing data. Note that missing pressure, temperature and/or RH data must be more than 1 minute in duration for the data to be set to missing.

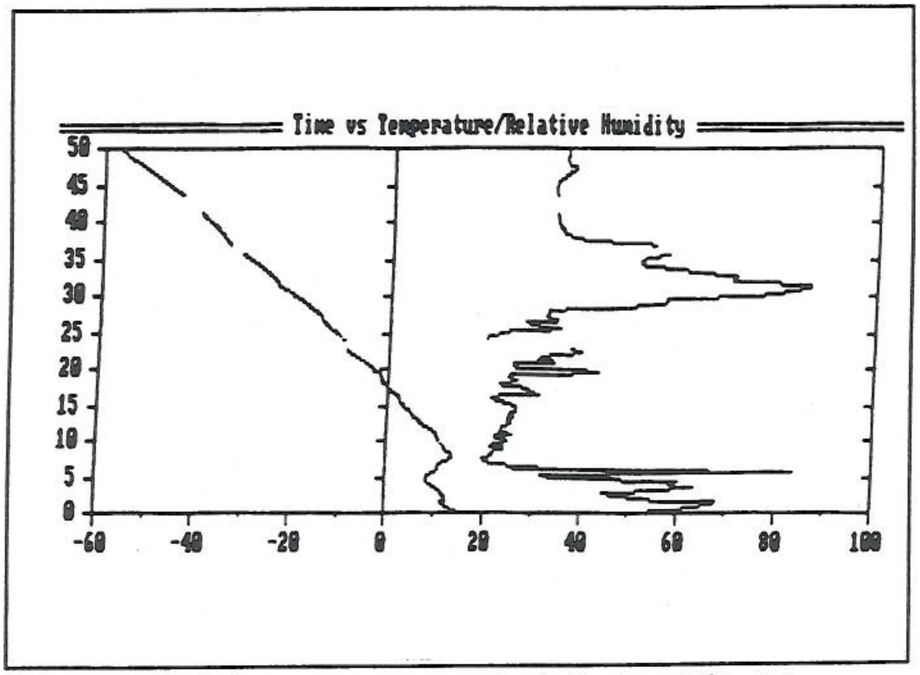

Exhibit 9-8. Missing temperature and relative humidity data.

In addition, POSITION data will be set to missing if they exceed the ART limiting angles or are deleted by the observer. Missing POSITION data is not interpolated. Exhibit 9-9 shows an example of missing elevation angles near the beginning of the flight that exceeded the limiting angles. Each elevation angle is compared with the limiting angle at the corresponding azimuth. If an elevation angle is less than the limiting angle, the elevation angle is automatically designated as missing. The limiting angles are stored in the station data file.

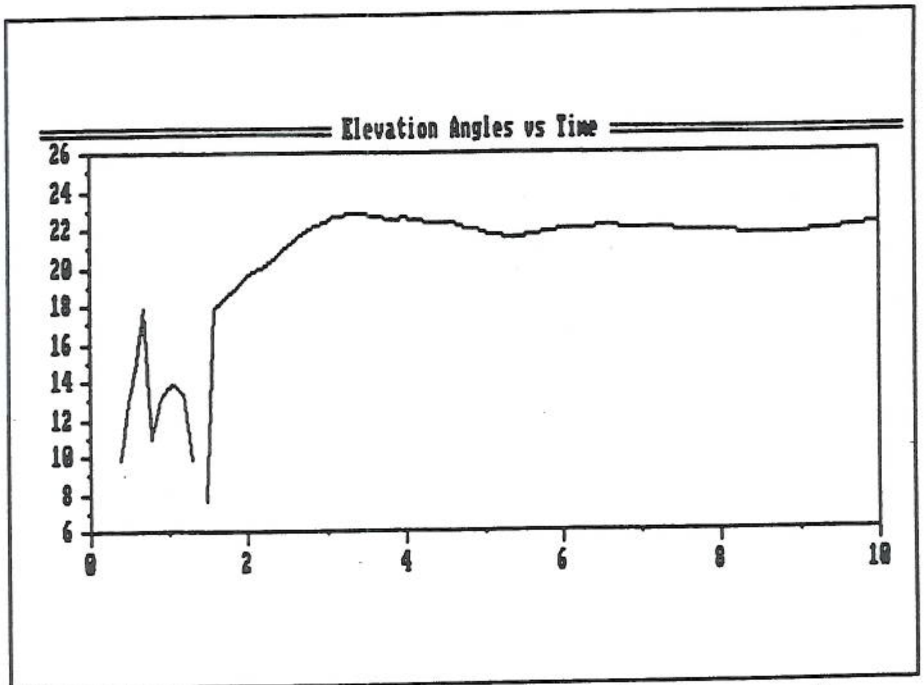

Exhibit 9-9. Elevation angle profile with missing data near the beginning of the flight.

9.6.3 Jet Stream Winds

Jet streams are narrow bands of high speed winds that meander around the Earth at altitudes ranging from 10 to 15 km. These high speed winds are generally 2 to 3 km thick and can be hundreds of km wide. Maximum wind speeds within jet streams can vary from about 70 knots to well over 200 knots and are strongest during the winter and spring months. By using the WINDS command, you can examine the 1 minute winds and determine if jet stream winds were observed. MicroART will automatically detect and record the highest winds observed and will alert you to validate any winds exceeding 180 knots.

9.6.4 Identifying the Tropopause

The tropopause is the level in the atmosphere where the rate of temperature decrease with height slows or stops. The average height of the tropopause is about 10 km. Its height varies with latitude and time of year and can change significantly from flight to flight. Above the tropopause is the stratosphere where temperature remains nearly constant or begins increasing with height. The tropopause is a feature of all upper air soundings, although sometimes it is not clearly defined. Exhibit 9-10 shows the tropopause appearing near minute 58. MicroART automatically detects and records the level of the tropopause.

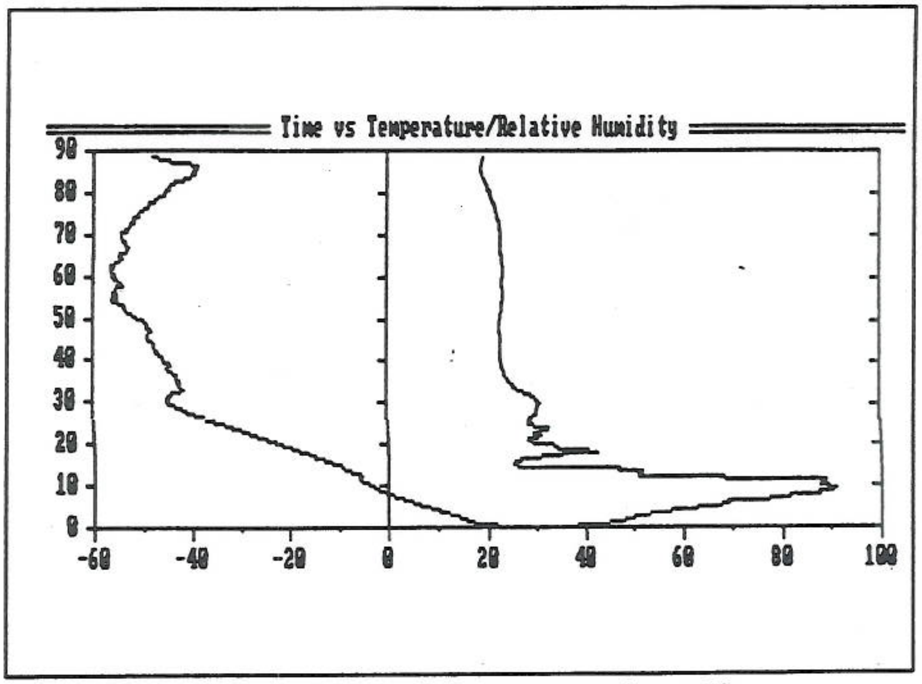

Exhibit 9-10. Plot showing tropopause near minute 58.

9.7 Automatic Command Execution

MicroART automatically issues certain commands at key points during a flight. These commands are discussed in the following sections.

9.7.1 Automatic Command Execution at 400 hPa

At 400 hPa (mb), the RADAT command is issued automatically. The RADAT message is generated, although it is not displayed. A message appears in the system status window to indicate the RADAT message has been generated. To see the RADAT message, you can issue either the RADAT or CALC command. The temperature profile can be plotted and the MET data examined to ensure the RADAT has been coded correctly. The LEVELS command can also be used to examine the freezing level data.

At 400 hPa the flight is deemed successful unless too much data is missing. A message appears in the system status window indicating whether or not the flight was successful. If the flight is unsuccessful, follow the instructions in Chapter 15 for processing the flight.

9.7.2 Automatic Command Execution at 70 hPa

When a flight reaches 70 hPa (mb), the CODE command is issued automatically and an alarm sounds. The MESSAGE command (see Chapter 5) is then issued automatically and Part A of the coded messages is displayed. (Part B or C/D may appear if Part A has been displayed previously.) Review the mandatory and significant levels (using the LEVELS command) for correctness. If the messages are correct, transmit them to the host computer as described in Chapter 10. Also, it is advisable to check the validity of the calculated parameters using the CALC command.

The CODE command may generate messages indicating you should examine certain parts of the flight. If there are questionable data, use [Esc] to exit the coded message display to the ?> prompt. Use the PLOT, MET, POSITION, WINDS, and LEVELS commands to examine the questionable data and edit it as necessary. Then issue the CODE command to recheck the data and recode the messages. Then issue the MESSAGE command to display the coded messages.

Occasionally it may be necessary to correct or edit a coded message prior to transmission. Usually this entails adding a code group to complete the message. Use the technique explained in Chapter 5 to add or delete code groups.

9.7.3 Automatic Command Execution at Termination

When a flight is terminated, whether manually with the TERM command or automatically by MicroART, the system issues the CODE command. The process is identical to that described in Section 9.6.2, except that the MESSAGE command must be issued manually.

10. ART Observation - Transmitting Messages

10.1 Introduction

This chapter discusses the procedure for transmitting coded upper air messages to host computers. The following section describes general procedures for transmission. Following that are separate sections describing specific procedures for stations in the following areas: 1) contiguous United States, 2) Alaska Region, 3) Pacific Region, and 4) international stations.

10.2 General Procedures

10.2.1 RADAT Message

The RADAT message is produced automatically at 400 hPa or may be manually activated during the flight by typing RADAT. After the RADAT message is coded, the current software allows the operator to send the freezing level message (FZL) directly from the MicroART terminal. This was not possible with earlier software versions.

Note: All upper air sites in the lower 48 will routinely transmit the RADAT message. Alaska and Pacific Region are considering transmitting the RADAT in the near future.

10.2.1.1 Manually Coding the RADAT Message

This may be done anytime during the flight by the observer typing RADAT. The observer should ensure that the flight has gone beyond the freezing level and has no chance of crossing the freezing level again. Manually coding of the RADAT message may at times be needed if a flight terminates prior to reaching 400 hPa or if the data is required due to operational demands prior to 400 hPa.

10.2.1.2 The MicroART Coded RADAT Message

The RADAT message indicates the height of the freezing level(s) along with the relative humidity at the various crossings. This data is of importance to meteorologist along with aviation interests. Exhibit 10-1 shows the Command screen if the operator desires to have MicroART go ahead and code the RADAT message prior to 400 hPa. Exhibit 10-2 is the RADAT screen display appears after entering manually entering RADAT at the command line or waiting until it is done automatically by MicroART at 400 hPa.

```
Station: Sterling, VA     Launch Time:  15:38       Ascension:  215-1
Met Time    Dir   Press  Temp   RH   El    Az Range            : MDO ETime
 24.0        ^    465.3  -20.3  32   --    --                  : LOS  27.5
______________________________________________________________________________
0.9 SPU11: * RELEASE
_________________________________________COMMAND______________________________

?> RAD
Validate RADAT. Flight has not reached 400 hPa.  Additional crossings may occur.
Ready to transmit RADAT? [Y/N]: N
```

Exhibit 10-1. Command screen to code the RADAT message.

10.2.1.3 Automatically Coded Groups of the RADAT message

The following is an breakdown of the RADAT message showing the parts that MicroART can automatically code. The RAICG and SNW section that must be manually entered to the Freezing Level Message (FZL) by the observer.

RADAT UU (D) (hphphp) (hphphp) (hphphp) (/n) RAICG HHMSL SNW

RADAT A contraction to indicate that freezing level data follows.

UU Relative humidity to the nearest percent. Use highest RH of any of the coded crossings of the 0° isotherm. Coded 00 when the RH is 100 percent, 20 when the RH is 20 percent or less. Enter "ZERO" when the entire sounding is below 0° Celsius. Coded "MISG" when the surface temperature is warmer than 0° Celsius and the sounding is terminated before the 0° Celsius isotherm is reached. Coded // when RH is missing.

(D) A letter designator identifying the 0° Celsius isotherm crossing to which the coded value of UU corresponds; L for lowest, M for middle, H for highest. When only one height value is coded, this figure is omitted.

(hphphp) A height coded in hundreds of feet above MSL at which the sounding crosses the 0° Celsius isotherm. Levels are selected as follows:

A. The first crossing of the 0° Celsius isotherm after release.

B. The uppermost crossing of the 0° Celsius isotherms.

C. The intermediate cross of the 0° Celsius isotherm. When there are two or more intermediate levels, the level with the highest RH is selected.. If these levels have the same RH, the lowest level is selected.

D. After the levels are selected they are encoded in ascending order of height.

(/n) Indicator group to show the number of crossings of the 0° Celsius isotherm other than those whose heights are coded. If all crossings are coded, the /n group is omitted.

Manually Added Groups:

(RAICG) A contraction to indicate that icing data follows. (Only when icing is present)

Note: As a general rule RAICG should be appended if the dew point depressions at the 0° Celsius crossings are 3 degrees are less and persist for several hundred meters..

A. (HH) The altitude of icing in hundreds of MSL as determined from the sounding. Include the indicator "MSL" following the height; e.g., RAICG 12 MSL indicating "icing above 1200 feet mean sea level."

B. (SNW) Include the contraction SNW if snow is apparently causing a slow ascension rate; e.g., RAICG 13 MSL SNW.

Examples of Coded Freezing Level Data

	RH (%)	HEIGHT (FT)	CODED AS:
Ex:	63	3500	
	(Missing)	(Unknown)	RADAT 63L035///
Ex:	46	2,300	
	(Missing)	(Unknown)	RADAT 89H023///042
	89	4,200	

```
              RADAT READY TO TRANSMIT
Met Time  Dir  Press  Temp  RH  El  Az Range SPU   : MDO ETime
30.6      ^   368.7  -33.4  47  --  --   BUSY  : LOS  35.3
_____________________________________________________________
31.4 Successful observation
31.4 RADATmessage has been generated.
______________________________RADAT__________________________

RADAT 27118=

F10: Transmit RADAT          Esc: Escape
```

Exhibit 10-2. RADAT screen.

After the RADAT message is displayed the observer should press the [F10] key to bring the RADAT XMIT screen up on the monitor. (See Exhibit 10-3.)

```
Station: Sterling, VA    Launch Time: 15:38        Ascension: 215-1
Met Time  Dir  Press  Temp  RH  El  Az Range SPU    : MDO ETime
 34.2      ^   362.3 -33.4  47  --  --   BUSY    : LOS  36.3
______________________________________________________________
31.4 Successful observation
31.4 RADATmessage has been generated.
_______________________________RADAT__________________________

Destination:  AFOS PRIMARY     Phone: 260-1111        Retry: 0
                   Status: CONNECTED

ZCZC WBCFZLIAD
TTAA00 KIAD 171900

IAD 1900 RADAT 27118=

F9: Destination   F10: Transmit   Esc: Exit
```

Exhibit 10-3. RADAT XMIT screen.

10.2.2 Coded Messages

The coded messages are produced with the CODE command or may be manually coded if no data is available. During an observation, the MicroART system issues the CODE command automatically when the flight reaches 70 hPa, and at termination. You can also issue the CODE command manually anytime during a flight. The CODE command must be run either by the system or the operator before the MESSAGE command is run.

The MESSAGE command (see Chapter 5) displays, allows you to edit, and allows you to transmit coded messages anytime during a flight. The XMIT command allows you to transmit a coded message but does not allow you to edit the message. That is the major difference between the MESSAGE and XMIT commands.

MicroART has been designed to automatically include required 101 groups to cover most situations. Because of this, the program does not present a prompt asking for 101 groups. Even with this automation, the operator should take the responsibility of ensuring that special situations are handled properly. If you believe an additional data group is needed and the program fails to code it, use the insert capability given on the MESSAGE screen (see Section 5.3.2). However, you should not remove 101 groups that were automatically encoded. These were included in the program based on detailed studies and interpretation of present coding procedures.

MicroART version 2.90 does not compute fallout winds. If stations have a need for fallout winds, it is suggested that they activate the IBM PC backup program and use the FALOW module. The backup program should be kept on station but not loaded on the IBM XT unless needed for this case.

10.2.2.1 Manually Coded Messages

If a flight fails at release and no data above surface is available, the observer should manually code the TTAA, TTBB, TTDD messages. The TTCC message does not need to be sent. Allowing MicroART to code the data will cause improper messages to be sent out with ///// for all met and wind data. These messages cause problems at NCEP and can corrupt the global models.

FMH-4, Chapter B7, paragraph 3.1 - 3.2 shows the proper procedures to use. (See examples of manually coded messages below)

AFOS Message:
ZCZC WBCMANIAD
TTAA00 KIAD 250000
72403 TTAA 7500/ 72403 51515 10142=

Alaska Message:
/D 70308 UJ1
70308 TTBB 7500/ 70308 51515 10145=

Pacific Message:
/C UJHW2 PHTO 250000
91285 TTDD 7500/ 91285 51515 10144=

Note: There are two different procedures that should be followed when a flight is missed.

1. When a flight is not possible for any reason - The observer should manually code the messages using the proper 101 groups for the reason for no data.

2. When a flight is missed and another was possible, but not allowed - The observer should add a 10148 group after the 51515 message to the TTAA, TTBB and TTDD messages. The 10148 group signifies that an ascent was not authorized.

   The 10148 group should only be used when a second release is possible, but not allowed by NCEP or other approving authorities.

10.2.2.2 Using the MESSAGE Command

Unless the system has automatically issued the CODE command, issue the CODE command manually. From the ?> prompt, type MESSAGE and press [Enter]. The screen showing the TTAA coded message appears (Exhibit 10-4). Note that the station identifier group is highlighted. The group following the 10164 is the stability index and the two groups following the 10194 group are the mean level winds from surface to 5,000 feet and from 5,000 feet to 10,000 feet.

```
                          MESSAGE READY TO TRANSMIT
Time   Dir   Press  Tempr  RH    El    Az     Range  Sync  QR  Ref    Frame
28.7    ^    60.0   -58.2   1  15.33 298.19          LOCK  99  1055.  1826
29.6 Successful observation.
29.6 RADAT message has been generated.
==================================== MESSAGE ==================================

72403 TTAA 64121 72403 99001 06806 16010 00097 09622 16010
92751 12337 17517 85455 07612 20023 70051 03656 26523 50572
10561 25527 40740 17960 28539 30950 31766 28536 25077 40380
30536 20226 49777 33557 15410 59169 32116 10660 63569 31577
88108 66166 32090 77133 32119 40720 51515 10164 00010 10194
19018 24525=









INS:        DEL:        A: Part A     B: Part B    C: Part C/D   X: Xmit
```

Exhibit 10-4. Sample MESSAGE screen.

Pressing B gives you Part B. Pressing C gives you Parts C and D. [Ins] will insert a blank group to the left of the highlighted group. An appropriate entry can be typed into the blank group. [Del] will delete a highlighted group. Pressing X causes the XMIT screen to appear. (The XMIT screen also appears when the XMIT command is issued from the ?> prompt.) The XMIT screen differs slightly depending on what type of host computer you transmit to.

10.3 Contiguous United States (AFOS)

Coded messages are transmitted via a 300-baud dial-up asynchronous line to a designated AFOS host site, a secondary (backup) AFOS host site, or, when necessary, a central AFOS location. The messages are then forwarded synchronously throughout the AFOS system to Gateway for further distribution. Gateway will accept and properly process these products with existing software. The transmission times for these messages will be the times of the observations.

The modem has built-in functions for setting the modem up and automatic hang up when power is lost. While in the XMIT command mode, the F10 function key is used to initialize the modem. The telephone numbers in the station data file are used for dialing the host computer. A "timeout" feature will disconnect the modem when it exceeds a time threshold. The modem will reinitialize, if necessary. Up to three attempts will be made to connect to the host site. After three attempts, the next host site (backup) will be attempted automatically. If this site is also unavailable, the central computer will be attempted.

Any time the operator exits the transmission of coded messages or the computer is reinitialized, the modem is disconnected automatically from an AFOS site. If the AFOS site is down but the asynchronous line is up, the modem remains connected. The messages will be transmitted to an inoperative primary host and then the system will wait for a return message. However, no message will be received. In this case, the modem will timeout waiting for the return message.

To transmit coded messages to an AFOS host computer, follow these steps:

1. From the MESSAGE screen, press X. The XMIT screen appears (Exhibit 10-5). (The XMIT screen can also be reached by issuing the XMIT command from the ?> prompt.)

```
Station:  Sterling, VA           Launch Time: 15:07              Ascension  : 217-1
Time   Dir    Press   Tempr   RH    El     Az      Range Sync   QR   Ref   Frame
28.7    ^      60.0   -58.2    1   15.33  298.19          LOCK   99   1055. 1826
29.6 Successful observation.
29.6 RADAT message has been generated
================================== XMIT ==================================
Destination:  AFOS PRIMARY             Phone: 260-1111               Retry: 0
                                       Status: DISCONNECTED
ZCZC WBCSGLIAD
TTAA00 KIAD 121500
72403 TTBB 62150 72403 00016 15058 11013 16056 22981 13433
33957 13239 44888 08856 55862 06805 66850 07804 77816 08205
88770 06206 99753 04241 11688 01650 22677 01462 33581 07345
44573 08157 55564 08764 66519 11361 77491 15357 88485 15724
99438 18161 11370 28161 22332 34377 33300 40380 44167 66166
55138 62373 66131 58175 77100 61774 31313 05102 81507=

PPBB 62150 72403 90012 23010 21511 17014 90346 18519 19521
24026 90789 25027 26022 26521 91246 25517 25023 24523 92025
27035 28536 29026 929// 29031 93035 29530 33532 33549 94035
32102 33085 32041 9468/ 29038 28049 9503/ 28045 27536=


A: Part A     B: Part B     C: Part C/D     F9: Destination    F10: Transmit   ESC: Exit
```

Exhibit 10-5. AFOS XMIT screen.

Part B of the coded messages is displayed. Note the Destination, Phone, and Status entries just below the heading. The Destination is the host computer that will be dialed, Phone indicates the number that will be dialed, and Status shows the status of the transmission. If you wish to change the host computer that will be dialed, pressing [F9] will toggle you through the primary, secondary, and central AFOS computer numbers. Before dialing begins, the status is DISCONNECTED.

Note: In the TTBB message after the 31313 group there are 2 groups following it. The group immediately after the 31313 group provides information to the user on if a solar correction is used, the radiosonde type and the ground equipment used.

31313 $s_r r_a r_a s_a s_a$ 8GGgg - (Example : 31313 05102 81507)

- s_r - Solar and infrared radiation correction
- $r_a r_a$ - Radiosonde/sounding system used
- $s_a s_a$ - Tracking technique/status of system used

- 8 - Indicator for time
- Gggg - Time of observation in hours and minutes UTC. The actual time or radiosonde release.

05102 -

0 -	No solar correction	4 -	Data corrected for solar radiation
51 -	Type of radisonde	51 -	Describes a VIZ B2 radiosonde
02 -	Type of Tracking Used	02 -	Describes a radiotheodolite System

81507 -

8 - Is a designator to indicate that the release time follows

1507 - Is the actual time of release in UTC

2. When you think Part B is ready to transmit, press [F10]. After a few seconds the Status changes to DIALING.

3. When a connection is made, the Status changes to CONNECTED.

4. When the transmission to AFOS begins, the Status changes to TRANSMITTING.

5. When the transmission to AFOS is complete, AFOS transmits the message back to MicroART. While MicroART is awaiting this return transmission, the Status changes to AWAITING REPLY.

6. When the return transmission is being receiving, the Status changes to RECEIVING.

7. MicroART compares each character of the return transmission with the original message to ensure the transmission was successful. When this check verifies the messages are identical, the Status changes to SUCCESSFUL TRANSMISSION. A message appears in the message window of the real-time monitor indicating the transmission was successful.

Various problems can occur during the transmission process. When a transmission is not successful, UNSUCCESSFUL TRANSMISSION appears in the Status field. If the first call to the AFOS primary site is unsuccessful, the system will automatically try dialing a second and then third time, if necessary. After three unsuccessful tries, the system will call the AFOS secondary site. If three calls to the secondary site are not successful, the system will try the AFOS central phone number (Central Region Headquarters). If three tries to the central phone number are unsuccessful, the transmission process stops.

NOTE: If you are in a hurry to transmit a message and the first transmission to the primary AFOS site is unsuccessful, immediately press [Esc] to terminate the transmission process. Then press [F10] to start the transmission process again.

If you wish to terminate the transmission process at any point, press [Esc] until you return to the desired screen. Pressing [Esc] during dialing will terminate the call.

If a coded message is retransmitted, the term COR is appended to the AFOS header and the time of the message is incremented by one minute for each retransmission. A 10181 group is appended to Parts A and B and a 10182 group is appended to Part C.

If the transmission was not successful, Status indicates UNSUCCESSFUL TRANSMISSION. The entry on the screen titled Retry will show a number indicating how many times it has retried transmitting.

10.4 Alaska Region

To transmit coded messages to the host computer in the Alaska Region, follow these steps:

1. From the MESSAGE screen, press X. The XMIT screen appears (Exhibit 10-6).

```
Station:  Sterling, VA          Launch Time: 15:07            Ascension   : 217-1
Time    Dir    Press   Tempr   RH    El      Az     Range Sync  QR  Ref   Frame
28.7     ^     60.0    -58.2    1   15.33  298.19         LOCK  99  1055. 1826
29.6 Successful observation.
29.6 RADAT message has been generated
=============================== XMIT ===============================
Destination:  AFOS PRIMARY            Status:  READY TO TRANSMIT

/D 72403 UJ1
72403 TTBB 62150 72403 00016 15058 11013 16056 22981 13433
33957 13239 44888 08856 55862 06805 66850 07804 77816 08205
88770 06206 99753 04241 11688 01650 22677 01462 33581 07345
44573 08157 55564 08764 66519 11361 77491 15357 88485 15724
99438 18161 11370 28161 22332 34377 33300 40380 44167 66166
55138 62373 66131 58175 77100 61774 31313 05102 81507=

PPBB 62150 72403 90012 23010 21511 17014 90346 18519 19521
24026 90789 25027 26022 26521 91246 25517 25023 24523 92025
27035 28536 29026 929// 29031 93035 29530 33532 33549 94035
32102 33085 32041 9468/ 29038 28049 9503/ 28045 27536=


A: Part A     B: Part B    C: Part C/D    F9: Destination    F10: Transmit   ESC: Exit
```

Exhibit 10-6. Xmit screen for Alaska Region.

2. Part B of the coded message is displayed. The Status is indicated as READY TO TRANSMIT.

3. After preparing the Alaska communications terminal, press [F10]. The Status changes to TRANSMITTING.

4. The Status changes to TRANSMITTED when the message has been transmitted.

5. Press B and repeat Steps 3 and 4 to transmit Part B of the coded messages.

6. Press C and repeat Steps 3 and 4 to transmit Parts C and D of the coded messages.

7. If for some reason you wish to retransmit the messages, press [Esc] and return to Step 1. (The Status will still be indicated as TRANSMITTED but will change to TRANSMITTING when transmission begins.)

10.5 Pacific Region

To transmit coded messages to the host computer in the Pacific Region, follow these steps:

1. From the MESSAGE screen, press X. The XMIT screen appears (Exhibit 10-7).

```
Station:  Sterling, VA          Launch Time: 15:07               Ascension   : 217-1
Time   Dir   Press   Tempr   RH   El     Az      Range  Sync   QR   Ref   Frame
28.7   ^     60.0    -58.2   1    15.33  298.19         LOCK   99   1055. 1826
29.6 Successful observation.
29.6 RADAT message has been generated
=================================== XMIT ===================================
Destination:  AFOS PRIMARY               Status:  READY TO TRANSMIT

/C UJHW1 PHTO 121500
91285 TTBB 62150 91285 00016 15058 11013 16056 22981 13433
33957 13239 44888 08856 55862 06805 66850 07804 77816 08205
88770 06206 99753 04241 11688 01650 22677 01462 33581 07345
44573 08157 55564 08764 66519 11361 77491 15357 88485 15724
99438 18161 11370 28161 22332 34377 33300 40380 44167 66166
55138 62373 66131 58175 77100 61774 31313 05102 81507=

PPBB 62150 91285 90012 23010 21511 17014 90346 18519 19521
24026 90789 25027 26022 26521 91246 25517 25023 24523 92025
27035 28536 29026 929// 29031 93035 29530 33532 33549 94035
32102 33085 32041 9468/ 29038 28049 9503/ 28045 27536=

A: Part A     B: Part B    C: Part C/D    F9: Destination    F10: Transmit   ESC: Exit
```

Exhibit 10-7. Xmit screen for Pacific Region.

2. Part B of the coded message is displayed. The Status is indicated as READY TO TRANSMIT.

3. After preparing the Pacific communications terminal, press [F10]. The Status changes to TRANSMITTING.

4. The Status changes to TRANSMITTED when the message has been transmitted.

5. Press B and repeat Steps 3 and 4 to transmit Part B of the coded messages.

6. Press C and repeat Steps 3 and 4 to transmit Parts C and D of the coded messages.

7. If for some reason you wish to retransmit the messages, press [Esc] and return to Step 1. (The Status will still be indicated as TRANSMITTED but will change to TRANSMITTING when transmission begins.)

10.6 International Stations

The instructions for transmitting coded messages from international stations have not been completed due to the various different communication circuits used.

11. ART Observation - Flight Termination

11.1 Introduction

MicroART flights terminate in one of three ways:

1. Automatic termination by the system
2. Manual termination by the observer
3. Predetermined termination at a certain pressure level.

The following sections discuss each type of termination.

11.2 Automatic Flight Termination

MicroART terminates a flight automatically when the data indicate the observation should be ended and only terminates on an even contact. Automatic termination can occur for a number of reasons, but the three most common ones are balloon burst, floating balloon, and weak or fading signals. These situations are discussed in the following subsections.

11.2.1 Balloon Burst

Most flights terminate due to balloon burst. The pressure profile is the best indication that the flight has terminated for this reason. Exhibit 11-1 illustrates a typical pressure profile that results when a balloon bursts.

