

**RESEARCH DIRECTED TOWARD DEFINING THE VARIABILITY
OF THE ATMOSPHERE BETWEEN 30 AND 200 KILOMETERS. II**

E. D. Schultz

**CASE FILE
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Bedford, Massachusetts

**FINAL REPORT
CONTRACT NO. NAS12-617**

PREPARED FOR
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Electronics Research Center
Cambridge, Massachusetts

July 1970

GCA-TR-70-6-N

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SUMMARY

A continuing investigation over a number of years has been performed to gather atmospheric thermodynamic data for use in a study of the global variability of the structure of the atmosphere up to 200 km. A major accomplishment of earlier programs has been the compilation of 442 rocket and optical probe soundings up to 1965. The current program has continued the data collection effort, resulting in the compilation of 400 additional soundings. A chronological bibliography of over 800 other soundings is presented. Discussions of computer programs that process and analyze this data and some of the Meteorological Rocket Network data are presented.

I. INTRODUCTION

For a number of years a continuing investigation has been performed to gather atmospheric thermodynamic data for use in a study of the global variability of the structure of the atmosphere up to 200 km (Refs. 1, 2, and 3). A major accomplishment of earlier programs has been the compilation of 442 rocket and optical-probe soundings performed during the period 1947 to early 1965 (Ref. 4).

The current program involved continued up-dating of the data-collection and further analysis of the data at hand with a view toward the ultimate development of a more cogent interpretation of the variations in this important altitude regime.

Initial progress under the present program was presented in an interim report (Ref. 5). That document described the expansion of the original (442) sounding collection by the acquisition of new sounding data with a specific discussion of Soviet rocket soundings. Also presented were the results of preliminary analysis of the original collection, including among other programs, a computer program which reprocessed and transferred this data to IBM tape into standard format for storage and to facilitate further analysis.

The present report discusses further progress in these areas. Section II presents a status of the sounding data collection phase of the program. Nearly 400 new soundings have been added to the non-MRN (Meteorological Rocket Network) inventory. In Section III descriptions of computer programs are presented. These programs deal with the processing and analysis of both MRN and non-MRN data.

II. DATA COLLECTION

An important part of the current and previous programs has been the compilation of density, pressure, and temperature profile data on a global scale throughout the year and throughout the eleven-year solar cycle. In previous efforts data was obtained from 442 reported atmospheric rocket soundings or rocket instrument releases. During this program data from an additional 499 soundings were collected.

The collected soundings refer to non-MRN (Meterological Rocket Network) data. This organization conducts a global systematic program of rocket launches to gather atmospheric meteorological and thermodynamic data. A large inventory of sounding data is contained on a series of magnetic tapes maintained by the MRN. The NASA technical monitor has acquired much of this extended data during the course of the current program and considerable work has been done to reorganize it and analyze the tapes for errors. Some 2000-3000 soundings to altitudes of about 50 or 60 km, from 35 sites are maintained on 12 MRN tapes. Further discussion of the MRN data is contained in Section III of this report.

Data collected under all programs to the present from both MRN and non-MRN sites has come from over 70 mobile and stationary sounding sites located throughout the world. These locations are shown in Figure 1.

Figure 2 presents a rough breakdown of the available rocket sounding collection-status. The available non-MRN soundings are presented in a chronological bibliography, discussed below. The collected and processed soundings refer to both the original collection of 442 soundings plus those collected during this program. Numbers in paratheses refer to work partially completed. The distribution of available non-MRN soundings according to sponsoring country is shown in Figure 3.

A general flow diagram indicating the collection process for non-MRN data is shown in Figure 4. Figure 5 presents a flow diagram indicating the analysis and processing phases for non-MRN data. Computer programs describing these operations are discussed in Section III. MRN sounding data processing is represented by the flow diagram shown in Figure 6.

Of the nearly 500 non-MRN sounding data sets collected under this program, 394 have been keypunched; keypunch-verified and entered on NASA IBM tape, referred to as Rocket Data Set No. 2. Much of the remaining data appeared in published form in indirect physical units such as number densities and pressure ratios. All original published data is being turned over to the NASA technical monitor with this report. Table 1 contains a listing arranged alphabetically by site then chronologically for each site, of the 394 soundings of Rocket Data Set No. 2. Listed are the date and GMT of the sounding, launch site, literature reference, experiment technique code, and principal experimenter. The literature references and sources of the data are contained in Table 2.

TOTAL AVAILABLE SOUNDINGS ~ 4300		NON-MRN SOURCES	
TOTAL SOUNDINGS PROCESSED ~ 1140			
METEOROLOGICAL ROCKET NETWORK (MRN)			
AVAILABLE SOUNDINGS:	2000-3000 SOUNDINGS FROM 35 SITES ON 12 TAPES	AVAILABLE SOUNDINGS:	1800 SOUNDINGS FROM 40 SITES
SOUNDINGS PROCESSED:	300	SOUNDINGS COLLECTED:	940
		SOUNDINGS PROCESSED PREVIOUSLY:	440
		SOUNDINGS PROCESSED CURRENTLY:	(400)
		TOTAL PROCESSED:	(840)

Figure 2. Summary of available rocket soundings.

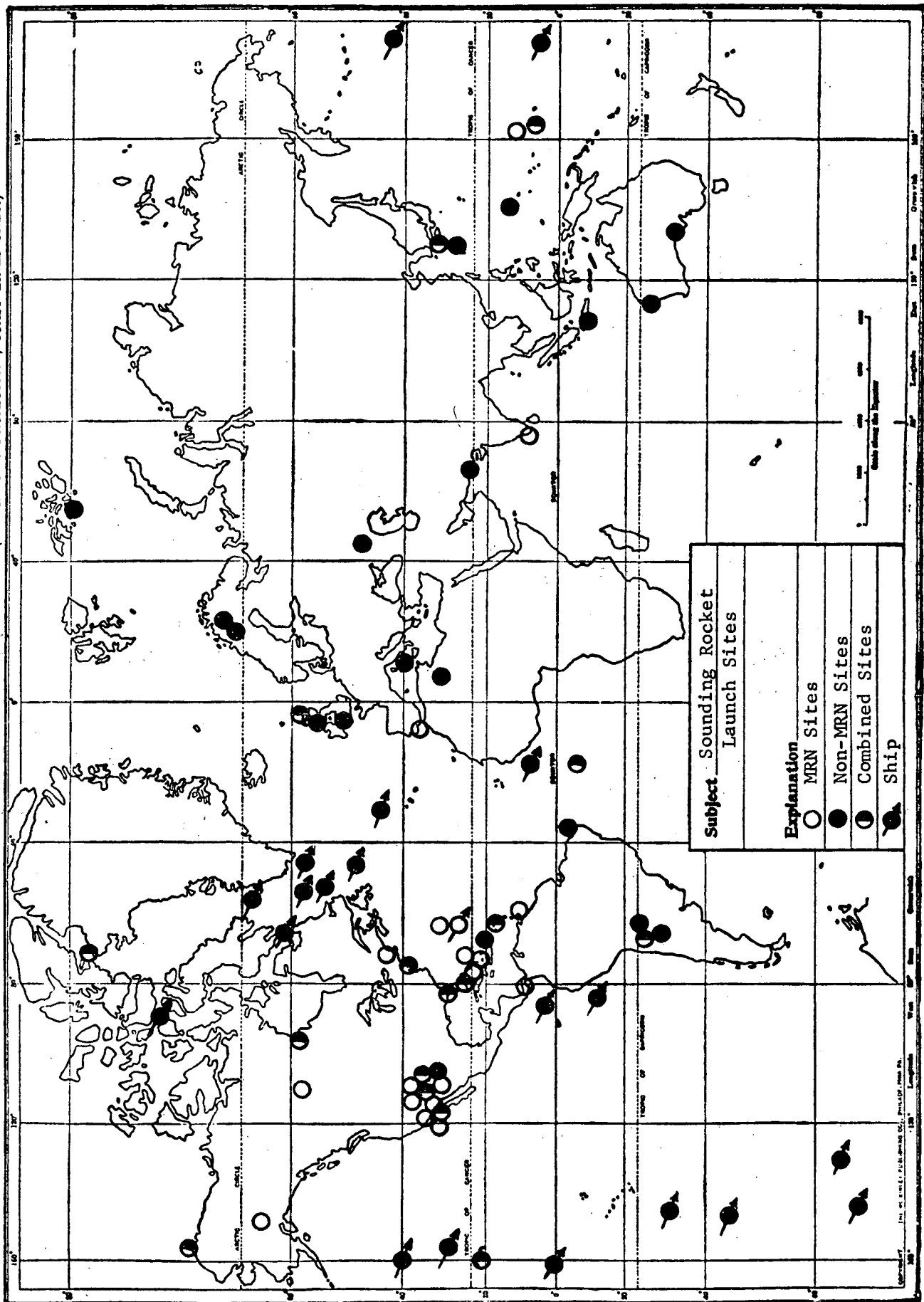


Figure 1. Sounding Rocket Launch Sites

McMurdo Sound, Antarctica → ●

DIVISION OF 1800 TOTAL SOUNDINGS ACCORDING TO SPONSORING COUNTRY

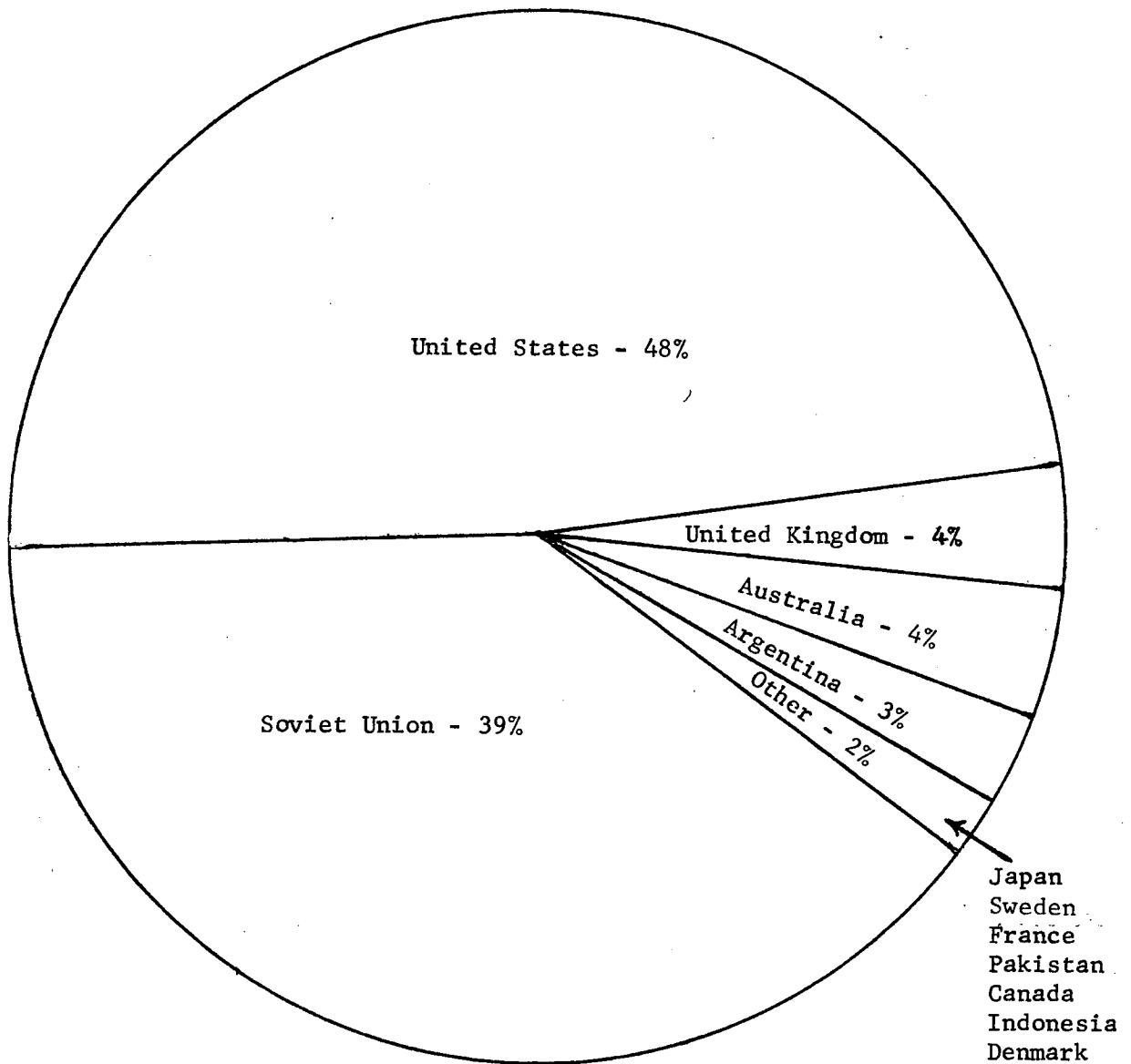


Figure 3. Non-MRN soundings.

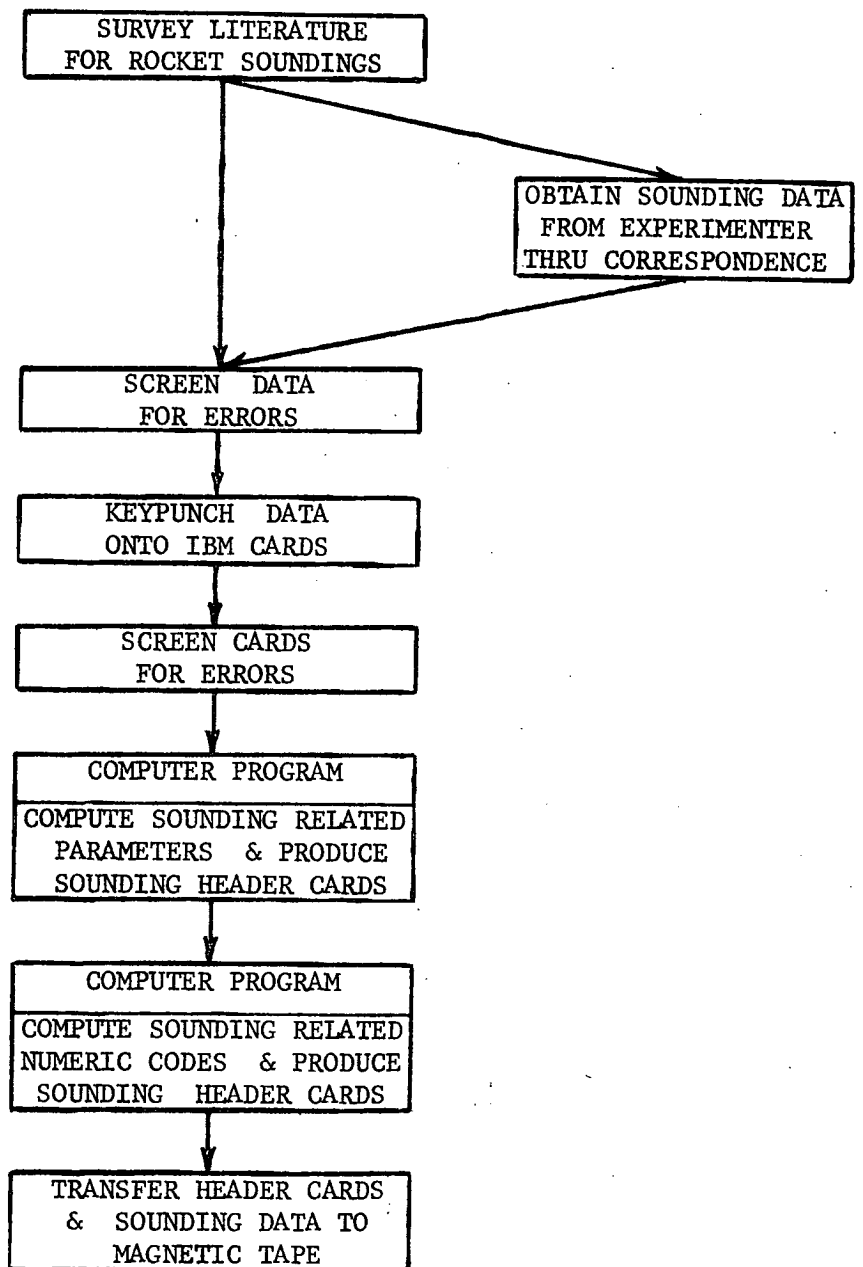


Figure 4. Non-MRN sounding data collection.

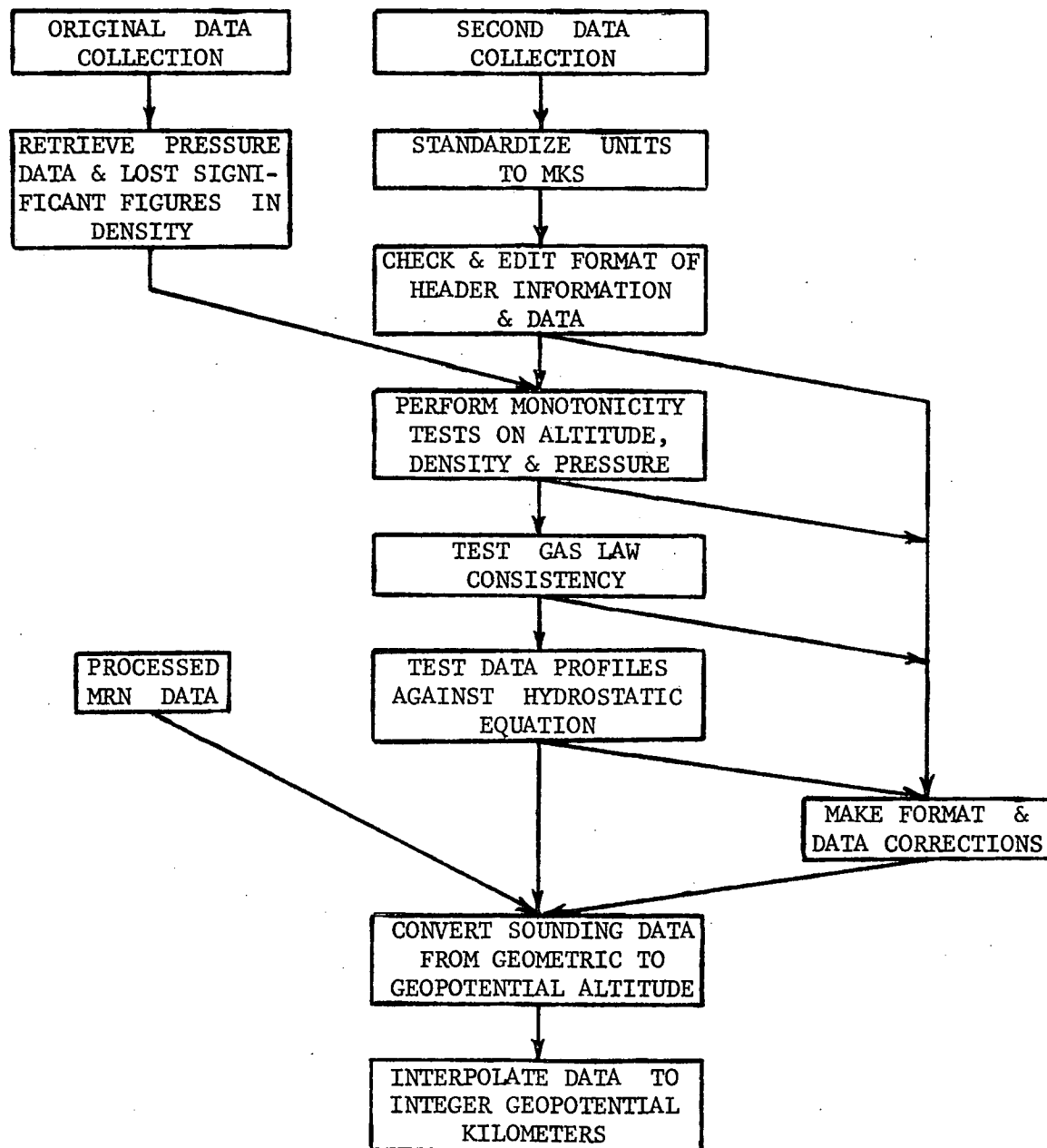


Figure 5. Non-MRN sounding data processing.

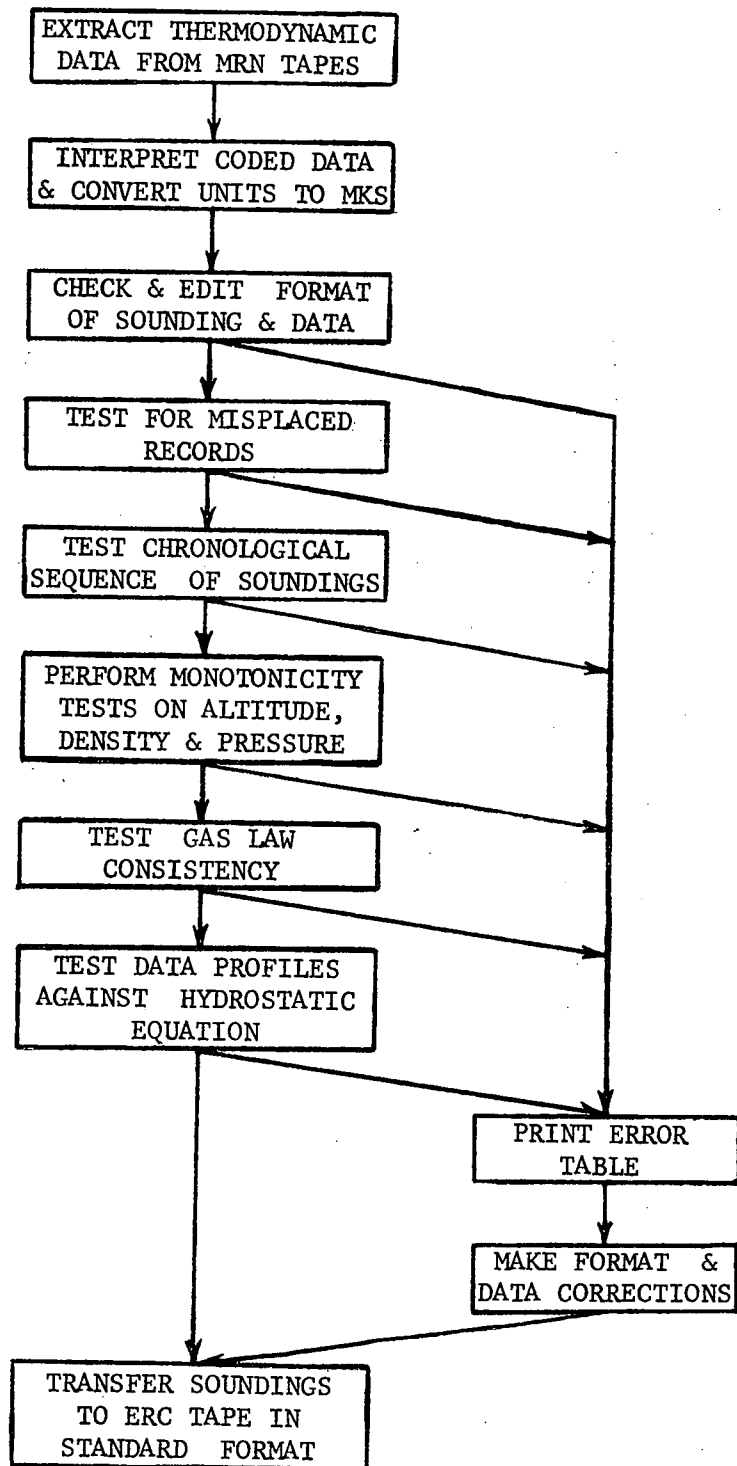


Figure 6. MRN sounding data processing.

TABLE 1

ROCKET DATA SET NO. 2

ASCENSION ISLAND						
23 MAY 65	0202	ASCENSION ISL	12	I	HORVATH J. J.	12
23 MAY 65	1400	ASCENSION ISL	12	I	HORVATH J. J.	12
27 FEB 66	1652	ASCENSION ISL	12	E	HORVATH J. J.	
CAPE KENNEDY						
25 MAY 65	0735	CAPE KENNEDY	11	TPD	HANDY P. O.	
CARNARVON						
21 OCT 64	2112	CARNARVON	14	S	HAD 148	
22 OCT 64	1103	CARNARVON	14	S	HAD 140	
CHAMICAL						
18 MAY 66	2022	CHAMICAL	3	P	LICHTENSTEIN E.	
13 JUL 66	2244	CHAMICAL	3	P	LICHTENSTEIN E.	
17 AUG 66	1630	CHAMICAL	3	P	LICHTENSTEIN E.	
8 SEP 66	1841	CHAMICAL	3	P	LICHTENSTEIN E.	
21 SEP 66	1640	CHAMICAL	3	P	LICHTENSTEIN E.	
14 DEC 66	2025	CHAMICAL	3	P	LICHTENSTEIN E.	
13 MAR 68	1528	CHAMICAL	5	P	LICHTENSTEIN E.	
27 MAR 68	1558	CHAMICAL	5	P	LICHTENSTEIN E.	
10 APR 68	0210	CHAMICAL	6	P	LICHTENSTEIN E.	
FORT CHURCHILL						
27 JAN 65	2223	FORT CHURCHILL	18	G	SMITH W. S.	
4 FEB 65	1735	FORT CHURCHILL	18	G	SMITH W. S.	
8 FEB 65	2300	FORT CHURCHILL	18	G	SMITH W. S.	
7 AUG 65	1200	FORT CHURCHILL	18	G	SMITH W. S.	
7 AUG 65	1945	FORT CHURCHILL	18	G	SMITH W. S.	
8 AUG 65	0400	FORT CHURCHILL	18	G	SMITH W. S.	
8 AUG 65	1003	FORT CHURCHILL	18	G	SMITH W. S.	
13 OCT 65	1612	FORT CHURCHILL	18	G	SMITH W. S.	
19 OCT 65	1730	FORT CHURCHILL	18	G	SMITH W. S.	
23 OCT 65	1638	FORT CHURCHILL	18	G	SMITH W. S.	
27 OCT 65	2349	FORT CHURCHILL	18	G	SMITH W. S.	
9 NOV 65	1840A	FORT CHURCHILL	12	I	CARIGNAN G. R.	
9 NOV 65	1840B	FORT CHURCHILL	12	I	CARIGNAN G. R.	
9 NOV 65	1915	FORT CHURCHILL	21			
10 NOV 65	0700	FORT CHURCHILL	22			
24 JAN 66	0542	FORT CHURCHILL	19	S	SMITH W. S.	
2 FEB 66	0202	FORT CHURCHILL	19	G	SMITH W. S.	
10 FEB 66	0709	FORT CHURCHILL	19	G	SMITH W. S.	
10 FEB 66	1800	FORT CHURCHILL	19	G	SMITH W. S.	
2 MAY 66	0232	FORT CHURCHILL	19	G	SMITH W. S.	
4 MAY 66	0008	FORT CHURCHILL	19	G	SMITH W. S.	
17 JUN 66	0313	FORT CHURCHILL	19	G	SMITH W. S.	

Table 1 (Continued)

23 JUN 66	0635	FORT CHURCHILL	19	G	SMITH W. S.
7 AUG 66	0904	FORT CHURCHILL	19	G	SMITH W. S.
7 AUG 66	0949	FORT CHURCHILL	12	G	HORVATH J.
7 AUG 66	1735	FORT CHURCHILL	19	G	SMITH W. S.
31 JAN 67	2317	FORT CHURCHILL	20	I	HORVATH J.
1 FEB 67	0538	FORT CHURCHILL	20	I	HORVATH J.
1 FEB 67	0826	FORT CHURCHILL	20	I	HORVATH J.
1 FEB 67	1158	FORT CHURCHILL	20	I	HORVATH J.

HEISS ISLAND

4 NOV 57	0755	HEISS ISLAND	13	G	
16 DEC 57	0435	HEISS ISLAND	13	G	
19 JAN 58	0845	HEISS ISLAND	13	G	
10 FEB 58	0845	HEISS ISLAND	13	G	
26 FEB 58	0335	HEISS ISLAND	13	G	
17 MAR 58	0300	HEISS ISLAND	13		
1 APR 58	1200	HEISS ISLAND	13	G	
24 JUN 58	0045	HEISS ISLAND	13	G	
17 JUL 58	2045	HEISS ISLAND	13	G	
27 JUL 58	1510	HEISS ISLAND	13	G	
7 AUG 58	0845	HEISS ISLAND	13	G	
14 AUG 58	0140	HEISS ISLAND	13	G	
1 OCT 58	0941	HEISS ISLAND	13		
23 OCT 58	0320	HEISS ISLAND	13	G	
25 OCT 58	0800	HEISS ISLAND	13	G	
28 OCT 58	2000	HEISS ISLAND	13		
31 OCT 58	0900	HEISS ISLAND	13		
4 NOV 58	1200	HEISS ISLAND	13	G	
14 NOV 58	0800	HEISS ISLAND	13		
18 NOV 58	0845	HEISS ISLAND	13		
28 NOV 58	2006	HEISS ISLAND	13	G	
8 DEC 58	2000	HEISS ISLAND	13	G	
10 DEC 58	1200	HEISS ISLAND	13	G	
12 DEC 58	1200	HEISS ISLAND	13	G	
10 JAN 59	1200	HEISS ISLAND	13	G	
11 FEB 59	2400	HEISS ISLAND	13	G	
2 APR 59	0800	HEISS ISLAND	13	G	
5 MAY 59	1200	HEISS ISLAND	13	TP	
8 OCT 59	2100	HEISS ISLAND	13	G	
15 OCT 59	2100	HEISS ISLAND	13	G	
22 OCT 59	2100	HEISS ISLAND	13	TP	
3 DEC 59	2100	HEISS ISLAND	13	G	
24 DEC 59	2100	HEISS ISLAND	13	TP	

KAGOSHIMA

11 MAR 65	0207	KAGOSHIMA	1	P	ARIZUMI N.
11 MAR 65	0707	KAGOSHIMA	1	P	ARIZUMI N.
8 JUL 65	0226	KAGOSHIMA	1	P	ARIZUMI N.
29 SEP 65	0200	KAGOSHIMA	1	P	ARIZUMI N.
29 SEP 65	0700	KAGOSHIMA	1	P	ARIZUMI N.
19 JAN 66	0200	KAGOSHIMA	1	P	ARIZUMI N.
19 JAN 66	1030	KAGOSHIMA	1	P	ARIZUMI N.

