78SDS4202
1 FEBRUARY 1978

LANDSAT-1 AND LANDSAT-2 FLIGHT EVALUATION REPORT 23 OCTOBER 1977 TO 23 JANUARY 1978

Prepared By

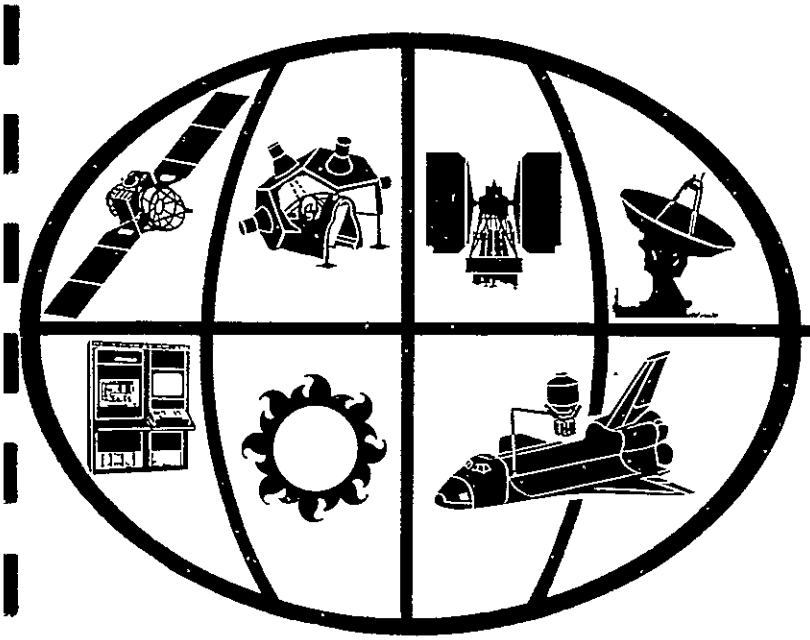
GE LANDSAT OPERATIONS CONTROL CENTER

For

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Goddard Space Flight Center

Greenbelt, Maryland 20771



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GENERAL ELECTRIC

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INTRODUCTION

This is the 23rd report in a continuing series of documents issued at launch, and quarterly, thereafter to present flight performance analyses of the Landsat-1 Spacecraft. Previously issued documents are:

72SD4255	ERTS-1 Launch and Flight Activation Evaluation Report 23 to 26 July 1972	18 October 1972
72SD4262	ERTS-1 Flight Evaluation Report 23 July 1972 to 23 October 1972	28 November 1972
72SD4224	ERTS-1 Flight Evaluation Report 23 October 1972 to 23 January 1973	27 February 1973
73SD4249	ERTS-1 Flight Evaluation Report 23 January 1973 to 23 April 1973	29 May 1973
73SD4260	ERTS-1 Flight Evaluation Report 23 April 1973 to 23 July 1973	10 August 1973
73SD4274	ERTS-1 Flight Evaluation Report. 23 July 1973 to October 1973	28 November 1973
74SD4205	ERTS-1 Flight Evaluation Report 23 October 1973 to 23 January 1974	26 February 1974
74SD4217	ERTS-1 Flight Evaluation Report 23 January 1974 to 23 April 1974	18 May 1974
74SD4236	ERTS-1 Flight Evaluation Report 23 April 1974 to 23 July 1974	15 August 1974
74SD4255	ERTS-1 Flight Evaluation Report 23 July 1974 to 23 October 1974	31 December 1974
75SDS4222	Landsat-1 Flight Evaluation Report 23 October 1974 to 23 January 1975	30 April 1975
75SDS4228	Landsat-1 and Landsat-2 Flight Evaluation Report 23 January 1975 to 23 April 1975	15 August 1975
75SDS4255	Landsat-1 and Landsat-2 Flight Evaluation Report 23 April 1975 to 23 July 1975	10 October 1975
75SDS4266	Landsat-1 and Landsat-2 Flight Evaluation Report 23 July 1975 to 23 October 1975	1 December 1975
76SDS4207	Landsat-1 and Landsat-2 Flight Evaluation Report 23 October 1975 to 23 January 1976	29 February 1976

76SDS4248	Landsat-1 and Landsat-2 Flight Evaluation Report 23 January 1976 to 23 April 1976	14 July 1976
76SDS4263	Landsat-1 and Landsat-2 Flight Evaluation Report 23 April 1976 to 23 July 1976	15 October 1976
76SDS4278	Landsat-1 and Landsat-2 Flight Evaluation Report 23 July 1976 to 23 October 1976	30 November 1976
77SDS4204	Landsat-1 and Landsat-2 Flight Evaluation Report 23 October 1976 to 23 January 1977	22 February 1977
77SDS4228	Landsat-1 and Landsat-2 Flight Evaluation Report 23 January 1977 to 23 April 1977	23 May 1977
77SDS4244	Landsat-1 and Landsat-2 Flight Evaluation Report 23 April 1977 to 23 July 1977	22 August 1977
77SDS4258	Landsat-1 and Landsat-2 Flight Evaluation Report 23 July 1977 to 23 October 1977	2 November 1977

This report contains analyses of performance for Orbits 26745 to 28032.

SECTION 1

SUMMARY

LANDSAT-1 OPERATIONS

SECTION 1

SUMMARY LANDSAT-1 OPERATIONS

Landsat-1 continues to perform its mission nominally, and has completed 66 months of successful operation.

The Landsat-1 spacecraft was launched from the Western Test Range on 23 July 1972, at 18:08:06.508Z. The launch and orbital injection phase of the space flight was nominal and deployment of the spacecraft followed predictions.

Orbital operations of the spacecraft and payload subsystems were satisfactory until Orbit 147, 3 August 1972, when an internal short circuit disabled one of the Wideband Video Tape Recorders (WBVTR-2).

In Orbit 196, 6 August 1972, the Return Beam Vidicon failed to comply when commanded off. The RBV was commanded off via alternate channels. Landsat-1 continued to perform its imaging mission with the Multispectral Scanner and the remaining Wideband Video Tape Recorder. The remaining Wideband Tape Recorder (WBVTR-1) experienced four suspensions of operation, the last being in Orbit 9881 on 2 July 1974, and has not been used operationally since.

In Orbit 4396, 3 July 1973, an integrated circuit chip in the TMP failed, disabling four TLM functions.

COMSTOR "B" has an intermittent problem with cell 12, and is not being used operationally.

The "B" section of the USB with full power output of 1.5 watts was substituted for the "A" section in Orbit 10068, 15 July 1974, because of excessive decline of transmitter power.

The pitch flywheel stopped for 2 minutes in Orbit 8040, 20 February 1974; and for 8 hours, 2 minutes in Orbits 11125 to 11130, 29 September 1974. It has been kept close to zero speed ever since, using pitch-bias control.

The RMP was switched from B to A in Orbit 11257, 8 October 1974, as a precautionary measure after RMP B began showing current variations.

The DCS subsystem was turned off after Orbit 12790, 19 January 1975, and the function assumed by DCS in Landsat-2.

Narrow Band Recorder 2 became noisy and was turned off in Orbit 13015, 12 February 1975. Operation of NBR 2 resumed in Orbit 14116, 2 May 1975, until failure in Orbit 15253, 22 July 1975, when its operation was terminated.

Battery 6 was turned off during Orbit 14780, 18 June 1975. When it was turned back on during Orbit 15467, 6 August 1975, high current transients occurred. The battery turn-on command has been prohibited from use in Landsat-1 ever since. Battery 6 was turned off again during Orbit 23832, 28 March 1977, due to high temperature and will not be returned to service because of the battery "ON" command problem. Seven batteries remained on line.

The pitch flywheel stopped again for 45 minutes in Orbit 15309, 26 July 1975, and 3 minutes in Orbit 15312, 26 July 1975. Pitch flywheel motor driver duty cycle remained high from Orbit 15191, 18 July 1975 to Orbit 15393, 1 August 1975, when it returned to normal. MSS operation was suspended during the pitch flywheel anomaly between Orbit 15309, 26 July 1975, and Orbit 15393, 1 August 1975.

Battery 8 was turned off in Orbit 15588, 15 August 1975, due to electrical characteristics causing high temperature and will not be returned to service because of the battery "ON" command problem. Six batteries remained on-line.

The rear ACS scanner had intermittent electrical failures beginning in Orbit 19078, 21 April 1976, and it failed to Orbit 19086, 22 April 1976. The spacecraft was switched to single scanner mode (forward scanner) in Orbit 19089, 22 April 1976, and normal ACS operation was resumed.

A series of Orbit Adjust firings from October 20 to November 9, 1976; and from January 7 to January 28, 1977, were performed to adjust time phasing between Landsat-1 and Landsat-2. This also changed the repeat cycle pattern coverage of Landsat-1 and Landsat-2 from a 9 day/9 day to a 12 day/6 day coverage. Landsat-1 was designated non-operational from October 20, 1976 to January 28, 1977, while the orbit adjust sequence was in progress.

Battery 5 was turned off in Orbit 22605, 31 December 1976, due to electrical characteristics causing high temperature and will not be returned to service because of the battery "ON" command problem. Five batteries remained on line.

Sensors 1 through 6 (Band 1) of the MSS were turned off because of a power supply failure during Orbit 23480 on 3 March 1977. The MSS is now operating with only 3 of its 4 spectral bands.

Battery 7 was turned off during Orbit 26024 on 1 September 1977 due to high temperatures and C/D ratio. It will not be returned to service because of the battery "ON" command problem. Four batteries are now on line.

MSS and WBPA-2 were last used during Orbit 27805 on 7 January, 1978, when Landsat-1 was placed in an orbital maintenance mode to support preparations for the launch of Landsat-3.

The Pitch Flywheel stopped in Orbit 27810 (8 January 1978) and restarted spontaneously in Orbit 27813 (8 January 1978). Subsequent operation has been normal.

Five and one-half years after launch, the cumulative precession of the Landsat-1 orbital plane has now rotated the orbit (about the earth axis) so that the entire orbit is in sunlight. It will remain so until mid-March when the apparent sun motion will return the orbit to partial night for about five months. The right solar panel has been stopped at 165°; the left solar panel is allowed to track. This is expected to maintain battery energy levels with the spacecraft in its "stand-by" status after Landsat-3 launch.

In-orbit payload system performance summary is shown on Table 1-1.

Table 1-1. In-Orbit Payload System Performance Launch Thru Orbit 28053 (1-25-78) Landsat-1

RBV	Total Scenes Imaged	1,690
	Avg. Scenes/Day	139
	Total Area Imaged (millions of sq. n.mi.)	14.7
	ON TIME (hr.)	14.0
	ON/OFF Cycles	91
	% Real Time Images	57
	% Recorded Images	43
MSS	Total Scenes Images	271,786
	Avg. Scenes/Day	157
	Total Area Imaged (millions of sq. n.mi.)	2,368
	ON TIME (hr.)	2,806
	ON/OFF Cycles	19,067
	% Real Time Images	83
	% Recorded Images	17
DCS	Messages at OCC	1,152,045
	Non-Perfect MSGS	90,691
	Max. DCP's ACTIVE/DAY	114
	Users	44
	Avg. MSG/ACTIVE Orbit	181
	ON TIME (hr.)	21,820.2
WPA-1	% Real Time Mode	55
	% Playback Mode	45
	ON TIME (hr.)	32.2
	ON/OFF Cycles	314
WPA-2	% Real Time Mode	80
	% P/B Mode	20
	ON TIME (hr.)	2,707
	ON/OFF Cycles	16,799
WBVTR-1	% Record Mode	38
	% Playback Mode	41
	% Rewind Mode	20
	% Standby Mode	1
	Minor Frame Sync Error Count in P/B (Failed Orbit 9,881)	
	Time Head-Tape Contact (hr.)	733
	Cycles Head-Tape Contact	11,954
	ON TIME (hr.)	927.6
WBVTR-2	% Record Mode	38
	% Playback Mode	41
	% Rewind Mode	20
	% Standby Mode	1
	MFSE Count in P/B (Failed Orbit 148)	
	Time Head-Tape Contact (hr.)	5.1
	Cycles Head-Tape Contact	44
	ON TIME (hr.)	6.5

SECTION 2

ORBITAL PARAMETERS

LANDSAT-1

SECTION 2

ORBITAL PARAMETERS

The initial orbit of Landsat-1 required some correction during Orbits 38, 44 and 59 to achieve the desired 18-day repeat cycle.

During Orbits 938, 2416, 6390 and 7826 it was necessary to fire the -X thruster of the orbit adjust system to maintain the ground trace in the desired 18-day repeat pattern of ± 10 nm.

On 29 September 1974, the ACS control system fired gas during a spacecraft emergency (pitch flywheel stoppage) which resulted in an unplanned orbit change similar to firing the -X thruster.

The +X thruster was fired during Orbits 11367, 11464, 13611, 19747 and 19871 in order to maintain the 18-day repeat cycle ground trace within ± 10 nm.

A 101 day orbit adjust program commenced in Orbit 21613 (20 October 1976) and lasted through Orbit 23007 (28 January 1977). This program increased the time separation between the Landsat spacecrafts by 12.17 minutes to remain within the operational time limits for ground station turn-around time to track the spacecrafts in successive passes. Another consequence of the 101-day orbit-adjust program was the change of the Landsat-1 - Landsat-2 combined earth coverage repeat cycle from a nine day - nine day schedule to a twelve day - six day schedule; i.e., Landsat-2 will pass over a point on earth twelve days after Landsat-1's passage. Six days after Landsat-2 crosses this point, Landsat-1 will pass over it again.

Current orbital parameters are given in Table 2-1.

Figure 2-1 shows the longitude error as a function of time and orbit maintenance burns. The longitude errors have been maintained within ± 10 nm in the east-west direction at the equator as planned. Figure 2-2 shows mean local time at the descending node. Figure 2-3 shows predicted mean time of descending node; however, it does not show the effects of the Landsat-2 orbit adjust program which commenced on 2 November 1977 and is still in progress at this writing (1-23-78). Updated curves for Figure 2-3 are forthcoming.

Appendix B gives the ground trace repeat cycle predictions.

Table 2-1. Landsat-1 Brouwer Mean Orbital Parameters

Element / Date	Apogee (km)	Perigee (km)	Inclination (Deg.)	Semi Major Axis (km)	Eccentricity	Anomalistic Period (Min)	Nodal Period (Min)	Argument of Perigee (Deg)	Right Ascension (Deg)	Mean Anomaly (Deg)
25 Oct 1972	917.3	898.1	99.103	7285.850	0.00132	103.152	103.268	93.721	1.060	86.484
25 Jan 1973	922.3	893.1	99.090	7285.865	0.00200	103.153	103.268	133.693	91.805	52.797
25 Apr 1973	911.056	888.763	99.073	7285.767	0.00073	103.151	103.267	168.857	181.411	11.098
25 Jul 1973	914.341	900.810	99.068	7285.741	0.00093	103.150	103.266	95.602	268.944	84.301
25 Oct 1973	922.913	893.229	99.056	7285.786	0.00198	103.151	103.266	65.071	0.291	301.002
25 Jan 1974	915.873	899.111	99.041	7285.657	0.00115	103.148	103.264	160.866	88.606	19.049
24 Apr 1974	920.090	912.672	99.023	7285.691	0.000802	103.149	103.265	117.631	176.743	62.319
23 Jul 1974	922.363	892.629	99.017	7285.661	0.002041	103.148	103.264	109.225	269.779	70.540
23 Oct 1974	918.657	896.316	99.004	7285.652	0.00153	103.148	103.264	150.750	354.743	29.110
24 Jan 1975	914.18	900.67	98.990	7285.590	0.000928	103.147	103.262	278.848	85.403	261.138
24 Apr 1975	914.74	900.05	98.972	7285.559	0.001008	103.146	103.262	37.047	173.043	142.764
25 Jul 1975	915.12	899.63	98.964	7285.541	0.001063	103.145	103.261	138.138	262.528	41.661
23 Oct 1975	914.19	900.54	98.951	7285.531	0.000937	103.145	103.261	250.370	349.952	289.612
24 Jan 1976	914.39	900.32	98.936	7285.523	0.000966	103.145	103.261	2.826	80.147	177.049
23 Apr 1976	915.28	899.41	98.919	7285.511	0.001089	103.145	103.261	110.622	167.275	69.142
22 Jul 1976	914.24	900.35	98.911	7285.464	0.000953	104.144	103.260	218.207	254.289	321.741
23 Oct 1976	914.33	900.42	98.894	7285.543	0.000955	103.145	103.262	332.337	343.897	207.595
28 Jan 1977	913.57	900.95	98.878	7285.427	0.000867	103.143	103.254	60.280	77.383	119.515
24 Apr 1977	913.35	901.18	98.865	7285.432	0.000835	103.143	103.260	180.132	158.417	359.749
24 July 1977	912.53	901.92	98.858	7285.391	0.000729	103.142	103.259	295.005	246.843	244.951
23 October 1977	913.47	900.97	98.847	7285.386	0.000857	103.142	103.259	45.423	335.165	134.388
24 January 1978	919.57	894.90	98.830	7285.375	0.001693	103.142	103.259	138.957	64.300	41.059