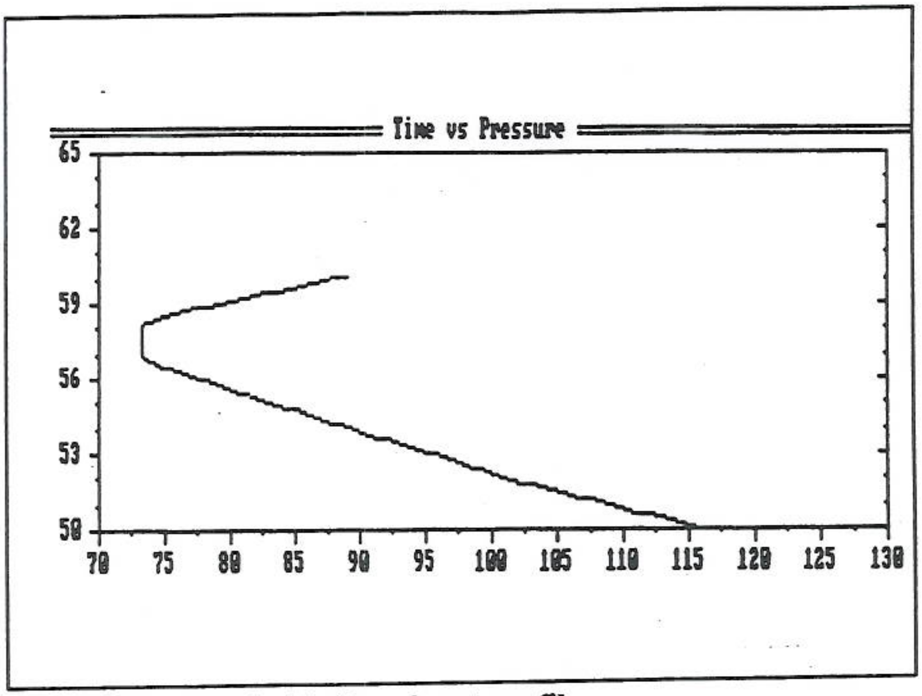

Exhibit 11-1. Typical balloon burst profile.

In this case, balloon burst occurred at about minute 57. After the pressure remained constant for about a minute, it began increasing rapidly with time as the radiosonde descended.

11.2.2 Floating Balloon

Occasionally a flight terminates because the balloon stops rising and begins floating at a nearly constant altitude, or rises so slowly that there is no point in continuing the flight.

11.2.3 Weak or Fading Signals

If the radiosonde signals become weak the data quality (Q-values) will usually be less than 30, which results in missing data. If this continues for too long, the flight is terminated automatically. Exhibit 11-2 illustrates a pressure profile for such a case.

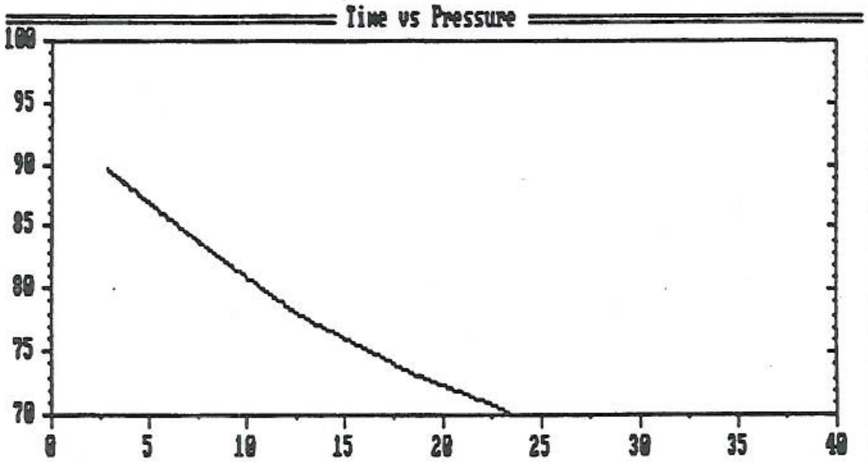

Exhibit 11-2. Pressure profile for weak radiosonde signal.

11.2.4 Automatic Termination Procedure

When the system terminates the flight, the following message appears in the message window of the real-time monitor:

Flight terminated: (Reason for termination)

The word TERM appears under the Sync heading in the top portion of the real-time monitor. The CODE and MESSAGE commands are executed automatically. As a result, either Part A, B, or C/D of the coded messages appears on the screen. You can then edit and transmit the coded messages, as was discussed in Chapter 10. It is a good idea to check the data for correctness before transmitting any coded messages.

After transmitting the coded messages, you exit the ART Observation option. Follow these steps to exit:

1. At the ?> prompt, type EXIT and press [Enter]. If you have transmitted all parts of the coded messages, proceed to Step 2. If you have not transmitted all of the coded messages, the following type of message appears:

Message PART A has not been transmitted
Do you want to exit without transmitting? [Y/N]:

Press N and [Enter] to return to the ?> prompt. Press Y and [Enter] to lead to the messages shown in Exhibit 11-3.

```
Writing Temporary Archive file to hard disk ...

Writing STORE file to hard disk ...

*** Insert diskette for STORE file backup. Press ENTER when ready.
```

Exhibit 11-3. Messages appearing after EXIT command is issued.

2. The messages shown in Exhibit 11-3 appear on the screen.

3. Remove the Log diskette from the diskette drive. Insert the Store diskette currently in use (i.e., must be formatted - see Chapter 3) and press [Enter]. The following messages appear:

   Writing STORE file to floppy disk ...
   Diskette has ## kb free space.

After the store file is written to the Store diskette, the ART Options menu appears with the Check System Status option highlighted.

4. If sufficient space is **not** available on the current Store diskette, the following messages appear:

   Insufficient space on floppy - Required: ## kb
   Available: ## kb
   ***** Insert a different diskette.**
   ***** Press ENTER when ready, or press ESC to bypass floppy backup.**

   Insert a new Store diskette and press [Enter].

5. If the observation was **not** successful, the following messages appear:

   Observation was not successful.
   Would you like another release? [Y/N]:

   Press Y and [Enter] to return to the Administrative Data screen. (See Chapter 15 for information on processing multiple releases.) Press N and [Enter] to return to the ART Options menu.

11.3 Manual Termination

A flight may reach a point where it should be terminated, but MicroART has not terminated it automatically. In such cases you can terminate the flight manually.
Perform the following steps to manually terminate a flight:

1. At the ?> prompt, type TERM and [Enter]. The screen shown in Exhibit 11-4 appears.

```
Station: Sterling, VA              Launch Time: 12:04                    Ascension: 222-1
Time   Dir   Press  Tempr  RH   El   Az   Range   Sync  QR  Ref   Frame
105.4   -                                         TERM
105.2 Balloon burst detected at 103.2 minutes.
105.2 Flight terminated: Balloon burst
                         TERMINATE

    1   Balloon Burst
    2   Balloon forced down by icing
    3   Floating balloon
    4   Weak Signals
    5   Battery Failure
    6   Ground equipment failure
    7   Switching Failure
    8   Radiosonde Failure
    9   Excessive Missing Data
   10   Other

Observation has already terminated.
Enter Number for termination reason or Press ESC to leave reason unchanged:
```

Exhibit 11-4. TERM screen.

2. Press the appropriate number and [Enter]. The CODE and MESSAGE commands are executed automatically by the system.

3. At the ?> prompt, type EXIT and press [Enter]. From this point on, processing is identical to the automatic method (Step 1 in Section 11.2.4).

4. On occasion you may wish to change the termination reason, which can be done easily with the TERM command. Simply enter the new reason when asked (see Exhibit 11-4), and it will be archived.

11.4 Predetermined Termination

A special (asynoptic) flight can be terminated when it reaches a predetermined pressure level. This pressure level is entered on the Administrative Data screen. Terminating this type of flight is identical to terminating a flight automatically (Section 11.2). Chapter 15 contains more information about special observations.

12. Transferring Archive Files

12.1 Introduction

At the end of each successful (official) flight, a temporary archive file is created and stored on the hard disk. This file must be transferred to an Archive Diskette. Data for about 25 to 30 flights can be stored on each Archive Diskette. Thus, data for all the flights for one month can usually be stored on two or three Archive Diskettes. These Archive Diskettes are sent to NCDC at the beginning of the following month.

NOTE: The temporary archive file should be transferred immediately after the flight. This greatly reduces the chance that archive data for the flight will be lost. It is possible to transfer a temporary archive file after other flights have taken place, but this should not be done routinely.

This chapter describes the processing of archive files. Section 12.2 discusses how to initialize a new Archive Diskette. Section 12.3 describes how temporary archive files are selected for transfer. The actual transfer of archive files from the hard disk to an Archive Diskette is discussed in Section 12.4. Viewing and printing archive data is the topic of Section 12.5 and deleting temporary archive files from the hard disk is described in Section 12.6.

12.2 Initializing a New Archive Diskette

An Archive Diskette must be initialized before it can be used to store archive files. This initialization **must** be done within the Transfer Archive Data option of MicroART. Follow these steps to initialize a new Archive Diskette:

1. Obtain an unused diskette labeled "MicroART Archive Diskette."

2. From the Main Menu, select the Archive Flights option. The Archive Data Options screen appears (Exhibit 12-1).

```
MicroART Version 2.90

Archive Data Options


Transfer Archive Data

Delete Temporary Archive Files

Print Archive Data

Rebuild Ascension Log
```

Exhibit 12-1. Archive Data Options screen.

3. Press [Enter] to select the Transfer Archive Data option. The Archive Flights - Preparation screen appears (Exhibit 12-2).

```
              ARCHIVE FLIGHTS - Preparation      VERSION 2.90


Insert or change diskette in drive A
Press Enter when ready ...




                                                      Esc: Quit
```

Exhibit 12-2. Archive Flights - Preparation screen.

4. Insert the new Archive Diskette into the drive and press [Enter]. The following messages appear:

   Diskette is NOT initialized for Archive.
   Any data on the diskette will be erased if continued.
   Change diskette, (Y/N) ? [Y]

5. Press N and [Enter]. The following message appears:

   Insert new diskette for drive A:
   and strike ENTER when ready

6. Press [Enter]. The initialization process begins and the message **Formatting...** appears. The initialization process takes about one minute. When it is complete, the following messages appear:

   Formatting...Format complete

   362496 bytes total disk space
   362496 bytes available on disk

Format another (Y/N)?

(The number of bytes of total disk space and number of bytes available on disk may vary slightly from the figures shown.) The initialization process formats the diskette and places a file named TADD.ARC on it. This file allows MicroART to recognize the diskette as an Archive Diskette.

7. Press N and [Enter]. The prompts for the year and month for archive appear (Exhibit 12-3).

```
              ARCHIVE FLIGHTS - Preparation      VERSION 2.90



              Enter Year and Month for Archive

                        Year:     [97]

                       Month:     [02]



  Enter: Accept Current Entry   PgDn: Accept Both Entries   Esc: Quit
```

Exhibit 12-3. Archive Flights - Preparation screen with year and month for archive prompts.

8. Enter the year and month to be archived. The [Enter], [PgDn], and [Esc] keys can be used as shown at the bottom of the screen. When the year and month are entered and [Enter] or [PgDn] is pressed, the following message appears:

   *** Wait ... Searching Temporary Archive files.**

   If Temporary Archive files for the month already exist on the hard disk, the Archive Flights - Data Transfer screen appears (proceed to Step 7 of Section 12.3). If no such files are present, the following message appears:

*** No Temporary Archive files for Specified Flt Period**
Change Flt Period, or Press Esc to Quit

Press [Esc]. The Archive Data Options menu appears. The Archive Diskette can be used to store archive files.

12.3 Selecting Temporary Archive Files for Transfer

To transfer temporary archive files to the Archive Diskette, perform the following steps:

1. From the Main Menu select the Archive Flights option. The screen shown previously in Exhibit 12-1 appears.

2. Press [Enter] to select the Transfer Archive Data option. The screen shown previously in Exhibit 12-2 appears.

3. Insert the Archive Diskette for the current month into the diskette drive and press [Enter]. The Content Summary, which provides information on the data on the Archive Diskette, appears.

4. In response to the prompt Continue, (Y/N) ? [Y] press [Enter]. The year and month for archive prompt appears.

5. Verify the Archive Diskette is for the current month and year. Press the appropriate key as indicated at the bottom of the screen. The following message appears:

   *** Wait ... Searching Temporary Archive files.**

   The Archive Flights - Data Transfer screen appears (Exhibit 12-4).

6. If the Archive Diskette does not have enough space to hold another flight, the following message appears:

   Insufficient available space on diskette. Remove diskette in drive A
   Press Enter when ready ...

   If this message appears, remove the diskette from the drive and press [Enter]. Insert an Archive Diskette that has been initialized according to the instructions in Section 12.2. Return to Step 3 of this section.

```
            ARCHIVE FLIGHTS - Data Transfer           VERSION 2.90

                          OBSERVATION        FILE    DISKETTE
RELEASE  ASCENSION     DATE      HOUR        SIZE    GEN DATE    SELECT
-----------------------------------------------------------------------
   1        071       02/07/97    00         3770    02/07/97      N
   1        072       02/07/97    09         2330    02/07/97      N
   2        073       02/07/97    12         3898                  Y
   1        074       02/08/97    00         2370                  Y
   1        075       02/08/97    12         4696                  Y





                                                         Space: 361 KBytes
        PgUp  PgDn: Paging          F10: Transfer          Esc: Quit
```

Exhibit 12-4. Archive Flights - Data Transfer screen.

7. Information about each temporary archive data file on the hard disk for the month is displayed. [PgDn] and [PgUp] are used to view other flights. The DISKETTE GEN DATE column shows the date that a flight was transferred to the Archive Diskette. The SELECT column has one of four possible entries. The entries and their meanings are as follows:

Y	-	The flight is selected for transfer to the Archive Diskette. (If the file has not been transferred before, Y is selected automatically.)
N	-	The flight has been transferred at least once previously.
B	-	The flight is bad, i.e., it cannot be transferred.
blank	-	Either the flight was unsuccessful or an ascension number was inadvertently skipped.

Do not change N to Y, unless you have reworked a flight that had been previously transferred. The reworked version of the flight should be transferred to the Archive Diskette.

If an ascension number does not have any data to its right, this means either:

a. An ascension number was inadvertently skipped, or

b. It was an unsuccessful observation that was not selected for archiving.

12.4 Transferring Files to the Archive Diskette

Once the temporary archive data files to be transferred have been selected, the actual transfer can take place. To transfer the files having Y under the SELECT column press [F10]. The highlight bar moves to the first file to be transferred, updates the screen with the current date under the DISKETTE GEN DATE, and changes the Y to N under the SELECT column after it has been transferred. This procedure takes place for each file that is transferred. When the procedure is completed, the message **File Transfer Successful Completed** is displayed.

12.5 Viewing and Printing Archive Data

Data stored on the Archive Diskette can be viewed on the screen and printed. To view or print archive data, follow these steps:

1. From the Main Menu, select the Archive Flights option. The screen shown previously in Exhibit 12-1 appears.

2. Select the Print Archive Data option. You are prompted to insert the Archive Diskette.

3. Insert the Archive Diskette and press any key. The Print Archive Files menu appears (Exhibit 12-5).

```
P R I N T   A R C H I V E   F I L E S
MICRO ART VERSION 2.90

Print Summary File

Print Header Data

Print Wind and MET Data

Print All (printer)

Esc:EXIT     F1:Toggle Output (Screen)     Return:Execute
```

Exhibit 12-5. Print Archive Files menu.

As indicated at the bottom of the screen, the [F1] key serves as a toggle switch. Pressing this key alternates the output either to appear on the screen or to print on the printer. Before you press [Enter], be sure the output is directed where you want it to go.

4. To view or print the Summary File, highlight Print Summary File option. Use the [F1] key to direct the output either to the screen or the printer. Then press [Enter].

5. To view or print the Header Data, Wind Data, MET Data, or all of these, first highlight the appropriate choice on the menu. Use the [F1] key to direct the output either to the screen or the printer. Then press [Enter]. If you are viewing the data on the screen, pressing [Esc] returns you to the menu.

12.6 Rebuilding the Ascension Log

The ascension log stored on the hard disk may need to be rebuilt from time to time. Without this file you can not transfer archive files from the hard disk to the archive diskette. Normally, you don't have to be concerned with this file. However,in the event of hard disk error, this file could be deleted or rendered unreadable. To rebuild the ascension log, follow these steps.

1. From the Main Menu, select the Archive Flights option. The screen shown earlier in the chapter in Exhibit 12-1 appears.

2. Select the Rebuild Ascension Log option. Another screen appears asking you to enter the two digit year. After entering the year, you are asked if you want to overwrite the old ascension log. If you say "YES" the old log will be rebuilt. (Exhibit 12-6)

```
Enter two digit year->97

ASCENLOG.97 already exists. Overwirte it? (Y/N):Y

Ascension log complete.
Press Enter to continue.
```

Exhibit 12-6. Rebuild Ascension Log.

13. Using the Resume and Rework Options

13.1 Introduction

The Resume option allows you to return to the MicroART program after a short-term power or system failure. The main purpose of this option is to allow you to recover the data stored on the Log Diskette for further processing. When using Resume, it is not necessary to reenter any of the prerelease or baseline data. The Resume option does allow you to begin retracking a VIZ B2 radiosonde. With the VIZ B and transponder radiosonde only flight data acquired before the failure are available. (You can transmit messages using this option.)

The Rework option allows you to correct observation data after a flight has terminated. For example, Rework could be used to correct data for a previous flight after it was discovered that some of the prerelease data were in error. Rework uses data from the Store file contained on the hard disk or a diskette. (You cannot transmit messages using the Rework option.)

13.2 Learning to Use the Resume Option

Before you begin this section, you should have completed at least one MicroART training flight. In order to use this tutorial, you will need a Log Diskette from a MicroART flight at your station.

To learn about the Resume option, follow these steps:

1. From the Main Menu, select ART Options.

2. From the ART Options menu, select the Resume Observation option. The screen goes blank for about 10 seconds and then the following message appears:

   Insert Log Diskette for flight NNN-N into drive. Press ENTER when ready.

   (Here NNN-N is the ascension number of the flight on the Log Diskette.)

3. Insert the Log Diskette into the diskette drive.

4. Press [Enter]. If the Log Diskette is not for the most recent MicroART flight at your station, the computer will beep and the following message will appear:

   Ascension numbers do not match. Observation: MMM-R Log: NNN-S
   Quit, Continue, or Retry? [Q/C/R]:

(Here MMM is the ascension number and R is the release number of the most recent MicroART flight at your station, and NNN is the ascension number and S is the release number of the flight on the Log Diskette.) If you wish to continue, press C. If you want to try another Log Diskette, press R (Retry). If you wish to quit, press Q.

5. The following message appears on the screen:

   Restoring data ...

   The data are read from the Log Diskette into the MicroART program. (For a 90-minute flight, this takes about a minute and a half.) A message may appear indicating that the end of the file (on the Log Diskette) has been reached. The following messages then appear:

   Met data restored up to minute LL.L.
   Position data restored up to minute LL.L.

   Press ENTER to continue or ESC to exit.

   (Here LL.L is the length of the flight in tenths of minutes.)

6. Before you press [Enter], note that the following things will be happening in rapid succession:

   a. The Resume data heading is displayed, and the temperature and relative humidity change rapidly as they are processed.

   b. The termination pressure is displayed in the heading.

   c. The flight status messages are displayed.

   d. The balloon burst sound (series of descending tones) is heard.

   e. The CODE command is executed automatically.

7. Press [Enter]. The procedures listed in the previous step occur. At the end of this process, a screen similar to the one shown in Exhibit 13-1 will appear, although the details will vary from flight to flight.

```
Station: Sterling, VA          Launch Time:                    Ascension: 222-1
Time            Dir   Press  Tempr  RH     El     Az    Range  Sync  QR  Ref   Frame
                      987.8  -4.7   89
      Flight was unsuccessful.
      Power Fail Recovery.
=========================== CODE ==================================================

Micro-ART Observation Program (VIZ) Version 2.87

Processing restored data ...

Selecting levels ...
Check time and pressure at the 3.5 min level.
No previous flight data available for comparison
Temperature lapse rate from 0.0 to 0.1 of 14.0 Deg/Km.
Temperature lapse rate from 0.1 to 0.4 of 11.6 Deg/Km.
Levels data up to 16.3 millibars have been checked.
Check azimuth angles, 329.65 and 306.90, for minutes 1 - 2
Check elevation angles, 51.20 and 20.84, for minutes 1 - 2
Position data up to 87 minutes have been checked.
Wind speed change of 28 knots between times: 0 1
Print the check messages? [Y/N]:
```

Exhibit 13-1. Screen when RESUME is entered.

8. In response to the **Print the check messages? [Y/N]:** prompt, press N and [Enter]. The following messages are displayed:

   Calculations have been completed.
   Coded messages have been generated.

   The **?>** prompt is displayed.

9. At this point, any of the MicroART commands can be issued. If you were using RESUME after an actual MicroART observation had ended due to a power or system failure, it would be a good idea to display and plot the data to ensure they were correct. Then the MESSAGE command could be used to review and transmit the coded messages.

10. Once you have finished reviewing the data and transmitting the coded messages (if necessary), type EXIT and press [Enter]. If you have not transmitted the coded messages, the following messages appear:

    Message PART A has not been transmitted

Message PART B has not been transmitted
Message PART C/D has not been transmitted
Do you want to exit without transmitting? [Y/N]:

11. If you press N and [Enter], the ?> prompt appears. If you press Y and [Enter], the following messages appear:

    Writing Temporary Archive file to hard disk ...

    Writing STORE file to hard disk ...

    ***** Insert diskette for STORE file backup. Press ENTER when ready.**

12. If you want to create a backup for the Store file, insert a Store diskette into the diskette drive and press [Enter]. Otherwise just press [Esc]. The ART Options menu appears.

13. Press [Esc] to return to the Main Menu.

13.3 Using the Rework Option

In Chapters 4 and 5 the Rework option was used to introduce you to displaying and editing data in MicroART. Operationally, Rework is used to correct observation data after a flight has terminated. For example, Rework could be used to correct data for a previous flight if it was discovered that some of the prerelease data, such as the surface pressure, were in error. Rework uses data from the Store file contained on either the hard disk or a Store Diskette. It is not possible to transmit coded messages from Rework. It is possible to transmit coded messages with the Resume option. The Resume uses data from the Log disk, which is generally recycled after each flight.

13.3.1 Recalling Old Flights

Perform the following steps in order to recall an old flight using the Rework Option:

1. Turn on the MicroART computer (if not already on). The Main Menu appears and the ART Options choice is highlighted.

2. Insert the Store Diskette for the flight you want to rework into the diskette drive. (If you are recalling a flight from the hard disk, skip to step 3.)

3. Select the ART Options choice by pressing the [Enter] key. The ART Options Menu appears with the Check System Status option highlighted.

4. Select the Rework Observation option and press [Enter].

5. In response to the **Ascension Number ?>** prompt, type the appropriate ascension number for the flight being reworked (see note below). Press [Enter]. The following prompt appears:

   Should current station data be used? [Y/N]:

   NOTE: Here the ascension number should be entered as a four-digit number. The first digit is the release number (1, 2, or 3) and the last three digits are the actual ascension number. For example, the second release of ascension 603 would be typed as 2603. To read the data from the Store diskette, type A: before the ascension number (for example, A:2603). To read the data from the hard disk, just type the number (for example, 2603).

6. Press Y and [Enter]. The Administrative Data screen appears.

13.3.2 Making Corrections

You are now in the prerelease screens of the flight you are reworking. This is the nearly the same procedure you followed in Chapter 4.

1. Use the [PgDn] key to move the cursor to the appropriate screen. Most likely you will want to change entries in the Surface Data screen (see Chapter 4). Make the changes by overwriting whatever value already appears on the screen. After you finish making these change(s), page down until the Check Screen appears.

2. In response to the **Continue with Rework? [Y/N]:N** type Y and press [Enter]. In about 10 seconds the heading **REWORK INITIALIZATION** appears along with the message **Reading STORE file....** After about another 15 seconds the **CODE** heading appears. This indicates the CODE command has been issued automatically. The prompt **Print the check messages? [Y/N]:** appears.

3. Answer the question with a Y for yes or an N for no. The following messages appear:

   Calculations have been completed.

Coded messages have been generated.

4. The ?> prompt appears below these messages. From this prompt you can enter commands to process, display, and delete data (see Chapter 5). (The STATUS, XMIT, and TERM commands, which can be used during an ART observation, are not available in Rework.)

5. When you are finished with reworking the flight, from the ?> prompt type EXIT and press [Enter]. The following prompt appears:

   Do you want to save the reworked flight? [Y/N]:

6. Answer Y for yes and press [Enter]. The following messages will appear:

   Writing STORE file to hard disk...

   Insert diskette for STORE file backup. Press ENTER when ready.

   The Store file and a Temporary Archive File will be written to the hard disk. Then a backup copy of the Store file will be written to the diskette that is already in your disk drive.

7. Press [Enter]. The following messages appear:

   Writing STORE file to floppy disk...
   Diskette has ## kb free space.

   After the store file is written to the Store diskette, the ART Options menu appears with the Check System Status option highlighted.

14. Special In-flight Situations

14.1 Introduction

This chapter covers a variety of special in-flight situations that do not occur during most upper air observations. When these situations arise, data editing may be required because the data is erroneous and may seriously impact weather analyses and forecasts if not deleted from the sounding (Chapter 5 provides general guidelines for editing data). The examples in this chapter illustrate how data profiles might appear in a given situation. You should become familiar with these special situations so that you can recognize them and take appropriate action if they occur.

MICROART DOES NOT AUTOMATICALLY EDIT OR DELETE ERRONEOUS DATA. It only alerts you of questionable or erroneous data. If you do not edit the sounding data as required, erroneous data will appear in the coded messages for transmission to data users.

14.2 Special Temperature Profiles

On occasion, the temperature data profile becomes erroneous and requires data editing. Sections 14.2.1 through 14.2.3 describe situations that may occur with temperature data from time to time and the appropriate procedures for editing the data.

14.2.1 Super-adiabatic Lapse Rates.

Super-adiabatic lapse rates are defined as a temperature decrease greater than 9.8°C per kilometer. Such lapse rates may occur naturally under certain atmospheric conditions. It is not uncommon for these lapse rates to occur in shallow layers near the ground due to surface heating from the sun (see Chapter 9, Section 9.5.2). If observed higher aloft, they may be caused by the "wet-bulb effect" (see Section 14.2.1.1), a faulty temperature sensor, or some other failure in the radiosonde (see Section 14.2.1.2). MicroART will alert you of super-adiabatic lapse rates with the CODE command. If observed super-adiabatic lapse rates aloft exceed 13°C per kilometer they are unrealistic and shall be deleted from the MET data. Sections 14.2.1.1 through 14.2.1.3 provide examples of super-adiabatic lapse rates and how the corresponding data shall be edited.

14.2.1.1 Wet-bulb Effect

The "wet-bulb effect" results when water or ice on the temperature sensor evaporates or sublimates, cooling the sensor. In general, high relative humidities will occur with the wet-bulb effect, followed by a sharp drying trend (e.g., the radiosonde exits a cloud). The temperature profile shows an abrupt bending to the left making the lapse rate super-adiabatic, which is not representative of the actual atmosphere. Following the super-adiabatic lapse rate, a characteristic temperature inversion will also be present at the level of drying. The inversion is due to the sensor's recovery from the cooling of evaporation or sublimation. The wet-bulb effect typically occurs between the surface and 400 hPa where high moisture levels are normally found.

An example of a typical wet-bulb effect is illustrated in Exhibits 14-1a-b. In Exhibit 14-1a the wet-bulb effect occurred between minutes 18 and 20, while in Exhibit 14-1b the effect occurred at minute 8.5 and possibly at minute 12.0. When the wet-bulb effect is suspected to be present, do the following:

1 Issue the CODE command and check for super-adiabatic layers. If the super-adiabatic lapse rates are 13°C per kilometer or less, no data editing is required. If they are, proceed to step two.

2 To help better determine the extent of the wet-bulb effect use the PLOT MET command to plot the temperature and relative humidity profiles. Sometimes, the wet-bulb effect will be seen within 10 minutes of crossing the 0°C isotherm. The beginning and ending times of the plot may need to be varied in order to obtain a clearer picture of where the wet-bulb effect is occurring.

3. Determine the beginning and end times of the wet-bulb effect, which includes both the super-adiabatic and inversion layers.

4. Issue the MET command. Press [F6] and enter the time the wet-bulb effect began. Delete the temperature values for the period of the effect. Deleted values will be automatically replaced with interpolated values. Remember that if the period of deleted data exceeds one minute, the temperatures will be assigned missing values (99999).

5. Enter the CODE command and if MicroART still indicates a super-adiabatic lapse rate, but it is less than 13°C per kilometer, accept the lapse rate as valid. If the super-adiabatic lapse rate is still greater than 13°C per kilometer (even after further editing), you must check the validity of the temperature data. Let the sounding continue, but compare the temperature and mandatory pressure height data with the previous sounding. If there are significant temperature changes and/or height changes (MicroART will alert you of significant height changes with the CODE command) from the previous sounding that cannot be attributed to changing atmospheric conditions, terminate the sounding at the point where the wet-bulb effect began.

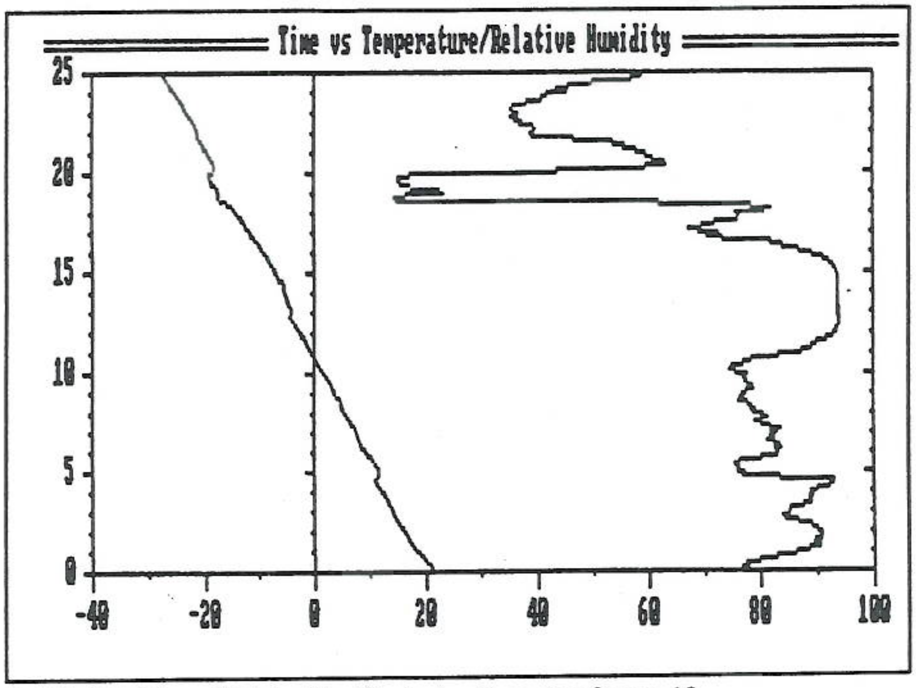

Exhibit 14-1a. Wet-bulb effect starting at minute 18.