Table 1 (Continued)

30 APR 66	0220	KAGOSHIMA	1	P	ARIZUMI N.
30 APR 66	1040	KAGOSHIMA	1	P	ARIZUMI N.
2 MAY 66	0200	KAGOSHIMA	1	P	ARIZUMI N.

KAPUSTIN YAR

11 JUL 57	0205	KAPUSTIN YAR	13	TPD
27 JUL 57	0220	KAPUSTIN YAR	13	TPD
14 AUG 57	0423	KAPUSTIN YAR	13	TPD
14 SEP 57	0300	KAPUSTIN YAR	13	TPD
20 SEP 57	0230	KAPUSTIN YAR	13	TPD
17 OCT 57	0300	KAPUSTIN YAR	13	TPD
16 DEC 57	0435	KAPUSTIN YAR	13	TPD
21 DEC 57	0440	KAPUSTIN YAR	13	TPD
21 DEC 57	0845	KAPUSTIN YAR	13	TPD
19 JAN 58	0945	KAPUSTIN YAR	13	TPD
19 JAN 58	2321	KAPUSTIN YAR	13	TPD
20 APR 58	1540	KAPUSTIN YAR	13	TPD
18 MAY 58	0156	KAPUSTIN YAR	13	TPD
24 JUN 58	0145	KAPUSTIN YAR	13	TPD
29 JUN 58	0130	KAPUSTIN YAR	13	TPD
27 JUL 58	0220	KAPUSTIN YAR	13	TPD
31 JUL 58	0220	KAPUSTIN YAR	13	TPD
12 AUG 58	0310	KAPUSTIN YAR	13	TPD
12 AUG 58	0440	KAPUSTIN YAR	13	TPD
12 MAR 59	1109	KAPUSTIN YAR	13	TP
12 MAR 59	1540	KAPUSTIN YAR	13	TPW
20 OCT 59	1315	KAPUSTIN YAR	13	TPW
22 OCT 59	0356	KAPUSTIN YAR	13	TPW
22 OCT 59	0955	KAPUSTIN YAR	13	TPW
3 DEC 59	0800	KAPUSTIN YAR	13	TPW
3 DEC 59	1004	KAPUSTIN YAR	13	TPW
3 DEC 59	1228	KAPUSTIN YAR	13	TPW

KWAJALEIN

12 JAN 65	1458	KWAJALEIN	16	D	SALAH J. E.
3 JUN 65	1104	KWAJALEIN	16	D	SALAH J. E.
10 JUN 65	1328	KWAJALEIN	16	D	SALAH J. E.
1 JUL 65	1021	KWAJALEIN	16	D	SALAH J. E.
26 AUG 65	1147	KWAJALEIN	16	D	SALAH J. E.
29 NOV 65	1457	KWAJALEIN	16	D	SALAH J. E.

MAR CHIQUITA

13 JUN 68	1820	MAR CHIQUITA	6	I	EXAMETNET
14 AUG 68	2328	MAR CHIQUITA	7	P	LICHTENSTEIN E.
13 NOV 68	1910	MAR CHIQUITA	8	I	EXAMETNET
18 DEC 68	1802	MAR CHIQUITA	8	I	EXAMETNET

NATAL

Table 1 (Continued)

2 MAY 66	0119	NATAL	19	G	DEMENDONCA F.
2 MAY 66	0155	NATAL	3	P	DEMENDONCA F.
4 MAY 66	0120	NATAL	19	G	DEMENDONCA F.
18 MAY 66	1550	NATAL	3	P	DEMENDONCA F.
1 JUN 66	1631	NATAL	3	P	DEMENDONCA F.
15 JUN 66	1532	NATAL	3	T	EXAMETNET
29 JUN 66	1619	NATAL	3	T	EXAMETNET
15 JUL 66	1605	NATAL	3	I	EXAMETNET
7 AUG 66	0705	NATAL	19	G	DEMENDONCA F.
7 AUG 66	0758	NATAL	3	I	EXAMETNET
7 AUG 66	2326	NATAL	19	G	DEMENDONCA F.
1 OCT 66	0823	NATAL	19	G	DEMENDONCA F.
1 OCT 66	2039	NATAL	19	G	DEMENDONCA F.
2 OCT 66	0220	NATAL	19	G	DEMENDONCA F.
2 OCT 66	0820	NATAL	19	G	DEMENDONCA F.
2 OCT 66	1409	NATAL	19	G	DEMENDONCA F.
12 OCT 66	1500	NATAL	3	I	EXAMETNET
16 NOV 66	1505	NATAL	3	I	EXAMETNET
24 JUN 67	0826	NATAL	20	G	SMITH W. S.
24 JUN 67	2035	NATAL	20	G	SMITH W. S.
25 JUN 67	0834	NATAL, BRAZIL	20	G	SMITH W. S.
26 AUG 67	0030	NATAL	20	G	SMITH W. S.
26 AUG 67	1139	NATAL	20	G	SMITH W. S.
26 AUG 67	2339	NATAL	20	G	SMITH W. S.
14 OCT 67	1120	NATAL	20	G	SMITH W. S.
15 OCT 67	1115	NATAL	20	G	SMITH W. S.
15 OCT 67	2315	NATAL	20	G	SMITH W. S.
18 DEC 67	1300	NATAL	20	G	SMITH W. S.
19 DEC 67	0100	NATAL	20	G	SMITH W. S.
19 DEC 67	1310	NATAL	20	G	SMITH W. S.
17 JAN 68	1500	NATAL	3	I	EXAMETNET
24 JUL 68	1602	NATAL	5	I	EXAMETNET
16 OCT 68	1514	NATAL	6	I	EXAMETNET
13 NOV 68	1530	NATAL	6	I	EXAMETNET
18 DEC 68	1500	NATAL	6	I	EXAMETNET

POINT BARROW

27 JAN 65	2132	POINT BARROW	18	G	THEON J. S.
4 FEB 65	0445	POINT BARROW	18	G	THEON J. S.
8 FEB 65	2215	POINT BARROW	18	G	THEON J. S.
7 AUG 65	1113	POINT BARROW	18	G	SMITH W. S.
7 AUG 65	1939	POINT BARROW	18	G	SMITH W. S.
8 AUG 65	0415	POINT BARROW	18	G	SMITH W. S.
9 AUG 65	1010	POINT BARROW	18	G	SMITH W. S.
13 OCT 65	1601	POINT BARROW	18	G	SMITH W. S.
19 OCT 65	1730	POINT BARROW	18	G	SMITH W. S.
23 OCT 65	1538	POINT BARROW	18	G	SMITH W. S.
27 OCT 65	2342	POINT BARROW	18	G	SMITH W. S.
1 FEB 66	2012	POINT BARROW	19	G	SMITH W. S.
10 FEB 66	0800	POINT BARROW	19	G	SMITH W. S.
10 FEB 66	2130	POINT BARROW	19	G	SMITH W. S.
1 MAY 66	2210	POINT BARROW	19	G	SMITH W. S.
3 MAY 66	2201	POINT BARROW	19	G	SMITH W. S.
17 JUN 66	0318	POINT BARROW	19	G	SMITH W. S.

Table 1 (Continued)

23 JUN 66	0752	POINT BARROW	19	G	SMITH W. S.
14 AUG 66	2035	POINT BARROW	19	G	SMITH W. S.
15 AUG 66	0808	POINT BARROW	19	G	SMITH W. S.
31 JAN 67	2348	POINT BARROW	20	G	SMITH W. S.
1 FEB 67	0141	POINT BARROW	20	G	SMITH W. S.
1 FEB 67	0418	POINT BARROW	20	G	SMITH W. S.
1 FEB 67	0741	POINT BARROW	20	G	SMITH W. S.
1 FEB 67	0956	POINT BARROW	20	G	SMITH W. S.
1 FEB 67	1426	POINT BARROW	20	G	SMITH W. S.
4 APR 67	0010	POINT BARROW	20	G	SMITH W. S.
10 APR 67	2100	POINT BARROW	20	G	SMITH W. S.
18 APR 67	2208	POINT BARROW	20	G	SMITH W. S.
30 APR 67	0140	POINT BARROW	20	G	SMITH W. S.
9 MAY 67	0720	POINT BARROW	20	G	SMITH W. S.
15 MAY 67	1140	POINT BARROW	20	G	SMITH W. S.
3 AUG 67	1110	POINT BARROW	20	I	SMITH W. S.
5 AUG 67	0956	POINT BARROW	20	X	HORVATH J.
19 JAN 69	0200	POINT BARROW		G	SMITH W. S.

SARDINIA

30 SEP 65	0420	SARDINIA	10	S	GROVES G. V.
2 OCT 65	0422	SARDINIA	10	S	

SHIP CROATAN

20 FEB 65	2210	37 48 N 75 20 W	9	T	FINGER, F. G.
8 MAR 65	1748	00 01 N 84 08 W	12	I	HORVATH J. J.
10 MAR 65	2130	07 22 S 83 25 W	9	T	FINGER, F. G.
16 MAR 65	1944	12 55 S 78 00 W	9	TW	FINGER, F. G.
18 MAR 65	1952	12 49 S 77 58 W	9	TW	FINGER, F. G.
21 MAR 65	1514	12 57 S 78 03 W	9	TW	FINGER, F. G.
24 MAR 65	1913	11 34 S 78 23 W	9	TW	FINGER, F. G.
27 MAR 65	1924	14 10 S 77 59 W	9	TW	FINGER, F. G.
2 APR 65	1550	12 19 S 78 11 W	9	TW	FINGER, F. G.
3 APR 65	0018	14 34 S 77 47 W	9	TW	FINGER, F. G.
4 APR 65	1606	24 05 S 76 08 W	12	I	HORVATH J. J.
5 APR 65	2119	30 52 S 75 00 W	9	T	FINGER, F. G.
6 APR 65	1634	35 14 S 74 15 W	12	I	HORVATH J. J.
9 APR 65	2026	44 23 S 77 47 W	12	I	HORVATH J. J.
10 APR 65	1604	47 02 S 77 45 W	9	TW	FINGER, F. G.
11 APR 65	0011	48 35 S 77 42 W	9	T	FINGER, F. G.
11 APR 65	1533	52 11 S 77 49 W	9	TW	FINGER, F. G.
13 APR 65	0405	60 00 S 78 00 W	12	I	HORVATH J. J.
13 APR 65	1600	60 00 S 78 00 W	12	I	HORVATH J. J.
13 APR 65	1956	59 52 S 77 58 W	9	TW	FINGER, F. G.
14 APR 65	0038	59 46 S 77 50 W	9	TW	FINGER, F. G.
15 APR 65	1600	52 35 S 78 20 W	12	I	HORVATH J. J.
15 APR 65	1842	52 28 S 78 09 W	9	TW	FINGER, F. G.

SONMIANI

29 APR 65	1732	SONMIANI	10	G	NASA10.94IA
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Table 1 (Continued)

27 MAR 66	1712	SONMIANI	10	G	GROVES G. V.
TARTAGAL					
16 NOV 66	1530	TARTAGAL	3	P	LICHTENSTEIN E.
WALLOPS ISLAND					
27 JAN 65	2224	WALLOPS ISLAND	18	G	SMITH W. S.
4 FEB 65	0510	WALLOPS ISLAND	18	G	SMITH W. S.
8 FEB 65	2253	WALLOPS ISLAND	18	G	SMITH W. S.
19 MAR 65	1809	WALLOPS ISLAND	23		CARIGNAN G. R.
20 MAR 65	0542	WALLOPS ISLAND	24		CARIGNAN G. R.
23 JUL 65	1705	WALLOPS ISLAND	18	GS	SMITH W. S.
7 AUG 65	2006	WALLOPS ISLAND	18	G	SMITH W. S.
8 AUG 65	0340	WALLOPS ISLAND	18	G	SMITH W. S.
8 AUG 65	1015	WALLOPS ISLAND	18	G	SMITH W. S.
8 SEP 65	2145	WALLOPS ISLAND	3	I	EXAMETNET
8 SEP 65	2235	WALLOPS ISLAND	3	I	EXAMETNET
8 SEP 65	2307	WALLOPS ISLAND	3	I	EXAMETNET
9 SEP 65	0047	WALLOPS ISLAND	3	I	EXAMETNET
9 SEP 65	0126	WALLOPS ISLAND	3	I	EXAMETNET
9 SEP 65	0141	WALLOPS ISLAND	3	I	EXAMETNET
9 SEP 65	0225	WALLOPS ISLAND	3	I	EXAMETNET
9 SEP 65	0501	WALLOPS ISLAND	3	I	EXAMETNET
9 SEP 65	0805	WALLOPS ISLAND	3	I	EXAMETNET
9 SEP 65	1201	WALLOPS ISLAND	3	I	EXAMETNET
9 SEP 65	1648	WALLOPS ISLAND	3	I	EXAMETNET
9 SEP 65	2234	WALLOPS ISLAND	3	I	EXAMETNET
10 SEP 65	0115	WALLOPS ISLAND	3	I	EXAMETNET
10 SEP 65	0500	WALLOPS ISLAND	3	I	EXAMETNET
10 SEP 65	0800	WALLOPS ISLAND	3	I	EXAMETNET
10 SEP 65	1238	WALLOPS ISLAND	3	I	EXAMETNET
13 OCT 65	1651	WALLOPS ISLAND	18	GS	SMITH W. S.
19 OCT 65	2310	WALLOPS ISLAND	18	G	SMITH W. S.
23 OCT 65	1614	WALLOPS ISLAND	18	G	SMITH W. S.
25 OCT 65	1938	WALLOPS ISLAND	3	I	EXAMETNET
26 OCT 65	1834	WALLOPS ISLAND	3	I	EXAMETNET
27 OCT 65	1942	WALLOPS ISLAND	3	I	EXAMETNET
27 OCT 65	2331	WALLOPS ISLAND	3	I	EXAMETNET
28 OCT 65	0010	WALLOPS ISLAND	18	G	SMITH W. S.
29 OCT 65	1845	WALLOPS ISLAND	3	I	EXAMETNET
3 NOV 65	1927	WALLOPS ISLAND	3	I	EXAMETNET
4 NOV 65	1911	WALLOPS ISLAND	3	I	EXAMETNET
8 NOV 65	2013	WALLOPS ISLAND	3	I	EXAMETNET
10 NOV 65	1819	WALLOPS ISLAND	3	I	EXAMETNET
1 FEB 66	2046	WALLOPS ISLAND	19	G	SMITH W. S.
10 FEB 66	0748	WALLOPS ISLAND	19	G	SMITH W. S.
10 FEB 66	1841	WALLOPS ISLAND	19	G	SMITH W. S.
2 MAR 66	1915	WALLOPS ISLAND	3	I	EXAMETNET
16 MAR 66	1623	WALLOPS ISLAND	3	I	EXAMETNET
14 APR 66	1509	WALLOPS ISLAND	3	T	EXAMETNET
2 MAY 66	0114	WALLOPS ISLAND	19	G	SMITH W. S.
2 MAY 66	0153	WALLOPS ISLAND	3	T	EXAMETNET

Table 1 (Continued)

4 MAY 66	0037	WALLOPS ISLAND	19	G	SMITH W. S.
1 JUN 66	1607	WALLOPS ISLAND	3	T	EXAMETNET
29 JUN 66	1436	WALLOPS ISLAND	3	T	EXAMETNET
13 JUL 66	1914	WALLOPS ISLAND	3	I	EXAMETNET
19 JUL 66	1525	WALLOPS ISLAND	2	I	CONIE
21 JUL 66	1530	WALLOPS ISLAND	2	I	CONIE
7 AUG 66	0700	WALLOPS ISLAND	19	G	SMITH W. S.
7 AUG 66	0736	WALLOPS ISLAND	3	I	EXAMETNET
7 AUG 66	2046	WALLOPS ISLAND	19	G	SMITH W. S.
12 AUG 66	2224	WALLOPS ISLAND	2	I	CONIE
17 AUG 66	2340	WALLOPS ISLAND	2	I	CONIE
17 AUG 66	2340	WALLOPS ISLAND	3	I	EXAMETNET
26 AUG 66	1831	WALLOPS ISLAND	25	I	CARIGNAN G. R.
26 AUG 66	1851	WALLOPS ISLAND	26	I	CARIGNAN G. R.
26 AUG 66	1911	WALLOPS ISLAND	12	I	HORVATH J. J.
28 AUG 66	0403	WALLOPS ISLAND	27	I	CARIGNAN G. R.
28 AUG 66	0423	WALLOPS ISLAND	12	I	HORVATH J. J.
7 SEP 66	1534	WALLOPS ISLAND	3	I	EXAMETNET
16 SEP 66	1935	WALLOPS ISLAND	3	I	EXAMETNET
23 SEP 66	1848	WALLOPS ISLAND	3	I	EXAMETNET
30 SEP 66	1735	WALLOPS ISLAND	19	G	SMITH W. S.
30 SEP 66	2350	WALLOPS ISLAND	19	G	SMITH W. S.
1 OCT 66	0033	WALLOPS ISLAND	3	I	EXAMETNET
1 OCT 66	0530	WALLOPS ISLAND	19	G	SMITH W. S.
1 OCT 66	1128	WALLOPS ISLAND	19	G	SMITH W. S.
13 OCT 66	1938	WALLOPS ISLAND	3	I	EXAMETNET
13 OCT 66	1938	WALLOPS ISLAND	2	I	CONIE
9 NOV 66	2031	WALLOPS ISLAND	2	I	CONIE
16 NOV 66	1606	WALLOPS ISLAND	2	I	CONIE
16 NOV 66	1606	WALLOPS ISLAND	3	I	EXAMETNET
18 JAN 67	1604	WALLOPS ISLAND	4	I	EXAMETNET
25 JAN 67	1639	WALLOPS ISLAND	4	I	EXAMETNET
31 JAN 67	1911	WALLOPS ISLAND	20	G	SMITH W. S.
1 FEB 67	1838	WALLOPS ISLAND	4	I	EXAMETNET
3 FEB 67	1752	WALLOPS ISLAND	20	G	SMITH W. S.
15 FEB 67	1651	WALLOPS ISLAND	4	I	EXAMETNET
8 MAR 67	1521	WALLOPS ISLAND	4	I	EXAMETNET
16 MAR 67	1429	WALLOPS ISLAND	4	I	EXAMETNET
31 MAR 67	1719	WALLOPS ISLAND	20	G	SMITH W. S.
6 APR 67	2143	WALLOPS ISLAND	4	I	EXAMETNET
11 APR 67	1715	WALLOPS ISLAND	20	G	SMITH W. S.
12 APR 67	1509	WALLOPS ISLAND	4	I	EXAMETNET
20 APR 67	1732	WALLOPS ISLAND	20	G	SMITH W. S.
20 APR 67	1806	WALLOPS ISLAND	4	I	EXAMETNET
26 APR 67	1451	WALLOPS ISLAND	4	I	EXAMETNET
29 APR 67	1139	WALLOPS ISLAND	20	G	SMITH W. S.
3 MAY 67	1407	WALLOPS ISLAND	4	I	EXAMETNET
4 MAY 67	2007	WALLOPS ISLAND	20	G	SMITH W. S.
10 MAY 67	1758	WALLOPS ISLAND	4	I	EXAMETNET
11 MAY 67	0825	WALLOPS ISLAND	20	G	SMITH W. S.
17 MAY 67	1429	WALLOPS ISLAND	4	I	EXAMETNET
25 MAY 67	1849	WALLOPS ISLAND	4	I	EXAMETNET
2 JUN 67	1846	WALLOPS ISLAND	4	I	EXAMETNET
7 JUN 67	1432	WALLOPS ISLAND	4	I	EXAMETNET
15 JUN 67	1742	WALLOPS ISLAND	4	I	EXAMETNET
21 JUN 67	1414	WALLOPS ISLAND	4	I	EXAMETNET

Table 1 (Continued)

28 JUN 67	1501	WALLOPS ISLAND	4	I	EXAMETNET
5 JUL 67	1442	WALLOPS ISLAND	4	I	EXAMETNET
26 JUL 67	1414	WALLOPS ISLAND	4	I	EXAMETNET
9 AUG 67	0130	WALLOPS ISLAND	4	I	EXAMETNET
16 AUG 67	1730	WALLOPS ISLAND	4	I	EXAMETNET
25 AUG 67	1417	WALLOPS ISLAND	4	I	EXAMETNET
30 AUG 67	1818	WALLOPS ISLAND	4	I	EXAMETNET
6 SEP 67	1435	WALLOPS ISLAND	4	I	EXAMETNET
15 SEP 67	1345	WALLOPS ISLAND	4	I	EXAMETNET
18 SEP 67	1910	WALLOPS ISLAND	17	I	CARIGNAN G. R.
20 SEP 67	1529	WALLOPS ISLAND	4	I	EXAMETNET
27 SEP 67	1445	WALLOPS ISLAND	4	I	EXAMETNET
5 OCT 67	0007	WALLOPS ISLAND	4	I	EXAMETNET
12 OCT 67	1530	WALLOPS ISLAND	4	I	EXAMETNET
20 OCT 67	1350	WALLOPS ISLAND	4	I	EXAMETNET
25 OCT 67	1417	WALLOPS ISLAND	4	I	EXAMETNET
3 NOV 67	1726	WALLOPS ISLAND	4	I	EXAMETNET
21 NOV 67	1515	WALLOPS ISLAND	4	I	EXAMETNET
29 NOV 67	1953	WALLOPS ISLAND	4	I	EXAMETNET
12 DEC 67	2159	WALLOPS ISLAND	20	G	SMITH W. S.
13 DEC 67	1816	WALLOPS ISLAND	4	I	EXAMETNET
5 JAN 68	1650	WALLOPS ISLAND	5	I	EXAMETNET
10 JAN 68	1840	WALLOPS ISLAND	5	I	EXAMETNET
17 JAN 68	1612	WALLOPS ISLAND	5	I	EXAMETNET
26 JAN 68	1559	WALLOPS ISLAND	5	I	EXAMETNET
14 FEB 68	1513	WALLOPS ISLAND	5	I	EXAMETNET
20 FEB 68	2144	WALLOPS ISLAND	5	I	EXAMETNET
28 FEB 68	1528	WALLOPS ISLAND	5	I	EXAMETNET
6 MAR 68	1503	WALLOPS ISLAND	5	I	EXAMETNET
14 MAR 68	1500	WALLOPS ISLAND	5	I	EXAMETNET
27 MAR 68	1841	WALLOPS ISLAND	5	I	EXAMETNET
3 APR 68	1559	WALLOPS ISLAND	6	I	EXAMETNET
10 APR 68	1505	WALLOPS ISLAND	6	I	EXAMETNET
17 APR 68	1851	WALLOPS ISLAND	6	I	EXAMETNET
2 MAY 68	1459	WALLOPS ISLAND	6	I	EXAMETNET
8 MAY 68	1459	WALLOPS ISLAND	6	I	EXAMETNET
15 MAY 68	1712	WALLOPS ISLAND	6	I	EXAMETNET
22 MAY 68	1420	WALLOPS ISLAND	6	I	EXAMETNET
5 JUN 68	1915	WALLOPS ISLAND	6	I	EXAMETNET
13 JUN 68	1413	WALLOPS ISLAND	6	I	EXAMETNET
19 JUN 68	1432	WALLOPS ISLAND	6	I	EXAMETNET
2 JUL 68	1554	WALLOPS ISLAND	7	I	EXAMETNET
10 JUL 68	1447	WALLOPS ISLAND	7	I	EXAMETNET
24 JUL 68	1506	WALLOPS ISLAND	7	I	EXAMETNET
31 JUL 68	1618	WALLOPS ISLAND	7	I	EXAMETNET
14 AUG 68	1730	WALLOPS ISLAND	7	I	EXAMETNET
21 AUG 68	1321	WALLOPS ISLAND	7	I	EXAMETNET
28 AUG 68	1421	WALLOPS ISLAND	7	I	EXAMETNET
4 SEP 68	1554	WALLOPS ISLAND	7	I	EXAMETNET
11 SEP 68	1810	WALLOPS ISLAND	7	I	EXAMETNET
18 SEP 68	1441	WALLOPS ISLAND	7	I	EXAMETNET
25 SEP 68	1424	WALLOPS ISLAND	7	I	EXAMETNET
2 OCT 68	1745	WALLOPS ISLAND	8	I	EXAMETNET
16 OCT 68	1920	WALLOPS ISLAND	8	I	EXAMETNET
23 OCT 68	1810	WALLOPS ISLAND	8	I	EXAMETNET
30 OCT 68	1652	WALLOPS ISLAND	8	I	EXAMETNET

Table 1 (Continued)

20 NOV 68	1556	WALLOPS ISLAND	8	I	EXAMETNET
27 NOV 68	1626	WALLOPS ISLAND	8	I	EXAMETNET
5 DEC 68	1525	WALLOPS ISLAND	8	I	EXAMETNET
11 DEC 68	2059	WALLOPS ISLAND	8	I	EXAMETNET
19 DEC 68	1922	WALLOPS ISLAND	8	I	EXAMETNET

WOOMERA

29 APR 65	1109	WOOMERA	9	G	SL-363
29 APR 65	1225	WOOMERA	9	G	SL-364
29 APR 65	1356	WOOMERA	9	G	SL-461
29 APR 65	1619	WOOMERA	9	G	SL-462
29 APR 65	1756	WOOMERA	9	G	SL-463
11 MAY 65	0839	WOOMERA	15	S	HAD 160
9 JUN 65	0832	WOOMERA	15	S	HAD 171
7 JUL 65	0837	WOOMERA	15	S	HAD 174
3 AUG 65	0852	WOOMERA	15	S	HAD 177

TABLE 2

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22. Taeusch, D. R. and G. R. Carignan, "Sounding Rocket Flight Report, NASA 18.02 Thermosphere Probe Experiment," Univ. Michigan, College Engineering, ORA Project 07065, Report No. 07065-3-R, Contract NAS5-9113, September (1966).
23. Taeusch, D. R. and G. R. Carignan, "Sounding Rocket Flight Report, NASA 18.01 Thermosphere Probe Experiment," Univ. Michigan, College Engineering, ORA Project 07065, Report No. 07065-1-R, Contract NAS5-9113, May (1966).
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Emphasis during the program has been given to the assembly of a bibliography of additional rocket launchings which yielded thermodynamic data in the upper atmosphere. Data collected previously covered the period 1947 through early 1965. The current survey is designed not only to update these data with the results from subsequent rocket launches but also to supplement the original records with data that covered the same period but have only recently been published.

The results of the current survey of rocket launches are summarized in Table 3. This table provides a chronological bibliography of all rocket launches which may provide useful thermodynamic data for inclusion into statistical studies. The listing gives the date and GMT, site, experiment code, principal investigator and/or rocket type and flight number for each sounding. There are a total of 858 entries in this table which do not, in general, reflect launches conducted as part of the MRN program.

The chronological bibliography is in a constant state of revision as more soundings are added while soundings keypunched and transferred to tape are removed from the listing. Since the publication of an earlier version of the chronological bibliography (Ref. 5), investigation and correspondence has shown that a number of soundings should be removed from the listing because they were either failures or did not measure temperature, pressure, or density. Soundings in this category are listed in Table 4. A number of the flights, specifically those of Manring and Bedinger, were instrumented principally for winds measurements. In some cases, however, temperature values could be inferred from the diffusion studies, where appropriate. Nevertheless, according to Bedinger, in each case the data were taken as a function of time for a single altitude or for widely separated altitudes and were in general too poor for any seasonal study owing to large error flags.

Investigation of the Blamont flights has failed to disclose altitude-data profiles. It appears that, similar to the experiments conducted by Manring and Bedinger, the experiments were primarily directed toward winds measurements and only crude temperature data were obtained at single altitude points. With respect to the ten HAD or HAT flights from Woomera, communication has been established with the Flight Projects Group, Weapons Research Establishment, South Australia, regarding the entire series between 1961 and the present. Numerous useful reports and generally specific data has been received for the series. However, for the ten cited flights, while not explicitly stated in the correspondence or reports, it is inferred that these flights did not obtain temperature, pressure, or density data. Accordingly, these soundings should be removed from the chronological bibliography.

A number of the earlier flights in the chronological bibliography, launched between 1957 and 1963, had lacked identification of principal experimenters. The only way to obtain the measured data from these flights appears to be through direct correspondence with these individual experimenters since the desired data have not been uncovered from a survey of various scientific journals, books, technical reports, etc.