FOLDOUT FRAME 1

FOLDOUT FRAME 2

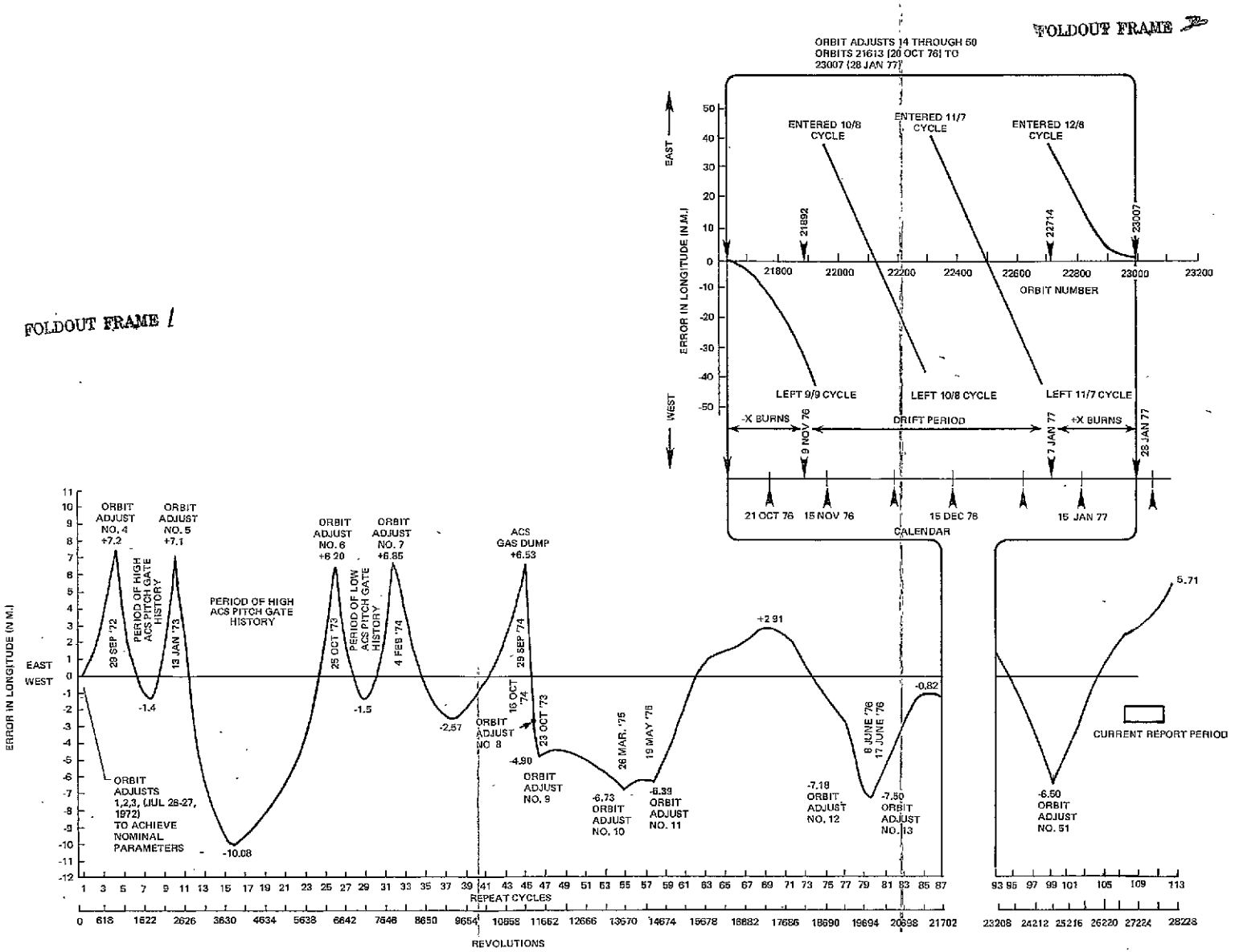


Figure 2-1. Effect of Orbit Adjusts on Landsat-1's Ground Track

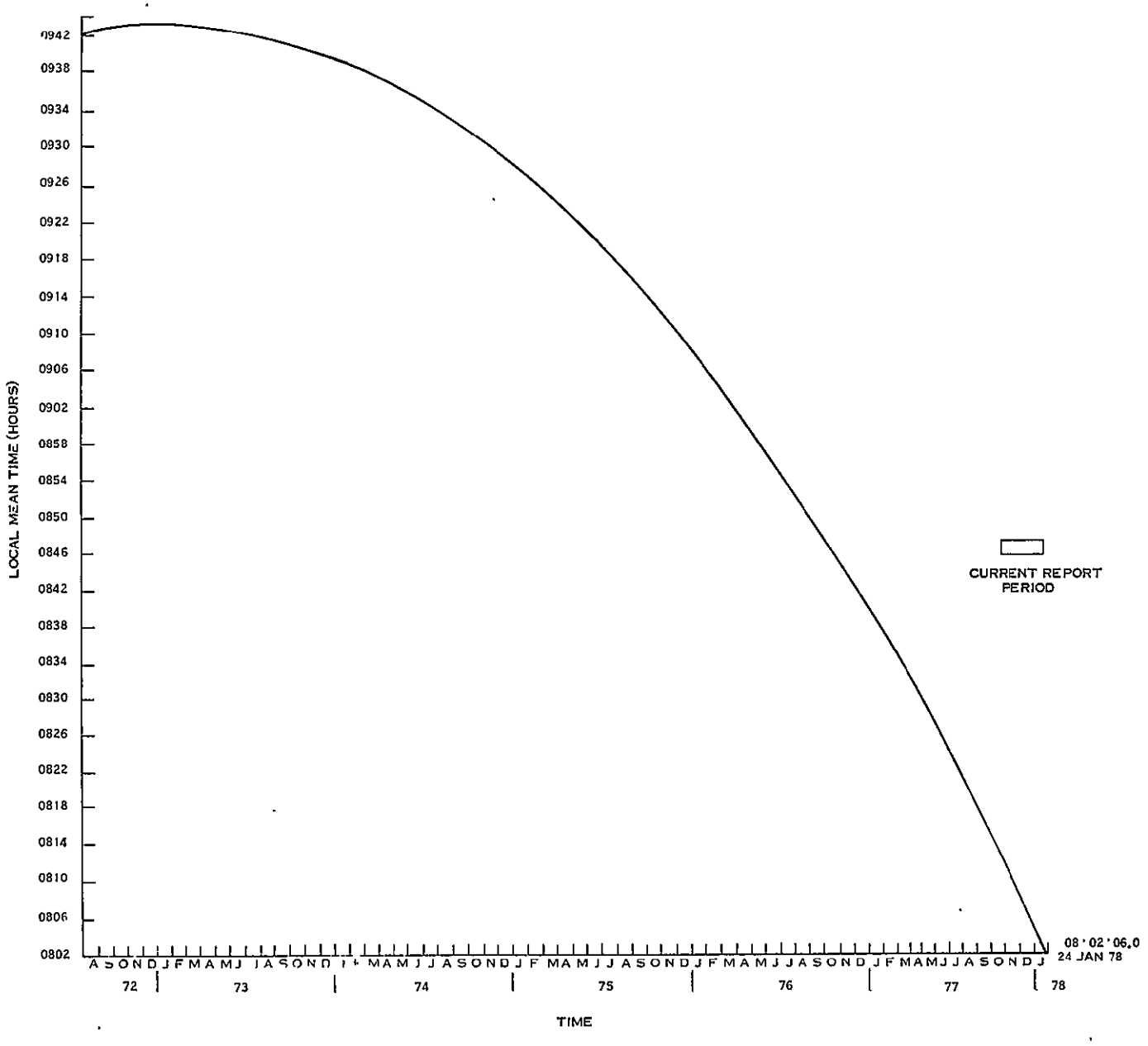
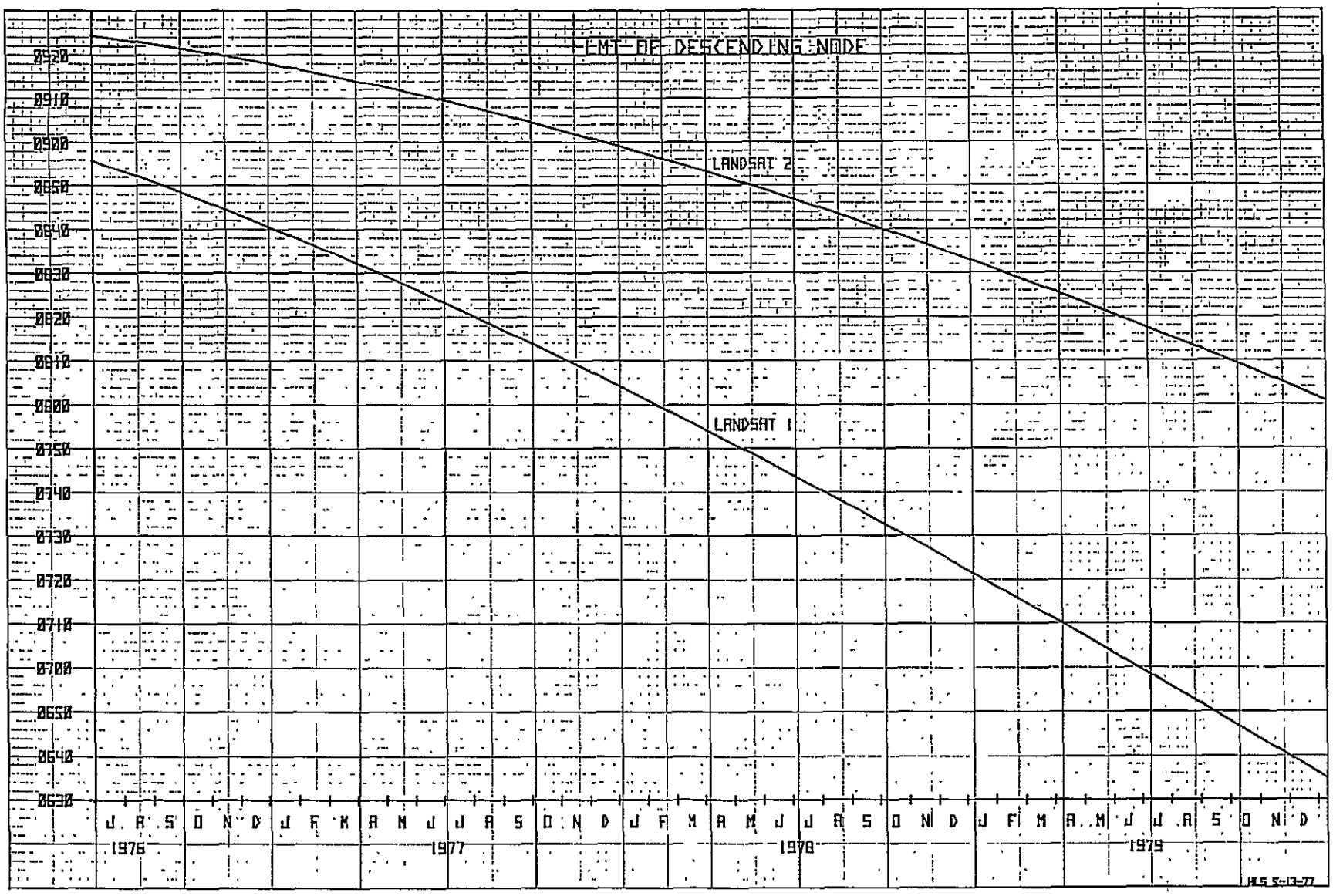


Figure 2-2. Local Mean Time of Descending Node



Note: These curves do not reflect the effects of the Landsat-2 orbit adjust program which commenced on 2 November 1977 and is currently in process (1-23-78). Updated curves are forthcoming.

Figure 2-3. Predicted Local Mean Time of Descending Node for LS1 and LS2, 1976, 1977, 1978, 1979

SECTION 3

POWER SUBSYSTEM (PWR)

LANDSAT-1

SECTION 3

POWER SUBSYSTEM (PWR)

The solar array continued to provide excess energy for the payload and spacecraft load throughout this report period. Auxiliary loads dissipated the excess power above the battery and load requirements using Landsat-1 power management procedures. No compensation loads were used.

Midday solar array current is shown in Figure 3-1. Figure 3-2 shows actual and predicted midday solar array degradation. Solar degradation was 40.1% at the end of 66 months in orbit. Figure 3-3 shows actual sun angles to the spacecraft and solar panels. Figure 3-4 is a prediction of sun angle through 1977 for Landsat-1 and 2. Five and one-half years after launch, the cumulative precession of the Landsat-1 orbital plane about the earth axis has now rotated the orbit so that the entire orbit is in sunlight (no spacecraft night), and will remain so until mid-March when the apparent sun motion will return the spacecraft to partial night. The right solar array is fixed in a position which will combine with the left tracking panel to maintain the energy level in the batteries while Landsat-1 is put in a "standby" condition, anticipating the launch of Landsat-3.

Since 30 August 1975, the batteries have been kept slightly undercharged to avert the possible recurrence of a run-away condition. Batteries 5, 6, 7, and 8 were turned off as previously reported. These batteries will remain off because of the "All Battery ON" command restriction resulting from the anomaly reported previously. Four batteries are now supporting operations and are adequate for the current limited payload operations. Temperatures ranged from 17.5° to 50.4°C and battery packs averaged a typical 10.1% Depth of Discharge (DOD) throughout this report period. Table 3-3 is a history of Landsat-1 Battery restoration cycles and turn-off.

The power system electronics performed well in this report period with all voltages stable. Table 3-1 shows major subsystem parameters and Table 3-2 shows power subsystem telemetry for selected orbits. Some parameters in Table 3-2 may differ slightly from Table 3-1, because Table 3-1 uses a power management time span (night followed by a day); whereas, the time span used in Table 3-2 is the playback period for the NBR.