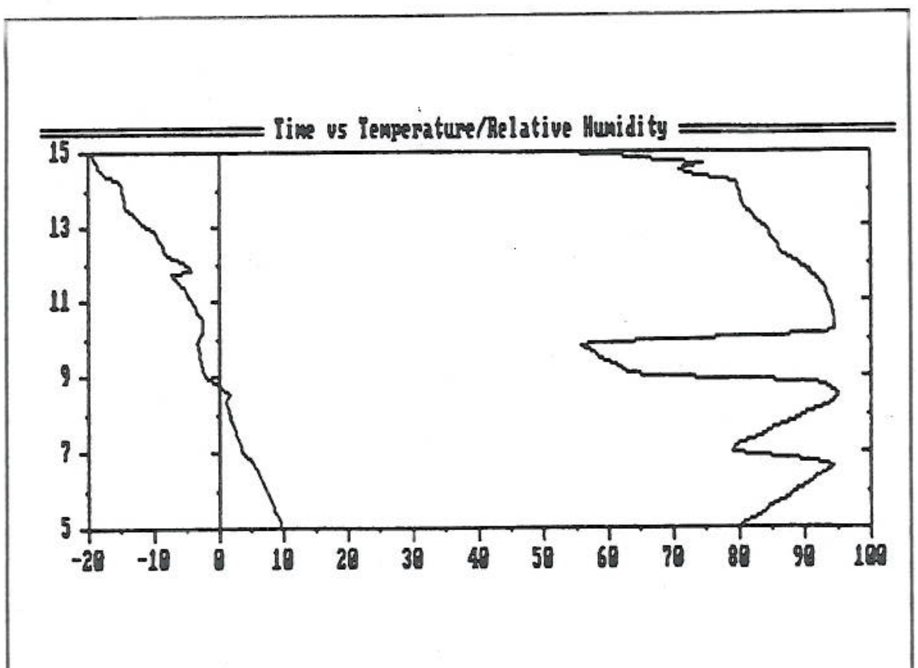

Exhibit 14-1b. Example of Wet-bulb effect at minutes 8.5 and 12.0.

In some rare cases, ice build-up on the sensor is so excessive that the sensor never fully recovers (i.e., the temperature inversion following the super-adiabatic lapse rate does not occur) If this is observed, terminate the sounding at the point where the wet-bulb effect began.

14.2.1.2 Spurious Temperature Data

Spurious (inconsistent) temperature data can occur due to signal interference or radiosonde defects. The temperature profile may show one or more points that deviate substantially from the surrounding data. Since spurious data will cause super-adiabatic lapse rates, the STATUS and CODE commands will alert you of such temperature lapse rates. Exhibit 14-2 shows a temperature profile with spurious data at about minute 12. The number of points that are spurious (three) is revealed in a point plot of the profile shown in Exhibit 14-3.

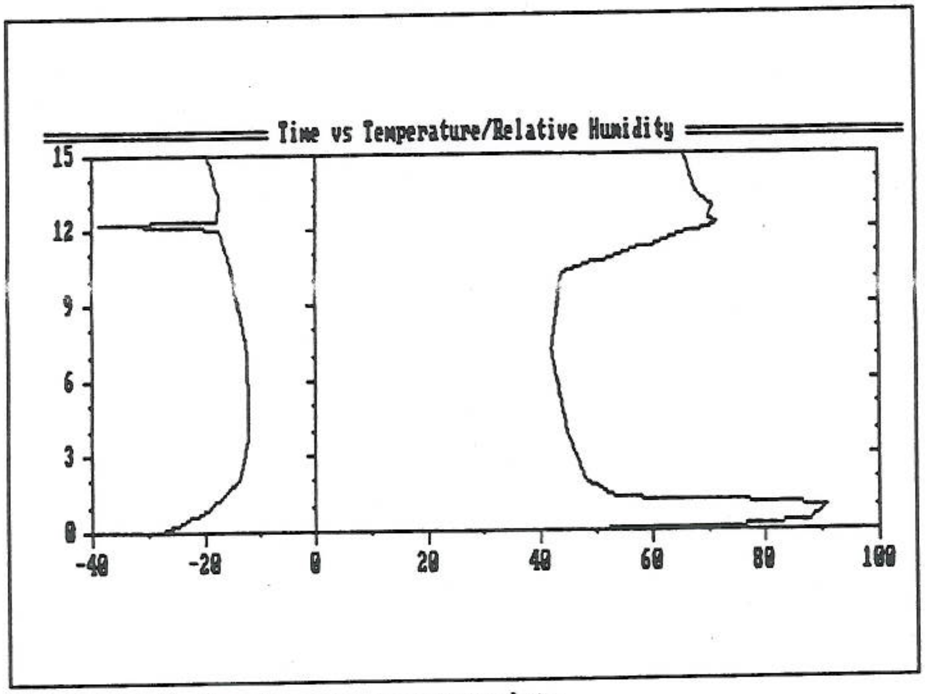

Exhibit 14-2. Spurious temperature data.

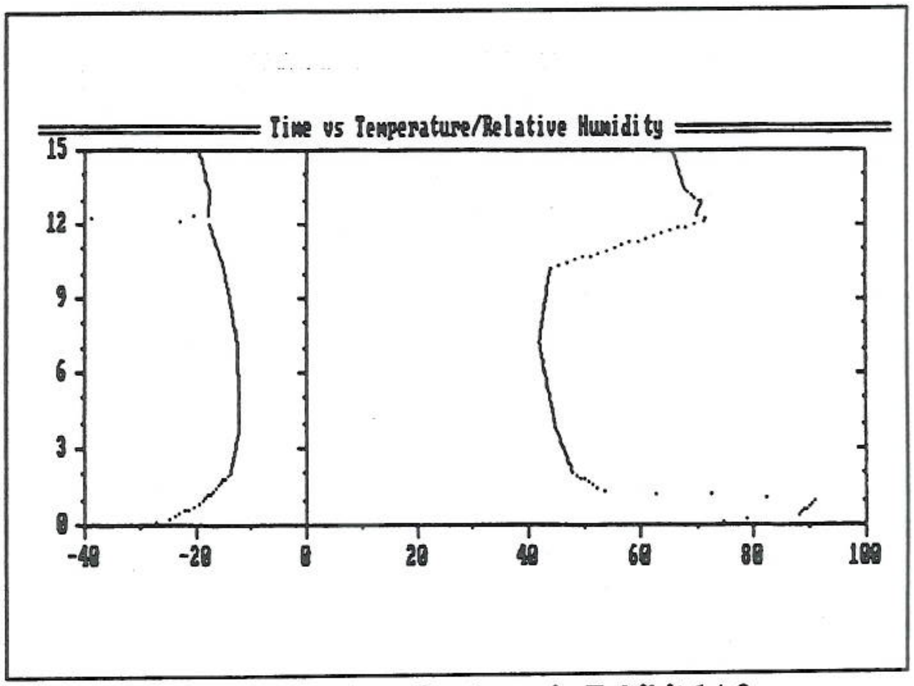

Exhibit 14-3. Point plot of profile shown in Exhibit 14-2.

When spurious temperature data is suspected, do the following:

1. Issue the PLOT MET command. To determine which data are spurious, zoom in on the suspect portion of the plot. Then press [F4] to display a point plot. Exhibit 14-3 is a point plot of the data shown in Exhibit 14-2.

2. Note the times associated with the spurious points. Execute the MET command and use [F6] to enter the time in the flight where the problem occurred.

3. Delete the points that are judged to be spurious. MicroART will replace deleted data with interpolated values. Exhibit 14-4 shows the same profile as Exhibit 14-2 but with the spurious data removed.

4. Issue the CODE command. Super-adiabatic lapse rates that were a result of spurious data should no longer appear in the check messages. If they are present go back to step 1.

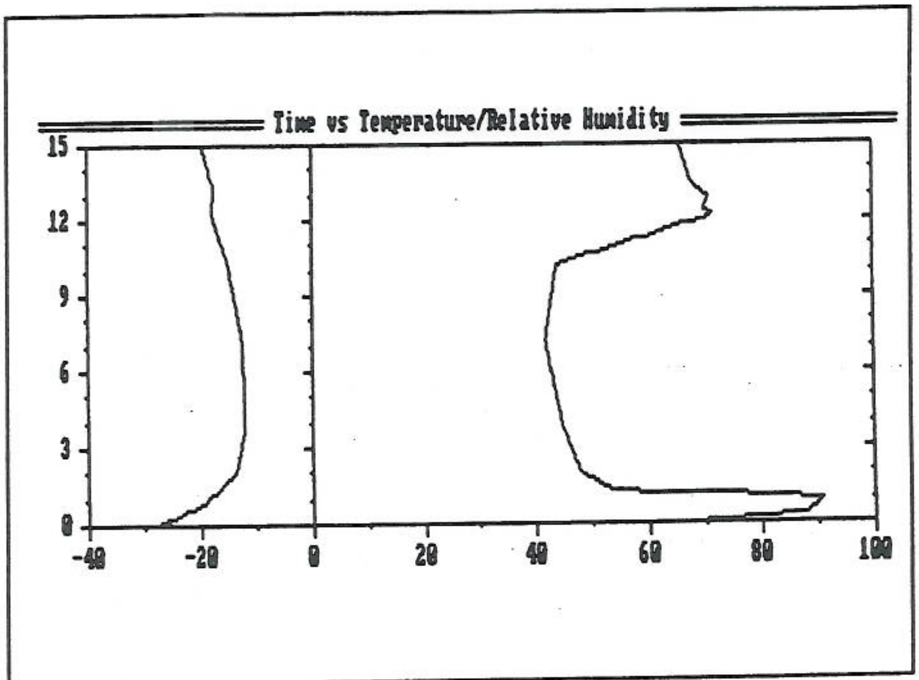

Exhibit 14-4. Profile with spurious temperature data removed.

14.2.1.3 Temperature Sensor Failure

On rare occasions, the temperature sensor or some other component in the radiosonde fails for a prolonged period of time. Unlike the case when only one or a few points are spurious, a failure of this type produces a continual stream spurious data points. In other flights, there may be an abrupt, unrealistic shift in the temperature profile, exceeding several degrees, that never reverts back to the original trend. This can be caused by excessive icing on the temperature sensor or some other defect in the radiosonde. This type of failure can cause an extreme super-adiabatic lapse rate to occur at the point of temperature sensor or radiosonde failure.

The following techniques can be used to detect erroneous temperature data:

1. Use the PLOT MET command and examine the temperature profile in 10 minute increments. Note any erratic changes or abrupt shifts in temperature profile. An example of a temperature profile with erratic temperatures is shown in Exhibit 14-5. A point plot of the same data reveals the scattered nature of the temperature data (Exhibit 14-6).

2. Temperature or pressure sensor failure will many times result in numerous and/or extreme super-adiabatic lapse rates that can be displayed with the CODE or STATUS command. If more than 10 super-adiabatic layers exceeding 13°C per kilometer are listed, it's likely that a sensor failure occurred. It's not uncommon for a sensor failure to cause an extreme

super-adiabatic lapse rate exceeding 100°C per kilometer

3. The CODE command will alert you that heights are substantially different from the previous flight. These differences may be due to significant changes in the weather or from a temperature or pressure sensor failure. If you notice any height changes from the previous flight exceeding 300 meters, it is likely due to a sensor failure. Also, freezing level heights shown in the RADAT message can provide a quick indicator of erroneous temperature data. Freezing levels exceeding 19,000 feet are not typical and are likely erroneous.

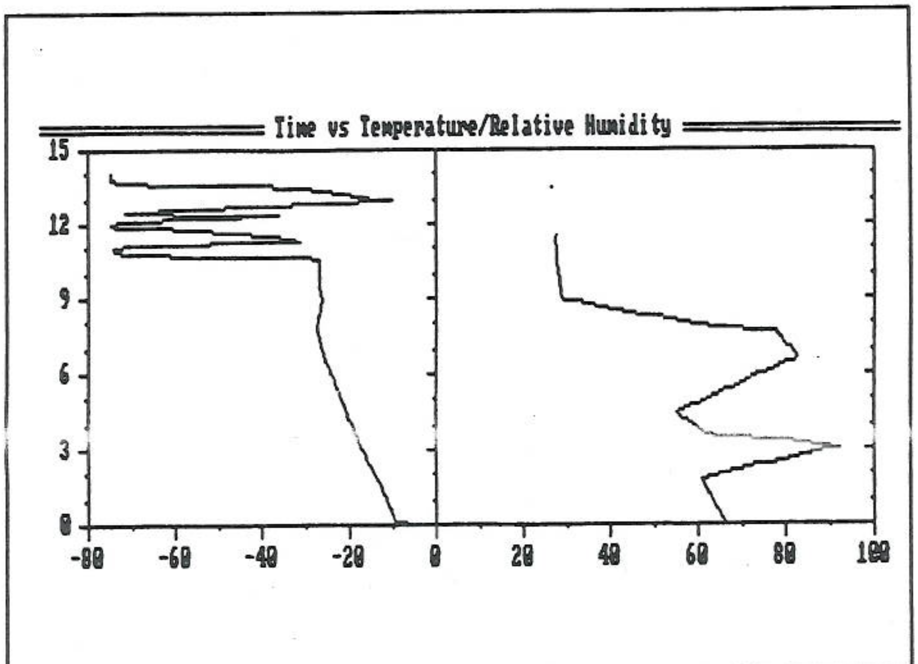

Exhibit 14-5. Temperature profile with temperature sensor failure.

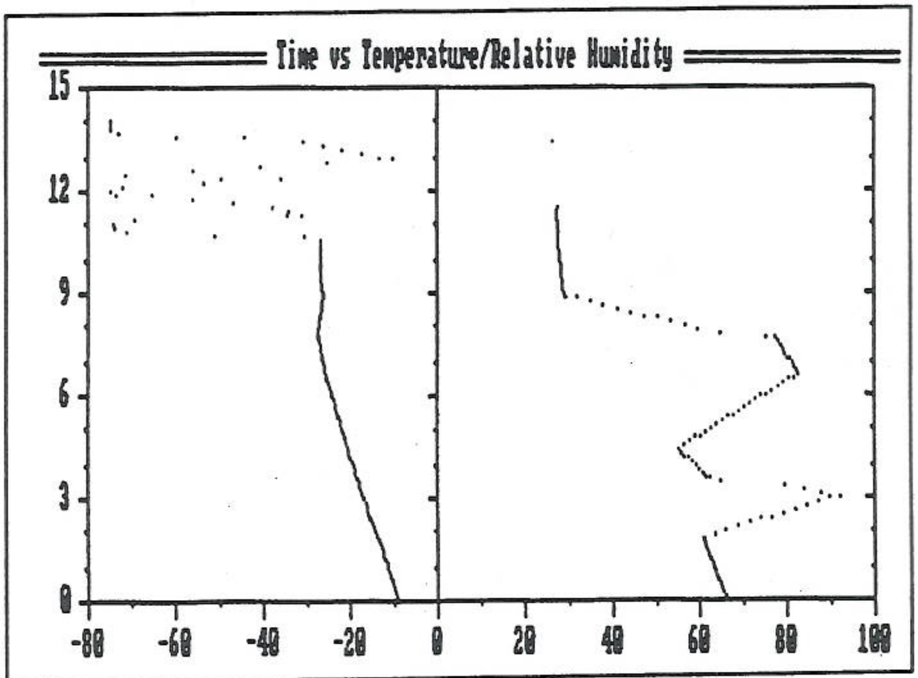

Exhibit 14-6. Point plot of temperature profile with temperature sensor failure.

To delete the stream of bad data, the same method used for deleting spurious temperature data (defined in Section 14.2.1.2) shall be used. After completing editing of the bad data stream, the resulting flight data should be carefully examined for its validity. This especially holds true if the amount of erroneous data exceeds 3 minutes or where the extent of the bad data results in super-adiabats (exceeding 13°C/km) no matter how much data editing is done. If you determine that the edited data is still erroneous and not realistic, the sounding should be terminated at the point where the bad data began.

14.2.2 Large Isothermal Layers

The temperature profile may contain significantly large isothermal layer (temperature doesn't change with height for more than 3 minutes) that may be of importance to the station staff. The STATUS command will report significant isothermal layers. On rare occasions, thick isothermal layers may be caused by a temperature sensor failure. If the temperature in the layer does not change by more than 0.5°C for 3 or more minutes, the data are likely erroneous and you should terminate the sounding at the point where the isothermal layer began.

14.2.3 Explosive Warming Event

Explosive (very rapid) warming sometimes occurs in the stratosphere during winter months at high latitudes (i.e., Alaska). Explosive warming above 100 hPa results in a sharp temperature inversion. When this occurs, you might want to print a plot of the temperature profile for use by the station staff.

14.3 Special Relative Humidity Profiles

Determining if relative humidity (RH) data is erroneous is difficult since moisture in the atmosphere can change significantly with height. Sections 14.3.1 through 14.3.3 describe situations that may occur with relative humidity data from time to time and the appropriate procedures for editing the data.

14.3.1 Relative Humidity Sensor Failure

A very small number of sensors fail after release, usually due to a sudden impact at release. When this happens, the sensor circuit may operate "open," causing the sensor to report the nearly constant RH values (constant high RH values will occur if you fail to insert the VIZ humidity sensor into the radiosonde). An example of the resulting RH profile is shown in Exhibit 14-7.

Exhibit 14-8 is an unusual case whereby MicroART indicates sensor failure during a flight when in fact the sensor is working properly. The sensor appears to be working between the fifth minutes and 20th minute of the flight, as the radiosonde passed through a cloud. However, the STATUS and CODE messages would call it a RH sensor failure because of the large strata of high RH. It is highly unlikely that a RH sensor would fail and then begin functioning again during a flight. Therefore, the status message should be ignored.

Another indicator that the RH sensor is not working properly is noting any rapid or abrupt increases in RH just off the surface with surface winds exceeding 15 knots. If the surface RH is correct (i.e., equipment is accurate and the observation was not taken too far from the release point), but 15 or more percent below the first 6-second RH data point reported by the radiosonde, the RH data from the radiosonde is likely erroneous. Determining if all or a portion of the RH flight data is erroneous is difficult. You should examine the RH profile carefully to determine extent of the erroneous data and delete it.

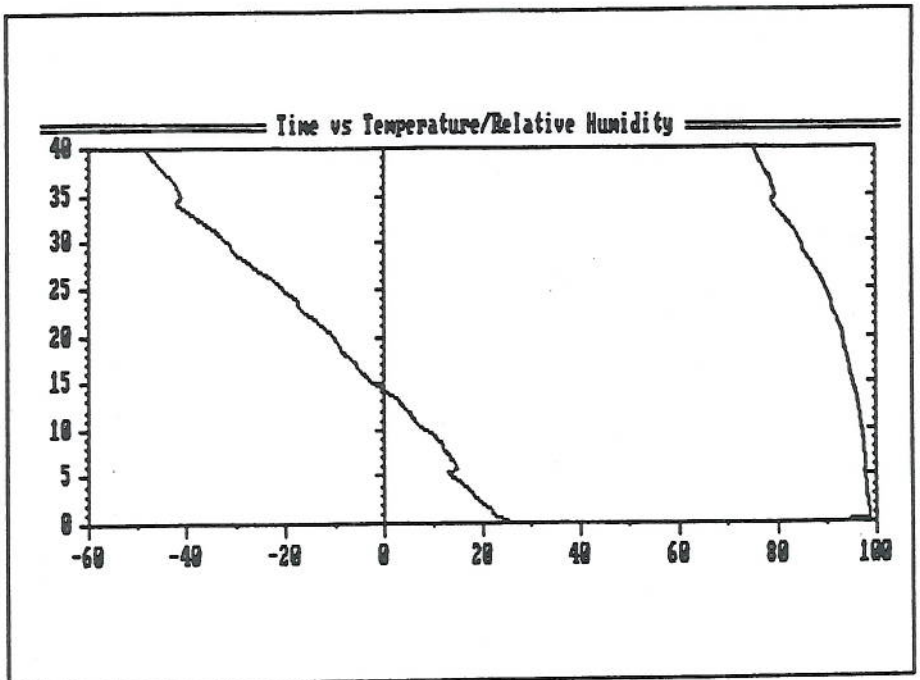

Exhibit 14-7. Relative humidity profile showing sensor failure.

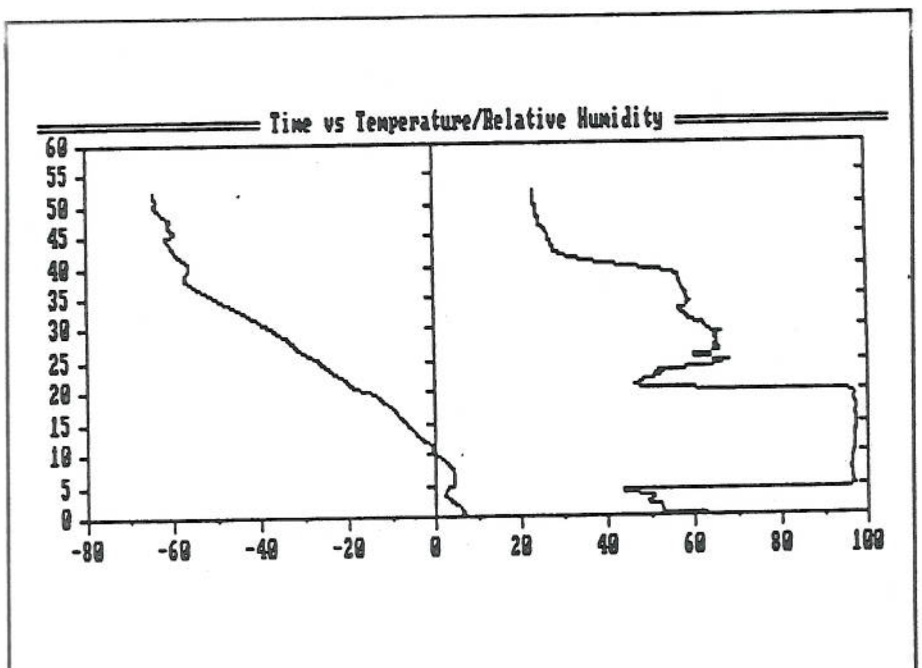

Exhibit 14-8. Relative humidity profile where system incorrectly states a sensor failure between minutes 5 and 20.

Erroneous RH data results in incorrect calculations of stability indices and can negatively impact weather forecasts. As a rule, it is better to report missing RH data than bad data. To eliminate the invalid RH data, follow these guidelines:

1. Use the PLOT MET command to plot the RH profile to see the extent of the problem. It may not have occurred immediately at release, so you must evaluate the situation.

2. Issue the MET command. Delete the RH data you think are incorrect. Be sure to delete all invalid points.

3. Replot the profile to ensure that no invalid data remain.

4. Issue the LEVELS command to ensure the erroneous data are reported as missing (99999 in the RH column).

5. Check the coded messages to ensure that the dew-point depressions appear as //.

14.3.2 Spurious Relative Humidity Data

Spurious RH data are much harder to spot than spurious temperature data, although they may occur for the same reasons. The RH profile may have one or more points that are not consistent with the surrounding data (i.e., RH differences between the spurious points and the surrounding data exceed 30 percent). You should follow the same guidelines as suggested in Section 14.2.1.2 to eliminate these points.

14.3.3 High RH Values in the Stratosphere

On occasion, as the radiosonde passes though a cloud or encounters precipitation, the RH sensor absorbs too much moisture or becomes ice covered and does not dry out after entering drier air. As a result, the humidity values remain biased too high for the remainder of the flight. This is readily apparent by examining the relative humidity values above 300 hPa. At these altitudes, RH values are typically less than 30%, but the RH sensor will report values in excess of 30% throughout the stratosphere. If such RH values are observed, the data are not realistic and shall be deleted. Issue the MET command and, using the block delete feature, delete all RH values from 300 hPa to flight termination.

14.4 Special Pressure Profiles

Unlike temperature and RH profiles, the pressure profile with time has a characteristic curve that looks very similar from one flight to the next. Exhibit 2-8 in Chapter 2 shows an example of such a profile. As you become accustomed to the normal shape of the pressure profile, profiles that are different or unusual become readily apparent. A pressure profile may look distorted for any number of reasons, some of which are:

1. Pressure sensor failure (see Sections 14.4.1 and 14.4.2).

2. Descending/reascending balloon (see Section 14.5)

3. Nearby thunderstorm activity (see Section 14.7)

The next two sections describe the types of problems that may be encountered with the pressure sensor.

14.4.1 Pressure Sensor Failure

The pressure sensor may fail for a variety of reasons, but manufacturing defects are the most common problem. Exhibit 14-9 illustrates a profile with a failed pressure sensor.

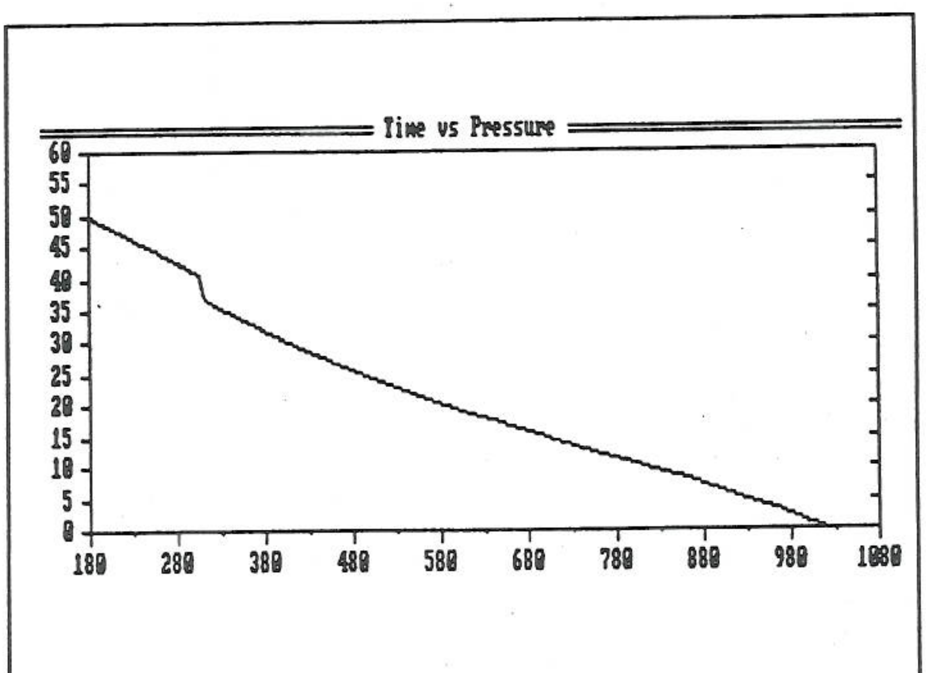

Exhibit 14-9. Pressure profile with a sensor failure.

The following techniques can be used to detect a pressure sensor failure:

1. Issue the CODE command which may provide some check messages for the suspect portion of the profile. Messages indicating super-adiabatic layers or large height changes from the previous flight may also appear.

2. Use the PLOT PRESSURE command and examine the pressure profile in 10 minute increments, with only slight fluctuations. It should appear as a smooth curve. Abrupt shifts in the profile are unrealistic.

3. Near the time of the suspected failure, check the difference (i.e., ascension rate) in height for each minute in the MET data. Differences exceeding 500 meters are unrealistic.

4. If it is determined that the unusual pressure profile is not due to descending/reascending balloon or thunderstorms (see Sections 14.5 and 14.7 respectively) and is due to a sensor failure, then terminate the sounding at the point where the erroneous data began.

14.4.2 Leaking Pressure Cell

The leaking pressure cell is another type of sensor failure that can cause serious problems with an observation. Leaking pressure cells cause the radiosonde to report pressures that are too low. This type of sensor failure will usually occur at pressures less than 100 hPa. The following can be used to detect a pressure sensor failure:

1. Using the LEVELS data, note the time that pressure levels are reached. A leaking pressure cell will cause the levels to be reached much earlier in the flight than usual. For example, the 10 hPa level may be reached at 60 minutes instead of the usual 90 to 100 minutes.

2. Use the PLOT PRESSURE command and examine the pressure profile in 10 minute increments. It should appear as a smooth curve, with only slight fluctuations. Sometimes a leaking pressure sensor will cause the profile to resemble a staircase.

3. In the CALC data, check the average ascension rates for surface to 400 hPa and 400 hPa to termination. Average ascension rates exceeding 500 meters per minute are not realistic. Also, in the MET data, check minute to minute height changes. Values exceeding 500 meters are also unrealistic.

4. The STATUS and CODE commands may alert the observer that Mandatory pressure heights are substantially different than for the previous flight.

5. If it is determined that the unusual pressure profile is not due to descending/reascending balloon or thunderstorms (see Sections 14.5 and 14.7 respectively) and is due to a sensor failure, then terminate the sounding at the point where the erroneous data began.

Sometimes a flight will terminate with a pressure observation less than 10 hPa. Whenever this occurs, the pressure data at 10 hPa and above should be checked for its validity, especially if the termination pressure is less than 5 hPa. At these pressures, the likelihood of a pressure sensor failure increases significantly. The following techniques can be used to help determine if these data are valid:

1. From the LEVELS data check the termination height and pressure of the flight. Termination heights greater than 39,000 meters or pressures less than 3 hPa are beyond the performance capabilities of the radiosonde and shall be deemed invalid.

2. Use the PLOT PRESSURE command and examine the pressure profile in 10 minute increments. It should appear as a smooth curve, with only slight fluctuations. Any abrupt shifts in the profile are unrealistic.

3. Check the height differences (i.e., ascension rate), above 10 hPa, from minute to minute in the MET data. Differences exceeding 500 meters are unrealistic.

If it is determined that the unusual pressure profile is not due to descending/reascending balloon or thunderstorms (see Sections 14.5 and 14.7 respectively) and is due to a sensor failure, then terminate the sounding at the point where the erroneous data began.

14.4.3 Descending/Reascending Balloon

A radiosonde flight train may be forced down for a number of reasons, but the two most common causes are icing on the balloon or strong down drafts associated with severe weather. These phenomena cause the flight train to lose altitude temporarily. As the phenomenon causing the descent abates, the flight train reascends. You are not required to edit data if this phenomena occurs. Follow these steps when you believe a descending/reascending balloon situation exists:

1. Issue the PLOT PRESSURE command. The pressure profile will show a characteristic S-shape as the flight train descends and then reascends (Exhibit 14-10). Note the beginning and ending times associated with this event.

2. Issue the PLOT MET command. The temperature/relative humidity profiles during the period will be almost a mirror-image of the profile just below the times denoted in Step 1.

3. Execute the CODE command to see whether the data are questionable. Use this information to check the data using the MET command. When a descending/reascending balloon is detected, the MET command will display the characters "D/R" under the DIR column. Data collected while the balloon is descending and reascending are ignored during the message coding process.

4. Check the levels by executing the LEVELS command. There should be levels entered for the beginning and ending of the descending/reascending layer and the REASON column will have D/R.