TABLE 3
CHRONOLOGICAL BIBLIOGRAPHY OF ROCKET SOUNDINGS

1957						
19 AUG 57	0313	KAPUSTIN YAR		TPD		
25 AUG 57	0223	KAPUSTIN YAR		CPL		
31 AUG 57	0530	KAPUSTIN YAR		CPL		
9 SEP 57	1550	KAPUSTIN YAR		CPL		
31 DEC 57	1910	66 26 S 92 49 E		TP	SHIP	OB
1958						
10 JAN 58	0727	KAPUSTIN YAR		TPD		
21 JAN 58	0315	65 26 S 120 32 E		TP	SHIP	OB
2 FEB 58	0726	67 44 S 147 12 E		TP	SHIP	OB
10 FEB 58	0747	69 49 S 161 52 E		TP	SHIP	OB
11 FEB 58	0944	KAPUSTIN YAR		TPD		
17 FEB 58	0306	48 01 S 171 06 E		TP	SHIP	OB
18 FEB 58	1431	KAPUSTIN YAR		TPD		
21 FEB 58	0842	KAPUSTIN YAR		CPL		
26 FEB 58	0435	KAPUSTIN YAR		TPD		
9 MAR 58	2330	38 53 S 142 08 E		T	SHIP	OB
15 MAR 58	1154	43 15 S 160 15 E		TP	SHIP	OB
18 MAR 58	1029	47 53 S 166 24 E		P	SHIP	OB
20 MAR 58	2145	KAPUSTIN YAR		TPD		
28 MAR 58	0000	67 26 S 165 40 E		P	SHIP	OB
31 MAR 58	2141	67 17 S 173 30 E		P	SHIP	OB
1 APR 58	1841	67 26 S 180 00 W		TP	SHIP	OB
2 APR 58	1445	69 19 S 164 55 W		TP	SHIP	OB
21 APR 58	1548	66 22 S 128 03 W		TP	SHIP	OB
23 APR 58	1624	65 41 S 109 46 W		TP	SHIP	OB
24 APR 58	1658	64 59 S 109 10 W		TP	SHIP	OB
26 APR 58	1659	60 28 S 109 16 W		TP	SHIP	OB
28 APR 58	1700	55 00 S 109 37 W		TP	SHIP	OB
30 APR 58	1700	49 12 S 109 20 W		TP	SHIP	OB
3 MAY 58	1742	39 52 S 109 17 W		TP	SHIP	OB
5 MAY 58	1845	32 46 S 109 18 W		TP	SHIP	OB
7 MAY 58	1734	27 37 S 109 25 W		TP	SHIP	OB
31 MAY 58	0145	KAPUSTIN YAR		TPD		
10 JUL 58	1553	32 10 S 47 50 W		TP	SHIP	OB
12 JUL 58	1530	24 41 S 39 06 W		T	SHIP	OB
14 JUL 58	1630	16 13 S 33 02 W		TP	SHIP	OB
15 JUL 58	2145	KAPUSTIN YAR		TPD		
16 JUL 58	0200	KAPUSTIN YAR		TPD		
18 JUL 58	1630	03 45 N 23 15 W		TP	SHIP	OB
20 JUL 58	1649	14 01 N 25 26 W		TP	SHIP	OB
21 JUL 58	1630	18 45 N 24 39 W		P	SHIP	OB
15 AUG 58	0440	KAPUSTIN YAR		TPD		
6 SEP 58	0425	KAPUSTIN YAR		TPD		
20 SEP 58	0535	KAPUSTIN YAR		TPD		
22 SEP 58	0347	KAPUSTIN YAR		TPD		
27 SEP 58	0348	KAPUSTIN YAR		TPD		
3 OCT 58	0332	KAPUSTIN YAR		TPD		
8 OCT 58	0350	KAPUSTIN YAR		TPD		
16 OCT 58	0400	KAPUSTIN YAR		TPD		
17 OCT 58	0405	KAPUSTIN YAR		TPD		

Table 3 (Continued)

23 OCT 58	1331	KAPUSTIN YAR	TPD	
23 DEC 58	0303	MICHIKAWA	TW	KAPPA-VI-TW-5
27 DEC 58	0950	KAPUSTIN YAR	TPD	
1959				
3 JAN 59	0000	HEISS ISLAND	TP	
18 MAR 59	0305	MICHIKAWA	TW	KAPPA-VI-TW-6
20 MAR 59	0312	MICHIKAWA	TW	KAPPA-VI-TW-7
23 APR 59		65 41 S 109 46 W		BOROVIKOV A. M.
25 APR 59		60 15 S 109 43 W		BOROVIKOV A. M.
27 APR 59		54 49 S 109 40 W		BOROVIKOV A. M.
29 APR 59		49 23 S 109 37 W		BOROVIKOV A. M.
1 MAY 59		43 57 S 109 34 W		BOROVIKOV A. M.
3 MAY 59		38 31 S 109 31 W		BOROVIKOV A. M.
5 MAY 59		33 05 S 109 28 W		BOROVIKOV A. M.
7 MAY 59		27 37 S 109 25 W		BOROVIKOV A. M.
12 MAY 59	1139	HOLLOMAN	AC	AA3.200C
22 MAY 59	1115	HOLLOMAN	AC	AA3.201C
27 MAY 59	0451	WHITE SANDS	UAP	AA6.161C
27 MAY 59	1950	WHITE SANDS	UAP	AA6.162C
10 JUL 59		32 S 46 W		BOROVIKOV A. M.
12 JUL 59		23 S 42 30 W		BOROVIKOV A. M.
14 JUL 59		14 S 39 W		BOROVIKOV A. M.
16 JUL 59		05 S 35 30 W		BOROVIKOV A. M.
18 JUL 59		04 N 32 W		BOROVIKOV A. M.
20 JUL 59		13 N 28 30 W		BOROVIKOV A. M.
22 JUL 59		22 N 25 W		BOROVIKOV A. M.
24 JUL 59		31 N 21 30 W		BOROVIKOV A. M.
26 JUL 59		40 N 18 W		BOROVIKOV A. M.
7 SEP 59	1245	HEISS ISLAND	TP	
10 SEP 59	0020	HEISS ISLAND	TP	
13 SEP 59	2100	HEISS ISLAND	TPW	
29 SEP 59	1059	EGLIN FIELD	AC	AA6.203C
30 SEP 59	1057	EGLIN FIELD	AC	AA6.204C
1 OCT 59	1049	EGLIN FIELD	AC	AA6.210C
2 OCT 59	1100	EGLIN FIELD	AC	AA6.211C
3 OCT 59	1103	EGLIN FIELD	AC	AA6.202C
9 OCT 59	0840	EGLIN FIELD	AC	AA6.209C
9 OCT 59	1117	EGLIN FIELD	AC	AA6.213C
12 OCT 59	0900	EGLIN FIELD	AC	AA6.208C
12 OCT 59	1112	EGLIN FIELD	AC	AA6.206C
13 OCT 59	1117	EGLIN FIELD	AC	AA6.214C
15 OCT 59	1105	EGLIN FIELD	AC	AA6.207C
16 OCT 59	1117	EGLIN FIELD	AC	AA6.215C
19 NOV 59	1036	FORT CHURCHILL	UAP	AA6.163C
20 NOV 59	1816	FORT CHURCHILL	UAP	AA6.164C
4 DEC 59	0507	KAPUSTIN YAR	PW	

1960

7 JAN 60	2100	HEISS ISLAND	TP
18 JAN 60	2100	HEISS ISLAND	TP
20 JAN 60	2145	36 20 N 176 24 E	TPW

Table 3 (continued)

21 JAN 60	1031	36 43 N 175 55 E	PW	
21 JAN 60	2100	HEISS ISLAND	TP	
24 JAN 60	0700	36 41 N 175 44 E	TPW	
26 JAN 60	2100	HEISS ISLAND	TP	
27 JAN 60	2301	30 50 N 179 53 E	TP	
28 JAN 60	2100	HEISS ISLAND	TP	
29 JAN 60	0921	29 08 N 169 13 E	TPW	
30 JAN 60	1154	26 00 N 169 27 E	TPW	
30 JAN 60	2100	HEISS ISLAND	TP	
31 JAN 60	1104	25 05 N 168 59 E	TW	
1 FEB 60	1030	23 03 N 166 57 E	TPW	
1 FEB 60	2100	HEISS ISLAND	TW	
2 FEB 60	1038	20 29 N 163 21 E	TPW	
3 FEB 60	1121	18 05 N 160 07 E	TPW	
3 FEB 60	2100	HEISS ISLAND	TPW	
4 FEB 60	1100	16 06 N 157 12 E	TPW	
5 FEB 60	1100	14 25 N 155 13 E	TPW	
6 FEB 60	1100	13 55 N 154 23 E	TPW	
7 FEB 60	1104	11 41 N 151 40 E	TPW	
8 FEB 60	1102	09 57 N 149 52 E	TPW	
9 FEB 60	1107	10 26 N 149 32 E	TPW	
9 FEB 60	2100	HEISS ISLAND	TP	
10 FEB 60	1200	14 05 N 149 13 E	TP	
11 FEB 60	1100	14 29 N 148 58 E	TPW	
13 FEB 60	0855	19 28 N 148 06 E	TP	
27 FEB 60	0648	FORT CHURCHILL	UAP	AA4.360C
27 FEB 60	2100	HEISS ISLAND	TPW	
2 MAR 60	2100	HEISS ISLAND	TPW	
9 MAR 60	2100	HEISS ISLAND	TPW	
27 MAR 60	2100	HEISS ISLAND	TPW	
17 APR 60	0000	HEISS ISLAND	TPW	
26 APR 60	0000	HEISS ISLAND	TPW	
29 APR 60	1547	WALLOPS ISLAND	AC	NASA4.09
5 MAY 60	0000	HEISS ISLAND	TPW	
16 MAY 60	0000	HEISS ISLAND	TP	
26 MAY 60	1825	KAPUSTIN YAR	TP	
27 MAY 60	0000	HEISS ISLAND	TPW	
8 JUN 60	0000	HEISS ISLAND	TPW	
8 JUN 60	0010	KAPUSTIN YAR	PW	
9 JUN 60	0420	45 46 N 32 21 E	TP	
9 JUN 60	1555	45 55 N 32 20 E	TP	
10 JUN 60	0400	45 46 N 32 21 E	TPW	
10 JUN 60	2000	45 46 N 32 23 E	TPW	
16 JUN 60	0529	WALLOPS ISLAND	UAP	NASA10.03
22 JUN 60	0000	KAPUSTIN YAR	TPW	
22 JUN 60	0115	KAPUSTIN YAR	TW	
27 JUN 60	1315	WHITE SANDS	UAP	NRL-58
27 JUN 60	2010	EGLIN FIELD	UAP	AA8.242
28 JUN 60	0610	EGLIN FIELD	UAP	AA8.243
29 JUN 60	0004	KAPUSTIN YAR	TPW	
30 JUN 60	0028	KAPUSTIN YAR	TPW	
30 JUN 60	0137	KAPUSTIN YAR	TW	
1 JUL 60	0013	KAPUSTIN YAR	TPW	
12 JUL 60	1100	42 21 N 179 43 E	TP	
15 JUL 60	1100	42 11 N 179 34 E	TPW	
18 JUL 60	1100	41 58 N 179 53 8 E	TP	

Table 3 (Continued)

21 JUL 60	1100	41 54 N 178 52 E	PW	
24 JUL 60	1100	42 13 N 179 25 3 E	TPW	
27 JUL 60	1100	42 04 N 179 42 8 E	TPW	
28 JUL 60	0021	KAPUSTIN YAR	TPW	
29 JUL 60	1100	39 41 N 180 00 E	TP	
30 JUL 60	1100	35 41 1 N 180 00 E	TPW	
31 JUL 60	1100	31 58 6 N 180 00 E	TPW	
1 AUG 60	1100	28 16 2 N 180 00 E	PW	
2 AUG 60	1100	24 40 N 180 00 E	TPW	
3 AUG 60	0008	KAPUSTIN YAR	TPW	
4 AUG 60	0000	KAPUSTIN YAR	TPW	
5 AUG 60	0000	KAPUSTIN YAR	TPW	
5 AUG 60	1100	13 31 3 N 180 00 E	TW	
6 AUG 60	0000	KAPUSTIN YAR	TPW	
6 AUG 60	1100	09 53 N 180 00 E	TPW	
7 AUG 60	0000	KAPUSTIN YAR	TPW	
8 AUG 60	0000	KAPUSTIN YAR	TPW	
9 AUG 60	0000	KAPUSTIN YAR	TPW	
9 AUG 60	1100	01 17 S 179 00 E	PW	
12 AUG 60	1100	05 16 4 N 179 57 E	TPW	
14 AUG 60	1100	12 11 5 N 177 21 E	TPW	
15 AUG 60	2300	13 24 N 175 24 E	TPW	
19 AUG 60	0000	HEISS ISLAND	TPW	
25 AUG 60	0104	EGLIN FIELD	UAP	AA8.244
1 SEP 60	0000	HEISS ISLAND	TPW	
12 SEP 60	0000	HEISS ISLAND	TPW	
16 SEP 60	0000	HEISS ISLAND	TP	
16 SEP 60	0015	KAPUSTIN YAR	TP	
17 SEP 60	0250	MICHIKAWA	T	S15 K-6(TW-8)
20 SEP 60	0000	HEISS ISLAND	TPW	
21 SEP 60	0100	KAPUSTIN YAR	TPW	
29 SEP 60	0246	MICHIKAWA	T	S18 K-6H(TW-9)
10 OCT 60	0000	HEISS ISLAND	TPW	
14 OCT 60	0000	HEISS ISLAND	TPW	
14 OCT 60	0000	KAPUSTIN YAR	TP	
18 OCT 60	0000	HEISS ISLAND	PW	
25 OCT 60	0010	KAPUSTIN YAR	TW	
26 OCT 60	0000	HEISS ISLAND	PW	
29 OCT 60	0000	HEISS ISLAND	TPW	
29 OCT 60	0014	KAPUSTIN YAR	TP	
30 OCT 60	0000	HEISS ISLAND	TPW	
30 OCT 60	0343	KAPUSTIN YAR	TP	
5 NOV 60	0000	HEISS ISLAND	PW	
8 NOV 60	1405	41 49 N 179 12 E	TPW	
10 NOV 60	0000	HEISS ISLAND	PW	
14 NOV 60	0000	HEISS ISLAND	TW	
15 NOV 60	1100	42 00 N 179 30 E	TPW	
15 NOV 60	1641	WALLOPS ISLAND	AC	NASA4.14
17 NOV 60	0000	HEISS ISLAND	PW	
17 NOV 60	1105	42 00 N 179 30 E	TPW	
19 NOV 60	1100	42 00 N 179 30 E	TP	
21 NOV 60	1107	42 00 N 179 30 E	TPW	
26 NOV 60	1100	39 00 N 179 30 E	TPW	
28 NOV 60	1142	39 00 N 179 30 E	TPW	
29 NOV 60	0001	KAPUSTIN YAR	TP	
30 NOV 60	1148	39 00 N 179 30 E	TPW	

Table 3 (Continued)

2 DEC 60	1100	33 51 N 179 50 E	PW	
4 DEC 60	1100	27 07 N 179 50 E	PW	
5 DEC 60	1100	23 32 N 179 50 E	TPW	
6 DEC 60	1100	19 55 N 179 50 E	TP	
8 DEC 60	1100	12 53 N 179 50 E	TPW	
9 DEC 60	1055	09 42 N 179 50 E	TPW	
13 DEC 60	0100	HEISS ISLAND	TPW	
13 DEC 60	1330	04 26 S 179 50 E	TPW	
14 DEC 60	1652	WALLOPS ISLAND	UAP	NASA10.06
15 DEC 60	0119	KAPUSTIN YAR	TP	
16 DEC 60	1100	12 01 S 179 48 5 E	TPW	
20 DEC 60	0000	HEISS ISLAND	TPW	
21 DEC 60	0000	HEISS ISLAND	PW	

1961

8 JAN 61	1044	39 16 N 179 51 8 W	TPW	
9 JAN 61	1052	35 48 N 179 40 W	TPW	
10 JAN 61	1104	32 21 8 N 179 55 2 W	TPW	
11 JAN 61	1056	29 07 2 N 179 59 5 W	TPW	
15 JAN 61	1052	14 20 5 N 179 59 5 W	TPW	
18 JAN 61	1100	03 35 4 N 179 55 W	PW	
20 JAN 61	1103	01 09 8 S 179 55 2 W	PW	
23 JAN 61	1100	10 59 6 S 179 44 5 W	PW	
24 JAN 61	1103	14 06 S 179 54 3 W	TPW	
25 JAN 61	1800	HEISS ISLAND	TPW	
26 JAN 61	1800	HEISS ISLAND	TPW	
27 JAN 61	1800	HEISS ISLAND	TPW	
14 FEB 61	1800	HEISS ISLAND	TW	
14 FEB 61	1803	KAPUSTIN YAR	TP	
15 FEB 61	0827	KAPUSTIN YAR	TPW	
15 FEB 61	0953	KAPUSTIN YAR	TPW	
21 FEB 61	1200	HEISS ISLAND	TPW	
24 FEB 61	0019	EGLIN FIELD	UAP	AA6.170
28 FEB 61	1200	HEISS ISLAND	TP	
27 APR 61	2300	08 06 S 179 53 E	TP	
29 APR 61	1100	02 45 S 179 59 2 E	TP	
3 MAY 61	2305	13 16 9 N 179 58 E	TPW	
8 MAY 61	1102	28 01 N 179 49 E	TPW	
9 MAY 61	1153	WALLOPS ISLAND	UAP	NASA10.29
12 MAY 61	0830	42 00 N 179 48 E	TP	
10 JUN 61	1314	43 19 5 N 178 47 7 E	TPW	
10 JUN 61	2255	43 11 N 179 48 7 E	TPW	
11 JUN 61	1050	41 26 2 N 180 00 E	TPW	
12 JUN 61	1110	38 01 N 179 52 5 E	TPW	
13 JUN 61	1100	34 47 N 179 59 E	TP	
14 JUN 61	1050	31 59 N 179 59 6 E	TPW	
16 JUN 61	1100	23 46 N 179 50 3 E	PW	
16 JUN 61	2100	HEISS ISLAND	TW	
18 JUN 61	0455	MICHIKAWA	P	S21 E-4(ROCKOON)
18 JUN 61	1100	15 56 9 N 180 00 E	TPW	
18 JUN 61	2100	HEISS ISLAND	TPW	
19 JUN 61	1100	12 35 2 N 180 00 E	TPW	
20 JUN 61	1050	09 16 N 179 56 E	TPW	
21 JUN 61	1100	05 44 3 N 179 58 6 E	PW	

Table 3 (Continued)

22 JUN 61	2100	HEISS ISLAND	TW	
24 JUN 61	2100	HEISS ISLAND	TPW	
26 JUN 61	2200	HEISS ISLAND	TPW	
15 JUL 61	2100	HEISS ISLAND	TPW	
16 JUL 61	2100	HEISS ISLAND	TPW	
17 JUL 61	2100	HEISS ISLAND	TPW	
18 JUL 61	2100	HEISS ISLAND	TPW	
19 JUL 61	2100	HEISS ISLAND	TPW	
20 JUL 61	2100	HEISS ISLAND	TPW	
21 JUL 61	0242	MICHIKAWA	T	S22 K-8(ID-6TW-10)
21 JUL 61	2100	HEISS ISLAND	TPW	
22 JUL 61	2100	HEISS ISLAND	PW	
18 NOV 61	0630	WALLOPS ISLAND	AC	NASA10.72NA
5 DEC 61	1803	HEISS ISLAND	TP	
8 DEC 61	1800	HEISS ISLAND	TP	
11 DEC 61	1900	HEISS ISLAND	TP	
13 DEC 61	1800	HEISS ISLAND	TPW	

1962

2 MAR 62	1047	WALLOPS ISLAND		NASA10.70GT
8 JUN 62	0053	WALLOPS ISLAND		NASA10.44GA
7 AUG 62	2202	KRONOGARD		K62-2
8 AUG 62	1655	WALLOPS ISLAND		NASA4.60GT
20 NOV 62	2141A	WALLOPS ISLAND		BRACE L. H.
20 NOV 62	2141B	WALLOPS ISLAND		BRACE L. H.
3 DEC 62	2320	EGLIN FIELD		NASA14.46AA
4 DEC 62	0706	FORT CHURCHILL		NASA10.67GA

1963

31 JAN 63	2100	HEISS ISLAND	TPW	
3 FEB 63	2100	HEISS ISLAND	PW	
12 FEB 63	2100	HEISS ISLAND	TP	
10 MAR 63	2100	HEISS ISLAND	TW	
12 MAR 63	0950	WOOMERA	S	HAD-116
14 MAR 63	2345*	RESEARCH SHIPS	T	
15 MAR 63	1725*	KAPUSTIN YAR	TPW	
18 MAR 63	2350*	RESEARCH SHIPS	TPW	
21 MAR 63	1751*	KAPUSTIN YAR	TP	
21 MAR 63	2150*	KAPUSTIN YAR	TP	
23 MAR 63	2305*	RESEARCH SHIPS	TPW	
26 MAR 63	0620*	KAPUSTIN YAR	TPW	
26 MAR 63	0730*	KAPUSTIN YAR	TP	
26 MAR 63	0950*	KAPUSTIN YAR	TPW	
26 MAR 63	1150*	KAPUSTIN YAR	TPW	
26 MAR 63	2258*	RESEARCH SHIPS	TP	
28 MAR 63	0754	WALLOPS ISLAND		NASA14.08UA
29 MAR 63	0752*	KAPUSTIN YAR	TPW	
29 MAR 63	1019*	KAPUSTIN YAR	TPW	
1 APR 63	2257*	RESEARCH SHIPS	TPW	
2 APR 63	2258*	RESEARCH SHIPS	TPW	
3 APR 63	2357*	RESEARCH SHIPS	TPW	
4 APR 63	0640*	KAPUSTIN YAR	TW	

Table 3 (Continued)

4 APR 63	1625*	KAPUSTIN YAR	TPW	
4 APR 63	1735*	KAPUSTIN YAR	TPW	
4 APR 63	2253*	RESEARCH SHIPS	TPW	
5 APR 63	2302*	RESEARCH SHIPS	TPW	
6 APR 63	2356*	RESEARCH SHIPS	TP	
12 APR 63	2305*	RESEARCH SHIPS	TPW	
12 APR 63	2100	HEISS ISLAND	TPW	
14 APR 63	2300*	RESEARCH SHIPS	TPW	
16 APR 63	2300*	RESEARCH SHIPS	TPW	
18 APR 63	2100A	WALLOPS ISLAND		BRACE L. H.
18 APR 63	2100B	WALLOPS ISLAND		BRACE L. H.
18 APR 63	2300*	RESEARCH SHIPS	TPW	
20 APR 63	2303*	RESEARCH SHIPS	TPW	
22 APR 63	2300*	RESEARCH SHIPS	TPW	
31 MAY 63	1604*	KAPUSTIN YAR	TP	
31 MAY 63	1822*	KAPUSTIN YAR	TP	
31 MAY 63	1940*	KAPUSTIN YAR	TPW	
31 MAY 63	2110*	KAPUSTIN YAR	TPW	
4 JUN 63	1543*	KAPUSTIN YAR	TPW	
4 JUN 63	1718*	KAPUSTIN YAR	TPW	
4 JUN 63	1840*	KAPUSTIN YAR	TP	
12 JUN 63	0925*	KAPUSTIN YAR	TP	
12 JUN 63	1034*	KAPUSTIN YAR	TPW	
13 JUN 63	1205*	KAPUSTIN YAR	TP	
18 JUN 63	1420*	KAPUSTIN YAR	TPW	
19 JUN 63	0835*	KAPUSTIN YAR	TPW	
19 JUN 63	1000*	KAPUSTIN YAR	TPW	
20 JUN 63	1715*	KAPUSTIN YAR	TP	
20 JUN 63	1817*	KAPUSTIN YAR	TPW	
20 JUN 63	1915*	KAPUSTIN YAR	TP	
20 JUN 63	2028*	KAPUSTIN YAR	TPW	
20 JUN 63	2137*	KAPUSTIN YAR	TPW	
20 JUL 63	2154A	WALLOPS ISLAND		BRACE L. H.
20 JUL 63	2154B	WALLOPS ISLAND		BRACE L. H.
27 JUL 63	0010	KRONOGARD		K63-1
29 JUL 63	2328	KRONOGARD		K63-2
1 AUG 63	2327	KRONOGARD		K63-3
7 AUG 63	2229	KRONOGARD		K63-4
10 SEP 63	0525*	KAPUSTIN YAR	TP	
10 SEP 63	0640*	KAPUSTIN YAR	TPW	
10 SEP 63	0850*	KAPUSTIN YAR	TPW	
10 SEP 63	0935*	KAPUSTIN YAR	TP	
12 SEP 63	0415*	KAPUSTIN YAR	TPW	
12 SEP 63	0512*	KAPUSTIN YAR	TP	
12 SEP 63	0610*	KAPUSTIN YAR	TPW	
12 SEP 63	0713*	KAPUSTIN YAR	TPW	
12 SEP 63	0900*	KAPUSTIN YAR	TP	
12 SEP 63	1055*	KAPUSTIN YAR	TPW	
12 SEP 63	1150*	KAPUSTIN YAR	TPW	
16 SEP 63	2107*	KAPUSTIN YAR	TPW	
16 SEP 63	2232*	KAPUSTIN YAR	TPW	
16 SEP 63	2340*	KAPUSTIN YAR	TPW	
17 SEP 63	0050*	KAPUSTIN YAR	TPW	
17 SEP 63	0200*	KAPUSTIN YAR	TPW	
17 SEP 63	0240*	KAPUSTIN YAR	TPW	
17 SEP 63	0530*	KAPUSTIN YAR	TPW	

Table 3 (Continued)

17 SEP 63	1820*	KAPUSTIN YAR	TPW	
26 NOV 63	1816	WALLOPS ISLAND		NASA14.100A
16 DEC 63	1132*	KAPUSTIN YAR	TPW	
16 DEC 63	1324*	KAPUSTIN YAR	TPW	
16 DEC 63	1973*	KAPUSTIN YAR	TPW	
18 DEC 63	1959*	KAPUSTIN YAR	TPW	
19 DEC 63	0920*	KAPUSTIN YAR	TPW	
19 DEC 63	1020*	KAPUSTIN YAR	TPW	
19 DEC 63	1439*	KAPUSTIN YAR	TPW	
19 DEC 63	1610*	KAPUSTIN YAR	TPW	
20 DEC 63	1720*	KAPUSTIN YAR	TPW	
20 DEC 63	1925*	KAPUSTIN YAR	TPW	
21 DEC 63	0907*	KAPUSTIN YAR	TPW	
23 DEC 63	1615*	KAPUSTIN YAR	TPW	
23 DEC 63	1721*	KAPUSTIN YAR	TPW	
24 DEC 63	1717*	KAPUSTIN YAR	TP	
24 DEC 63	2131*	KAPUSTIN YAR	TPW	
1964				
13 JAN 64	2100	HEISS ISLAND	TP	
17 JAN 64	2200	HEISS ISLAND	TP	
29 JAN 64	0309A	WALLOPS ISLAND		BRACE L. H.
29 JAN 64	0309B	WALLOPS ISLAND		BRACE L. H.
5 FEB 64	0440	FORT CHURCHILL	G	SMITH W. S.
12 FEB 64	1016	WOOMERA	S	HAD 124
19 MAR 64	1400	KAPUSTIN YAR	TPW	
24 MAR 64	1736	KAPUSTIN YAR	TPW	
8 APR 64	2008	HEISS ISLAND	TPW	
13 APR 64	2008	HEISS ISLAND	TP	
14 APR 64	0906	WOOMERA	S	HAD 129
17 APR 64	2315	WALLOPS ISLAND	S	HANSEN W. H.
18 APR 64	2000	HEISS ISLAND	TPW	
19 APR 64	2000	HEISS ISLAND	TP	
20 APR 64	2100	HEISS ISLAND	TPW	
20 APR 64	2100	HEISS ISLAND	TP	
22 APR 64	2200	HEISS ISLAND	TPW	
22 APR 64	2230	HEISS ISLAND	TPW	
24 APR 64	2100	HEISS ISLAND	TPW	
26 APR 64	2008	HEISS ISLAND	TPW	
27 APR 64	1732	KAPUSTIN YAR	PW	
27 APR 64	2008	HEISS ISLAND	TPW	
29 APR 64	1733	KAPUSTIN YAR	TPW	
29 APR 64	2008	HEISS ISLAND	TPW	
4 MAY 64	1729	KAPUSTIN YAR	TPW	
6 MAY 64	1908	KAPUSTIN YAR	PW	
12 MAY 64	1706	KAPUSTIN YAR	TPW	
14 MAY 64	0837	WOOMERA	D	HAD 126
14 MAY 64	1736	KAPUSTIN YAR	T	
19 MAY 64	1702	KAPUSTIN YAR	TP	
20 MAY 64	1700	KAPUSTIN YAR	TPW	
21 MAY 64	1700	KAPUSTIN YAR	TPW	
21 MAY 64	1805	KAPUSTIN YAR	TPW	
7 JUN 64	2000	HEISS ISLAND	TPW	
8 JUN 64	2000	HEISS ISLAND	TPW	

Table 3 (Continued)

10 JUN 64	2000	HEISS ISLAND	TPW	
11 JUN 64	0831	WOOMERA	D	HAD 128
12 JUN 64	2000	HEISS ISLAND	TPW	
16 JUN 64	2000	HEISS ISLAND	TPW	
17 JUN 64	2000	HEISS ISLAND	TP	
18 JUN 64	2000	HEISS ISLAND	TPW	
8 JUL 64	2000	HEISS ISLAND	TPW	
9 JUL 64	0839	WOOMERA	D	HAD 141
10 JUL 64	2100	HEISS ISLAND	TP	
12 JUL 64	2000	HEISS ISLAND	TPW	
13 JUL 64	2000	HEISS ISLAND	TPW	
14 JUL 64	2000	HEISS ISLAND	TPW	
17 JUL 64	2000	HEISS ISLAND	TPW	
24 JUL 64	2000	HEISS ISLAND	TPW	
28 JUL 64	2114	FORT CHURCHILL	I	CARIGNAN G. R.
7 AUG 64	0015	KRONOGARD	G	SMITH W. S.
14 AUG 64	2070	HEISS ISLAND	TPW	
16 AUG 64	0113	KRONOGARD	G	SMITH W. S.
16 AUG 64	2000	HEISS ISLAND	TPW	
17 AUG 64	0049	KRONOGARD	G	SMITH W. S.
18 AUG 64	1600	KAPUSTIN YAR	TP	
20 AUG 64	0902	WOOMERA	D	HAD 135
20 AUG 64	1711	KAPUSTIN YAR	TPW	
22 AUG 64	2000	HEISS ISLAND	TP	
24 AUG 64	2100	HEISS ISLAND	TP	
26 AUG 64	1809	KAPUSTIN YAR	TP	
26 AUG 64	2000	HEISS ISLAND	TP	
31 AUG 64	1731	KAPUSTIN YAR	TP	
9 SEP 64	1705	KAPUSTIN YAR	TPW	
12 SEP 64	2000	HEISS ISLAND	TP	
17 SEP 64	0917	WOOMERA	D	HAD 144
24 SEP 64	2000	HEISS ISLAND	TPW	
12 OCT 64	2000	HEISS ISLAND	TP	
14 OCT 64	2000	HEISS ISLAND	TP	
15 OCT 64	0936	WOOMERA	S	HAD 146
16 OCT 64	2000	HEISS ISLAND	TP	
19 OCT 64	2100	HEISS ISLAND	P	
21 OCT 64	2140	HEISS ISLAND	P	
26 OCT 64	2000	HEISS ISLAND	P	
28 OCT 64	2200	HEISS ISLAND	T	
29 OCT 64	2000	HEISS ISLAND	TP	
1 NOV 64	0615	BARKING SANDS	S	SMITH L. B.
3 NOV 64	1738	WALLOPS ISLAND	G	THEON J. S.
10 NOV 64	2326	EGLIN		SMIDDY M.
11 NOV 64	0119	EGLIN		SMIDDY M.
11 NOV 64	0959	WOOMERA	S	HAD 145
12 NOV 64	0305	KAGOSHIMA	G	TAKAYA T.
12 NOV 64	1000	WOOMERA	D	HAD 157
15 NOV 64	2000	HEISS ISLAND	TP	
16 NOV 64	1818	WALLOPS ISLAND		CARIGNAN G. R.
18 NOV 64	2000	HEISS ISLAND	TP	