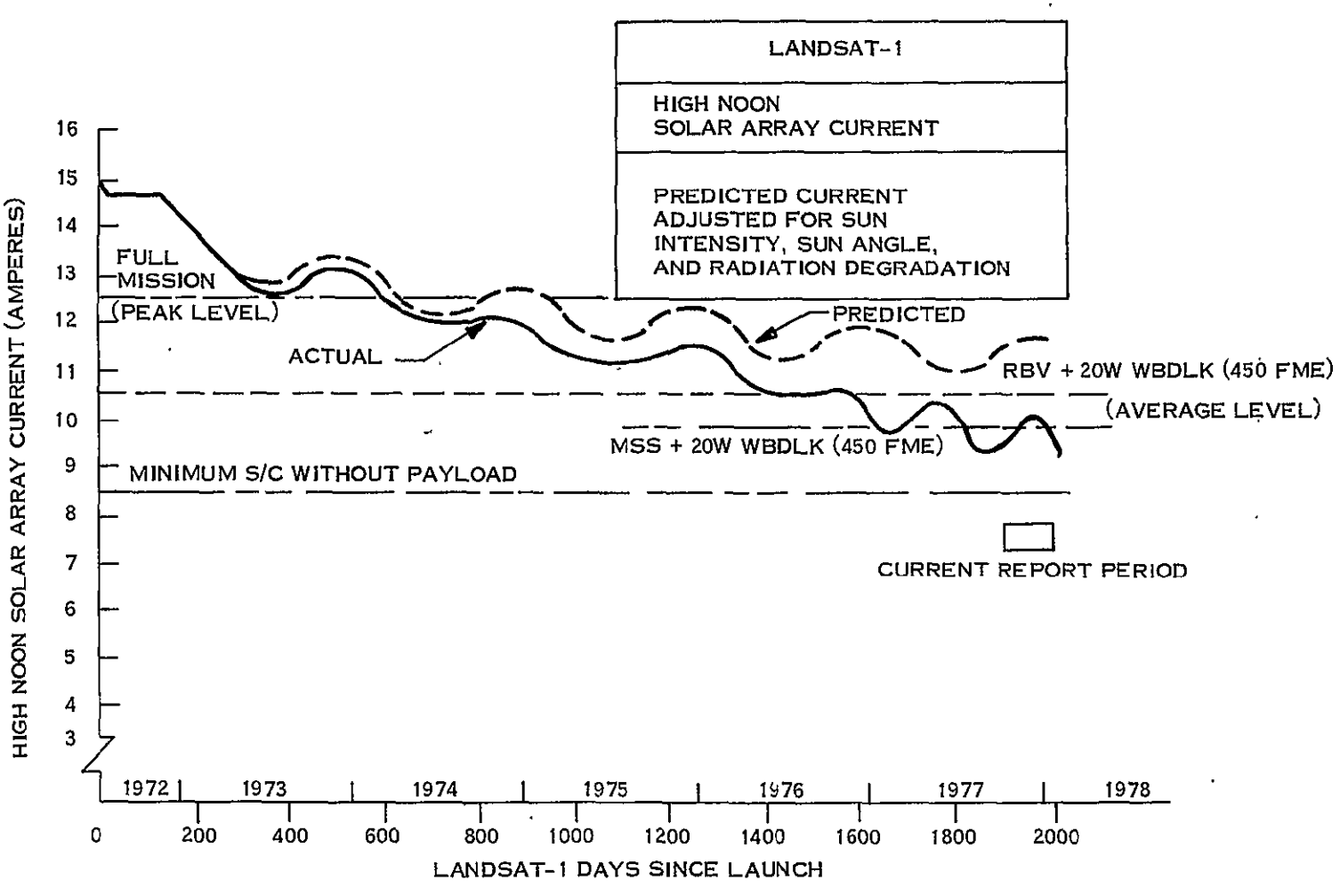


Figure 3-1. Midday Solar Array Current

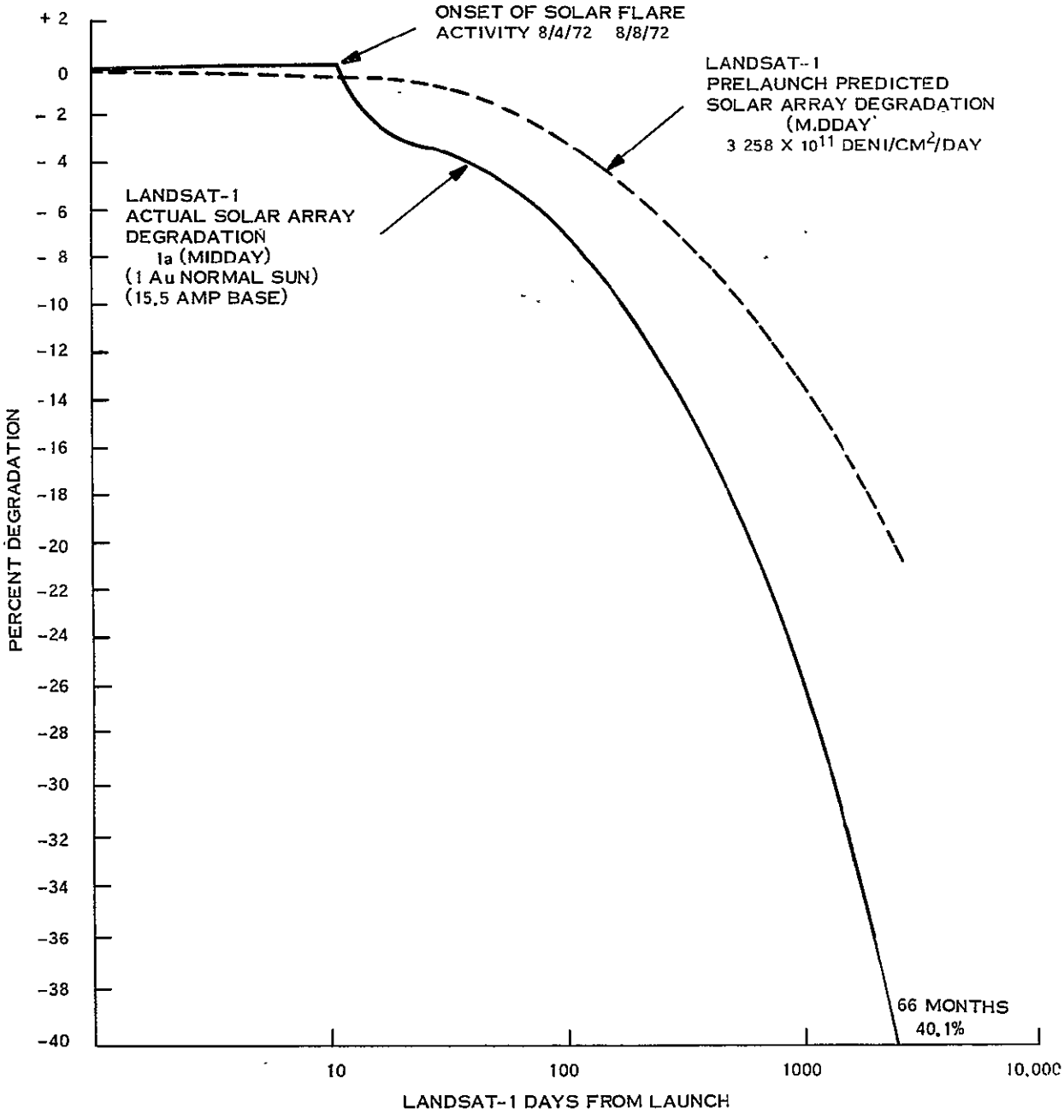


Figure 3-2. I_A (Midday) Degradation vs. Days

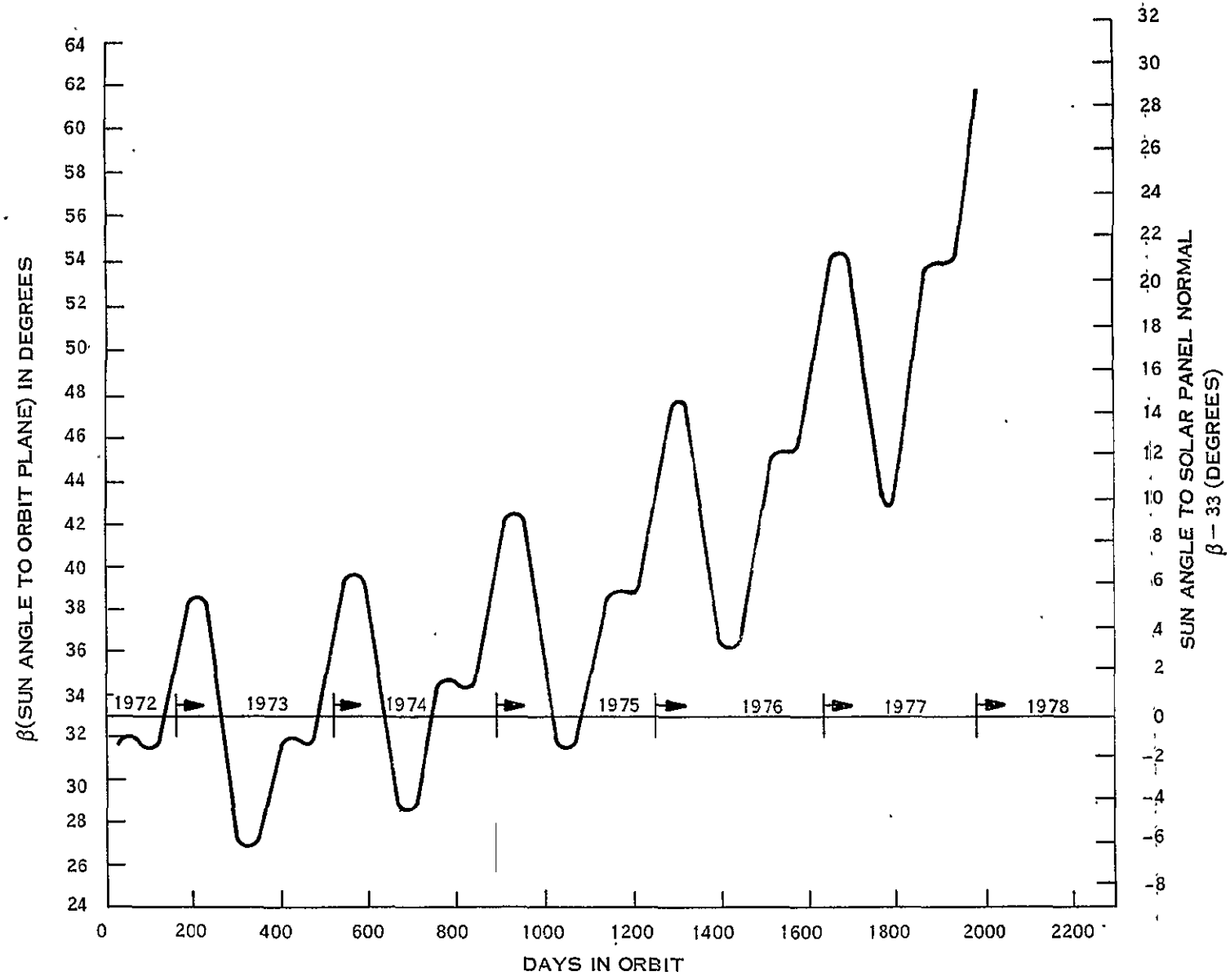


Figure 3-3. Actual β and α (Paddle) Sun Angles, Landsat-1

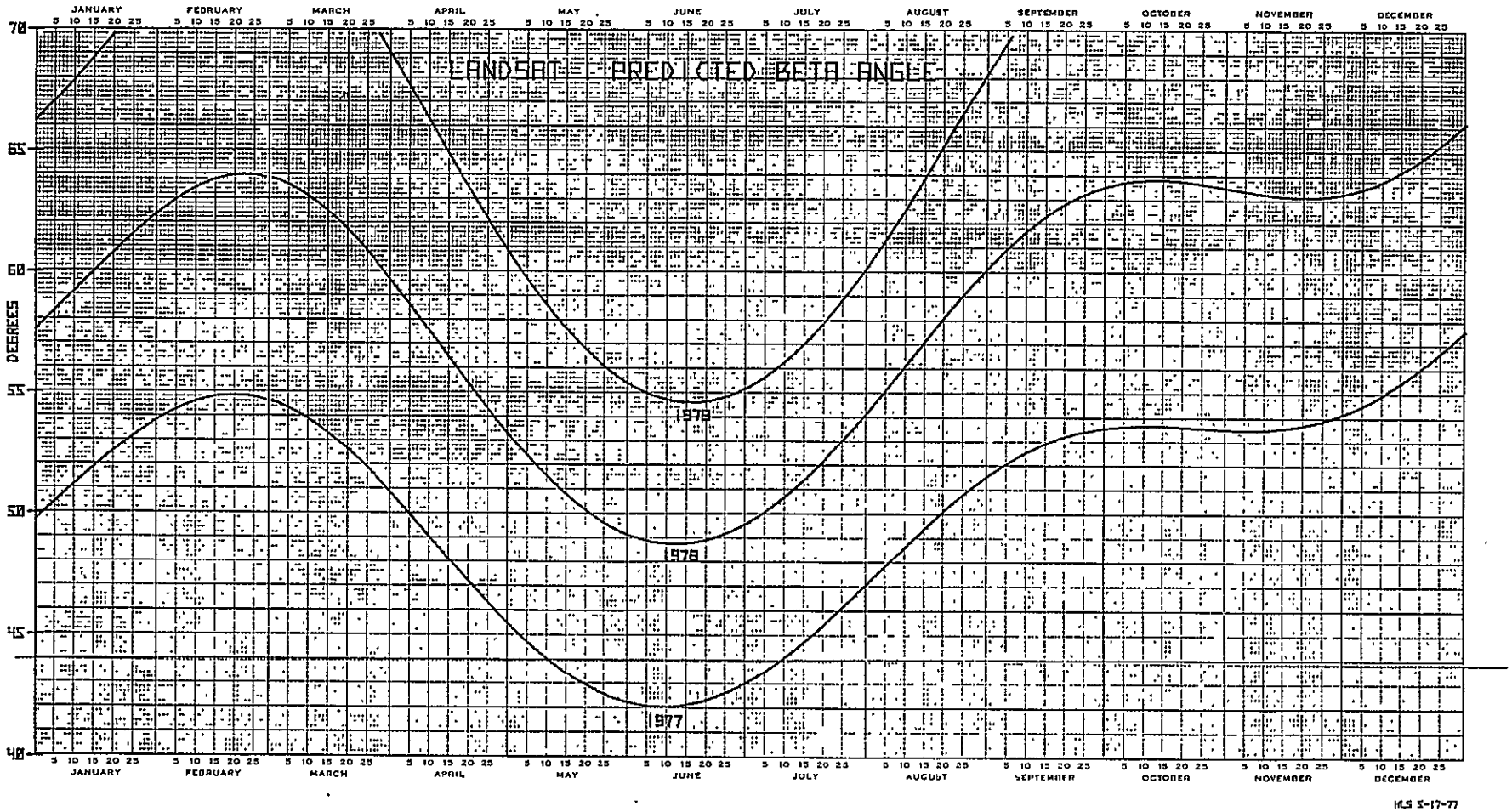


Figure 3-4. Landsat-1 Predicted Beta Angle, 1977, 1978, 1979

Table 3-1. Landsat-1 Major Power Subsystem Parameters

ORBIT NO	26	5098	10178	15254	20363	25455	26943	27457	27950
BATT 1 MAX	32.48	32 91	33 25	33.16	32 48	32,99	12 73	12 82	12,39
2 CHGE	32 48	32.91	33.16	33 16	32 48	32,99	12 73	12 91	12 48
3 -VOLTS	32.48	32.99	33.25	33.16	32 48	33,08	32 82	12 91	12,37
4	32 48	32 99	33.25	33 16	32 48	33,08	12 82	12 91	12 37
5	32.48	32.99	33.33	33 25	32 57	F	F	F	F
6	32.31	32.91	33.25	F	32.48	F	F	F	F
7	32.22	32 91	33 25	33 16	32 48	33,08	F	F	F
8	32.14	32.91	33.25	33.16	F	F	F	F	F
AVERAGE-	32.38	32.92	33.25	33 17	32.49	33,04	12 79	12 89	12 54
BATT 1 END	28 81	28 30	28.98	29.15	29.23	29,15	28 64	27 70	29,92
2 OF	28 81	28.30	28.98	29.15	29.23	29,15	28 72	27 70	29.92
3 NIGHT	28.81	28 30	28.98	29.15	29.23	29,15	28 64	27 61	20 92
4 -VOLTS	28 89	28.38	28.98	29 15	29.32	29,15	28 72	27.70	10 00
5	28.89	28 38	29.06	29 23	29 32	F	F	F	F
6	28 81	28 30	28.98	F	29.23	F	F	F	F
7	28 81	28.30	28.98	29.15	29 23	29,15	F	F	F
8	28 81	28 30	28.98	29 15	F	F	F	F	F
AVERAGE	28.84	28.32	28.99	29.16	29.26	29,15	28 68	27.68	20 94
BATT 1	13.11	13 58	13.96	15 27	14 45	20,73	26 88	26 64	31 97
2* SHARE	12,93	13.58	13 96	15.27	15.06	21,32	27 59	27.06	32 68
3 (%)	11.38	11.38	11 95	13.59	13.26	17,97	22 38	22.43	17 10
4	12 39	11.96	12 28	14.06	14.19	19,18	23 12	23 76	18 25
5	12 32	11.85	11.93	13.53	14.32	F	F	F	F
6	12 80	12 35	11.79	F	14.59	F	F	F	F
7	12.62	12.42	12 13	13.59	14 11	20,81	F	F	F
8	12 45	12 10	11.98	14 54	F	F	F	F	F
BATT 1 LOAD	12 71	12 44	12 58	14.67	14 32	20,15	24 36	25 10	11 79
2 SHARE	12.90	13 62	13.70	15 88	14.89	21,27	26.27	26.21	31.49
3 (%)	11 43	11 91	12.23	13 85	13 54	19,62	24 14	23 52	27 24
4	12.77	13 01	13.12	14 91	14.81	21,05	25.22	25 15	29 45
5	12.54	12 42	12.60	14 02	14 31	F	F	F	F
6	12.53	12 21	11.30	F	13 73	F	F	F	F
7	12.80	12.41	12.50	13.77	14.36	17,87	F	F	F
8	12.32	11.98	11.97	12.88	F	F	F	F	F
BATT 1 TEMP	21 11	24.65	24.76	23.12	21.47	23,37	26 08	26 94	33 49
2 IN	18.74	21.42	20.69	19.32	17.81	17,86	19 34	19 71	21 41
3 (°C)	18 77	20.29	20 16	18.77	17 25	16,97	18 55	18 26	18 69
4	21.57	23 17	23 32	22.71	21.64	21,27	23 75	24 34	25.22
5	21 82	23 85	24 09	23.69	24 40	28,49	37 83	41.30	47.71
6	21 21	24 37	24 78	22.10	23.52	27,21	34 69	37.90	44 07
7	21.41	25 01	24 96	23.75	23.23	27,92	31 91	34.85	40 79
8	21 82	25 14	25.24	24.59	22.15	24,66	28 63	30 76	37 91
AVERAGE	20.81	23 49	23.53	22.26	21.43	23,47	27 60	29 26	1 41
S/C REG BUS PWR (W)	176.8	153.4	165 0	137.9	123.49	106,0	114 8	112 1	105.8
COMP LOAD PWR (W) (P/O S/C REG BUS PWR)	49.0	34.8	41 9	20.4	17.4	0	0	0	0
P/L REG BUS PWR (W)	16 2	13.7	8 9	8.9	9.13	8,9	8 8	8 9	9 0
C/D RATIO	1.06	1.13	1.21	1 18	1 01	1,14	1.26	1 75	1 59
TOTAL CHARGE (A-M)	309.2	290.21	258.3	249.29	172.42	158,68	139 64	207.50	94.53
TOTAL DISCHARGE (A-M)	290 9	256 28	214.2	194.13	168 31	138,72	110 57	118 21	59 50
SOLAR ARRAY (A-M)	1044.0	908.0	832.0	876.0	754	718,0	740 4	802.7	688 3
S.A PEAK I (AMP)	15.8	13.68	12.44	11 60	10 88	10,08	9 92	10 40	9 44
MIDDAY ARRAY I (AMP)	15.01	12.80	N	11 04	10 56	9,76	9 60	9 84	8 24
SUN ANGLE (DEG)	-3 33	-3.54	-1.82	1.49	6 4	13,9	20 1	22 2	27.5
MAX R PAD TEMP (°C)	-62.00	+68.00	63.20	62 0	58 40	55,12	56 00	58 40	-7 80
MIN R PAD TEMP (°C)	-62 00	-59.00	-42.79	-42.18	-38 54	-35,50	-30 04	-29 41	-36 00
MAX L PAD TEMP (°C)	+57.90	+60.50	56 00	56 00	55 12	55,12	59 60	60 80	59 60
MIN L PAD TEMP (°C)	-67 00	-64 00	-47 00	-46 25	-42 18	-37,32	-25 41	-21 69	20 08

* After the telemetry failure in Orbit 4396 Battery 2 charge share was taken equal to Battery 1 charge share as an approximation in order to derive a charge share value of each battery.

N - Data Not Available

F - Unit Off

Table 3-2. Landsat-1 Power Subsystem Analog Telemetry
(Average Value for Data Received in NBTR Playback)

Function	Description	Unit	Orbits								
			26	5089	10162	15254	20364	25455	26949	27443	27950
6001	BATT 1 DISC	AMP	0.94	0.81	0.81	0.91	0.81	0.99	0.98	0.95	0.34
6002	2		0.95	N	N	N	N	1.02	1.07	1.04	0.48
6003	3		0.84	0.76	0.80	0.86	0.75	0.94	0.98	0.96	0.41
6004	4		0.93	0.86	0.86	0.92	0.84	1.03	1.03	1.00	0.46
6005	5		0.92	0.82	0.82	0.87	0.79	F	F	F	F
6006	6		0.91	0.78	0.72	F	0.78	F	F	F	F
6007	7		0.94	0.82	0.80	0.85	0.80	0.89	F	F	F
6008	8		0.91	0.77	0.78	0.80	F	F	F	F	F
6011	BATT 1 CHG	AMP	0.58	0.58	0.69	0.53	0.35	0.46	0.52	0.61	0.64
6012	2		0.57	N	N	N	N	N	0.53	0.63	0.66
6013	3		0.50	0.48	0.60	0.46	0.33	0.40	0.44	0.49	0.35
6014	4		0.54	0.51	0.60	0.48	0.35	0.42	0.46	0.51	0.37
6015	5		0.54	0.50	0.58	0.48	0.35	F	F	F	F
6016	6		0.57	0.52	0.66	F	0.35	F	F	F	F
6017	7		0.55	0.53	0.60	0.48	0.35	0.46	F	F	F
6018	8		0.55	0.52	0.58	0.49	F	F	F	F	F
6021	BATT 1 VOLT	VDC	30.87	31.24	31.64	31.62	31.20	31.53	31.41	31.06	31.15
6022	2		30.87	31.25	31.66	31.62	31.19	31.52	31.42	31.08	31.30
6023	3		30.87	31.25	31.66	31.62	31.18	31.52	31.42	31.08	31.29
6024	4		30.90	31.28	31.70	31.65	31.22	31.55	31.46	31.12	31.33
6025	5		30.95	31.33	31.75	31.71	31.28	F	F	F	F
6026	6		30.86	31.24	31.65	F	31.18	F	F	F	F
6027	7		30.89	31.27	31.68	31.64	31.21	31.53	F	F	F
6028	8		30.89	31.27	31.68	31.63	F	F	F	F	F
6031	BATT 1 TEMP	DGC	21.17	24.48	26.09	23.02	21.43	22.80	26.15	27.46	33.83
6032	2		18.80	21.29	22.81	19.28	17.80	17.84	19.27	19.68	21.45
6033	3		18.76	20.17	21.26	18.78	17.21	16.95	18.46	18.30	18.72
6034	4		21.57	23.04	23.83	22.69	21.60	21.25	23.70	24.47	25.24
6035	5		21.84	23.77	24.78	23.64	24.36	28.49	37.86	40.96	47.67
6036	6		21.24	24.27	25.78	22.08	23.51	27.21	34.81	37.74	44.11
6037	7		21.43	24.88	26.09	23.67	23.18	27.87	32.05	34.73	40.90
6038	8		21.86	25.02	26.21	24.51	22.14	24.64	28.71	30.73	36.02
6040	RT PAD TEMP	DGC	25.82	27.22	27.16	27.29	28.24	29.03	35.07	37.41	-0.37
6041	R PAD V N	VDC	33.40	33.85	34.36	34.18	33.06	32.50	29.92	30.62	28.16
6042	R PAD V M	VDC	33.29	33.50	33.60	32.92	31.75	31.57	32.07	31.89	21.31
6044	LT PAD TEMP	DGC	14.14	16.61	19.11	19.84	22.62	24.81	37.65	39.84	43.66
6045	L PAD V F	VDC	33.69	34.16	34.67	34.63	33.84	34.23	33.89	33.53	33.09
6046	L PAD V G	VDC	33.68	34.19	34.72	34.68	33.88	34.27	33.91	33.58	33.13
6050	S/C UR BUS V	VDC	31.24	31.68	32.60	32.07	31.61	31.99	-31.95	-31.69	-31.60
6051	S/C RG BUS V	VDC	24.54	24.55	24.55	24.54	24.55	24.54	-24.54	-24.54	-24.55
6052	AUX REG A V	VDC	23.41	23.48	23.47	23.49	23.49	23.50	-23.48	-23.48	23.50
6053	AUX REG B V	VDC	23.50	23.50	23.50	23.50	23.50	23.50	-23.50	-23.50	-23.50
6054	SOLAR I	AMP	14.87	12.69	11.60	10.83	10.17	9.36	9.14	9.31	7.31
6055*	S/C RG BUS I	AMP	7.11	6.27	6.80	5.63	5.04	4.94	4.70	4.58	3.34
6056*	S/C RG BUS I	AMP	7.11	6.27	6.79	5.62	5.02	4.93	4.69	4.58	3.34
6058	PC MOD T 1	DGC	21.82	22.23	23.22	20.63	19.54	18.68	20.03	19.99	18.38
6059	PC MOD T 2	DGC	21.68	22.53	23.00	21.17	20.14	19.38	20.62	20.68	19.22
6070	P/L RG BUS V	VDC	24.66	24.68	24.66	24.68	24.67	24.68	-24.68	-24.67	-24.76
6071	P/L UR BUS V	VDC	31.08	31.63	31.92	31.92	31.45	31.83	-31.79	-31.52	-31.46
6072*	P/L RG BUS I	AMP	0.57	0.56	0.36	0.36	0.37	0.37	0.36	0.37	0.17
6073	P AUX A V	VDC	23.51	23.51	23.50	23.50	23.50	23.50	-23.50	-23.50	-23.50
6074	P AUX B V	VDC	23.51	23.51	23.50	23.50	23.50	23.50	-23.50	-23.50	23.50
6075	PR MOD T 1	DGC	21.50	23.13	25.62	21.44	20.69	20.20	21.51	21.63	21.02
6076	PR MOD T 2	DGC	20.34	21.46	21.84	19.83	19.35	18.96	20.06	20.21	19.84
6079	FUSE BLOW V	VDC	24.56	24.57	24.60	24.59	24.58	24.58	-24.58	-24.58	-24.65
6080	SHUNT 1 I	AMP	F	F	F	F	F	F	F	F	F
6081	SHUNT 2 I	AMP	F	F	F	F	F	F	F	F	F
6082	SHUNT 3 I	AMP	F	F	F	F	F	F	F	F	F
6083	SHUNT 4 I	AMP	F	F	F	F	F	F	F	F	F
6084	SHUNT 5 I	AMP	F	F	F	F	F	F	F	F	F
6085	SHUNT 6 I	AMP	F	F	F	F	F	F	F	F	F
6086	SHUNT 7 I	AMP	F	F	F	F	F	F	F	F	F
6087	SHUNT 8 I	AMP	F	F	F	F	F	F	F	F	F
6100	P/L RG BUS I	AMP	0.58	0.56	0.36	0.36	0.37	0.36	0.36	0.36	0.16
Total No.	MAJOR FRAMES	FRM	764.0	889.0	884.0	785	788	795	660	625	632

* FUNC 6055, 6056, 6072 data is derived from Pseudo FUNC 6155, 6156, 6172 used after change to Mode 11.
F - Unit Off,
N - Data Not Available.

FOLDOUT FRAME 1

FOLDOUT FRAME 2

ORIGINAL PAGE IS
OF POOR QUALITY

Table 3-3. Landsat-1 Battery Restoration Cycles

Restoration Cycle			1	2	3
Batt 5	Off	Orbit	22605		
		Date	12-30-76		
	On	Orbit	*		
		Date	-		
Batt 6	Off	Orbit	13346	14780	23832
		Date	3-7-75	6-18-75	3-28-77
	On	Orbit	15100	15467*	*
		Date	4-30-75	8-6-75	
Batt 7	Off	Orbit	26024		
		Date	9-1-77		
	On	Orbit	*		
		Date	-		
Batt 8	Off	Orbit	15588		
		Date	8-15-75		
	On	Orbit	*		
		Date			

* Since "All Battery On" high current transient anomaly in Orbit 15467 on 8-6-75 the "All Battery On" command is restricted. Batteries turned off after that date will remain off.

SECTION 4

ATTITUDE CONTROL SUBSYSTEM (ACS)
LANDSAT-1

SECTION 4

ATTITUDE CONTROL SYSTEM (ACS)

During this report period, Landsat-1's ACS system performed normally in the Forward Single Scanner mode

Landsat-1's orbit has regressed with time and Beta angle (the angle between the orbit and the sun) has increased to a level where the sun sensors are ineffective in maintaining Solar Array Alignment with the sun.

In order to maintain an optimum power balance commencing with Orbit 27888 (13 January 1978) - the Right Solar Array was stopped at the $+165^{o}$ position and the Left Solar Array is controlled semi-manually so that its alignment maintained within $\pm 20^{o}$.

Figure 3-4 shows Beta angle plotted as a function of time. Tracking errors commenced when Beta was approximately 46.5^{o}. Historically. solar array tracking errors first appeared in mid-January 1976 and lasted through March 1976. They reappeared in December 1976 and continued through April 1977.

The ACS is normally in the Pneumatics Disabled mode; however, seasonal gating demand was evident during this report period and momentary enables - to unload roll wheel momentum - were commanded more frequently. See Figure 4-1, 4-2 and 4-3.

Pitch Flywheel stoppage occurred from Orbits 27810 (January 7, 1978) to 27813 (January 7, 1978) and intermittent, high duty cycles with momentary stoppages have occurred on occasion.

RMP 1 functioned normally during this report period; however, RMP 2 was commaned into the standby mode from Orbits 27754 (January 3, 1978) to 27799 (January 5, 1978) while a false anomaly in RMP 1 was being investigated.

With payload operations suspended, the ACS system is maintained in the Roll Diff Tach High Gain mode continuously. $+0.6^{o}$ Pitch Position Bias will normally maintain Pitch Flywheel speed between -80 RPM and -120 RPM; however, $+2.0^{o}$ PPB is commanded if the Pitch Flywheel speed exceeds 225 RPM.

Pressure/temperature ratios have all been satisfactory.

Tables 4-1, 4-2 and 4-3 are summaries of telemetry values for Landsat-1's Attitude control system.

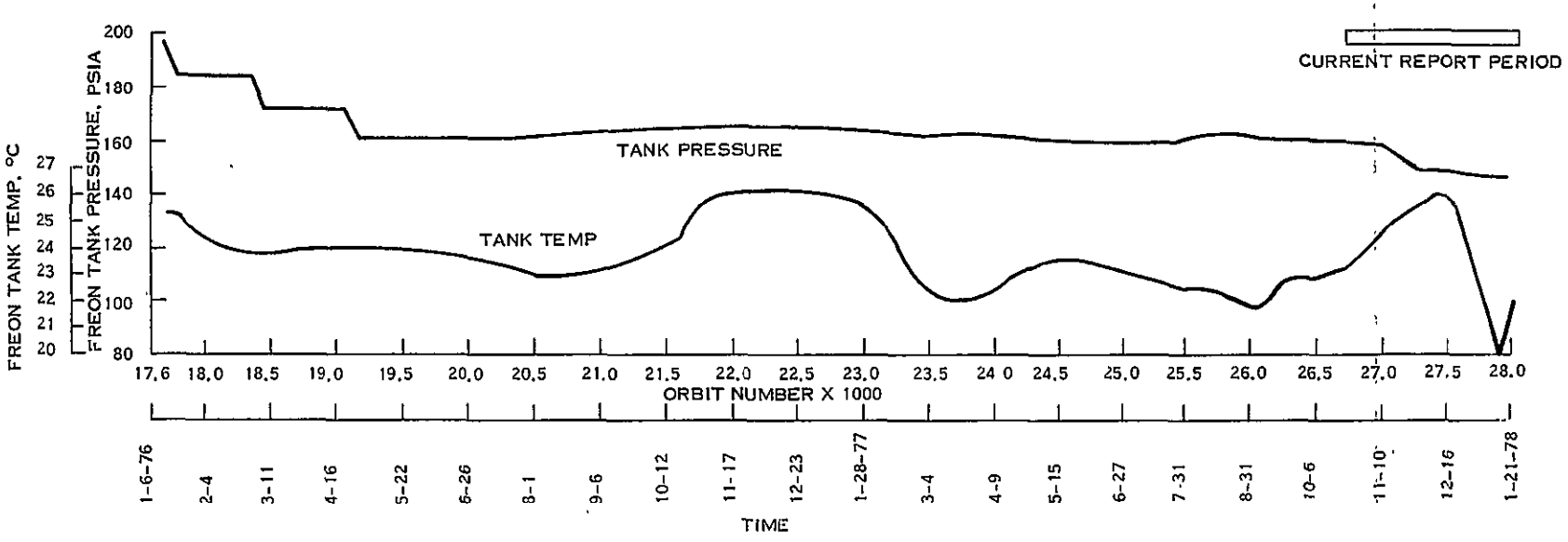


Figure 4-1. Landsat-1 Freon History (Telemetry Values)