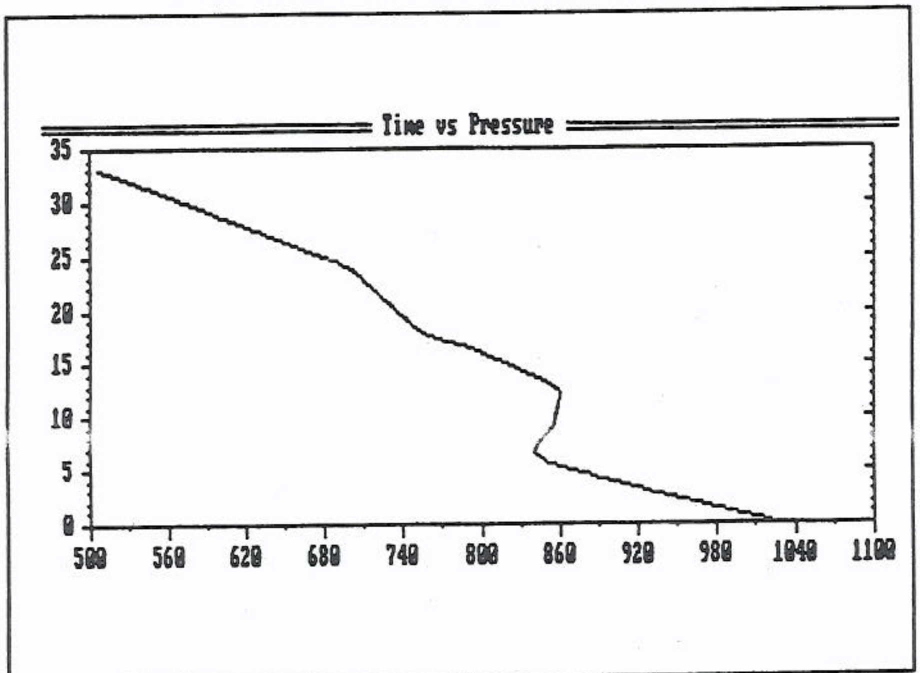

Exhibit 14-10. Pressure profile for descending/reascending balloon.

14.5 Special Position Data Profiles

As the radiosonde flight train ascends, The periodic checking for erroneous positions of the Automated Radio-Theodolite (ART) must be done during the flight, especially for the first few minutes, to ensure that erroneous winds aloft calculations will not result.

Side lobe tracking, erratic angles, and balloon overhead are special situations that require editing of the POSITION data.

14.5.1 Side Lobe Tracking

The ART receives radio signals in two distinct patterns:

a. Main lobe

b. Side lobes.

If after release, the ART system locks onto a side lobe instead of the main lobe, the position data POSITION data will appear very erratic (see Exhibits 14-11 and 14-12). These plots are from a flight where side-lobe tracking was allowed to continue without operator intervention. The signals dropped out totally about 28 minutes into the flight. This loss of signal is indicated by the abbreviation SRCH appearing in the real-time monitor under Sync. When the radiosonde signal has been lost for about 30 seconds, MicroART will sound an audio alert. This provides you with an opportunity to regain the signal and minimize the amount of erratic position data.

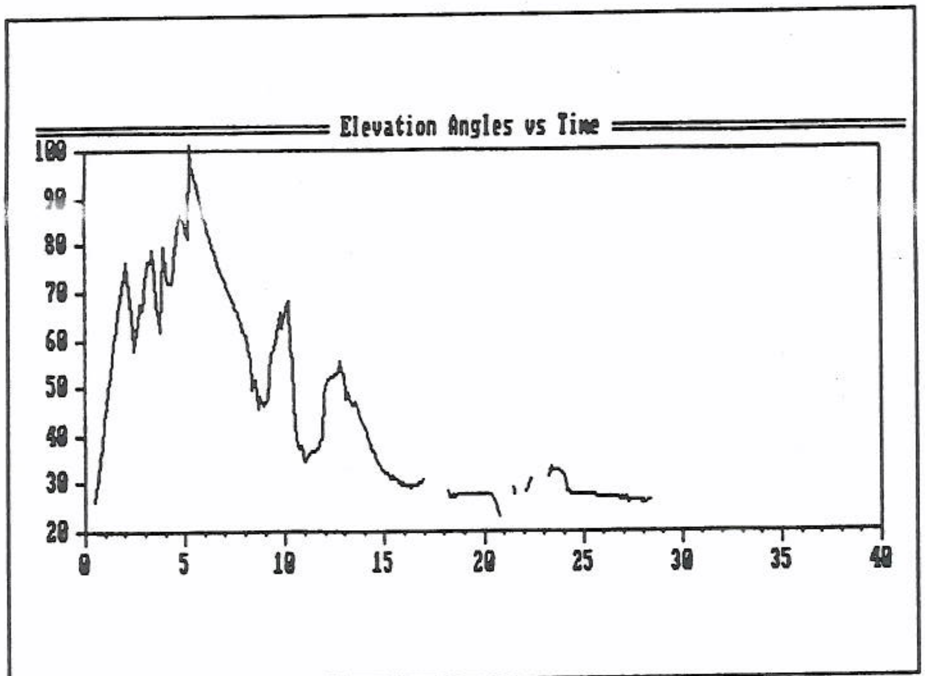

Exhibit 14-11. Elevation angle plot showing side-lobe effects.

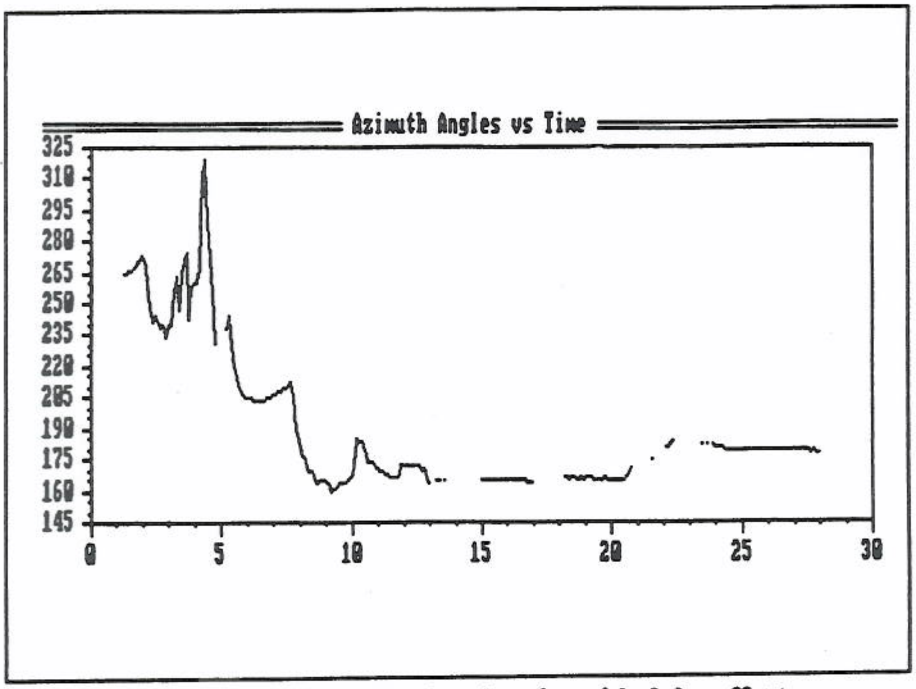

Exhibit 14-12. Azimuth angle plot showing side-lobe effects.

The meteorological data are probably valid through the period of side lobe tracking. However, the position data are unusable and must be deleted. If time permits, delete the erroneous position data using the POSITION command until all the erratic data eliminated. Otherwise, use the WINDS command to delete the winds.

14.5.2 Erratic Angles

Erratic angles have a variety of causes, but they occur most often because of multipath propagation of the radiosonde signal to the RDF antenna. The multipathing effect typically occurs when the elevation or azimuth angle of the RDF approaches the limiting angle of the ART system. As a result, the antenna stays in one position for a short time, then tries to recover when it gets a good signal. This effect will cause the antenna to "bounce" and the elevation and azimuth angles to look like steps or waves on the plots. Exhibit 14-13 shows an example of erratic elevation angles.

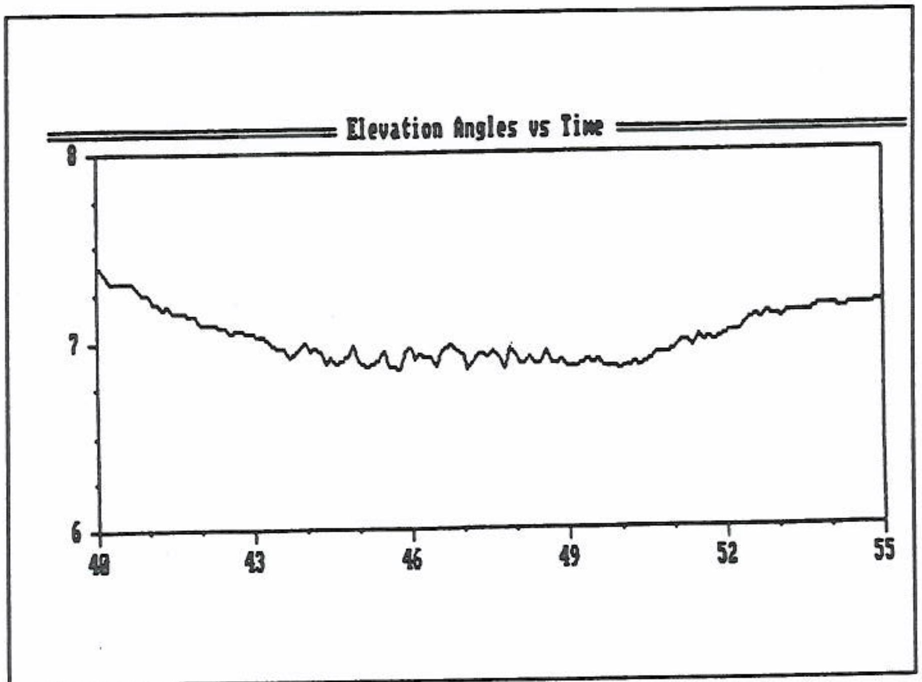

Exhibit 14-13. Erratic elevation angles due to multipathing.

Another type of erratic elevation or azimuth angle is associated with noisy signals which cause a spike to appear in the data. When this happens, the CODE command will indicate when the spikes occur. Exhibit 14-14 illustrates an elevation angle profile with noise spikes, while Exhibit 14-15 is a corresponding example for the azimuth angle.

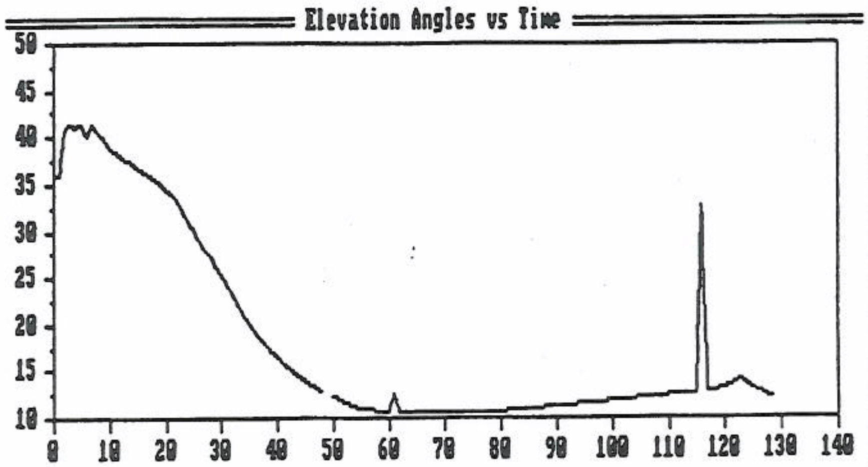

Exhibit 14-14. Noise spikes in an elevation profile.

Erratic angles can also result from weak radiosonde signals received by the ART antenna. If erratic angles persist from flight to flight and are not being caused by multipathing or weak signals, the ART equipment may be operating out of alignment and should be checked.

As with side lobe tracking, the meteorological data are likely valid through the period of erratic angles. However, the position data are in error and must be deleted. If time permits, delete the erroneous position data using the POSITION command until all the erratic data are deleted. Otherwise, use the WINDS command to delete the winds.

After issuing the CODE command, check the WINDS data for their validity. MicroART will alert you to validate all winds over 180 knots. Any wind speeds over 250 knots are not typical and may be erroneous. In most cases, increases or decreases in wind speed from minute to minute should not be greater than 40 knots. Wind profiles with speeds above 20 knots typically show a gradual shift in direction with height. Abrupt changes in wind direction (i.e., exceeding 90 degrees) may be in error and should be checked. However, when wind speeds are below 20 knots or there in a strong temperature inversion present, rapid changes in wind direction are not uncommon.

14.5.3 Balloon Overhead Case

On occasion, when light winds are present or in a wind shift aloft, the radiosonde will travel directly over the ART antenna. Exhibits 14-16 and 14- 17 demonstrate what the position data profiles look like in such a case. Sometimes the ART equipment "locks up" while tracking the radiosonde at such high elevation angles. Naturally, the elevation and azimuth angles for the period when the system is locked up are invalid and must be removed.

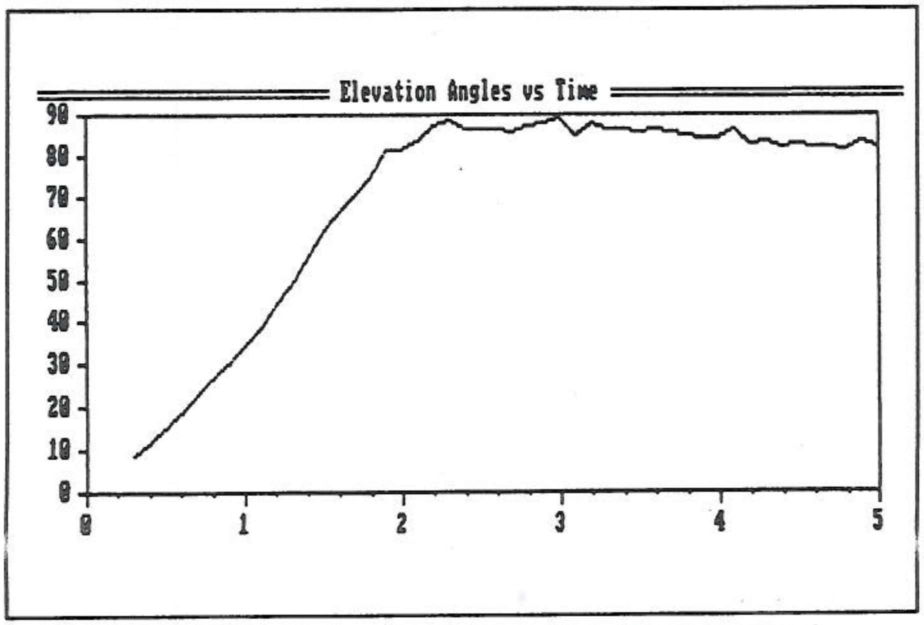

Exhibit 14-16. Elevation angle profile with balloon overhead.

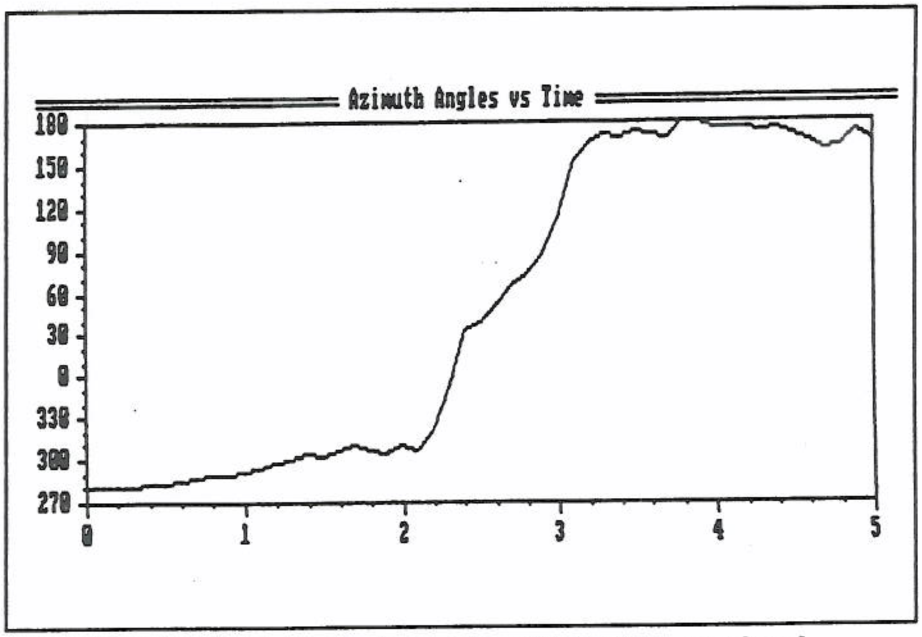

Exhibit 14-17. Azimuth angle profile with balloon overhead.

In many instances, MicroART will detect this situation and automatically deletes the position data during the period of the lock up. To see this, issue the POSITION command. In many cases, MicroART can identify erroneous position data during balloon overhead situations and such data will be flagged with "OVHD" and set to missing (99999). However, if the balloon is overhead for a short period, MicroART may not detect the lock up. In this case, the following method will help you to edit the angles that are suspect:

1. Execute the CODE command; the check messages may give you indications suspicious angle data.

2. Use the PLOT EL and PLOT AZ commands to visually see where the questionable angles are located.

3. Execute the POSITION command and delete angles you believe to be erroneous. Check the WINDS data, after executing the CODE command again, to check if the data appear valid.

14.6 Flights into or Near Thunderstorms

In general, it is best to avoid launching a balloon flight train in or near thunderstorms. Sometimes though, this is impossible. The result is often meteorological profiles that are unrepresentative of the surrounding environment. Furthermore, thunderstorms can degrade the meteorological data. If you determine that the flight data is being seriously affected by a thunderstorm, contact the lead NWS forecaster or the NCEP Senior Duty Meteorologist to discuss with them if the sounding should be terminated or not.

Sections 14.6.1 through 14.6.3 describe how thunderstorms can affect flight data and how to edit the data accordingly.

14.6.1 Temperature/Relative Humidity Profiles

Super-adiabatic lapse rates often occur near and within thunderstorms. Exhibit 14-18 shows a temperature and RH profile from an observation taken near a thunderstorm. The first 15 minutes of this flight show significant temperature structure with a number of super-adiabatic layers. Note also the large variation of relative humidity, which is characteristic of the thunderstorm environment.

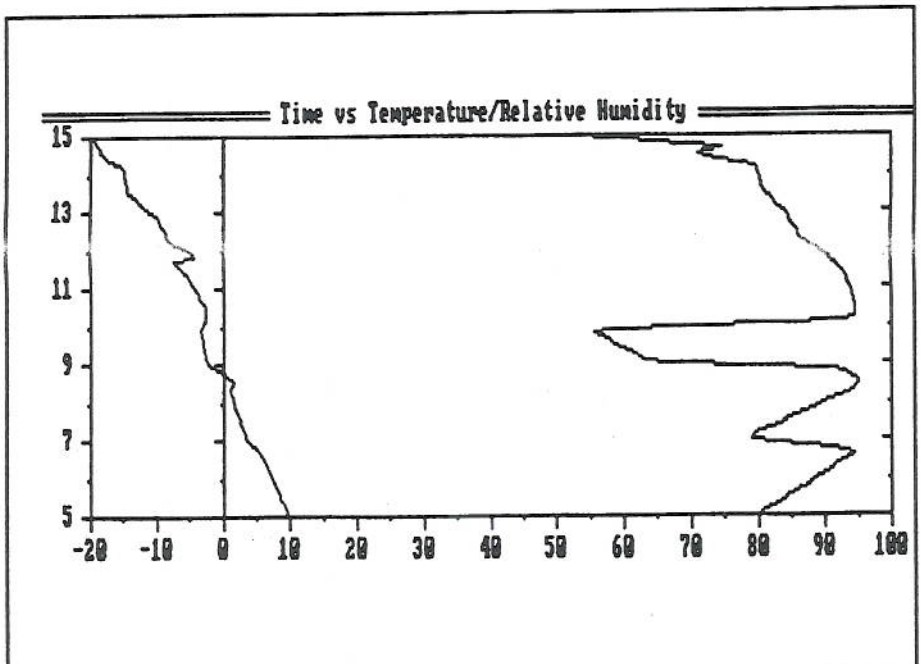

Exhibit 14-18. Super-adiabatic lapse rate in a thunderstorm environment.

Follow these steps in handling temperature and relative humidity data near thunderstorms:

1. Use PLOT MET and zoom in on the temperature and RH plot to view the structure more clearly. Then use the MET command to delete any invalid temperature data.

Note that the system interpolates data automatically for periods of deleted data exceeding 1 minute or less. Beyond 1 minute the values are set to missing.

2. Expect to see super-adiabatic lapse rates. These lapse rates are likely caused by the wet bulb effect and should be deleted (see Section 14.2.1.1). You should consider terminating the sounding if the number of super-adiabatic layers is excessive.

3. Delete any spurious RH data points (see Section 14.3.1).

14.6.2 Pressure Profile

Flights taken near or inside thunderstorms have a characteristic pressure versus time profile. Exhibit 14-19 shows an example of such a profile. The profile is distorted, not because of a pressure sensor problem, but because of changes in the ascension rate of the balloon. From about minute 8 to 13 of this flight, the ascension rate increased. It then slowed and by minute 16 the flight train recovered to its normal rate of ascent. The CODE command will show check messages when significant variations in the pressure profile exist.

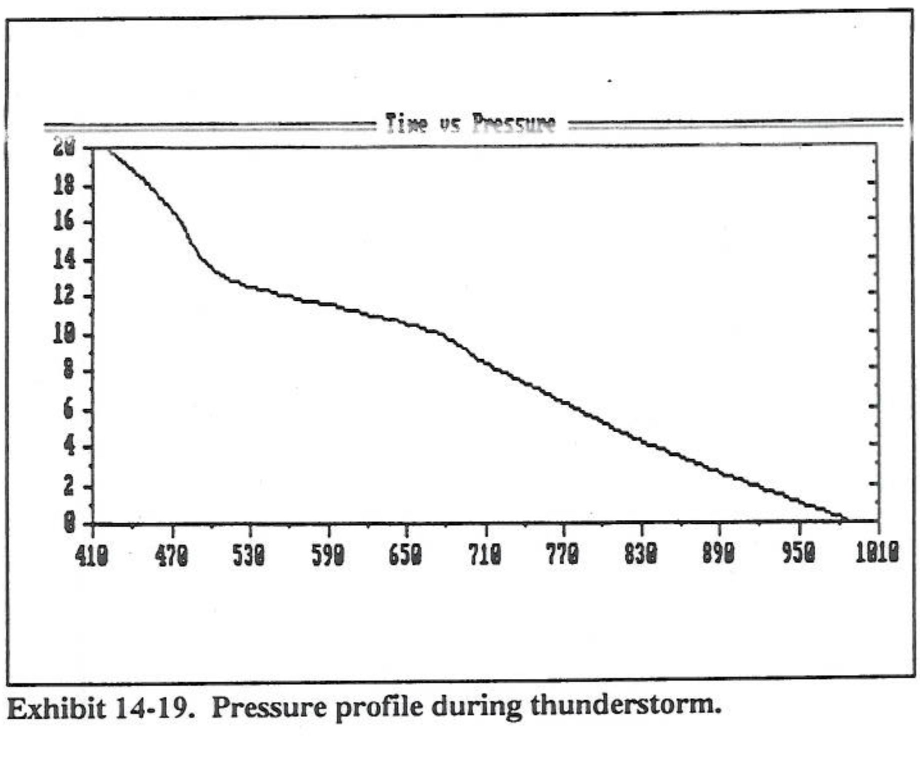

Exhibit 14-19. Pressure profile during thunderstorm.

As with a descending/reascending balloon (see Section 14.4.3), you are not required to edit the pressure data. However, you may want to consider terminating the sounding if there are frequent or prolonged periods of descending/reascending balloon data.

14.6.3 Position Data Profiles

Thunderstorms also affect the position data (elevation and azimuth angles). Typically, wind speed and direction will change abruptly, causing unusual wind profiles to appear. Signal loss may occur from lightning in the vicinity of the radiosonde, resulting in erratic angles. Refer to Section 14.6.2 for examples of erratic angles and how to delete them.

14.7 System Error Messages

On rare occasions, the system may display a message that indicates a system problem. One message you may encounter is **** UNX INT ****. Don't be concerned with this. If you see this message, press [Esc]. If that doesn't restore the system, press [Esc] several more times. If this fails, it will be necessary to reboot the system, which will terminate the flight. First, attempt a warm boot (CTRL C). If that doesn't work, do a cold boot of the system type (CTRL-ALT-DEL). Use the Resume option in the ART Options menu to process the flight data and transmit the coded messages.

During an observation, the STATUS command may report a system error with **SYSTEM ERROR:** followed by a short message. For example, if the system cannot read the position data properly, it will say **SYSTEM ERROR: Invalid Position Data Read.** This usually means that something is wrong with the hardware. Other messages of this type are self-explanatory.

15. Processing Multiple Releases and Special Observations

15.1 Introduction

This chapter discusses two types of processing that will be necessary from time to time:

1. Multiple releases

2. Special observations

Section 15.2 deals with multiple releases, while special observations are discussed in Section 15.3.

15.2 Multiple Releases

A multiple release may be necessary for any number of reasons, although it is usually related to some malfunction of the flight equipment immediately after release. Within 3 to 5 minutes after launch, MicroART determines if the release is successful. If the quality or quantity of data during this period is insufficient, the release is deemed unsuccessful and the flight terminated. If the flight reaches 400 hPa and the amount of missing data is not excessive, the flight is considered successful.

Messages about whether or not the release and flight are successful appear in the system status window when they are generated. These messages can be viewed with the STATUS command.

15.2.1 Flight Termination

If the message window of the real-time monitor declares the flight to be either an unsuccessful release or observation, the flight will be terminated automatically. Follow these steps for another release:

1. At the ?> prompt type EXIT and press [ENTER].

2. After the data are stored and the temporary archive created, the following messages appear:

   Observation was not successful.
   Would you like another release? [Y/N]:

3. Press Y and [Enter] to begin the process for the next release.

4. The Administrative Data screen of the prerelease sequence appears (Exhibit 15-1). Entries on this screen can be updated for the next release. Note that the Release Number entry has been changed from 1 to 2 (2 to 3 for a third release). Press [PgDn] when you are ready to advance to the next screen.

```
MicroART Version 2.90          Prerelease Data

Station: Sterling, VA                Index: 72403     Pressure Corr: 0.0 mb
Orientation correction AZ: 0.00      EL: 0.00         Elevation: 85 m
Date Last Flight: 02/12/97           Hour: 00         Prev. Asc. No.: 216-1

*** Administrative Data ***

Observer:                        RNT
Date:                       02/12/97
Hour:                             12
Ascension Number:                217
Release Number:                    2
Process Winds [Y/N]:               Y
Process Ranging Data [Y/N]:        N
Special Observation [Y/N]:         N
Termination Level                0.1 mb

                      PgDn:Next Screen
```

Exhibit 15-1. Administrative Data screen.

5. Make any necessary updates to the Flight Equipment Data screen. Press [PgDn] when you are ready to advance to the next screen.

6. Make the necessary entries in the VIZ Radiosonde Data screen. Press [PgDn] when you have finished.

7. Complete the Surface data screen with new entries for the latest surface observation.

8. For each multiple release, the Log Diskette should be changed.

9. From this point on, processing of the flight is identical to the normal observation.

15.2.2 Archiving Multiple Unsuccessful Releases

If the second or third release was successful, the observation is stored and archived in the usual manner. However, none of the releases may have been successful. When you issue the EXIT command after an unsuccessful first or second release, the following messages appear:

Observation was not successful.
Would you like another release? [Y/N]:

If there will be no more releases, press N and [Enter]. An example of how the screen appears is shown in Exhibit 15-2.

```
Writing Temporary Archive file to hard disk ...

Writing STORE file to hard disk ...

Insert diskette for STORE file backup. Press ENTER when ready.

Writing STORE file to floppy disk ...

Observation was not successful.
Would you like another release? [Y/N]: N

     Release Summary for Ascension 217

 Release   Termination Altitude (m)   Termination Pressure (mb)
    1               4963                        545.7
    2                945                        904.1

Which release should be archived? [Enter 0 for none]:
```

Exhibit 15-2. Screen displaying prompt for release archiving.

You have two options in determining which flight to archive. One option is to archive the flight that reached the highest altitude (lowest pressure), or whichever flight you think provided the most information. The other option is to archive none of the flights. This would be done if none of the flights provided significant information. For example, if none of the flights had a successful release, then none of them should be archived.

If none of the flights is archived, then no valid observation is associated with the current ascension number. Therefore, when the next observation is taken, MicroART uses the same ascension number. Do not attempt to change the ascension number manually, because this will cause an ascension number to be missed. Note that if no flight is archived, the temporary archive files for all of the unsuccessful flights are deleted automatically. **So be sure of your response before you decide not to archive any of the flights.**

15.2.3 Transmitting Coded Messages

If either the second or third observation is successful, the coded messages are transmitted in the usual manner. If none of the observations are successful, then the coded messages for the flight that was chosen to be archived are transmitted. If the last of the unsuccessful flights is to be transmitted, follow these steps:

1. Select the Resume option from the ART Options menu.
2. Insert the Log Diskette for the last unsuccessful flight into the diskette drive and close the drive door.
3. Press [Enter] and follow the usual procedure for entering the Resume option.
4. Review and transmit the coded messages using the MESSAGE command.
5. Issue the EXIT command when transmission is complete. The Temporary Archive file and Store file are updated.

If the coded messages for a flight other than last release are to be transmitted, the transmission can be done if the log diskette from the first release has been saved. If not, the messages should be entered directly into your host computer system or phoned in to the National Center Environmental Prediction (NCEP).

15.3 Special Observations

For the most part, special observations are processed in the same manner as synoptic flights. Two entries on the Administrative Data screen are different for special observations (Exhibit 15-3).

```
MicroART Version 2.90          Prerelease Data

Station: Sterling, VA                Index: 72403       Pressure Corr: 0.0 mb
Orientation correction AZ: 0.00      EL: 0.00           Elevation: 85 m
Date Last Flight: 02/12/97           Hour: 12           Prev. Asc. No.: 217-1

*** Administrative Data ***

Observer:                      RNT
Date:                     02/12/97
Hour:                           15
Ascension Number:              218
Release Number:                  1
Process Winds [Y/N]:             Y
Process Ranging Data [Y/N]:      N
Special Observation [Y/N]:       Y
Termination Level            100.0

                              PgDn:Next Screen
```

Exhibit 15-3. Administrative Data screen for special observations.

Note these two changes to this screen:

1. The Special Observation entry has been changed to Y.

2. The termination level in this example is 10.0 hPa. The termination level should always be set at a pressure less than or equal to 400.0 hPa, e.g., 100 hPa. This is because flights that terminate at a pressure greater than 400.0 hPa are deemed unsuccessful by MicroART.

A special observation receives the next ascension number in the sequence for standard flights. When the flight reaches the termination level, the flight is terminated automatically and the coded messages are generated. Special flights are stored and archived in the same manner as the standard observations.

16. Processing Ranging Data

16.1 Introduction

This chapter provides information and instructions on use of the transponder radiosonde as used with the MicroART system. Included are instructions for operating the ART equipment and activating the transponder. This chapter describes the basic commands to be used with the transponder, and how to detect problems and special cases. You should become thoroughly familiar with this chapter before flying a transponder.