1965

7 JAN 65	0350	WALLOPS ISLAND	S	POTTER A. E.
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Table 3 (Continued)

2 NOV 65	2000	EGLIN	S	FAIRE A. C.
2 NOV 65	2250	SOUTH UST	P	FRITH R.
3 NOV 65	0917	EGLIN	S	FAIRE A. C.
9 NOV 65	2000A	FORT CHURCHILL	I	CARIGNAN G. R.
9 NOV 65	2000B	FORT CHURCHILL	I	CARIGNAN G. R.
16 NOV 65	1203	HEISS ISLAND	TPW	
17 NOV 65	1200	HEISS ISLAND	TPW	
18 NOV 65	1344	HEISS ISLAND	TPW	
24 NOV 65	1202	HEISS ISLAND	TPW	
9 DEC 65	2133	FORT CHURCHILL	S	FAIRE A.
10 DEC 65	0600	FORT CHURCHILL	S	FAIRE A.
11 DEC 65	0552	FORT CHURCHILL	S	FAIRE A.
11 DEC 65	1955	FORT CHURCHILL	S	FAIRE A.
13 DEC 65	1235	HEISS ISLAND	TPW	
15 DEC 65	1210	HEISS ISLAND	TPW	
17 DEC 65	1200	HEISS ISLAND	TPW	

1966

18 JAN 66	1110	KAGOSHIMA	P	ARIZUMI N.
23 JAN 66	0742	FORT CHURCHILL	G	SMITH W. S.
25 JAN 66	0152A	WALLOPS ISLAND	S	PETERSON J. W.
25 JAN 66	0152B	WALLOPS ISLAND	S	PETERSON J. W.
26 JAN 66	1745	BARKING SANDS	S	SMITH L. B.
26 JAN 66	2350	BARKING SANDS	S	SMITH L. B.
3 FEB 66	1831A	WALLOPS ISLAND	S	PETERSON J. W.
3 FEB 66	1831B	WALLOPS ISLAND	S	PETERSON J. W.
4 FEB 66	0154A	WALLOPS ISLAND	S	PETERSON J. W.
4 FEB 66	0154B	WALLOPS ISLAND	S	PETERSON J. W.
8 FEB 66	2000	WEST GEIRINISH	P	FRITH R.
8 FEB 66	0300	BARKING SANDS	S	SMITH L. B.
10 FEB 66	2000	WEST GEIRINISH	P	FRITH R.
10 FEB 66	2030	POINT BARROW	G	SMITH W. S.
12 FEB 66	2000	WEST GEIRINISH	P	FRITH R.
14 FEB 66	2000	WEST GEIRINISH	P	FRITH R.
18 FEB 66	2000	WEST GEIRINISH	P	FRITH R.
21 FEB 66	2200	WEST GEIRINISH	P	FRITH R.
23 FEB 66	2000	WEST GEIRINISH	P	FRITH R.
26 FEB 66	2000	WEST GEIRINISH	P	FRITH R.
28 FEB 66	2000	WEST GEIRINISH	P	FRITH R.
2 MAR 66	2000	WEST GEIRINISH	P	FRITH R.
4 MAR 66	2000	WEST GEIRINISH	P	FRITH R.
7 MAR 66	2000	WEST GEIRINISH	P	FRITH R.
9 MAR 66	2000	WEST GEIRINISH	P	FRITH R.
24 MAR 66	1531	SONMIANI	G	GROVES G. V.
18 APR 66	2153	WEST GEIRINISH	P	FRITH R.
21 APR 66	2203	WEST GEIRINISH	P	FRITH R.
3 JUN 66	0848	ABERPORTH	P	FRITH R.
8 JUN 66	1515	BARKING SANDS	S	SMITH L. B.
12 JUN 66	0918	BARKING SANDS	S	SMITH L. B.
16 JUN 66	0625	BARKING SANDS	S	SMITH L. B.
14 JUL 66	0118	CHAMICAL	P	LICHTENSTEIN E.
14 JUL 66	1517	CHAMICAL	P	LICHTENSTEIN E.
1 AUG 66	2200	WHITE SANDS	S	AFCRL
1 AUG 66	1900	WHITE SANDS	S	AFCRL

Table 3 (Continued)

14 JUN 65	1100	25 09 N 165 01 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
14 JUN 65	1205	HEISS ISLAND	TPW	
14 JUN 65	1205	HEISS ISLAND	TPW	
14 JUN 65	1217	28 59 N 150 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
15 JUN 65	1127	33 00 N 150 02 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
15 JUN 65	1151	29 36 N 165 00 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
15 JUN 65	1225	HEISS ISLAND	TPW	
15 JUN 65	1505	KAPUSTIN YAR	TPW	
16 JUN 65	1153	33 04 N 165 01 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
16 JUN 65	1200	HEISS ISLAND	TPW	
18 JUN 65	1210	HEISS ISLAND	TPW	
18 JUN 65	1705	KAPUSTIN YAR	TPW	
19 JUN 65	1251	35 49 N 170 00 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
21 JUN 65	1215	HEISS ISLAND	TPW	
21 JUN 65	1500	KAPUSTIN YAR	TPW	
23 JUN 65	1210	HEISS ISLAND	TPW	
23 JUN 65	1210	HEISS ISLAND	TPW	
25 JUN 65	1153	KAPUSTIN YAR	TPW	
6 JUL 65	0930	KAPUSTIN YAR	TPW	
9 JUL 65	0815	KAPUSTIN YAR	TPW	
13 JUL 65	0815	KAPUSTIN YAR	TPW	
21 JUL 65	0802	KAPUSTIN YAR	TPW	
21 JUL 65	1033	EGLIN	S	FAUCHER G
22 JUL 65	0817	KAPUSTIN YAR	TPW	
22 JUL 65	1315	HEISS ISLAND	TPW	
23 JUL 65	0816	KAPUSTIN YAR	TPW	
26 JUL 65	1215	HEISS ISLAND	TPW	
27 JUL 65	0817	KAPUSTIN YAR	TPW	
28 JUL 65	1215	HEISS ISLAND	TPW	
7 AUG 65	1830A	WALLOPS ISLAND	S	PETERSON J. W.
7 AUG 65	1830B	WALLOPS ISLAND	S	PETERSON J. W.
8 AUG 65	0840A	WALLOPS ISLAND	S	PETERSON J. W.
8 AUG 65	0840B	WALLOPS ISLAND	S	PETERSON J. W.
9 AUG 65	1112	POINT BARROW	G	SMITH W. S.
12 AUG 65	0816	KAPUSTIN YAR	TPW	
13 AUG 65	1215	HEISS ISLAND	TPW	
17 AUG 65	1200	HEISS ISLAND	TPW	
17 AUG 65	2355	LAPAN SPACE CENTER	G	SUBAGJO H.
18 AUG 65	1215	HEISS ISLAND	TPW	
8 SEP 65	0817	KAPUSTIN YAR	TPW	
15 SEP 65	0817	KAPUSTIN YAR	TPW	
19 SEP 65	1235	HEISS ISLAND	TPW	
20 SEP 65	0327	KAPUSTIN YAR		
20 SEP 65	1240	HEISS ISLAND	TPW	
22 SEP 65	1013	KAPUSTIN YAR	TPW	
22 SEP 65	1225	HEISS ISLAND	TPW	
23 SEP 65	0916	KAPUSTIN YAR	TPW	
24 SEP 65	1205	HEISS ISLAND	TPW	
1 OCT 65	0357	KAPUSTIN YAR		
1 OCT 65	0422	SARDINIA	S	GROVES G. V.
6 OCT 65	1116	KAPUSTIN YAR	TPW	
19 OCT 65	1211	HEISS ISLAND	TPW	
20 OCT 65	1200	HEISS ISLAND	TPW	
27 OCT 65	1206	HEISS ISLAND	TPW	
28 OCT 65	1107	KAPUSTIN YAR	TPW	
29 OCT 65	0836	KAPUSTIN YAR	TPW	

Table 3 (Continued)

8 MAY 65	1200	00 01 S	154 30 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
9 MAY 65	0859	16 24 N	179 29 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
9 MAY 65	1200	00 09 S	157 39 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
10 MAY 65	0730	CARNARVON		S	HAD 165
10 MAY 65	0943	13 25 N	180 00 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
10 MAY 65	1020	CARNARVON		S	HAD 164
10 MAY 65	1242	00 00 S	162 10 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
10 MAY 65	1320	CARNARVON		S	HAD 162
10 MAY 65	1620	CARNARVON		S	HAD 158
10 MAY 65	1920	CARNARVON		S	HAD-170
10 MAY 65	2040	WOOMERA		S	SL-361
11 MAY 65	0045	CARNARVON		S	HAD 154
11 MAY 65	0310	CARNARVON		S	HAD 155
11 MAY 65	0959	10 10 N	180 00 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
11 MAY 65	1100	00 00 S	166 36 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
12 MAY 65	0905	05 57 N	180 00 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
12 MAY 65	1132	00 00 S	171 13 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
12 MAY 65	1215	HEISS ISLAND		TPW	
13 MAY 65	1000	00 02 S	175 11 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
14 MAY 65	0859	00 44 S	180 00 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
15 MAY 65	0913	05 02 S	180 00 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
15 MAY 65	1041		179 59 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
16 MAY 65	1000	06 44 S	179 52 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
17 MAY 65	1000	11 20 S	179 27 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
18 MAY 65	1215	HEISS ISLAND		TPW	
19 MAY 65	1215	HEISS ISLAND		TPW	
20 MAY 65	1205	HEISS ISLAND		TPW	
26 MAY 65	1058	19 50 S	164 41 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
27 MAY 65	1053	17 59 S	172 31 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
28 MAY 65	1042	18 06 S	167 50 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
28 MAY 65	2203	19 30 S	162 47 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
29 MAY 65	1058	17 37 S	163 45 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
29 MAY 65	2206	19 41 S	158 25 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
30 MAY 65	2201	18 48 S	158 41 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
30 MAY 65	2309	18 48 S	158 41 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
2 JUN 65	1445	19 13 S	153 05 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
3 JUN 65	1100	18 02 S	164 37 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
3 JUN 65	1232	15 04 S	150 09 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
4 JUN 65	1206	11 12 S	150 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
5 JUN 65	1102	10 54 S	164 56 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
5 JUN 65	1155	06 57 S	150 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
6 JUN 65	1100	06 27 S	165 00 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
6 JUN 65	1200	02 59 S	150 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
7 JUN 65	1130	02 58 S	165 00 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
7 JUN 65	1158	00 55 N	150 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
8 JUN 65	0831	WOOMERA		S	HAD 172
8 JUN 65	1235	05 03 N	150 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
9 JUN 65	1102	05 37 N	165 00 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
9 JUN 65	1216	08 55 N	150 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
10 JUN 65	1100	08 55 N	165 00 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
10 JUN 65	1201	13 00 N	150 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
11 JUN 65	1100	13 18 N	165 00 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
11 JUN 65	1200	16 40 N	150 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
12 JUN 65	1525	21 29 N	150 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
13 JUN 65	1205	25 01 N	150 W	TPW	SHIP VOYEIKOV (12TH VOYAGE)
13 JUN 65	1221	21 12 N	165 04 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)

Table 3 (Continued)

11 JAN 65	1215	HEISS ISLAND	TPW	
13 JAN 65	1300	HEISS ISLAND	TPW	
15 JAN 65	1200	HEISS ISLAND	TPW	
18 JAN 65	1200	HEISS ISLAND	TPW	
20 JAN 65	1200	HEISS ISLAND	TPW	
20 JAN 65	1646	KAPUSTIN YAR	TPW	
22 JAN 65	1230	HEISS ISLAND	TPW	
22 JAN 65	1742	KAPUSTIN YAR	TPW	
22 JAN 65	1842	KAPUSTIN YAR	TPW	
10 FEB 65	1200	HEISS ISLAND	TPW	
16 FEB 65	1200	HEISS ISLAND	TPW	
18 FEB 65	1200	HEISS ISLAND	TPW	
19 FEB 65	1200	HEISS ISLAND	TPW	
28 FEB 65	0915	EGLYN	S	ULWICK J.
7 MAR 65	1965	03 55 N 82 46 W	TW	FINGER, F. G.
8 MAR 65	1200	HEISS ISLAND	TPW	
8 MAR 65	1517	KAPUSTIN YAR	TPW	
10 MAR 65	0745	KAPUSTIN YAR	TPW	
10 MAR 65	1205	HEISS ISLAND	TPW	
10 MAR 65	1515	KAPUSTIN YAR	TPW	
10 MAR 65	1715	KAPUSTIN YAR	TPW	
11 MAR 65	0935	9 27 S 82 26 W	I	SCHAEFER E. J.
11 MAR 65	2007	9 32 S 84 14 W	I	SCHAEFER E. J.
12 MAR 65	1700	KAPUSTIN YAR	TPW	
15 MAR 65	0745	KAPUSTIN YAR	TPW	
15 MAR 65	1205	HEISS ISLAND	TPW	
17 MAR 65	1200	HEISS ISLAND	TPW	
17 MAR 65	1400	KAPUSTIN YAR	TPW	
17 MAR 65	2113	FORT CHURCHILL	I	GREND A R. N.
18 MAR 65	1205	HEISS ISLAND	TPW	
18 MAR 65	1230	KAPUSTIN YAR	TPW	
19 MAR 65	1205	HEISS ISLAND	TPW	
19 MAR 65	1441	KAPUSTIN YAR	TPW	
14 APR 65	1215	HEISS ISLAND	TPW	
15 APR 65	1045	WHITE SANDS	P	NIER A. O. C.
17 APR 65	0944	41 48 N 131 46 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
18 APR 65	1416	41 46 N 132 03 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
20 APR 65	1215	HEISS ISLAND	TPW	
22 APR 65	1210	HEISS ISLAND	TPW	
28 APR 65	1303	39 55 N 149 59 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
30 APR 65	1030	40 07 N 161 04 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
30 APR 65	1200	31 00 N 150 07 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
30 APR 65	1417	40 03 N 156 02 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
1 MAY 65	1124	40 00 N 166 30 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
1 MAY 65	1159	26 28 N 150 00 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
2 MAY 65	1209	21 59 N 149 56 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
3 MAY 65	1211	17 20 N 150 00 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
4 MAY 65	1211	39 51 N 178 04 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
4 MAY 65	1507	12 14 N 149 57 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
5 MAY 65	0941	37 52 N 179 51 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
5 MAY 65	1305	08 16 N 149 35 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
6 MAY 65	0858	28 57 N 180 00 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
6 MAY 65	1159	04 09 N 150 00 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
7 MAY 65	0957	24 19 N 180 00 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)
7 MAY 65	1222	00 00 S 150 09 E	TPW	SHIP SHOKALSKY (8TH VOYAGE)
8 MAY 65	1351	19 07 N 180 00 E	TPW	SHIP VOYEIKOV (12TH VOYAGE)

Table 3 (Continued)

6 AUG 66	0800	WHITE SANDS	S	AFCRL
6 AUG 66	1100	WHITE SANDS	S	AFCRL
28 AUG 66	0700	WALLOPS ISLAND	I	CARIGNAN G. R.
14 SEP 66	1915	CHAMICAL	P	LICHTENSTEIN E.
27 SEP 66	2037	WEST GEIRINISH	P	FRITH R.
30 NOV 66	1145	WHITE SANDS	P	NIER A. O. C.
14 DEC 66	1407	CHAMICAL	P	LICHTENSTEIN E.

1967

23 JAN 67	0701	WHITE SANDS	S	FAIRE A.
23 JAN 67	1000	WHITE SANDS	S	FAIRE A.
23 JAN 67	1300	WHITE SANDS	S	FAIRE A.
23 JAN 67	1925	WHITE SANDS	S	FAIRE A.
26 JAN 67	1845	WHITE SANDS	S	FAIRE A.
1 FEB 67	0346	FORT CHURCHILL	I	HORVATH J.
9 FEB 67	0616	FORT CHURCHILL	I	OBRIEN B. J.
16 FEB 67	0712	KIRUNA	G	CENTAURE CE-09
4 MAR 67	2104	EGLIN	S	FAUCHER G.
5 MAR 67	2104	EGLIN	S	FAUCHER G.
13 APR 67	0712	EGLIN	S	FAIRE A.
18 APR 67	1140	EGLIN	S	FAIRE A.
17 MAY 67	1615	CHAMICAL	P	LICHTENSTEIN E.
21 MAY 67	0700	BARKING SANDS	S	SMITH L. B.
1 JUN 67	0645	BARKING SANDS	S	SMITH L. B.
1 JUN 67	1030	BARKING SANDS	S	SMITH L. B.
14 JUN 67	1640	CHAMICAL	P	LICHTENSTEIN E.
5 AUG 67		POINT BARROW	I	SMITH W. S.
26 AUG 67	0635	EGLIN	X	MCISAAC J.
7 SEP 67	0600	EGLIN	X	FAIRE A.
13 SEP 67	2030	CHAMICAL	P	LICHENSTEIN E.
13 OCT 67	2141	BARKING SANDS	X	KRUEGER A.
15 NOV 67	1557	CHAMICAL	P	LICHTENSTEIN E.
29 NOV 67	0106	SONMIANI	X	RAHMATULLAH D.
29 NOV 67	0210	SONMIANI	X	RAHMATULLAH D.
13 DEC 67	0840	EGLIN	S	FAIRE A.

1968

1 FEB 68	0542	KIRUNA	G	GROVES V. G. CE-34
1 FEB 68	1853	WALLOPS ISLAND	G	SMITH W. S. NASA-10.264 GM
1 FEB 68	1900	FORT CHURCHILL	G	SMITH W. S. NASA-10.259 GM
1 FEB 68	1930	FORT CHURCHILL	G	SMITH W. S. NASA-10.260 GM
1 FEB 68	2015	FORT CHURCHILL	G	SMITH W. S. NASA-10.261 GM
1 FEB 68	2115	FORT CHURCHILL	G	SMITH W. S. NASA-10.262 GM
4 FEB 68	0533	KIRUNA	G	GROVES V. G. CE-35
5 FEB 68	2222	FORT CHURCHILL	G	SMITH W. S. NASA-10.263 GM
17 MAR 68	0659	VEGA BAJA	I	HORVATH J. NASA-14.344 UM
17 MAR 68	1845	VEGA BAJA	I	HORVATH J. NASA-14.345 UM
18 MAR 68	0700	VEGA BAJA	I	HORVATH J. NASA-14.333 UM
24 MAR 68	1804	NATAL	G	SMITH W. S. NASA-10.270 GM
25 MAR 68	0600	NATAL	G	SMITH W. S. NASA-10.271 GM
25 MAR 68	1800	NATAL	G	SMITH W. S. NASA-10.272 GM
29 MAR 68	1353	SOUTH UYST	T	WILLIAMS E. R.

Table 3 (Continued)

1 MAY 68	2025	EGLIN	S	FAIRE A. AH 7.177
17 MAY 68	0900	KAUAI	D	FAUCHER G.
17 MAY 68	1825	11 07 N, 20 04 E	X	USSR, INST. EXPER. MET.
18 MAY 68	1805	10 52 N, 24 59 E	X	USSR, INST. EXPER. MET.
21 MAY 68	2009	23 07 N, 20 08 E	X	USSR, INST. EXPER. MET.
22 MAY 68	2100	KAUAI	D	FAUCHER G.
30 MAY 68	2039	WOOMERA	G	REES D. J. SL-761
31 MAY 68	0849	WOOMERA	G	REES D. J. SL-762
13 JUN 68	1820	MAR CHIQUITA	P	LICHTENSTEIN E. EXAMETNET
24 JUL 68	0046	WALLOPS ISLAND	G	SMITH W. S. NASA-10.265 GM
24 JUL 68	1019	WALLOPS ISLAND	G	SMITH W. S. NASA-10.258 GM
24 JUL 68	1830	WALLOPS ISLAND	X	DUBIN M. NASA-10.254 UA
24 JUL 68	2155	WALLOPS ISLAND	G	SMITH W. S. NASA-10.266 GM
7 AUG 68	1312	SOUTH UIST	T	WILLIAMS E. R.
8 AUG 68	1910	WALLOPS ISLAND	I	BRACE L. H. NASA-18.51 GA
8 AUG 68	1935	WALLOPS ISLAND	I	SMITH W. S. NASA-14.187 UM
9 AUG 68	0702	WALLOPS ISLAND	I	BRACE L. H. NASA-18.56 GA
9 AUG 68	0724	WALLOPS ISLAND	I	SMITH W. S. NASA-14.357 UM
4 SEP 68	0104	EGLIN	S	FAIRE A. AO-7.913-1
15 SEP 68	0200	KAGOSHIMA	P	ARIZUMI N. MT-135-36
15 SEP 68	0518	KAGOSHIMA	P	ARIZUMI N. MT-135-37
16 SEP 68	1712	WALLOPS ISLAND	G	SMITH W. S. NASA-10.269 GM
17 SEP 68	2003	POINT BARROW	G	SMITH W. S. NASA-10.257 GM
18 SEP 68	0730	FORT CHURCHILL	G	SMITH W. S. NASA-10.282 GM
15 OCT 68	0100	POINT BARROW	G	SMITH W. S. NASA-10.287 GM
15 OCT 68	0300	POINT BARROW	G	SMITH W. S. NASA-10.288
15 OCT 68	1632	KIRUNA	G	GROVES G. V. CE-39
15 OCT 68	2212	FORT CHURCHILL	G	SMITH W. S. NASA-10.251 GM
16 OCT 68	0012	FORT CHURCHILL	G	SMITH W. S. NASA-10.252 GM
1 NOV 68	0440	KIRUNA	G	GROVES G. V. CE-50
8 NOV 68	1200	SOUTH UIST	T	WILLIAMS E. R.
16 NOV 68	1149	SOUTH UIST	T	WILLIAMS E. R.
19 NOV 68	1800	WALLOPS ISLAND	G	SMITH W. S. NASA-10.293 GM
19 NOV 68	2005	WALLOPS ISLAND	IS	HORVATH J. NASA-14.386 UM
20 NOV 68	1124	FORT CHURCHILL	G	SMITH W. S. NASA-10.283 GM
20 NOV 68	1324	FORT CHURCHILL	G	SMITH W. S. NASA-10.284 GM
22 NOV 68	0031	POINT BARROW	G	SMITH W. S. NASA-10.289 GM
22 NOV 68	0755	POINT BARROW	G	SMITH W. S. NASA-10.290
5 DEC 68	1348	SOUTH UIST	T	WILLIAMS E. R.
7 DEC 68	0433	WOOMERA	X	BURROWS D. K. SL-725
9 DEC 68	1317	SOUTH UIST	T	WILLIAMS E. R.
9 DEC 68	2255	EGLIN	X	HIGGINS J. AF-7.660
13 DEC 68	0311	FORT CHURCHILL	G	SMITH W. S. NASA-10.285 GM
13 DEC 68	0459	POINT BARROW	G	SMITH W. S. NASA-10.291 GM
13 DEC 68	0511	FORT CHURCHILL	G	SMITH W. S. NASA-10.286 GM

1969

4 JAN 69	0200	KAGOSHIMA	T	ARIZUMI N.
4 JAN 69	0500	KAGOSHIMA	T	ARIZUMI N.
5 JAN 69	0200	KAGOSHIMA	T	ARIZUMI N.
5 JAN 69	0500	KAGOSHIMA	T	ARIZUMI N.
11 JAN 69	1015	POINT BARROW	G	SMITH W. S.
14 JAN 69	0525	FORT CHURCHILL	T	MCNAMARA A. G.
17 JAN 69	1834	KIRUNA	G	UDIN T.

Table 3 (Continued)

17 JAN 69	2132	WALLOPS ISLAND	G	SMITH W. S.
19 JAN 69	0200	POINT BARROW	G	SMITH W. S.
19 JAN 69	1905	KIRUNA	G	UDIN I.
23 JAN 69	2000	WOOMERA	T	BURROWS K.
23 JAN 69	2300	KIRUNA	G	UDIN I.
25 JAN 69	2100	KIRUNA	G	UDIN I.
28 JAN 69	0716	FORT CHURCHILL	T	MCNAMARA A. G.
30 JAN 69	2017	FORT CHURCHILL	G	SMITH W. S.
31 JAN 69	0700	POINT BARROW	G	SMITH W. S.
31 JAN 69	1757	WALLOPS ISLAND	G	SMITH W. S.
31 JAN 69	1836	WALLOPS ISLAND	S	FAUCHER G.
31 JAN 69	1910	WALLOPS ISLAND		BARTH C. A.
31 JAN 69	2153	WALLOPS ISLAND	S	AFCRL AH 7.576
4 FEB 69	2230	POINT BARROW	G	SMITH W. S.
6 FEB 69	0939	FORT CHURCHILL	G	SMITH W. S.
6 FEB 69	1929	WALLOPS ISLAND		BARTH C. A.
6 FEB 69	2109	WALLOPS ISLAND	G	SMITH W. S.
7 MAR 69	2230	NATAL	X	WALKER R. G.
8 MAR 69	1535	HEISS ISLAND	T	
9 MAR 69	1634	HEISS ISLAND	T	
10 MAR 69	1610	HEISS ISLAND	T	
10 MAR 69	2300	HEISS ISLAND	T	
13 MAR 69	1645	HEISS ISLAND	T	
13 MAR 69	2223	HEISS ISLAND	T	
14 MAR 69	2220	HEISS ISLAND	T	
17 MAR 69	1835	HEISS ISLAND	T	
20 MAR 69	1750	HEISS ISLAND	T	
20 MAR 69	1830	HEISS ISLAND	T	
20 MAR 69	2030	HEISS ISLAND	T	
28 MAR 69	0025	ARENOSILLO	G	AZCARRAGA A.
28 MAR 69	0732	WALLOPS ISLAND	G	SMITH W. S.
29 MAR 69	0005	ARENOSILLO	G	AZCARRAGA A.
29 MAR 69	0715	WALLOPS ISLAND	G	SMITH W. S.
29 MAR 69	1300	VOLGOGRAD	P	
31 MAR 69	1418	SONMIANI	P	SHAFI AHMAD M.
9 APR 69	0933	VOLGOGRAD	P	
23 APR 69	1310	VOLGOGRAD	P	
8 MAY 69	0311	WALLOPS ISLAND	G	SMITH W. S.
10 MAY 69	0436	WALLOPS ISLAND	G	SMITH W. S.
11 JUN 69	1805	VOLGOGRAD	P	
28 JUN 69	0035	WALLOPS ISLAND		ANDERSON J. G.
24 JUL 69	1006	WALLOPS ISLAND	PT	BOWHILL S. A.
24 JUL 69	1036	WALLOPS ISLAND	PT	BOWHILL S. A.
24 JUL 69	1700	WALLOPS ISLAND	PT	BOWHILL S. A.
24 JUL 69	2136	WALLOPS ISLAND	PT	BOWHILL S. A.
7 AUG 69	0336	FORT CHURCHILL	S	FAIRE A. C.
7 AUG 69	0535	FORT CHURCHILL	S	FAIRE A. C.
21 AUG 69	1539	WALLOPS ISLAND		HORVATH J. J.
6 SEP 69	0200	KAGOSHIMA	T	SHIMIZU I.
7 SEP 69	0200	KAGOSHIMA	T	SHIMIZU I.
7 SEP 69	0500	KAGOSHIMA	T	SHIMIZU I.
27 SEP 69	0205	KAGOSHIMA	T	SHIMIZU I.
27 SEP 69	0500	KAGOSHIMA	T	SHIMIZU I.
15 OCT 69	1846	WOOMERA	G	REES D.
17 OCT 69	0915	WOOMERA	G	REES D.
3 NOV 69	0642	FORT CHURCHILL	S	FAIRE A. C.

Table 3 (Continued)

3 NOV 69	1232	FORT CHURCHILL	S	FAIRE A. C.
3 NOV 69	2308	FORT CHURCHILL	S	FAIRE A. C.
1970				
22 JAN 70	0500	KAGOSHIMA	T	SHIMIZU I.
23 JAN 70	0220	KAGOSHIMA	T	SHIMIZU I.
23 JAN 70	0500	KAGOSHIMA	T	SHIMIZU I.
25 JAN 70	0500	KAGOSHIMA	T	OYAMA K.
25 JAN 70	0500	KAGOSHIMA	T	SUITSU T.
25 JAN 70	0500	KAGOSHIMA	T	OGAWA T.
7 FEB 70	0531	WHITE SANDS		WALKER R.
7 MAR 70	1651	EGLIN	S	WEEKS L.
7 MAR 70	1810	EGLIN	S	WEEKS L.
7 MAR 70	1925	EGLIN	S	WEEKS L.
12 APR 70	1915	EGLIN	S	WEEKS L.

TABLE 4.

SOUNDINGS REMOVED FROM EARLIER CHRONOLOGICAL BIBLIOGRAPHY

17 AUG 59	0918	WALLOPS ISLAND	UAP	NASA3.13
18 NOV 59	2217	WALLOPS ISLAND	UAP	NASA3.15
25 MAY 60	0048	WALLOPS ISLAND	UAP	NASA3.24
9 DEC 60	1130	WALLOPS ISLAND	UAP	NASA10.12
10 DEC 60	2230	WALLOPS ISLAND	UAP	NASA8.05
19 APR 61	0936	WALLOPS ISLAND	UAP	NASA3.05
20 APR 61	2312	WALLOPS ISLAND	UAP	NASA3.06
21 APR 61	0939	WALLOPS ISLAND	UAP	NASA3.08
24 APR 61	0253	WOOMERA	DS	HAT-201
13 SEP 61	0932	WALLOPS ISLAND	UAP	NASA8.06CA
13 SEP 61	2353	WALLOPS ISLAND	UAP	NASA8.22CA
16 SEP 61	2339	WALLOPS ISLAND	UAP	NASA3.18CA
17 SEP 61	1003	WALLOPS ISLAND	UAP	NASA3.19CA
9 DEC 61	0605	HAMMAGUIR	WT	CENTAURE-C07
14 DEC 61	1029	WOOMERA	S	HAD-103
1 MAR 62	2323	WALLOPS ISLAND		NASA10.100CA
2 MAR 62	2105	WALLOPS ISLAND		NASA10.101CA
23 MAR 62	2344	WALLOPS ISLAND		NASA10.102CA
27 MAR 62	2348	WALLOPS ISLAND		NASA10.103CA
17 APR 62	0943	WALLOPS ISLAND		NASA3.20CA
31 MAY 62	0301	WOOMERA	DS	LONG TOM 14
7 JUN 62	0056	WALLOPS ISLAND		NASA3.21CA
26 JUN 62	0838	WOOMERA	S	HAD-108
27 AUG 62	0908	WOOMERA	S	HAD-107
24 OCT 62	0946	WOOMERA	S	HAD-111
7 NOV 62	1053	WALLOPS ISLAND		NASA14.16CA
27 NOV 62	1017	WOOMERA	S	HAD-112
30 NOV 62	1115	WALLOPS ISLAND		NASA14.17CA
4 DEC 62	1028	WOOMERA	S	HAD-113
5 DEC 62	2216	WALLOPS ISLAND		NASA14.18CA
30 JAN 63	1032	WOOMERA	S	HAD-115
20 FEB 63	2318	WALLOPS ISLAND		NASA14.35CA
21 FEB 63	2316	WALLOPS ISLAND		NASA14.39CA
21 MAR 63	0930	WOOMERA	S	HAD-118
22 MAY 63	0410	FORT CHURCHILL		NASA14.13CA
22 MAY 63	0751	WALLOPS ISLAND		NASA14.14CA
23 MAY 63	0413	WALLOPS ISLAND		NASA14.15CA
24 MAY 63	0045	WALLOPS ISLAND		NASA14.40CA
25 MAY 63	0047	WALLOPS ISLAND		NASA14.42CA
17 MAY 67	1615	CHAMICAL	P	LICHTENSTEIN E.
17 JAN 68	1725	CHAMICAL	X	LICHTENSTEIN E.
16 JUL 68	0145	MAR CHIQUITA	P	LICHTENSTEIN E.