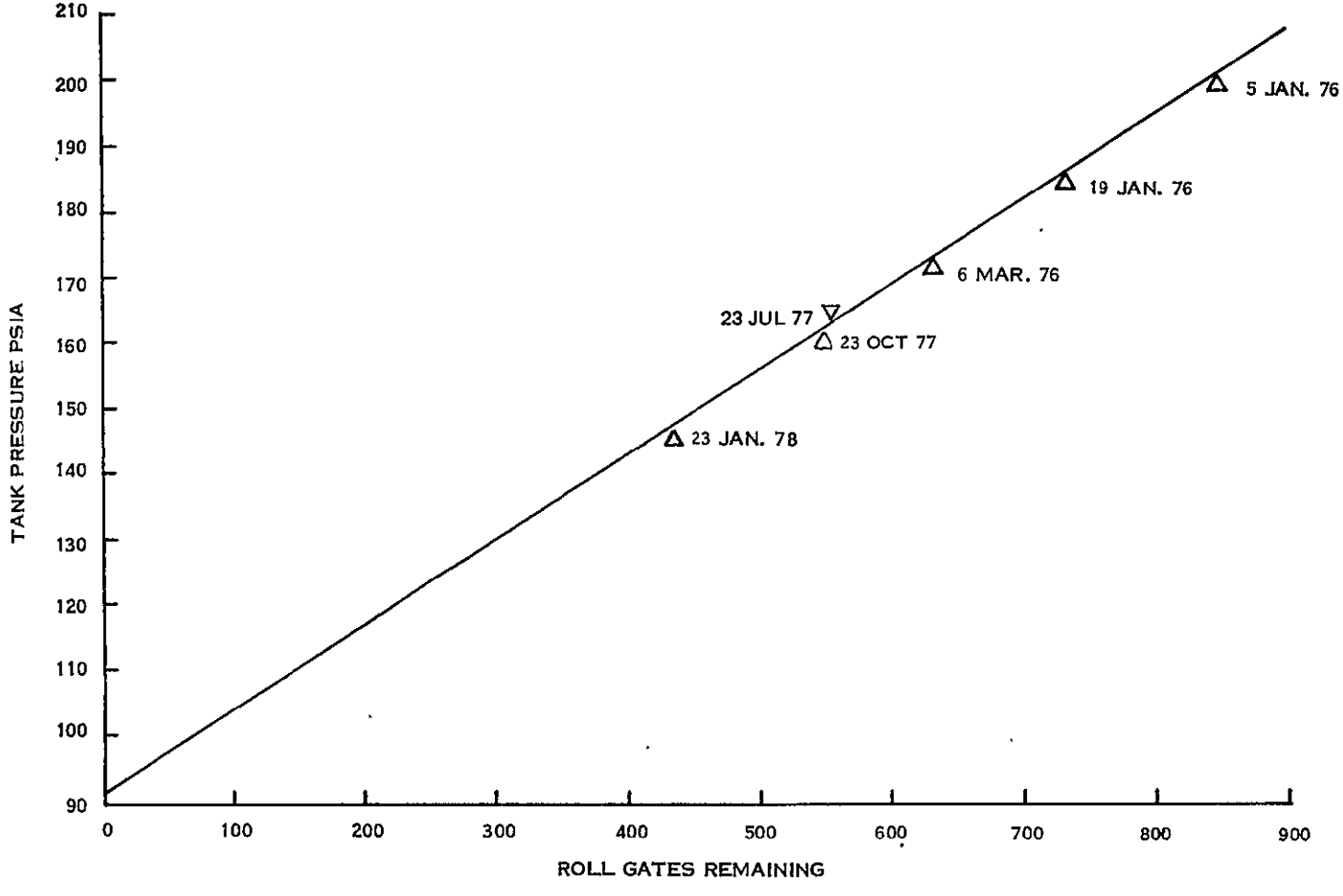


Figure 4-2. Landsat-1 Pressure - Roll Gate Prediction

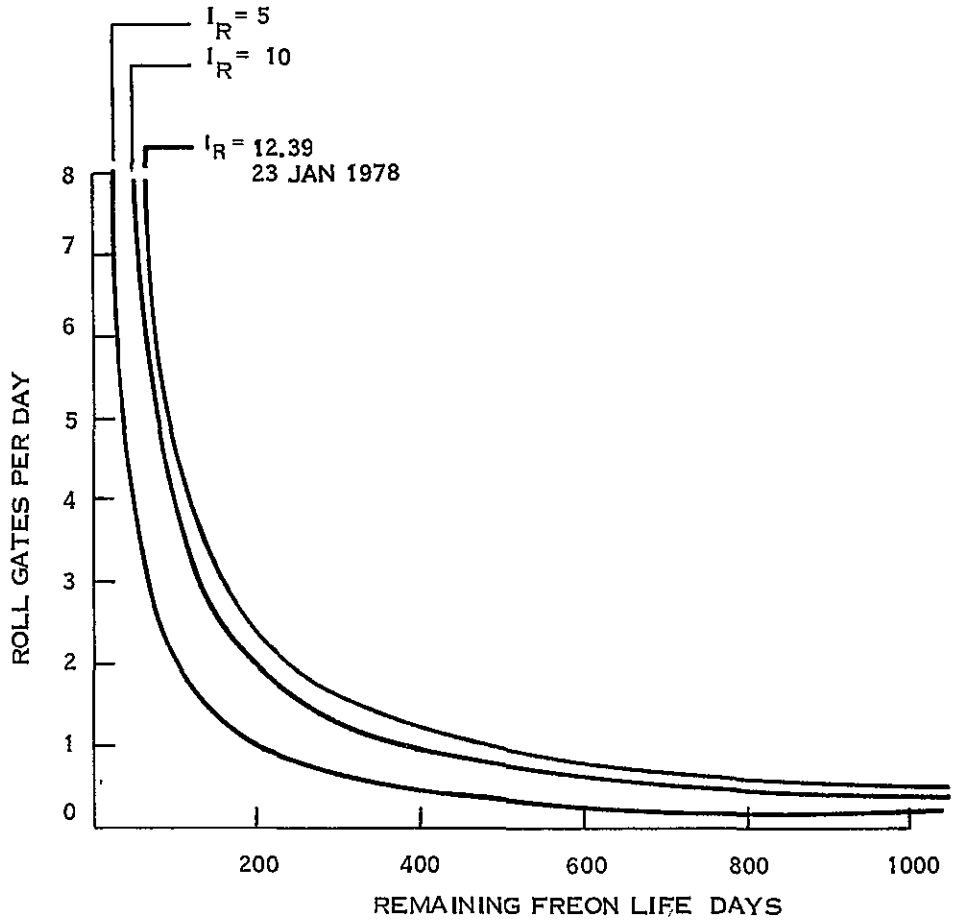


Figure 4-3. Landsat-1 Remaining Freon Life vs Gating Frequency

Table 4-1. Landsat-1 ACS Temperature and Pressure Telemetry Summary

Function	Units	Orbit								
		31	5099	10182	15254	20364	25455	26943	27443	27950
1084 RMP 1 Gyro Temperature	DGC	44.5	23.06	21.22	42.40	41.47	40.71	42.56	43.43	38.13
1094 RMP 2 Gyro Temperature	DGC	74.3	75.10	43.45	24.05	23.49	23.15	25.86	26.98	23.45
1222 SAD RT MTR HSING Temp	DGC	21.1	22.00	20.55	22.89	21.70	20.73	22.07	22.90	14.26
1242 SAD LT MTR HSING Temp	DGC	27.0	30.38	28.18	29.53	28.88	28.32	31.17	32.26	28.78
1223 SAD RT MTR WNDNG Temp	DGC	25.3	26.54	24.63	27.06	25.74	24.15	25.19	26.03	13.35
1243 SAD LT MTR WNDNG Temp	DGC	28.7	32.92	30.32	31.98	31.40	30.72	33.69	34.83	31.65
1228 SAD RT HSG Pressure	PSI	7.6	7.35	7.12	6.88	6.70	6.45	6.39	6.39	6.06
1248 SAD LT HSG Pressure	PSI	7.0	6.86	6.47	6.18	5.90	5.64	5.56	5.56	5.44
1007 FWD Scanner MTR Temp	DGC	19.8	19.88	18.46	20.36	19.16	18.20	20.17	21.06	16.84
1016 Rear Scanner MTR Temp	DGC	20.5	19.83	17.86	19.24	18.87	17.94	19.86	20.51	17.00
1003 FWD Scanner Pressure	PSI	4.6	4.02	3.50	3.00	2.60	2.00	2.02	2.01	1.99
1012 Rear Scanner Pressure	PSI	7.8	7.87	7.44	6.97	6.74	6.28	6.28	6.28	6.05
1212 Gas Tank Pressure	PSI	1988.0	1702.34	1454.19	235.44	162.92	163.20	161.08	149.33	148.70
1210 Gas Tank Temperature	DGC	22.6	24.30	22.56	24.36	23.22	22.56	24.87	25.87	20.59
1213 Manifold Pressure	PSI	56.7	57.44	58.73	61.67	61.66	61.66	62.08	62.05	62.43
1211 Manifold Temperature	DGC	21.9	23.62	21.77	23.82	22.69	21.83	24.39	25.35	19.77
1059 CLB Power Supply Card Temp	DGC	37.1	40.54	38.83	40.58	39.55	38.99	41.63	42.76	38.94
1260 ACS Baseplate 1	DGC	25.4	27.93	25.36	26.54	26.01	25.61	28.64	29.78	T
1261 ACS Baseplate 2	DGC	22.9	24.73	23.00	25.05	24.21	23.58	26.33	27.51	T
1262 ACS Baseplate 3	DGC	23.4	23.69	21.97	24.95	23.89	23.01	25.06	26.03	T
1263 THO1 STS	DGC	-6.8	-0.97	-3.41	1.22	1.86	1.57	6.69	6.86	T
1264 THO2 STS	DGC	-14.6	-9.42	-8.27	-4.50	-3.17	-2.93	2.51	2.27	T
1265 THO3 STS	DGC	-3.1	9.31	7.58	12.92	15.02	16.80	22.05	22.55	T
1266 THO4 STS	DGC	-13.9	2.85	-1.85	2.40	3.05	3.15	7.77	9.59	T
1267 THO5 STS	DGC	-8.9	-1.16	-5.17	2.92	4.80	4.61	12.85	14.82	T
1224 SAD R FSST	DGC	39.5	60.21	63.25	64.74	62.86	56.55	31.90	49.64	12.94
1244 SAD L FSST	DGC	27.1	51.11	53.21	54.69	53.22	52.90	58.28	59.03	62.78

T - Switched Telemetry Off.

Table 4-2. Landsat-1 ACS Voltages and Currents

Function	Units	Orbit								
		31	5099	10182	15254	20364	25455	26943	27443	27950
1057 CLB Power Supply Volts	TMV	2.8	2.78	2.78	2.78	2.77	2.77	2.78	2.78	2.77
1081 RMP 1 MTR Volts	VDC	F	F	F	-30.14	-30.14	-30.14	-30.14	-30.14	-30.14
1082 RMP 1 MTR Current	Amps	F	F	F	.11	.11	0.11	0.11	0.11	0.11
1080 RMP 1 Supply Volts	VDC	F	F	F	-23.78	-23.79	-23.80	-23.78	-23.77	-23.84
1091 RMP 2 MTR Volts	VDC	-29.7	-29.63	-29.63	F	F	F	- 3.36	- 3.36	- 3.36
1092 RMP 2 MTR Current	Amps	0.10	0.10	0.11	F	F	F	0.03	0.03	0.03
1090 RMP 2 Supply Volts	VDC	-23.4	-23.41	-23.50	F	F	F	-17.09	-17.09	-17.09
1320 SAD RT MTR WNDNG Volts	VDC	-4.8	-4.25	-3.89	-3.85	-4.20	- 3.68	- 3.89	- 3.92	T
1240 SAD LT MTR WNDNG Volts	VDC	-4.8	-4.09	-3.36	-3.43	-3.65	- 3.35	- 3.40	- 3.38	- 3.48
1227 SAD RT -15 VDC Conv.	VDC	14.9	14.88	14.89	14.87	14.87	14.87	14.88	-14.88	T
1247 SAD LT -15 VDC Conv.	VDC	15.2	15.13	15.14	15.06	15.11	15.10	15.09	15.08	15.07
1056 CLB ± 6 VDC	TMV	2.4	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35
1055 CLB ± 10 VDC TMV	TMV	2.75	2.73	2.74	2.74	2.73	2 73	2.74	2.73	2.73

T - Switched Telemetry Off

F - Unit Off

Table 4-3. Landsat-1 ACS Attitude Errors and Driver Duty Cycles

Function	Units	Orbits								
		13198	13569	14001	15251	20364	25455	26943	27443	27950
1141 Pitch Fine-Error *	DEG	- 0.40	- 0.08	- 0.02	- 2.13	-.11	- 0.06	- 0.49	- 0.34	- 0.80
1143 Pitch Flywheel Speed	RPM	- 10.49	- 26.86	- 1.21	12.92	-76.17	- 58.01	- 46.98	- 66.60	- 87.04
1038 Pitch MTR DRVR CCW	PCT	4.96	5.81	4.55	3.28	2.69	1.73	1.52	2.38	1.22
1039 Pitch MTR DRVR CW	PCT	2.29	2.17	5.10	19.65	1.04	0.26	0.48	0.48	0 11
1030 Roll Fine Error **	DEG	- 2.25	- 0.20	- 0.20	- 2.52	-2.70	- 2.68	- 2.60	- 1.57	- 2.55
1127 Roll Rear Flywheel Speed	RPM	715.78	756.92	782.08	714.05	720.23	718.42	744.26	813.58	728.21
1126 Roll Fwd Flywheel Speed	RPM	641.82	674.47	693.31	641.32	640.80	640.29	648.03	700.23	646.50
1022 Roll Rear MTR DRVR CCW	PCT	0.01	0.68	0.90	.13	.96	0.00	0.05	0.00	0.00
1025 Roll Rear MTR DRVR CW	PCT	4.26	5.22	5.52	4.17	5.61	4.83	5.31	5.74	5.53
1023 Roll Fwd MTR DRVR CCW	PCT	0.01	0.66	0.72	.08	.99	0.02	0.05	0.01	0.00
1024 Roll Fwd MTR DRVR CW	PCT	4.15	4.94	5.35	4.24	5.16	4.32	4.16	4.06	4.41
1035 Yaw Tach	RPM	-206.08	-116.50	- 93.72	-169.52	-200.01	-225.26	-223.84	-232.55	-155.82
1033 Yaw MTR DRVR CW	PCT	0.04	1.53	1.84	.09	.05	0.00	0.13	0.42	0.12
1034 Yaw MTR DRVR CCW	PCT	0.07	1.60	1.76	.68	.67	0.73	0.60	0.77	0.53
1221 SAD Right Tach	DEG/MIN	3.37	3.37	2.81	3.37	3.40	3.46	3.55	3.41	18.00
1241 SAD Left Tach	DEG/MIN	2.80	2.81	2.81	2.79	2.79	2.82	2.76	2.71	2.75

NOTE: Tabulation of these functions began after the pitch flywheel anomaly (stopped) in Orbit 11125.

* Pitch Fine Error is high due to use of Pitch Position Bias (PPB) to control Pitch wheel speed on some orbits which raise the average error above that of normal attitude without PPB.

** Roll Fine Error is high due to use of High Gain Roll Differential Tachometer mode to control Roll wheel speed which raises the average error above that of normal attitude in Normal Gain Roll Differential Tachometer mode.

SECTION 5

COMMAND CLOCK SUBSYSTEM (CMD)

LANDSAT-1

SECTION 5

COMMAND/CLOCK SUBSYSTEM (CMD)

The Command Clock Subsystem operated nominally in this report period. Figure 5-1 shows the history of the S/C clock drift since launch. Figure 5-2 shows the cumulative clock drift, 17.563 seconds slower in 66 months. Figure 5-3 gives the drift rate of the S/C clock. The clock in Landsat-1 drifts in opposite direction from the clock of Landsat-2. Both S/C clock and GMT were updated January 1, 1978. The GMT clock was set one second ahead and the S/C clock was set three seconds ahead.

Table 5-1 shows typical telemetry values since launch. All are nominal.