16.1.1 Transponder

The type of radiosonde normally used has a transmitter to relay data back to a ground receiver. To obtain wind data, direct line-of-sight from the radiosonde to the ground receiver is required as the winds are computed using angular readings. This poses problems and results in missing wind data when the radiosonde enters the area of limiting angles.

A transponder is a type of radiosonde that has both transmitter and receiver. The ground equipment transmits a signal to the receiver on-board the transponder keying a return signal from the transmitter in the transponder. Along with the normal meteorological data, Slant Range data is also received. Basically this is a measurement of timing differences from the ground receiver to the transponder radiosonde and back to ground receiver. Therefore, wind data are available when the tracking is into the area of limiting angles and where elevation/azimuth angles may be erratic.

16.1.2 Visual Differences

The VIZ transponder has two differences in the physical appearance which readily identify it as such. The first is flexible transponder antenna extended vertically on the outside of the unit (Exhibit 16-1). The second is a card located inside the radiosonde. The Artsonde will have the single card, whereas the transponder has two cards mounted inside. Besides these two differences. the transponder operates like the normal ART radiosonde.

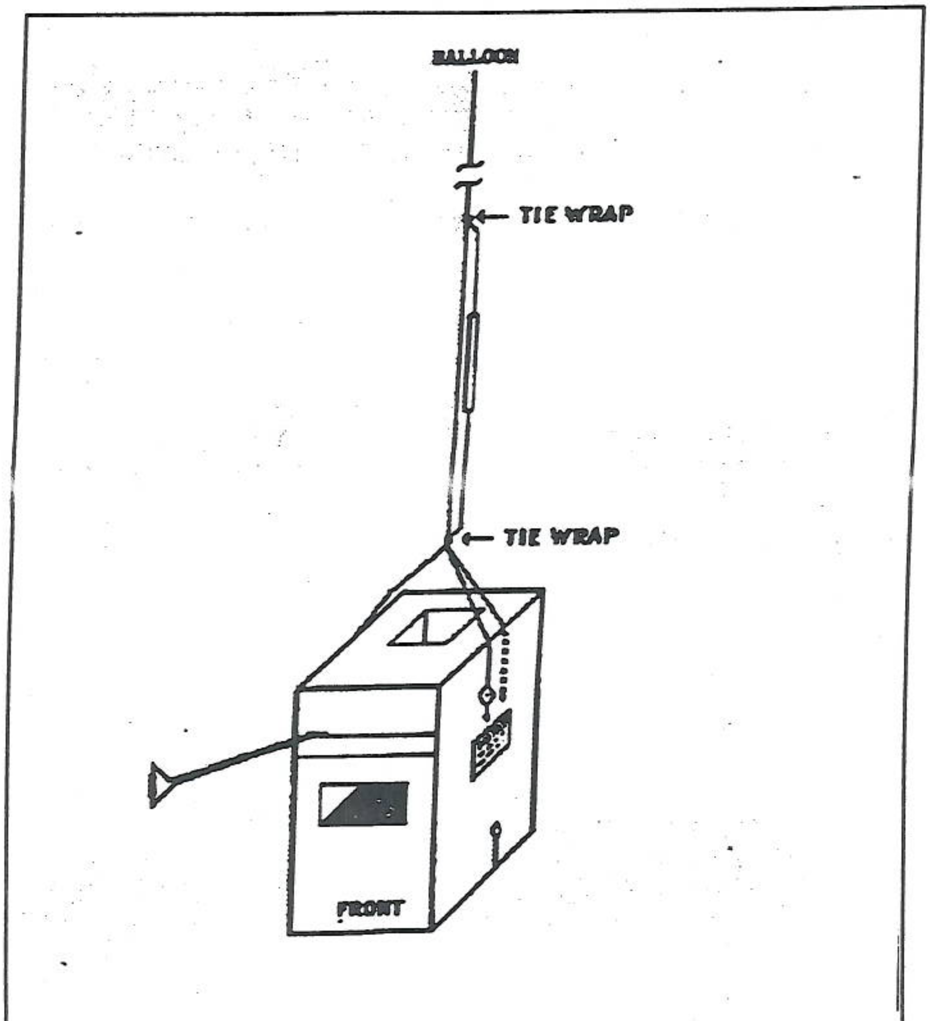

Exhibit 16-1. Transponder Radiosonde.

16.2 Prerelease

The prerelease sequence for transponders is for the most part identical to that for the ART sonde. There are two entries that require a change when using a transponder. The first entry change is on the Administrative Data screen (Exhibit 16-2).

```
Micro ART Version 2.90          Prerelease Data                 Rework No.: 1

Station: Spokane, WA               Index: 72785        Pressure Corr: 0.0 mb
Orientation correction AZ: -0.04   EL: 0.01            Elevation: 85 m
Date Last Flight:                  Hour:               Prev. Asc. No.:

*** Administrative Data ***

Observer:                    RNT
Date:                     6/1/97
Hour:                         12
Ascension Number:            272
Release Number:                1
Process Winds [Y/N]:           Y
Process Ranging Data [Y/N]:    Y
Special Observation [Y/N]:     N
Termination Level         0.0 mb

                          PgDn:Next Screen
```

Exhibit 16-2. Administrative Data screen for transponder observations.

Note the change to this screen:

1. The Process Ranging Data entry has been changed to **Y**. Ranging data will now be processed, instead of elevation and azimuth angles. It is very important to make this change during the prerelease sequence for a transponder flight. Failure to do so will preclude ranging data use during the flight.

The second change is on the Flight Equipment Data screen. (Exhibit 16-3)

```
MicroART Version 2.90          Prerelease Data

Station: Sterling, VA                 Index: 72403     Pressure Corr: 0.0 mb
Orientation correction AZ: -0.04      EL: 0.01         Elevation: 85 m
Date Last Flight: 6/1/97              Hour: 12         Prev. Asc. No.: 272-1

*** Flight Equipment Data ***

Radiosonde Type:                  SR
Balloon Size:                    600
Balloon Mfg:                  KAYSAM
Date Balloon Mfg:           06/01/97
Parachute? [Y/N]:                  Y
Train Regulator? [Y/N]:            N
Lighting Unit? [Y/N]:              N

            PgDn:Next Screen       PgUp:Previous Screen
```

Exhibit 16-3. Flight Equipment Data screen.

Note the change to this screen.

1. The Radiosonde Type entry has been changed to SR, which indicates solid-state time-commutated radiosonde with ranging capability.

2. If the Radiosonde Type is not changed to SR, a message will appear on the last prerelease screen that says:

   Check entries for PROCESS RANGING DATA and RADIOSONDE TYPE.

   This same message will appear if the Process Ranging entry is N and the Radiosonde Type is SR.

16.3 Launch Procedures

As shown in Exhibit 16-1, the VIZ transponder radiosonde has a flexible antenna that is secured to the string extending from the radiosonde to the parachute. This can be accomplished by using the plastic ties supplied by the manufacturer, or by using a length of tape.

16.4 Commands

There are a number of commands that have been modified available with the transponder version of MicroART. These include two new plot commands and one to terminate slant range processing at any point. Another command has been added that displays whole minute position data along with the calculated winds.

The PLOT (PL) command was explained in an earlier chapter (Ch 5.3.4). With the use of transponders, two additional plots are made available to the operator. During the flight you will use these two plots and the position data screen, to check the quality of data being received and to make certain that you have a valid transponder flight. It is good practice to use these plots throughout the entire flight.

16.4.1 Radiosonde Radial Acceleration (RR)

A plot of time (horizontal axis) versus radiosonde radial acceleration (vertical axis) is displayed in Exhibit 16-4. This is a plot of the changes in slant range data as the transponder moves away from the radiotheodolite. The more consistent the movement away from the radiotheodolite, the less change in the acceleration. This will result in plotted values very near zero. When the transponder experiences signal loss or interference, the plot becomes more erratic. The two stepped lines above and below the plotted data are guides in helping to determine whether the slant range values are erratic or good. Note: The Radiosonde Radial Acceleration plot is designated RRA6 but for brevity and practicality, RR is referred to in this chapter and can be used by the operator to plot the radial acceleration.

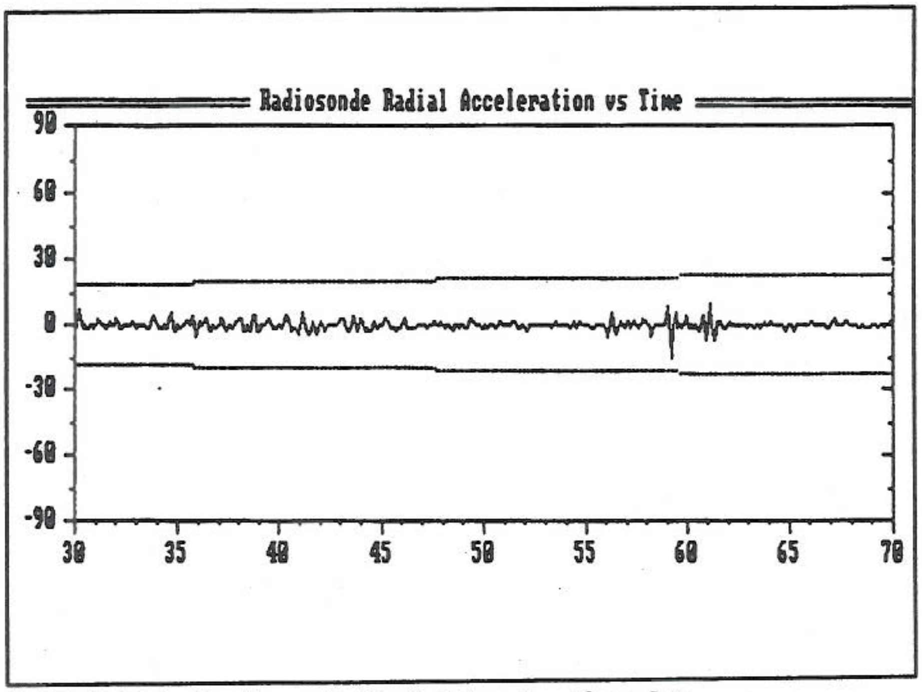

Exhibit 16-4. Radiosonde Radial Acceleration plot.

Exhibit 16-4 is an example of slant range data that would be considered valid. Even though there are a number of "squiggles" in the plot, none exceed the guide lines and the points are centered near the zero line. This means the radiosonde was moving away from the radiotheodolite at a normal rate. **Note:** It is suggested that you keep the RR plot on the screen as much as possible during the flight starting with a zero to 30 minute segment and then increasing in increments of 20 minutes.

16.4.2 Slant Range (RA)

A plot of time (horizontal axis) versus slant range in kilometers (vertical axis) is displayed in Exhibit 16-5. This plot shows the slant range distance of the transponder from the tracking unit at a given time. Exhibit 16-5 is an example of a very good transponder flight and shows the characteristic "S" shape which is typical of good transponder data. The line is continuous and without any noticeable erratic spikes or shifts. The flow of the slant range flight trace flattens after the 50 minute mark as an area of much lighter winds is encountered. Other examples in this chapter will give you an insight as to what problems you might encounter using transponders.

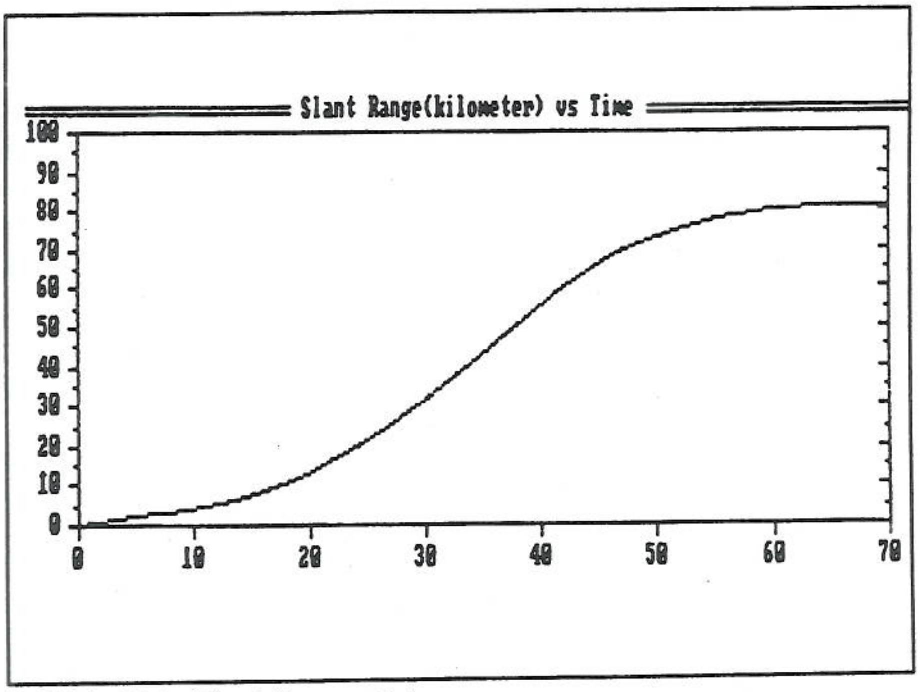

Exhibit 16-5. Slant Range plot.

16.5.3 Position Data screen (PO)

The PO command has been modified to display slant ranges in a column next to the Az. Angle column (Exhibit 16-6). It is very important that you learn to review the slant range data periodically to become familiar with the normal values to be expected.

POSITION DATA

Time (min)	El. Angle	Az. Angle	Slant Range	Comments
0.0	34.70	168.53	0	
0.1	34.70	168.53	50	
0.2	34.70	174.68	60	
0.3	55.41	174.65	120	
0.4	57.92	173.65	140	
0.5	58.02	172.42	200	
0.6	59.34	167.45	220	
0.7	55.58	164.76	270	
0.8	54.99	165.50	300	
0.9	53.13	161.25	350	
1.0	51.72	162.98	400	
1.1	50.56	163.82	430	
1.2	49.74	163.59	490	
1.3	47.99	163.64	530	
1.4	47.00	165.08	580	
1.5	45.40	166.61	640	
1.6	44.24	166.93	700	
1.7	43.06	165.76	760	
1.8	42.25	166.21	840	
1.9	40.45	166.90	930	
2.0	39.27	167.28	1010	
2.1	37.92	167.89	1120	
2.2	37.06	167.56	1180	
2.3	36.16	167.79	1290	
2.4	35.51	168.47	1360	
2.5	35.16	168.96	1410	
2.6	35.07	169.75	1480	
2.7	34.51	170.40	1570	
2.8	34.52	170.82	1610	
2.9	34.62	171.47	1680	
3.0	34.52	172.11	1730	
3.1	34.62	172.75	1780	
3.2	34.79	173.11	1830	
3.3	34.98	173.47	1890	
3.4	35.46	174.07	1940	
3.5	35.28	174.53	2000	
3.6	35.70	174.46	2050	
3.7	35.77	175.00	2100	
3.8	36.11	174.89	2140	
3.9	36.50	175.21	2170	
4.0	37.20	175.34	2210	
4.1	37.86	175.62	2230	
4.2	38.30	176.07	2250	
4.3	38.95	176.20	2270	
4.4	39.57	176.25	2290	
4.5	40.08	177.05	2320	
4.6	40.34	177.23	2350	
4.7	40.77	177.61	2370	
4.8	41.05	177.90	2390	
4.9	41.42	178.25	2430	
5.0	41.95	178.49	2450	

Exhibit 16-6. Position Data screen.

16.4.4 Wind / 1 Minute Angular (WA)

Using the command WA allows you to see a "read only" display of the winds and 1-minute position data. The operator cannot edit or otherwise change data on this screen. This new command is very helpful in determining which winds may be invalid. (Exhibit 16-7)

WINDS / 1 MINUTE ANGULAR

MINUTE	HT(M-AGL)	DIR	SPEED	Alt(ft-msl)	EDIT	AZ	ELEV	RANGE
53	17247	254	11	56866		281.19	20.08	46310
54	17608	254	10	58050		280.90	20.31	46710
55	17984	260	6	59284		280.77	20.65	46950
56	18354	270	4	60498		280.65	20.91	47370
57	18715	322	3	61682		280.82	21.26	47550
58	19080	37	4	62880		280.79	21.61	47700
59	19474	55	5	64173		281.10	22.01	47810
60	19866	54	10	65459		281.25	22.52	47780
61	20258	70	14	66745		281.45	23.01	47770
62	20650	78	17	68031		281.95	23.56	47620
63	21060	90	19	69376		282.30	24.25	47180
64	21497	103	19	70810		282.37	24.98	46790
65	21935	110	18	72247		282.10	25.73	46440
66	22372	112	17	73681		281.91	26.30	46360
67	22809	110	16	75115		281.87	27.03	46050
68	23247	104	19	76552		281.83	27.76	45810
69	23684	103	19	77986		281.72	28.47	45640

Exhibit 16-7. Wind / 1 Minute Angular.

16.4.5 Terminating Ranging (RAN)

This is a new command used only with transponder flights and allows you to terminate slant ranging processing in the event of ranging failure. Terminating the ranging will enable the operator to use angular readings to obtain wind data instead of slant ranges. Procedures on use of this command are found later in this chapter.

16.5 Editing Ranging Data

With the use of transponders, editing of slant range data is accomplished using the position (PO) command. The position screen is used to display and edit 6 second elevation and azimuth angles and slant range data. Deleting a slant range value will change the entry to 999999 as shown in Exhibit 16-8. Deleting the slant range value for one entry leaves the elevation and azimuth angles intact. When 11 or more consecutive entries (greater than 1 min.) are deleted, the elevation and azimuth angles are also changed to 9's to designate missing position data.

When viewing the position screen, you may see a slant range value of 999999 that you did not delete. MicroART automatically eliminates "noise spikes" or other interference and replaces them with 9's. These may be "restored" by using the F7 function key. The original slant range value will appear in lieu of the 9's.

MicroART REWORK Version 2.90

Station: Caribou, ME
Ascension: 962-1 Date: 18-JUN-97 Time: 18:59
R/S No: 85000020.RST Baro No: 314-4197

POSITION

Time(min)	El. Angle	Az. Angle	Slant Range	Flags
2.5	32.11	321.54	5330	
2.6	39.81	318.99	5420	
2.7	44.17	324.67	5540	
2.8	44.55	294.49	5560	
2.9	29.94	285.92	5680	
3.0	42.94	286.20	5790	
3.1	42.98	287.44	5800	
3.2	46.27	310.19	5860	
3.3	46.03	342.89	5770	
3.4	57.34	351.38	5410	
3.5	35.08	351.08	999999	
3.6	34.14	352.16	999999	
3.7	33.48	352.28	999999	
3.8	31.52	352.81	999999	
3.9	33.55	352.30	6420	
4.0	33.48	352.69	999999	
4.1	32.16	326.69	999999	

F6:time: F7: Restore Data F8: Delete Data

Exhibit 16-8. Position data screen.

Editing of slant range data can have very positive results when done properly. In the following example, you will take a systematic approach to editing slant range data.

1. After release you monitor the slant range data using the Radiosonde Radial Acceleration (RR) plot as shown in Exhibit 16-8a. At minute 13 you see a spike on the plot that goes well outside the stepped guidelines and exceeds the radial acceleration value of -60. At this point it is evident there is a problem with the transponder data. You would then proceed to the next logical step.

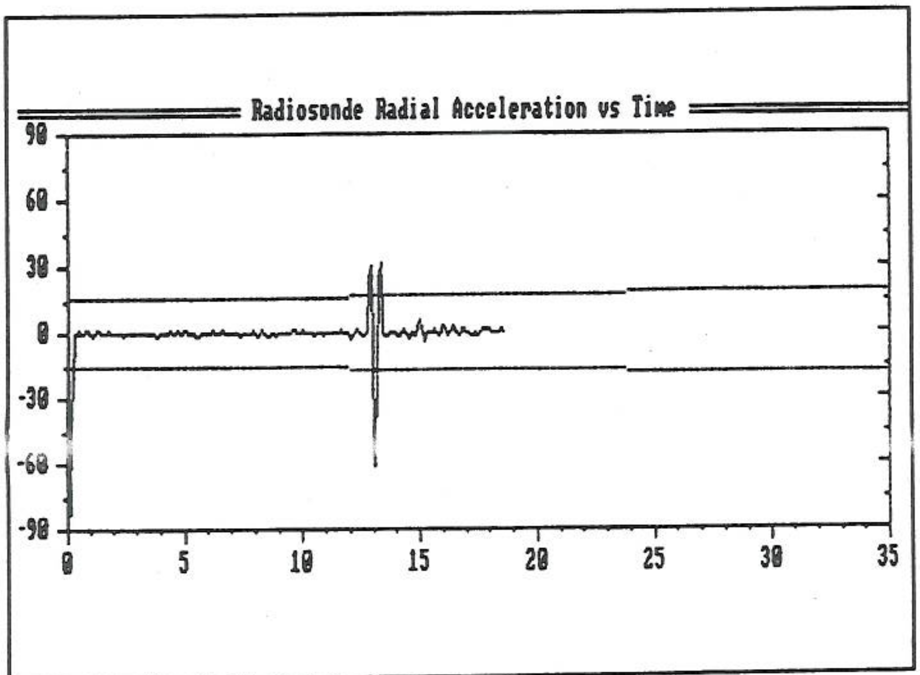

Exhibit 16-8a. Radiosonde Radial Acceleration plot - Editing.

2. The next step would be to look at the slant range plot of the time period the spike occurred on the RR plot. You would escape from the RR plot by pressing [ESC], and at the ?> prompt, type PL RA and press [Enter]. The beginning time is 10 and the end time is 15. This will cover the time of the interruption of the signal (spike).

A look at the RA plot will confirm a problem exists around minute 13 as seen in Exhibit 16-8b.

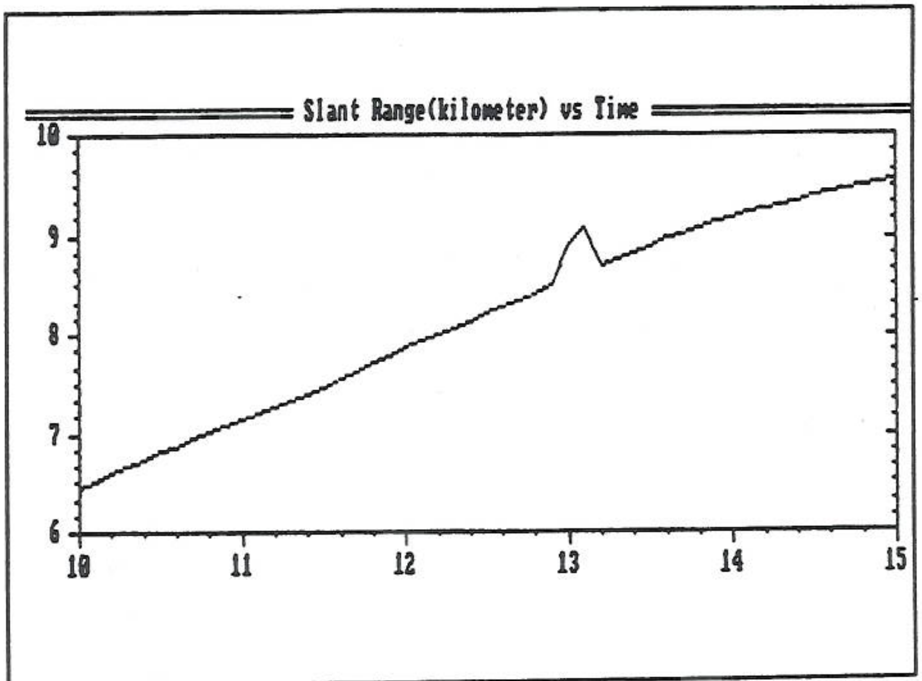

Exhibit 16-8b. Slant Range plot showing a "Kink" in the profile.

Notice that the "Kink" in the profile is not a phase shift, because the trend is before and after the bump is similar and not "shifted" (See Section 16.7.1). **It is critical that the operator know this difference before editing is done.**

3. Finally, you look at the 6-second data for the period of time that the spike occurred as shown with the RR and RA plots. Using the PO command to retrieve the Position Data display (Exhibit 16-8c), you see that two slant ranges values are not correct (minutes 13.0 and 13.1). Editing is accomplished using the F8 key to delete the bad data. The two points deleted will then be replaced with 9's.

POSITION DATA

Time (min)	El. Angle	Az. Angle	Slant Range	Comments
12.0	28.97	301.56	7870	
12.1	28.98	301.43	7930	
12.2	28.96	301.36	8000	
12.3	29.01	301.20	8060	
12.4	29.01	301.19	8140	
12.5	29.04	301.09	8220	
12.6	29.04	300.99	8290	
12.7	29.01	301.03	8360	
12.8	29.08	301.06	8420	
12.9	29.10	301.07	8500	
13.0	29.22	301.09	8930	
13.1	29.24	301.09	9070	
13.2	29.27	301.04	8700	
13.3	29.32	301.06	8760	
13.4	29.32	300.98	8830	
13.5	29.36	300.89	8900	
13.6	29.36	300.92	8970	
13.7	29.38	300.95	9020	
13.8	29.43	300.98	9080	
13.9	29.51	300.95	9130	
14.0	29.64	300.91	9180	

Exhibit 16-8c. Position Data display - Editing.

4. Execute the RA command again to see the results of the editing of the two slant range values. The spike has been eliminated and the plotted line is fairly smooth (Exhibit 16-8d).

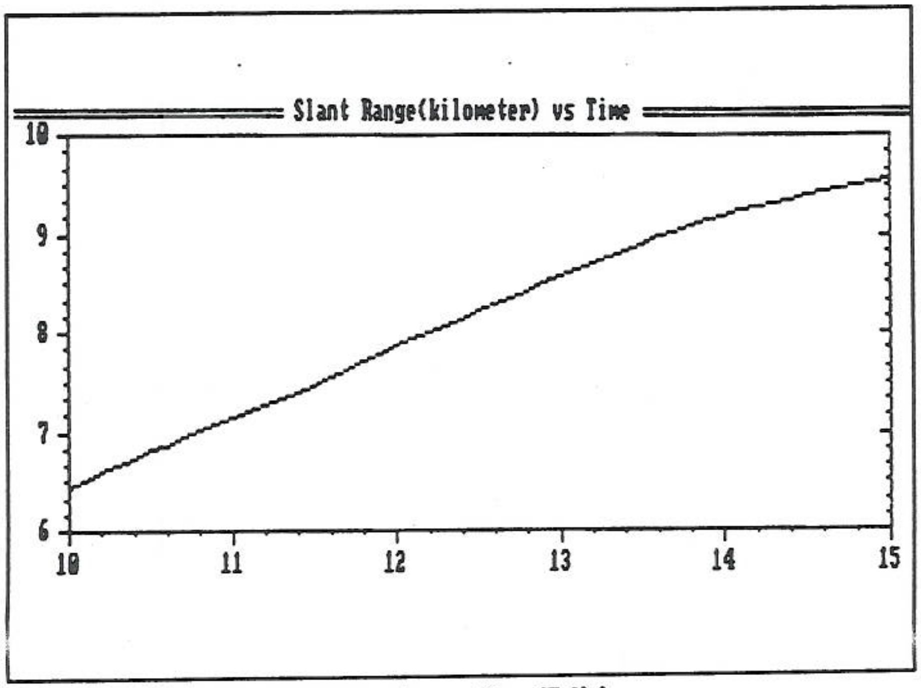

Exhibit 16-8d. Slant Range plot - After Editing.

16.6 Special or Unusual Cases

In the next several exhibits you will see examples of special or unusual cases that you may encounter when using the transponder. These will include:

1. Phase shifts
2. Meteorological events
3. Transponder failure

16.6.1 Phase Shift

Exhibit 16-9 is a classic example of a phase shift indicated by the shift in the slant range profile as seen on the PLOT RA command. Phase shifts are usually caused by signal interference or by a loss of signal due to a momentary power interruption, which causes the sync signal LOS to be flashed in the header section of the screen. When you suspect a phase shift, do the following:

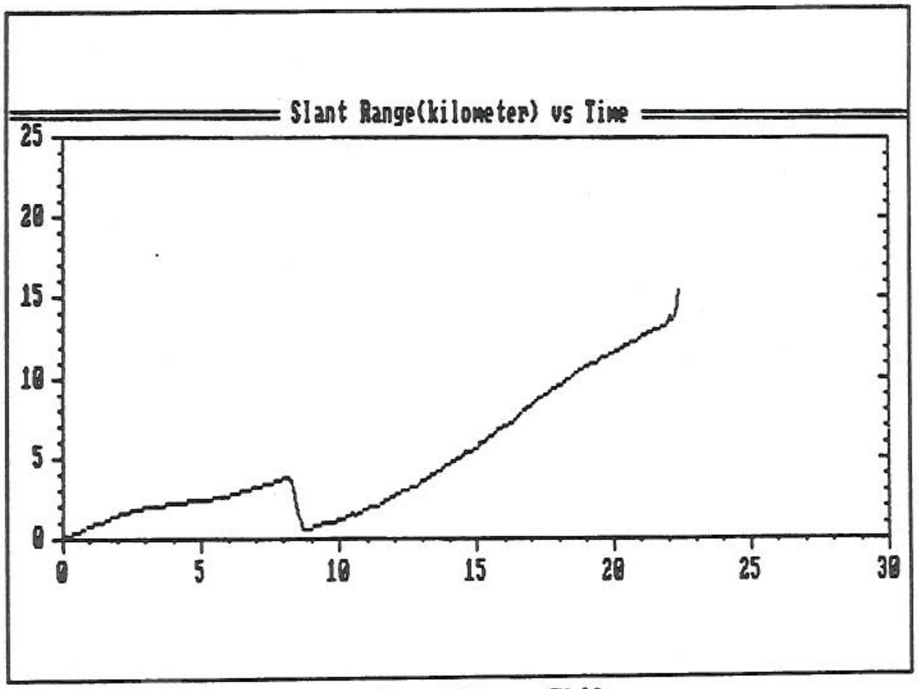

Exhibit 16-9. Slant Range plot of Phase Shift.

1. The Radiosonde Radial Acceleration plot as shown in Exhibit 16-10, is the recommended plot for monitoring during the transponder flight. In this exhibit you can see a large "spike" in the acceleration rate of this flight around minute 8 of this example.

2. You would then plot the slant range as in Exhibit 16-9 and confirm that there was a problem with this transponder around minute 8.

