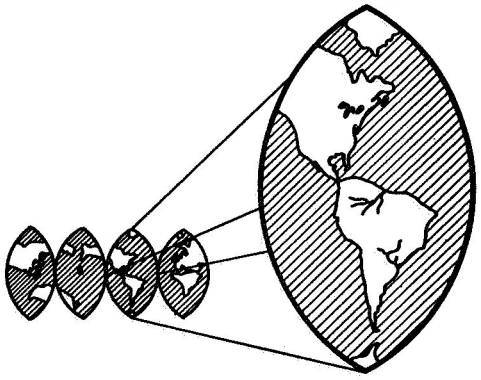
EXAMETNET DATA PREPARATION AND GUIDANCE PROCEDURES MANUAL



EXPERIMENTAL INTER-AMERICAN METEOROLOGICAL ROCKET NETWORK

JANUARY 1968

ERRATA

Page 19: On line directly under label "RP" and "Station Name" remove "Date", "Time" and "Z", insert a blank line. This line is used for entry of "RP" and "Station Name."

Bottom of form, label "Techncal Data" should read "Technical Data."

Page 31: Table 2, Number 08, 7.8 foot diameter should read, 7.8 foot diameter parachute.

Page 32: Table 5, Number 05, SCD Datasonde should read SDC Datasonde.

EXAMETNET DATA PREPARATION AND GUIDANCE PROCEDURES MANUAL

2ND EDITION

PREPARED FOR

THE EXPERIMENTAL INTER-AMERICAN METEOROLOGICAL ROCKET NETWORK

PREPARED BY

METEOROLOGICAL PROJECTS AND SYSTEMS SECTION, RANGE ENGINEERING DIVISION

AND

METEOROLOGY SECTION, FLIGHT TEST DIVISION

NASA, WALLOPS STATION, WALLOPS ISLAND, VIRGINIA

JANUARY 1968

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APPENDIX

INTRODUCTION

The formation of the Experimental Inter-American Meteorological Rocket Network (EXAMETNET) in 1965[1] required the establishment of standardized procedures. This manual, a result of this standardization, features pertinent data formats and reduction instructions. The inclusion of descriptions of the raw data-output-formats is necessary for manual completeness. Full details and descriptions of these are available elsewhere.[2] Sample forms and worksheets that originally appeared in the 1st Edition of this manual have been removed from this 2nd Edition. The data reduction process with its many facets, standard and non-standard, is unique to each participant's range activities, but still requires a systematic procedure.

The formats shown throughout this manual need no detailed explanations, other than those given. The aim of this manual is to provide adequate but simple instructions. Hence, following a brief discussion of the data handling routine and a dissemination outline, graphical descriptions of the EXAMETNET charts and forms are presented. To enable efficient preparation of quality assured data reports, it is necessary that entries made on these charts and forms be as consistent as possible. Following the figures, more specific instructions are presented for "Rocket Winds Aloft Data Reduction" and "Rocketsonde Temperature Data Reduction". It is hoped that these guidelines and instructions will help to establish a relatively standard nomenclature of rockets, payloads, sensors, and tracking equipment as well as consistent methods of EXAMETNET procedures.

Since EXAMETNET is experimental in nature, changes and improvements are constantly sought. As improvements occur they will be added to the EXAMETNET procedures and reflected in this manual.

1 The Establishment of the Experimental Inter-American Meteorolgical Rocket Network (EXAMETNET): J. F. Bettle, J. F. Spurling, and F. J. Schmidlin. Presented at the AIAA Sounding Rocket Vehicle Technology Specialist Conference, Williamsburg, Virginia, February, 1967.

2 Meteorological Rocket Facility Handbook, NASA, Wallops Station, Virginia, 1968.

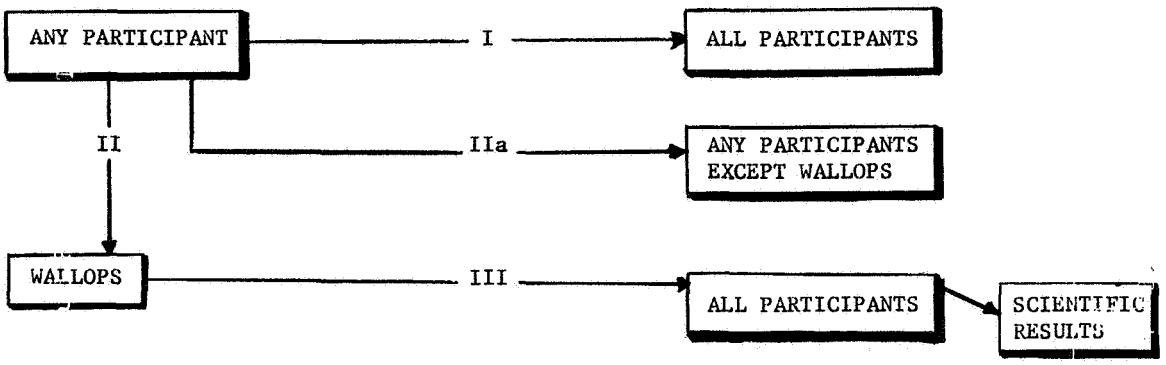
DATA HANDLING ROUTINE

The participants of EXAMETNET exchange two data packages, and disseminate a third data package to the world scientific community. These data packages are known as Data Package I, Data Package II, and Data Package III. The specific contents of each data package are shown on page 3.

Data Package I, the rocket observation (ROCOB) and supporting balloon-borne observation (RAWINSONDE) coded messages, is exchanged between the participants on a near real-time basis (within 24 hours). To provide this valuable synoptic data, dependable real-time communications facilities must exist.

Data Package II (elements of this package are shown on page 3) is air-mailed to Wallops Island, Virginia within 14 days of the rocket launching. Because all participants do not have a need for all the elements of Data Package II, and to reduce mailing costs, an abridged Data Package II (Data Package IIa) is also exchanged. When received at Wallops Island, Data Package II is prepared for printing and publication as Data Package III.

EXAMETNET DATA FLOW AND DISSEMINATION CHART



I. Real-time Data[1]

1. ROCOB coded message (including code groups to indicate future schedule).

2. Second transmission (Parts C and D) of TEMP and PILOT messages.

II. Raw Data Package (to be sent to Wallops by all participants)

1. Radar Output and Telemetry Data Records.

a. Horizontal Range-Time strip chart.

b. Altitude-Time strip chart.

c. Azimuth-Time strip chart.

d. Rocketsonde temperature telemetry record.

e. Payload calibration data sheet.

2. Reduced Data Record EXAMETNET Form No. 1

IIa. Abridged Data Package (to be exchanged between all participants except Wallops)

1. Reduced Data Record EXAMETNET Form No. 1

III. Compiled Data Submitted for Publication

NOTE: [1] Data Package I should be exchanged by mail between Argentina and Brazil until such time as real-time communications are established.

Figure 1

OA-626 PLOTBOARD RECORD

Shown is a sample analog data presentation of the MPS-19 mobile radar. Output from the radar tracking system, in the form of elevation and azimuth angles and slant range, is converted to cartesian form in terms of Height-Horizontal Range (H-HR), and East-West, North-South Range (X-Y) components for presentation on the plotting board.

The plotting board is a one-arm type unit capable of plotting either the H-HR or X-Y functions as determined and selected by the system operator through available controls. Normal operation is to plot the H-HR function from rocket ignition until approximately 30 seconds prior to payload ejection, and then switch to the X-Y function for the remainder of the track. The changeover from the H-HR function to the X-Y function requires 20 to 30 seconds to complete.

For the most accurate utilization of the data, it is important that: all scales be correctly noted on the plot; all ink traces be time marked (at least once per minute); and true north and a baseline for orientation of data reduction equipment be indicated. Time marks may be made at 1-, 10-, 30-, or 60- second intervals. For the best data presentation it is recommended that one second intervals be used for the rocket's trajectory track and 10 second intervals be used for the initial tracking of the sensor.

Atmospheric wind conditions normally will dictate the scale factor to be used, and will also be a factor in determining the amount of smoothing required. This smoothing is set by the radar operator, and is applied to the antenna positioning motors; experience has shown that two or three seconds smoothing, applied manually, is adequate.

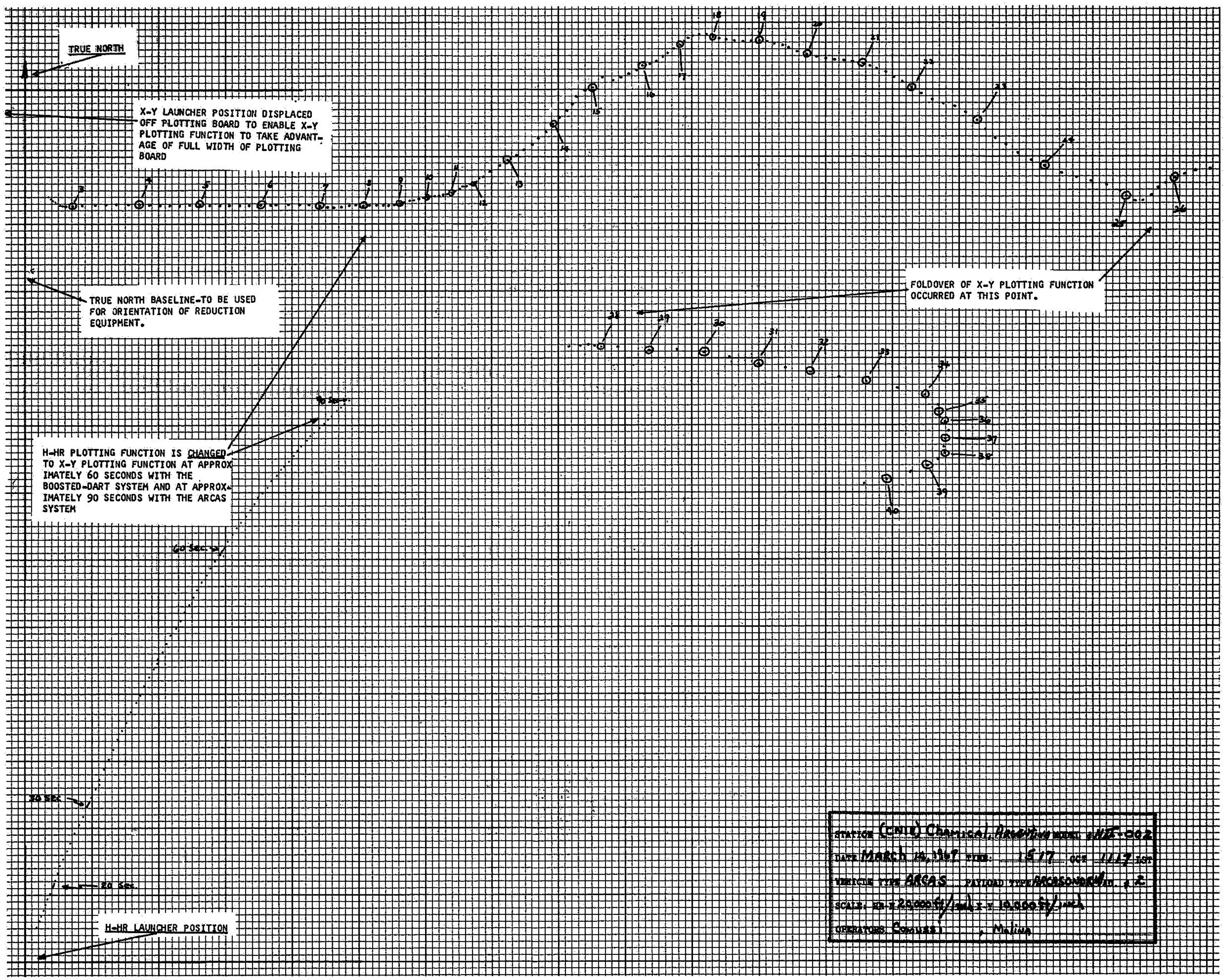

TRUE NORTH
X-Y LAUNCHER POSITION DISPLACED OFF PLOTTING BOARD TO ENABLE X-Y PLOTTING FUNCTION TO TAKE ADVANTAGE OF FULL WIDTH OF PLOTTING BOARD
TRUE NORTH BASELINE-TO BE USED FOR ORIENTATION OF REDUCTION EQUIPMENT.
FOLDOVER OF X-Y PLOTTING FUNCTION OCCURRED AT THIS POINT.
H-HR PLOTTING FUNCTION IS CHANGED TO X-Y PLOTTING FUNCTION AT APPROXIMATELY 60 SECONDS WITH THE BOOSTED-DART SYSTEM AND AT APPROXIMATELY 90 SECONDS WITH THE ARCAS SYSTEM
90 Sec.
60 Sec.
30 Sec.
20 Sec.
H-HR LAUNCHER POSITION
STATION (CNIE) Chemical, Argentina
DATE MARCH 14, 1967 TIME: 1517 GCT 1117 EST
VEHICLE TYPE ARCAS
SCALE: 20,000 ft/inch X Y 10,000 ft/inch
OPERATORS Comuzzi, Malina

FIGURE 2

TIME-ALTITUDE STRIP CHART

The analog presentation indicates the altitude position of the target above the radar plane in feet.