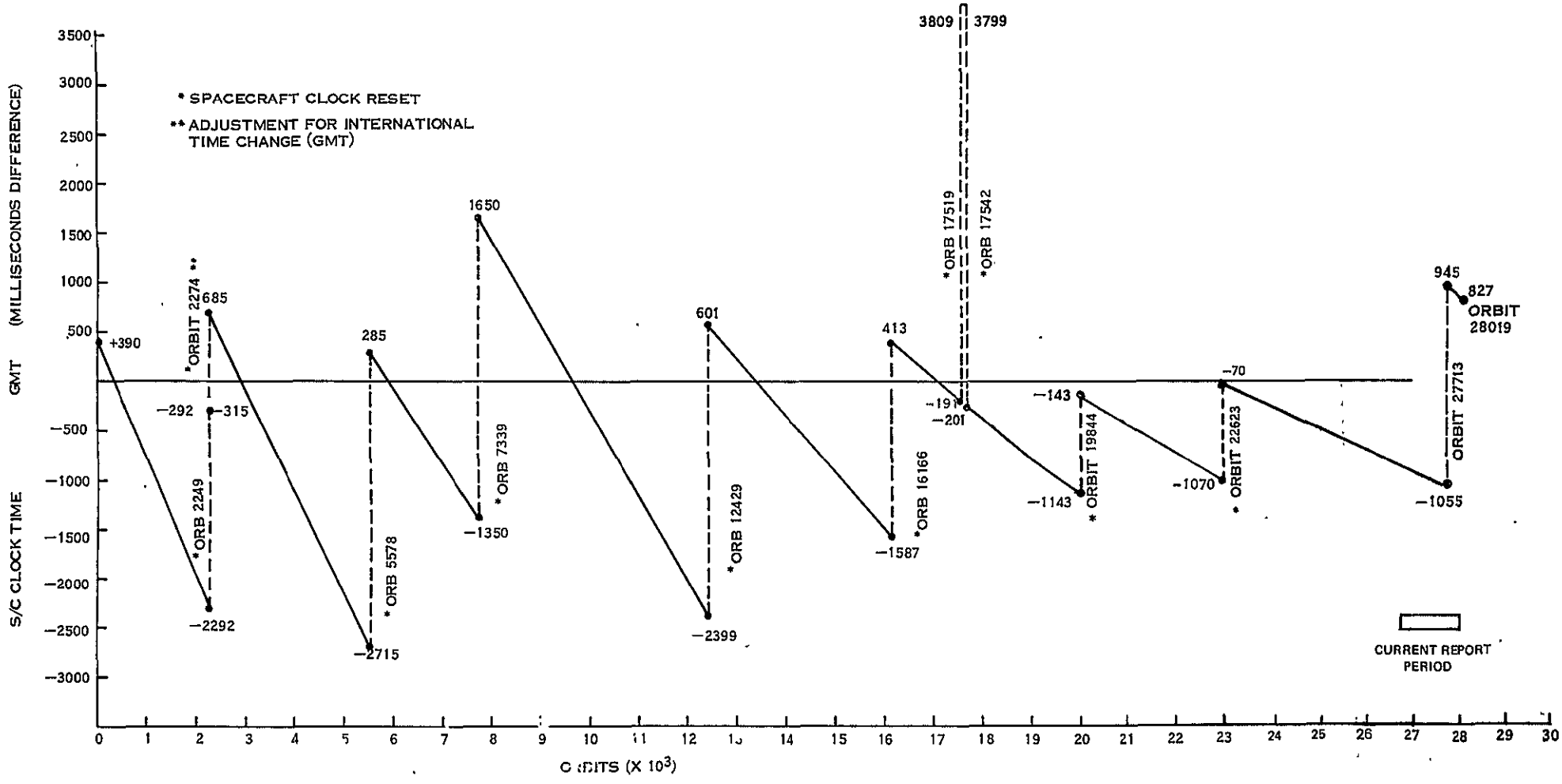


Figure 5-1. Landsat-1 Spacecraft Clock Drift History

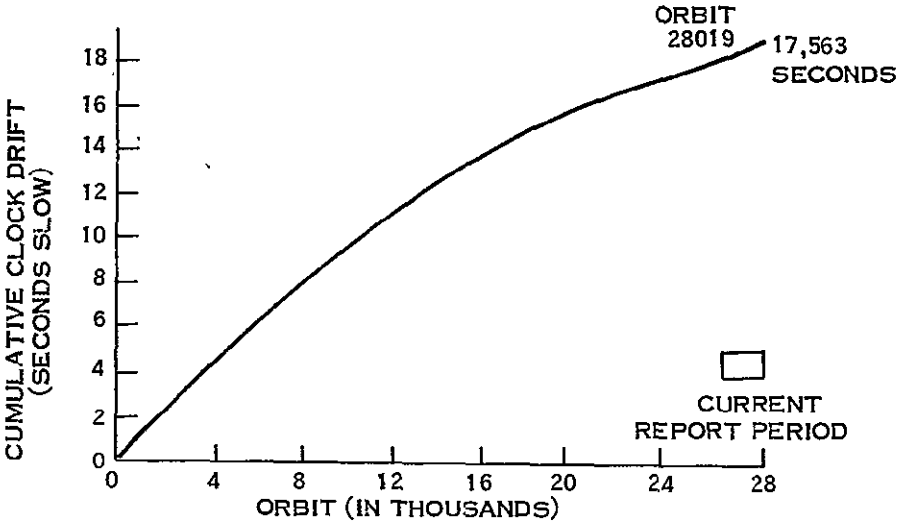


Figure 5-2. Cumulative Clock Drift

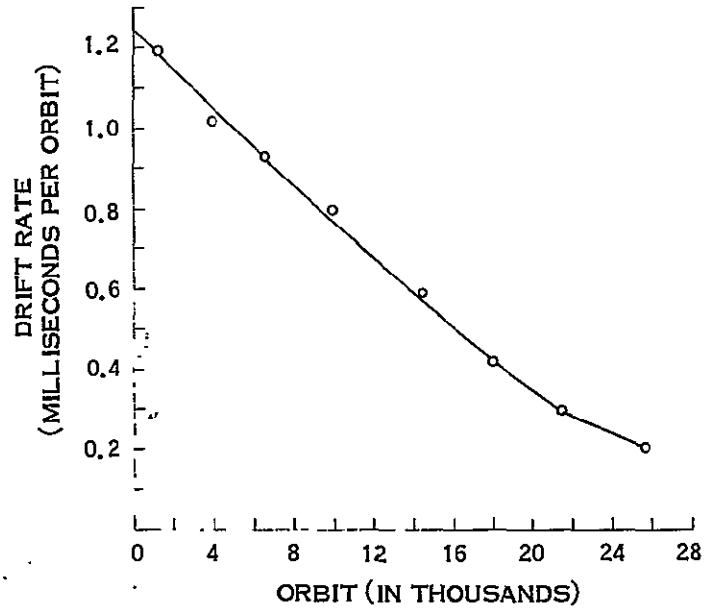


Figure 5-3. Drift Rate of Spacecraft Clock

Table 5-1. Landsat-1 Command Clock Telemetry Summary

Function No.	Name	Mode	Units	Orbit								
				35	5099	10182	15233	20364	25455	26943	27443	27950
8005	Pri. Power Supply Temp	-	°C	37.31	39.37	39 50	38.26	38.06	36.96	37.70	37.89	32.31
8006	Red. Power Supply Temp	-	°C	35.73	38.08	38 38	37.06	37.33	36.05	36.80	37.03	23.13
8007	Pri. Osc Temp	-	°C	31.14	31.98	32 11	31.14	31.04	29.61	31 11	31 94	30 25
8008	Red. Osc. Temp	-	°C	30.47	31.39	31.42	30.48	30.18	28.70	30.48	31 14	29.53
8009	Pri. Osc. Output	-	TMV	0.95	0.96	0 97	0.97	0.95	0.95	0.95	0.96	0 95
8010	Red. Osc. Output	-	TMV	F	F	F	F	F	F	1 00	1 01	1.00
8011	100 kHz	Pri -Red	TMV	3 11	3.10	3.11	3 12	3 11	3.10	3.10	3 10	3.10
8012	10 kHz	Pri.-Red	TMV	3 10	3 07	3.08	3 08	3.08	3.07	3 07	3.07	3.05
8013	2 5 kHz	Pri.-Red	TMV	2 95	2 95	2 95	2 96	2 95	2.95	2.95	2.95	2.93
8014	400 Hz	Pri -Red.	TMV	4.40	4 40	4.40	4 40	4.40	4.40	4.40	4.40	4.40
8015	Pri +4 V Power Supply	Pri. Clk ON	VDC	4.10	4 10	4.10	4 10	4.08	4.06	4 07	4 08	4 05
8016	Red. +4 V Power Supply	Red. Clk ON	VDC	3 95	3.95	3.95	3 95	3.92	3.91	3.91	3.90	F
8017	Pri. +6 V Power Supply	Pri. Clk ON	VDC	6 06	6 07	6.07	6.11	6 06	6.06	6 07	6 07	6 06
8018	Red +6 V Power Supply	Red. Clk ON	VDC	6.00	5 94	5.94	5.97	5.93	5.93	5 93	5.93	F
8019	Pri. -6 V Power Supply	Pri. Clk On	VDC	-6.02	-6 02	-6.03	-6 04	-6.02	- 6.02	-6 02	-6 02	-6 02
8020	Red. -6 V Power Supply	Red. Clk ON	VDC	-5.99	-6 00	-.600	-6.01	-5.99	- 5.99	-5 99	-5 99	F
8021	Pri. -23 V Power Supply	Pri. Clk ON	VDC	-22.88	-22.89	-22.89	-22.95	-22.88	-22.88	-22 89	-22 89	-22.88
8022	Red. -23 V Power Supply	Red. Clk ON	VDC	-22.98	-23.00	-23.01	-23.06	-22.99	-22.98	-22 99	-22 99	F
8023	Pri. -29 V Power Supply	Pri. Clk ON	VDC	-29.13	-29.16	-29.15	-29.15	-29.16	-29.15	-29.15	-29 15	-29.09
8024	Red. -29 V Power Supply	Red. Clk ON	VDC	-29.07	-29.21	-29.21	-29.21	-29.21	-29.21	-29 21	-29 21	F
8101	CIU A -12 V	CIA A ON	VDC	-12.33	-12.33	-12.34	-12.35	-12.34	-12.34	-12 35	-12 35	-12.35
8102	CIU B -12 V	CIU B ON	VDC	-12.26	-12.23	-12.23	-12.20	-12.24	-12.24	-12 36	-12 26	T
8103	CIU A -5 V	CIU A ON	VDC	-5.32	-5.34	-5.34	-5.34	-5.34	- 5.34	-5 34	-5 34	-5 34
8104	CIU B -5 V	CIU B ON	VDC	65.31	-5.31	-5.31	-5 31	-5.31	- 5.31	-5 31	-5.31	-5.31
8105	CIU A Temp	CIU A ON	°C	24 47	34.77	25.04	24.09	24.11	23.79	25 35	25.90	26 07
8106	CIU B Temp	CIU B ON	°C	24.96	25.31	25 45	24.48	24.44	24.01	25 66	26.19	26 35
8201	Receiver RF-A Temp	-	°C	F	F	28 67	27.53	26.88	25.89	27.17	27.49	T
8202	Receiver RF-B Temp	-	°C	27.98	28.22	F	F	17.47	16.22	17.98	18 32	T
8203	D MOD A Temp	-	°C	25.41	25.73	37 98	37.31	36 40	35.62	36.81	37.20	T
8204	D MOD B Temp	-	°C	35.03	35.61	26 12	25 27	24 10	22.83	24 72	25.18	T
8205	Receiver A AGC	Receiver A ON	DBM	F	F	-96 77	-85 62	-95 73	-92.73	-96.32	-92.95	-93 42
8206	Receiver B AGC	Receiver B ON	DMB	-94.74	-84.67	F	F	F	F	F	F	F
8207	Amp A Output	Receiver A ON	TMV	F	F	2.31	2.94	2.46	2.66	2.37	2 55	2 66
8208	Amp. B Output	Receiver B ON	TMV	2.81	3.22	F	F	F	F	F	F	F
8209	Freq. Shift Key A Out	Receiver A ON	TMV	F	F	1.10	1.11	1.10	1.10	1 11	1.10	1.11
8210	Freq Shift Key B Out	Receiver B ON	TMV	1.10	1.11	F	F	F	F	F	F	F
8211	Amp. A Output	Receiver A ON	TMV	F	F	1 10	1.10	1.10	1.11	1.11	1.11	1.11
8212	Amp B Output	Receiver B ON	TMV	1.13	1.13	F	F	F	F	F	F	F
8215	D MOD A -15 V	Receiver A ON	TMV	F	F	5 00	5.00	4.99	4.98	5 00	5.00	4 98
8216	D MOD B -15 V	Receiver B ON	TMV	5.00	5.00	F	F	F	F	F	F	F
8217	Regulator A -10 V	Receiver A ON	TMV	F	F	5.40	5 39	5 38	5.38	5 39	5 39	5.37
8218	Regulator B -10 V	Receiver B ON	TMV	5.50	5.50	F	F	F	F	F	F	F

F - Unit Off.
T - Switched Telemetry Off.

SECTION 6

TELEMETRY SUBSYSTEM (TLM)
LANDSAT-1

SECTION 6

TELEMETRY SUBSYSTEM (TLM)

The Telemetry Subsystem has performed nominally during this report period.

Landsat-1 used Memory Section 0.0 until Orbit 12,565, 10 January 1975, after which it was reprogrammed to Memory Section 1,1 to be compatible with Landsat-2 telemetry matrix. Memory Section 1,1 continues to be used in the telemetry matrix. Total performance has been excellent except for one integrated circuit chip failure, containing four functions (6012, 7011, 12238, 7010) in Orbit 4396.

Table 6-1 shows typical telemetry values since launch. Components are rising in temperature reflecting rotation of the Landsat-1 orbit plane causing these components to be closer to the earth-sun line.

Table 6-1. TLM Telemetry Summary

Function No.	Function Name	Unit	Orbit								
			35	5099	10592	15233	20364	25455	26943	27443	27950
9001	Memory Sequencer A Converter	VDC	6.35	6.33	6.33	6.33	6.33	6.33	6.33	6.34	6 35
9002	Memory Sequencer B Converter	VDC	F	F	F	F	F	F	F	F	F
9003	Memory Sequencer Temp	°C	19.59	21.06	21.30	21.94	20.78	21.60	24 07	25.84	T
9004	Formatter A Converter	VDC	5.99	5.99	5.99	5.99	5.99	6.00	6.02	6 02	6.06
9005	Format B Converter	VDC	F	F	F	F	F	F	F	F	F
9006	Dig. Mux A Converter	VDC	10.01	10.04	10.07	10.07	10.07	10.07	10.07	10.07	10.09
9007	Dig. Mux B Converter	VDC	F	F	F	F	F	F	F	F	F
9008	Formatter/Dig. Mux Temp	°C	22.50	24.89	25.00	23.55	25.00	29.96	37.45	40.86	T
9009	Analog Mux A Converter	VDC	26.01	21.18	26.20	26.32	26.35	26.35	26.35	26.35	26.35
9010	Analog Mux B Converter	VDC	F	F	F	F	F	F	F	F	F
9011	A/D Converter A Voltage	VDC	10.00	10.07	10.07	10.07	10.07	10.07	10.07	10.07	10.07
9012	A/D Converter B Voltage	VDC	F	F	F	F	F	F	F	F	F
9013	Analog Mux Aux	°C	25.00	26.83	27.49	25.63	26.56	28.49	32.44	34.91	T
9014	Preregulator A Voltage	VDC	19.93	19.95	19.94	19.98	19.90	19.93	20.00	20.00	19.99
9015	Preregulator B Voltage	VDC	F	F	F	F	F	F	F	F	F
9016	Reprogrammer Temp	°C	22.00	22.50	22.53	22.50	22.50	25.93	32.31	34.88	T
9017	Memory A Converter	VDC	6.00	5.99	6.00	5.97	5.97	5.97	6.00	6.00	6.00
9018	Memory A Temp	°C	17.51	17.50	17.50	17.50	17.47	17.50	19.10	19.98	T
9019	Memory B Converter	VDC	F	F	F	F	F	F	F	F	F
9020	Memory B Temp	°C	17.68	17.63	17.51	17.50	16.93	17.51	20.45	22.37	T
9100	Reflected Power	dBm	11.95	12.32	12.38	11.37	11.45	12.50	14.11	14.57	T
9101	Xmtr A -20 VDC	VDC	-19.75	-19.76	-19.75	-19.84	-19.75	-19.75	-19.76	-19.76	-19.78
9102	Xmtr B -20 VDC	VDC	F	F	F	F	F	F	F	F	F
9103	Xmtr A Temp	°C	20.95	21.14	22.01	21.98	23.02	29.58	43.17	46.87	T
9104	Xmtr B Temp	°C	21.69	21.95	22.76	22.91	23.92	30.88	44.31	47.88	T
9105	Xmtr A Power Output	dBm	25.12	25.35	25.24	25.00	24.57	24.62	25.15	25.27	25.60
9106	Xmtr B Power Output	dBm	F	F	F	F	F	F	F	F	F

F - Unit Off
T - Telemetry Off

SECTION 7

ORBIT ADJUST SUBSYSTEM (OAS)
LANDSAT-1

SECTION 7

ORBIT ADJUST SUBSYSTEM (OAS)

The Orbit Adjust Subsystem has been fired 51 times, 26 times using the -X thruster and 25 times using the +X thruster.

The subsystem pressure/temperature parameters continue to be normal. There are 64.43 pounds of hydrazine fuel remaining from an initial pre-launch load of 67.00 pounds. Figure 2-1 shows spacecraft ground track drift from standard orbit tracks and the effects of orbit adjustment. Table 7-1 is a summary of OAS performance to date, and Table 7-2 gives average telemetry values for the off (quiescent) state.

Table 7-1. Landsat-1 Orbit Adjust Summary

Orbit	Orbit Adjust No.	Ignition Epoch	Burn Duration (Seconds)	+ Δ a (Meters)	Engine Performance Efficiency	Fuel[1] Used (Lbs)	Tank Pressure (PSIA)	Tank Temperature (°F)	Axis Thruster
38	1	26 Jul 72 11:25.0.0	4.8	12	60%		540	75	-X
44	2	26 Jul 72 21:44:46	250.0	1976	103.4%	2.15	U[2]	U[2]	-X
59	3	27 Jul 72 23:34:46	318.0	2891	101.5%		516	73.9	-X
938	4	29 Sep 72 00.30:00	12.8	98	110.0%	0.039	U[2]	U[2]	-X
2818	5	13 Jan 73 00:21:30	20.4	154	106.0%	0.071	489.4	75.4	-X
6390	6	25 Oct 73 00:04,10.8	14.8	110	100.0%	0.048	486.8	73.9	-X
7826	7	4 Feb 74 23:27:10.4	14.7	112	101.8%	0.048	490.59	75.4	-X
11367	8	16 Oct 74 22:42:10.8	8.0	-65	106.0%	0.026	490.59	74.0	+X
11484	9	23 Oct 74 21:40:00.4	8.4	-68	102.0%	0.027	490.58	73.8	+X
13611	10	26 Mar 75 19:39:00.8	2.8	-23.6	101.8%	0.01	490.09	72.5	+X
14365	11	12 May 1975 21:19:00.8	1.6	-13	102.4%	0.01	486.84	71.6	+X
19747	12	8 June 76 19:56:00.4	2.4	-19.3	102.1%	0.01	490.59	70.1	+X
19871	13	17 June 76 17:22:00.4	2.4	-19.9	103.8%	0.01	486.84	69.4	+X
21613	14*	20 Oct 76 18:28:01.2	2.4	-16.2	85.3%	0.01	494.34	73.2	+X
21616	15*	20 Oct 76 20:34:01.2	2.4	15.3	86.0%	0.01	494.34	73.2	-X
21627	16	21 Oct 76 15,33:01.2	5.2	39.2	103.2%	0.02	494.34	73.2	-X
21641	17	22 Oct 76 15,38,01.2	5.2	39.9	105.0%	0.02	494.34	72.4	-X
21655	18	23 Oct 76 15;47;01.2	5.2	40.0	105.3%	0.02	494.34	72.4	-X
21669	19	24 Oct. 76 15;50-01.2	5.2	39.0	103 4	.02	490.59	72.4	-X
21683	20	25 Oct. 76 15,57;01.2	5.2	39.1	103.7	.02	490.59	72.4	-X
21697	21	26 Oct. 76 16;05-01.2	5.2	37.8	100.3	.02	490.59	72.4	-X
21710	22	27 Oct. 76 14-24;01	5.2	42.4	112.5	.02	490.59	72.4	-X
21724	23	28 Oct. 76 14-30;01.2	5.2	39.6	105.0	.02	490.59	72.4	-X
21738	24	29 Oct. 76 14;36;01.2	5.2	40.3	107.4	.02	490.59	72.4	-X
21752	25	30 Oct. 76 14-44-01.2	5.2	40.5	108.0	.02	490.59	72.4	-X
21766	26	31 Oct. 76 14;47;01.2	5.2	36.5	96.8	.02	490.59	72.4	-X
21780	27	1 Nov. 76 14;52-01.2	5.2	42.4	113.1	.02	486.84	73.2	-X
21794	28	2 Nov. 76 14,59;01.2	5.2	42.0	112.0	.02	486.84	73.2	-X
21808	29	3 Nov. 76 15:07;01.2	5.2	35.6	96.8	.02	486.84	73.2	-X
21822	30	4 Nov. 76 15;10;01.2	5.2	38.0	101.3	.02	486.84	73.2	-X
21836	31	5 Nov. 76 15;16;01.2	5.2	40.3	107.6	.03	486.84	73.2	-X
21878	33	8 Nov. 76 15;34;01.2	5.2	39.7	105.9	.03	486.84	73.2	-X
21892	33	9 Nov. 76 15;45-01.2	5.2	37.9	101.1	.02	486.84	73.2	-X
22714	34	7 Jan. 77 14;36;01.2	5.2	-40.7	109.7	.02	490.59	76.9	+X
22756	35	10 Jan. 77 14:59:01.2	5.2	-41.2	102.0	.02	490.59	76.9	+X
22770	36	11 Jan. 77 15:02;01.2	5.2	-41.4	102.5	.02	490.59	77.9	+X
22798	37	13 Jan. 77 16:52:00	5.2	-41.6	103.0	.02	490.59	77.6	+X
22812	38	14 Jan. 77 15;14.01.2	5.2	-39.8	98.5	.02	490.59	77.6	+X
22826	39	15 Jan. 77 15;19;41.2	5.2	-40.2	99.5	.02	490.59	77.6	+X
22840	40	16 Jan. 77 15;25;01.2	5.2	-41.7	103.2	.02	490.59	78.4	+X
22854	41	17 Jan 77 15:31:01.2	5.2	-40.6	100.5	.02	490.59	79.1	+X
22868	42	18 Jan. 77 15,38;01.2	5.2	-41.8	103.5	.02	490.59	79.1	+X
22882	43	19 Jan.77 16;42;01.2	6.0	-46.5	104.1	.02	490.59	79.1	+X
22896	44	20 Jan. 77 15;48;01.2	6.0	-46.7	104.5	.02	490.59	79.1	+X
22910	45	21 Jan. 77 15;53;01.2	6.0	-47.0	100.9	.03	490.59	79.1	+X
22923	46	22 Jan. 77 14: 17:01.2	6.0	-45.2	103.4	.02	490.59	79.1	+X
22937	47	23 Jan. 77 14;25;01.2	6 6.0	-47.5	102.6	.02	490.59	79.1	+X
22951	48	24 Jan. 77 14;31,01.2	6.0	-47.4	102.4	.02	486.84	79.1	+X
22965	49	25 Jan. 77 14;34.01.2	6.0	-47.6	102.8	.02	486.84	79.1	+X
23007	50	28 Jan. 77 14.31.01.2	1.2	-9.9	103.1	.00	486.84	79.9	+X
24822	51	7 June 77 18;23.01.2	4.8	-35.5	98.1	.02	472.21	88.6	+X

*Test Burns

1 Initial Fuel Capacity - 87 lbs.
2 Unavailable

FOLDOUT FRAME 1

FOLDOUT FRAME 2

ORIGINAL PAGE IS OF POOR QUALITY

Table 7-2. Landsat-1 OAS Telemetry Values

Function No.	Name	Units	Orbit								
			35	5099	10182	15254	20364	25455	26943	27443	27950
2001	Prop. Tank Temp.	°C	22.03	22.86	23.28	21.62	21.20	21.61	25.77	27.44	30.33
2003	Thrust Chamber No. 1 (-x) Temp.**	°C	29.57	29.93	30.55	30.52	27.32	22.62	20.47	17.41	15.28
2004	Thrust Chamber No. 2 (+x) Temp.**	°C	38.76	40.28	38.91	36.25	35.20	32.93	34.65	36.43	31.78
2005	Thrust Chamber No. 3 (-y) Temp.**	°C	34.55	34.41	36.09	38.45	43.88	53.63	78.07	88.15	113.01
2006	Line Pressure	psia	539.29	486.87	490.61	486.87	489.66	475.66	490.50	494.38	505.54

**Wide spread of temperature is due to nozzle locations and satellite day/night transitions relative data averaged. Typical orbital range is from 19 to 59 DGC.

SECTION 8

MAGNETIC MOMENT COMPENSATING ASSEMBLY (MMCA)

LANDSAT-1

SECTION 8

MAGNETIC MOMENT COMPENSATING ASSEMBLY (MMCA)

From launch through this report period Landsat-1's MMCA has been energized eleven times in seven orbits, i.e., Orbits 73, 85, 110, 220, 11181, 11185* and 11186*. The MMCA was operated in the early orbits to reduce +Roll pneumatic gating. (*Energized 3 times in one orbit).

In Orbits 11181 and 11186, it was energized in the plus and minus Yaw dipole configuration respectively in order to save freon gas by reducing the amplitude of the Pitch flywheel orbit frequency oscillation. In a short successful test during Orbit 11185 the plus Roll dipole was temporarily energized to determine if a positive roll dipole at the poles could unload the pitch flywheel. Upon test completion the Roll dipole was returned to 500 pole-cm.

No dipole adjustments were made during this report period.

The current dipole values are:

Pitch	+2950 Pole-Cm
Roll	-500 Pole-Cm
Yaw	-3600 Pole-Cm

Telemetry Measurement shown in Table 8-1 shows that the dipoles are holding steady without drift.

Table 8-1. MMCA Telemetry Summary (Landsat-1)

Number	Name	Units	Orbits								
			35	5099	10182	15254	20364	25455	26943	27443	27950
4001	A1 Board Temp	°C	19.77	19.03	19.11	17.59	16.69	16.14	17.55	17.94	18.26
4002	A2 Board Temp	°C	23.58	23.05	23.13	21.83	21.05	20.60	21.79	22.09	22.30
4003	Hall Current	TMV	3.48	3.48	3.48	3.47	3.48	3.48	3.47	3.47	3.47
4004	Yaw Flux Density	TMV	3.11	3.11	3.15	4.02	4.03	4.04	4.04	4.04	4.04
4005	Pitch Flux Density	TMV	3.13	2.51	2.52	2.52	2.52	2.52	2.52	2.52	2.52
4006	Roll Flux Density	TMV	3.19	3.19	3.20	3.28	3.28	3.28	3.29	3.29	3.28

SECTION 9

UNIFIED S-BAND/PREMODULATION PROCESSOR (USB/PMP)

LANDSAT-1

SECTION 9

UNIFIED S-BAND/PREMODULATION PROCESSOR (USB/PMP)

The USB Subsystem is not being used for command functions, but is delivering telemetry data normally.

On January 6, 1978, temperatures of over 60°C in the PMP is believed to have caused unreliable operation of the command functions. Command via VHF is being used until the temperatures drop enough to permit normal operation.

Table 9-1 shows telemetry values since launch. All are nominal. Higher temperatures reflect precession of the Landsat-1 orbit plane and the annual perihelion position of the earth.

Figure 9-1 shows the USB power output history since launch. AGC readings at Goldstone continue to show nominal operational values.

Table 9-1. USB/PMP Telemetry Values

Functions			Orbit								
No.	Name	Units	35	5099	10592	15233	20364	25455	26943	27443	27921
11001	USB Rcvr AGC	DBM	-122.78	-131.99	-129.81	-105.41	-132.06	-126.09	-124.25	-127.97	-131.98
11002	USB Xmtr Pwr	WTS	1.60	0.29	1.54	1.53	1.55	1.44	1.55	1.49	1.48
11003	USB Rcvr Error	KHZ	21.79	-21.32	-23.25	-18.01	-21.76	-23.02	-22.20	-23.16	-20.69
11004	USB Xpond Temp	DGC	22.92	22.64	25.64	25.11	25.37	28.59	37.60	40.18	44.82
11005	USB Xpond Press	PSI	15.91	15.91	15.92	15.94	15.90	16.19	16.88	17.00	17.00
11007	USB Xmtr A -15V	VDC	-15.20	-15.20	F	F	F	F	F	F	F
11008	USB Xmtr B -15V	VDC	F	F	-15.20	-15.20	-15.20	-15.20	-15.20	-15.20	-15.20
11109	USB Range -15V	VDC	-14.76	-14.76	-14.58	-14.58	-14.58	-14.58	-14.58	-14.60	-14.58
11101	PMP Pwr A Volt	VDC	-15.12	-15.18	F	F	F	F	F	F	F
11102	PMP Pwr B Volt	VDC	F	F	-15.12	-15.12	-15.12	-15.12	-15.10	-15.12	-15.14
11103	PMP Temp A	DGC	30.44	30.23	26.60	26.09	26.62	32.67	44.24	48.02	55.57
11104	PMP Temp B	DGC	F	F	31.64	31.67	31.12	37.04	48.04	51.48	60.92

F - Unit Off.