Efforts to obtain the data from these earlier flights from either the World Data Center A, Rockets and Satellites, or the National Space Science Data Center (NSSDC) have proved negative. However, the latter facility has recently provided a list of as many of the respective experimenters as they were able to determine from their archives. The identified individuals and/or their affiliations are contained in Table 5 their current addresses, if known, are listed in Table 6.

TABLE 5
LIST OF ROCKET SOUNDINGS 1957 - 1963

<u>DATE</u>	<u>TIME(UT)</u>	<u>LAUNCH SITE</u>	<u>ROCKET NUMBER</u>
26 Sep 58	1250	Michikawa	Kappa-VI-TW-4
23 Dec 58	1203	Michikawa	Kappa-VI-TW-5
18 Mar 59	1205	Michikawa	Kappa-VI-TW-6
20 Mar 59	1212	Michikawa	Kappa-VI-TW-7
12 May 59	1139	Holloman	AA3.200C
22 May 59	1115	Holloman	AA3.201C
27 May 59	0451	White Sands	AA6.161C
27 May 59	1950	White Sands	AA6.162C
29 Sep 59	1059	Eglin Field	AA6.203C
30 Sep 59	1057	Eglin Field	AA6.204C
1 Oct 59	1049	Eglin Field	AA6.210C
2 Oct 59	1100	Eglin Field	AA6.211C
3 Oct 59	1103	Eglin Field	AA6.202C
9 Oct 59	0840	Eglin Field	AA6.209C
9 Oct 59	1117	Eglin Field	AA6.213C
12 Oct 59	0900	Eglin Field	AA6.208C
12 Oct 59	1112	Eglin Field	AA6.206C
13 Oct 59	1117	Eglin Field	AA6.214C
15 Oct 59	1105	Eglin Field	AA6.207C
16 Oct 59	1117	Eglin Field	AA6.215C
19 Nov 59	1036	Fort Churchill	AA6.163C
20 Nov 59	1816	Fort Churchill	AA6.164C
27 Feb 60	0648	Fort Churchill	AA4.360C
29 Apr 60	1547	Wallops Island	NASA4.09
16 Jun 60	0529	Wallops Island	NASA10.03
27 Jun 60	1315	White Sands	NRL-58
27 Jun 60	2010	Eglin Field	AA8.242
28 Jun 60	0610	Eglin Field	AA8.243
25 Aug 60	0104	Eglin Field	AA8.244
28 Aug 60	1427	Woomera	Skylark 13
17 Sep 60	0250	Michikawa	S-15 K-6(TW-8)
29 Sep 60	0246	Michikawa	S-18 K-6H(TW-9)
15 Nov 60	1641	Wallops Island	NASA4.14
14 Dec 60	1652	Wallops Island	NASA10.06
24 Feb 61	0019	Eglin Field	AA6.170
9 May 61	1153	Wallops Island	Nasa10.29
18 Jun 61	0455	Michikawa	S21 E-4(Rockoon)
21 Jul 61	0242	Michikawa	S22 K-8(ID-6TW-10)
18 Nov 61	0630	Wallops Island	NASA10.72NA
2 Mar 62	1047	Wallops Island	NASA10.70GT
5 Mar 62	0955	Woomera	Skylark 66
8 Jun 62	0053	Wallops Island	NASA10.44CA
7 Aug 62	2202	Kronogard	K62-2
8 Aug 62	1655	Wallops Island	NASA4.60GT
27 Nov 62	1017	Woomera	HAD-112
30 Nov 62	1115	Wallops Island	NASA14,17CA

TABLE 5 (Cont.)

<u>DATE</u>	<u>TIME(UT)</u>	<u>LAUNCH SITE</u>	<u>ROCKET NUMBER</u>
3 Dec 63	2320	Eglin Field	NASA14.46AA
4 Dec 62	0706	Fort Churchill	NASA10.67CA
12 Mar 63	0950	Woomera	HAD-116
28 Mar 63	0754	Wallops Island	NASA14.08.UA
18 Apr 63	2100	Wallops Island	NASA6.07CA
20 Jul 63	2154	Wallops Island	NASA6.08CA
27 Jul 63	0010	Kronogard	K63-1
29 Jul 63	2328	Kronogard	K63-2
1 Aug 63	2327	Kronogard	K63-3
7 Aug 63	2229	Kronogard	K63-4
26 Nov 63	1816	Wallops Island	NASA14.100UA

TABLE 6

ADDRESSES OF EXPERIMENTERS

<u>DATE</u>	<u>EXPERIMENTER(S)</u>	
26 Sept 58	H. Matsumoto	Kyoto University - Kyoto, Japan
	Y. Takeya	" " " "
	T. Okumoto	Osaka City University - Osaka, Japan
23 Dec 58	H. Matsumoto	Kyoto University - Kyoto, Japan
	Y. Takeya	Osaka City University - Osaka, Japan
	T. Okumoto	" " " "
18 March 59	H. Matsumoto	Kyoto University - Kyoto, Japan
	I. Kimura	" " " "
	Y. Takeya	Osaka City University - Osaka, Japan
	T. Okumoto	" " " "
20 March 59		
12 May 59	Air Force Cambridge Research Center	
	Bedford, Mass.	
22 May 59	Air Force Cambridge Research	
	Bedford, Mass.	
27 May 59	Air Force Cambridge Research Center	
	Bedford, Mass.	
27 May 59	Air Force Cambridge Research Center	
	Bedford, Mass.	
29 Sept 59	Air Force Cambridge Research Center	
	Bedford, Mass.	
30 Sept 59	Air Force Cambridge Research Center	
	Bedford, Mass.	
1 Oct 59	Air Force Cambridge Research Center	
	Bedford, Mass.	
2 Oct 59	Air Force Cambridge Research Center	
	Bedford, Mass.	
3 Oct 59	Air Force Cambridge Research Center	
	Bedford, Mass.	
9 Oct 59	Air Force Cambridge Research Center	
	Bedford, Mass.	
9 Oct 59	Air Force Cambridge Research Center	
	Bedford, Mass.	

TABLE 6 (Continued)

<u>DATE</u>	<u>EXPERIMENTER(S)</u>
12 Oct 59	Air Force Cambridge Research Center Bedford, Mass.
12 Octo 59	Air Force Cambridge Reseach Center Bedford, Mass.
13 Oct 59	Air Force Cambridge Research Center Bedford, Mass.
15 Oct 59	Air Force Cambridge Research Center Bedford, Mass.
16 Oct 59	Air Force Cambridge Research Center Bedford, Mass.
19 Oct 59	Air Force Cambridge Research Center Bedford, Mass.
20 Oct 59	Air Force Cambridge Research Center Bedford, Mass.
27 Feb 60	Air Force Cambridge Research C nter Bedford, Mass.
29 April 60	Edith B. Meadows (Chief Scientist) R. Horowitz H. Taylor Goddard Space Flight Center - Greenbelt, Md. J. Albus All are Project Scientists C. Smith
16 June 60	W. Nordberg (Project Scientist) Goddard Space Flight Center - Greenbelt, Md. University of Michigan
27 June 60	J. C. Holmes J. H. Hoffman U. S. Naval Research Laboratory J. M. Young
27 June 60	R. G. Sagalyn (Project Manager) Air Force Cambridge Research Center - Bedford, Mass.
28 June 60	R. G. Sagalyn (Project Manager) Air Force Cambridge Research Center Bedford, Mass.
25 Aug 60	R. G. Sagalyn (Project Manager) Air Force Cambridge Research Center Bedford, Mass.

TABLE 6 (Continued)

<u>DATE</u>	<u>EXPERIMENTER(S)</u>
28 Aug 60	Queens University (Sponsor)
17 Sept 60	H. Matsumoto Kyoto University - Kyoto, Japan Y. Takeya Osaka City University - Osaka, Japan T. Okumoto " " " " " W. Tatebe " " " " "
29 Sept 60	H. Matsumoto Kyoto University - Kyoto, Japan Y. Takeya Osaka City University - Osaka, Japan T. Okumoto Osaka City University - Osaka, Japan W. Tatebe " " " " "
15 Nov 60	Harry A. Taylor (Chief Scientist) H. Benton C. Smith Goddard Space Flight Center - Greenbelt, Md. H. Brinton All are Project Scientists J. Albus
14 Dec 60	W. Nordberg (Project Scientist) Goddard Space Flight Center - Greenbelt, Md.
24 Feb 61	G. Faucher Air Force Cambridge Research Center Bedford, Mass.
9 May 61	W. Smith (Project Scientist) Goddard Space Flight Center - Greenbelt, Md. University of Michigan
18 June 61	H. Takeuchi F. Imai Kubota Meteorological Equip. Co. F. Yoshizawa Koga, Ibaraki K. Otsuka Prefecture, Japan K. Oya
21 July 61	H. O-ya Kyoto University - Kyoto, Japan Y. Takeya Osaka City University - Osaka, Japan T. Okumoto " " " " " W. Tatebe " " " " "
18 Nov 61	Richard A. Hord Harold B. Tolejson Project Scientists Wade E. Lanford Langley Research Center
2 March 62	Dr. B. D. Donn (Project Scientist) Goddard Space Flight Center - Greenbelt, Md.
5 March 62	U.C.L. (Sponsor)
8 June 62	W. S. Smith Goddard Space Flight Center - Greenbelt, Md.

TABLE 6 (Continued)

<u>DATE</u>	<u>EXPERIMENTER(S)</u>	
7 Aug 62	George Witt (Project Scientist) Lars Rey (Project Manager)	Institute of Meteorology University of Stockholm Stockholm, Sweden
8 Aug 62	Dr. A. Boggess III (Code 613)	Goddard Space Flight Center Greenbelt, Maryland
20 Nov 62	Mr. L. H. Brace	Goddard Space Flight Center - Greenbelt, Md.
3 Dec 62	Dr. N. W. Rosenberg	Air Force Cambridge Research Bedford, Mass.
4 Dec 62	J. Theon (Code 651)	Goddard Space Flight Center - Greenbelt, Md.
12 March 63	Flight Project Group Weapons Research Establishment Salisbury, South Australia	
28 March 63	E. Schaeffer	University of Michigan - Ann Arbor, Michigan
18 April 63	Mr. G. Carignan	University of Michigan - Ann Arbor, Michigan
	J. C. Maurer	University of Michigan - Ann Arbor, Michigan
20 July 63	G. R. Carigan	University of Michigan - Ann Arbor, Michigan
27 July 63	George Witt Johan Martin	Institute of Meteorology - University of Stockholm - Stockholm, Sweden
29 July 63	George Witt Johan Martin	Institute of Meteorology - University of Stockholm - Stockholm, Sweden
1 Aug 63	George Witt Johan Martin	Institute of Meteorology - University of Stockholm - Stockholm, Sweden
7 Aug 63	George Witt Johan Martin	Institute of Meteorology - University of Stockholm - Stockholm, Sweden
26 Nov 63	E. J. Schaeffer	University of Michigan Ann Arbor, Michigan

III. DATA PROCESSING AND ANALYSIS

The interim report for the current program (Ref. 5) discussed a computer program that standardized and transferred the original 442 sounding data-collection to tape. A printout of a sample sounding from this program is shown in Figure 7. As part of this data transfer phase, several preliminary screening, checking, and editing procedures were incorporated. Figure 8 shows a printout of another sample which contains two types of errors, altitude monotonicity errors and density monotonicity errors. Investigation of these errors is handled separately, according to type.

A. Analysis of Pressure and Density Altitude Profiles

With regard to the density monotonicity test, each density profile was tested for inversions. If an inversion occurred, an error printout routine was activated identifying the inversion. Owing to several possible sources for density errors, no attempt at correction was programmed, but rather, each case was evaluated separately.

Many soundings were found to contain density inversions which occurred either at isolated altitudes or at several altitudes within various sounding segments. Each case was plotted by hand on semi-log graph paper and inspected to determine the nature or source of the inversion. The original publication containing each sounding was inspected to check for transcription errors and also to retrieve original pressure data. It was found that for each inversion, at a given altitude, the pressure, density, and temperature data were consistent with respect to the gas law.

The question was raised as to whether pressure or density inversions were physically realistic. An analysis of this problem is presented here.

The equation of state

$$p = \frac{R}{M} \rho T \quad (1)$$

and the hydrostatic equation

$$dp = -G\rho dh \quad (2)$$

may be combined to yield the relation

$$\frac{d \ln p}{dh} = \frac{-GM}{R} \frac{1}{T} \quad (3)$$

T may never be negative. Accordingly, for T to remain positive, $\frac{d \ln p}{dh}$,

the slope of the pressure altitude profile, must remain negative. Thus, for increasing altitude, the situation of a pressure inversion cannot arise for equilibrium conditions. Conversely, considering a sounding from the top altitude downward, the pressure must always be monotonically increasing, regardless of the associated temperature profile, provided that all temperatures are real. The response of the pressure altitude profile to changes in temperature is shown schematically in Figure 9.

6311261844WI	0	0	82	82	999347	23	3	13.91	64.5	.000E-50	114	90	25	23	2021
0311261844WI	0	6351.054	.431	.999347	E-07	301.		4	1	4	0.1103	14			2022
0311261844WI	0	114.01	.517	E-07	281.										2023
0311261844WI	0	112.99	.635	E-07	259.										2024
0311261844WI	0	112.00	.776	E-07	242.										2025
0311261844WI	0	110.99	.954	E-07	227.										2026
0311261844WI	0	109.99	.113	E-06	221.										2027
0311261844WI	0	109.03	.145	E-06	203.										2028
0311261844WI	0	107.98	.168	E-06	204.										2029
0311261844WI	0	107.02	.197	E-06	206.										2030
0311261844WI	0	105.98	.235	E-06	203.										2031
0311261844WI	0	105.00	.271	E-06	206.										2032
0311261844WI	0	104.02	.332	E-06	199.										2033
0311261844WI	0	103.00	.399	E-06	196.										2034
0311261844WI	0	101.99	.487	E-06	192.										2035
0311261844WI	0	100.97	.598	E-06	184.										2036
0311261844WI	0	100.02	.728	E-06	182.										2037
0311261844WI	0	99.02	.891	E-06	178.										2038
0311261844WI	0	98.03	.108	E-05	179.										2039
0311261844WI	0	96.97	.126	E-05	183.										2040
0311261844WI	0	96.01	.147	E-05	187.										2041
0311261844WI	0	95.03	.168	E-05	195.										2042
0311261844WI	0	94.01	.193	E-05	201.										2043
0311261844WI	0	92.99	.228	E-05	201.										2044
0311261844WI	0	92.00	.279	E-05	194.										2045
0311261844WI	0	91.01	.338	E-05	191.										2046
0311261844WI	0	90.00													2047
0311261844WI	0														2048

Figure 7. Sample - Rocket sounding with header records.

0106062148WI	70.	.1196 E-03	196.
0106062148WI	69.	.1502 E-03	186.
0106062148WI	68.	.1447 E-03	227.
0106062148WI	67.	.1875 E-03	205.
0106062148WI	66.	.1890 E-03	237.
0106062148WI	65.	.2113 E-03	243.
0106062148WI	64.	.2093 E-03	279.
0106062148WI	63.	.2616 E-03	253.
0106062148WI	62.	.2629 E-03	285.
0106062148WI	61.	.3299 E-03	257.
0106062148WI	60.	.3277 E-03	293.
0106062148WI	59.	.3845 E-03	280.
0106062148WI	58.	.4373 E-03	278.
0106062148WI	57.	.5071 E-03	271.
0106062148WI	56.	.5797 E-03	268.
0106062148WI	55.	.6354 E-03	278.
0106062148WI	54.	.6922 E-03	286.
0106062148WI	53.	.7725 E-03	288.
0106062148WI	52.	.8763 E-03	286.
0106062148WI	51.	.1007 E-02	280.
0106062148WI	50.	.1172 E-02	272.
0106062148WI	49.	.1294 E-02	279.
0106062148WI	48.	.1440 E-02	282.
0106062148WI	47.	.1646 E-02	277.
0106062148WI	46.	.1860 E-02	278.
0106062148WI	45.	.2158 E-02	271.
0106062148WI	44.	.2432 E-02	272.
0106062148WI	43.	.2735 E-02	274.
0106062148WI	42.	.3168 E-02	267.
0106062148WI	41.	.3612 E-02	266.
0106062148WI	40.	.4185 E-02	262.
0106062148WI	39.	.5038 E-02	248.
0106062148WI	38.	.6291 E-02	229.
0106062148WI	37.	.9308 E-02	182.
0106062148WI	36.	.1462 E-01	143.
0106062148WI	35.	.1773 E-01	149.
0106062148WI	34.	.1907 E-01	172.
0106062148WI	33.	.2065 E-01	191.

-2

ALTITUDE MONOTONICITY ERROR-DECK NO. 16, DATE 610713, TIME 2207, SITE W1.

ALTA= 30.78, ALTB= 28.78, ALTC= 29.78 KM.

DENSITY MONOTONICITY ERROR-DECK NO. 16, DATE 610713, TIME 2207, SITE W1,
DENSEA= 0.17280E-01, DENSEB= 0.23370E-01, DENSEC= 0.20090E-01 KG/(CU M).

ALTITUDE MONOTONICITY ERROR-DECK NO. 16, DATE 610713, TIME 2207, SITE W1,

ALTA= 28.78, ALTB= 29.78, ALTC= 27.78 KM.

DENSITY MONOTONICITY ERROR-DECK NO. 16, DATE 610713, TIME 2207, SITE W1,
DENSEA= 0.23370E-01, DENSEB= 0.20090E-01, DENSEC= 0.27220E-01 KG/(CU M).

Figure 8. Sample - Computer output showing sounding with altitude and density errors.

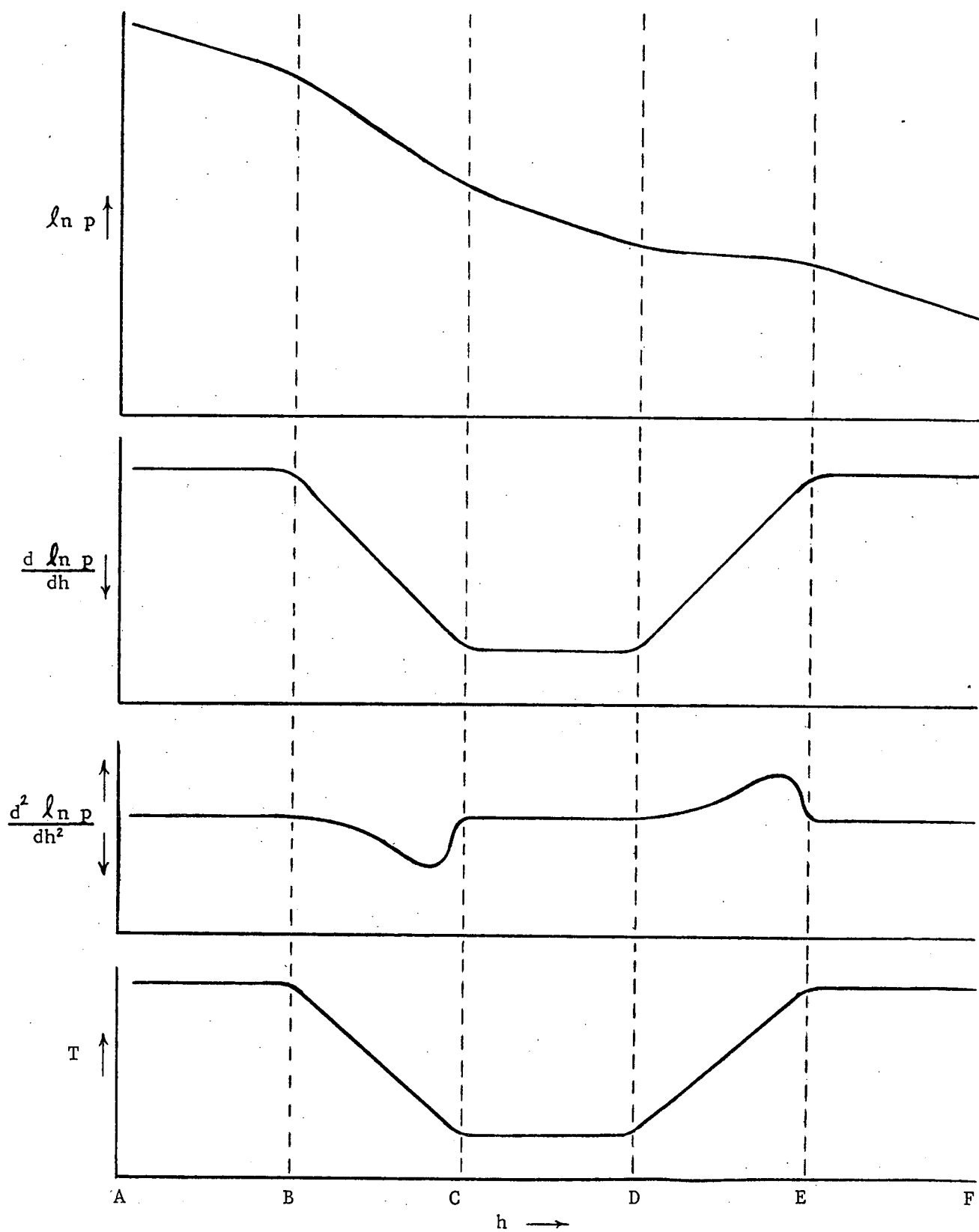


Figure 9. Representative Response of Pressure-Altitude Profile to Changes in Temperature.

For the region A to B, T is constant and, neglecting variations in G and M, $\frac{d\ell_{np}}{dh}$ has a constant negative value.

For a negative temperature gradient, region B to C,

$$\frac{dT}{dh} = + \frac{GM}{R} \left(\frac{d\ell_{np}}{dh} \right)^{-2} \frac{d^2\ell_{np}}{dh^2} \quad (4)$$

or

$$\frac{d^2\ell_{np}}{dh^2} = + \frac{GM}{RT} \frac{1}{T} \frac{dT}{dh}, \quad (5)$$

$\frac{d^2\ell_{np}}{dh^2}$ is negative when $\frac{dT}{dh}$ is negative. In the limit

$$\text{as } T \rightarrow 0, \frac{d\ell_{np}}{dh} \rightarrow -\infty, \text{ and } \ell_{np} \rightarrow 0.$$

Region C to D is a second isothermal region at a different constant value of $\frac{d\ell_{np}}{dh}$.

For a positive temperature gradient, region D to E, $\frac{d^2\ell_{np}}{dh^2}$ is also positive. In the limit as $T \rightarrow \infty$, $\frac{d\ell_{np}}{dh} \rightarrow 0$, and ℓ_{np} becomes constant with altitude. Region E to F is an isothermal region similar to region A to B.

For the case of density, Equation (3) may be rewritten as

$$\frac{d}{dh} \left(\ell_{np} + \ln \frac{R}{M} + \ln T \right) = - \frac{GM}{R} \frac{1}{T} \quad (6)$$

Rearrangement yields

$$\frac{d\ell_{np}}{dh} = - \frac{1}{T} \left(\frac{GM}{R} + \frac{dT}{dh} \right) \quad (7)$$

If $\frac{dT}{dh} = 0$, the density equation assumes the isothermal form

$$\frac{d \ln \rho}{dh} = - \frac{GM}{RT} ,$$

as shown schematically in Figure 10, region A to B.

Equation (7) involves the temperature gradient; hence, to analyze the density profile to changes in temperature, it is not required to take a second derivative in density.

If $\frac{dT}{dh}$ is negative but less in magnitude than $\frac{GM}{R} \approx 33 \text{ deg/km}$, $\frac{d \ln \rho}{dh}$ remains negative and density inversions will not occur. However, if $\frac{dT}{dh}$ is more negative than $\approx 33 \text{ deg/km}$, $\frac{d \ln \rho}{dh}$ becomes positive and a density inversion situation is created as shown in region B to C. However, the adiabatic lapse rate is about 7 deg/km and hence gradients of -33 deg/km or more negative are unrealistic in a static atmosphere.

Region C to D is a second isothermal region at a different constant value of $\frac{d \ln \rho}{dh}$.

For a positive temperature gradient $\frac{dT}{dh}$ is always negative. In the limit as $T \rightarrow \infty$, $\frac{d \ln \rho}{dh} \rightarrow 0$ and $\ln \rho$ becomes constant with altitude as shown in region D to E. Region E to F is an isothermal region similar to region A to B.

In summary, it is clear that inversions in the pressure-altitude profile may not occur. However, although a temperature gradient more negative than about -33 deg/km is physically unrealistic in a static atmosphere, experimental temperature profiles published for some cases do in fact exhibit such a condition. In these cases the accompanying density profiles show inversions and trip the programmed monotonicity error test. The source of such errors lies not in the density profile but rather in the temperature data as measured by the respective experimenter.

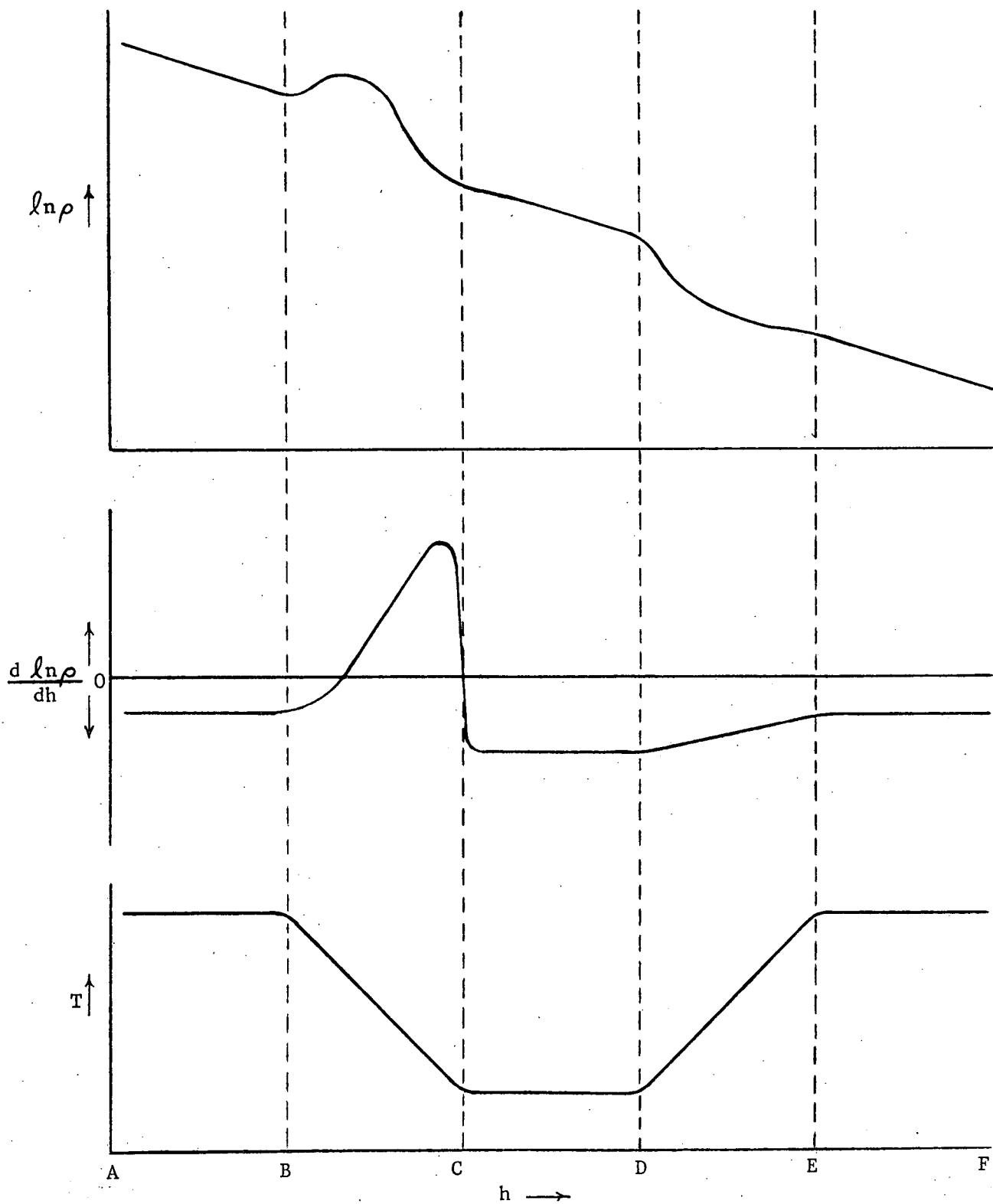


Figure 10. Representative Response of Density-Altitude Profile to Changes in Temperature.

B. Analysis of Altitude Monotonicity Errors

With regard to the altitude monotonicity test, each altitude within a sounding, arranged from the highest altitude downward, was tested for inversions. In each case where altitude inversions occurred, it was discovered that the error could be traced to cards out of order in the decks that were filed, so that an automatic procedure for rearrangement could be programmed. Program No. 1010 deals with such situations. The complete inventory of the original 442 soundings is transferred from one tape to another correcting in each case the order of inverted altitude-data records. This program is listed in Table 7.