This strip chart recorder gives a continuous plot of the rocket and sensor altitude beginning at target acquisition and ending when data is no longer required. The mode of presentation is such that coarse scale readings in 25000-foot increments are summed in order to provide an approximate altitude value. The number of 25000-foot chart increments are indicated every 30 seconds by the response of the pen. A fine scale value which is read from the continuous ink curve is added to the sum of the 25000-foot increments. The total of the coarse and fine scale readings is the absolute altitude value of the target above the tracking radar. The fine scale provides read out resolution to within 100 feet.

The strip chart recorder paper drive has 10 speeds, but for convenience in chart handling and adequate resolution of time and altitude a paper speed of 1 1/2 inches per minute is satisfactory.

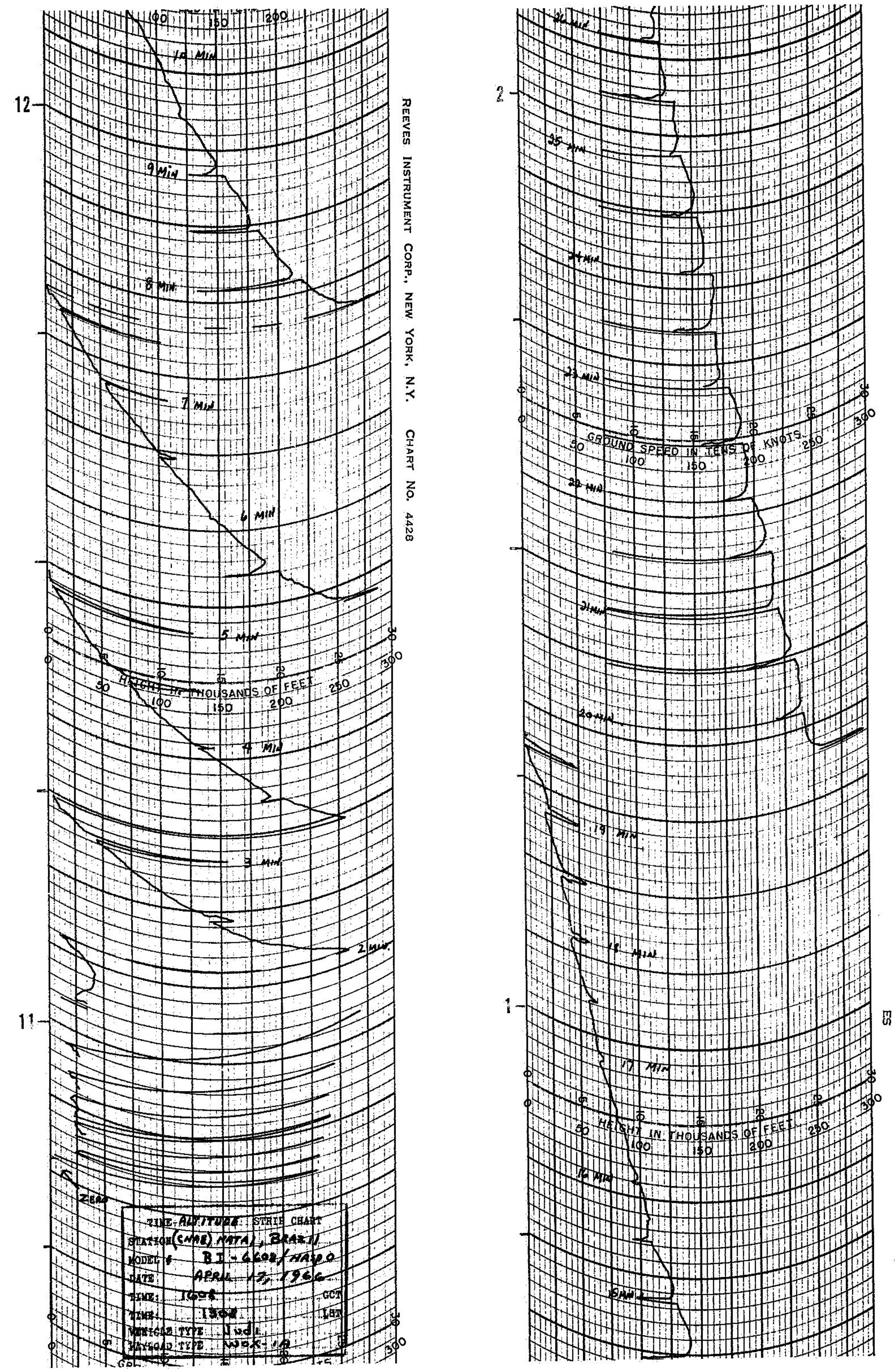
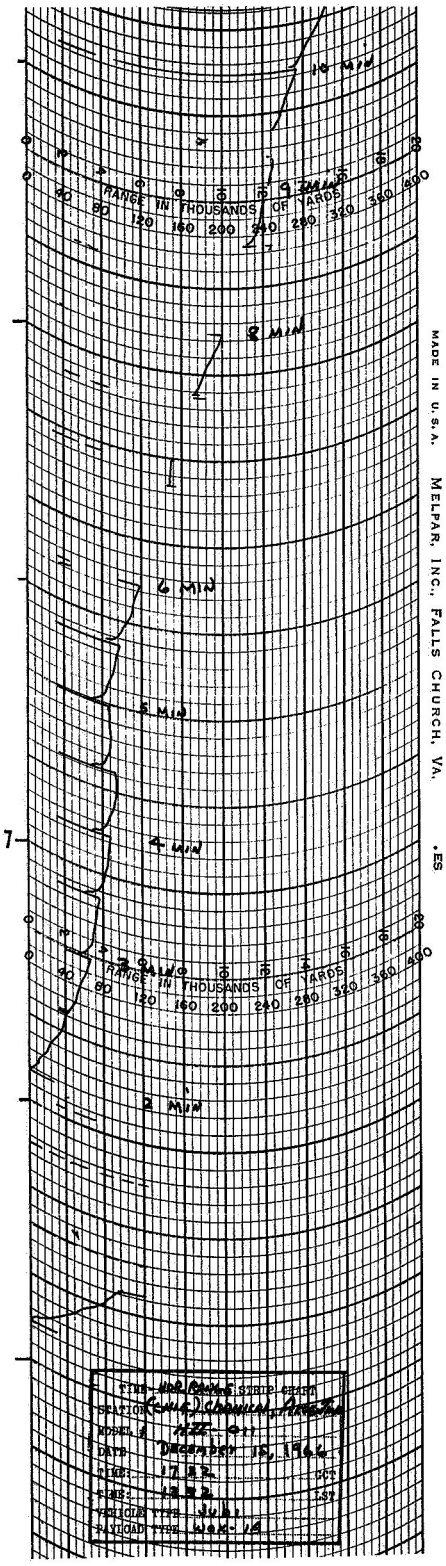

REEVES INSTRUMENT CORP., NEW YORK, N.Y. CHART NO. 4428
HEIGHT IN THOUSANDS OF FEET
GROUND SPEED IN TENS OF KNOTS
TIME-ALTITUDE STRIP CHART
STATION
MODEL
DATE
TIME
VEHICLE TYPE
PAYLOAD TYPE

FIGURE 3

TIME-HORIZONTAL RANGE STRIP CHART

This presentation indicates the horizontal range in yards to the target from the tracking radar along the radar plane.

This strip chart recorder gives a continuous plot of the rocket and sensor horizontal range beginning at target acquisition and ending when data is no longer required. The mode of presentation is similiar to that of the Time-Altitude recorder (see figure 2) except that 20000-yard increments are summed to provide the approximate range. The number of 20000-yard range increments are indicated every 30 seconds by the response of the pen. To this coarse value is added a fine scale value which is interpolated from the continuous ink curve. The total of the coarse and fine scale readings is the absolute horizontal range to the target along the radar plane. The chart drive is 1 1/2 inches per minute and scale resolution is 100 yards.


RANGE IN THOUSANDS OF YARDS
MADE IN U.S.A. MELPAR, INC., FALLS CHURCH, VA.
TYPE
STATION
MODEL
DATE
TIME
TIME
VEHICLE TYPE
PAYLOAD TYPE

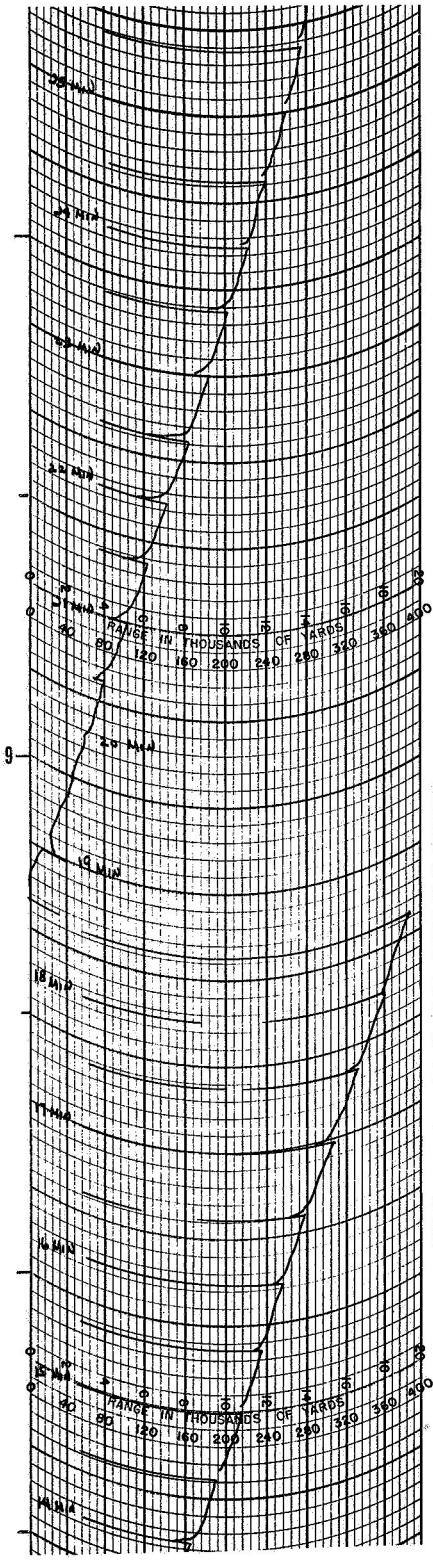
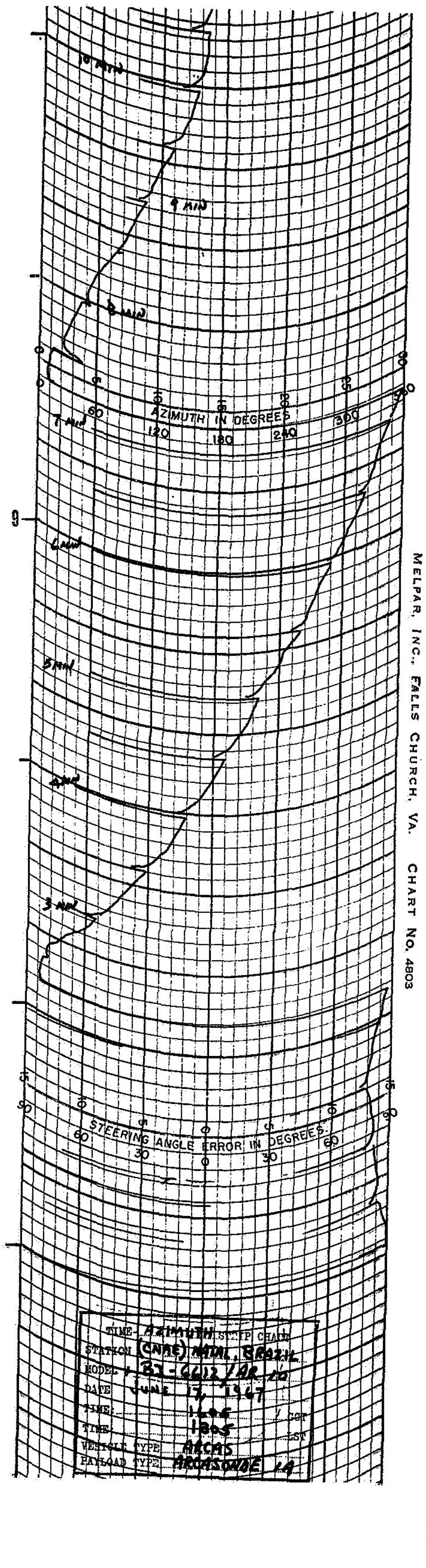

RANGE IN THOUSANDS OF YARDS
MELPAR, INC., FALLS CHURCH, VA. CHART NO. 4802

FIGURE 4

TIME-AZIMUTH STRIP CHART

This analog presentation indicates the azimuth angle in degrees to the target.