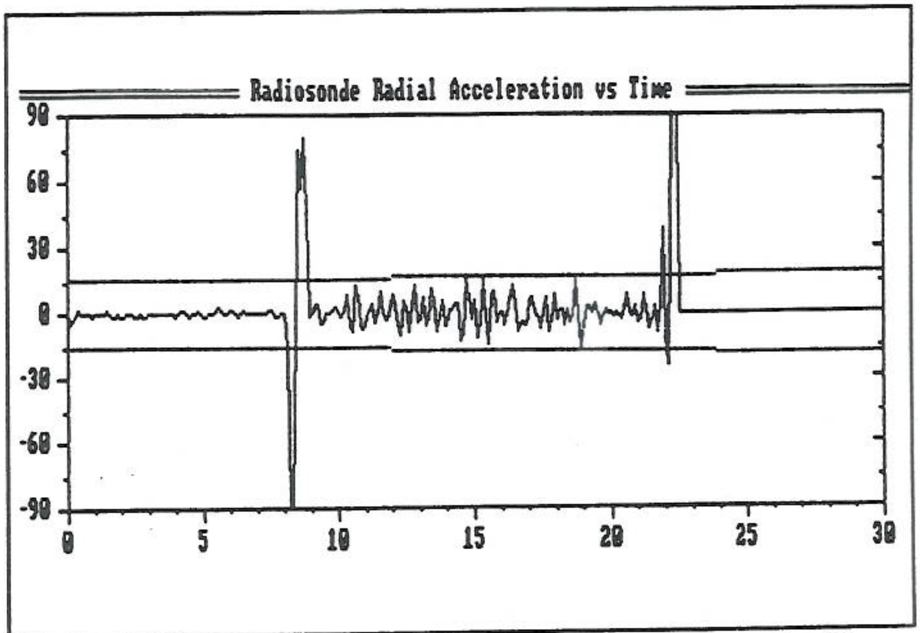

Exhibit 16-10. Radiosonde Radial Acceleration plot showing Phase Shift.

3. Exhibit 16-11 shows the Position Data screen of the same flight indicating the phase shift. As indicated in the 6-second data at the time of 8.3 minutes, there is a slight decrease in the slant range value. This is more pronounced in minute 8.4 with a decrease of over 1000 meters (1 km) from minute 8.3. The decrease continues through minute 8.7 after which the values start to increase steadily. In the last three exhibits of the same flight, each confirmed to the operator that a phase shift occurred.

POSITION DATA

Time (min)	El. Angle	Az. Angle	Slant Range	Comments
8.0	40.43	262.91	3700	
8.1	40.26	262.87	3760	
8.2	40.21	262.87	3800	
8.3	40.20	263.15	3630	
8.4	40.22	263.16	2490	
8.5	40.23	263.16	1530	
8.6	39.72	262.70	1110	
8.7	39.42	262.63	500	
8.8	39.38	263.09	560	
8.9	39.26	262.93	620	
9.0	39.20	262.95	660	
9.1	39.20	263.23	710	
9.2	39.08	263.00	750	
9.3	39.08	263.28	860	
9.4	39.02	262.98	900	
9.5	39.03	263.32	940	
9.6	38.95	263.10	980	
9.7	38.93	263.45	1020	
9.8	38.84	263.37	1070	
9.9	38.82	263.80	1090	
10.0	38.74	264.21	1180	
10.1	38.59	264.10	1200	
10.2	38.57	264.55	1280	
10.3	38.49	264.49	1290	
10.4	38.29	264.88	1400	
10.5	38.18	265.03	1500	
10.6	37.89	264.76	1440	
10.7	37.75	265.04	1590	
10.8	37.57	264.98	1660	
10.9	37.45	265.00	1800	
11.0	37.23	264.70	1800	
11.1	37.20	264.74	1910	
11.2	36.97	264.32	1910	
11.3	37.04	264.52	2040	
11.4	36.78	264.12	2080	
11.5	36.69	264.18	2110	
11.6	36.50	263.96	2240	
11.7	36.25	264.05	2320	
11.8	35.96	263.99	2390	
11.9	35.87	264.06	2490	
12.0	35.57	264.01	2500	

Exhibit 16-11. Position Data screen of Phase Shift.

In the following three exhibits is another example of phase shifts. You will see plots of the slant range, elevation angles and azimuth angles indicating the phase shifts.

In Exhibit 16-12, the first interruption in the signal (phase shift) is indicated around minute 41 with an abrupt deviation of the plot trace. Just after minute 45 the second phase shift occurs with a flattening of the trace followed by a gradual decrease in the slant range.

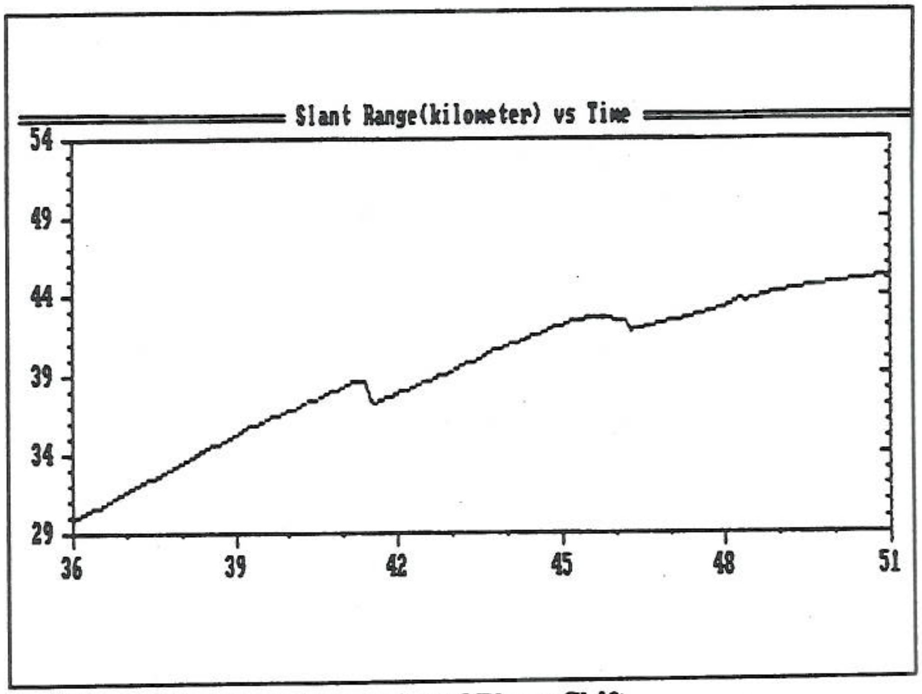

Exhibit 16-12. Slant Range plot of Phase Shift.

This flight, as in other transponder flights, you monitor the Radiosonde Radial Acceleration plot which will provide evidence of a phase shift. Next, look at the Slant Range plot and the Position data for the time period of the phase shift. Then use the PLOT EL and PLOT AZ commands to determine if the phase shift occurred as a result of LOS. **NOTE:** In some instances, the elevation and azimuth plots will be of little or no value since tracking will already be in the limiting angle zone. In this case, you may need to use the PO command and look at the slant ranges near the suspected phase shift.

For example, Exhibit 16-13 shows a large change in the elevation angle at the time of the phase shift as you saw on the previous plots and data screens. It is evident the phase shift was caused by large changes in the elevation angle likely due to signal interference. Winds near the phase shift are invariably invalid and must be removed using the Wind (WI) command.

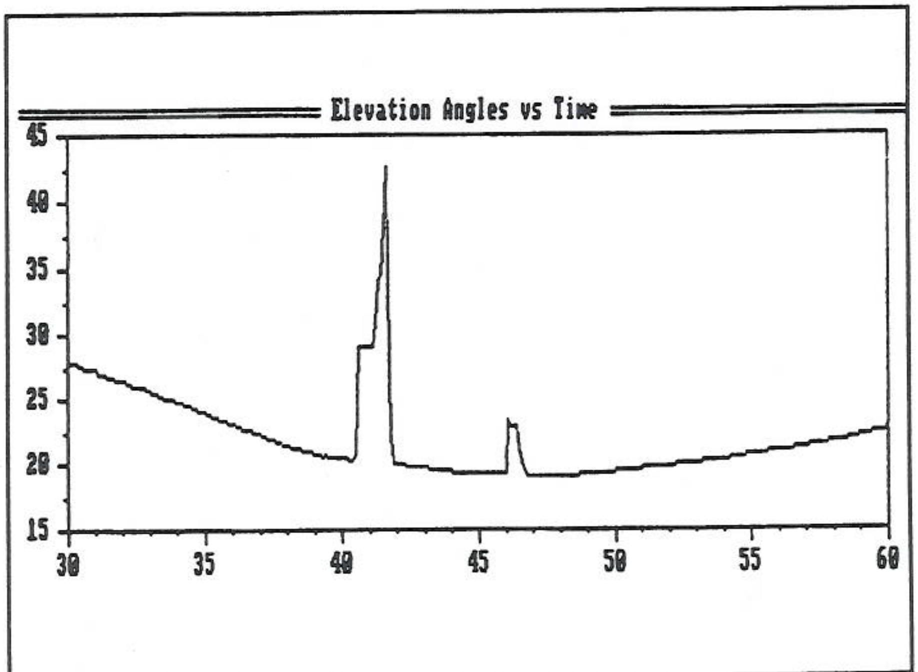

Exhibit 16-13. Elevation Angle plot of Phase Shift.

The second phase shift during this flight occurred just after minute 45. Exhibits 16-13 and 16-14 will be used to examine this case. The plot of the elevation angle shows a slight deviation in the trace line around minute 45. On the plot of the azimuth angle and at the corresponding time of around 45 minutes, you can see the large change in the azimuth angle indicating the reason for the phase shift. Again, winds must be deleted before and after the phase shift. The observer must look at the winds for at least 5 minutes before and after to determine which ones to delete.

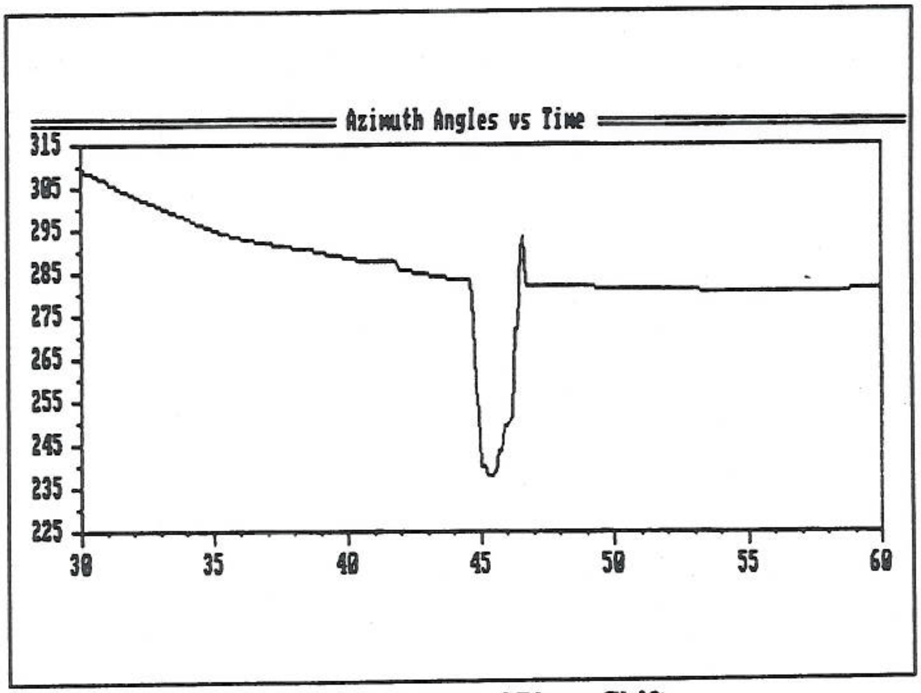

Exhibit 16-14. Azimuth Angle plot of Phase Shift.

Assume that one of the two example flights is your actual transponder flight in progress. You were monitoring the RR plot and saw a possible problem in the flight. To further check the problem area, do the following:

1. Note the times associated with your problem area. Escape from the RR plot by pressing [ESC]. Use the PL RA command with the start and end times of the suspect area to display the slant range plot. You will see the slant range plot as in Exhibit 16-10. This plot will show that a phase shift occurred.

2. To see the slant range values for the time frame of the phase shift, issue the command for position data (PO xx) with xx the start time of the desired data. You will then see the interruption in slant range values and decide which winds to delete.

3. Use the WA command to further assist you in checking the winds and 1-minute Position data, and the WI command for deleting bad winds.

16.6.2 Meteorological Events

In this section we will discuss various meteorological events occurring during transponder flights. Sometimes what might look like a phase shift or transponder failure is actually a result of a meteorological event. The following exhibits show examples of these events as they look on the slant range plot and in the position data. These meteorological events include:

1. Light winds
2. Wind direction change
3. Strong jet winds

16.6.2.1 Light Winds

Using the Slant Range (RA) plot, a general rule-of-thumb in determining light winds is the less the incline of the line trace, the lighter the wind. This does not continue to be valid when the line trace or the slant range values decreases steadily with no reversal. (This will be discussed later in this section). Slight decreases followed by small increases (wobbling effect) in the slant range values would show the light wind continuing. This is an indication that the transponder ground equipment is "rocking" back and forth due to little or no change. Do not confuse this with a type of transponder failure where there is no change in the slant ranges, but the elevation angles continue to decrease.

As shown in Exhibit 16-15, the slant range plot trace starts a lessening of incline around minute 45 and continues until near minute 59. At this point you would want to retrieve the elevation angle screen using the PL EL command.

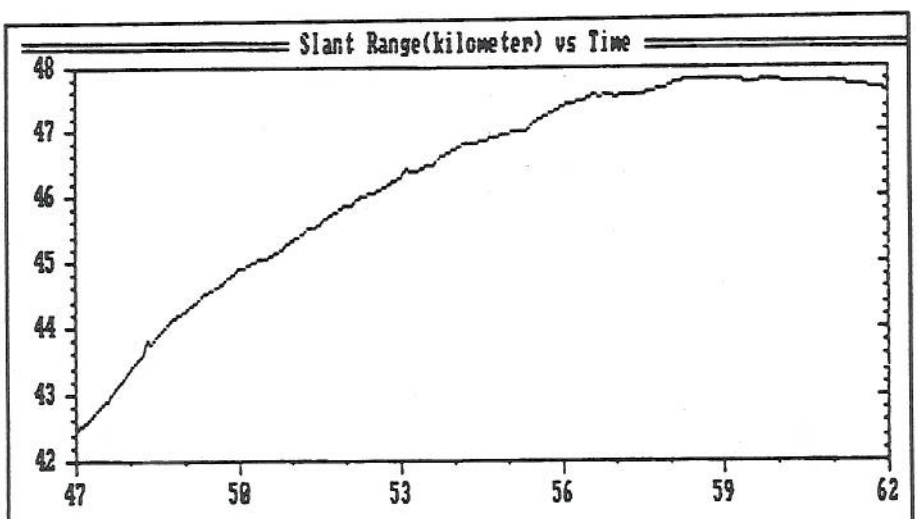

Exhibit 16-15. Slant Range plot showing Light Wind.

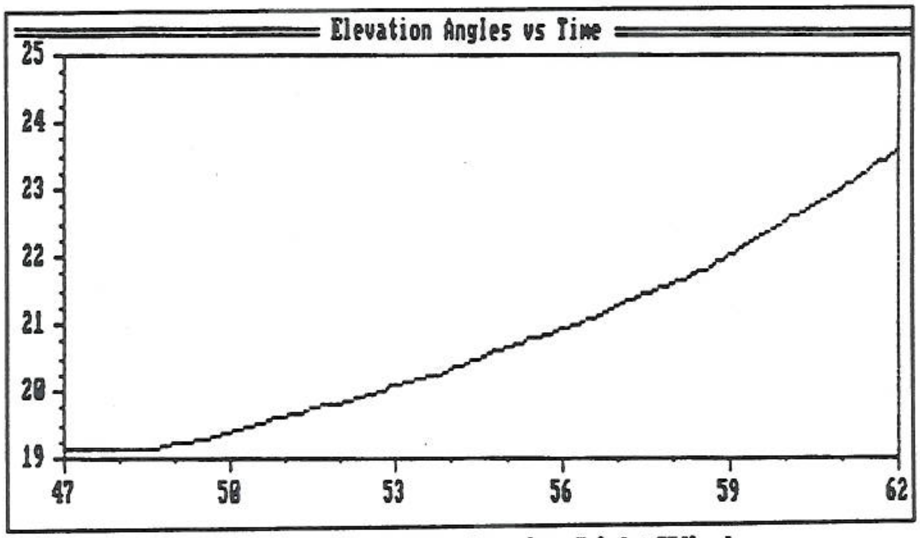

Exhibit 16-15a. Elevation Angles showing Light Wind.

This plot (Exhibit 16-15a) shows the elevation angles increasing in time which is normally what occurs when winds are decreasing.

Next you want to look at the Position data. At the ?> prompt, type the command PO 45 and press [Enter]. This will give you the position data screen starting with minute 45.0 (Exhibit 16-16). The 6-second data shows small increases in the slant range values through minute 45.7. After this point, slight increases and decreases occurred in the slant range values as light winds were encountered. For the purpose of instruction, the light winds as indicated by the slant range values of this flight continued until around minute 58.7 where the maximum value was recorded.

POSITION DATA

Time (min)	El. Angle	Az. Angle	Slant Range	Comments
45.0	19.33	240.21	42170	
45.1	19.34	240.22	42370	
45.2	19.33	240.21	42440	
45.3	19.33	238.15	42520	
45.4	19.33	238.15	42570	INTRP LOS
45.5	19.33	238.16	42620	
45.6	19.33	238.98	42670	
45.7	19.33	243.83	42780	
45.8	19.34	243.84	42630	
45.9	19.34	249.19	42680	
46.0	19.33	249.19	42580	
46.1	23.44	250.12	42500	
46.2	22.93	251.25	42490	
46.3	22.93	272.06	41770	
46.4	22.93	272.06	41800	
46.5	21.29	291.81	41900	
46.6	19.95	293.97	42050	
46.7	19.42	282.69	42100	
46.8	19.15	282.38	42200	
46.9	19.13	282.31	42310	
47.0	19.13	282.30	42420	
47.1	19.13	282.27	42520	
47.2	19.13	282.23	42590	
47.3	19.15	282.23	42670	
47.4	19.15	282.20	42760	
47.5	19.15	282.18	42840	
47.6	19.15	282.17	42920	
47.7	19.15	282.12	43030	
47.8	19.15	282.11	43130	
47.9	19.15	282.06	43250	
48.0	19.15	282.06	43380	
48.1	19.15	282.02	43480	
48.2	19.15	282.00	43590	
48.3	19.16	281.98	43620	
48.4	19.16	281.97	43760	
48.5	19.16	281.95	43860	
48.6	19.16	281.94	43970	
48.7	19.16	281.94	44030	
48.8	19.18	281.92	44120	
48.9	19.19	281.94	44210	
49.0	19.22	281.94	44260	
49.1	19.26	281.94	44340	
49.2	19.26	281.92	44390	
49.3	19.26	281.89	44460	
49.4	19.27	281.84	44530	
49.5	19.29	281.84	44580	
49.6	19.30	281.80	44640	
49.7	19.33	281.80	44690	
49.8	19.35	281.77	44740	
49.9	19.38	281.75	44790	
50.0	19.39	281.73	44890	

Exhibit 16-16. Position Data screen of Light winds.

16.6.2.2 Wind Direction Change

In the following exhibits you will see a slant range plot, position data and collaborating wind data that indicate a change in the wind direction during a transponder flight. This direction change may occur at any altitude or time in the flight. The balloon reverses direction and can move directly over or near the release point in its new course. Exhibit 16-17 is the slant range plot of a previously looked at transponder flight. The light winds continued and then the flight experienced a wind direction change. This reversal would bring the balloon back toward the release point.

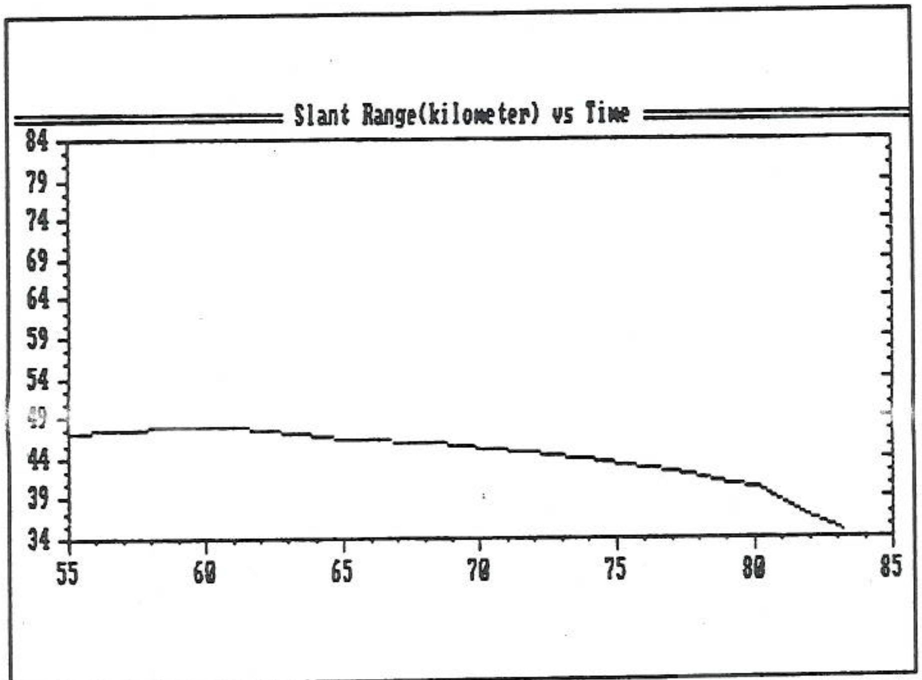

Exhibit 16-17. Slant Range plot of Wind Direction Change.

As indicated by the line trace of the slant range plot, a decline is noted near minute 60. Noting this change in the flight, the operator would want to look at the 6-second data for that time period to determine what was occurring with the flight.

To see the 6-second data for this time frame of the flight you will:

1. Press [ESC] to get the ?> prompt.

2. At the ?> prompt, type PO 58 and press [Enter] to get to minute 58 in the position data screen. You would need to see the data in advance of the actual occurrence. This will be up to the operator to decide the time period to analyze.

POSITION DATA

Time (min)	El. Angle	Az. Angle	Slant Range	Comments
58.0	21.62	280.80	47700	
58.1	21.65	280.82	47740	
58.2	21.68	280.86	47760	
58.3	21.70	280.87	47800	
58.4	21.75	280.94	47800	
58.5	21.78	280.95	47810	
58.6	21.82	280.99	47820	
58.7	21.87	281.04	47830	
58.8	21.92	281.07	47830	
58.9	21.96	281.09	47820	
59.0	22.03	281.12	47810	
59.1	22.06	281.11	47810	
59.2	22.14	281.21	47790	
59.3	22.17	281.16	47790	
59.4	22.21	281.11	47780	
59.5	22.29	281.20	47780	
59.6	22.32	281.13	47780	
59.7	22.39	281.26	47790	
59.8	22.42	281.21	47790	
59.9	22.48	281.26	47790	
60.0	22.51	281.22	47790	
60.1	22.59	281.28	47780	
60.2	22.62	281.29	47770	
60.3	22.68	281.26	47780	
60.4	22.71	281.27	47770	
60.5	22.76	281.30	47770	
60.6	22.81	281.27	47770	
60.7	22.85	281.27	47770	
60.8	22.90	281.33	47780	
60.9	22.95	281.39	47780	
61.0	23.01	281.43	47770	
61.1	23.08	281.55	47780	
61.2	23.09	281.50	47740	
61.3	23.17	281.61	47730	
61.4	23.25	281.67	47720	
61.5	23.28	281.70	47710	
61.6	23.35	281.79	47720	
61.7	23.40	281.80	47680	
61.8	23.42	281.82	47660	
61.9	23.50	281.88	47650	
62.0	23.56	281.96	47630	
62.1	23.62	282.01	47590	
62.2	23.68	282.01	47570	
62.3	23.75	282.07	47500	
62.4	23.84	282.16	47460	
62.5	23.93	282.21	47430	
62.6	23.98	282.25	47390	
62.7	24.06	282.35	47340	
62.8	24.12	282.18	47290	
62.9	24.18	282.24	47240	
63.0	24.27	282.34	47180	

Exhibit 16-18. Position Data screen - Wind Direction Change.

On the Position Data screen (Exhibit 16-18), the slant range reached its apex at minute 58.7 followed by a slow decrease in the slant range. This would indicate that the direction change started around the time the slant range reached its highest value. Note that the elevation angles are increasing as would be expected as the winds decrease, while the slant range values change minimally. Do not confuse this with a transponder failure where the slant ranges are not changing (See Section 16.7.3).

In a look at the position data screen, you might still have doubts as to what has occurred with this section of the flight. This would be especially true in the case of a newly assigned operator or someone with less experience. Another command is available that would confirm a wind direction change.

1. Press [ESC] to clear the screen and bring you to the ?> prompt.

2. At the ?> prompt, type WI 53 and press [Enter]. This will give you the Winds display starting at minute 53 (Exhibit 16-19). The operator would determine the time period of the wind display. You will note that a large change in direction started around minute 57 and the radiosonde moving towards the station at around minute 61.

WINDS

Time(min)	Height(M-AGL)	Dir	Speed	Alt(FT-MSL)	Edited
53	17247	254	11	56866	
54	17608	254	10	58050	
55	17984	260	6	59284	
56	18354	270	4	60498	
57	18715	322	3	61682	
58	19080	37	4	62880	
59	19474	55	5	64173	
60	19866	54	10	65459	
61	20258	70	14	66745	
62	20650	78	17	68031	
63	21060	90	19	69376	
64	21497	103	19	70810	
65	21935	110	18	72247	
66	22372	112	17	73681	
67	22809	110	16	75115	
68	23247	104	19	76552	
69	23684	103	19	77986	

F6: Time: F7: Restore Data F8: Delete Data

Exhibit 16-19. Winds display screen - Wind Direction Change.

16.6.2.3 Strong Jet Winds

Strong jet winds are noted particularly well during a transponder flight by the plotted trace line of the Slant Range (RA). The general rule that can be used in looking for jet or strong winds is, the steeper the incline of the trace line, the higher the wind speed. Depending on the wind speed at release and whether the speed increases slowly or rapidly, the incline of the trace line can have the effect of looking greater from one flight compared to another. With a slow increase in wind speed as the flight progresses, the plotted line will show a slight incline until contact with high wind speeds of the jetstream. This would show a rapid increase in the incline of the plot. A rapid increase in the wind speed from release until merging into the strong jet winds, would make the plotted line appear less pronounced. The observer can then confirm the wind speeds by using the Wind Data (WI) display and Radiosonde Radial Acceleration (RR) plot.

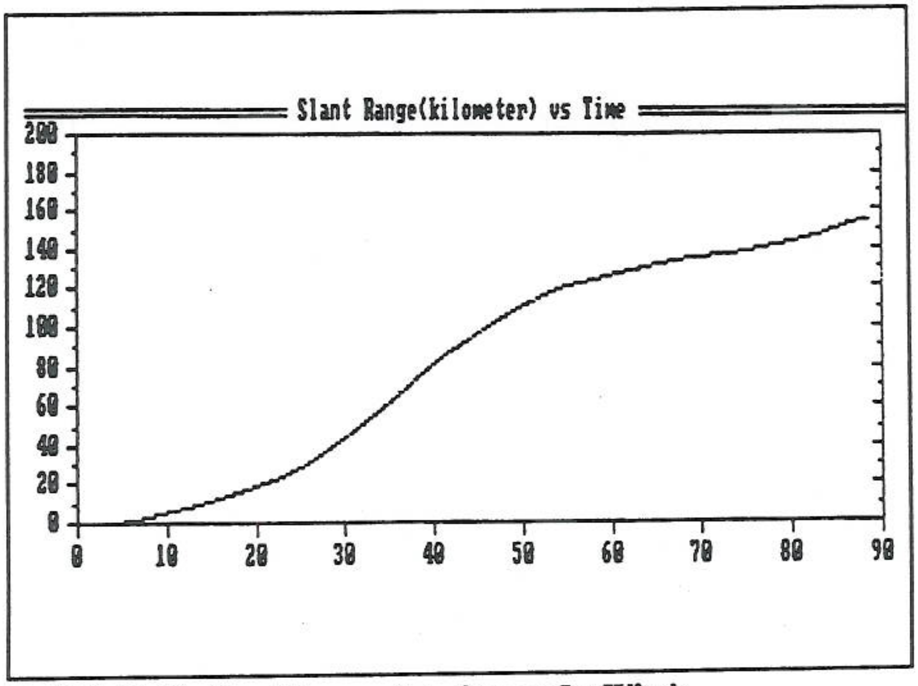

Exhibit 16-20. Slant Range plot - Strong Jet Winds.

Exhibit 16-20 is the Slant Range (RA) plot of a transponder flight that encountered strong jet winds with peak speed reached at 38 minutes into the flight. Around minute 25, the incline of the plotted line increased noticeably and continued until around minute 52.

In the plot of the Radiosonde Radial Acceleration (RR) of the same flight (Exhibit 16-21), you see that the radial acceleration plot is fairly stable with an increase in the activity of the acceleration line around minute 25. This is due to the substantial increase in the wind speed as the transponder moves into the area of the jetstream and remains under this influence until around minute 52. The radial acceleration plot is well within the stepped guidelines, which is indicative of a good flight. However, there could be occasional peaks outside these guidelines in this flight and still be considered a good flight. The operator must look at the position data and determine what effect these spikes have on the flight and then take the proper action.

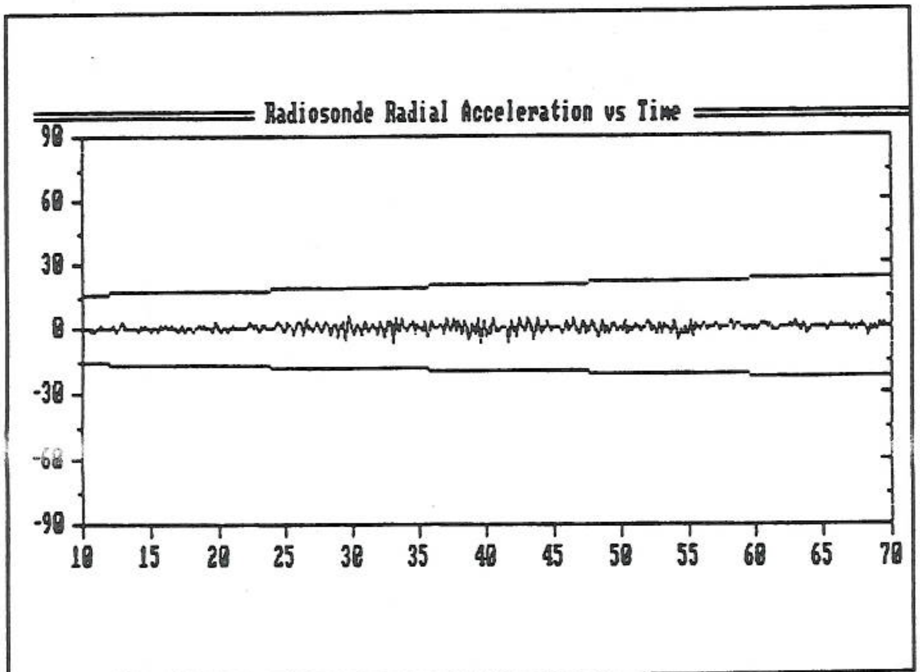

Exhibit 16-21. Radiosonde Radial Acceleration plot - Strong Jet Winds.

The Winds Data display (Exhibit 16-22) gives the wind data at 1-minute increments of the same flight. You can see that the increases and decreases of the wind speeds match the incline and decline of the plotted trace line of this transponder.