C. Soundings in Geopotential Profiles

After all screening, conversion, editing, checking, and testing have been effected and necessary corrections made, if possible, the original data soundings are converted into operational form in terms of geopotential for the appropriate launch sites. Interpolation to integral geopotential-kilometer altitudes is made for all parameters including any and all derived data.

Program No. 1020, listed in Table 8, performs this transformation in the following manner:

From the header record data, the effective earth radius and the inverted ratio-of-gravity for a particular site are used to transform the data in a sounding from geometric to geopotential altitude, record by record, that is, altitude by altitude. Values of the thermodynamic data are interpolated at even geopotential kilometers using a semilog interpolation scheme.

Temperature profiles are interpolated as with pressure and density data only if a continuous or mostly continuous temperature profile were included in the sounding. In some cases no temperature data were provided and in other cases only a single value was included corresponding to the top altitude of the sounding. If only a single value were given this value is included in the transformed sounding whether or not the geometric kilometer converts to an even geopotential kilometer.

D. Errors in MRN Data

As an additional part of the overall plan of this study, processing of some of the MRN data has been accomplished. A master program, prepared by the NASA technical monitor, has already processed and examined much of the MRN data. As a result, numerous errors in the original MRN-provided version of the data have been uncovered.

TABLE 7

PROGRAM 1010

C	ORIGINAL DATA DECKS - ALTITUDE INVERSION CORRECTION	
C		E.D. SCHULTZ, GCA, 15 MAY 1969
C	CALL ERC TAPE 1451	
C	ERC YELLOW CARD SPECIFICATION	
C	A5 - ERC 1451 (RING IN)	
C	COMPUTER MODE - LOGICAL 8	
C		THIS PROGRAM MAKES ALTITUDE
C		CORRECTIONS ON ERC TAPE 1451 WHICH
C		CONTAINS ORIGINAL 442 SOUNDINGS.
C		ERC TAPE 1451 IS WORKING TAPE.
C		ERC TAPE 559 IS STORAGE COPY OF 1451.
C		WHEN CORRECTIONS ARE MADE ON 1451,
C		THEN 559 SHOULD BE RECOPIED.
C		SKIP TO RECORD NO. 842 AND INVERT
C		TWO ALTITUDE-DATA RECORDS 842,843
C		PRESERVING SEQUENTIAL TAPE RECORD
C		COUNT.
100	DO 105 I = 1,841	
105	READ (8,901) PASREC	
901	FORMAT(A6)	
	INDEX = 1	
C		SET INDEX FOR RETURN FROM
C		SUBROUTINE 200.
	GO TO 200	
110	DO 115 I = 1,9422	
C		SKIP TO RECORD NO. 10266 AND CORRECT
C		INVERSION INVOLVING THREE ALTITUDE-
C		DATA RECORDS 10266,10267,10268
C		PRESERVING SEQUENTIAL TAPE RECORD
C		COUNT.
115	READ (8,901) PASREC	
	READ (8,902) A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,REC1	
	READ (8,902) B1,B2,B3,B4,B5,B6,B7,B8,B9,B10,B11,B12,B13,B14,REC2	
	READ (8,902) C1,C2,C3,C4,C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,REC3	
	BACKSPACE 8	
	BACKSPACE 8	
	BACKSPACE 8	
	WRITE (8,902) C1,C2,C3,C4,C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,REC1	
	WRITE (8,902) A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,REC2	
	WRITE (8,902) B1,B2,B3,B4,B5,B6,B7,B8,B9,B10,B11,B12,B13,B14,REC3	
120	DO 125 I = 1,1005	
C		SKIP TO RECORD NO. 11274 AND INVERT
C		TWO ALTITUDE-DATA RECORDS 11274,11275
C		PRESERVING SEQUENTIAL TAPE RECORD
C		COUNT.
125	READ (8,901) PASREC	
	INDEX = 2	
C		SET INDEX FOR RETURN FROM
C		SUBROUTINE 200.
	GO TO 200	
130	DO 135 I = 1,122	
C		SKIP TO RECORD NO. 11398 AND PUT
C		THIS RECORD INTO PROPER PLACE
C		ELEVEN RECORDS LATER.
C		PRESERVING SEQUENTIAL TAPE RECORD

TABLE 7 (Continued)

C	COUNT.
135	READ (8,901) PASREC READ (8,902) A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,RECS DO 137 J = 1,11 READ (8,902) S1,S2,S3,S4,S5,S6,S7,S8,S9,S10,S11,S12,S13,S14,RECT BACKSPACE 8 BACKSPACE 8 WRITE (8,902) S1,S2,S3,S4,S5,S6,S7,S8,S9,S10,S11,S12,S13,S14,RECS READ (8,901) PASREC
137	RECS = RECT BACKSPACE 8 WRITE (8,902) A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,RECS DO 145 I = 1,747
140	SKIP TO RECORD NO. 12157 AND INVERT TWO ALTITUDE-DATA RECORDS 12157,12158 PRESERVING SEQUENTIAL TAPE RECORD COUNT.
145	READ (8,901) PASREC INDEX = 3
C	SET INDEX FOR RETURN FROM
C	SUBROUTINE 200.
	GO TO 200
150	DO 155 I = 1,1624
C	SKIP TO RECORD NO. 13783 AND INVERT
C	TWO ALTITUDE-DATA RECORDS 13783,13784
C	PRESERVING SEQUENTIAL TAPE RECORD
C	COUNT.
155	READ (8,901) PASREC INDEX = 4
200	READ (8,902) A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,REC1 READ (8,902) B1,B2,B3,B4,B5,B6,B7,B8,B9,B10,B11,B12,B13,B14,REC2
902	FORMAT(13A6,A2,A5)
C	SUBROUTINE 200 IS USED FOR A SIMPLE
C	TWO-RECORD INVERSION OPERATION.
	BACKSPACE 8
	BACKSPACE 8
	WRITE (8,902) B1,B2,B3,B4,B5,B6,B7,B8,B9,B10,B11,B12,B13,B14,REC1
	WRITE (8,902) A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,REC2
	GO TO (110,130,150,600),INDEX
600	REWIND 8 STOP END
1	END OF FILE CARD
1	END OF FILE CARD

TABLE 8

PROGRAM 1020

```

C      E. D. SCHULTZ, GCA, 1 AUGUST 1969
C      ORIGINAL DATA DECKS - REPROCESSING - 2
C      CALL (A5) ERC 1465 RING OUT
C      CALL (B5) ERC 1451 RING IN
C      THIS PROGRAM CONVERTS REFORMED DATA
C      OF 442 ORIGINAL SOUNDINGS FROM
C      GEOMETRIC TO GEOPOTENTIAL ALTITUDES
C      AND INTERPOLATES DENSITY AT INTEGER
C      GEOPOTENTIAL KILOMETERS. INITIAL
C      (HIGHEST) TEMPERATURE IS INCLUDED
C      IF PROVIDED IN THE SOUNDING.
C      IF AN INITIAL TEMP APPEARS IN THE
C      CONVERTED SOUNDING IT IS ACCOMPANIED
C      BY AN EXPLANATION CODE IN COL 55.
C      THIS CODE IS 1 IF THE HIGHEST
C      GEOMETRIC ALT CONVERTS TO AN INTEGER
C      GEOPOTENTIAL KM AND A TEMP VALUE IS
C      PROVIDED. IN THIS CASE, INTERPOLATION
C      IS NOT REQUIRED. THE CODE IS 2 IF A
C      TEMP VALUE IS PROVIDED ONLY FOR THE
C      HIGHEST ALT OF THE SOUNDING, WHICH
C      DOES NOT CONVERT TO AN INTEGER
C      GEOPOTENTIAL KM. THE CODE IS 3 IF THE
C      TEMP VALUE WHICH APPEARS IN THE
C      CONVERTED SOUNDING HAS BEEN
C      INTERPOLATED TO THE HIGHEST
C      GEOPOTENTIAL KM.
C      FORMAT OF TAPE SOUNDING DATA IS
C      UNALTERED.
C      IREC = 0
C      INITIALIZE RECORD COUNT, IREC, AT 0.
900  FORMAT(A6)
      READ (5,899) KBLNK6,BLANK6,DECPT,IONE
899  FORMAT(3A6,A1)
C      KBLNK6 AND BLANK6 ARE FIELDS OF 6
C      BLANK SPACES EACH, USED IN TESTING
C      FOR SEPARATER RECORD AND PRESENCE OF
C      TEMP DATA. DECPT EQUALS ( . )
C      AND IS USED FOR TEMP TESTING.
      READ (3,900) BLREC
C      READ FIRST BLANK SEPARATER RECORD,
C      INCREMENT IREC, AND TRANSFER TO
C      OUTPUT TAPE.
100  IREC = IREC+1
      WRITE (9,901) IREC
      WRITE (6,901) IREC
901  FORMAT(80X15)
      M = 0
      N = 0
      KODE = 0
C      M, N, AND KODE ARE REGISTERS USED
C      TO DESIGNATE AND CONTROL TEMP DATA.
      READ (8,902) A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14
902  FORMAT(13A6,A2)
      READ 1ST HEADER RECORD, INCREMENT

```

TABLE 8 (Continued)

		IREC, AND TRANSFER TO OUTPUT TAPE.
C		
	IREC = IREC+1	
	WRITE (9,903) A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,IREC	
	WRITE (6,903) A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14,IREC	
903	FORMAT(13A6,A2,I5)	
	READ (8,904) B1,B2,B3,RAD,GRAV,B4,B5,B6,B7,B8,B9,B10,B11	
904	FORMAT(2A6,A3,F9.3,F8.6,8A6)	
C		READ 2ND HEADER RECORD. COPY
C		EFFECTIVE EARTH RADIUS (RAD) AT SITE
C		AND INVERTED RATIO OF GRAVITY (GRAV)
C		AT SITE, INCREMENT IREC, AND TRANSFER
C		TO OUTPUT TAPE.
	IREC = IREC+1	
	WRITE (9,905) B1,B2,B3,RAD,GRAV,B4,B5,B6,B7,B8,B9,B10,B11,IREC	
	WRITE (6,905) B1,B2,B3,RAD,GRAV,B4,B5,B6,B7,B8,B9,B10,B11,IREC	
905	FORMAT(2A6,A3,F9.3,F8.6,8A6,I5)	
	READ (8,910) IDENT1,IDENT2,IDENT3,ALTZ1,DENS1,TEMP1	
910	FORMAT(2A6,A2,F8.2,E12.5,F7.1)	
C		READ 1ST ALT-DATA RECORD OF SOUNDING.
C		IDENT 1 THRU 3 CONTAIN SOUNDING
C		IDENTIFICATION DATA WHICH IS
C		TRANSFERRED DIRECTLY TO OUTPUT TAPE
C		BELOW.
	IF(TEMP1.GT.0.0) M=IONE	
C		IF HIGHEST ALT OF SOUNDING CONTAINS
C		A TEMP VALUE, SET M REGISTER.
	ALTH1 = GRAV*RAD*ALTZ1/(RAD+ALTZ1)	
C		CONVERT 1ST ALT FROM GEOMETRIC TO
C		GEOPOTENTIAL KM.
140	IALTH = ALTH1	
C		DEFINING IALTH = ALTH1 SETS IALTH
C		AT A VALUE EQUAL TO THE TRUNCATED
C		VALUE OF ALTH1 WITHOUT A DECIMAL
C		POINT.
	HBASE = IALTH	
C		DEFINING HBASE = IALTH SETS HBASE
C		AT A VALUE EQUAL TO IALTH BUT WITH
C		THE DECIMAL POINT ADDED.
	READ (8,911) ITEST,ALTZ2,DENS2,TEMP2,KOUNT	
911	FORMAT(A6,8XF8.2,E12.5,F7.1,39X15)	
C		READ NEXT ALT-DATA RECORD, SKIPPING
C		IDENTIFICATION DATA WHICH HAS
C		ALREADY BEEN COPIED.
	N = 0	
	IF(TEMP2.GT.0.0) N=IONE	
C		IF THIS RECORD CONTAINS A TEMP VALUE
C		SET N REGISTER.
C		IF THIS VALUE DOES NOT CONTAIN A
C		TEMP VALUE, CLEAR N REGISTER WHICH
C		MAY HAVE BEEN SET PREVIOUSLY.
	IF(ITEST.NE.KBLNK6) GO TO 200	
C		TEST IF RECORD JUST READ WAS BLANK
C		SEPARATER RECORD. IF SO, CONVERSION
C		AND INTERPOLATION OF THIS SOUNDING
C		IS COMPLETE.
	IF(ALTH1-HBASE) 600,160,100	

TABLE 8 (Continued)

C		TEST IF PREVIOUS ALT IS AN INTEGER.
C		IF NOT, LAST DATA POINT HAS NO BASIS
C		FOR INTERPOLATION AND IS LOST, SO
C		ACQUIRE NEXT SOUNDING. IF IT IS AN
C		INTEGER, CONTINUE.
160	IREC = IREC+1	
	WRITE (9,915) IDENT1,IDENT2,IDENT3,ALTH1,DENS1,IREC	
915	FORMAT(2A6,A2,F8.2,E12.5,46X15)	
	WRITE (6,916) IDENT1,IDENT2,IDENT3,ALTH1,DENS1,IREC	
916	FORMAT(1X2A6,A2,F8.2,E12.5,45X15)	
	GO TO 100	
C		IF ALTH1 IS AN INTEGER, TRANSFER DATA
C		POINT TO OUTPUT TAPE AND ACQUIRE
C		NEXT SOUNDING.
200	ALTH2 = GRAV*RAD*ALT22/(RAD+ALT22)	
C		CONVERT NEXT ALT TO GEOPOTENTIAL.
	IF(ALTH1-HBASE) 600,202,204	
C		TEST IF ALTH1 IS AN INTEGER.
202	IREC = IREC+1	
	IF(M.EQ.10NE) GO TO 500	
	WRITE (9,915) IDENT1,IDENT2,IDENT3,ALTH1,DENS1,IREC	
	WRITE (6,916) IDENT1,IDENT2,IDENT3,ALTH1,DENS1,IREC	
C		IF ALTH1 EQUALS HBASE, NO
C		INTERPOLATION IS REQUIRED, SO
C		INCREMENT IREC, TRANSFER DATA POINT
C		TO OUTPUT TAPE.
203	ALTH1 = ALTH2	
	DENS1 = DENS2	
	TEMP1 = TEMP2	
C		REPLACE ALT, DENS AND TEMP THEN
C		CONTINUE PROCESSING.
	IF(14760-KOUNT) 600,600,700	
700	GO TO 140	
204	IF(ALTH2-GE.HBASE) GO TO 203	
C		IF ALTH2 IS GE HBASE REPLACE ALT,DENS
C		AND TEMP AND ACQUIRE NEXT RECORD.
C		THIS INSTRUCTION ASSURES THAT
C		INTERPOLATION IS BASED ON THE TWO
C		POINTS CLOSEST TO (ABOVE AND BELOW)
C		THE INTEGER GEOPOTENTIAL KM.
220	DELH = ALTH1-HBASE	
C		DELH IS THE GEOPOTENTIAL ALT
C		DIFFERENCE BETWEEN THE ITH DATA POINT
C		AND THE INTEGER GEOPOTENTIAL KM
C		BELOW THAT POINT.
	HDENS = ALOG(DENS1)+(ALOG(DENS2)-ALOG(DENS1))*DELH/(ALTH1-ALTH2)	
C		COMPUTE SEMILOG INTERPOLATION OF
C		DENSITY TO INTEGER GEOPOTENTIAL KM.
	HDENS = EXP(HDENS)	
	IF(M.EQ.10NE) GO TO 505	
C		TAKE ANTILOG OF DENSITY AT HBASE.
C		INCREMENT IREC AND TRANSFER DATA
C		TO OUTPUT TAPE.
	IREC = IREC+1	
	WRITE (9,915) IDENT1,IDENT2,IDENT3,HBASE,HDENS,IREC	
	WRITE (6,916) IDENT1,IDENT2,IDENT3,HBASE,HDENS,IREC	

TABLE 8 (Continued)

221	HBASE = HBASE-1.0	DECREASE INTEGER GEOPOTENTIAL ALT BY 1 KM.
C		
C	IF (ALH2-HBASE) 220,203,203	TEST IF DELH COVERS MORE THAN ONE WHOLE KM INTERVAL. IF DECREASED HBASE IS HIGHER THAN NEXT DATA POINT, INTERPOLATE DENS AT NEXT LOWEST INTEGER KM. IF IT IS EQUAL TO AN INTEGER, NO INTERPOLATION IS NECESSARY, SO GO TO 203. IF IT IS LOWER THAN THE NEXT DATA POINT, INTERPOLATION IS COMPLETE BETWEEN THE LAST TWO DATA POINTS, SO CONTINUE PROCESSING.
C		
C		
C		
C		
C		
C		
500	KODE = 1	
	WRITE (9,970) IDENT1,IDENT2,IDENT3,ALH1,DENS1,TEMP1,KODE,IREC	
	WRITE (6,971) IDENT1,IDENT2,IDENT3,ALH1,DENS1,TEMP1,KODE,IREC	
970	FORMAT(2A6,A2,F8.2,E12.5,F7.1,13X11,25X15)	
971	FORMAT(1X2A6,A2,F8.2,E12.5,F7.1,13X11,24X15)	
C		500 IS ENTERED IF THE HIGHEST ALT INCLUDES A TEMP VALUE AND ALSO CONVERTS TO AN INTEGER GEOPOTENTIAL KM. NO INTERPOLATION IS NECESSARY SO INCLUDE THIS TEMP IN OUTPUT TAPE.
C		
C		
C		
C		RESET M REGISTER AND RETURN.
C		
	M = 0	
	GO TO 203	
505	IF (N.NE.1) GO TO 507	505 IS ENTERED IF THE HIGHEST ALT INCLUDES A TEMP VALUE BUT DOES NOT CONVERT TO AN INTEGER GEOPOTENTIAL KM. IF 2ND CONVERTED ALT INCLUDES A TEMP VALUE, TEMP IS INTERPOLATED TO HIGHEST GEOPOTENTIAL KM. IF NOT, TEMP FROM HIGHEST GEOMETRIC KM IS COPIED AS BEST ESTIMATE OF INITIAL TEMP IN CONVERTED SOUNDING.
C		
C		
C		
C		
C		
C		
C		
	KODE = 3	
	HTEMP = TEMP1+(TEMP2-TEMP1)*DELH/(ALH1-ALH2)	INTERPOLATE TEMP LINEARLY.
C		
506	IREC = IREC+1	
	WRITE (9,970) IDENT1,IDENT2,IDENT3,HBASE,HDENS,HTEMP,KODE,IREC	
	WRITE (6,971) IDENT1,IDENT2,IDENT3,HBASE,HDENS,HTEMP,KODE,IREC	
	M = 0	
C		RESET M REGISTER AND RETURN.
	GO TO 221	
507	KODE = 2	
	HTEMP = TEMP1	
	GO TO 506	
600	WRITE (6,950) IDENT1,IDENT2,IDENT3,IREC	
950	FORMAT(1X2A6,A2,I5)	
	ENDFILE 9	
	STOP	
	END	

\$DATA

Major errors in the Fort Churchill data have been corrected through Program No. 1007. Similar to Program No. 1010, obvious altitude inversions are corrected as well as blocks of records found to be out of place. In addition, other specific data corrections are made by feeding in revised data into respective records as the entire data for a site is transferred from one tape to another. This program is listed in Table 9. Program 1007 was modeled after a similar program written by the NASA technical monitor for Wallops Island and Antigua data.

As a fallout of the processing of the MRN tapes it was planned to prepare a formal report itemizing errors contained therein. Toward this end the Appendix to this report contains a sample error table for the Antigua MRN tape.

E. Standardization of Physical Units

The physical units of the measured data of Rocket Data Set No. 2 vary among the different investigators. To achieve a consistent system of units and to minimize the chance of errors due to copying, Program No. 1009 was written to convert any combination of given units to a standard set: altitude-kilometers, temperature-degrees Kelvin, density-kilograms per cubic meter, and pressure-newtons per square meter. A conversion table for the various types of units used by different investigators is presented in Figure 11. Table 10 contains a listing of Program 1009.

F. Header Record Information and Codes

Rocket Data Set No. 2 has been transferred to tape without header records. Two programs are available to generate the information required in the header records, so that these new soundings will contain the same type of header data as does the original 442 data set. Both programs were written for a previous NASA study concerned with the original data set. As written for the IBM 1620 computer, the original versions of both programs has appeared in Reference 6, which contains a complete description of the operations involved.

Briefly, the first header record program, Program No. 1030 (Table 11) computes the following parameters for a given sounding: local apparent time, subsolar angle, and shadow height. In the course of the calculation, the declination angle of the sun and the equation of time are also computed. Also, the solar 10.7-cm flux indices are entered for the day of the flight and the preceeding day (to allow for a study of lag effects).

The first header record program was revised, under a separate contract from the NASA technical monitor, to be compatible with the IBM 7094 computer.

The second header record program, Program No. 1031 (Table 12) transforms parameters of the first header record as well as site location and time and day of sounding into numeric codes suitable for statistical studies; height, latitude, season, time of day or diurnal solar influence, subsolar angle, and solar flux. This program was revised for the 7094 computer under the current contract. Also, appropriate comment cards were inserted in the program.

TABLE 9

PROGRAM 1007

```

C F. D. SCHULTZ GCA SEPTEMBER 1969
C
C PROGRAM FOR CORRECTING SOME OF THE ERRORS IN THE
C MNR DATA TAPE FOR FORT CHURCHILL WITHIN THE
C PERIOD 590921 2125 TO 650827 1800.
C
C ERC TAPE 553 ON A5 (LOGICAL 8) RING OUT, SYSUT 5
C ERC TAPE 1626 ON B5 (LOGICAL 9) RING IN, SYSUT 6
C SCRATCH TAPE ON B6 (LOGICAL 11) RING IN
C
C THIS PROGRAM PROVIDES FOR CORRECTING THE ORDER OF RECORDS
C ON THE TAPE BY SETTING BACK A SINGLE RECORD OR BLOCK OF
C RECORDS TO LATER POSITIONS, CORRECTING SPECIFIC PORTIONS
C OF PARTICULAR RECORDS, AND BY INSERTING OR REMOVING BLANK
C SEPARATER RECORDS.
C THE CORRECTION OF PARTS OF SPECIFIC RECORDS IS ACCOMPLISHED
C BY WRITING THE RECORD NUMBERS DIRECTLY INTO THE MAIN BODY
C OF THE PROGRAM, AND BY INSERTING THE CORRECTIONS READ FROM
C A DATA CARD.
C
C DIMENSION IC(11),ID(18),IE(18),IB(18),IG(18)
C ID(I) IS THE SERIES OF 18 VARIABLES OF VARYING FIELD
C LENGTH ALL READ IN *A* FORMAT AS INDICATED IN
C FORMAT 100.
C IC(I) IS THE SERIES OF VALUES CORRESPONDING TO
C CORRECTIONS WHICH ARE TO BE MADE TO PARTICULAR
C VALUES OF PRESSURE, DENSITY, SALT,
C OR SITE CODE IN THE FT. CHURCHILL TAPE.
C IB(I),IE(I), AND IG(I) ARE TEMPORARY STORAGE
C LOCATIONS USED TO MANIPULATE THE DATA.
C
C REWIND 8
C REWIND 9
C REWIND 11
C READ (5,500)(IC(I),I=1,11)
C NRC=0
C NRRC=0
C NNRC=0
C
C NRC IS THE NUMBER OF RECORDS READ FROM ORIGINAL TAPE.
C NRRC IS THE NUMBER OF RECORDS ENTERED ONTO THE
C REVISED TAPE.
C NNRC AND NNRCR ARE TEMPORARY NUMBERS USED TO
C MANIPULATE THE DATA.
C
C 1 READ (8,100)(ID(I),I=1,18)
C NRRC=NRRC+1
C NRC=NRC+1
C
C READ RECORD FROM ORIGINAL TAPE AND INCREMENT
C RECORD NUMBERS.
C IF(NRC.LT. 2091) GO TO 3
C
C SKIP EARLY RECORDS WHICH DO NOT REQUIRE
C CORRECTIONS AT THIS TIME.
C IF(NRC.GT. 4195) GO TO 2
C
C FOR LARGE RECORD NUMBERS, SKIP PART OF LIST
C OF IF STATEMENTS.
C FOLLOWING IF STATEMENTS PROVIDE FOR TRANSFER TO

```

TABLE 9 (Continued)

C	ERROR CORRECTION SECTIONS FOR PREDETERMINED	
	RECORD NUMBERS.	
	IF(NRC.EQ. 2091) GO TO 201	
	IF(NRC.LT. 2820) GO TO 3	
	IF(NRC.EQ. 2820) GO TO 202	
	IF(NRC.LT. 2935) GO TO 3	
	IF(NRC.EQ. 2935) GO TO 201	
	IF(NRC.LT. 3390) GO TO 3	
	IF(NRC.EQ. 3390) GO TO 203	
	IF(NRC.LT. 3812) GO TO 3	
	IF(NRC.EQ. 3812) GO TO 204	
	IF(NRC.LT. 4195) GO TO 3	
	IF(NRC.EQ. 4195) GO TO 205	
2	IF(NRC.LT. 4649) GO TO 3	
	IF(NRC.EQ. 4649) GO TO 206	
	IF(NRC.LT. 4674) GO TO 3	
	IF(NRC.EQ. 4674) GO TO 207	
	IF(NRC.LT. 5293) GO TO 3	
	IF(NRC.EQ. 5293) GO TO 208	
	IF(NRC.LT. 5480) GO TO 3	
	IF(NRC.EQ. 5480) GO TO 209	
	IF(NRC.LT. 5696) GO TO 3	
	IF(NRC.EQ. 5696) GO TO 211	
	IF(NRC.LT. 5707) GO TO 3	
	IF(NRC.EQ. 5707) GO TO 212	
	IF(NRC.LT. 5830) GO TO 3	
	IF(NRC.EQ. 5830) GO TO 213	
	IF(NRC.LT. 6104) GO TO 3	
	IF(NRC.EQ. 6104) GO TO 201	
	IF(NRC.LT. 6111) GO TO 3	
	IF(NRC.EQ. 6111) GO TO 214	
	IF(NRC.LT. 6147) GO TO 3	
	IF(NRC.EQ. 6147) GO TO 215	
	IF(NRC.LT. 6205) GO TO 3	
	IF(NRC.EQ. 6205) GO TO 201	
	IF(NRC.LT. 6274) GO TO 3	
	IF(NRC.EQ. 6274) GO TO 216	
	IF(NRC.LT. 6372) GO TO 3	
	IF(NRC.EQ. 6372) GO TO 217	
	IF(NRC.LT. 6403) GO TO 3	
	IF(NRC.EQ. 6403) GO TO 218	
	GO TO 3	
C	STATEMENT NUMBERS IN 200 SERIES ARE SPECIFIC	
C	ERROR CORRECTION SECTIONS.	
201	DO 2010 I=1,18	
2010	IF(I)=IC(I)	
	NNRC=NRC+1	
	READ (8,100)(ID(I),I=1,18)	
	IF(NNRC.EQ. 2092) ID(1)=IC(1)	
	WRITE (9,100)(ID(I),I=1,18)	
	WRITE (6,101)(ID(I),I=1,18),NRCR,NNRC	
	NNRCR=NNRC	
	NPCR=NRCR+1	
	WRITE (9,100)(IE(I),I=1,18)	
	WRITE (6,101)(IE(I),I=1,18),NRCR,NRC	
	IF(NNRC.EQ. 2092) WRITE(6,102)	

TABLE 9 (Continued)

```

WRITE (6,103)NNRCR,NARC,NRCR,NRC
NRC=NRC+1
GO TO 4
202 DO 2020 I=1,18
2020 IB(I)=ID(I)
NRCR=NRCR-1
WRITE (6,104)
GO TO 4
203 WRITE(11,100)(ID(I),I=1,18)
NRCR=NRCR-1
NNRC=NRC-1
DO 2030 K=1,25
READ (8,100)(ID(I),I=1,18)
NRC=NRC+1
2030 WRITE(11,100)(IC(I),I=1,18)
DO 2031 K=1,26
2031 BACKSPACE 11
WRITE (6,397)
GO TO 4
204 WRITE (6,398)
DO 2040 K=1,25
2040 READ (8,100)(ID(I),I=1,18)
NRC=NRC-1
NRCR=NRCR-1
DO 2041 K=1,26
READ(11,100)(ID(I),I=1,18)
NRC=NRC+1
NRCR=NRCR+1
WRITE (9,100)(IC(I),I=1,18)
2041 WRITE (6,101)(ID(I),I=1,18),NRCR,NRC
WRITE (6,399)
WRITE (6,105)
GO TO 4
205 ID(14)=IC(2)
GO TO 314
206 DO 2060 I=1,18
2060 IG(I)=ID(I)
NNRC=NRC
NRCR=NRCR-1
WRITE (6,112)
GO TO 4
207 WRITE (9,100)(IG(I),I=1,18)
WRITE (6,101)(IG(I),I=1,18),NRCR,NNRC
WRITE (6,106)
NRCR=NRCR+1
GO TO 3
208 ID(8)=IC(3)
GO TO 308
209 ID(9)=IC(4)
GO TO 309
211 ID(8)=IC(5)
GO TO 308
212 ID(8)=IC(6)
GO TO 308
213 WRITE (9,100)(IB(I),I=1,18)
WRITE (6,101)(IB(I),I=1,18),NRCR