Chart speed and mode of presentation are similiar to the Time-Altitude recordings. To provide an approximate angle thirty degree increments are summed. The number of 30 degree increments to be summed is indicated every thirty seconds by response of the pen. To these summed coarse scale values is added a fine scale value between 0 and 30 degrees which is read from the continuous ink trace. The total of the coarse and fine scale readings is the absolute angle to the target. Scale resolution is one degree.


10 MIN
9 MIN
8 MIN
7 MIN
AZIMUTH IN DEGREES
60
120
180
240
300
360
9
6 MIN
5 MIN
4 MIN
3 MIN
STEERING ANGLE ERROR IN DEGREES
MELPAR, INC., FALLS CHURCH, VA.
CHART NO. 4803
TIME-AZIMUTH STRIP CHART
STATION (CNRE) NATAL, BRAZIL
DATE JUNE 17, 1967
VEHICLE TYPE ARCAS
PAYLOAD TYPE ARCASONDE 1A

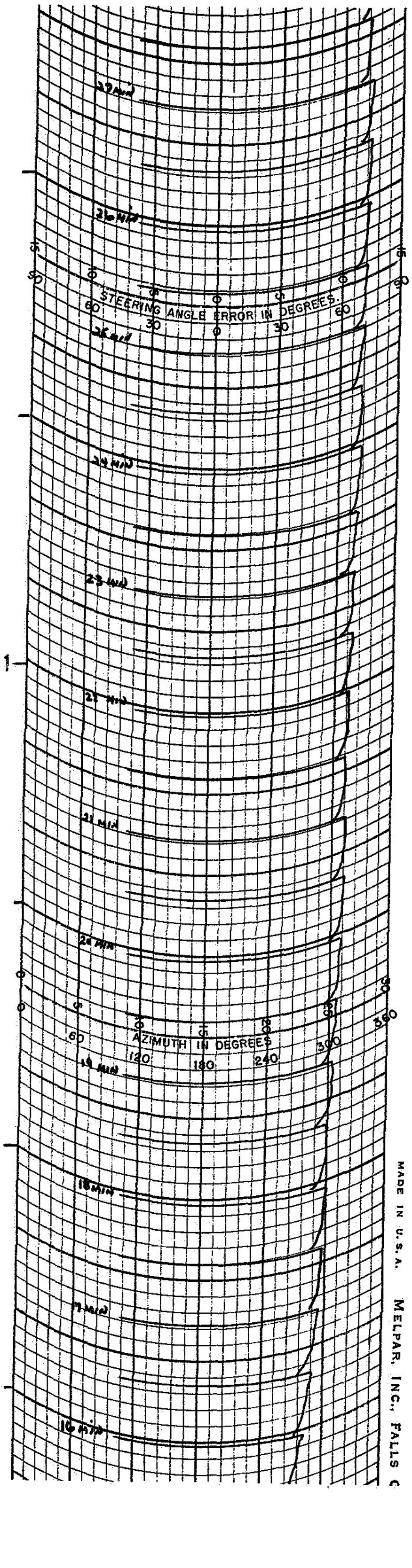


CHART NO. 4803
STEERING ANGLE ERROR IN DEGREES
AZIMUTH IN DEGREES
11
MADE IN U.S.A.
MELPAR, INC., FALLS C

FIGURE 5

MILGO PLOTBOARD PRESENTATION

The figure shown is from a real time analog data presentation called the MILGO system. This system converts the polar form of the radar output into cartesian form and plots the target position as a function of time. The plotting board is a two-arm type unit capable of plotting both Height-Horizontal Range, (H-HR) and East-West, North-South Range components (X-Y) simultaneously.

For the most accurate utilization of the data, it is important that: all scales used be correctly noted on the plot; ink traces be time marked (at least once per minute); and true north and a baseline for orientation of data reduction equipment be clearly indicated. Time marks may be made at 1-, 10-, 30-, or 60- second intervals. For best data presentation it is recommended that one second intervals be used for the rocket's trajectory track and 10 second intervals for the initial tracking of the sensor. Atmospheric wind conditions will normally dictate the scale factor used.

STATION (WRSA) Wallops Island, Va. MODEL # LI-282

DATE August 17, 1966 TIME: 152.1 GCT 1021 LST

VEHICLE TYPE ARCAS PAYLOAD TYPE ARCASONDE 1A AD. # 2

SCALE: ER-H 10,000 ft/inch X-Y 5,000 ft/inch

OPERATORS F. J. Schmidlin, M. Powell

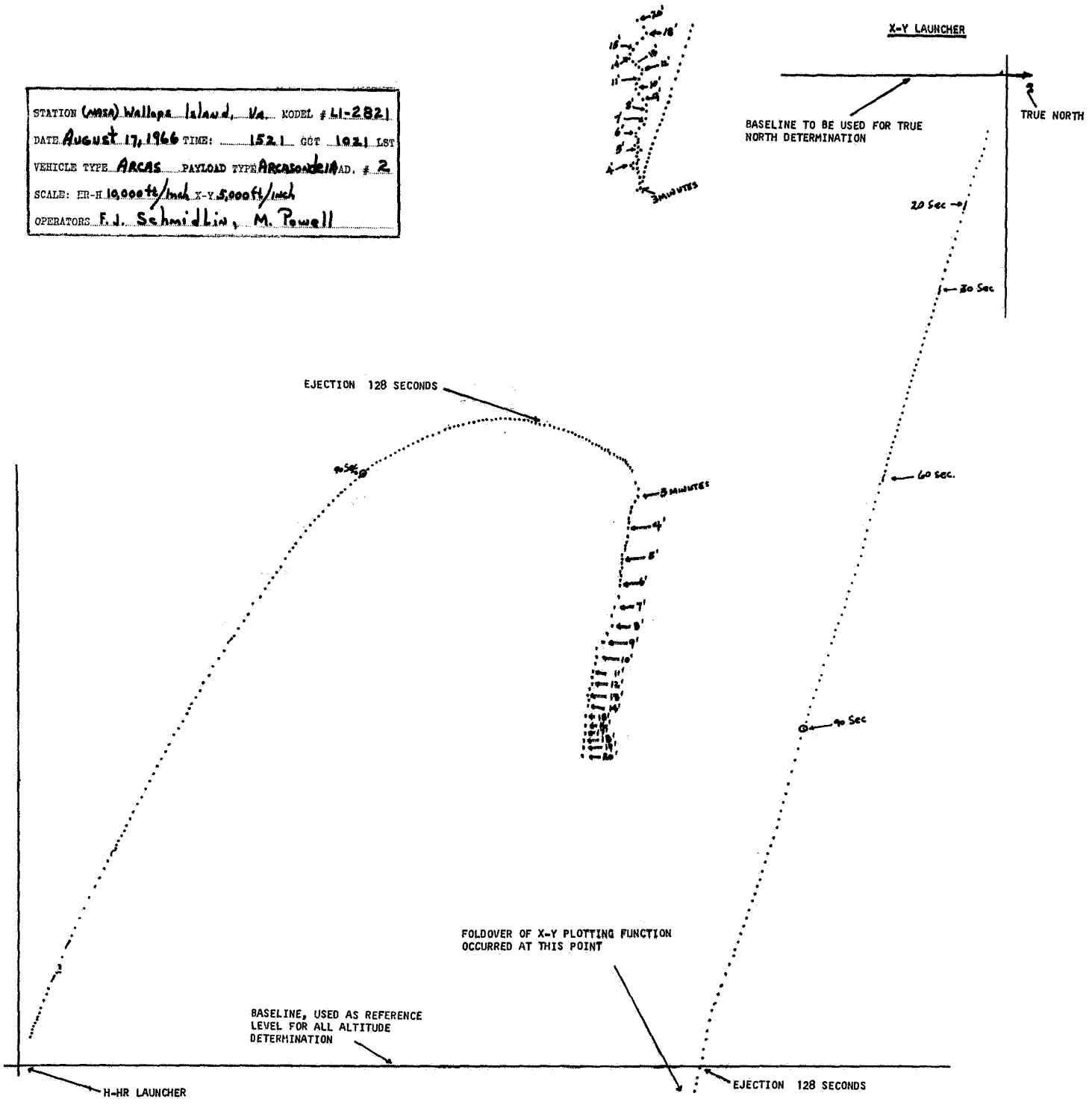


FIGURE 6

TMQ-5 RECORDER RECORD

The TMQ-5 recorder is an integral part of the GMD-1 rawinsonde equipment. The TMQ-5 recorder translates the detected signal from the rocketsonde into graphical functions of temperature and time.

The signals from the rocket radiosonde transmitter in free flight are received on the antenna, amplified, and detected by the receiver. These signals are pulse repetition frequencies (PRF) modulated at an audio rate as a function of atmospheric temperature. The audio signal of approximately 10 to 190 cps from the receiver are shaped, amplified, and converted to a DC analog voltage. This DC voltage output is applied to the recorder. The recorder pen response is a direct function of the magnitude of the applied DC voltage. The recorder provides a permanent record of meteorological temperature conditions aloft for evaluation purposes.

It is important that the telemetry record be clearly annotated as shown in the figure. There is no limitation to the number of significant levels selected. Present criterion for level selection is for a two (2) degree temperature departure from linearity between adjacent levels. The level selected should be marked with the time, temperature ordinate value, and reference ordinate value.