WINDS DATA

TIME(min)	HEIGHT(M-AGL)	DIR	SPEED	HEIGHT(FT-MSL)	NOTES
0	0	330	13	279	SIG
1	216	0	0	988	MISG
2	414	0	0	1637	MISG
3	613	0	0	2290	MISG
4	805	0	0	2920	MISG
5	994	0	0	3540	MISG
6	1205	0	0	4232	MISG
7	1478	335	30	5128	
8	1779	332	37	6115	
9	2127	331	40	7257	
10	2415	332	36	8202	SIG
11	2659	328	35	9003	
12	2900	320	36	9793	
13	3150	314	41	10613	
14	3451	312	44	11601	
15	3751	308	45	12585	
16	4044	302	49	13546	
17	4337	298	53	14508	
18	4632	295	53	15476	
19	4953	295	53	16529	
20	5273	294	55	17579	
21	5573	291	56	18563	SIG
22	5894	291	60	19616	
23	6217	293	65	20676	
24	6540	295	72	21735	
25	6864	297	81	22798	
26	7188	297	91	23861	
27	7537	296	99	25006	SIG
28	7888	295	104	26158	
29	8277	292	109	27434	
30	8662	287	113	28697	
31	9013	284	116	29849	
32	9374	284	117	31033	
33	9763	288	114	32309	
34	10103	292	116	33425	
35	10430	289	121	34498	
36	10787	285	125	35669	
37	11148	283	131	36853	
38	11506	285	135	38028	SIG
39	11839	287	129	39120	
40	12182	288	117	40246	
41	12541	284	107	41423	
42	12898	276	101	42595	SIG
43	13241	274	100	43720	
44	13615	275	101	44947	
45	13966	273	101	46099	
46	14300	273	100	47194	SIG
47	14614	274	96	48224	
48	15004	273	93	49504	
49	15371	274	86	50708	
50	15721	273	79	51856	
51	16057	273	75	52959	SIG
52	16379	277	70	54015	SIG

Exhibit 16-22. Winds display - Strong Jet Winds.

Do not be surprised to see winds in excess of 180 knots. However, winds greater than 150 knots must be verified before messages are generated and transmitted.

16.6.3 Transponder Failure

In this section we will examine three examples of transponder failures. For each of the examples, you will see the various plots and 6-second data of the failure. These are only a few samples of failures that could occur while using a transponder, but this should help you to recognize and better understand some of the problems that may be encountered.
It is recommended that you use all the available plots and displays when using a transponder radiosonde. This will enable you to accomplish editing or make a decision on another release in a timely manner. Waiting for a flashing message, audible signal or (in the worst case) the end of the flight, to look at the various screens, could very well mean delayed transmissions or useless data.

NOTE: When using a transponder, MicroART will not compute wind data when the slant range is equal to, or less than the height of the radiosonde above ground level. This normally occurs immediately after release when elevation angles move above 50 degrees.

The Radiosonde Radial Acceleration plot in Exhibit 16-23 shows a very jagged plot. This is indicative of rapid change in the position of the transponder in relation to the tracking unit. In this case the plot should alert the operator to possible problems with this flight. The fact that the plotted trace exceeds the stepped guidelines does not always mean that you have a bad transponder. A jagged plot of the radial acceleration may also occur when the transponder encounters strong winds, but transponder failures will have many more points exceeding the guidelines.

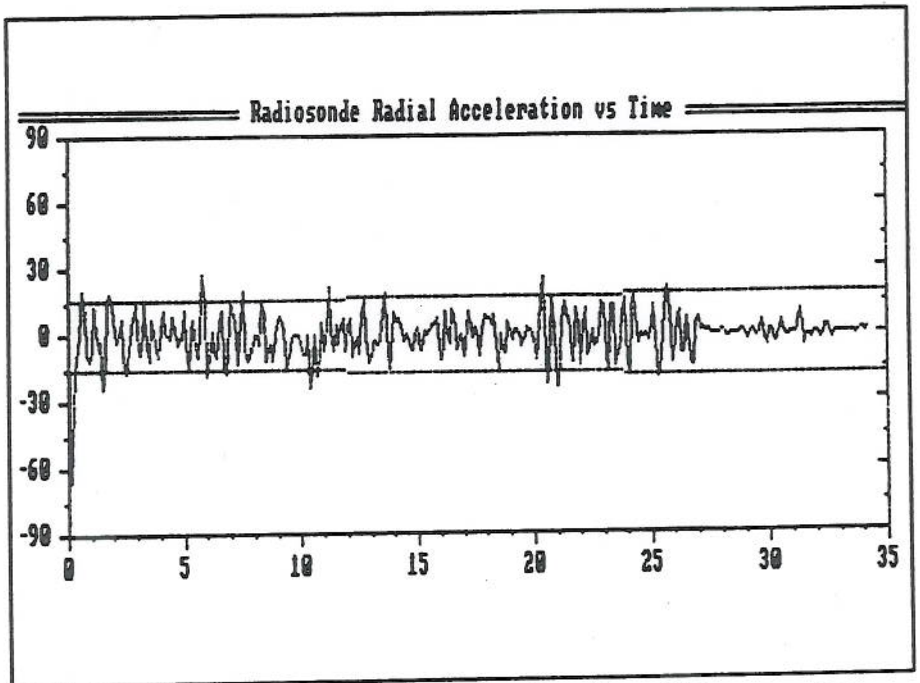

Exhibit 16-23. Radiosonde Radial Acceleration of Transponder Failure. (Example 1)

In Exhibit 16-23, the figures on the left border or the "Y" axis, is the radiosonde radial acceleration rate expressed in meters per second per second (mps/s).

When the radial acceleration exceeds the value of 30 (+/-), the status message **Possible Transponder Failure. Check RRA6 Plot** is generated, along with an audible signal. The operator would clear the signal and check the RR plot. (**NOTE:** The signal is generated in "real time" of the flight, therefore a slight delay exists before the plot is actually available). You would leave the RR plot on the screen and continuously check to see if the plot stabilizes or becomes more erratic.

After checking the Radiosonde Radial Acceleration plot, you decide that it is suspect and need to check other plots to get a better idea of what is occurring with the flight.

In Exhibit 16-24 you see a very erratic plot of the slant range, with the trace near the ground level in several instances. The ranging from this transponder is very unstable and you should not expect any reasonable data from it. Notice that at minute 10, the slant ranges are back to 0 which can only occur realistically if the radiosonde came back to the ground, which in this case, it did not.

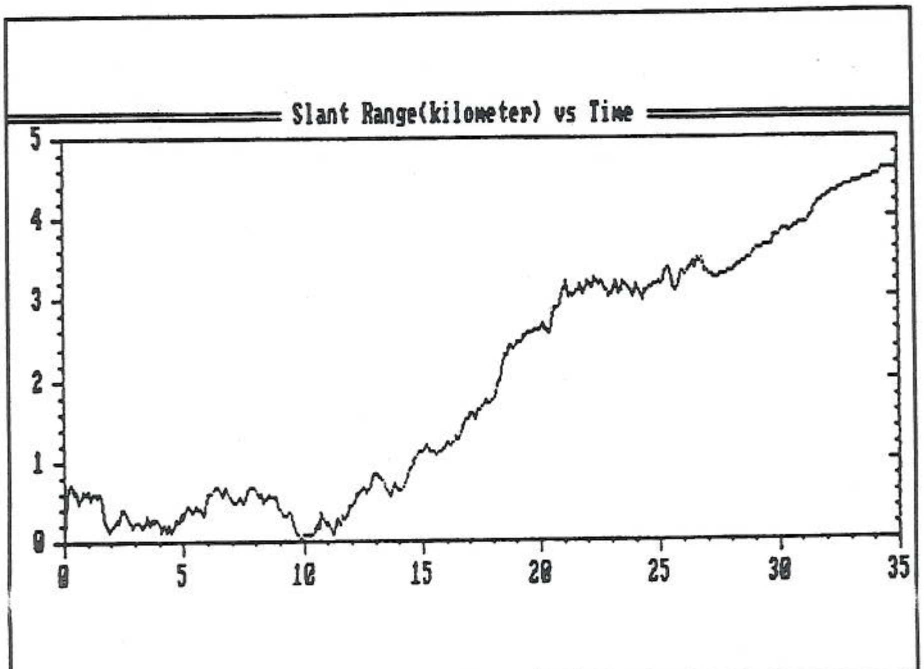

Exhibit 16-24. Slant Range plot of Transponder Failure. (Example 1)

Your next step is to look at the slant range values as shown on the Position Data screen (Exhibit 16-25). As you can see, the values bounce back and forth matching the slant range plot as previously shown. It is evident that wind computations using slant range are not valid for this sounding.

POSITION DATA

Time (min)	El. Angle	Az. Angle	Slant Range	Comments
0.0	99.99	273.91	20	LIM
0.1	8.07	270.52	570	
0.2	10.99	269.42	660	
0.3	13.96	268.73	720	
0.4	16.72	267.12	600	
0.5	19.67	266.30	630	
0.6	22.82	263.78	470	
0.7	25.87	262.45	540	
0.8	28.91	261.15	620	
0.9	31.82	259.72	600	
1.0	34.44	258.42	640	
1.1	36.77	256.45	500	
1.2	39.61	254.36	580	
1.3	42.40	252.05	590	
1.4	44.93	249.36	540	
1.5	47.43	248.39	600	
1.6	48.57	246.39	450	
1.7	50.11	244.24	260	
1.8	51.68	241.81	180	
1.9	53.17	239.99	130	
2.0	54.45	238.14	170	
2.1	55.93	235.29	210	
2.2	57.32	232.91	270	
2.3	58.72	230.05	240	
2.4	59.93	227.22	380	
2.5	61.06	224.28	380	
2.6	62.45	222.16	340	
2.7	63.32	219.46	280	
2.8	63.93	216.37	220	
2.9	64.61	213.02	150	
3.0	65.54	208.48	220	
3.1	66.24	206.53	220	
3.2	67.00	204.45	230	
3.3	67.47	201.22	160	
3.4	68.35	199.12	250	
3.5	68.97	197.46	300	
3.6	69.51	195.16	200	
3.7	69.76	193.59	270	
3.8	69.86	192.64	250	
3.9	69.90	190.19	260	
4.0	70.29	187.86	200	
4.1	70.83	186.89	110	
4.2	69.63	184.17	190	
4.3	70.10	181.56	120	
4.4	70.04	180.94	210	
4.5	69.85	179.71	130	
4.6	69.90	179.09	210	
4.7	69.47	177.07	270	
4.8	69.38	175.87	250	
4.9	69.19	175.27	350	
5.0	69.11	172.59	260	
5.1	68.99	172.33	400	
5.2	68.49	170.81	430	

Exhibit 16-25. Position Data screen of Transponder Failure. (Example 1)

In Exhibit 16-26 you will see the plot of the elevation angles of this sounding. The plot indicates that immediately after release, the transponder went overhead due to very light winds. In looking at this exhibit and the Position Data screen in the previous exhibit, the elevations angles exceeded 50 degrees before reaching 2 minutes into the flight. With the slant range values less than the height of the transponder above the station, this prevented computation of the winds.

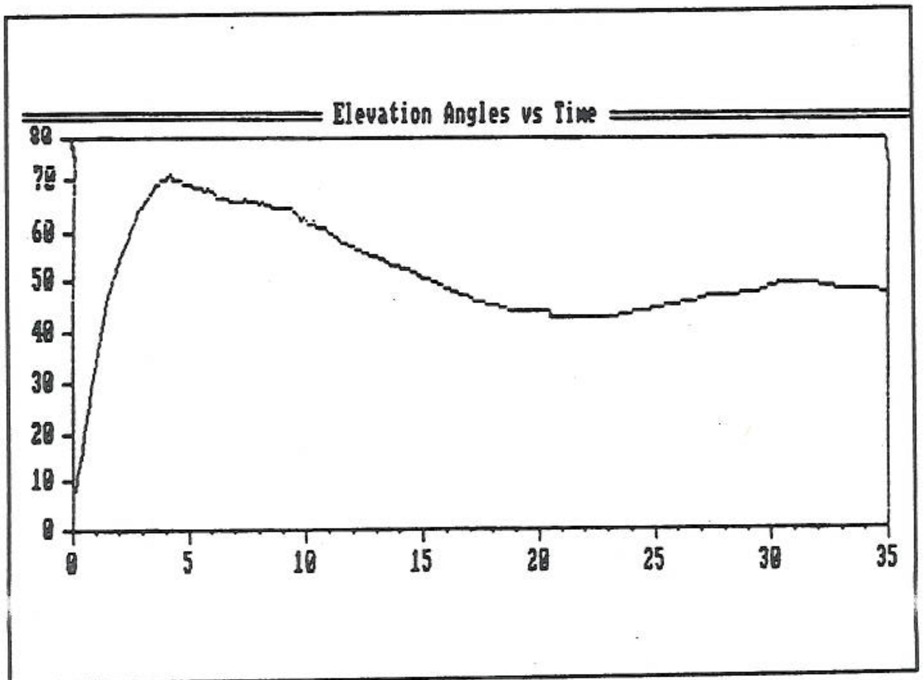

Exhibit 16-26. Elevation Angles showing Transponder Failure. (Example 1)

This example sounding was intended for instructional purposes and under normal operations, a transponder would not be used with light winds. The occasion will happen, however, that you will fly a transponder based on expected strong winds or limiting angles and this does not occur. The method to terminate the slant range processing is explained in the last section of this chapter (16.9 Terminating Ranging).

Exhibit 16-27 is the RR plot of the next example of a transponder failure. The trace line exceeds the stepped guidelines immediately after release and continued erratic until midway into minute 3 when the transponder failed completely as indicated by the flat line. The flat line is a result of the slant ranges having been replaced with 9's in the Position Data screen (see Exhibit 16-29).

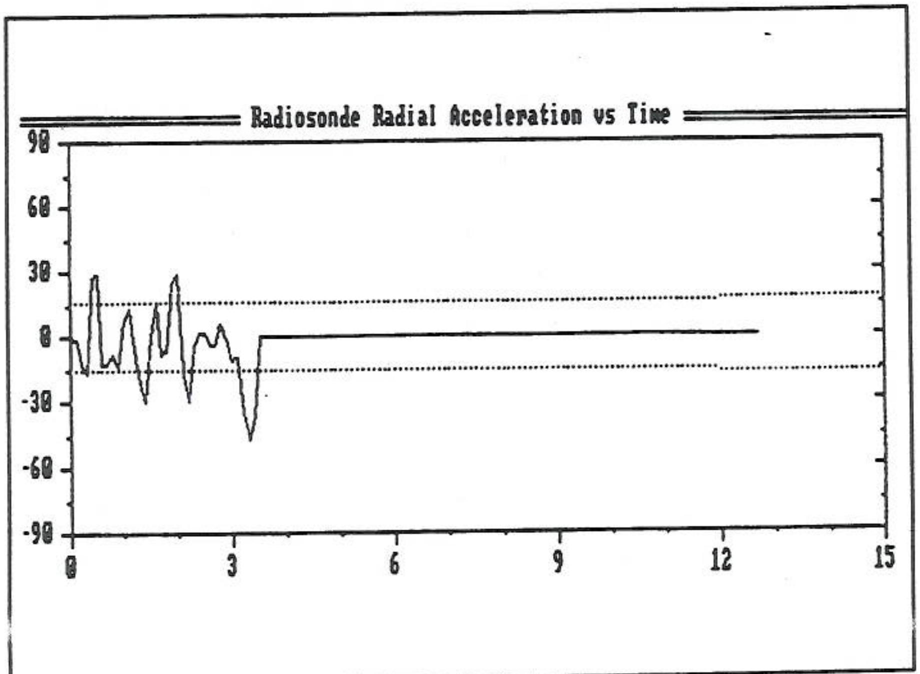

Exhibit 16-27. Radiosonde Radial Acceleration of Transponder Failure. (Example 2)

The Slant Range plot in Exhibit 16-28 shows an almost straight line from minutes 3.5 to 12.0 confirming the failure at that time. The probable cause of this failure can not be determined, but it may have been the ranging deck or radiosonde failing.

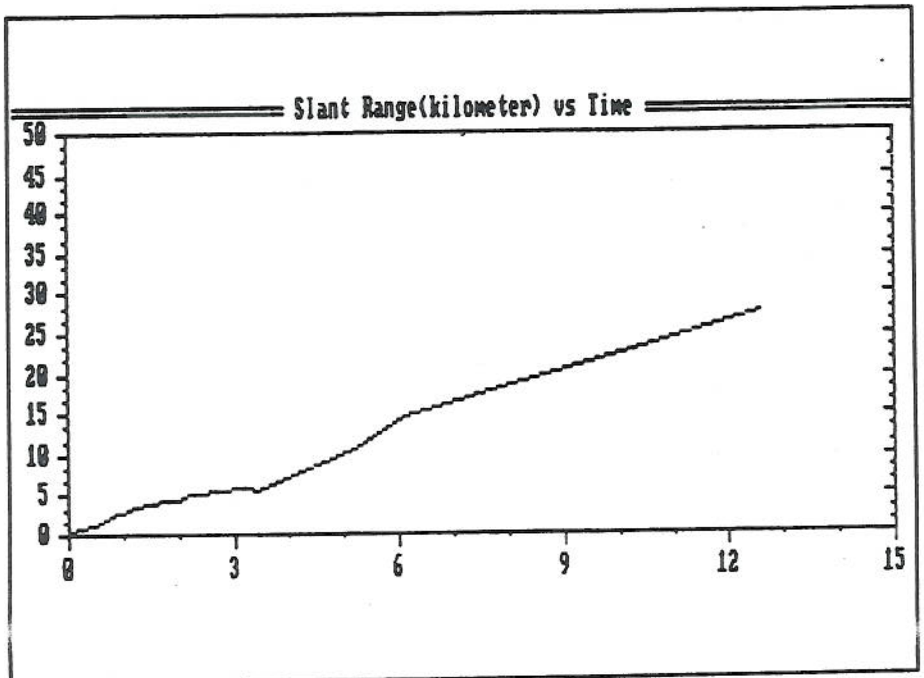

Exhibit 16-28. Slant Range plot of Transponder Failure. (Example 2)

You need to monitor the Slant Range and Radiosonde Radial Acceleration plots to make sure that the ranging did not fail prematurely. Next, it is critical to review the winds and slant ranges to ensure that the winds being transmitted are valid.

To get a better grasp on this, you would go to the Position Data screen (Exhibit 16-29) and look at the elevation angles which increased rapidly after release. Also you would note the slant range values and confirm once again the transponder failure by the 9's inserted at minute 3.5 and for the remainder of the flight..

POSITION DATA

Time (min)	El. Angle	Az. Angle	Slant Range	Commen
0.0	14.81	281.97	30	
0.1	14.81	281.97	350	
0.2	16.19	282.50	610	
0.3	22.22	285.97	960	
0.4	29.56	283.30	1000	
0.5	20.45	280.78	1330	
0.6	33.81	292.61	1780	
0.7	33.69	309.07	2120	
0.8	33.89	314.44	2380	
0.9	33.15	313.30	2720	
1.0	32.36	312.57	2860	
1.1	32.17	312.64	3110	
1.2	32.13	313.33	3440	
1.3	32.19	313.79	3690	
1.4	32.34	308.23	3930	
1.5	32.47	314.92	3970	
1.6	32.74	315.56	3990	
1.7	32.95	316.53	4250	
1.8	32.95	317.45	4270	
1.9	32.83	318.32	4400	
2.0	32.81	319.01	4450	
2.1	32.70	319.76	4890	
2.2	32.61	320.74	5050	
2.3	32.38	306.80	5140	
2.4	32.51	328.15	5220	
2.5	32.08	321.35	5330	
2.6	39.78	318.80	5420	
2.7	44.14	324.48	5540	
2.8	44.52	294.30	5560	
2.9	29.91	285.73	5680	
3.0	42.91	286.01	5790	
3.1	42.95	287.25	5800	
3.2	46.24	310.00	5860	
3.3	46.00	342.70	5770	
3.4	57.31	351.19	5410	
3.5	35.05	350.89	999999	
3.6	34.11	351.97	999999	
3.7	33.45	352.09	999999	
3.8	31.49	352.62	999999	
3.9	33.52	352.11	999999	
4.0	33.45	352.50	999999	

Exhibit 16-29. Position Data of Transponder Failure. (Example 2)

In the next example of a transponder failure, the RR plot (Exhibit 16-30) leaves no doubt as to where the failure occurred. Initially the flight had good slant range data, then a large phase shift occurred at minute 8 with total failure at minute 22. Around the time of failure, the trace line exceeded the stepped guidelines totally followed by the flat line indicating the point of failure.

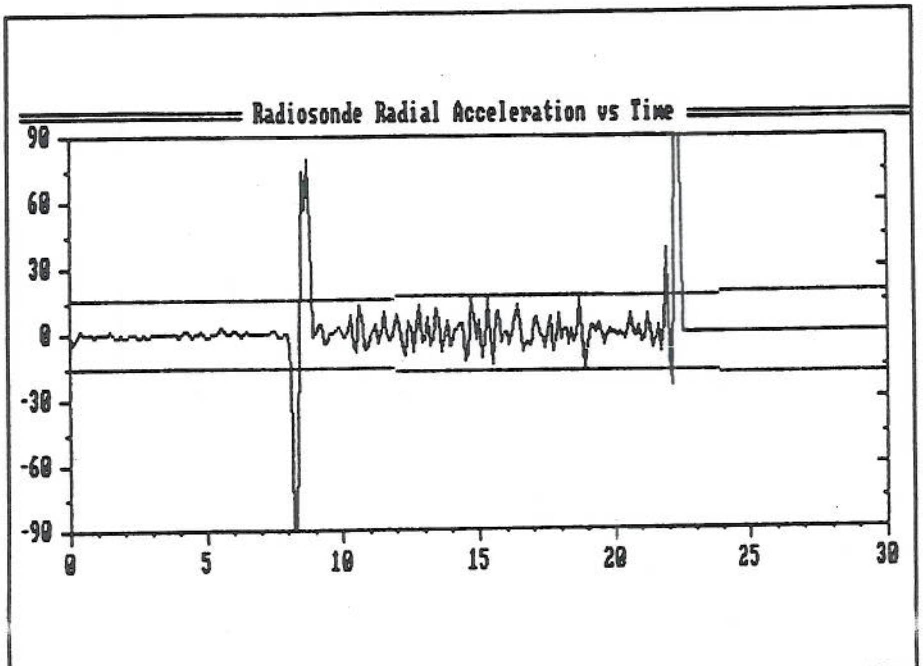

Exhibit 16-30. Radiosonde Radial Acceleration of Transponder Failure. (Example 3)

The Slant Range plot (Exhibit 16-31), shows the failure happened just after minute 22 when the trace line went vertical indicating a large increase in the slant range value.

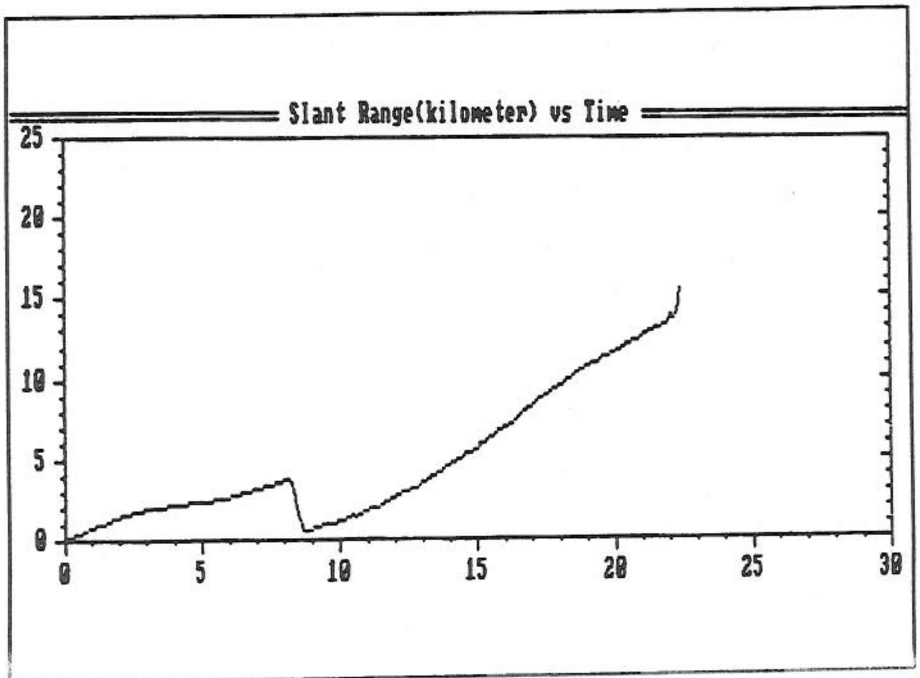

Exhibit 16-31. Slant Range plot of Transponder Failure.
(Example 3)

Next you might look at the Position Data screen (Exhibit 16-32) for the time period of time of the suspected failure. At minute 22.5 the MicroART program inserted 9's for values in the slant range column due to a loss or interruption of the signal.

POSITION DATA

Time (min)	El. Angle	Az. Angle	Slant Range	Comments
20.0	23.64	265.82	11510	
20.1	23.96	265.77	11540	
20.2	23.86	265.86	11700	
20.3	23.81	266.07	11720	
20.4	23.73	266.15	11870	
20.5	23.81	266.12	11900	
20.6	23.56	266.23	12020	
20.7	23.86	266.23	12030	
20.8	23.56	266.46	12210	
20.9	23.62	266.46	12280	
21.0	23.59	266.48	12390	
21.1	23.48	266.46	12500	
21.2	23.40	266.58	12620	
21.3	23.69	266.60	12650	
21.4	23.15	266.73	12800	
21.5	23.00	266.87	12920	
21.6	22.82	266.66	13010	
21.7	22.46	266.65	13090	
21.8	22.37	266.83	13170	
21.9	22.73	266.63	13310	
22.0	21.85	266.98	13210	
22.1	22.12	266.64	13600	
22.2	22.25	266.65	13800	
22.3	21.79	266.91	13720	
22.4	22.14	266.60	14050	
22.5	22.28	263.96	999999	INTRP LOS
22.6	22.28	261.32	999999	INTRP LOS
22.7	22.14	258.68	999999	
22.8	23.27	260.02	999999	INTRP LOS
22.9	24.35	261.40	999999	INTRP LOS
23.0	25.40	262.83	999999	INTRP LIM LOS
23.1	26.41	264.30	999999	INTRP LOS
23.2	27.37	265.82	999999	INTRP LOS
23.3	28.29	267.39	999999	INTRP LOS

Exhibit 16-32. Position Data of Transponder Failure. (Example 3)

In the three examples above, the operator must be able to:

1. Identify a suspected transponder failure.
2. Confirm the failure.
3. Terminate the ranging process and return to elevation/azimuth angles.

16.7 Terminating Ranging (RAN)

After the transponder flight has been in the air for several minutes and you have checked the two plots and looked at the position data, you decide there are possible problems with the ranging. Then with another look at the available data and you are X number of minutes into the flight, the decision is made to terminate the ranging portion and use angular data. You will have determined the flight is not into limiting angles. Then you will use the command RAN to terminate ranging data. Exhibit 16-33 through 16-35 shows the steps for termination.

```
COMMAND

?> RAN
```

Exhibit 16-33. Terminating Ranging (RAN)

1. At the?> prompt, type the command RAN and press [Enter].(Exhibit 16-33)

```
COMMAND

Do you wish to abort ranging? [Y/N]: N
```

Exhibit 16-34. Terminating Ranging (RAN)

The following message is displayed:

Do you wish to abort ranging? [Y/N]: N

2. Change the default N to Y and press [Enter].

In response to this command, the entry in Exhibit 16-35 will appear as follows:

Do you wish to abort ranging? [Y/N]: Y
Winds, calculated parameters and coded message erased.

The ?> prompt is displayed.

Next, execute the CO command to recompute the winds using the elevation/azimuth angles.

```
COMMAND
Do you wish to abort ranging? [Y/N]: Y
Winds, calculated parameters and coded messages erased.

?> CO
```

Exhibit 16-35. CODE screen.

From this point on, the winds will be computed using elevation and azimuth angles (many winds may be missing due to limiting angles).

16.8 Rework - Transponder Flights

Chapter 5 of this training guide covers instructions for the Rework function of MicroART and these instructions also hold true for the rework of transponder flights. A feature of the rework function that you should become familiar with concerns the Process Ranging Data entry of the Administrative Data screen.

Appendix A. Loading Calibration Files

A.1 Introduction

Each box of radiosondes contains a calibration diskette. The calibration data for each radiosonde are contained on a separate file on the diskette. These calibration files must be transferred to the hard disk where they are read by MicroART. You can enter as many calibration diskettes as you have on-site at one time.

A.2 Loading Calibration Files

Before using a radiosonde from a new box, load the calibration data:

1. From the Main Menu (ART Options highlighted) press the ↓ key two times to highlight Load Calibration Files.

2. Press [Enter]. The following message appears:

   Insert Calibration Diskette to be copied in Drive A:
   Strike a key when ready . . .

3. Insert the calibration diskette into the diskette drive and close the drive door. Press any key. The following message appears:

   Loading VIZ B2 Calibration Files into C:\ART\VIZB2CAL

   As each file is loaded the file name appears on the screen, e.g., **A:84000077.CSN.** After all 16 files have been loaded, the following messages appear:

   16 File(s) copied
   Strike a key to return to menu . . .

4. Press any key. The Main Menu appears.

NOTE: When a flight is completed and stored, the calibration file for the radiosonde is erased from the hard disk automatically. Calibration files for unsuccessful flights are not erased. This does not present a problem due to the very small amount of disk space used by each calibration file. However, the station computer focal point can remove these files from within DOS.

Appendix B. Clouds/WX Codes

B.1 Introduction

This appendix provides the necessary tables and specific instructions to enter Clouds/Wx at the Surface Data screen. This guidance assumes no previous knowledge of synoptic code procedures. However, a basic understanding of clouds and weather is necessary.

For those already familiar with synoptic code, you will notice some departure from conventional WMO coding procedures. If you simply observe the elements requested and report them according to tables provided in this text, the intent of the Clouds/Wx entry will be fully met.

B.2 Getting Started

The Cloud/WX entry is a nine-digit, mandatory group. All nine digits must be entered, regardless of the presence or absence of clouds or significant weather conditions.

Operational Suggestion: If time before release is critical to where a proper Clouds/Wx coding cannot be made, simply enter <u>any</u> nine digits to complete the Surface Data screen. After release, properly code the clouds and weather. Edit the surface observation by typing **SURFACE** or SUR at the ?> prompt and replace the bogus Clouds/Wx group with new data.

The WMO format for entry of clouds and weather has been modified in MicroART to meet NCDC requirements. All stations using MicroART will follow this modified format, regardless of location; i.e., stations in either WMO Region IV or WMO Region V. A description of the nine-digit format follows:

1. Clouds/Wx group format: $N_hC_LhC_MC_HWWWW$

   a. N_h = Amount (in oktas) of the sky covered by <u>all</u> low clouds (C_L) observed or the amount of sky covered by all the middle clouds (C_M) observed. In no case will the amounts of the low and middle clouds be combined to report N_h. Use **Table B-1** to report the amount of low or middle cloud coverage.

b. C_L = Type of low cloud, based on the priority given in **Table B-2.** A solidus (/) is reported if C_L clouds are not visible owing to fog or similar obscuring phenomena.