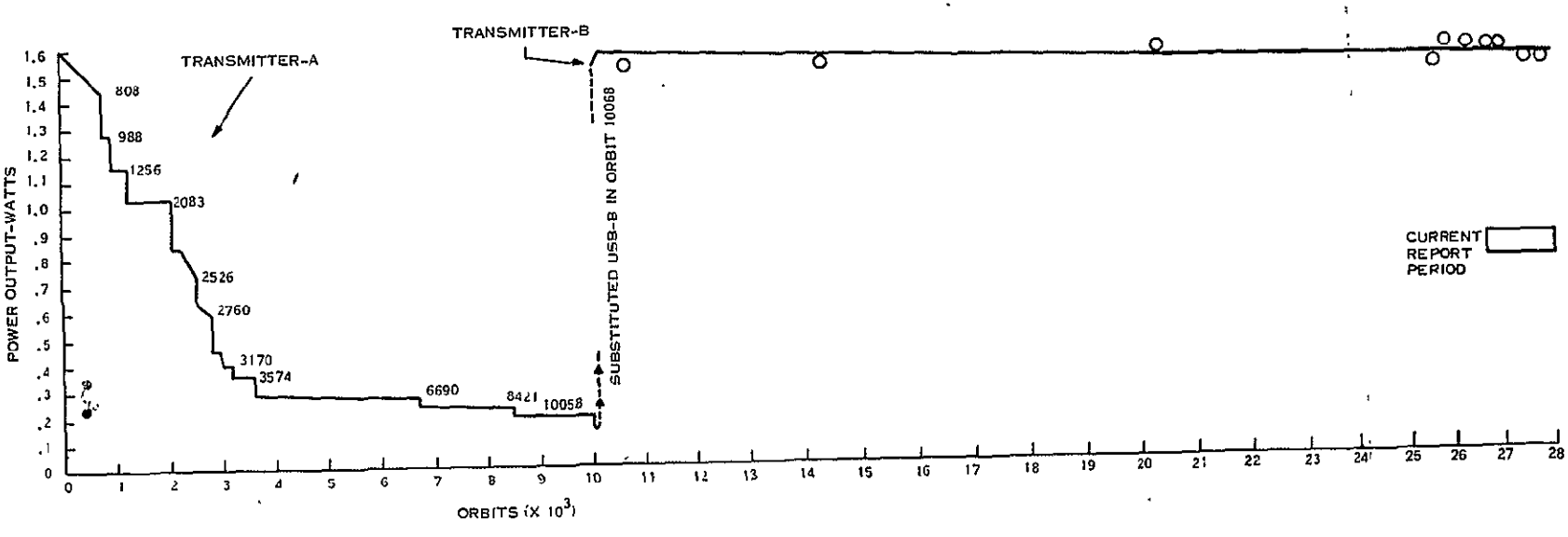


Figure 9-1. USB Power Output History (Landsat-1)

SECTION 10

ELECTRICAL INTERFACE SUBSYSTEM (EIS) LANDSAT-1

SECTION 10

ELECTRICAL INTERFACE SUBSYSTEM (EIS)

Auxiliary Processing Unit (APU) consisting of Search Track Data, Time Code Data, and Backup Timers, operated satisfactorily throughout this report period. Telemetry for the APU is shown in Table 10-1. The APU is in Normal mode.

Table 10-1. Landsat-1 APU Telemetry Functions

			Orbit								
Functions	Description	Unit	7	5098	10182	15254	20364	25455	26943	27443	27784
13200	APU, -24.5 VDC	VDC	-24.90	-24.90	-24.91	-24.90	-24.90	-24.89	-24.90	-24.90	-24.90
13201	APU, -12 Volts	VDC	-12.08	-12.08	-12.07	-12.06	-12.05	-12.04	-12.05	-12.06	-12.04
13202	APU Temp.	DGC	25.49	26.95	27.15	26.82	27.31	28.93	35.51	37.21	40.30

The Power Switching Module (PSM), containing the switching relays for power to Orbit Adjust, MSS, WBPA-1, WBPA-2. WBVTR-1, WBVTR-2, RBV and PRM, functioned normally. The MSS and WBPA-2 power circuits operated until January 7, 1978, during orbit 27805, when the MSS was shut down--possibly put into an indefinite "STAND-BY" position (see Section 17). The power relay for the RBV remained in a failed closed condition since Orbit 196.

The Interface Switching Module (ISM) performed all switching normally during this report period.

SECTION 11

THERMAL SUBSYSTEM (THM)
LANDSAT-1

SECTION 11

THERMAL SUBSYSTEM (THM)

The Thermal Subsystem continues to operate satisfactorily.

Since the time of launch, the right sun sensor on Landsat-1 has registered temperatures higher than expected. This is due to the particular location and bonding techniques used for the sensor. During Orbit 4396 (3 June 1973) telemetry function 7101 (THM TH07 ST1) became disabled when four telemetry gates mounted on one integrated circuit chip failed.

Landsat-1 experiences an annual cycle of high and low temperatures due to a combination of high sun intensity and sun angle, and to longer satellite days. The cycles of sun angle and length of satellite day reach higher and higher peaks in successive years due to the drift in the satellite's orbital plane. During February 1977, Landsat-1 experienced high temperatures, especially along bays 11 through 17, which are normally warmer than others.

During this report period the sun intensity ranged between 1.010 and 1.032 times the mean annual value and the spacecraft temperatures increased. Figure 11-1 shows a typical thermal profile for average bay temperatures of the sensory ring at the end of this report period.

Table 11-1 shows average analog telemetry values from data recorded on the NBR, for selected orbits since launch.

The compensation load configuration on Landsat-1 has been switched several times to balance temperatures among spacecraft components. During this report period all comp loads have remained off. A history of compensation load switching is given in Table 11-2.

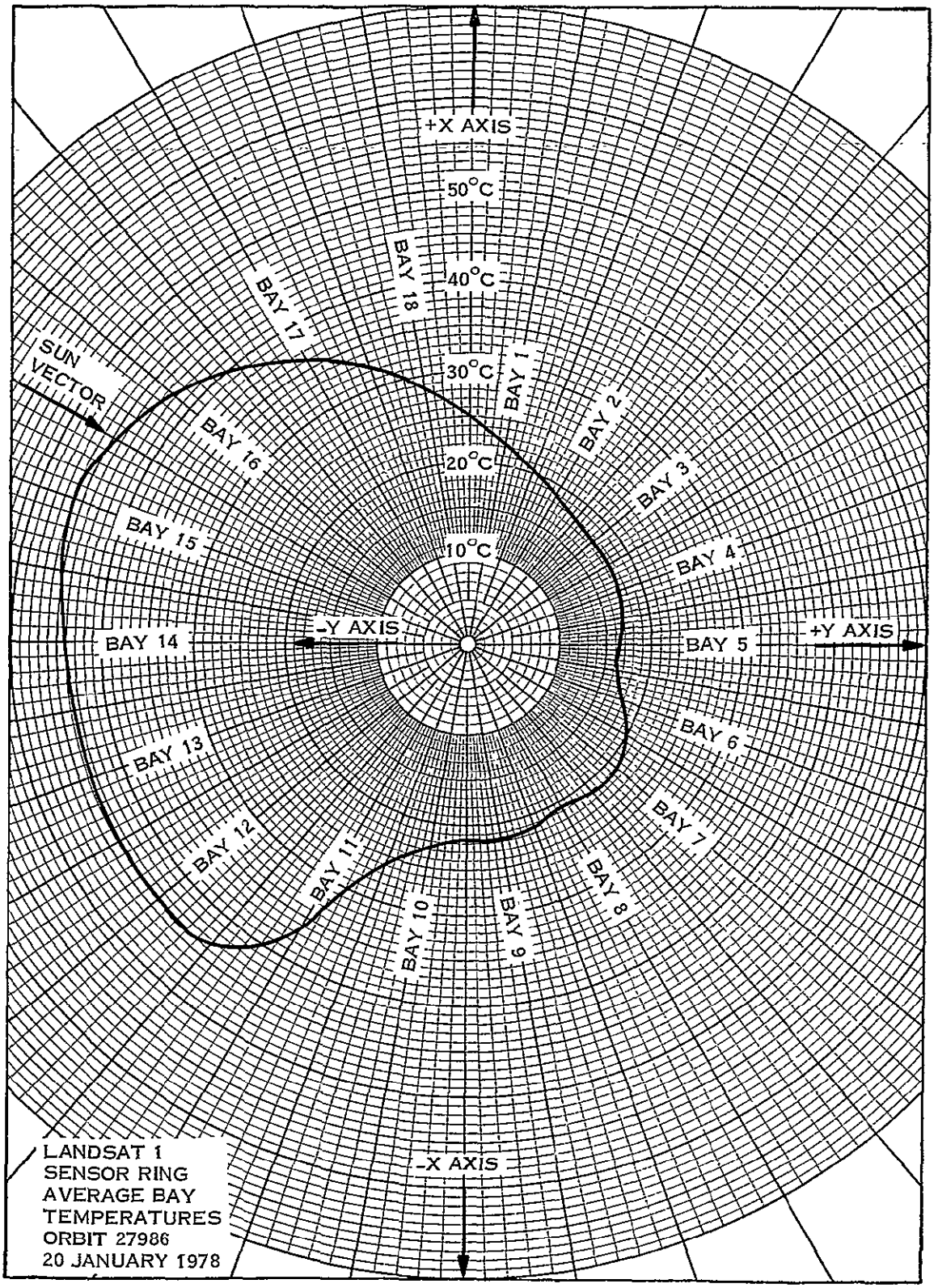


Figure 11-1. Landsat-1 Sensory Ring Thermal Profile

Table 11-1. Landsat-1 Thermal Subsystem Analog Telemetry
(Average Value of Frames for Data Received in NBTR Playback)

Function			Orbit								
No.	Description	Unit	26	5098	10182	15254	20364	25455	26943	27443	27986
7001	THM TH01 ST1	DGC	19.52	20.85	21.65	19.48	18.72	19.37	22.02	23.27	27.57
7002	THM TH02 SBO	DGC	18.60	19.95	20.60	18.62	17.87	17.68	19.05	19.68	21.75
7003	THM TH03 STI	DGC	18.48	20.16	20.87	18.11	17.20	16.79	18.77	19.41	21.50
7004	THM TH10 TCB	DGC	19.47	20.25	20.36	19.76	19.75	20.05	24.47	26.07	30.72
7005	THM TH04 STI	DGC	18.39	19.71	20.35	17.86	17.08	16.45	18.15	18.45	19.69
7006	THM TH05 SBO	DGC	17.57	18.39	18.81	17.20	16.47	16.12	17.15	17.18	18.02
7007	OA-X THRUSTER	DGC	21.95	22.95	22.90	22.25	21.33	20.02	21.48	21.67	21.27
7008	THM TH06 STO	DGC	15.95	16.61	16.90	15.34	14.52	13.94	15.04	15.06	15.59
7009	THM TH06 SBI	DGC	19.38	20.35	20.93	18.98	17.86	17.34	18.94	29.18	20.34
7010	THM TH07 STI	DGC	18.61	*	*	*	*	*	*	*	*
7011	THM TH08 STO	DGC	21.78	22.77	22.88	22.03	21.17	19.88	20.97	21.07	19.97
7012	THM TH09 SBI	DGC	21.81	22.87	23.08	22.20	21.66	20.53	22.90	23.71	25.10
7013	THM TH10 SBO	DGC	18.73	19.53	19.64	19.00	18.56	18.14	20.90	21.75	24.97
7014	THM TH11 STI	DGC	22.37	23.35	23.57	22.80	22.88	23.52	28.82	30.69	35.37
7015	THM TH12 SBO	DGC	22.37	23.17	23.03	22.86	23.71	26.48	34.86	37.42	44.88
7016	THM TH13 STI	DGC	20.95	22.02	22.47	22.00	22.89	26.60	35.73	38.68	46.59
7017	RBV BEAM CTR LN	DGC	21.53	22.62	22.84	21.88	21.63	20.98	24.76	26.16	29.52
7018	THM TH14 STO	DGC	20.38	21.40	21.93	21.83	23.19	28.89	41.17	44.65	54.03
7019	NBR RAD OUTBD B4	DGC	5.09	5.86	6.00	4.37	3.31	3.00	4.73	4.99	5.98
7020	THM TH15 SBI	DGC	21.14	23.24	23.99	22.18	23.06	27.64	37.27	40.62	48.99
7021	THM TH16 STI	DGC	20.73	22.90	23.68	21.64	21.68	25.14	33.01	36.08	44.13
7022	THM TH17 SBI	DGC	20.22	22.76	23.56	21.47	20.83	23.89	29.62	32.32	39.58
7023	THM TH18 SBO	DGC	21.90	24.29	25.19	23.47	22.56	24.63	28.81	31.07	37.36
7030	THM TH08 BUR	DGC	16.05	17.07	17.42	15.35	14.62	14.10	15.24	15.45	15.85
7031	THM TH06 BUR	DGC	13.59	14.17	14.28	12.87	12.07	11.32	12.37	12.30	12.56
7032	THM TH09 BUR	DGC	19.92	20.75	20.74	20.17	19.64	18.88	20.64	21.11	22.29
7033	THM TH12 BUR	DGC	21.51	22.16	22.76	22.65	23.67	27.16	37.13	39.89	48.60
7034	THM TH15 BUR	DGC	19.70	21.67	22.38	21.33	22.23	27.22	38.18	41.90	50.91
7035	THM TH18 BUR	DGC	20.11	21.36	22.02	20.54	20.07	21.15	23.88	25.47	29.40
7040	THM TH01 TCB	DGC	19.27	20.46	21.26	19.19	18.59	18.86	20.63	21.23	24.06
7041	THM TH02 TCB	DGC	17.99	19.23	19.89	17.80	17.11	16.90	18.07	18.49	20.21
7042	THM TH03 TCB	DGC	18.34	19.94	20.92	17.79	17.16	16.26	17.98	18.05	18.58
7043	THM TH04 TCB	DGC	18.95	19.94	20.26	18.60	18.00	17.62	18.64	18.76	19.42
7044	THM TH05 TCB	DGC	16.27	16.98	17.32	15.90	15.22	14.86	15.84	15.85	16.59
7045	THM TH07 TCB	DGC	18.41	19.21	19.45	18.25	17.46	16.56	17.77	17.88	17.89
7046	THM TH09 TCB	DGC	19.38	20.37	20.64	19.85	19.17	18.69	20.63	21.28	23.64
7048	THM TH11 TCB	DGC	21.98	22.94	23.18	22.80	23.18	24.50	30.62	32.70	37.84
7049	THM TH12 TCB	DGC	21.92	22.46	22.35	22.30	23.35	27.37	36.82	39.74	47.96
7050	THM TH13 TCB	DGC	21.21	21.99	22.29	22.26	23.62	29.14	40.46	43.81	52.94
7051	THM TH14 TCB	DGC	21.38	22.38	23.82	22.74	23.83	29.19	40.95	44.40	53.35
7052	THM TH16 TCB	DGC	21.30	22.96	26.13	22.68	23.00	27.04	35.76	39.09	47.18
7053	THM TH17 TCB	DGC	21.73	24.03	25.02	23.33	21.89	24.18	29.00	31.44	37.84
7054	THM TH18 TCB	DGC	20.02	22.20	23.35	21.04	20.10	21.42	24.00	25.29	31.66
7060	THM SHUTTER BY 1	DEG	25.85	33.12	38.62	24.41	19.19	21.17	34.95	37.63	54.37
7061	THM SHUTTER BY 2	DEG	6.62	8.65	13.28	1.73	0.00	0.00	.88	2.33	18.75
7062	THM SHUTTER BY 3	DEG	19.96	23.58	30.24	17.30	12.44	8.27	11.92	10.30	10.78
7063	THM SHUTTER BY 4	DEG	30.60	35.71	37.92	29.50	25.00	20.20	24.52	25.51	28.03
7064	THM SHUTTER BY 5	DEG	15.03	16.25	15.00	8.08	4.62	2.31	4.58	5.19	6.92
7065	THM SHUTTER BY 7	DEG	17.14	24.64	21.96	14.50	8.00	4.50	4.50	9.50	5.00
7067	THM SHUTTER BY 9	DEG	33.26	38.44	39.50	38.24	37.50	36.56	46.02	51.16	68.33
7068	THM SHUTTER BY 10	DEG	24.68	28.68	27.31	26.03	24.26	0.00	.00	.00	.00
7069	THM SHUTTER BY 11	DEG	39.66	46.89	48.96	46.97	48.40	54.65	63.75	63.75	63.75
7070	THM SHUTTER BY 12	DEG	43.61	46.63	45.68	45.95	52.19	66.56	66.54	66.55	66.54
7071	THM SHUTTER BY 13	DEG	40.39	46.38	44.79	42.84	44.43	62.25	62.62	62.62	62.62
7072	THM SHUTTER BY 14	DEG	34.20	39.70	41.91	34.28	34.65	42.36	42.36	42.36	42.35
7073	THM SHUTTER BY 15	DEG	45.40	58.74	64.79	55.15	63.60	79.59	80.02	80.14	80.36
7074	THM SHUTTER BY 16	DEG	24.50	48.46	53.54	38.76	40.06	60.09	65.14	65.12	65.25
7075	THM SHUTTER BY 17	DEG	39.06	64.96	61.88	51.06	39.95	57.03	79.23	80.00	80.009
7076	THM SHUTTER BY 18	DEG	29.70	43.15	51.20	35.12	28.09	38.26	58.35	57.71	60.05
7080	THM Q1 T ZENER V	VDC	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19
7081	THM Q2 T ZENER V	VDC	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40
7082	THM Q3 T ZENER V	VDC	8.31	8.31	8.32	8.31	8.31	8.31	8.32	8.32	8.32
7083	THM Q1 S ZENER V	VDC	8.31	8.32	8.35	8.31	8.31	8.31	8.35	8.35	8.36
7084	THM Q2 S ZENER V	VDC	8.19	8.19	8.20	8.19	8.19	8.19	8.22	8.23	8.23
7085	THM Q3 S ZENER V	VDC	8.15	8.15	8.15	8.15	8.15	8.15	8.16	8.18	8.19
7090	THM PSM MOUNT	DGC	21.60	22.54	22.98	21.43	20.98	21.40	26.07	27.80	32.41
7091	THM IND ATTITUDE	DGC	19.40	20.42	20.88	19.13	18.23	17.48	19.29	19.78	21.21
7092	THM RBV-RADIATOR	DGC	15.65	17.22	17.47	16.55	16.52	13.53	17.23	18.61	22.80
7093	THM REVC CTR BM	DGC	20.30	21.61	21.87	20.73	20.69	18.71	22.85	24.41	28.57
7094	THM WBVTR ROOT	DGC	12.96	15.71	16.07	13.77	12.80	12.74	16.59	18.34	23.09
7095	THM WBVTR RAD CT	DGC	4.81	8.17	8.68	6.99	5.99	6.18	8.82	10.19	12.63
7096	THM WBVTR STRAP	DGC	16.62	19.32	19.66	17.29	14.72	15.46	19.11	20.77	25.45
7097	THM WB MT BAY 1	DGC	20.56	19.52	21.37	16.97	16.35	16.57	19.07	20.40	24.49
7098	THM WB MAT BAY 1	DGC	20.22	18.90	20.39	17.12	16.65	17.28	20.32	21.90	26.64
7099	THM WBVTR SEP 3	DGC	18.60	20.55	21.05	18.45	17.09	17.02	19.37	20.21	23.23
7100	THM WBVTR SEP 17	DGC	21.31	23.66	24.23	22.02	20.96	23.36	28.63	31.07	38.03
7101	THM WBVTR 1 CENT	DGC	21.49	23.72	24.01	21.63	18.23	19.20	22.79	24.41	29.57
7102	THM WBVTR 2 BAY	DGC	17.46	18.92	19.32	17.23	16.31	16.11	18.18	18.81	20.93
7103	THM WBVTR 2 BY 15	DGC	21.00	23.16	23.82	21.73	21.33	24.43	31.92	34.83	42.74
7104	THM WBVTR 2 CTR	DGC	19.35	21.51	21.81	19.54	17.53	18.67	23.17	25.07	30.71
7105	THM NBTR B SEP 6	DGC	18.06	19.30	19.79	17.82	16.74	16.47	18.95	19.80	22.14
7106	THM NBTR B SEP 1	DGC	20.82	22.35	22.89	21.61	22.04	25.47	34.02	37.01	45.04
7107	THM NBTR BM CTR	DGC	19.37	21.04	21.34	19.51	18.94	19.52	24.7	25.90	31.00
7108	THM MSS MOUNT 14	DGC	19.18	21.15	21.70	20.06	20.70	24.29	32.73	35.72	43.90
7109	THM OA -Y THRUSTER	DGC	22.21	23.80	24.69	24.40	26.22	32.05	43.93	48.16	55.24
7110	THM MSS WBVTR BM	DGC	18.14	20.06	20.53	18.18	17.38	17.48	20.76	22.10	25.93
7111	THM OA +X THRUSTER	DGC	20.30	19.92	21.22	18.07	17.57	17.93	20.56	21.98	22.92
7130	THM AUX P1 T	DGC	15.69	8.49	-18.90	9.68	10.29	13.92	19.23	17.02	-2.34
7131	THM AUX P2 T	DGC	10.63	1.59	.41	5.64	25.81	28.79	38.46	38.03	35.41

*Function 7010 became invalid after an integrated circuit chip failure in the TMP on Orbit 4396.

FOLDOUT FRAME 1

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Table 11-2. Landsat-1 Compensation Load History

	Compensation Load Status*							
Orbits	1	2	3	4	5	6	7	8
Launch	0	0	0	0	0	0	0	0
2	0	0	x	x	x	0	x	x
6	x	x	x	x	x	0	x	x
118	0	0	0	0	0	0	0	0
156	x	x	x	x	x	0	x	x
194	0	0	0	0	0	0	0	0
197	x	x	x	x	x	0	x	x
701	x	x	0	x	x	0	x	x
1410	x	x	0	x	x	0	0	x
3484	x	x	x	x	x	0	0	x
3644	x	x	0	x	x	0	0	x
3646	x	x	x	x	x	0	0	x
4177	x	x	0	x	x	0	0	x
6872	x	x	x	x	x	0	0	x
6966	x	x	0	x	x	0	0	x
8291	x	x	x	x	x	0	0	x
8348	x	x	0	x	x	0	0	x
8449	x	x	x	x	x	0	0	x
8472	x	x	0	x	x	0	0	x
8538	x	x	x	x	x	0	0	x
8928	x	x	0	x	x	0	0	x
9898	x	x	x	x	x	0	0	x
10410	x	x	0	x	x	0	0	x
11125	0	0	0	0	0	0	0	0
11126	x	x	0	x	x	0	0	x
11127	0	0	0	0	0	0	0	0
11133	x	x	0	x	x	0	0	x
12604	x	x	x	x	x	0	0	x
13206	x	x	0	x	x	0	0	0
15584	x	x	0	0	x	0	0	0
22487	x	x	0	0	0	0	0	0
23113	0	0	0	0	0	0	0	0

*Note: x = ON; 0 = OFF

SECTION 12

NARROWBAND TAPE RECORDERS (NBR)
LANDSAT-1

SECTION 12

NARROW BAND TAPE RECORDERS (NBR)

Narrowband Recorder-A operated satisfactorily during this report period, and has provided coverage for MSS real-time operations as well as approximately 3-1/2 hours daily of normal orbital telemetry recording and playback functions.

Table 12-1 gives cumulative operating hours for both recorders by modes, and Table 12-2 gives typical telemetry values.