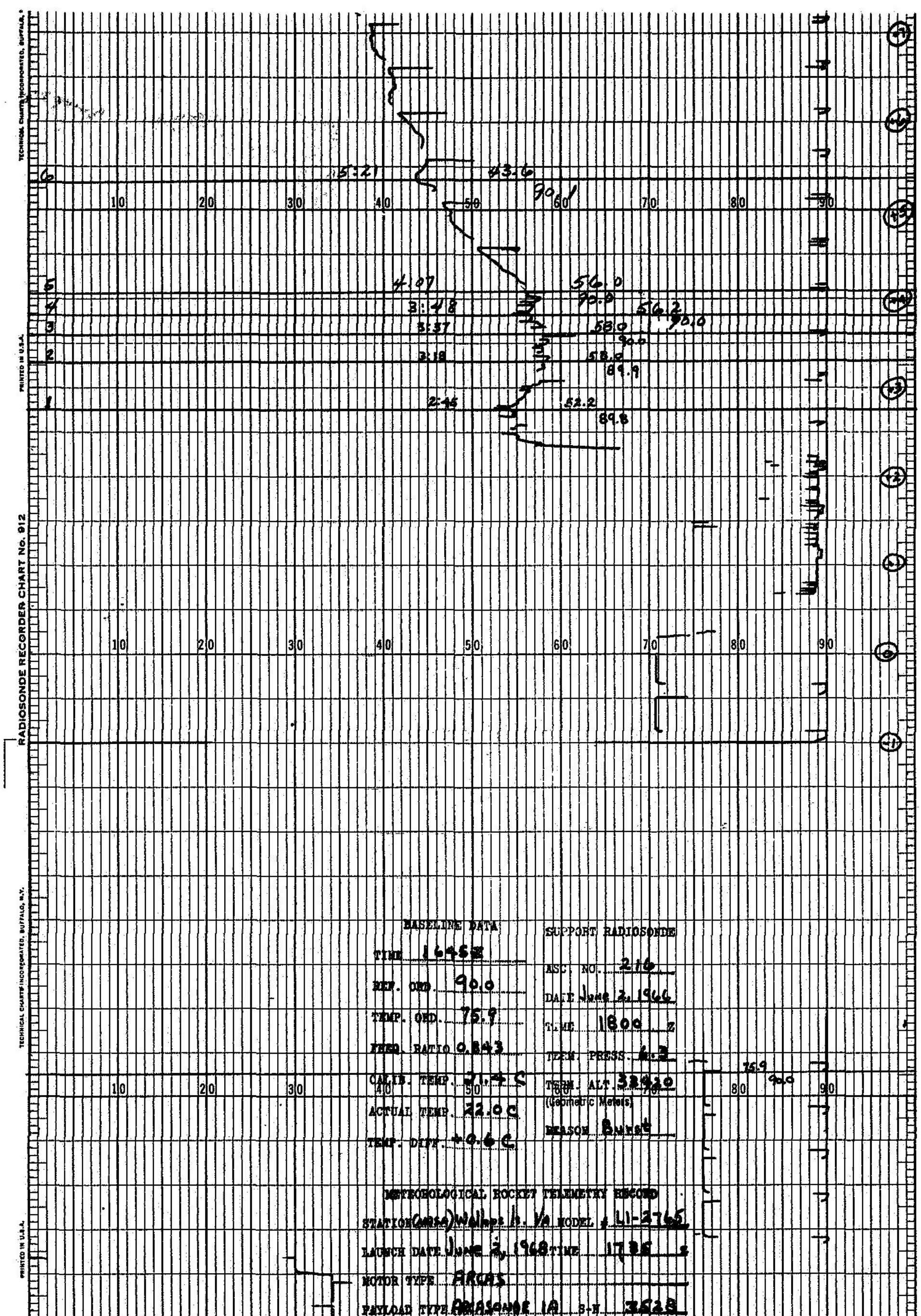

RADIOSONDE RECORDER CHART No. 912
BASELINE DATA
TIME 1645Z
REF. ORD. 90.0
TEMP. ORD. 75.9
FREQ. RATIO 0.843
CALIB. TEMP. 21.4 C
ACTUAL TEMP. 22.0 C
TEMP. DIFF. +0.6 C
SUPPORT RADIOSONDE
ASC. NO. 216
DATE June 2, 1966
TIME 1800 Z
TERM. PRESS.
TERM. ALT. 33420
(Geometric Meters)
REASON Burst
METEOROLOGICAL ROCKET TELEMETRY RECORD
STATION (WRSA) Wallops Is. Va MODEL # LI-2765
LAUNCH DATE June 2, 1968 TIME 1735 Z
MOTOR TYPE ARCAS
PAYLOAD TYPE ARCASONDE 1A S-N 3528
SENSOR TYPE 10 mil bead therm S-N 1058
RECEIVER GMD
RECORDER TMQ CHART SPEED 1 inch/min
COMPUTER M. Powell
VERIFIER V. Boynton

FIGURE 7

403 MHz PORTABLE RECEIVER-RECORDER

This figure is a sample recorder tracing of the 403 MHz portable receiver-recorder. Description of this recorder is similiar to that given in figure 6.

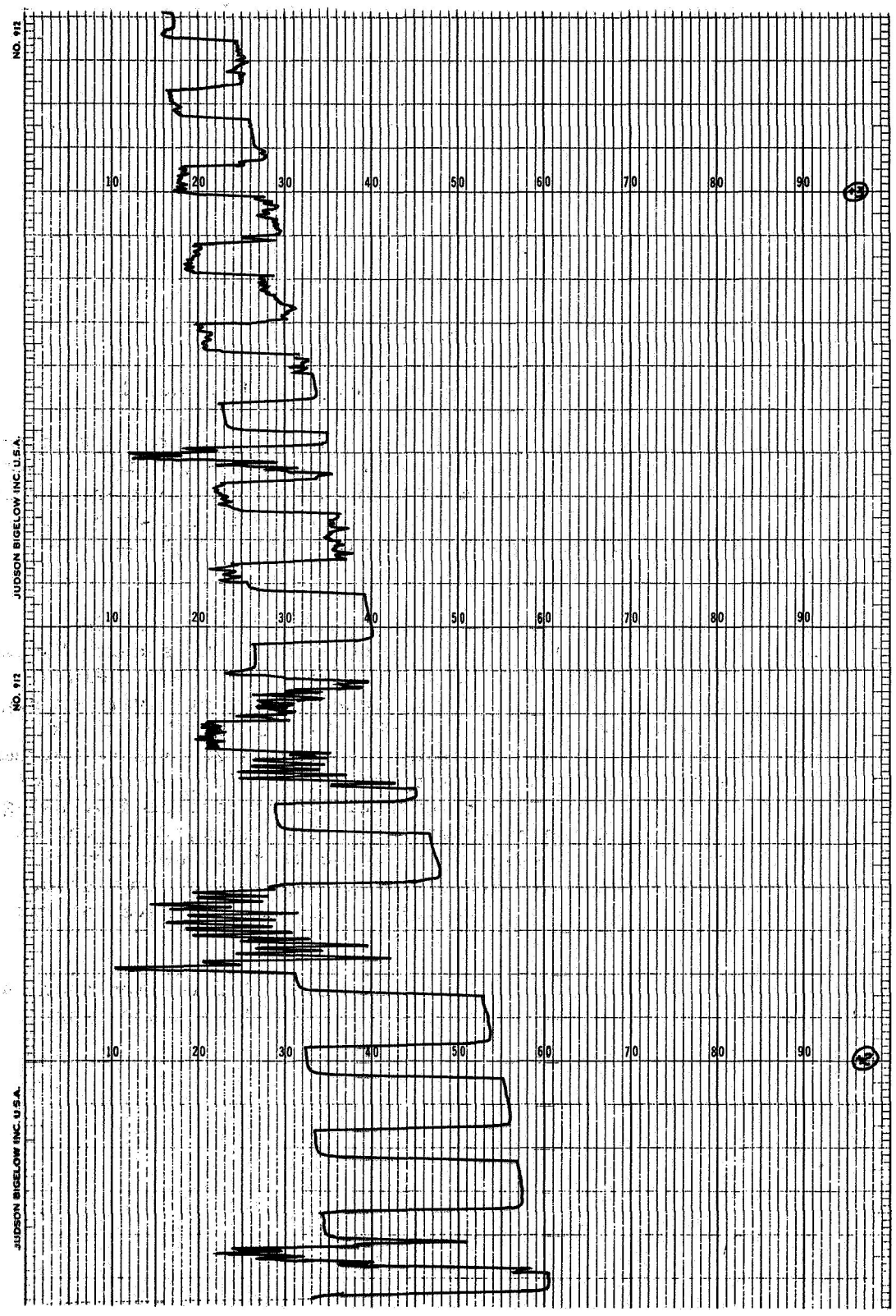

NO. 912
JUDSON BIGELOW INC. U.S.A.
10
20
30
40
50
60
70
80
90
NO. 912
JUDSON BIGELOW INC. U.S.A.

FIGURE 8

ROCKET OBSERVATION DATA (EXAMETNET FORM NO. 1)

To carry out the objectives of EXAMETNET, it is desirable to disseminate the accumulated rocket data as quickly as possible. The form shown on page 19 is an improvement over, and replaces, previous network data forms. It also has the advantage of allowing the data to be distributed to interested scientists prior to formal publication.

Identification entries (Station Name, Date, etc.) are self-explanatory. Entries made in the columns under the section "Rocket Winds" are to be in the units specified in the column headings. The "Rocket Thermodynamics" will contain entries of levels of significant temperature change. The criterion for level selection is: select any level that departs from linearity by 2C or more between adjacent levels. Computation of pressure, density, and speed of sound accomplished by each participant, can be completed by using manual, graphical, or computer methods. The winds, to be entered in conjunction with the significant temperature levels, may be interpolated from the wind profile. The supporting "Rawinsonde" will include data for every two kilometers, the top level of the sounding, and the tropopause.

Technical data provides sufficient additional information about an observation to allow the degree of confidence in the sounding to be established by the user.

ROCKET OBSERVATION DATA

(EXAMETNET FORM NO. 1)

RP STATION NAME

DATE ______ TIME ______ Z

LAT. ______ LONG. ______

ROCKET LAUNCH

DATE ______ TIME ______ Z

RAWINSONDE RELEASE

DATE ______ TIME ______ Z

ROCKET WINDS					
FALL VEL	ALT	WIND			
		POLAR		COMPONENTS MPS	
M/S	KM	DEG	MPS	N-S	E-W
	75				
	74				
	73				
	72				
	71				
	70				
	69				
	68				
	67				
	66				
	65				
	64				
	63				
	62				
	61				
	60				
	59				
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	31				
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	26				
	25				
	24				
	23				
	22				
	21				
	20				
	19				
	18				
	17				
	16				
	15				

ROCKET THERMODYNAMICS							
ALT TENS OF METERS	TEMP	PRESSURE	DENSITY	WIND			
				POLAR		COMPONENTS MPS	
	DEG C	MB	GM^{-3}	DEG	MPS	N-S	E-W
CONSTANT PRESSURE SURFACES (GEOPOTENTIAL HEIGHT)							
		50.000					
		30.000					
		20.000					
		10.000					
		07.000					
		05.000					
		03.000					
		02.000					
		01.000					

RAWINSONDE							
PRESSURE	ALT TENS OF METERS	WIND				RH	TEMP
		POLAR		COMPONENTS MPS			
MB	METERS	DEG	MPS	N-S	E-W	%	DEG C
	0200						
	0400						
	0600						
	0800						
	1000						
	1200						
	1400						
	1600						
	1800						
	2000						

TECHNCAL DATA

MOTOR TYPE: ______ MOTOR PERFORMANCE: ______

PAYLOAD TYPE: ______ PAYLOAD PERFORMANCE: ______

FUSE TYPE: ______ ACTUAL FUSE DELAY TIME: ______ SEC

LAUNCHER SETTING: ______ °azimuth ______ °elevation

RADAR TYPE: ______ APOGEE ______ meters

WIND SENSOR TYPE: ______ SENSOR FALL-RATE: ______

TEMPERATURE SENSOR TYPE: ______

GROUND EQUIPMENT TYPE: ______

REMARKS: ______

RADIOSONDE MANUFACTURER: ______ RADIOSONDE TYPE: ______

TEMPERATURE ELEMENT TYPE: ______ BALLOON TYPE: ______

PRESSURE SENSOR TYPE: ______ BALLOON SIZE: ______ grams

GROUND EQUIPMENT TYPE: ______

WIND AT ROCKET LAUNCH: ______

BALLISTIC WIND: ______ °azimuth ______ mps

THERMODYNAMIC BASE DATA: pressure ______ mbs

temperature ______ °C

altitude ______ meters

NASA WI-883 (12-67)

FIGURE 9

CODED MESSAGES FORM

This form is used to provide a record to the communications personnel of the coded messages exchanged by the participants.

The sample shown should be followed to provide the correct format of the messages. Coding instructions as found in the international ROCOB code and parts C and D of the radiosonde code. Note particularly the additional groups added to the ROCOB code, following JJJ. These groups indicate types of systems and dates of future launches. See Appendix 4 for complete details.