Note: Clouds are divided into three families, classified as low, middle, or high. The general height ranges for these are: surface to 6500 feet for low; 6500 feet to 20000 feet for middle; and above 20000 feet for high. Remember, these ranges are not absolute, but given as a guide only. More consideration may be given to the cloud form than the height in many cases. Each cloud family is coded with a single digit, 0 through 9. The code figure 0 is used to indicate that clouds are not present for a given family.

c. h = Height of the base of the lowest cloud seen. The height reported is with respect to the surface. The height is coded as a solidus (/) if there is a total surface-based obscuration that prevents an observation of the clouds. Use **Table B-3** for the cloud base height.

d. C_M = Type of middle cloud, based on priority given in **Table B-4.** A solidus (/) is reported if C_M clouds are not visible owing to fog or similar obscuring phenomena, or because of a continuous layer of lower clouds.

e. C_H = Type of high cloud, based on priority given in **Table B-5.** A solidus (/) is reported if C_H clouds are not visible owing to fog or similar obscuring phenomena, or because of a continuous layer of lower clouds.

f. **WWWW** = Present weather coded in two groups of **WW.** These code groups are found in **Table B-6.** The coding starts with 99 (the highest priority) and descends to 00 (the lowest priority). Note that code figure 17 is placed out of numerical sequence to highlight its relative coding priority. You should note that present weather codes for some weather phenomena are events that have occurred during the past hour, not at observation time. When entering **WWWW**, go down **Table B-6** and use the first and second applicable code figures. Note that two **WW** groups must always be coded, even if that means using the same code figure twice.

(See the Example Observations page at the end of Appendix B.)

Table B-1. Amount of Low/Middle Cloud, N_h

Code figure	Cloud amount in oktas (eights)	Cloud amount in tenths
0	0	0
1	1 okta or less, but not zero	1/10 or less, but not zero
2	2 oktas	2/10 - 3/10
3	3 oktas	4/10
4	4 oktas	5/10
5	5 oktas	6/10
6	6 oktas	7/10 - 8/10
7	7 oktas or more, but not 8 oktas	9/10 or more, but not 10/10
8	8 oktas	10/10
9	Sky obscured by fog and/or other meteorological phenomena	
/	Cloud cover is indiscernible for reasons other than fog or other meteorological phenomena, or observation is not made	

Note: If there are any breaks in the sky at all, such as an overcast with a mackerel sky (altocumulus perlucidus or stratocumulus perlucidus), N_h would be encoded as 7. If there are only a few patches of low or middle cloud in the sky, N_h cannot be encoded as 0 but is encoded as 1. A partial obscuration does not affect the coding of N_h. A total obscuration is coded as 9, not 8 (overcast sky).

Table B-2. Coding of Low Cloud, C_L

This table presents the specifications for type of low cloud, C_L, in order of priority. Go down the table and use the first applicable code figure.

Code figure	Coding criteria
	(a) Cumulonimbus present, with or without other C_L clouds
$C_L = 9$	If the upper part of at least one of the cumulonimbus clouds present is clearly fibrous or striated, use $C_L = 9$.
$C_L = 3$	If the upper part of none of the cumulonimbus clouds present is clearly fibrous or striated, use $C_L = 3$.
	(b) No cumulonimbus present
$C_L = 4$	If stratocumulus formed by the spreading out of cumulus is present, use $C_L = 4$.
$C_L = 8$	If the C_L code figure 4 is not applicable and if cumulus and stratocumulus clouds with bases at different levels are present, use $C_L = 8$.
$C_L = 2$	If the C_L code figures 4 and 8 are not applicable and if cumulus clouds of moderate or strong vertical extent are present, use $C_L = 2$.

(Table B-2 continues next page)

Table B-2. Coding of Low Cloud, C_L (Continued)

Code Figure	Coding criteria
$C_L = 1$	If the C_L code figures 4, 8, and 2 are not applicable: use $C_L = 1$, if the C_L clouds present are predominantly[1] cumulus with little vertical extent and seemingly flattened or ragged cumulus other than of bad weather[2], or both;
$C_L = 5$	Use $C_L = 5$, if among the C_L clouds present, stratocumulus other than that formed by the spreading out of cumulus is predominant;
$C_L = 6$	Use $C_L = 6$, if the C_L clouds present are predominantly stratus in a more or less continuous sheet or layer, or in ragged shreds (other than ragged stratus of bad weather), or both;
$C_L = 7$	Use $C_L = 7$, if the C_L clouds present are predominantly pannus (ragged shreds of stratus of bad weather or ragged cumulus of bad weather), or both.
0	No C_L Clouds -- No cumulus, cumulonimbus, stratocumulus, or stratus.
/	C_L clouds not visible owing to fog or similar obscuring phenomena.

[1]Consideration of predominance is restricted to the clouds corresponding to C_L code figures 1, 5, 6 and 7, which have the same priority. Clouds of any one of these four specifications are said to be predominant when their sky cover is greater than that of the clouds of any of the other three specifications.

[2]'Bad weather' denotes the conditions which generally exist during precipitation and a short time before and after.

Table B-3. Height of Cloud Base Above Ground, h

Code figure	Reportable heights(ft)
0	0 or 100
1	200 or 300
2	400 to 600*
3	700 to 900*
4	1000 to 1900*
5	2000 to 3200*
6	3300 to 4900*
7	5000 to 6500**
8	7000 to 8000**
9	8500 or higher or no clouds
/	unknown or base of clouds below surface of station

* reported in 100 foot increments
** reported in 500 foot increments

Note: This group is used to report the height of the base of the lowest cloud seen, regardless of cloud amount. The height reported is with respect to the surface.

The lowest cloud height is coded with a solidus (/) if there is a total surface-based obscuration that prevents an observation of the clouds.

Table B-4. Coding of Middle Cloud, C_M

This table presents the specifications for type of middle cloud, C_M, in order of priority. Go down the table and use the first applicable code figure.

Code figure	Coding criteria
	(a) Altocumulus present
$C_M = 9$	If the sky is chaotic, use $C_M = 9$.
$C_M = 8$	If the C_M code figure 9 is not applicable and if altocumulus with sprouting in the form of turrets or battlements or altocumulus having the appearance of small cumuliform tufts is present, use $C_M = 8$.
$C_M = 7$	If the C_M code figures 9 and 8 are not applicable and if altostratus or nimbostratus is present together with altocumulus, use $C_M = 7$.
$C_M = 6$	If the C_M code figures 9, 8, and 7 are not applicable and if altocumulus formed by the spreading out of cumulus or cumulonimbus is present, use $C_M = 6$.
$C_M = 5$	If the C_M code figures 9, 8, 7, and 6 are not applicable, and if the altocumulus present is progressively invading the sky, use $C_M = 5$.

*There are several definitions of $C_M = 7$ and each has a different priority; therefore $C_M = 7$ appears several times in this code table.

(Table B-4 continues next page)

Table B-4. Coding of Middle Cloud, C_M (Continued)

Code figure	Coding criteria
$C_M = 4$	If the C_M code figures 9, 8, 7, 6, and 5 are not applicable and if the altocumulus present is continually changing in appearance, use $C_M = 4$.
$C_M = 7$	If the C_M code figures 9, 8, 6, 5, and 4 are not applicable and if the altocumulus present occurs at two or more levels, use $C_M = 7$.
$C_M = 7, 3$	If the C_M code figures 9, 8, 6, 5, and 4 are not applicable and if the altocumulus present occurs at one level, use $C_M = 7$ or 3 depending on whether the greater part of the altocumulus is respectively opaque or semi-transparent.
	(b) No altocumulus present
$C_M = 2$	If nimbostratus is present or if the greater part of the altostratus present is opaque, use $C_M = 2$.
$C_M = 1$	If there is no nimbostratus and if the greater part of the altostratus present is semi-transparent, use $C_M = 1$.
0	No C_M Clouds -- No altocumulus, altostratus, or nimbostratus.
/	C_M clouds not visible owing to fog or similar obscuring phenomena, or because of a continuous layer of lower clouds.

Table B-5. Coding of High Cloud, C_H

This table presents the specifications for type of high cloud, C_H, in order of priority. Go down the table and use the first applicable code figure.

Code figure	Coding criteria
$C_H = 9$	If cirrocumulus is present alone or is more than the combined sky cover of any cirrus and cirrostratus present, use $C_H = 9$.
	(a) Cirrostratus present
$C_H = 7$	If the cirrostratus covers the whole sky, use $C_H = 7$.
$C_H = 8$	If the cirrostratus does not cover the whole sky and is not invading the celestial dome, use $C_H = 8$.
$C_H = 6$	If the cirrostratus is progressively invading the sky and if the continuous veil extends more than 45 degrees above the horizon but does not cover the whole sky, use $C_H = 6$.
$C_H = 5$	If the cirrostratus is progressively invading the sky but the continuous veil does not reach 45 degrees above the horizon, use $C_H = 5$.

(Table B-5 continues next page)

Table B-5. Coding of High Cloud, C_H (Continued)

Code figure	Coding criteria
	(b) $C_H = 9$ not applicable and no cirrostratus present
$C_H = 4$	If the cirrus clouds are invading the sky, use $C_H = 4$.
$C_H = 3$	If the C_H code figure 4 is not applicable and if dense cirrus which originated from cumulonimbus is present in the sky, use $C_H = 3$.
$C_H = 2, 1$	If the C_H code figures 4 and 3 are not applicable:
	Use $C_H = 2$, if the combined sky cover of dense cirrus, of cirrus with sproutings in the form of small turrets or battlements and of cirrus in tufts is greater than the combined sky cover of cirrus in the form of filaments, strands or hooks;
	Use $C_H = 1$, if the combined sky cover of cirrus in the form of filaments, strands or hooks is greater than the combined sky cover of dense cirrus, of cirrus with sproutings in the form of small turrets or battlements and of cirrus in tufts.
0	No C_H Clouds -- No cirrus, cirrostratus, or cirrocumulus.
/	C_H clouds not visible owing to fog or similar obscuring phenomena, or because of a continuous layer of lower clouds.

Table B-6. Coding of Present Weather, WW

This table presents the specifications for present weather, WW, in order of priority. Go down the table and use the first and second applicable code figures. The code figure with the higher priority is reported as the first WW group and the code with the lower priority is the second WW group. (This convention is followed even if the higher priority code decribes weather that occurred during the preceding hour but not at the time of observation.) Note that two WW groups must always be coded, even if that means using the same code figure twice. (See the Example Observations page at the end of Appendix B.)

---

ww = 99-50. Used for precipitation at the station at the time of observation.

---

ww = 99-80. Used for showery precipitation or precipitation with current or recent thunderstorms.

---

99 Thunderstorm, severe, with hail, small hail, or snow pellets at time of observation.

There may or may not also be rain or snow or a mixture of rain and snow of any intensity.

98 Thunderstorm at time of observation combined with duststorm at time of observation.

There must also be some sort of precipitation at the time of observation, but it may not be seen because of poor visibility. Judgment must be used.

97 Thunderstorm, severe without hail, small hail, or snow pellets but with rain and/or snow at time of observation.

The rain or snow may be of any intensity.

96 Thunderstorm with hail, small hail, or snow pellets at time of observation.

There may or may not be rain or snow or a mixture of rain and snow of any intensity.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

95 **Thunderstorm without hail, small hail, or snow pellets, but with rain and/or snow at time of observation.**

---

ww = 94-91. Used if there was a thunderstorm during the past hour, and there is some sort of precipitation at the time of observation. In order to have this situation, the last lightning or thunder observed must have been more than 15 minutes before the observation, but less than 1 hour 15 minutes before the observation.

---

94 **Moderate or heavy snow or rain and snow mixed or hail, small hail, or snow pellets at time of observation. Thunderstorm during previous hour but not at time of observation.**

93 **Light snow or rain and snow mixed or hail, small hail, or snow pellets at time of observation. Thunderstorm during previous hour but not at time of observation.**

92 **Moderate or heavy rain at time of observation. Thunderstorm during previous hour but not at time of observation.**

No other forms of precipitation.

91 **Light rain at time of observation. Thunderstorm during previous hour but not at time of observation.**

No other forms of precipitation.

---

ww = 90-80. Used to report showery precipitation that is not associated with a thunderstorm. Showers fall from cumuliform clouds that are, by nature, isolated. Because of this, individual showers do not last very long. Code figure 89 is not reported under United States rules.

---

90 **Moderate or heavy shower(s) of hail, with or without rain or rain and snow mixed, not associated with thunder.**

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

---

ww = 88-87. Used if showers of snow pellets or ice pellets are observed at the station at the time of the observation. The snow pellets or ice pellets may or may not be mixed with rain or both rain and snow

---

88 Moderate or heavy shower(s) of snow pellets or small hail, with or without rain or rain and snow mixed.

All of the precipitation must be moderate or heavy.

87 Light shower(s) of snow pellets or small hail, with or without rain or rain and snow mixed.

All of the precipitation must be light.

---

ww = 86-85. Used if only snow showers are observed at the station at the time of observation.

---

86 Snow shower(s), moderate or heavy.

85 Snow shower(s), light.

---

ww = 84-83. Used if mixed rain showers and snow showers are observed at the station at the time of observation.

---

84 Moderate or heavy shower(s) of rain and snow mixed. Intensity of either may be moderate or heavy.

83 Light shower(s) of rain and snow mixed. Intensity of both must be light.

---

ww = 82-80. Used to report rain showers at the time of observation.

---

82 Violent rain shower(s).

Report a rain shower as violent if the rate of fall is at least 1.0" per hour or 0.10" in 6 minutes.

Table B-6. Coding of Present Weather, WW (Continued)

81 Moderate or heavy rain shower(s).

80 Light rain shower(s).

ww = 79-50. Use code figures 79-50 for precipitation that is not showery.

ww = 79-70. Use code figures 79-70 to report solid precipitation not in showers.

ww = 79-76. Use code figures 79-76 to report types of solid, non-showery precipitation.

79 Ice Pellets.

Use this code figure regardless of the intensity of the ice pellets and regardless of whether the ice pellets are mixed with another type of precipitation.

78 Isolated star-like snow crystals with or without fog or ice fog.

77 Snow grains with or without fog or ice fog.

Use this code figure regardless of intensity.

76 Diamond dust (ice crystals) with or without fog or ice fog.

ww = 75-70. Use code figures 75-70 to report snow that is not in the form of showers at the station at the time of the observation. The code figure selected depends on a combination of intensity and whether the snow is intermittent or continuous.

75 Continuous fall of snowflakes, heavy at time of observation.

74 Intermittent fall of snowflakes, heavy at time of observation.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

73 Continuous fall of snowflakes, moderate at time of observation.

72 Intermittent fall of snowflakes, moderate at time of observation.

71 Continuous fall of snowflakes, light at time of observation.

70 Intermittent fall of snowflakes, light at time of observation.

---

ww = 69-60. Code figures 69-60 are generally used to report rain.

ww = 69-66. Use code figures 69-66 to report liquid precipitation that is mixed with snow or is freezing.

---

69 Rain or drizzle and snow, moderate or heavy.

68 Rain or drizzle and snow, light.

67 Rain, freezing, moderate or heavy.

66 Rain, freezing, light.

---

ww = 65-60. Use code figures 65-60 to report rain (but not freezing rain or rain mixed with snow) at the station at the time of observation. The code figure used depends on the combination of intensity and whether the precipitation is intermittent or continuous.

---

65 Rain, not freezing, continuous, heavy at time of observation.

64 Rain, not freezing, intermittent, heavy at time of observation.

63 Rain, not freezing, continuous, moderate at time of observation.

62 Rain, not freezing, intermittent, moderate at time of observation.

61 Rain, not freezing, continuous, light at time of observation.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

60 Rain, not freezing, intermittent, light at time of observation.

ww = 59-50. Use 59-50 to report drizzle.

ww = 59-56. Drizzle mixed with rain, or freezing drizzle.

59 Drizzle and rain, moderate or heavy.

58 Drizzle and rain, light.

57 Drizzle, freezing, moderate or heavy.

56 Drizzle, freezing, light.

ww = 55-50. Use code figures 55-50 to report drizzle (but not freezing drizzle or drizzle mixed with rain) at the station at the time of observation.

55 Drizzle, not freezing, continuous, heavy at time of observation.

54 Drizzle, not freezing, intermittent, heavy at time of observation.

53 Drizzle, not freezing, continuous, moderate at time of observation.

52 Drizzle, not freezing, intermittent, moderate at time of observation.

51 Drizzle, not freezing, continuous, light at time of observation.

50 Drizzle, not freezing, intermittent, light at time of observation.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

ww = 17. Thunderstorm, but no precipitation at time of observation. Code figure 17 has priority over code figures 49-20 and 16-00.

17 Thunderstorm, but no precipitation at time of observation.

A thunderstorm is an electrical storm that may or may not be accompanied by precipitation. Since by U.S. definition, a thunderstorm does not end until 15 minutes after the last lightning or thunder, code figure 17 would be used if the thunderstorm occurred within 15 minutes of the observation.

ww = 49-00. Use code figure 49-00 when no precipitation is occurring at the station at the time of observation.

ww = 49-40. Use code figures 49-40 only if there is fog. The fog may be made of water droplets or ice crystals (ice fog). The visibility in fog or ice fog must be less than 5/8 mi. If the visibility is 5/8 mi or more, use code figure 10. The code figure used will depend on whether the fog has changed during the past hour and whether the sky can be seen (blue sky, stars or higher clouds).

49 Fog depositing rime, sky invisible.

Fog that deposits rime will be made up mostly of supercooled water droplets, not ice crystals.

48 Fog, depositing rime, sky visible.

47 Fog or ice fog, sky invisible. Fog has begun or has become thicker during the preceding hour.

46 Fog or ice fog, sky visible. Fog has begun or has become thicker during the preceding hour.

45 Fog or ice fog, sky invisible. Fog has shown no appreciable change during the preceding hour.

44 Fog or ice fog, sky visible. Fog has shown no appreciable change during the preceding hour.

(Table B-6 continues on next page)

Table B-6. Coding of Present Weather, WW (Continued)

43 **Fog or ice fog, sky invisible. Fog has become thinner during the preceding hour.**

42 **Fog or ice fog, sky visible. Fog has become thinner during the preceding hour.**

41 **Fog or ice fog in patches. Fog has begun or has become thicker during the preceding hour.**

40 **For or ice fog at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer.**

---

ww = 39-30. Use code figures 39-30 to report a duststorm, sandstorm, or drifting or blowing snow.

---

ww = 39-36. In deciding among code figures 39-36, the following must be considered: snow that is being moved by the wind may be generally low (below about 6 ft) or generally high (above 6 ft). If the snow is low, it is drifting snow; if high, it is blowing snow. Code figure 37 is not reported under United States rules.

---

39 **Heavy blowing snow, generally high (above eye level). Visibility less than 5/16 mi.**

38 **Light or moderate blowing snow, generally high (above eye level). Visibility 6 mi or less but not less than 5/16 mi.**

36 **Drifting snow, generally low (below eye level).**

---

ww = 35-30. In deciding among code figures 35-30 the following must be considered: if the visibility at the station at the time of observation is less than 5/16 mi, there is a severe duststorm or sandstorm; if the visibility is at least 5/16 mi but less than 5/8 mi, there is a light or moderate duststorm or sandstorm. The code figure used depends on the intensity of the duststorm or sandstorm and any change in its intensity during the preceding hour.

---

35 **Severe duststorm or sandstorm that has begun or has increased during the preceding hour.**

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

34 **Severe duststorm or sandstorm that has had no appreciable change during the preceding hour.**

33 **Severe duststorm or sandstorm that has decreased during the preceding hour.**

32 **Light or moderate duststorm or sandstorm that has begun or has increased during the preceding hour.**

31 **Light or moderate duststorm or sandstorm that has had no appreciable change during the preceding hour.**

30 **Light or moderate duststorm or sandstorm that has decreased during the preceding hour.**

---

ww = 29-20. Use code figures 29-20 to report precipitation, fog, ice fog, or thunderstorm at the station during the preceding hour but not at the station at the time of observation. Use code figures 29-25 if the precipitation was showery; otherwise use code figures 24-20.

---

29 Thunderstorm (with or without precipitation).

Since by U.S. definition, a thunderstorm ends 15 minutes after the last thunder or lightning, the last thunder or lightning must have happened at least 15 minutes before the time of the observation.

28 **Fog or ice fog.**

The visibility in the fog or ice fog must have been less than 5/8 mi.

27 **Shower(s) of hail, small hail, or ice pellets, or of rain and hail, small hail, or ice pellets.**

26 **Shower(s) of snow, or of rain and snow.**

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

25 **Shower(s) of rain.**

24 **Freezing drizzle or freezing rain, not falling as shower(s).**

23 **Rain and snow or ice pellets, not falling as shower(s).**

22 **Snow not falling as shower(s).**

21 **Rain (not freezing), not falling as shower(s).**

20 **Drizzle (not freezing) or snow grains, not falling as shower(s).**

---

ww = 19-00. Use code figures 19-00 to report certain hydrometeors, electrometeors, lithometeors or no precipitation at the station at the time of observation or during the preceding hour.

---

19 **Funnel cloud(s), tornado, or waterspout at or within sight of the station during the preceding hour of the time of observation.**

Since the highest code figure is reported (except code figure 17), code figure 19 cannot be used if WW can be encoded as some higher number.

18 **Squalls. By U.S. definition, a sudden increase of at least 15 knots in average wind speed and sustained at 20 knots or more for at least 1 minute. This must occur at or within sight of the station during the preceding hour or at the time of observation.**

If a squall without any precipitation is observed, either at the time of observation or during the past hour, use code figure 18. If there was any precipitation, or if there was a thunderstorm with the squall, use one of the other code figures, possibly code figure 29 or one of the code figures 99-80. Select the one that best describes what happened.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

16 **Precipitation within sight, reaching the ground or the surface of the sea, near to, but not at the station.**

The precipitation must be 3 mi or less from the station, but not at the station to use code figure 16.

15 **Precipitation within sight, reaching the ground or the surface of the sea, but distant; i.e., estimated to be more than 3 mi from the station.**

14 **Precipitation within sight, not reaching the ground or the surface of the sea.**

Sometimes precipitation may fall from a cloud, but into air that is dry enough to evaporate it before it can reach the ground. This is fairly common in desert areas like some parts of the southwestern United States. This phenomena is called virga.

13 **Lightning visible, no thunder heard.**

There are two reasons you may see lightning but not hear thunder. The first is that the lightning may be far enough away that the thunder doesn't reach the station. The other is that local sounds may muffle the thunder. Use code figure 13 to report distant lightning.

---

ww = 12-10. Use code figure 12 or 11 to report shallow fog. Continuous refers to covering half or more of the ground or sea; patchy refers to less than one-half coverage. The apparent visibility shall be less than 5/8 mi. Code figure 10 is used to report fog that is neither shallow nor has visibility less than 5/8 mi. (Code figures 49-40 are used to report fog that is not shallow but with visibility less than 5/8 mi.)

---

12 **More or less continuous shallow fog or ice fog at the station; the fog or ice fog is not deeper than about 6 ft.**

11 **Patches of shallow fog or ice fog at the station; the fog or ice fog is not deeper than about 6 ft.**

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

10 Mist

Code figure 10 refers only to water droplets and ice crystals. The visibility restriction shall be 5/8 mi or more but less than 7 mi. Use code figure 10 whether the mist is patchy or more or less continuous.

ww = 09-04. Use code figures 09-04 to report lithometeors.

09 **Duststorm or sandstorm within sight at the time of observation, or at the station during the preceding hour.**

Visibility in dust or sand must be (or have been) 6 mi or less.

08 **Well-developed dust whirl(s) (devils) or sand whirl(s) seen at or near the station during the preceding hour or at the time of observation, but no duststorm or sandstorm.**

07 **Dust or sand raised by wind at or near the station at the time of observation, but no well-developed dust whirl(s) (devils) or sand whirl(s), and no duststorm or sandstorm seen.**

Visibility at the time of observation must be 6 mi or less.

06 **Widespread dust in suspension in the air, not raised by wind at or near the station at the time of observation.**

This code figure may be used with any visibility, as long as there is dust in the air.

05 **Haze**

Code figure 05 is not restricted to the definition for reports of haze in the basic observation, but can be used if it is simply hazy, regardless of the visibility.

(Table B-6 continues next page)

Table B-6. Coding of Present Weather, WW (Continued)

04 Visibility reduced by smoke; e.g., veldt or forest fires, industrial smoke, or volcanic ash.

If the smoke is coming from a great distance, it will be spread through a deep layer of the atmosphere. In this case, use code figure 04 regardless of how much the visibility is restricted. If the smoke is coming from somewhere fairly close, then it will be pretty much layered in the lower atmosphere. In this case, the visibility has to be 6 mi or less before code figure 04 is used.

---

ww = 03-00. Phenomena without significance.

---

03 Clouds generally forming or developing.

Used only if there are clouds at the time of the observation, no other weather exists, and the clouds have increased or become more developed during the past hour.

02 State of sky on the whole unchanged. This is the characteristic of the sky during the past hour.

01 Clouds generally dissolving or becoming less developed. This is the characteristic of the sky during the past hour.

Used if the sky is clear at the time of observation, but there were clouds during the past hour. Also used when clouds have dissolved or become less developed during the past hour.

00 Cloud development not observed or not observable. This is the characteristic of the past hour.

Used if clouds were not observed during the past hour, whether the sky is clear or not at time of observation.

(See the Example Observations page)

EXAMPLE OBSERVATIONS

Sky: 3/10 moderate cumulus at 2100 feet, 2/10 stratocumulus at 5000 feet, 3/10 altocumulus (one level, opaque) at 12000 feet. State of sky generally becoming less developed during past hour.
Weather: Light rain shower ended 17 minutes before observation.
Code: 485702501

Sky: Clear sky with few patches of semi-transparent altocumulus at 15000 feet. Altocumulus covered 5/10 of sky during past hour.
Weather: None.
Code: 109300101

Sky: Surface-based obscuration in fog with 300 feet vertical visibility.
Weather: Fog with visibility 1/2 mile. Last hour had a partial obscuration (fog) and 10/10 stratus at 400 feet.
Code: 9////4747

Sky: 7/10 cumulonimbus (no anvil visible) at 1800 feet, 2/10 cirrus at 35000 feet, originating from cumulonimbus.
Weather: Moderate showers of rain and small hail. Lightning seen in distance (on horizon), but no thunder heard.
Code: 734038813

Sky: 10/10 stratocumulus (with breaks) at 4500 feet. State of sky unchanged during past hour.
Weather: None.
Code: 756//0202

Sky: 10/10 nimbostratus at 2100 feet. State of sky unchanged during past hour.
Weather: Light rain and drizzle. Patchy fog reducing visibility to 3 miles was present during past hour but not at time of observation. No other changes.
Code: 8052/5802

Appendix C. Glossary

A: Disk The diskette in the diskette drive of the IBM XT.

A: Drive The diskette drive on the IBM XT.

Archive Diskette A diskette containing archive data in the National Climatic Data Center (NCDC) format. At the beginning of each month, the archive diskette(s) for the previous month are sent to NCDC.

ART Interface Card (ARCTIC) The circuit board in the IBM XT that translates signals from the ART equipment into a digital format that is used by the MicroART program.

ARCTIC See ART Interface Card.

ART Automatic Radiotheodolite.

Ascension Log The file on the IBM XT that contains information about each flight taken at a station.

Boot To start a computer program or system. See also Warm Boot and Cold Boot.

Byte A unit of data storage in data processing. Each MicroART 5.25" diskette holds approximately 365 kilobytes of data. The hard disk on the IBM XT holds either 10 or 20 megabytes of data.

C: Disk Another name for the hard disk on the IBM XT.

C: Drive The hard disk drive on the IBM XT.

Calibration Diskette A diskette containing radiosonde calibration data. Each box of radiosondes contains a calibration diskette.

Case Sensitive Refers to whether or not uppercase and lowercase keyboard entries are treated the same by a particular computer program. MicroART is not case sensitive, therefore either uppercase or lowercase letters may be typed.

Cold Boot To start a computer program or system beginning with the power off.

Corrected Pressure The surface pressure at the point a radiosonde is released. This pressure is the sum of the observed surface pressure (from a barometric reading) and the pressure correction. (See Pressure Correction.)

Cursor The blinking underline character on the display that indicates where characters typed from the keyboard will be entered.

Directory An index to the files on a disk.

Diskette A removable, usually square disk used to store information. The MicroART diskettes measure 5¼" on a side.

Display The monitor showing the visual output of a program and the commands and data entered by the user.

DOS Disk Operating System. The computer program that controls the basic operations of the most of the IBM series of personal computers. MicroART uses Version 3.3 of DOS.

ET Electronics Technician.

File A collection of data or program statements stored as a single entity.

Fixed Disk Another name for the hard disk or C: disk on the IBM XT.

Floppy Disk Another name for diskette.

Format To initialize a diskette (or hard disk) so that files may be placed on it. When formatting takes place, all data on the diskette or disk is destroyed.

GMT Greenwich Mean Time.

Hard Disk The storage device on the IBM XT. Storage capacity.

Highlight To make a particular option, data item, or area of the screen stand out. On menus, MicroART uses yellow lettering on a red background to highlight an option. On most other screens, black lettering on a gray background is used for highlighting.

Kb Kilobyte.

Kilobyte One thousand bytes.

Megabyte One million bytes.

Mb Megabyte.

mb Millibars.

MCU Master Control Unit.

MDO Met Data Oscilator. A electronic component of the radiosonde.

Menu A screen containing a list of options that the user selects from.

MicroART An abbreviation for Microcomputer Automatic Radiotheodolite. A system for collecting, displaying, editing, transmitting, and archiving upper air observations.

NCDC National Climatic Data Center.

Prompt A message from the MicroART program that requests data or a Yes/No reply.

SDC Space Data Corporation.

Source Diskette The diskette from which files are to be copied, i.e., the "original." See also Target Diskette.

Tab, Write-protect See Write-protect tab.

Target Diskette The diskette to which files are copied from the original or Source Diskette.

Temporary Archive File A file on the hard disk containing archive data. This file is copied to an Archive Diskette for storage and then erased.

UTC Universal Time Coordinated (formerly Greenwich Mean Time [GMT]).

Warm Boot To start a program or system without turning the power off and then back on. MicroART is warm booted by pressing [Ctrl]-[Alt]-[Del].

Write-protect Tab A small (about 1" x ½") rectangular piece of material that is sticky on one side. When a write-protect tab is placed over the small rectangular notch on the right side of a diskette, no data can be written onto the diskette.

WSH Weather Service Headquarters.

During a transponder flight, using the RANGE command allows you to abort slant range processing and use elevations angles to compute winds. By aborting ranging, the prerelease prompt "Process Ranging Data" is automatically changed to N.

If you choose to rework the flight, the ranging question must be answered Y. If not, angular data will again be used to compute winds.

Note: If the ranging data is not aborted, the flight will be stored in the ranging mode and no further action is required to rework it as such. In this case, you would have to answer N to process ranging data to obtain angular data processing.