Table 12-1. NBR Operating Hours by Modes, Landsat-1

NBR	ON	OFF	Playback	Record
A	18,645	29,697	749	17,896
B(F)	11,909	12,666	476	11,433

F - Not used since Orbit 15,253, 22 July 1975

Table 12-2. Narrowband Tape Recorder Telemetry Values, Landsat-1

Function		Typical Telemetry Values - Orbits								
No.	Name	6	3750-3751	10862	15256	20375	25368	26943-27165	27443-27555	27950-27969
10001	A - Motor Cur. (ma)									
	Record	190.10	189.20	186.31	192.63	196.20	183.26	184.00	181.32	175.36
	P/B	180.00	178.69	180.00	N	192.60	198.41	184.74	176.84	175.26
10101	B - Motor Cur. (ma)									
	Record	193.26	193.04	198.95	198.95	F	F	F	F	F
	P/B	188.18	185.44	187.89	202.1	F	F	F	F	F
10002	A - Pwr Sup. Cur. (ma)									
	Record	320.56	338.20	339.81	343.24	343.20	341.74	339.62	340.22	341.92
	P/B	535.78	568.38	567.75	N	572.90	576.97	566.19	556.06	556.06
10102	B - Pwr Sup. Cur. (ma)									
	Record	317.62	336.05	350.00	346.75	F	F	F	F	F
	P/B	570.78	553.63	567.50	580.51	F	F	F	F	F
10003	A - Rec. Temp. (DGC)	25.47	34.40	23.60	22.00	20.80	22.88	24.44	25.28	28.02
10103	B - Rec. Temp. (DGC)	24.58	23.41	23.41	23.18	18.40	18.40	20.74	21.52	22.99
10004	A - Supply (VDC)	-24.47	-24.44	-24.62	-24.62	-24.60	-24.58	-24.57	-24.56	-24.53
10104	B - Supply (VDC)	-24.44	-24.51	-24.29	-24.57	-24.70	-24.72	-24.71	-24.71	-24.71

N - Data not available
F - Unit Off

SECTION 13

WIDEBAND TELEMETRY SUBSYSTEM (WBTS)
LANDSAT-1

SECTION 13

WIDEBAND TELEMETRY SUBSYSTEM (WBTS)

The Wideband Telemetry Subsystem has operated nominally in this report period.

WBPA-2 was last used during Orbit 27805 on January 7, 1978 when ACS and command problems prompted an advancement of the scheduled shut-down date (January 16, 1978) of Landsat-1 operations in preparation for the launch of Landsat-3.

WBPA-1 was last used during Orbit 2100 on 21 December 1972.

Table 13-1 shows typical telemetry values since launch. All are nominal.

AGC readings at Goldstone continue to show nominal values. (See Figure 13-1).

Table 13-1. Wideband Modulator Telemetry Values, Landsat-1

WBPA-1

Function			Orbits			
Number	Name		26	1894	1944	2095
12001	Tmpt TWT Coll.	(DgC)	35.7	39.20	39.90	39.90
12002	Helix Current	(Ma)	6.08	6.49	6.58	6.78
12003	TWT Cath. Curr.	(Ma)	45.89	43.54	43.48	45.01
12004	Forward Pwr	(DBM)	43.18	42.88	42.61	43.15
12005	Reflected Pwr	(DBM)	34.95	34.99	34.80	35.21
12227	Loop Str. AFC Con Volt (1)	(MHz)	-0.39	-1.29	-0.86	-0.67
12229	Mod Temp VCO	(DgC)	21.93	20.31	20.88	20.39
12232	+15 VDC Pwr Sup A (2)	(TMV)	2.69	2.69	2.65	2.62
12234	-15 VDC Pwr Sup A	(TMV)	5.98	5.96	5.73	5.78
12235	+5 VDC Pwr Sup A	(TMV)	3.94	3.94	3.94	3.95
12238	-5 VDC Pwr Sup A	(TMV)	5.28	5.26	5.18	5.12
12240	-24 VDC Unreg Volt A	(TMV)	5.56	5.51	5.42	5.49
12242	Inv. Temp	(DgC)	20.60	23.43	24.71	24.04

WBPA-2

Function			Orbits								
Number	Name		33	4096	10602	15233	20358	25452	26943	27443	27723
12101	Temp TWT Coll. (Max)	(DgC)	35.38	34.24	35.96	29.77	33.90	29.61	33.07	31.92	33.65
12102	Helix Current	(Ma)	7.32	7.70	7.67	7.90	7.82	7.90	7.90	7.85	7.85
12103	TWT Cath. Cur.	(Ma)	44.30	43.85	42.72	43.70	42.83	43.84	42.42	42.40	43.64
12104	Forward Pwr	(DBM)	43.57	43.57	43.47	43.52	43.41	43.38	43.37	43.33	43.34
12105	Reflected Pwr	(DBM)	31.59	32.79	32.62	33.07	32.60	32.97	32.39	32.35	32.32
12228	Loop Str. AFC Con Volt (1)	(MHz)	1.11	-0.78	-1.12	-1.05	-1.53	-2.13	-2.09	-2.77	-2.32
12229	Mod Temp VCO	(DgC)	21.70	20.88	21.50	21.78	23.65	18.09	20.56	21.03	19.61
12232	+15 VDC Pwr Sup A (2)	(TMV)	2.68	2.69	2.69	2.65	2.66	2.69	2.69	2.69	2.69
12234	-15 VDC Pwr Sup A	(TMV)	5.90	5.98	5.92	5.81	5.85	5.97	5.94	5.96	5.93
12236	+5 VDC Pwr Sup A	(TMV)	3.97	4.01	4.01	3.97	3.96	4.01	4.01	4.01	4.01
12239	-5 VDC Pwr Sup A	(TMV)	5.24	D	D	D	D	D	D	D	D
12240	-24.5 VDC Unreg Volt A	(TMV)	5.43	5.52	5.46	5.44	5.37	5.61	5.51	5.33	5.45
12242	Inv. Temp	(DgC)	23.03	22.96	23.86	23.66	22.73	21.10	23.06	24.25	26.74

(1) Satisfactory if not -14.0 or +14.0. (2) B Power Supply not yet used in orbit

D - Defection Telemetry Point

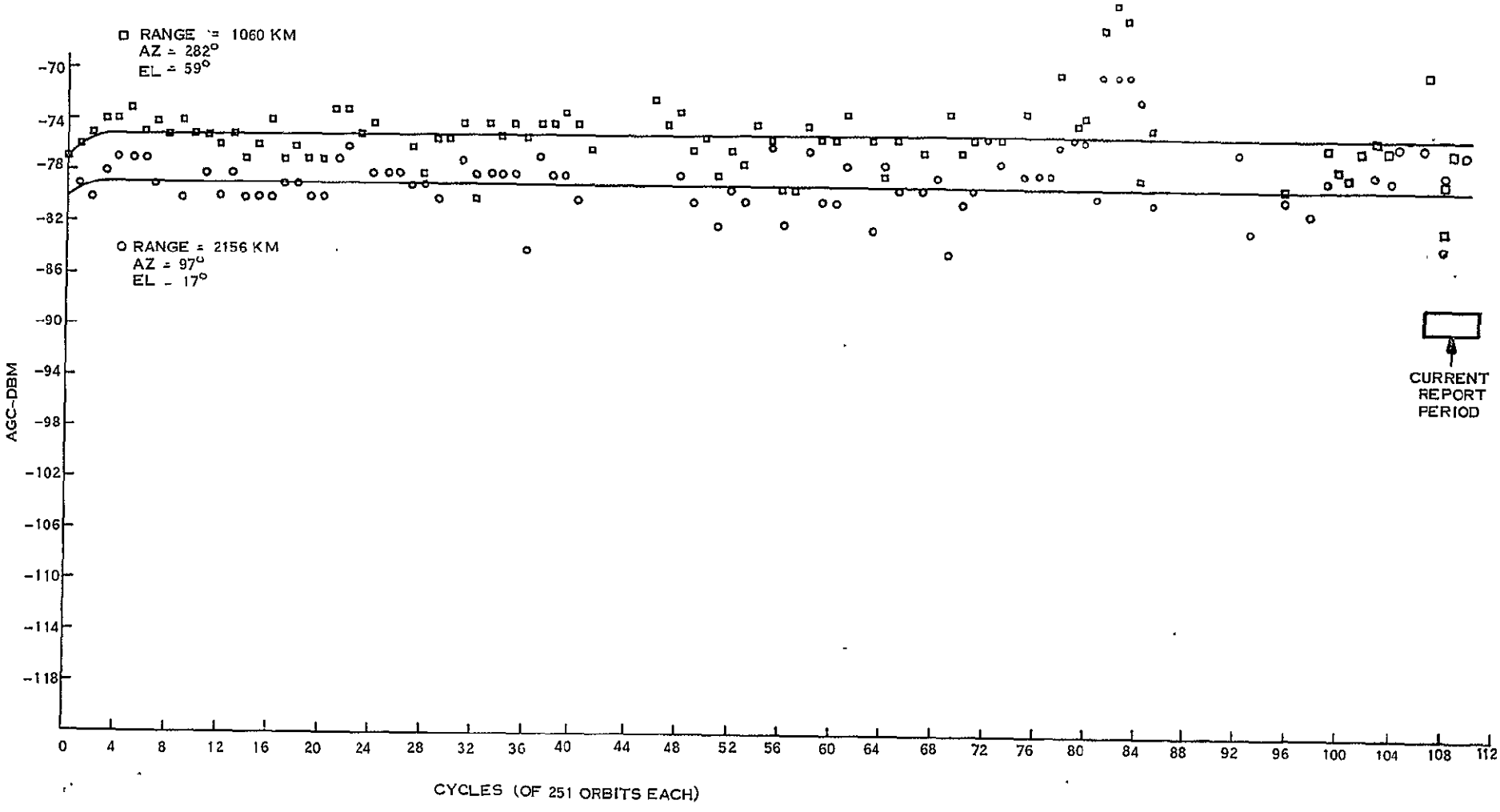


Figure 13-1. WPA-2 (Link 3) AGC Readings at Goldstone with 30' Antenna - Landsat-1

SECTION 14

ATTITUDE MEASUREMENT SENSOR (AMS)
LANDSAT-1

SECTION 14

ATTITUDE MEASUREMENT SYSTEM (AMS)

The AMS subsystem was launched in the OFF mode and energized in Orbit 6. Its performance since Orbit 6 has been without incident. Attitude measurements made with the AMS are in good agreement with ACS fine attitude error measurements.

Table 14-1 gives typical AMS telemetry values. All are nominal.

Table 14-1. Landsat-1 AMS Temperature Telemetry

Function	Description	Units	Orbits								
			35	5099	10182	15254	20364	25523	26943	27443	27950
3004	Case-Temp 1	DGC	18.92	19.42	19.71	18.54	18.23	17.28	19.24	20.10	21.24
3005	Assembly-Temp 2	DGC	19.15	19.76	19.96	18.73	18.51	17.54	19.57	20.53	21.77

SECTION 15

WIDEBAND VIDEO TAPE RECORDERS (WBVTR)
LANDSAT-1

SECTION 15

WIDEBAND VIDEO TAPE RECORDERS (WBVTR)

WBVTR-2 has not been operated since its failure in Orbit 148, 3 August 1972.

WBVTR-1 was removed from operational service after Orbit 9881, 2 July 1974, because of high minor frame sync error counts. The recorder has remained inactive since suspension of engineering tests after Orbit 10861, 10 September 1974.

SECTION 16

RETURN BEAM VIDICON (RBV)
LANDSAT-1

SECTION 16

RETURN BEAM VIDICON (RBV)

The RBV has not been reactivated since Orbit 196, but it is capable of operation through individual component power switching. An assessment of the RBV performance was given in ERTS-1 Flight Evaluation Report 23 July to 23 October 1972.

SECTION 17

MULTISPECTRAL SCANNER SUBSYSTEM (MSS)
LANDSAT-1

SECTION 17

MULTISPECTRAL SCANNER SUBSYSTEM (MSS)

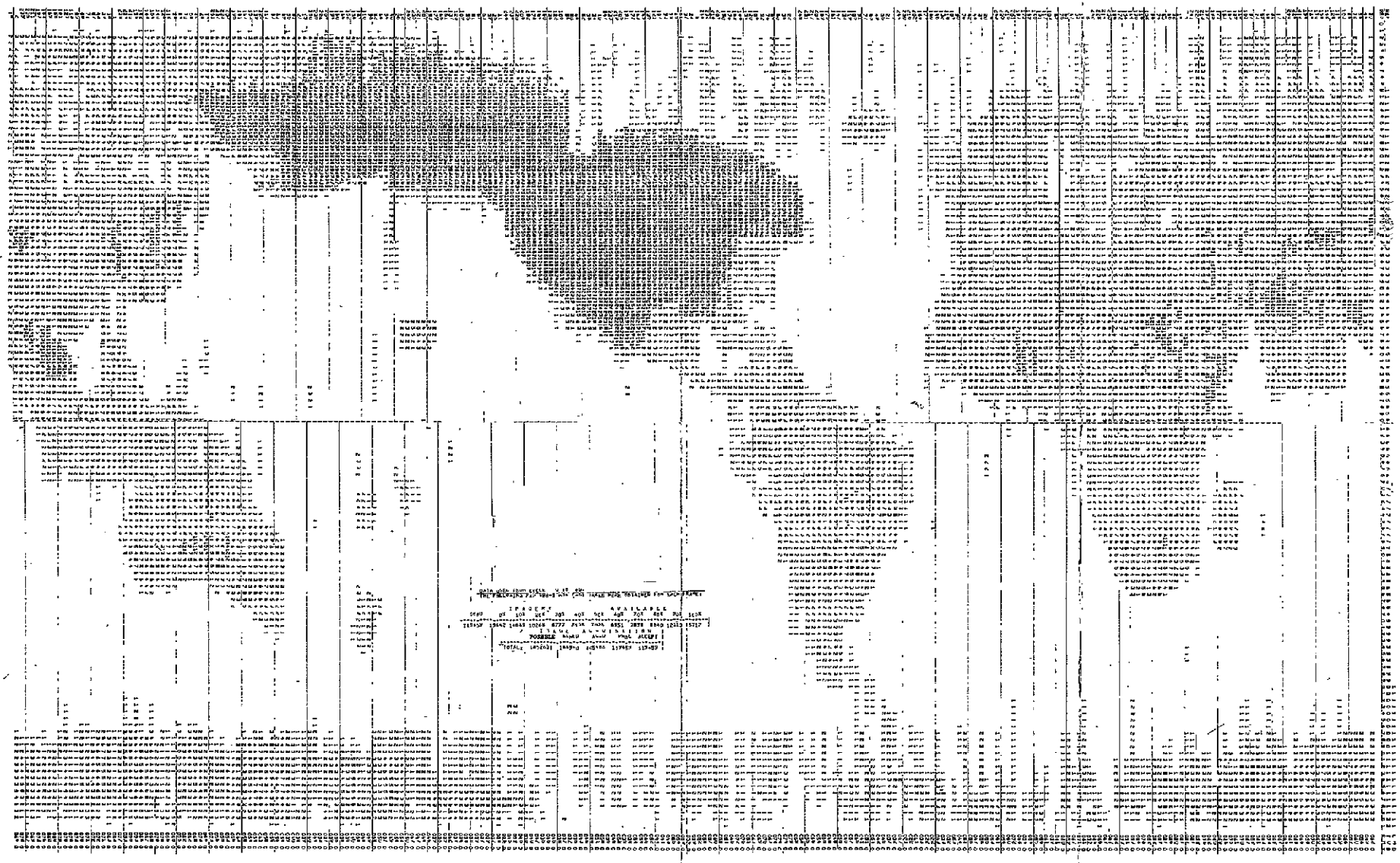
MSS was last used during Orbit 27805 on 7 January, 1978, when ACS and command problems prompted an advancement of the scheduled shut-down date (January 16, 1978) of Landsat-1 operations in preparation for the launch of Landsat-3.

Band 1 (0.5 to 0.6 micrometers), the green band, had been turned off because of a failure, probably in the $\pm$15 V power supply, on March 3, 1977 during Orbit 23480.

Figure 17-1 shows the number of scenes imaged at each geographical location in the first three years of operation. Figure 17-2 shows the number of scenes imaged since the first three years. In these maps, only those scenes received by U.S. ground stations are shown. Scenes transmitted to Canada, Brazil and Italy (44% of total) are not shown.

Table 17-1 shows typical MSS Telemetry Values for this report period. All are nominal. Table 17-2 shows the history of sensor response to a constant input radiance level. Each sensor is sampled at 5 radiance levels, and all show essentially the same trends. Only one of these levels (the second highest) is listed in Table 17-2. Sensor 22 has declined most (22%) since launch. This is twice the average sensor decline. Line length history is also shown in Table 17-2, and is nominal.

Sun calibrations, performed every two weeks, continue to show nominal performance.



FOLDOUT FRAME 1

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FOLDOUT FRAME 2

Figure 17-1. Computer Map of MSS Scenes for First Three Years Operation - Landsat-1

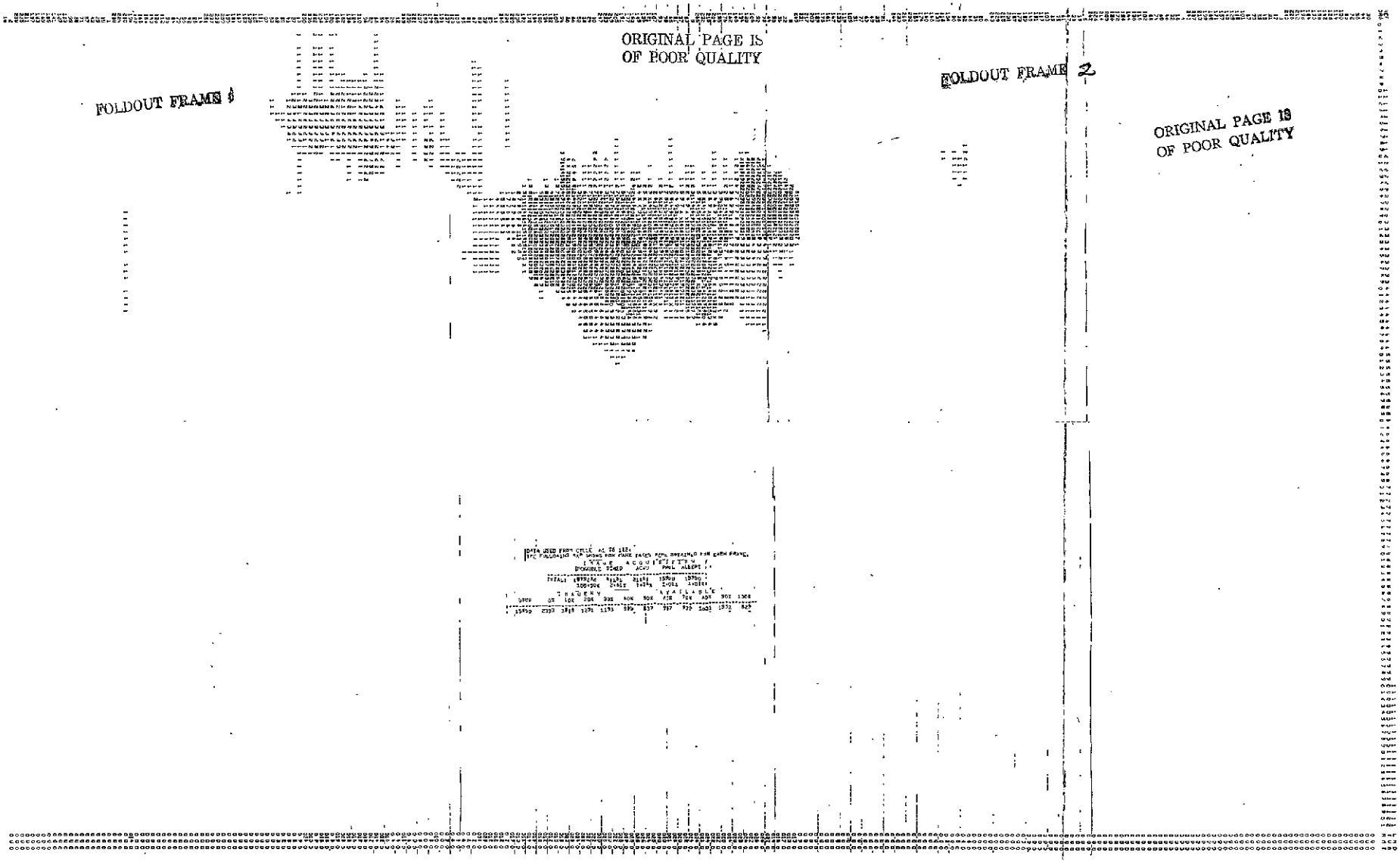

Figure 17-2. Scenes from End of Three-Year Period to Present Quarter - Landsat-1

Table 17-1. MSS Telemetry Values

Function No.	Name	Telemetry Values in Orbits								
		Units	20	5060	10587	15233	20358	25452	26943	27443	27706
15044	FOPT 2 T	(DGC)	17.46	19.84	19.75	18.15	18.07	17.50	21.20	22.57	25.44
15046	ELEC CVR T	(DGC)	19.37	21.83	21.96	20.20	20.11	19.46	22.14	24.02	26.24
15048	SCAN MIR REG T	(DGC)	16.35	19.77	20.48	20.94	21.90	21.14	24.52	26.75	29.62
15050	SCAN MIR DR. COIL T	(DGC)	15.94	19.30	19.78	19.21	19.96	19.56	24.13	25.96	28.67
15052	ROT SHUT HSG T	(DGC)	16.91	20.07	20.23	18.74	18.78	18.17	21.64	23.24	25.51
15043	FOPT 1 T	(DGC)	17.67	20.01	19.93	18.35	18.28	17.76	21.39	22 83	25.51
15045	MUX T	(DGC)	21.19	22.03	23.87	26.92	28.63	28.58	32.58	35.68	38.26
15047	PWR SUP T	(DGC)	17.41	20.00	20.21	19.83	20.28	19.14	22.39	24.50	27.34
15049	SCAN MIR DR. ELC T	(DGC)	16.12	19.41	20.23	21.16	22.41	21.22	24.32	26.35	28.96
15051	SCAN MIR HSG T	(DGC)	15.60	19.05	19.49	18.40	19.04	18.92	23.84	25.83	28.57
15040	MUX -6 VDC	(TMV)	4.03	4.03	3.98	4.02	4.03	4.03	4.03	4.03	4.03
15042	AVE DENS DATA	(TMV)	1.67	2.13	2.05	2.28	2.28	2.06	2.07	1.82	1.91
14054	CAL LAMP CUR A	(TMV)	1.12	1.12	1.12	1.12	1.12	1.10	1.10	1.10	1.10
15056	BAND 2 $\pm$15 VDC	(TMV)	5.10	5.10	5.04	5.10	5.10	5.10	5.08	5.10	5.10
15058	BAND 4 $\pm$15 VDC	(TMV)	5.10	5.10	5.04	5.10	5.10	5.10	5.10	5.10	5.10
15060	+12 -6 VDC REG	(TMV)	4.82	5.02	4.97	5.02	5.02	5.02	5.01	5.01	5.02
15062	+19 VDC REC OUT	(TMV)	4.80	4.90	4.97	5.03	5.03	5.08	5.01	5.01	5.01
15064	BAND 1 HV A	(TMV)	5.10	5.16	5.12	5.12	5.12	F	F	F	F
15066	BAND 2 HV A	(TMV)	4.50	4.52	4.52	4.50	4.50	4.50	4.52	4.52	4.52
15068	BAND 3 HV A	(TMV)	4.60	4.62	4.62	4.62	4.62	4.62	4.62	4.62	4.63
15070	SHUT MOT CON OUT	(TMV)	2.43	2.44	2.47	2.51	2.50	2.50	2.49	2.48	2.48
15041	A/D SUPPLY	(TMV)	5.93	5.93	5.87	5.93	5.92	5.93	5.93	5.92	5.93
15053	SCAN MIR REG V	(TMV)	4.42	4.51	4.51	4.61	4.61	4.61	4.61	4.61	4.61
15055	BAND 1 $\pm$15V	(TMV)	4.97	4.97	4.92	4.97	4.97	Q	Q	Q	Q
15057	BAND 3 +15V	(TMV)	5.00	5.00	4.94	5.00	5.00	5.00	5.00	5.00	4.99
15059	-15 VDC TEL.	(TMV)	5.02	5.02	5.02	5.02	5.02	5.02	5.02	5.02	5.02
15061	+5 VDC LOGIC REG	(TMV)	4.82	4.81	4.77	4.76	4.78	4.73	4.77	4.78	4.78
15063	-19 VDC REG OUT	(TMV)	3.43	3.39	3.50	3.58	3.57	3.55	3.57	3.58	3.58
15071	SCAN MIR DR. CLK	(TMV)	1.93	1.97	1.98	2.00	1.96	2.00	2.00	2.00	2.00