EXAMETNET

CODED MESSAGE'S FORM

Station (NASA) WALLOPS ISLAND, VIRGINIA USA Lat. 37° 51' N Long. 75° 29' W

	Year	Month	Day	Zero Time
75th Mer.	1968	JAN	20	1644
GCT	1968	JAN	20	2144

ROCOB	72402	0530/	202144	20555	28464	21555	27374
25549	26594	26550	26724	28538	26084	30541	75144
33536	77414	35533	76344	36534	76404	39519	77454
40515	77344	41511	77264	45514	76574	50505	76684
53505	77974	54506	/////	JJJ	12802	10603	

Rawinsonde Time 202315 GCT

WW	7100/	72402	70808	595//	50019	589//	30341
534//	20604	531//	YY	7100/	72402	11820	597//
22350	581//	33260	495//	4422/	545//	55115	437//
51515	10190	10061	STOP	MM	71000	72402	XMTD
STOP	WALLOPS EXAMETNET PROJECT MANAGER SENDS BT						

FIGURE 13

COSPAR REPORTING FORM

This form suggested by the Committee on Space Research (COSPAR) is used to report a certain type of information to the World Data Centers. Use of this form by EXAMETNET is voluntary.

The pattern of this form is found in Appendix 1 of the Guide to International Data Exchange through the World Data Centers, IQSY Instruction Manual No. 6.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

REPORT OF SOUNDING ROCKET LAUNCHING

Vehicle No.:	Rocket Type:	Launching Site: Wallops Island, Virginia
L1-2993	JUDI	Co-ordinates: 37° 51' N 75° 29' W

	Name	Affiliation	Address
Project Scientist(s):			
Experimenter(s) and Location:	EXAMETNET	National Aeronautics and Space Administration	Wallops Island Virginia

Objectives and Instrumentation:

To determine stratospheric wind and temperature profile using the instrumented boosted-dart system (Judi I and WOX-3A instrumented payload.)

Remarks:

This was a special test of the WOX-3A instrument. Telemetry data is equivalent to the WOX-1A.

Launching Date (UT):	Time (UT):	Peak Altitude:
March 16, 1967	1429	59.0 KM

Rocket Performance: Good

Instrumentation Performance: Good

Preliminary Experimental Results:

This test was a routine synoptic observation performed for EXAMETNET.

Preliminary descriptive analysis is good.

Comments and Recommendations:

None

FIGURE 14

PUBLISHED FORMAT

The printed and disseminated format for 1966 and 1967 EXAMETNET data is shown on pages 25 and 26. Beginning with January 1968 data, the printed and published format is the same as shown in Figure 8. This data is published quarterly for participant review and correction prior to publication of a highly quality-checked annual report.

ROCKET OBSERVATIONAL DATA

METEOROLOGICAL ROCKET SOUNDING DATA

RP	STATION NAME	DATE	ROCKET LAUNCH TIME Z	RAWINSONDE RELEASE TIME Z
	(CNIE) CHAMICAL ARGENTINA			
87320	30° 22' S 67° 17' W ALT. 457 M	SEPTEMBER 21, 1966	1640	1415

TABULATED DATA

ROCKET WINDS

TIME TENTHS OF A MINUTE	FALL VEL M/S	ALT KM	WIND POLAR DEG	KTS	COMPONENTS MPS N-S	E-W
021	111	60	270	093	+000	+048
023	111	59	261	167	+013	+085
024	111	58	259	172	+017	+087
026	111	57	264	141	+008	+072
027	111	56	272	160	-003	+082
029	111	55	277	149	-009	+076
030	111	54	277	112	-007	+057
032	111	53	286	109	-015	+054
033	083	52	293	104	-021	+049
036	067	51	288	114	-018	+056
038	067	50	279	098	-008	+050
041	067	49	270	105	+000	+054
043	067	48	272	117	-002	+060
046	056	47	274	113	-004	+058
049	056	46	283	106	-012	+053
052	056	45	292	094	-018	+045
055	056	44	287	081	-012	+040
058	056	43	285	084	-011	+042
061	048	42	288	086	-014	+042
065	042	41	287	079	-012	+039
069	042	40	278	088	-006	+045
073	037	39	277	084	-005	+043
078	037	38	280	079	-007	+040
082	033	37	271	076	-001	+039
088	028	36	263	068	+004	+035
094	028	35	253	059	+009	+029
100	026	34	244	050	+011	+023
107	022	33	242	042	+010	+019
115	022	32	245	037	+008	+017
122	022	31	247	030	+006	+014
130	020	30	243	022	+005	+010
139	017	29	230	015	+005	+006
150	016	28	239	011	+003	+005
160	015	27	281	010	-001	+005
172	014	26	342	006	-003	+001
184	013	25	027	004	-002	-001
198	011	24	000	004	-002	+000
213	011	23	014	008	-004	-001
228	010	22	045	008	-003	-003
246	009	21	056	007	-002	-003
264	008	20	000	004	-002	+000
288	008	19	270	004	+000	+002
308	008	18	254	014	+002	+007
332	008	17	250	023	+004	+011

ROCKET THERMODYNAMICS

ALT TENS OF METERS	TEMP DEG C	PRESSURE MB	DENSITY G M -3	SPEED OF SOUND M/S	WIND POLAR DEG	KTS	COMPONENTS N-S	E-W
5200	-01.9	00.067	00.086	330	293	104	-021	+049
5066	-01.7	00.079	00.101	330	286	109	-015	+054
4648	-03.2	00.133	00.171	329	278	108	-008	+055
4458	-06.5	00.170	00.222	327	289	089	-015	+043
4349	-09.8	00.193	00.256	325	285	083	-011	+041
4180	-07.3	00.240	00.314	327	289	084	-014	+041
3950	-13.8	00.322	00.433	323	278	086	-006	+044
3790	-22.3	00.398	00.553	317	279	079	-006	+040
3652	-25.2	00.480	00.674	316	268	072	+001	+037
3580	-32.5	00.530	00.768	311	262	067	+005	+034
3490	-36.7	00.602	00.887	308	252	057	+009	+028
3400	-39.8	00.686	01.024	306	244	050	+011	+023
3242	-45.7	00.864	01.324	302	243	039	+009	+018
2943	-44.1	01.347	02.048	303	238	018	+005	+008
2842	-47.6	01.565	02.418	301	231	012	+004	+005
2622	-45.7	02.175	03.331	302	326	007	-003	+002
2525	-50.3	02.517	03.935	299	027	004	-002	+001
2415	-48.4	02.973	04.609	301	000	004	-002	+000
2315	-52.9	03.463	05.477	298	014	008	-004	+001
2160	-57.9	04.409	07.135	294	045	008	-003	+003
2026	-58.2	05.447	08.827	294	027	004	-002	+001
1850	-59.4	07.198	11.731	293	259	010	+001	+005
1835	-64.0	07.374	12.282	290	259	010	+001	+005
1715	-62.7	08.955	14.824	291	248	021	+004	+010
1665	-61.7	09.706	15.991	292				
1570	-59.8							

CONSTANT PRESSURE LEVEL DATA
(HEIGHT IN GEOPOTENTIAL METERS)

1643	-61.3	10.000	16.448	292				
1865	-59.3	07.000	11.401	293	256	008	+001	+004
2077	-58.1	05.000	08.099	294	056	007	-002	-003
2674	-46.2	02.000	03.071	302	284	008	-001	+004
3142	-45.3	01.000	01.529	303	246	034	+007	+016

RAWINSONDE

PRESSURE MB	ALT TENS OF METERS	WIND POLAR DEG	KTS	COMPONENTS N-S	E-W	RH %	TEMP DEG C
0975.0	0046	070	005	-001	-002	37	+16.4
0809.0	0200	053	010	-003	-004	70	+02.1
0630.0	0400	236	018	+005	+008	23	-02.2
0486.0	0600	217	032	+013	+010	30	-18.9
0370.0	0800	231	046	+015	+018	50	-34.4
0275.0	1000	235	052	+015	+022		-49.0
0199.8	1200	229	065	+022	+025		-58.9
0146.0	1400	261	060	+005	+031		-61.3
0105.8	1600	248	040	+008	+019		-60.6
0097.0	1800	246	019	+004	+009		-60.3
0056.0	2000	100	007	+001	-004		-56.9
0040.8	2200	049	010	-003	-004		-55.2

TECHNICAL DATA

VEHICLE DATA..
MOTOR TYPE.. JUDI
MOTOR PERFORMANCE.. GOOD
PAYLOAD TYPE.. WDX-1A
PAYLOAD PERFORMANCE.. GOOD
FUSE TYPE.. PYROTECHNICAL
FUSE DELAY TIME.. 90 SECONDS
TYPE OF LAUNCHER.. 8-1/2 FT TUBULAR
LAUNCHER SETTING.. 40 DEG AZIMUTH, 0 DEG ELEVATION

RADAR DATA..
RADAR TYPE.. MPS-19
MOTOR ACQUISITION AT 4 SECONDS, 3048 METERS ALTITUDE
MOTOR TRACK DROPPED AT 100 SECONDS, 62880 METERS ALTITUDE
PAYLOAD ACQUISITION AT 100 SECONDS, 62880 METERS ALTITUDE
PAYLOAD TRACK DROPPED AT 2160 SECONDS, 14935 METERS ALTITUDE
APOGEE.. OCCURRED AT 100 SECONDS, 62880 METERS ALTITUDE

SENSOR AND TELEMETRY DATA..
WIND SENSOR.. 6 FT SQ PARACHUTE
TEMPERATURE SENSOR.. .014 BEAD THERMISTOR
SENSOR FALL RATE.. NORMAL
GROUND EQUIPMENT TYPE.. WB PORTABLE
TELEMETRY FREQUENCY.. 403 MHZ
TELEMETRY QUALITY.. GOOD
TELEMETRY DATA RECEIVED FROM 90 SECONDS, 61800 METERS ALTITUDE UNTIL 2160 SECONDS, 14935 METERS ALTITUDE

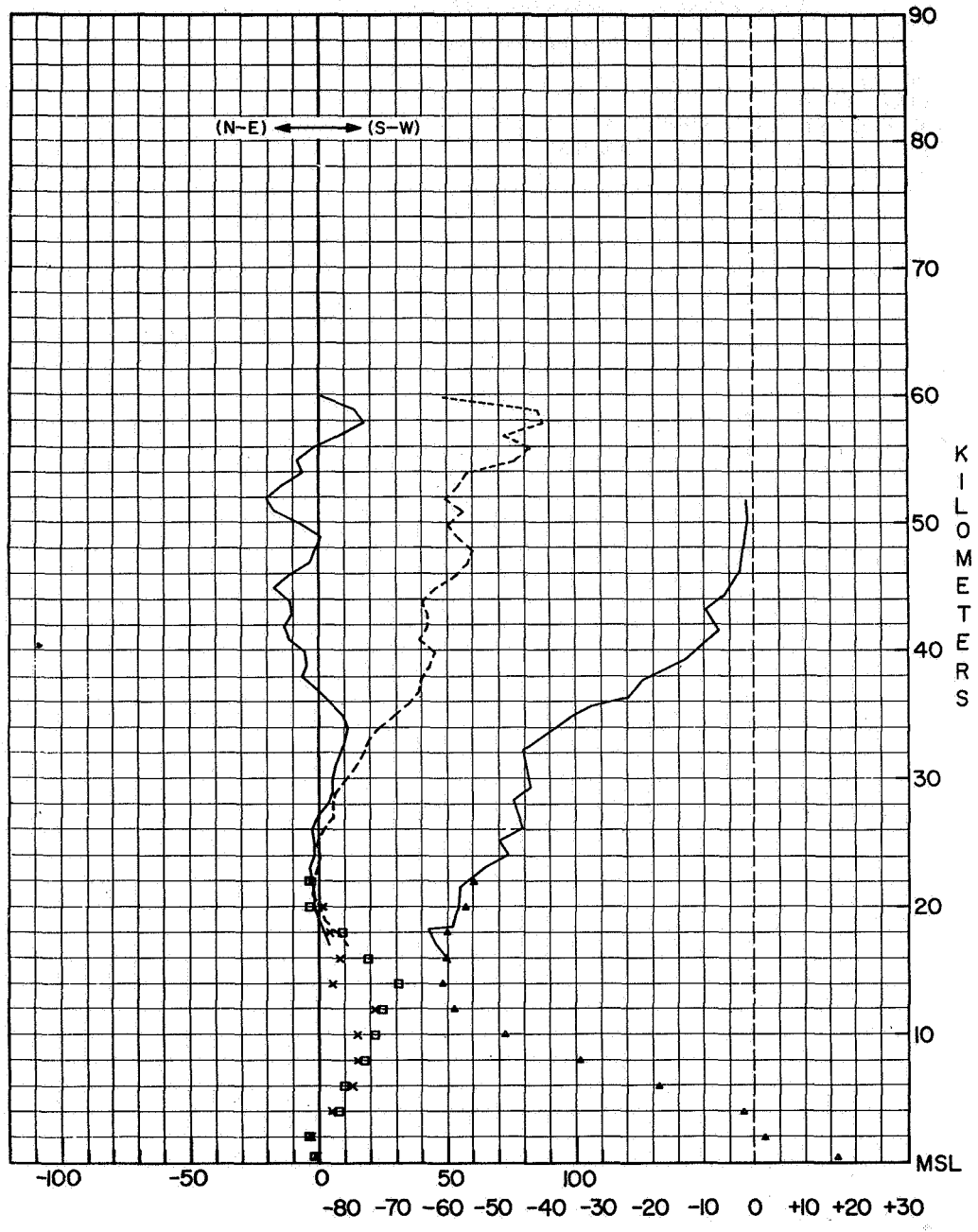
REMARKS..
PAYLOAD FALL RATE BELOW NORMAL
THERMODYNAMICS BASE DATA.. PRESSURE= 11.3 MB
ALTITUDE= 15700 METERS
TEMP= -59.8 DEG. C