```

TABLE 9 (Continued)

```

WRITE (6,107)
NRCR=NRCR+1
GO TO 3
214 ID(8)=IC(7)
ID(9)=IC(8)
GO TO 389
215 DO 2150 I=1,18
2150 IE(I)=ID(I)
READ (8,100)(ID(I),I=1,18)
DO 2151 I=6,10
IB(I)=IE(I)
IE(I)=ID(I)
2151 ID(I)=IB(I)
WRITE (9,100)(IE(I),I=1,18)
WRITE (6,101)(IE(I),I=1,18),NRCR,NRC
NRCR=NRCR+1
NRC=NRC+1
WRITE (9,100)(ID(I),I=1,18)
WRITE (6,101)(ID(I),I=1,18),NRCR,NRC
WRITE (6,111)
GO TO 4
216 ID(9)=IC(9)
GO TO 309
217 ID(9)=IC(10)
GO TO 309
218 ID(9)=IC(11)
GO TO 309
C STATEMENT NUMBERS IN 300 SERIES ARE ENTERED
C FROM 200 SERIES AND PROVIDE FOR OUTPUT NOTATION.
308 WRITE (9,100)(ID(I),I=1,18)
WRITE (6,101)(ID(I),I=1,18),NRCR,NRC
WRITE (6,108)NRCR,NRC
GO TO 4
309 WRITE (9,100)(ID(I),I=1,18)
WRITE (6,101)(ID(I),I=1,18),NRCR,NRC
WRITE (6,109)NRCR,NRC
GO TO 4
314 WRITE (9,100)(ID(I),I=1,18)
WRITE (6,101)(ID(I),I=1,18),NRCR,NRC
WRITE (6,114)NRCR,NRC
GO TO 4
389 WRITE (9,100)(ID(I),I=1,18)
WRITE (6,101)(ID(I),I=1,18),NRCR,NRC
WRITE (6,108)NRCR,NRC
WRITE (6,109)NRCR,NRC
GO TO 4
3 WRITE (9,100)(ID(I),I=1,18)
WRITE (6,101)(ID(I),I=1,18),NRCR,NRC
4 IF(NRC.EQ. 6510) GO TO 5
GO TO 1
5 END FILE 9
STOP
100 FORMAT(4A6,2A4,A3,2A5,A3,2A6,2A4,A6,A2,A3,A1)
101 FORMAT(1X4A6,2A4,A3,2A5,A3,2A6,2A4,A6,A2,A3,A1,I6,1X1H(.I6,1H))
102 FORMAT(44X76H SITE CODE CORRECTIONS MADE TO ORIGINAL VERSION
10F RECORD 2091 ( 2092))

```

TABLE 9 (Continued)

103 FORMAT(120X/ 31X7HRECORDS,16,2H (,15,5H) AND,16,2H (,15,51H) HAVE
 1 BEEN INVERTED IN ORDER FROM ORIGINAL VERSION/120X)
 104 FORMAT(120X/ 50X7GHRECORD (2820) WAS AN EXTRA BLANK RECORD DELET
 1ED FROM ORIGINAL VERSION/120X)
 105 FORMAT(120X/ 2X118HSOUNDING ORIGINALLY CONTAINED IN RECORDS (381
 12 - 3837) IS DELETED, BEING SUPERSEDED BY ABOVE SET OF MISPLACED R
 2ECORDS/120X)
 106 FORMAT(120X/ 31X89HRECORD (4649) OUT OF PLACE. INSERTED IN PROPE
 1R SPOT PRECEDING RECORD 4648 (4674) HERE/120X)
 107 FORMAT(120X/ 6X114HBLANK RECORD MISSING HERE IN ORIGINAL VERSION
 1PRECEDING RECORD (5830). BLANK RECORD IS INSERTED IN LOCATION 38
 204/120X)
 108 FORMAT(44X62HROCKET-PRESSURE CORRECTIONS MADE TO ORIGINAL VERSION
 1OF RECORD,16,2H (,15,1H))
 109 FORMAT(44X62H ROCKET-DENSITY CORRECTIONS MADE TO ORIGINAL VERSION
 1OF RECORD,16,2H (,15,1H))
 111 FORMAT(120X/ 25X95HTHERMO DATA IN RECORDS 6122 (6147) AND 6123
 1 (6148) HAVE BEEN INVERTED FROM ORIGINAL VERSION/120X)
 112 FORMAT(120X/ 31X89HRECORD (4649) OUT OF PLACE. INSERTED IN PROPE
 1R SPOT PRECEDING RECORD 4648 (4674) BELOW/120X)
 114 FORMAT(44X62H RA08-ALTITUDE CORRECTIONS MADE TO ORIGINAL VERSION
 1OF RECORD,16,2H (,15,1H))
 397 FORMAT(120X/ 11X109HBLCK OF 26 80H ORIGINALLY MISPLACED RECORDS
 1SET BACK FROM THIS WRONG POSITION FOLLOWING RECORD 3388 (3389)/1
 220X)
 398 FORMAT(120X/ 2X118HSTART OF BLCK OF 26 80H ORIGINALLY MISPLACED
 1RECORDS SET BACK TO THIS PROPER SPOT, ALL PRECEDING RECORD 3812 (2
 3838)/120X)
 399 FORMAT(120X/ 2X118H LAST OF BLCK OF 26 80H ORIGINALLY MISPLACED
 1RECORDS SET BACK TO THIS PROPER SPOT, ALL PRECEDING RECORD 3812 (2
 3838)/120X)
 500 FORMAT(A6,A4,2A5,7A6)
 END

ROCKET DATA PHYSICAL UNITS CONVERSION TABLE

<u>UNIT</u>	<u>CONVERT FROM</u>	<u>CONVERT TO (STANDARD)</u>	<u>OPERATE</u>
<u>Altitude:</u>	thous.of ft	km	mult. by .30480061
<u>Density:</u>	gm/cm ³	kg/m ³	mult. by 10 ³
	gm/m ³	kg/m ³	mult. by 10 ⁻³
	slugs/ft ³	kg/m ³	mult. by 515.37865
<u>Pressure:</u>	mb	newt/m ²	mult. by 10 ²
	dynes/cm ²	newt/m ²	mult. by 10 ⁻¹
	lbs/ft ²	newt/m ²	mult. by 47.880067
<u>Temperature:</u>	deg. C	deg. K	add 273.15
	deg. F	deg. K	$K = \frac{5}{9} (F-32) + 273.15$

Reference: Handbook Chemistry & Physics, College Edition

Figure 11

TABLE 10

PROGRAM 1009

```

C STANDARDIZATION OF ROCKET SOUNDING DATA PHYSICAL UNITS
C PROGRAM INSPECTS INITIAL DECK AND CONVERTS
C UNITS AND FORMAT TO STANDARD FORM, ALTITUDE
C BY ALTITUDE
99 READ 99, NDECK
   FORMAT (I4)
C READ DECK SET HEADER CARD. NDECK = NUMBER OF
C DECKS TO BE STANDARDIZED.
DO 400 J=1,NDECK
  READ 100,NALT,M1,M2,M3,M4,L,ISEQ
  100 FORMAT (I4,1X4I2,1XI3,1XA1)
C READ DECK HEADER CARD. NALT = NUMBER OF
C ALTITUDES IN INITIAL DECK.
C M1 THROUGH M4 ARE NUMBERED CODES DESCRIBING
C INITIAL UNITS OF ALT, DENS, TEMP, PRESS.
C L IS NUMBERED CODE DESCRIBING FORMAT OF
C INITIAL DECK. ISEQ IS ALPHAMERIC CODE
C DESCRIBING TYPE OF ROCKET FLIGHT AND
C EXPERIMENT MULTIPLICITY.
DO 300 I=1,NALT
  GO TO (11,12,13,14,15,16,17,18,19,20) L
C BRANCH OUT ACCORDING TO FORMAT SPECIFIED IN
C HEADER CARD. L=11 THRU 20. ALLOWS FOR 10
C DIFFERENT DATA ARRANGEMENTS.
  INTEGER YEAR, DAY, HOUR
  11 READ 211, MONTH, DAY, YEAR, HOUR, MIN, ALT, DENS, TEMP, ISITE, PRESS
  211 FORMAT (A2,1XA2,1XA2,1XA2,1XA2,F8.2,E10.4,F7.1,1XA2,1XE10.4)
  GO TO 20
  12 READ 212, MONTH, DAY, YEAR, HOUR, MIN, ALT, TEMPT, ISITE, DENS
  212 FORMAT (A2,1XA2,1XA2,1XA2,1XA2,F8.2,10XF7.1,1XA2,1XE10.4)
  GO TO 20
  13 READ 213, MONTH, DAY, YEAR, HOUR, MIN, ALT, DENS, TEMP, ISITE, PRESS
  213 FORMAT (A2,1XA2,1XA2,1XA2,1XA2,F8.2,E10.4,F7.1,1XA2,1XF8.3)
  GO TO 20
C L=11 THRU 13 REFLECT NEW DATA SETS. L=14 THRU
C 20 REFLECT ORIGINAL DATA SETS. FORMATS OF
C WHICH ARE NOT YET DELINEATED. DUMMY
C INSTRUCTIONS ARE INSERTED FOR THESE.
  14 READ MONTH
  214 FORMAT (A2)
  GO TO 500
  15 READ MONTH
  215 FORMAT (A2)
  GO TO 500
  16 READ MONTH
  216 FORMAT (A2)
  GO TO 500
  17 READ MONTH
  217 FORMAT (A2)
  GO TO 500
  18 READ MONTH
  218 FORMAT (A2)
  GO TO 500
  19 READ MONTH
  219 FOMRAT (A2)

```

TABLE 10 (Continued)

GO TO 500	
20 READ MONTH	
220 FORMAT (A2)	
GO TO 500	
C	ITH ALTITUDE DATA CARD HAS NOW BEEN READ.
C	PROGRAM WILL HALT ON FORMAT ERROR IF JTH
C	ALTITUDE DATA CARD DOES NOT CONFORM TO FORMAT
C	OF THAT SET.
20 GO TO (31,32,500) M1	
C	BRANCH TO CONVERT ALTITUDE UNITS. IF M1=2,
C	UNITS ARE KM SO PROCEED. IF M1=1, UNITS ARE
C	THOUSANDS OF FEET SO CONVERT THEN PROCEED.
C	IF M1=3 OR LARGER, STOP.
31 ALT = ALT*0.30480061	
32 GO TO (41,42,43,44,500) M2	
C	BRANCH TO CONVERT DENSITY UNITS. IF M2=4,
C	UNITS ARE KG/SQ M SO PROCEED. IF M2=1,2,3,
C	UNITS ARE GM/CU CM, GM/CU M, SLUGS/CU FT,
C	RESPECTIVELY, SO CONVERT AND ROUND OFF LAST
C	SIGNIFICANT FIGURE IF REQUIRED THEN PROCEED.
C	IF M2=5 OR LARGER, STOP.
41 DENSI = DENSI*1.0E+03	
GO TO 44	
42 DENSI = DENSI*1.0E-03	
GO TO 44	
43 DENSI = DENSI*5.1537865E+02	
DENSI = DENSI+0.000005	
C	LAST STATEMENT ROUNDS OFF 5TH DECIMAL PLACE.
44 GO TO (51,52,53,500) M3	
C	BRANCH TO CONVERT TEMPERATURE. IF M3=3, UNITS
C	ARE DEG K SO PROCEED. IF M3=1,2, UNITS ARE
C	DEG C, DEG F, RESPECTIVELY, SO CONVERT AND
C	ROUND OFF THEN PROCEED. IF M3=4 OR LARGER,
C	STOP.
51 TEMP = TEMP+273.15	
GO TO 53	
52 TEMP = 5.0(TEMP-32.00)/9.0+273.15	
TEMP = TEMP+0.005	
C	LAST STATEMENT ROUNDS OFF 2ND DECIMAL PLACE.
53 GO TO (61,62,63,64,500) M4	
C	BRANCH TO CONVERT PRESSURE. IF M4=4, UNITS
C	ARE N/SQ M SO PROCEED. IF M4=1,2,3, UNITS ARE
C	MB, DYN/SQ CM, LBS/SQ FT, RESPECTIVELY, SO
C	CONVERT AND ROUND OFF THEN PROCEED. IF
C	M4=5 OR LARGER, STOP.
61 PRESS = PRESS*1.0E+02	
GO TO 64	
62 PRESS = PRESS*1.0E-01	
GO TO 64	
63 PRESS = PRESS*47.880067	
PRESS = PRESS+0.000005	
C	LAST STATEMENT ROUNDS OFF 5TH DECIMAL PLACE.
64 PUNCH 101, YEAR, MONTH, DAY, HOUR, MIN, ISITE, ISEQ, ALT, DENSI, TEMP, PRESS	
101 FORMAT (6A2, A1, F8.2, E12.5, F7.1, E12.5)	
300 CONTINUE	
400 CONTINUE	
500 STOP	
END	

TABLE 11

PROGRAM 1030

```

C      SHADOW HEIGHT AND SOLAR DEPRESSION ANGLE, NOV 29, 1966
C      PROGRAM FOR COMPUTING LOCAL APPARENT TIME OF AN
C      EVENT WHICH OCCURRED AT A KNOWN DATE AND GREENWICH
C      MEAN TIME (GMT) AND AT A PARTICULAR SITE ON EARTH.
C      THE PROGRAM ALSO CALCULATES THE SUBSOLAR ANGLE REL-
C      ATIVE TO THE SITE, AS WELL AS THE HEIGHT OF THE
C      SHADOW OF THE EARTH ABOVE THE SITE WHEN THE SUN IS
C      BELOW THE HORIZON. IN THE COURSE OF THE CALCULATION
C      THE DECLINATION ANGLE AND THE EQUATION OF TIME ARE
C      ALSO COMPUTED. ENTER LAT, LONG, MONTH, DAY, YEAR, TIME
C      (GMT). SOUTH LATITUDE AND EAST LONGITUDE ARE
C      ENTERED AS NEGATIVE NUMBERS.
C      WRITTEN BY MOGENSTERN, COMMENTED BY MINZNER.
C      DIMENSION DM(12), A(20), B(20), X(67)
C      THE NUMBERS TO BE READ IN FORMAT 107 AS X(1) TO
C      X(67) CONSIST OF THE FOLLOWING NUMBERS BUT PUNCHED
C      WITHOUT SEPARATION, 00 01 02 03 ETC TO 39 ON ONE
C      CARD, AND FROM 40 TO 66 ON A SECOND CARD.
C      READ (5,107) (X(I), I=1,40)
C      READ (5,107) (X(I), I=41,67)
C      107 FORMAT(40A2)
C      THE FOLLOWING TWENTY VALUES, A(1) THROUGH A(20)
C      CONSIST OF THE OCCURRENCE OF THE VERNAL EQUINOX IN
C      NUMBER OF DAYS AFTER THE BEGINNING OF THE CALENDAR
C      YEAR, FOR THE YEARS 1947 TO 1966 INCLUSIVE.
C
C      A( 1)=80.46736
C      A( 2)=80.70625
C      A( 3)=79.95069
C      A( 4)=80.19167
C      A( 5)=80.43472
C      A( 6)=80.67639
C      A( 7)=79.91736
C      A( 8)=80.16250
C      A( 9)=80.40000
C      A(10)=80.63958
C      A(11)=79.88681
C      A(12)=80.12917
C      A(13)=80.37153
C      A(14)=80.61319
C      A(15)=79.85556
C      A(16)=80.10417
C      A(17)=80.34722
C      A(18)=80.59028
C      A(19)=79.83681
C      A(20)=80.07847
C
C      THE FOLLOWING TWENTY VALUES, B(1) THROUGH B(20)
C      CONSIST OF THE LENGTH OF THE YEAR X IN DAYS AS
C      MEASURED FROM THE VERNAL EQUINOX OF YEAR X TO THE
C      VERNAL EQUINOX OF YEAR X+1 WHEN X HAS THE VALUES
C      1947 TO 1966 INCLUSIVE.
C
C      B( 1)=365.2389
C      B( 2)=365.2444
C      B( 3)=365.2410
C      B( 4)=365.2431
C      B( 5)=365.2417

```

TABLE 11 (Continued)

B(6)=365.2410

B(7)=365.2451

B(8)=365.2375

B(9)=365.2396

B(10)=365.2472

B(11)=365.2424

B(12)=365.2424

B(13)=365.2417

B(14)=365.2424

B(15)=365.2486

B(16)=365.2431

B(17)=365.2431

B(18)=365.2465

B(19)=365.2417

B(20)=365.2389

THE FOLLOWING TWELVE VALUES, DM(X) FOR X=1 THROUGH 12 CONSISTS OF THE CUMULATIVE NUMBER OF DAYS IN THE YEAR UP TO THE BEGINNING OF MONTH X, FOR YEARS WHICH ARE NOT LEAP YEARS.

1 DM(1)=0.0

DM(2)=31.0

DM(3)=59.0

DM(4)=90.0

DM(5)=120.0

DM(6)=150.0

DM(7)=181.0

DM(8)=212.0

DM(9)=242.0

DM(10)=273.0

DM(11)=303.0

DM(12)=334.0

THE CONSTANT .0174533 IS THE FACTOR FOR CONVERTING DEGREES OF ANGLE TO RADIAN.

C=.0174533

THE NECESSARY INPUT DATA INCLUDE MONTH THE MONTH OF THE YEAR, IDAY THE DAY OF THE MONTH IN GMT, IYEAR THE YEAR OF THE CENTURY, IHOURL THE GMT HOUR OF THE DAY, AND MIN THE MINUTE OF THE GMT HOUR. OTHER QUANTITIES ON THE DATA CARD IN FORMAT 104 ARE NOT REQUIRED IN THIS CALCULATION AND ARE REPUNCHED ON THE OUTPUT CARD FOR OTHER APPLICATIONS.

THE ORDER OF THE INPUT DATA IS A BLANK CARD FOLLOWED BY A CARD WITH THE SITE LATITUDE AND LONGITUDE COORDINATES FOLLOWED BY CARDS WITH THE DATE-TIME INFORMATION. PLACE A CARD WITH -1 IN COLUMNS 3 AND 4 AT THE END OF THE DATA SET.

READ (5,104) MONTH,IDAY,IYEAR,IHOURL,MIN,KD,KA,ILUX1,ILUX2,MAXH,

IMINH,NP,KB,KC

104 FORMAT(2X12,1X12,1X12,2I3,A1,A5,I4,2X14,23X314,1XA3,1XA4)

IF(MONTH)20,12,13

THE REMAINING REQUIRED INPUT DATA IS XLAT THE LATITUDE, AND XLONG THE LONGITUDE OF THE SITE OF THE EVENT. THESE ARE READ IN FORMAT 105.

12 READ (5,105) XLAT,XLONG

TABLE 11 (Continued)

```

105 FORMAT(33XF6.2,2XF7.2)
GO TO 1
C
C THE NEXT 5 STATEMENTS CONVERTS GMT IN HOURS AND
C MINUTES TO GMT IN HOURS AND DECIMAL FRACTIONS OF HR
13 XMIN=MIN
HOUR=IHOUR
ITIME=IHOUR*100+MIN
DAY=IDAY
GMT=HOUR+XMIN*60.**(-1)
C
C THE NEXT STATEMENT DEFINES JYEAR IN TERMS OF IYEAR
C FOR USE IN SELECTING THE PROPER A AND B CONSTANTS
C TO BE USED IN THE EIGHTH STATEMENT BELOW THIS
C COMMENT, AND FOR REESTABLISHING THE VALUE OF IYEAR
C IN THE SEVENTH STATEMENT BELOW, AFTER IT HAS BEEN
C DESTROYED IN THE LEAP YEAR DETERMINATION STATEMENTS
JYEAR=IYEAR-46
C
C THE FIRST TWO OF THE NEXT FIVE STATEMENTS DETERMINE
C WHETHER OR NOT THE YEAR CORRESPONDING TO THE EVENT
C IS A LEAP YEAR, AND IF IT IS, THE NEXT TWO STATE-
C MENTS INCREASE THE VALUES OF DM(3) THROUGH DM(12)
C BY 1 DAY SO THAT IN THE FIFTH STATEMENT, THE DATE
C AND TIME ARE CONVERTED TO THE NUMBER OF DAYS AND
C FRACTION THEREOF BETWEEN THE EVENT AND THE 31ST OF
C DECEMBER OF THE PRECEDING YEAR, FOR EITHER LEAP
C YEAR OR A REGULAR YEAR
10 IYEAR=IYEAR-4
IF(IYEAR) 8,9,10
9 DO 11 L=3,12
11 DM(L)=DM(L)+1.
8 EN=DM(MONTH)+DAY+GMT*24.**(-1)
IYEAR=JYEAR+46
C
C ARG IS THE ARGUMENT OF SEVERAL TRIGONOMETRIC
C FUNCTIONS USED IN DETERMINING DECL, TEG AND ALPHA
C BELOW. ARG IS EQUAL TO 2 PI TIMES THE NUMBER OF
C DAYS BETWEEN THE EVENT AND THE VERNAL EQUINOX ALL
C DIVIDED BY THE LENGTH OF THE PARTICULAR ASTRO-
C NOMICAL YEAR, B(JYEAR).
ARG=6.2831854*(EN-A(JYEAR))*B(JYEAR)**(-1)
C
C THE NEXT 8 STATEMENTS DEFINE THE SEVERAL TRIGONO-
C METRIC FUNCTIONS REQUIRED BELOW.
C1=COS (ARG)
C2=COS (2.*ARG)
C3=COS (3.*ARG)
C4=COS (4.*ARG)
S1=SIN (ARG)
S2=SIN (2.*ARG)
S3=SIN (3.*ARG)
S4=SIN (4.*ARG)
C
C THE FIRST TWO OF THE NEXT FOUR STATEMENTS DEFINE
C THE DECLINATION ANGLE OF THE SUN WHILE THE NEXT TWO
C STATEMENTS DEFINE THE EQUATION OF TIME. BOTH OF
C THESE QUANTITIES ARE EXPRESSED AS SERIES EXPANSIONS
C WITH A LIMITED NUMBER OF TERMS, THE COEFFICIENTS OF
C WHICH WERE DETERMINED BY MORGENSTERN USING A
C FOURIER ANALYSIS OF TABULAR DATA OF THE RESPECTIVE
C QUANTITIES GIVEN IN THE NAUTICAL ALMANAC FOR THE

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TABLE 11 (Continued)

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C      YEAR 1966. THESE FUNCTIONS APPLY STRICTLY ONLY FOR
C      THE YEAR 1966, BUT BY ADJUSTING THE ARGUMENT ARG
C      ABOVE FOR ANY PARTICULAR YEAR, THE SAME FUNCTIONS
C      ARE EXTENDED TO APPLY TO OTHER YEARS. THE EQUATION
C      OF TIME YIELDS RESULTS IN MINUTES.
DECL=.3796-.7565*C1+.3653*C2+.0199*C3-.0080*C4
DECL=DECL+23.257*S1+.1088*S2-.1709*S3-.0029*S4
TEQ=.0066-7.0937*C1-.6772*C2+.3016*C3+.0316*C4
TEQ= TEQ-1.9441*S1+9.9101*S2+.1051*S3-.2195*S4
C      THE NEXT STATEMENT DEFINES T THE LOCAL APPARENT
C      TIME IN HOURS, IN TERMS OF GMT, THE LONGITUDE OF
C      THE SITE, AND THE EQUATION OF TIME CONVERTED TO
C      HOURS.
T=GMT-XLONG*15.**(-1)+TEQ*60.**(-1)
C      THE NEXT FIVE STATEMENTS DETERMINE WHETHER OR NOT
C      THE VALUE OF T IS WITHIN THE LIMITS OF 00.00 TO
C      23.99 HOURS INCLUSIVE, AND MAKES APPROPRIATE
C      ADJUSTMENTS IF THE VALUE OF T IS OUTSIDE OF THESE
C      LIMITS.
IF(T)4,5,14
4 T=T+24.
GO TO 5
14 IF(T-24.)15,15,15
15 T=T-24.
C      THE NEXT STATEMENT IS THE EXPRESSION FOR COMPUTING
C      THE COSINE OF A THE SUBSOLAR ANGLE (OR OF THE
C      ZENITH DISTANCE FROM THE OBSERVER TO THE SUN, IN
C      THE TERMINOLOGY OF W.M.SMART, TEXT-BOOK ON SPHER-
C      ICAL ASTRONOMY) IN TERMS OF TRIGONOMETRIC FUNCTIONS
C      OF XLAT THE LATITUDE OF THE SITE, DECL THE DECLI-
C      NATION ANGLE OF THE SUN, AND T*15 THE HOUR ANGLE OF
C      THE SUN RELATIVE TO THE LOWER MERIDIAN OF THE SITE.
C      THIS EQUATION IS GIVEN ON PAGE 52 OF THE ABOVE
C      REFERENCE WITH AN OPPOSITE SIGN FOR THE SECOND TERM
C      SINCE SMART MEASURES HOUR ANGLE RELATIVE TO THE
C      UPPER MERIDIAN RATHER THAN RELATIVE TO THE LOWER
C      MERIDIAN.
5 COSA=SIN(XLAT*C)*SIN(DECL*C)-COS(XLAT*C)*COS(DECL*C)*COS(T*15.*C)
C      THE NEXT STATEMENT CONSISTS OF A TRIGONOMETRIC
C      IDENTITY WHERE FNUM IS EQUAL TO TANGENT OF A. THE
C      TRANSFORMATION FROM COSA TO TANA OR TO FNUM IS
C      NECESSARY BECAUSE THE COMPUTER HAS A ROUTINE FOR
C      TAKING THE ARCTANGENT BUT NOT THE ARCCOSINE.
FNUM=SQRT (1.-COSA*COSA)*COSA**(-1)
C      THE NEXT STATEMENT DETERMINES A BY TAKING THE
C      ARCTANGENT OF THE TANGENT OF A AND REDEFINES A AS
C      ALPHA, WHILE THE FOLLOWING STATEMENT CONVERTS ALPHA
C      IN RADIANS TO ALPHA IN DEGREES.
ALPHA=ATAN (FNUM)
ALPHA=ALPHA*C**(-1)
C      THE NEXT TWO STATEMENTS CONVERT NEGATIVE VALUES OF
C      ALPHA TO CORRESPONDING POSITIVE VALUES.
IF(ALPHA)2,3,3
2 ALPHA=ALPHA+180.
C      THE NEXT STATEMENT RELATES SOLAR DEPRESSION ANGLE
C      TO SUBSOLAR ANGLE FOR USE IN THE SHADOW HEIGHT

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TABLE 11 (Continued)

C	CALCULATION.
3 SOLAR=(ALPHA-90.)	THE QUANTITY HSHAD, THE HEIGHT OF THE EARTH SHADOW ABOVE A GIVEN SITE BETWEEN SUNSET AND SUNRISE, IS EXPRESSED FUNDAMENTALLY IN TERMS OF THE RADIUS OF THE EARTH, MULTIPLIED BY A QUANTITY EQUAL TO THE SECANT OF AN ANGLE MINUS UNITY, WHERE THE ANGLE IS THE SOLAR DEPRESSION ANGLE REDUCED BY TWICE THE REFRACTION ANGLE AND FURTHER REDUCED BY THE SEMIDIAMETER OF THE LIMB OF THE SUN. SINCE THE REFRACTION ANGLE IS 34 MINUTES AND THE SEMIDIAMETER OF THE SUN IS 16 MINUTES, THE TOTAL CORRECTION IS 1.4 DEGREES. BECAUSE THE COMPUTER DOES NOT DEAL WITH THE SECANT FUNCTION, THE EQUIVALENT IN THE FORM OF THE RECIPROCAL OF THE COSINE FUNCTION IS USED. WITH R=6371. KM, HSHAD IS IN KM.
HSHAD=6371.*(1.*(COS (C*(SOLAR-1.4)))*(-1)-1.)	WHEN THE SUN IS ABOVE THE HORIZON OF THE SITE, THE COMPUTED SHADOW HEIGHT IS NEGATIVE. THE NEXT TWO STATEMENTS CAUSE SUCH NEGATIVE SHADOW HEIGHTS TO BE DESIGNATED ZERO.
IF(SOLAR)6,7,7 6 HSHAD=0.	THE NEXT STATEMENT IS A PROCEDURE FOR ROUNDING OFF AND TRUNCATING ALPHA. HERE DRH IS A TRUNCATION FUNCTION.
7 ALPHA=AINT((ALPHA+.05)*10.)*.1	THE OUTPUT IS A PUNCHED CARD UPON WHICH IS GIVEN THE DATE AND TIME OF THE EVENT, THE VALUE OF ALPHA IN DEGREES, THE VALUE OF HSHAD IN KM AS WELL AS THE REMAINING NINE QUANTITIES GIVEN AS INPUT DATA BUT NOT USED IN THIS PROGRAM. THE DATE AND TIME QUANTITIES ARE PUNCHED OUT IN A FORMAT FROM THE SET OF INDEXED NUMBERS READ INTO THE MACHINE SINCE THE FIRST OF THESE IS 00, THE INDEXED QUANTITIES BEGINNING WITH 1 WOULD BE TOO SMALL BY 1 IF THE INDEX DID NOT CONTAIN THE +1 STATEMENT. THE A FORMAT WITH INDEXED NUMBERS IS USED SO THAT ZEROS MAY BE PUNCHED OUT IN THE DATE AND TIME DESIGNATIONS.
WRITE(6,102)X(MONTH+1),X(IDAY+1),X(IYEAR+1),X(IHOUR+1),X(MIN+1), 1KD,KA,ILUX1,ILUX2,T,ALPHA,HSHAD,MAXH,MINH,NP,KB,KC 102 FORMAT(2XA2,1H/,A2,1H/,A2,1XA2,1XA2,A1,A5,I4,2XI4,2XF6.2,F6.1, 1E9.3,3I4,1XA3,1XA4) GO TO 1 20 STOP END	
\$DATA 00010203040506070809101112131415161718192021222324252627282930313233343536373839 404142434445464748495051525354555657585960616263646566	

TABLE 12

PROGRAM 1031