RADIOSONDE AND BALLOON DATA..
RADIOSONDE MANUFACTURER.. VAISALA
RADIOSONDE TYPE.. VAISALA
TEMPERATURE ELEMENT TYPE.. BIMETEL
PRESSURE SENSOR TYPE.. ANEROID
GROUND EQUIPMENT TYPE.. VAISALA
BALLOON TYPE.. TOTEX
BALLOON SIZE.. 800 GRAMS
FREE LIFT.. 1800 GRAMS
ASCENSION RATES.. SFC-400MB= 296 METERS/MINUTE
400MB-BURST= 356 METERS/MINUTE

WEATHER OBSERVATION AT RAWINSONDE RELEASE..
STATION PRESSURE.. 975.0 MB
TEMPERATURE.. 16.4 DEG C
RELATIVE HUMIDITY.. 37%
VISIBILITY.. 30 KILOMETERS
SURFACE WIND.. 70 DEG, 5 KTS
CLOUD TYPE AND AMOUNT.. 3 OCTAS
LOW CLOUD TYPE AND AMOUNT.. NONE
MIDDLE CLOUD TYPE AND AMOUNT.. NONE
HIGH CLOUD TYPE AND AMOUNT.. NONE
TYPE PRECIPITATION.. NONE
OBSTRUCTIONS TO VISION.. NONE

WIND DATA..
WIND AT ROCKET LAUNCH.. 50 FT 7 DEG/5KTS, 100 FT 12 DEG/6KTS
150 FT 14 DEG/6KTS, 200 FT 12 DEG/7.5KTS
250 FT 0 DEG/0KTS

GRAPHIC DATA



LEGEND

ROCKET: N/S - - - - RAWIN: N/S XXXX
E/W ———— E/W □□□□
TEMP—— TEMP △△△△

STATION: (CNIE) CHAMICAL ARGENTINA
DATE: 21 9 66
ROCKET TIME: 1240 LST 1640 GCT
ROCKET MOTOR TYPE: JUDI I
PAYLOAD TYPE: WOX-1A (403 MHZ)
RADIOSONDE TYPE: VALSALA

INSTRUCTIONS FOR ROCKET WINDS ALOFT DATA REDUCTION

When radar tracking is completed, the plotboard record (Figures 1 and 5) is taped to a flat table. A draftsman-type table with a horizontal motion protractor is preferable. Determine a layer-mean wind over a two-kilometer layer. The altitude for which this layer-mean wind data is reported is the mid-point of the layer and is usually a whole kilometer.

1. From either the H-HR plot or the altitude-time strip chart determine the elapsed time (ΔT) the sensor took to fall from the upper level to the lower level of the two-kilometer layer.

2. From the X-Y plotted data, measure the horizontal displacement of the sensor. This displacement (measured in feet) is that which occurred in the two-kilometer layer.

3. On the X-Y plot and within the two-kilometer layer determine the direction of the displacement with respect to true north. Enter this direction in the column provided on the Rocket Observation Form (EXAMETNET FORM NO. 1, Figure 8).

4. Divide the displacement by the time difference (ΔT) over the two-kilometer interval and multiply by the constant 0.3048 to derive the wind speed in meters per second. The wind speed is entered in the column provided on the Rocket Observation Data Form.

5. Convert the wind direction and speed to component velocities and enter in the appropriate columns of the Rocket Observation Data Form.

INSTRUCTIONS FOR ROCKETSONDE TEMPERATURE DATA REDUCTION

1. When telemetry tracking is completed the temperature record will be reduced. Enter the appropriate rubber stamp entries at the beginning of the recorded data.

2. Select a temperature level at the first usable, recorded temperature. Select additional levels based on a 2C temperature departure from linearity between adjacent levels.

3. The time, in minutes and seconds, and the reference and temperature ordinate values will be marked on the record as shown in Figure 6.

4. Determine the actual temperature using applicable instructions for the specific payload. For example:

    a. When using the WOX-1A type, calculate the thermistor resistance value by instructions contained in the handbook "Rocket, Meteorological 1.375-inch and 1.625-inch Types (HASP) Description and Instructions for Use", NAVWEPS OP 2700, 4th revision (this document is available from the Chief of the Bureau of Naval Weapons). Use the thermistor resistance and temperature calibration chart (furnished with each WOX-1A) to determine the temperature.

    b. When using the Arcasonde 1-A calculate the frequency ratio using instructions supplied with each payload (e.g., divide the temperature ordinate value by the reference ordinate value to determine the ratio); use the frequency ratio and the calibration chart supplied to determine the temperature.

5. Enter the temperature in the column provided on the Rocket Observation Data Form (EXAMETNET FORM NO. 1, Figure 8).

6. Determine, from the radar altitude record, the altitude corresponding to the time at which the temperature level selected occurred. Enter this altitude on the Rocket Observation Data Form.

APPENDIX SECTION

APPENDIX 1

TABLE 1

REPORTING STATION, POSITION AND ALTITUDE

01	(CNIE) Chamical, Argentina	30° 22' S	67° 17' W	456 Meters
02	(CNAE) Natal, Brazil	05° 55' S	35° 10' W	42 Meters
03	(NASA) Wallops Island, Virginia	37° 51' N	75° 29' W	3 Meters
04	Reserved			
05	Reserved			
06	Reserved			
07	Reserved			
08	Reserved			

TABLE 2

TYPE OF WIND SENSING EQUIPMENT

01	0.005 inch "S" band copper chaff	11	1 meter inflatable sphere (ROBIN)
02	Reserved	12	Inflatable sphere (other type)
03	Reserved	13	Reserved
04	Reserved	14	Reserved
05	Reserved	15	Reserved
06	6 foot square parachute	16	Reserved
07	15 foot diameter parachute	17	Reserved
08	7.8 foot diameter	18	Reserved
09	16 ft. dia. Disk-Gap-Band parachute	19	Reserved
10	Reserved	20	Other Type (describe in remarks)

TABLE 3

TYPE OF ROCKET MOTOR

01	MK 32 Mod 0	09	SKUA
02	Judi I	10	Reserved
03	Loki	11	Gun Probe (5 inch)
04	Reserved	12	Gun Probe (7 inch)
05	Reserved	13	Reserved
06	Arcas	14	Reserved
07	Boosted Arcas	15	MT-135
08	Reserved	16	Reserved

TABLE 4

TYPE OF GROUND TRACKING EQUIPMENT

01	MPS-19 radar	09	Verlort
02	Mod II radar	10	Reserved
03	FPS-16 radar	11	GMD-1 (a) or (b)
04	Spandar	12	GMD-2
05	FPQ-6 radar	13	Portable 403 MHz receiver-recorder
06	Cotal	14	Reserved
07	Super Cotal	15	Eddystone & Smith 28 MHz system
08	Reserved	16	RD-66

TABLE 5

TYPE OF PAYLOAD

01	WOX-1A (403 MHz)	06	MET 56000 (SKUA)
02	WOX-3A (403 MHz)	07	Reserved
03	Arcasonde 1A	08	ES64B
04	Arcasonde 2B	09	Reserved
05	SCD Datasonde	10	Reserved

TABLE 6

TYPE OF TEMPERATURE SENSOR

01	0.014 inch bead thermistor	06	Reserved
02	0.010 inch bead thermistor	07	Reserved
03	Resistance wire	08	Reserved
04	SDC Thin-film mount	09	Reserved
05	Reserved	10	Other (describe)

APPENDIX 2
ROCKETSONDE FORM OF MESSAGE

1. Form of Message

ROCOB IIiii $rae_s m_r G_d$ YYGGgg

$HHZ_T TT$ $ddffj_n$ $(9d_p p_1 p_1 p_1)$

$HHZ_T TT$ $ddffj_n$ $(9d_p p_1 p_1 p_1)$ .... etc. .... JJJ

2. Definitions

UN = Rocketsonde. (Telecommunications identification used in the heading of collective. This identication is being used on temporary basis.)

ROCOB = Code Name for Rocketsonde Form of Message.

ROCOB SHIP= Code name for Rocketsonde Form of Message from a ship. When the ship form of message is used the group IIiii is replaced by the groups $YQL_a L_a L_a \; L_o L_o L_o //$ $MMMU_{La} U_{Lo}$

and the form becomes: ROCOB SHIP $YQL_a L_a L_a \; L_o L_o L_o //$

$MMMU_{La} U_{Lo}$ $rae_s m_r G_d$ YYGGgg .... etc. .....

IIiii = Index Number of the observing station; i. e., where the telemetering equipment is located. (Note: In the event an index number has not been assigned the Location Identifier will be substituted.

r = Type of rocket motor. (Code Table 1)

a = Reason for no report and ground equipment. (Code Table 2)

e_s = Type of data sensing equipment. (Code Table 3)

m_r = Method of reducing data. (Code Table 4)

G_d = Estimated delay until replacement replacement rocket is fired. (Code Table 5)

YY = Day of the month (GCT) on which the observation was taken.

GGgg = Time of observion in hours and minutes GMT. The time of firing of the rocket is the time of observation.

HH = Altitude, to the nearest kilometer, of the level for which data are reported.

Z_T = Character of the temperature. (When the temperture is zero degrees or above, code figure 0 is reported for Z_T.

When the temperature is within the range of -1° to -99°, inclusive, code figure 5 is reported for Z_T.

When the temperature is within the range of -100° to -199°, inclusive, code figure 6 is reported for Z_T.

When the temperature is missing for any reason, the solidus (/) is reported for Z_T.

TT = Temperature of the air in whole degree Celsius. The absolute value of the temperature is reported (i. e., the plus or minus sign is disregarded in determining the value to be coded.) For example: If the temperature is -57°, the coding is TT= 57 and Z_T = 5. When the temperature is missing for

any reason, two solidi (//)are reported for TT.

dd = True direction, in tens of degrees, from which the wind is blowing at the specified level. (WMO Code 0877) When the wind speed is 100 to 199 knots, inclusive, 50 is added to the value normally reported for "dd".

When the wind direction is missing for any reason, two solidi (//) are reported for dd.

ff = Wind speed in knots at the specified level. For wind speeds of 100-199 knots, inclusive, 50 is added to "dd" and the actual speed in excess of 100 is reported for "ff". For wind speeds of 200 to 299, inclusive, the speed in excess of 200 is reported for "ff" and the group 00200 is inserted in the message immediately following the "ddffj_n" group for the specified level.

When the wind speed is missing for any reason, two solidi (//) are reported for ff.
(Note: 50 is added to "dd" only when the speed is from 100 to 199, inclusive.)

j_n = Thickness of the layer through which the wind speed and direction was determined. Normally these elements will be averaged over a 2km. layer for both MANDATORY and SIGNIFICANT levels (i. e., 1km. on each side of the altitude reported.) In cases where this is impracticable or produces a nonrepresentative value the thickness of the

actual layer used will be reported. (Code Table 6)

9 = Indicator figure for the $9d_pP_1P_1P_1$ group.

d_p = Decimal point locator. The number of places to the left of the third significant figure the decimal point must be placed in order to obtain the actual density in g/m is reported for symbol d_p. (Note: The third significant figure is always included in the value reported for symbol d_p).

[Example: Assume 120 g/m^3, the group is coded 90120 (i. e., $d_p = 0$)
Assume 1.20 g/m^3, the group is coded 92120 (i. e., $d_p = 2$).

Assume 0.281 g/m^3, the group is coded 93281 (i. e., $d_p = 3$).

Assume 0.0788 g/m^3, the group is coded 94788 (i. e., $d_p = 4$).]

$P_1P_1P_1$ = Density in g/m^3 rounded to three significant figures, at the specified level

JJJ = Termination group. The letters JJJ are always included as the last group of the report to indicate its end.

Y = Day of the week (GCT) on which the observation is taken. (Code Table 7).

Q = Octant of the globe. (Code Table 8).

$L_aL_aL_a$ = Latitude in tenths of degrees.

$L_oL_oL_o$ = Longitude in tenths of degrees. The hundreds digit is omitted for longitudes 100° to 180°.

MMM = Number of the Marsden Square for the ship's position at the time of observation.

U_{La} = Units figure in the reported Latitude.

U_{Lo} = Units figure in the reported longitude.

NOTES

1. MANDATORY levels are defined as specified altitudes for which data are reported. These levels are:
   (a) the 20, 25, 30, 35, 40, 45, 50, etc., kms. and for every 5 kms. upward to the top of the ascent, and
   (b) the lowest (i. e., termination) level of the ascent for which data are available, provided its altitude is higher than 20 kms.

   In the event data are not available for one of the specified altitude MANDATORY levels, the code group for that level will be inserted in the report in its altitude sequential order and solidi (/ or //, as appropriate) will be reported for the missing elements.

2. SIGNIFICANT levels are defined as those levels (other than MANDATORY) at which significant changes occur. Whenever any one of the criteria is satisfied, all data available for that SIGNIFICANT level will be reported. SIGNIFICANT levels are determined according to the following criteria:

2.1. Speed - A departure of 10 or more knots from a linear interpolation between any two consecutive levels selected for transmission;

OR

2.2 Direction - When the departure from a linear interpolation between any two consecutive levels selected for transmission is one of the following:

2.2.1 60° or more When the average wind speed for the layer is 16* to 30 knots, inclusive;

2.2.2 30° or more When the average wind speed for the layer is 31 to 60 knots, inclusive;

2.2.3 20° or more When the average wind speed for the layer is 61 knots or greater;

OR

2.3 Temperature - A temperature change of 3° from linearity between any two consecutive levels selected for transmission.

* (Note: Speeds of 15 knots, or less, are not considered to be of significance for this purpose.)

3. A SIGNIFICANT level will be reported when any one of the above criteria (i. e., speed, direction or temperature) is satisfied. All data available will be reported for each SIGNIFICANT level included in the message. The MANDATORY and SIGNIFICANT levels are intermixed in the message in ascending order with respect to altitude.

NOTES (Continued):

4. The $9d_p p_1 p_1 p_1$ group is enclosed in parentheses to indicate that the group is included in the message when data are available and omitted whenever data are not available.

5. The $HHZ_T TT$ $ddfff j_n$ groups are always included in the message for each level reported.

6. The first four groups (i. e., ROCOB IIiii $rae_s m_r G_d$ YYGGgg) are always included in the report.

7. When a firing is made but data are not obtained, the group "$rae_s m_r G_d$" is coded as follows:

   Symbols r, e_s and m_r = code figures normally applicable will be reported.

   Symbol a - a code figure from 0 through 4 will be reported.

   Symbol G_d - the code figure from 0 through 8 which best describes the expectations for firing a replacement rocket will be reported.

   Code figure 9 will be reported when it is definitely known that a replacement rocket will NOT be fired.

8. When a firing is made and data are obtained, the solidus (/) will be reported for symbol "G_d".

APPENDIX 2 (CONT'D)

TABLES OF SPECIFICATIONS

Code Table 1

Symbol r = Type of Rocket Motor

Code Figure	Type of Rocket Motor
0	4.5 inch, end burning
1	3.0 inch, internal burning
2	Boosted, 4.5 inch end burning
	" 3.0 inch internal burning

Code Table 2

Symbol a = Reason for No Report and Ground Equipment

Code Figure	Reasons for No Report and Type of Tracking Equipment
0	Data doubtful and not transmitted, reason not specified
1	Rocketmotor failure
2	Instrument (or telemetry) signal not received by tracking equipment - data not available
3	Ground tracking equipment failure
4	Automatic data processing equipment failure
5	GMD-1 and radar
6	GMD-2
7	FPS-16 class
8	Unassigned
9	Other tracking systems not comparable to GMD-1 and radar, GMD-2 or FPS-16 class (i. e., double GMD-1, SCR 584, etc.)

Code Table 3

Symbol e_s = Type of Data Sensing Equipment

Code Figure	Type of Data Sensing Equipment
0	Falling sphere
1	Chaff
2	Immersion thermometry with hypsometer
3	Immersion thermometry without hypsometer
4	Pressure or density guage
5	Unassigned
6	"
7	"
8	"
9	Other Type

TABLE OF SPECIFICATIONS

Code Table 4

Symbol m_r = Method of Reducing Data

Code Figure	Method of Reducing Data
0	Manually - Nomogram
1	Electronic computer
2	Unassigned
3	"
4	"
5	"
6	"
7	"
8	"
9	Other Method

Code Table 5

Symbol G_d = Estimated Delay until Replacement Rocket is Fired

Code Figure	Estimated Delay	
0	0 - 3 hours after scheduled launch	= Replacement rocket will be fired
1	3 - 6 hours " " "	
2	6 -12 hours " " "	
3	12 -18 hours " " "	
4	18 -24 hours " " "	
5	1 - 2 days " " "	
6	2 - 3 days " " "	
7	Over 3 days	
8	Unknown	
9	Replacement rocket will not be fired	
/	Replacement rocket not required	

Symbol j_n = Thickness of the layer through which the wind speed and direction was determined

Code Figure	Thickness of layer Meters
0	0 - 250
1	251 - 500
2	501 - 1000
3	1001 - 1500
4	1501 - 2500
5	2501 - 3500
6	3501 - 4500
7	4501 - 5500
8	5501 - 6500
9	6501 - or greater

Code Table 7

Symbol Y = Day of the Week (GCT)

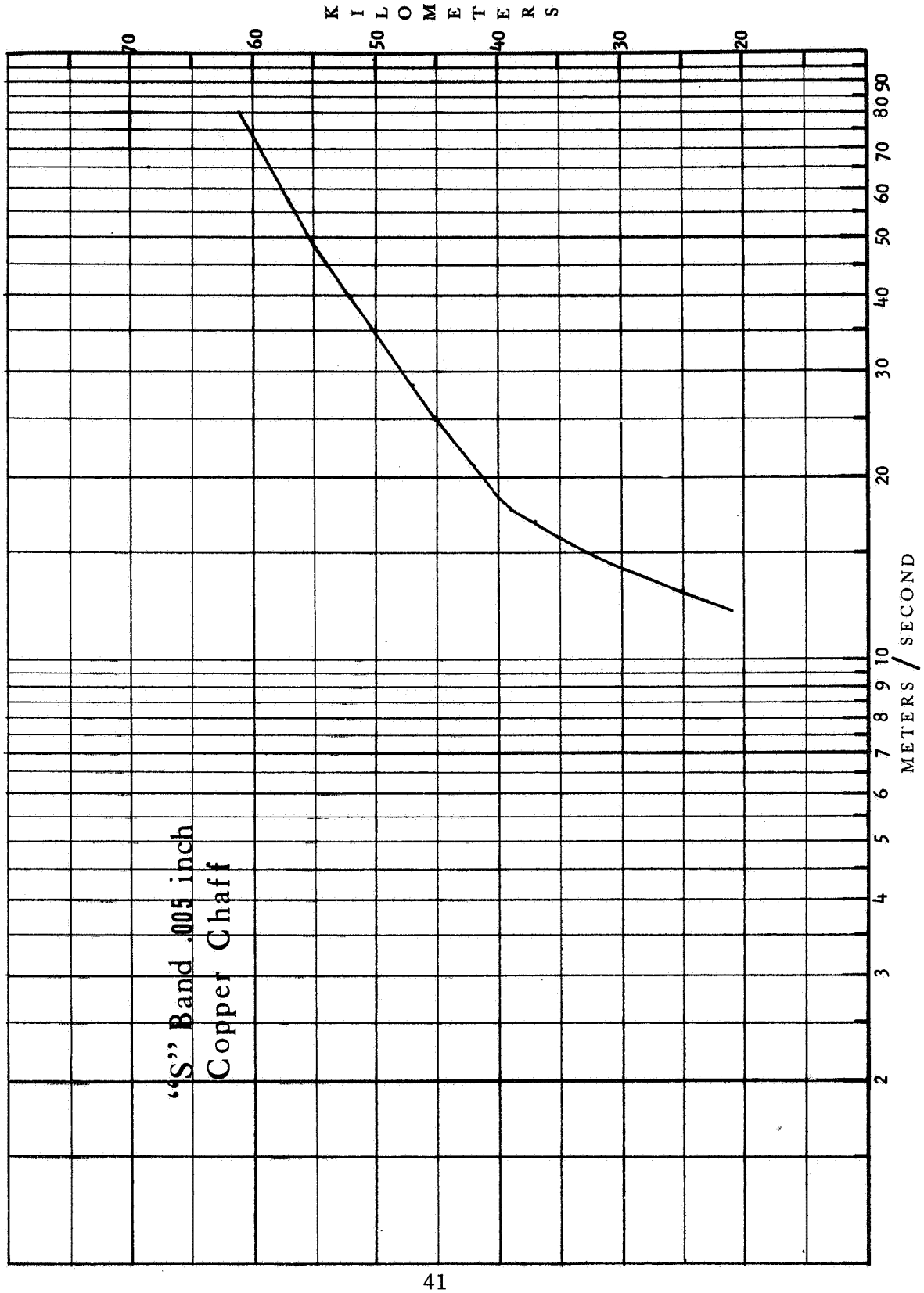
Code Figure	Day
0	
1	Sunday
2	Monday
3	Tuesday
4	Wednesday
5	Thursday
6	Friday
7	Saturday