```

C      PROGRAM FOR CODING HEADER RECORD DATA
C      PROGRAM TRANSFORMS VARIABLES OF FIRST HEADER RECORD INTO
C      NUMERIC CODES FOR STATISTICAL STUDIES - HEIGHT, LATITUDE,
C      SEASON, TIME OF DAY OR DIURNAL SOLAR INFLUENCE, SUBSOLAR
C      ANGLE, AND SOLAR FLUX
C      LATITUDE (KL)
C-----
      DIMENSION KS(40),KT(25),SF(10),KL(40)
      DIMENSION DM(16),D(12)
C      STORE CODE DATA FOR SITE (KS), TECHNIQUE (KT), AND
      READ (5,100)(KS(I),I=1,40)
100  FORMAT(40A2)
      READ (5,101)(KT(I),I=1,25)
101  FORMAT(25A2)
      READ (5,104)(KL(I),I=1,40)
104  FORMAT(40A1)
      READ (5,214)(D(I),I=1,12)
      READ (5,214)(DM(I),I=1,16)
      READ (5,214)(SF(I),I=1,10)
214  FORMAT(16F5.0)
      READ (5,300) SD,II
300  FORMAT(E11.5,I5)
      II=II-1
C      II IS SOUNDING INDEX, ORIGINALLY FLIGHT NUMBER
      1 READ (5,102) ID1,ID2,ID3,ID4,ID5,ISITE,ITECH,SOLAR,FLUX,APAR,SUB,
      1HSHAD,MAXH,MINH,NP
102  FORMAT(2XI2,1XI2,1XI2,1XI2,1XA3,1XA2,A2,1XF3.0,3XF3.0,2XF6.2,F6.1,E9.3,
      13I4)
C      READ IN IS OUTPUT FROM FIRST HEADER RECORD PROGRAM -
C      ID1=MONTH,ID2=DAY,ID3=YEAR,ID4=GMT HOUR,ID5=GMT MINUTE
C      PLUS LETTER,ISITE=LETTER SITE,ITECH=LETTER TECHNIQUE,
C      SOLAR=FLUX VALUE ON DAY PRECEDING FLIGHT AND FLUX=FLUX
C      VALUE ON DAY OF FLIGHT,APAR=LOCAL APPARENT TIME,SUB=SUBSOLAR
C      ANGLE,HSHAD=SHADOW HEIGHT,MAXH=MAXIMUM ALTITUDE AND MINH=
C      MINIMUM ALTITUDE,NP=NUMBER OF DATA POINTS IN SOUNDING
      II=II+1
      CODE=0
      DO 15 IS=1,40
C      SET NUMERIC SITE CODE (KS). KL(IS) IS SIX-GROUP NUMERIC
C      DIVISION OF NORTH OR SOUTH LATITUDE
      IF(KS(IS)-ISITE) 15,16,15
15  CONTINUE
16  DO 72 IT=1,24
C      SET NUMERIC TECHNIQUE CODE (KT)
      IF(KT(IT)-ITECH) 72,38,72
72  CONTINUE
C      SET SOLAR FLUX INDEX CODE FOR FLIGHT DAY-1
38  SOLA=SOLAR
      IF(SOLAR-SD) 17,40,17
40  ISO=0
      IF(FLUX-SD) 42,41,42
42  CODE=1.
      SOLA=FLUX
      ISOL=ISO
C      ISOL=SOLAR FLUX CODE FOR FLIGHT DAY-1
17  IF(SOLA) 70,70,71

```

TABLE 12 (Continued)

```

70 ISO=0
  GO TO 32
71 DO 19 ISO=1,8
  IF(SOLA-SF(ISO)) 21,18,18
18 IF(SOLA-SF(ISO+1)) 32,19,19
19 CONTINUE
  ISO=9
  GO TO 32
21 ISO=1
32 IF(CODE) 33,33,34
C      SET SOLAR FLUX INDEX CODE FOR FLIGHT DAY
33 IF(FLUX-SD) 39,41,39
41 ISOL=ISO
  ISO=0
  GO TO 34
39 CODE=1
  ISOL=ISO
  SOLA=FLUX
  GO TO 17
34 IFLUX=ISO
C      IFLUX=SOLAR FLUX CODE FOR FLIGHT DAY
C      DO 35 ISA=1,13
C      SET SUBSOLAR ANGLE CODE (ISA)
  FFF=ISA
  IF(SUB-FFF*15.) 37,37,35
35 CONTINUE
37 ISA=ISA-1
  DAID=ID2
  DAYYR=DAID+D (ID1)
  IF(ID1-3) 3,4,4
4 YR=ID3
  IF(DRH(YR*(4.**(-1)))*4.-YR) 3,5,3
5 DAYYR=DAYYR+1.
C      FOR SOUTHERN-HEMISPHERE SITES THE SEASONS ARE INVERTED BY
C      SUBTRACTING 183 FROM THE NUMBER OF THE DAY OF THE YEAR
C      WHEN THAT NUMBER IS EQUAL TO OR GREATER THAN 183, OR BY
C      ADDING 183 WHEN THAT NUMBER IS LESS THAN 183
C      FOR LEAP YEAR, ONE DAY IS ADDED TO THE DAY OF THE YEAR FOR
C      MONTHS MARCH THROUGH DECEMBER. CORRESPONDINGLY, NO
C      CORRECTION IS MADE FOR THE ACCUMULATED QUARTER-DAY ERRORS IN
C      SUCCESSIVE MEMBERS OF THE REMAINDER OF THE FOUR YEAR
C      CYCLE, INSOFAR AS THE SEASONAL DIVISION IS CONCERNED
3 IF(IS-3) 200,201,200
200 IF(IS-13) 202,201,202
202 IF(IS-26) 203,201,203
203 IF(IS-37) 204,201,204
201 IF(DAYYR-183.) 205,206,206
205 DAYYR=DAYYR+183.
  GO TO 204
206 DAYYR=DAYYR-183.
204 DO 207 ID=1,12
  IF(DAYYR-DM(ID)) 208,209,209
209 IF(DAYYR-DM(ID+1)) 210,207,207
207 CONTINUE
213 ID=13
  GO TO 210

```

TABLE 12 (Continued)

```

208 DO 211 ID=14,15
      IF(DAYYR-DM(ID)) 213,212,212
212 IF(DAYYR-DM(ID+1)) 210,211,211
211 CONTINUE
C      SET SEASON CODES AS FOLLOWS - SIXTEEN-SEASON CODE =
C      THOUSANDS AND HUNDREDS DIGIT OF ISEA1, EXTREME SEASON CODE =
C      TENS DIGIT OF ISEA1, FOUR-SEASON CODE = UNITS DIGIT OF
C      ISEA1, TWO-SEASON CODE = TENS DIGIT OF ISEA2, EIGHT-SEASON
C      CODE = UNITS DIGIT OF ISEA2
      ID=16
210 ISEA1=ID
      IF(ID -1)217,217,215
217 ISEA5=7
      GO TO 216
215 ISEA5=ID/2-1
216GO TO(239,239,239,239,240,240,239,239,239,239,239,239,241,241,239,239),ISEA1
239 ISEA2=0
      GO TO 242
240 ISEA2=8
      GO TO 242
241 ISEA2=9
242GO TO(243,243,243,244,244,244,244,245,245,245,245,246,246,246,246,243),ISEA1
243 ISEA3=1
      GO TO 247
244 ISEA3=2
      GO TO 247
245 ISEA3=3
      GO TO 247
246 ISEA3=4
247GO TO(248,249,249,249,249,249,249,249,249,249,248,248,248,248,248,248,248),ISEA1
248 ISEA4=1
      GO TO 250
249 ISEA4=2
C      SET DIURNAL CODES AS FOLLOWS - IHS = SIX CLASS DIURNAL CODE,
C      IETR = THREE CLASS DIURNAL CODE
C      DIURNAL CODING INVOLVES RANGES IN LOCAL APPARENT TIME,
C      SUPSOLAR ANGLE, AND SHADOW HEIGHT
250 IF(HSHAD) 251,251,252
251 IF(SUB-60.)261,262,262
262 IETR=0
      IF(APAR-12.)263,264,264
263 IHS=1
      GO TO 253
264 IHS=4
      GO TO 253
261 IETR=1
      IF(APAR-12.)265,266,266
265 IHS=2
      GO TO 253
266 IHS=3
      GO TO 253
252 IF(HSHAD-300.)267,268,268
267 IETR=0
      IF(APAR-12.)269,270,270
269 IHS=1
      GO TO 253

```

TABLE 12 (Continued)

270 IHS=4

GO TO 253

268 IETR=2

IF (APAR-12.) 271,272,272

271 IHS=6

GO TO 253

272 IHS=5

253 ISEA1=ISEA1*100+ISEA2*10+ISEA3

ISEA2=ISEA4*10+ISEA5

ID1=ID1*100+ID2

WRITE (6,103) ID1,ID3,ID4,ID5,ISITE,ITECH,APAR,SUB,HSHAD,MAXH,MINH,

INP,II,IS,KL(IS),IT,ISEA1,ISEA2,ISA,ISOL,IFLUX,IHS,IETR

103 FORMAT(I5,I3,I3,A3,2A2,F6.2,F6.1,E9.3,2I4,I3,I4,I3,A1, I3,I5,2I3,4I2)

GO TO 1

STOP

END

G. Summary of Computer Programs

Table 13 presents a summary of the computer programs written for this study for the analysis and processing of MRN and non-MRN data sets. This summary includes MRN programs written by the NASA technical monitor as well as the header record programs discussed in Section F.

TABLE 13
SUMMARY OF PROGRAMS FOR PROCESSING
AND ANALYSIS OF MRN AND NON-MRN
ROCKET SOUNDINGS

Program	Description
Sounding related header information	Computes local apparent time, subsolar angle, shadow height; enter these parameters plus solar flux indices on first header record
Coded Header Information	Assigns numeric codes to sounding related variables (latitude, season, diurnal, subsolar angle, solar flux, site) to facilitate statistical analysis
Physical Units Standardization	Converts original sounding data from different system of units to standard MKS system
Initial Sounding Data Processing	Transfers soundings which are contained in various formats on cards or tape to tape in standardized form; checks and edits data and soundings; performs monotonicity tests on altitudes and density
Altitude Monotonicity Correction	Transforms incorrect sounding and altitude order to proper order
Geopotential Conversion & Interpolation	Converts reformed and processed soundings from geometric to geopotential domains and interpolates data at integer geopotential kilometers
MRN Data Tapes Initial Processing	Extracts pertinent data from MRN tapes; transfers to NASA tape in standardized form, checks & edits soundings & data; performs monotonicity tests on data; tests for gas low consistency and computes % departures for error analysis, records various errors

TABLE 13 (continued)

Program	Description
Specific MRN Tapes Error Corrections	A set of programs that performs a variety of specific corrections to predetermined errors on MRN tapes; e.g. rearranging incorrect order, replacing bad data with punched card corrections, etc.
Thermistor Temperature Data Correction	Computes nth degree polynomial curve for fitting specific temperature corrections and applies these to certain soundings
Solar Flux Density Correlation Smoothing	Smooths correlation profiles of solar flux with density; correlations computed by z-transform; 5 & 95% confidence limits are tested for correlation significance

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APPENDIX

Sample Error Table for Antigua MRN Tape

SPECIFIC RECORDS SUSPECTED OF ERRORS IN THE TAPE OF ANTIGUA MRN DATA FOR THE PERIOD 630607J1800 TO 650830J1700
AS DETECTED BY FORMAT, MONOTONICITY, AND GAS-LAW TESTS ONLY

CO
CO

116046403240915	30.48-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF .30 PC, 4.3 TIMES ALLOWABLE IN REC	170
116046403240915	WITH TAB VALS, TDENS= 16.643 GM/ICU M, TTEMP= -40.1 DEG C (233.06 K), AND TPRES= 11.10 MB,	
116046403240915	COMPUTED VALS, CDENS= 16.5925 , CTEMP= -40.81 (232.35 K), AND CPRES= 11.1398 ,	
116046403240915	AND ABS DIFS, ADD= 0.0505 , ADT= 0.71 , AND ADP= 0.0338 ,	
116046408150511	47.24-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 25.92 PC, 72.1 TIMES ALLOWABLE IN REC	216
116046408150511	WITH TAB VALS, TDENS= 1.520 GM/ICU M, TTEMP= -8.3 DEG C (264.86 K), AND TPRES= 1.56 MB,	
116046408150511	COMPUTED VALS, CDENS= 2.0519 , CTEMP= 84.39 (357.55 K), AND CPRES= 1.1556 ,	
116046408150511	AND ABS DIFS, ADD= 0.5319 , ADT= 92.69 , AND ADP= 0.4044 ,	
	ROCKET-PRESSURE MONOTONICITY ERROR IN RECORD 216 OR 217	
116046409251755	30.48-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 566.95 PC, 1265.3 TIMES ALLOWABLE IN REC	338
116046409251755	WITH TAB VALS, TDENS= 17.052 GM/ICU M, TTEMP= -32.7 DEG C (240.46 K), AND TPRES= 1.77 MB,	
116046409251755	COMPUTED VALS, CDENS= 2.5644 , CTEMP= -237.0 (36.16 K), AND CPRES= 11.7696 ,	
116046409251755	AND ABS DIFS, ADD= 14.4876 , ADT= 204.3 , AND ADP= 9.9596 ,	
	ROCKET-PRESSURE MONOTONICITY ERROR IN RECORD 337 OR 338	
116046410272348	30.48-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF .42 PC, 6.0 TIMES ALLOWABLE IN REC	558
116046410272348	WITH TAB VALS, TDENS= 16.858 GM/ICU M, TTEMP= -42.8 DEG C (230.36 K), AND TPRES= 3.16 MB,	
116046410272348	COMPUTED VALS, CDENS= 16.7870 , CTEMP= -43.77 (229.39 K), AND CPRES= 11.1469 ,	
116046410272348	AND ABS DIFS, ADD= 0.0710 , ADT= 0.97 , AND ADP= 0.0569 ,	
116046410280435	39.62-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF .78 PC, 4.1 TIMES ALLOWABLE IN REC	578
116046410280435	WITH TAB VALS, TDENS= 4.321 GM/ICU M, TTEMP= -16.4 DEG C (256.76 K), AND TPRES= 3.18 MB,	
116046410280435	COMPUTED VALS, CDENS= 4.2876 , CTEMP= -18.38 (254.78 K), AND CPRES= 3.1846 ,	
116046410280435	AND ABS DIFS, ADD= 0.0334 , ADT= 1.98 , AND ADP= 0.0246 ,	
116046411022141	32.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF .27 PC, 3.4 TIMES ALLOWABLE IN REC	657
116046411022141	WITH TAB VALS, TDENS= 13.399 GM/ICU M, TTEMP= -37.2 DEG C (236.61 K), AND TPRES= 9.10 MB,	
116046411022141	COMPUTED VALS, CDENS= 13.4357 , CTEMP= -36.55 (236.61 K), AND CPRES= 9.0751 ,	
116046411022141	AND ABS DIFS, ADD= 0.0367 , ADT= 0.65 , AND ADP= 0.0249 ,	
116046411022141	24.38-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 1.35 PC, 31.7 TIMES ALLOWABLE IN REC	662
116046411022141	WITH TAB VALS, TDENS= 43.991 GM/ICU M, TTEMP= -55.2 DEG C (217.96 K), AND TPRES= 27.90 MB,	
116046411022141	COMPUTED VALS, CDENS= 44.5949 , CTEMP= -52.21 (220.95 K), AND CPRES= 27.5222 ,	
116046411022141	AND ABS DIFS, ADD= 0.6039 , ADT= 2.99 , AND ADP= 0.3778 ,	
116046411201843	25.91-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF .26 PC, 5.5 TIMES ALLOWABLE IN REC	857
116046411201843	WITH TAB VALS, TDENS= 34.358 GM/ICU M, TTEMP= -49.2 DEG C (223.26 K), AND TPRES= 22.03 MB,	
116046411201843	COMPUTED VALS, CDENS= 34.2690 , CTEMP= -48.78 (223.98 K), AND CPRES= 22.0872 ,	
116046411201843	AND ABS DIFS, ADD= 0.0890 , ADT= 0.58 , AND ADP= 0.0572 ,	
116046501181808	50.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 2.81 PC, 4.4 TIMES ALLOWABLE IN REC	1097
116046501181808	WITH TAB VALS, TDENS= 1.059 GM/ICU M, TTEMP= 8.2 DEG C (281.36 K), AND TPRES= 0.88 MB,	
116046501181808	COMPUTED VALS, CDENS= 1.0896 , CTEMP= 16.34 (289.50 K), AND CPRES= 0.8553 ,	
116046501181808	AND ABS DIFS, ADD= 0.0306 , ADT= 8.14 , AND ADP= 0.0247 ,	
116046501181808	26.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF .34 PC, 7.1 TIMES ALLOWABLE IN REC	1119
116046501181808	WITH TAB VALS, TDENS= 32.968 GM/ICU M, TTEMP= -45.4 DEG C (227.76 K), AND TPRES= 21.48 MB,	
116046501181808	COMPUTED VALS, CDENS= 32.8560 , CTEMP= -46.17 (226.99 K), AND CPRES= 21.5532 ,	
116046501181808	AND ABS DIFS, ADD= 0.1120 , ADT= 0.77 , AND ADP= 0.0732 ,	

116046501201821	48.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 38.44 PC.	132.5 TIMES ALLOWABLE IN REC	1177
116046501201821	WITH TAB VALS, TDENS= 1.471 GM/ICU M, TTEMP= 9.7 DEG C (282.86 K), AND TPRES= 1.94 MB,		
116046501201821	COMPUTED VALS, CDENS= 2.3894 , CTEMP= 18.63 (459.46 K), AND CPRES= 1.1943 ,		
116046501201821	AND ABS DIFS , ADD= 0.9184 , ADT= 17.66 , AND ADP= 0.7457 ,		
116046501201821	ROCKET-PRESSURE MONOTONICITY ERROR IN RECORD -- 1177 OR	1178	
116046501291800	42.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 33 PC.	1.3 TIMES ALLOWABLE IN REC	1274
116046501291800	WITH TAB VALS, TDENS= 3.034 GM/ICU M, TTEMP= -6.5 DEG C (266.66 K), AND TPRES= 2.33 MB,		
116046501291800	COMPUTED VALS, CDENS= 3.0441 , CTEMP= -5.61 (267.55 K), AND CPRES= 2.3223 ,		
116046501291800	AND ABS DIFS , ADD= 0.0101 , ADT= 0.89 , AND ADP= 0.0077 ,		
116046502101815	31.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 19 PC.	2.5 TIMES ALLOWABLE IN REC	1335
116046502101815	WITH TAB VALS, TDENS= 15.039 GM/ICU M, TTEMP= -36.2 DEG C (236.96 K), AND TPRES= 10.21 MB,		
116046502101815	COMPUTED VALS, CDENS= 15.0110 , CTEMP= -36.64 (236.52 K), AND CPRES= 10.2291 ,		
116046502101815	AND ABS DIFS , ADD= 0.0280 , ADT= 0.44 , AND ADP= 0.0191 ,		
116046502241435	45.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 37 PC.	1.0 TIMES ALLOWABLE IN REC	1481
116046502241435	WITH TAB VALS, TDENS= 2.040 GM/ICU M, TTEMP= 2.8 DEG C (275.96 K), AND TPRES= 1.61 MB,		
116046502241435	COMPUTED VALS, CDENS= 2.0325 , CTEMP= 1.79 (274.95 K), AND CPRES= 1.6159 ,		
116046502241435	AND ABS DIFS , ADD= 0.0075 , ADT= 1.01 , AND ADP= 0.0059 ,		
116046503011845	53.34-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 98 PC.	1.8 TIMES ALLOWABLE IN REC	1529
116046503011845	WITH TAB VALS, TDENS= 1.446 GM/ICU M, TTEMP= -25.0 DEG C (248.16 K), AND TPRES= 1.02 MB,		
116046503011845	COMPUTED VALS, CDENS= 1.4319 , CTEMP= -27.41 (245.75 K), AND CPRES= 1.0300 ,		
116046503011845	AND ABS DIFS , ADD= 0.0141 , ADT= 2.41 , AND ADP= 0.0100 ,		
116046503011845	51.82-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 61 PC.	1.4 TIMES ALLOWABLE IN REC	1530
116046503011845	WITH TAB VALS, TDENS= 1.751 GM/ICU M, TTEMP= -24.0 DEG C (249.16 K), AND TPRES= 1.26 MB,		
116046503011845	COMPUTED VALS, CDENS= 1.7618 , CTEMP= -22.47 (250.69 K), AND CPRES= 1.2523 ,		
116046503011845	AND ABS DIFS , ADD= 0.0108 , ADT= 1.53 , AND ADP= 0.0077 ,		
116046503081804	50.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 8.32 PC.	13.0 TIMES ALLOWABLE IN REC	1619
116046503081804	WITH TAB VALS, TDENS= 1.011 GM/ICU M, TTEMP= 1.7 DEG C (274.86 K), AND TPRES= 0.87 MB,		
116046503081804	COMPUTED VALS, CDENS= 1.1027 , CTEMP= 26.64 (299.80 K), AND CPRES= 0.7976 ,		
116046503081804	AND ABS DIFS , ADD= 0.0917 , ADT= 24.94 , AND ADP= 0.0724 ,		
116046503081804	34.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 16 PC.	1.5 TIMES ALLOWABLE IN REC	1635
116046503081804	WITH TAB VALS, TDENS= 9.718 GM/ICU M, TTEMP= -33.7 DEG C (239.46 K), AND TPRES= 6.69 MB,		
116046503081804	COMPUTED VALS, CDENS= 9.7331 , CTEMP= -33.33 (239.83 K), AND CPRES= 6.6796 ,		
116046503081804	AND ABS DIFS , ADD= 0.0151 , ADT= 0.37 , AND ADP= 0.0104 ,		
116046503101800	53.34-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 1.05 PC.	1.1 TIMES ALLOWABLE IN REC	1650
116046503101800	WITH TAB VALS, TDENS= 0.752 GM/ICU M, TTEMP= -11.0 DEG C (262.16 K), AND TPRES= 0.56 MB,		
116046503101800	COMPUTED VALS, CDENS= 0.7442 , CTEMP= -13.73 (259.43 K), AND CPRES= 0.5659 ,		
116046503101800	AND ABS DIFS , ADD= 0.0078 , ADT= 2.73 , AND ADP= 0.0059 ,		
116046504021815	39.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 52 PC.	3.0 TIMES ALLOWABLE IN REC	1834
116046504021815	WITH TAB VALS, TDENS= 4.845 GM/ICU M, TTEMP= -17.3 DEG C (255.86 K), AND TPRES= 3.54 MB,		
116046504021815	COMPUTED VALS, CDENS= 4.8201 , CTEMP= -18.61 (254.55 K), AND CPRES= 3.5583 ,		
116046504021815	AND ABS DIFS , ADD= 0.0249 , ADT= 1.31 , AND ADP= 0.0183 ,		
116046504071837	RAOB-ALTITUDE MONOTONICITY ERROR IN RECORD 1884 OR 1885		
116046504141801	57.91-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 2.25 PC.	1.3 TIMES ALLOWABLE IN REC	1944
116046504141801	WITH TAB VALS, TDENS= 0.397 GM/ICU M, TTEMP= 5.0 DEG C (278.16 K), AND TPRES= 0.31 MB,		
116046504141801	COMPUTED VALS, CDENS= 0.3883 , CTEMP= -1.12 (272.04 K), AND CPRES= 0.3170 ,		
116046504141801	AND ABS DIFS , ADD= 0.0087 , ADT= 6.12 , AND ADP= 0.0070 ,		

116046504192020	46.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 15.67 PC, 41.4 TIMES ALLOWABLE IN REC	1976
116046504192020	WITH TAB VALS, TDENS= 1.5878 GM/ICU M), TTEMP= 3.2 DEG C (276.36 K), AND TPRES= 1.49 MB,	
116046504192020	COMPUTED VALS, CDENS= 1.6783 , CTEMP= 34.52 (327.71 K), AND CPRES= 1.2365 ,	
116046504192020	AND ABS DIFS , ADD= 0.2943 , ADT= 51.35 , AND ADP= 0.2335 ,	
116046504192020	ROCKET-DENSITY MONOTONICITY ERROR IN RECORD 1975 OR 1976	
116046506091802	46.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 1.24 PC, 3.2 TIMES ALLOWABLE IN REC	2400
116046506091802	WITH TAB VALS, TDENS= 1.905 GM/ICU M), TTEMP= -4.7 DEG C (268.46 K), AND TPRES= 1.45 MB,	
116046506091802	COMPUTED VALS, CDENS= 1.8817 , CTEMP= -7.99 (265.17 K), AND CPRES= 1.4680 ,	
116046506091802	AND ABS DIFS , ADD= 0.0233 , ADT= 3.29 , AND ADP= 0.0180 ,	
116046506161631	28.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF .33 PC, 6.0 TIMES ALLOWABLE IN REC	2508
116046506161631	WITH TAB VALS, TDENS= 25.183 GM/ICU M), TTEMP= -44.0 DEG C (229.16 K), AND TPRES= 16.51 MB,	
116046506161631	COMPUTED VALS, CDENS= 25.0995 , CTEMP= -44.76 (228.40 K), AND CPRES= 16.5649 ,	
116046506161631	AND ABS DIFS , ADD= 0.0835 , ADT= 0.76 , AND ADP= 0.0549 ,	
116046506251630	55.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 5.62 PC, 90.4 TIMES ALLOWABLE IN REC	2543
116046506251630	WITH TAB VALS, TDENS= 0.617 GM/ICU M), TTEMP= 0.1 DEG C (273.26 K), AND TPRES= 0.98 MB,	
116046506251630	COMPUTED VALS, CDENS= 1.2494 , CTEMP= 280.19 (553.35 K), AND CPRES= 0.4840 ,	
116046506251630	AND ABS DIFS , ADD= 0.6324 , ADT= 280.09 , AND ADP= 0.4960 ,	
116046506251630	ROCKET-PRESSURE MONOTONICITY ERROR IN RECORD 2543 OR 2544	
116046507091628	37.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 11.70 PC, 270.0 TIMES ALLOWABLE IN REC	2709
116046507091628	WITH TAB VALS, TDENS= 6.563 GM/ICU M), TTEMP= -20.5 DEG C (252.66 K), AND TPRES= 4.261 MB,	
116046507091628	COMPUTED VALS, CDENS= 5.8753 , CTEMP= -46.97 (226.19 K), AND CPRES= 4.7597 ,	
116046507091628	AND ABS DIFS , ADD= 0.6877 , ADT= 26.47 , AND ADP= 0.4987 ,	
116046507091628	31.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 4.84 PC, 155.2 TIMES ALLOWABLE IN REC	2715
116046507091628	WITH TAB VALS, TDENS= 15.786 GM/ICU M), TTEMP= -34.9 DEG C (238.26 K), AND TPRES= 10.298 MB,	
116046507091628	COMPUTED VALS, CDENS= 15.0577 , CTEMP= -45.89 (227.27 K), AND CPRES= 10.7961 ,	
116046507091628	AND ABS DIFS , ADD= 0.7283 , ADT= 10.99 , AND ADP= 0.4981 ,	
116046507231700	35.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 29.77 PC, 1036.3 TIMES ALLOWABLE IN REC	2814
116046507231700	WITH TAB VALS, TDENS= 6.199 GM/ICU M), TTEMP= -28.5 DEG C (244.66 K), AND TPRES= 6.199 MB,	
116046507231700	COMPUTED VALS, CDENS= 8.8271 , CTEMP= 75.22 (348.38 K), AND CPRES= 4.3534 ,	
116046507231700	AND ABS DIFS , ADD= 2.6281 , ADT= 103.72 , AND ADP= 1.8456 ,	
116046507231700	ROCKET-DENSITY MONOTONICITY ERROR IN RECORD 2813 OR 2814	
116046507231700	34.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 3.12 PC, 1118.2 TIMES ALLOWABLE IN REC	2815
116046507231700	WITH TAB VALS, TDENS= 7.118 GM/ICU M), TTEMP= -29.7 DEG C (243.46 K), AND TPRES= 7.118 MB,	
116046507231700	COMPUTED VALS, CDENS= 10.1856 , CTEMP= 75.22 (348.38 K), AND CPRES= 4.9743 ,	
116046507231700	AND ABS DIFS , ADD= 3.0676 , ADT= 104.92 , AND ADP= 2.1437 ,	
116046507231700	33.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 3.40 PC, 1198.4 TIMES ALLOWABLE IN REC	2816
116046507231700	WITH TAB VALS, TDENS= 8.177 GM/ICU M), TTEMP= -30.7 DEG C (242.46 K), AND TPRES= 8.177 MB,	
116046507231700	COMPUTED VALS, CDENS= 11.7493 , CTEMP= 75.22 (348.38 K), AND CPRES= 5.6908 ,	
116046507231700	AND ABS DIFS , ADD= 3.5723 , ADT= 105.92 , AND ADP= 2.4862 ,	
116046507231700	32.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 3.98 PC, 1291.4 TIMES ALLOWABLE IN REC	2817
116046507231700	WITH TAB VALS, TDENS= 9.403 GM/ICU M), TTEMP= -32.7 DEG C (240.46 K), AND TPRES= 9.403 MB,	
116046507231700	COMPUTED VALS, CDENS= 13.6233 , CTEMP= 75.22 (348.38 K), AND CPRES= 6.4901 ,	
116046507231700	AND ABS DIFS , ADD= 4.2203 , ADT= 107.92 , AND ADP= 2.9129 ,	
116046507231700	31.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 32.61 PC, 1435.2 TIMES ALLOWABLE IN REC	2818
116046507231700	WITH TAB VALS, TDENS= 10.835 GM/ICU M), TTEMP= -38.4 DEG C (234.76 K), AND TPRES= 10.835 MB,	
116046507231700	COMPUTED VALS, CDENS= 16.0791 , CTEMP= 75.22 (348.38 K), AND CPRES= 7.3012 ,	
116046507231700	AND ABS DIFS , ADD= 5.2441 , ADT= 113.62 , AND ADP= 3.5338 ,	

116046507281830	ROCKET-ALTITUDE MONOTONICITY ERROR IN RECORD	2855	OR	2856
116046507281830	ROCKET-DENSITY MONOTONICITY ERROR IN RECORD	2155	OR	2856
116046507281830	ROCKET-PRESSURE MONOTONICITY ERROR IN RECORD	2155	OR	2856
116046508131738	46.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF 7.77 PC, 86.9 TIMES ALLOWABLE IN REC			2867
116046508131738	WITH TAB VALS, TDENS= 1.851 GM/ICU M, TTEMP= -11.7 DEG C (261.46 K), AND TPRES= 1.289 MB,			
116046508131738	COMPUTED VALS, CDENS= 1.7175 , CTEMP= -30.55 , (242.61 K), AND CPRES= 1.3892 ,			
116046508131738	AND ABS DIFS , ADD= 0.1335 , ADT= 18.85 , AND ADP= 0.1002 ,			
116046508131738	30.00-KM-ALT DATA CONTAINS A GAS-LAW DISCREPANCY OF .36 PC, 12.4 TIMES ALLOWABLE IN REC			2883
116046508131738	WITH TAB VALS, TDENS= 18.612 GM/ICU M, TTEMP= -42.7 DEG C (230.46 K), AND TPRES= 12.357 MB,			
116046508131738	COMPUTED VALS, CDENS= 18.6799 , CTEMP= -41.86 , (231.30 K), AND CPRES= 12.3121 ,			
116046508131738	AND ABS DIFS , ADD= 0.0679 , ADT= 0.84 , AND ADP= 0.0449 ,			
116046508061705	THIS SOUNDING IS NOT IN CHRONOLOGICAL ORDER ON THE TAPE. IT BEGINS WITH RECORD			2911
116046508091700	THIS SOUNDING IS NOT IN CHRONOLOGICAL ORDER ON THE TAPE. IT BEGINS WITH RECORD			2937
116046508111700	THIS SOUNDING IS NOT IN CHRONOLOGICAL ORDER ON THE TAPE. IT BEGINS WITH RECORD			2961