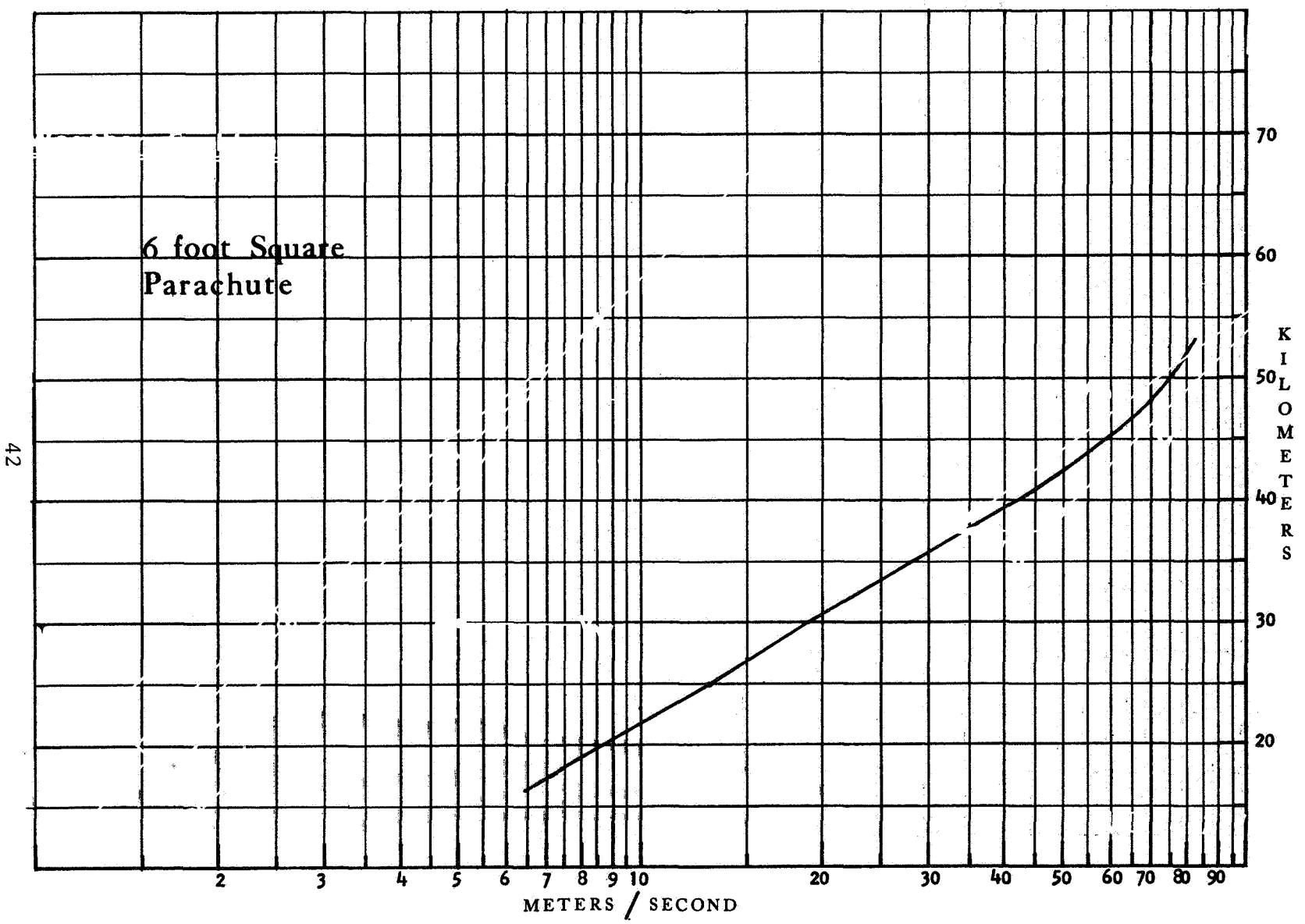
Code Table 8

Symbol Q=Octant of the Globe

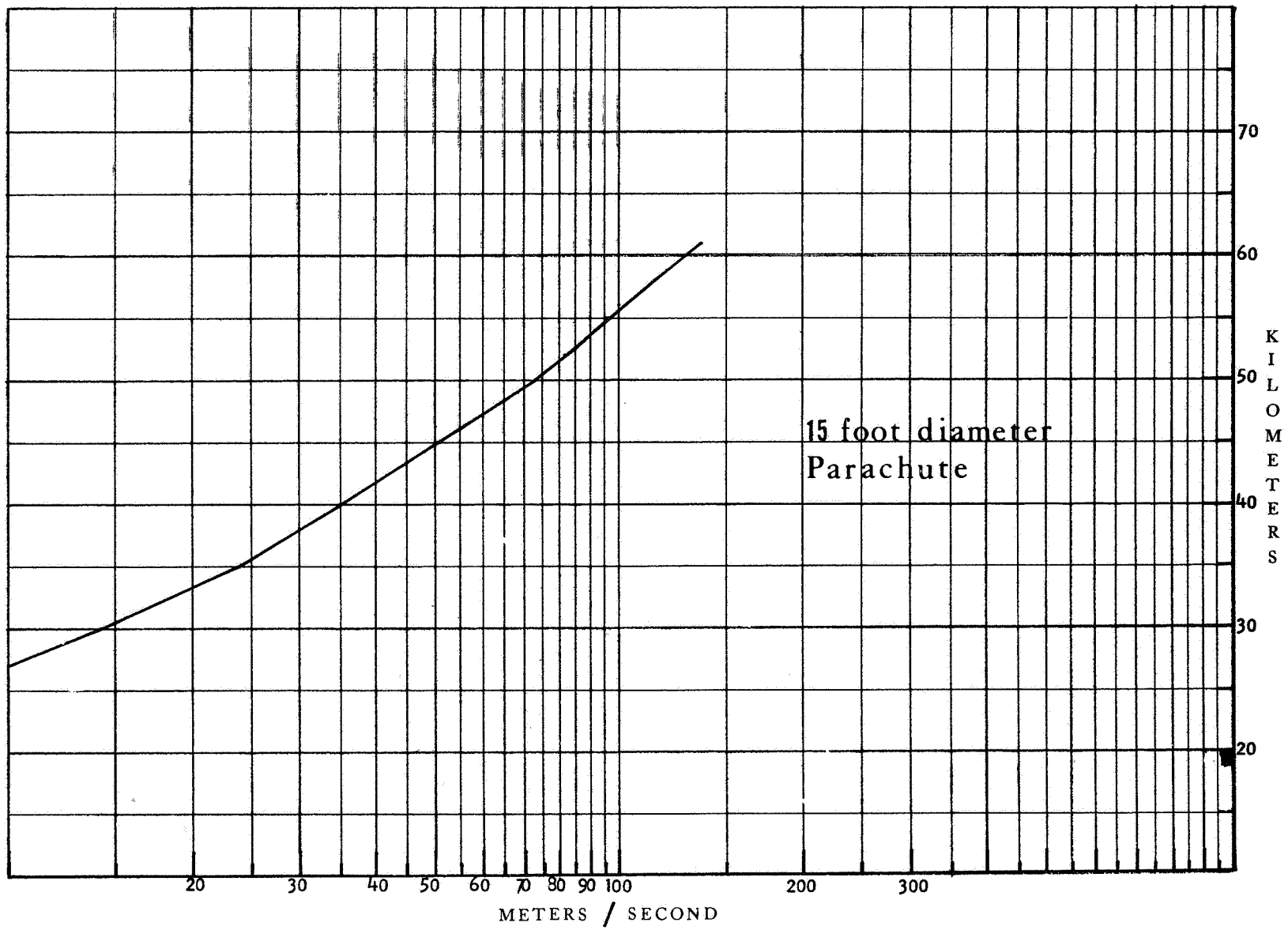
Code Figure	Longitude
0	0° 90° W (Northern Hemisphere).
1	90° W to 180° (Northern Hemisphere).
2	180° to 90° E (Northern Hemisphere).
3	90° E to 0° (Northern Hemisphere).
4	
5	0° to 90° W (Southern Hemisphere).
6	90° W to 180° (Southern Hemisphere).
7	180° to 90° E (Southern Hemisphere).
8	90° E to 0° (Southern Hemisphere).
9	

APPENDIX 3

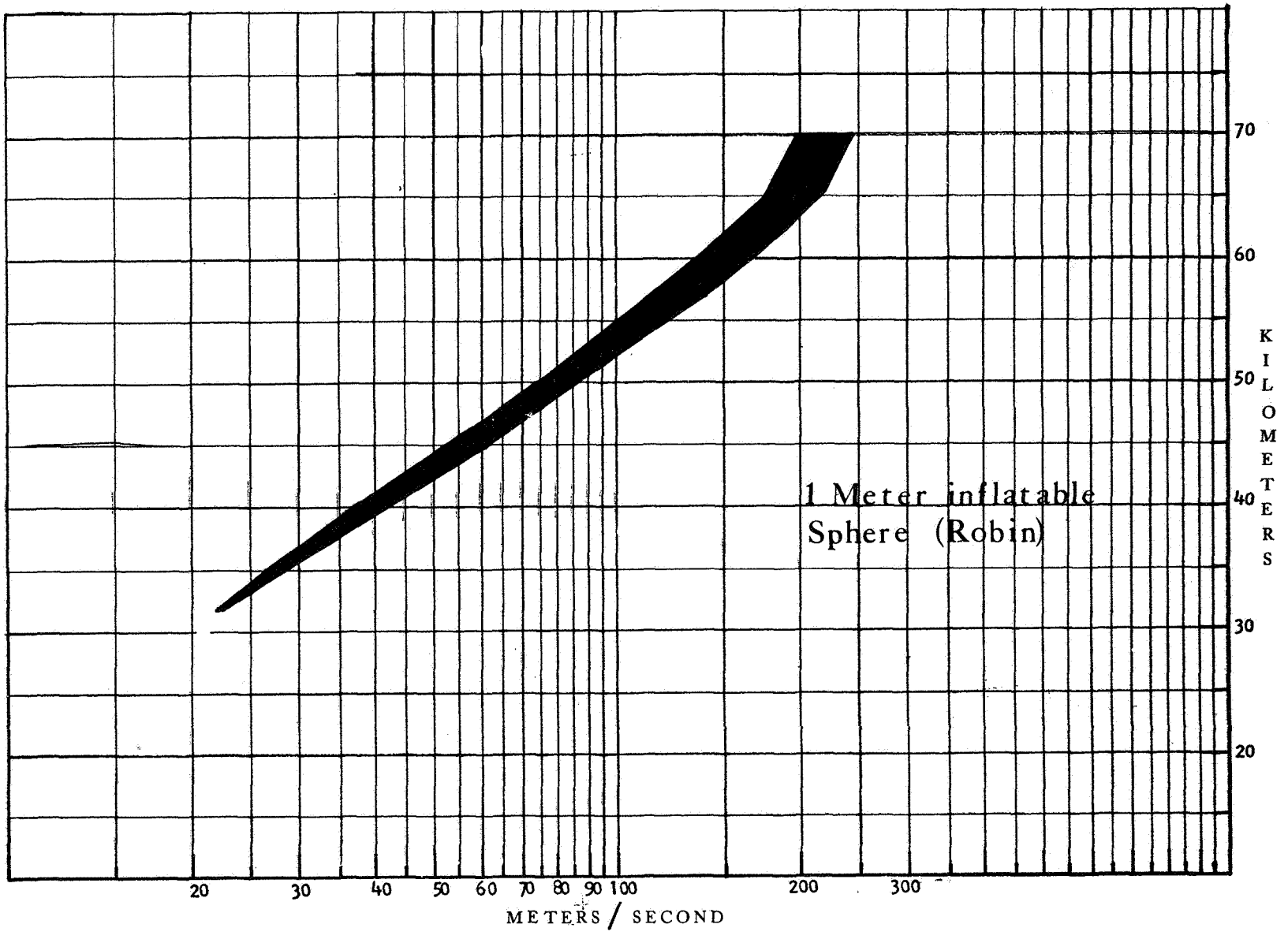

KILOMETERS
70
60
50
40
30
20
"S" Band .005 inch
Copper Chaff
2 3 4 5 6 7 8 9 10
METERS / SECOND
20 30 40 50 60 70 80 90


6 foot Square
Parachute
70
60
50
40
30
20
KILOMETERS
2
3
4
5
6
7
8
9
10
20
30
40
50
60
70
80
90
METERS / SECOND

APPENDIX 3 (CONT'D)



APPENDIX 3 (CONT'D)



APPENDIX 4

CODE FORM FOR INFORMATION ON FUTURE LAUNCHINGS

1. Add two 5-digit coded groups to the end of the ROCOB code, following the end-of-message indicator, JJJ.

   The first additional group pertains to the next launching; the second group pertains to the following launching.

   The form of each group is to be:

   $R_s YYM_o M_o$

   R_s - type of rocket and payload

   YY - day of month

   $M_o M_o$ - month of year

CODE TABLE

R_s

1	-	Arcas and Arcasonde
2	-	Arcas and Sphere
3	-	Judi-Dart and Chaff
4	-	Judi-Dart and Instrument
5	-	MK 32 MOD 0 - Dart and Chaff
6	-	MK 32 MOD 0 - Dart and Instrument
7	-	
8	-	
9	-	
0	-	