F - Unit Off
Q - Power Supply Failure

Table 17-2. MSS Response History Landsat-1

Quantum Level for Selected Word (0=Black: 63=White)

Band	Sensor	Value at Launch	1st Year	2nd Year	3rd Year	4th Year	5th Year	21-22 Quarter	% Chg. Since Launch
			2-4 Quar.	5-8 Quar.	9-12 Quar.	13-16 Quar.	17-20 Quar.		
1	1	43	39	39	38	37	37	POWER SUPPLY FAILED	
	2	44	39	40	40	39	38.5		
	3	43	38	40	40	39	39.5		
	4	43	38	39	39	38	37.5		
	5	41	36	35	34	32	31		
	6	43	39	41	41	40	39		
2	7	47	43	43	42	41	41	41	-13
	8	46	41.5	41	41	40	40	40	-13
	9	47	44	42.5	42	41	39	40	-15
	10	46	42	41.5	41	41	40	40	-13
	11	47	42.5	42	42	41	41	41	-13
	12	45	42	42.5	42	42	42	42	- 7
3	13	46	46	49	51	52	53	54	17
	14	44	42	42	42	42	43	42	- 5
	15	45	42.5	42	41	41	41	41	- 9
	16	40	37.5	37.5	37	37	37	37	- 8
	17	42	39	40	40	40	41	41	- 2
	18	44	40	40.5	41	41	41	41	- 2
4	19	28	28	27	25	23	23	22	-21
	20	25	26	25	23	21	20	20	-20
	21	26	27	26.5	25	23	22	22	-15
	22	23	23	22	21	19	19	18	-22
	23	22	22.5	23	21	21	20	21	- 5
	24	24	23.5	24	23	22	22	22	- 8
Line Length		3221	3219	3217	3216	3217	3215	3211	- 0.3

SECTION 18

DATA COLLECTION SUBSYSTEM (DCS)
LANDSAT-1

SECTION 18

DATA COLLECTION SUBSYSTEM (DCS)

The Data Collection Subsystem was turned OFF after Orbit 12690 on 19 January 1975 and the Data Collection mission was assumed by Landsat-2 at that time. The Landsat-1 Data Collection Subsystem is capable of resuming operational status, if desired.

APPENDIX A

LANDSAT-1 ANOMALY LIST

APPENDIX B

LANDSAT-1 SPACECRAFT ORBIT REFERENCE TABLES

LANDSAT-1

SPACECRAFT ORBIT REFERENCE TABLES

FROM AUGUST 1977 THROUGH JUNE 1978

ORBIT 25578 THROUGH 30235

FLIGHT DAY 1835 THROUGH 2168

LANDSAT-1

AUG. 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	213	1835	25578-25591	154-167	12	102
2	214	1836	25592-25605	168-181	13	102
3	215	1837	25606-25619	182-195	14	102
4	216	1838	25620-25633	196-209	15	102
5	217	1839	25634-25647	210-223	16	102
6	218	1840	25648-25661	224-237	17	102
7	219	1841	25662-25675	238-251	18	102
8	220	1842	25676-25689	1- 14	1	103
9	221	1843	25690-25703	15- 28	2	103
10	222	1844	25704-25717	29- 42	3	103
11	223	1845	25718-25731	43- 56	4	103
12	224	1846	25732-25745	57- 70	5	103
13	225	1847	25746-25759	71- 84	6	103
14	226	1848	25760-25773	85- 98	7	103
15	227	1849	25774-25786	99-111	8	103
16	228	1850	25787-25800	112-125	9	103
17	229	1851	25801-25814	126-139	10	103
18	230	1852	25815-25828	140-153	11	103
19	231	1853	25829-25842	154-167	12	103
20	232	1854	25843-25856	168-181	13	103
21	233	1855	25857-25870	182-195	14	103
22	234	1856	25871-25884	196-209	15	103
23	235	1857	25885-25898	210-223	16	103
24	236	1858	25899-25912	224-237	17	103
25	237	1859	25913-25926	238-251	18	103
26	238	1860	25927-25940	1- 14	1	104
27	239	1861	25941-25954	15- 28	2	104
28	240	1862	25955-25968	29- 42	3	104
29	241	1863	25969-25982	43- 56	4	104
30	242	1864	25983-25996	57- 70	5	104
31	243	1865	25997-26010	71- 84	6	104

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SEP 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	244	1866	26011-26024	85- 98	7	104
2	245	1867	26025-26037	99-111	8	104
3	246	1868	26038-26051	112-125	9	104
4	247	1869	26052-26065	126-139	10	104
5	248	1870	26066-26079	140-153	11	104
6	249	1871	26080-26093	154-167	12	104
7	250	1872	26094-26107	168-181	13	104
8	251	1873	26108-26121	182-195	14	104
9	252	1874	26122-26135	196-209	15	104
10	253	1875	26136-26149	210-223	16	104
11	254	1876	26150-26163	224-237	17	104
12	255	1877	26164-26177	238-251	18	104
13	256	1878	26178-26191	1- 14	1	105
14	257	1879	26192-26205	15- 28	2	105
15	258	1880	26206-26219	29- 42	3	105
16	259	1881	26220-26233	43- 56	4	105
17	260	1882	26234-26247	57- 70	5	105
18	261	1883	26248-26261	71- 84	6	105
19	262	1884	26262-26275	85- 98	7	105
20	263	1885	26276-26288	99-111	8	105
21	264	1886	26289-26302	112-125	9	105
22	265	1887	26303-26316	126-139	10	105
23	266	1888	26317-26330	140-153	11	105
24	267	1889	26331-26344	154-167	12	105
25	268	1890	26345-26358	168-181	13	105
26	269	1891	26359-26372	182-195	14	105
27	270	1892	26373-26386	196-209	15	105
28	271	1893	26387-26400	210-223	16	105
29	272	1894	26401-26414	224-237	17	105
30	273	1895	26415-26428	238-251	18	105

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OCT 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	274	1896	26429-26442	1- 14	1	106
2	275	1897	26443-26456	15- 28	2	106
3	276	1898	26457-26470	29- 42	3	106
4	277	1899	26471-26484	43- 56	4	106
5	278	1900	26485-26498	57- 70	5	106
6	279	1901	26499-26512	71- 84	6	106
7	280	1902	26513-26526	85- 98	7	106
8	281	1903	26527-26539	99-111	8	106
9	282	1904	26540-26553	112-125	9	106
10	283	1905	26554-26567	126-139	10	106
11	284	1906	26568-26581	140-153	11	106
12	285	1907	26582-26595	154-167	12	106
13	286	1908	26596-26609	168-181	13	106
14	287	1909	26610-26623	182-195	14	106
15	288	1910	26624-26637	196-209	15	106
16	289	1911	26638-26651	210-223	16	106
17	290	1912	26652-26665	224-237	17	106
18	291	1913	26666-26679	238-251	18	106
19	292	1914	26680-26693	1- 14	1	107
20	293	1915	26694-26707	15- 28	2	107
21	294	1916	26708-26721	29- 42	3	107
22	295	1917	26722-26735	43- 56	4	107
23	296	1918	26736-26749	57- 70	5	107
24	297	1919	26750-26763	71- 84	6	107
25	298	1920	26764-26777	85- 98	7	107
26	299	1921	26778-26790	99-111	8	107
27	300	1922	26791-26804	112-125	9	107
28	301	1923	26805-26818	126-139	10	107
29	302	1924	26819-26832	140-153	11	107
30	303	1925	26833-26846	154-167	12	107
31	304	1926	26847-26860	168-181	13	107

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NOV 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	305	1927	26861-26874	182-195	14	107
2	306	1928	26875-26888	196-209	15	107
3	307	1929	26889-26902	210-223	16	107
4	308	1930	26903-26916	224-237	17	107
5	309	1931	26917-26930	238-251	18	107
6	310	1932	26931-26944	1- 14	1	108
7	311	1933	26945-26958	15- 28	2	108
8	312	1934	26959-26972	29- 42	3	108
9	313	1935	26973-26986	43- 56	4	108
10	314	1936	26987-27000	57- 70	5	108
11	315	1937	27001-27014	71- 84	6	108
12	316	1938	27015-27028	85- 98	7	108
13	317	1939	27029-27041	99-111	8	108
14	318	1940	27042-27055	112-125	9	108
15	319	1941	27056-27069	126-139	10	108
16	320	1942	27070-27083	140-153	11	108
17	321	1943	27084-27097	154-167	12	108
18	322	1944	27098-27111	168-181	13	108
19	323	1945	27112-27125	182-195	14	108
20	324	1946	27126-27139	196-209	15	108
21	325	1947	27140-27153	210-223	16	108
22	326	1948	27154-27167	224-237	17	108
23	327	1949	27168-27181	238-251	18	108
24	328	1950	27182-27195	1- 14	1	109
25	329	1951	27196-27209	15- 28	2	109
26	330	1952	27210-27223	29- 42	3	109
27	331	1953	27224-27237	43- 56	4	109
28	332	1954	27238-27251	57- 70	5	109
29	333	1955	27252-27265	71- 84	6	109
30	334	1956	27266-27279	85- 98	7	109

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DEC. 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	335	1957	27280-27292	99-111	8	109
2	336	1958	27293-27306	112-125	9	109
3	337	1959	27307-27320	126-139	10	109
4	338	1960	27321-27334	140-153	11	109
5	339	1961	27335-27348	154-167	12	109
6	340	1962	27349-27362	168-181	13	109
7	341	1963	27363-27376	182-195	14	109
8	342	1964	27377-27390	196-209	15	109
9	343	1965	27391-27404	210-223	16	109
10	344	1966	27405-27418	224-237	17	109
11	345	1967	27419-27432	238-251	18	109
12	346	1968	27433-27446	1- 14	1	110
13	347	1969	27447-27460	15- 28	2	110
14	348	1970	27461-27474	29- 42	3	110
15	349	1971	27475-27488	43- 56	4	110
16	350	1972	27489-27502	57- 70	5	110
17	351	1973	27503-27516	71- 84	6	110
18	352	1974	27517-27530	85- 98	7	110
19	353	1975	27531-27543	99-111	8	110
20	354	1976	27544-27557	112-125	9	110
21	355	1977	27558-27571	126-139	10	110
22	356	1978	27572-27585	140-153	11	110
23	357	1979	27586-27599	154-167	12	110
24	358	1980	27600-27613	168-181	13	110
25	359	1981	27614-27627	182-195	14	110
26	360	1982	27628-27641	196-209	15	110
27	361	1983	27642-27655	210-223	16	110
28	362	1984	27656-27669	224-237	17	110
29	363	1985	27670-27683	238-251	18	110
30	364	1986	27684-27697	1- 14	1	111
31	365	1987	27698-27711	15- 28	2	111

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JAN. 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	1	1988	27712-27725	29- 42	3	111
2	2	1989	27726-27739	43- 56	4	111
3	3	1990	27740-27753	57- 70	5	111
4	4	1991	27754-27767	71- 84	6	111
5	5	1992	27768-27781	85- 98	7	111
6	6	1993	27782-27794	99-111	8	111
7	7	1994	27795-27808	112-125	9	111
8	8	1995	27809-27822	126-139	10	111
9	9	1996	27823-27836	140-153	11	111
10	10	1997	27837-27850	154-167	12	111
11	11	1998	27851-27864	168-181	13	111
12	12	1999	27865-27878	182-195	14	111
13	13	2000	27879-27892	196-209	15	111
14	14	2001	27893-27906	210-223	16	111
15	15	2002	27907-27920	224-237	17	111
16	16	2003	27921-27934	238-251	18	111
17	17	2004	27935-27948	1- 14	1	112
18	18	2005	27949-27962	15- 28	2	112
19	19	2006	27963-27976	29- 42	3	112
20	20	2007	27977-27990	43- 56	4	112
21	21	2008	27991-28004	57- 70	5	112
22	22	2009	28005-28018	71- 84	6	112
23	23	2010	28019-28032	85- 98	7	112
24	24	2011	28033-28045	99-111	8	112
25	25	2012	28046-28059	112-125	9	112
26	26	2013	28060-28073	126-139	10	112
27	27	2014	28074-28087	140-153	11	112
28	28	2015	28088-28101	154-167	12	112
29	29	2016	28102-28115	168-181	13	112
30	30	2017	28116-28129	182-195	14	112
31	31	2018	28130-28143	196-209	15	112

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FEB 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	32	2019	28144-28157	210-223	16	112
2	33	2020	28158-28171	224-237	17	112
3	34	2021	28172-28185	238-251	18	112
4	35	2022	28186-28199	1- 14	1	113
5	36	2023	28200-28213	15- 28	2	113
6	37	2024	28214-28227	29- 42	3	113
7	38	2025	28228-28241	43- 56	4	113
8	39	2026	28242-28255	57- 70	5	113
9	40	2027	28256-28269	71- 84	6	113
10	41	2028	28270-28283	85- 98	7	113
11	42	2029	28284-28296	99-111	8	113
12	43	2030	28297-28310	112-125	9	113
13	44	2031	28311-28324	126-139	10	113
14	45	2032	28325-28338	140-153	11	113
15	46	2033	28339-28352	154-167	12	113
16	47	2034	28353-28366	168-181	13	113
17	48	2035	28367-28380	182-195	14	113
18	49	2036	28381-28394	196-209	15	113
19	50	2037	28395-28408	210-223	16	113
20	51	2038	28409-28422	224-237	17	113
21	52	2039	28423-28436	238-251	18	113
22	53	2040	28437-28450	1- 14	1	114
23	54	2041	28451-28464	15- 28	2	114
24	55	2042	28465-28478	29- 42	3	114
25	56	2043	28479-28492	43- 56	4	114
26	57	2044	28493-28506	57- 70	5	114
27	58	2045	28507-28520	71- 84	6	114
28	59	2046	28521-28534	85- 98	7	114

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MAR. 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	60	2047	28535-28547	99-111	8	114
2	61	2048	28548-28561	112-125	9	114
3	62	2049	28562-28575	126-139	10	114
4	63	2050	28576-28589	140-153	11	114
5	64	2051	28590-28603	154-167	12	114
6	65	2052	28604-28617	168-181	13	114
7	66	2053	28618-28631	182-195	14	114
8	67	2054	28632-28645	196-209	15	114
9	68	2055	28646-28659	210-223	16	114
10	69	2056	28660-28673	224-237	17	114
11	70	2057	28674-28687	238-251	18	114
12	71	2058	28688-28701	1- 14	1	115
13	72	2059	28702-28715	15- 28	2	115
14	73	2060	28716-28729	29- 42	3	115
15	74	2061	28730-28743	43- 56	4	115
16	75	2062	28744-28757	57- 70	5	115
17	76	2063	28758-28771	71- 84	6	115
18	77	2064	28772-28785	85- 98	7	115
19	78	2065	28786-28798	99-111	8	115
20	79	2066	28799-28812	112-125	9	115
21	80	2067	28813-28826	126-139	10	115
22	81	2068	28827-28840	140-153	11	115
23	82	2069	28841-28854	154-167	12	115
24	83	2070	28855-28868	168-181	13	115
25	84	2071	28869-28882	182-195	14	115
26	85	2072	28883-28896	196-209	15	115
27	86	2073	28897-28910	210-223	16	115
28	87	2074	28911-28924	224-237	17	115
29	88	2075	28925-28938	238-251	18	115
30	89	2076	28939-28952	1- 14	1	116
31	90	2077	28953-28966	15- 28	2	116

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APR 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE No.
1	91	2078	28967-28980	29- 42	3	116
2	92	2079	28981-28994	43- 56	4	116
3	93	2080	28995-29008	57- 70	5	116
4	94	2081	29009-29022	71- 84	6	116
5	95	2082	29023-29036	85- 98	7	116
6	96	2083	29037-29049	99-111	8	116
7	97	2084	29050-29063	112-125	9	116
8	98	2085	29064-29077	126-139	10	116
9	99	2086	29078-29091	140-153	11	116
10	100	2087	29092-29105	154-167	12	116
11	101	2088	29106-29119	168-181	13	116
12	102	2089	29120-29133	182-195	14	116
13	103	2090	29134-29147	196-209	15	116
14	104	2091	29148-29161	210-223	16	116
15	105	2092	29162-29175	224-237	17	116
16	106	2093	29176-29189	238-251	18	116
17	107	2094	29190-29203	1- 14	1	117
18	108	2095	29204-29217	15- 28	2	117
19	109	2096	29218-29231	29- 42	3	117
20	110	2097	29232-29245	43- 56	4	117
21	111	2098	29246-29259	57- 70	5	117
22	112	2099	29260-29273	71- 84	6	117
23	113	2100	29274-29287	85- 98	7	117
24	114	2101	29288-29300	99-111	8	117
25	115	2102	29301-29314	112-125	9	117
26	116	2103	29315-29328	126-139	10	117
27	117	2104	29329-29342	140-153	11	117
28	118	2105	29343-29356	154-167	12	117
29	119	2106	29357-29370	168-181	13	117
30	120	2107	29371-29384	182-195	14	117

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MAY, 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	121	2108	29385-29398	196-209	15	117
2	122	2109	29399-29412	210-223	16	117
3	123	2110	29413-29426	224-237	17	117
4	124	2111	29427-29440	238-251	18	117
5	125	2112	29441-29454	1- 14	1	118
6	126	2113	29455-29468	15- 28	2	118
7	127	2114	29469-29482	29- 42	3	118
8	128	2115	29483-29496	43- 56	4	118
9	129	2116	29497-29510	57- 70	5	118
10	130	2117	29511-29524	71- 84	6	118
11	131	2118	29525-29538	85- 98	7	118
12	132	2119	29539-29551	99-111	8	118
13	133	2120	29552-29565	112-125	9	118
14	134	2121	29566-29579	126-139	10	118
15	135	2122	29580-29593	140-153	11	118
16	136	2123	29594-29607	154-167	12	118
17	137	2124	29608-29621	168-181	13	118
18	138	2125	29622-29635	182-195	14	118
19	139	2126	29636-29649	196-209	15	118
20	140	2127	29650-29663	210-223	16	118
21	141	2128	29664-29677	224-237	17	118
22	142	2129	29678-29691	238-251	18	118
23	143	2130	29692-29705	1- 14	1	119
24	144	2131	29706-29719	15- 28	2	119
25	145	2132	29720-29733	29- 42	3	119
26	146	2133	29734-29747	43- 56	4	119
27	147	2134	29748-29761	57- 70	5	119
28	148	2135	29762-29775	71- 84	6	119
29	149	2136	29776-29789	85- 98	7	119
30	150	2137	29790-29802	99-111	8	119
31	151	2138	29803-29816	112-125	9	119

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JUN-1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	152	2139	29817-29830	126-139	10	119
2	153	2140	29831-29844	140-153	11	119
3	154	2141	29845-29858	154-167	12	119
4	155	2142	29859-29872	168-181	13	119
5	156	2143	29873-29886	182-195	14	119
6	157	2144	29887-29900	196-209	15	119
7	158	2145	29901-29914	210-223	16	119
8	159	2146	29915-29928	224-237	17	119
9	160	2147	29929-29942	238-251	18	119
10	161	2148	29943-29956	1- 14	1	120
11	162	2149	29957-29970	15- 28	2	120
12	163	2150	29971-29984	29- 42	3	120
13	164	2151	29985-29998	43- 56	4	120
14	165	2152	29999-30012	57- 70	5	120
15	166	2153	30013-30026	71- 84	6	120
16	167	2154	30027-30040	85- 98	7	120
17	168	2155	30041-30053	99-111	8	120
18	169	2156	30054-30067	112-125	9	120
19	170	2157	30068-30081	126-139	10	120
20	171	2158	30082-30095	140-153	11	120
21	172	2159	30096-30109	154-167	12	120
22	173	2160	30110-30123	168-181	13	120
23	174	2161	30124-30137	182-195	14	120
24	175	2162	30138-30151	196-209	15	120
25	176	2163	30152-30165	210-223	16	120
26	177	2164	30166-30179	224-237	17	120
27	178	2165	30180-30193	238-251	18	120
28	179	2166	30194-30207	1- 14	1	121
29	180	2167	30208-30221	15- 28	2	121
30	181	2168	30222-30235	29- 42	3	121

APPENDIX C

LANDSAT-1 DOCUMENTS ISSUED THIS REPORT PERIOD

APPENDIX C

LANDSAT-1 DOCUMENTS ISSUED THIS REPORT PERIOD

No.	Document No.	Title and Date

None issued this report period.

LANDSAT-2

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

INTRODUCTION

This is the 13th report in a continuing series of documents issued at launch, and quarterly thereafter, to present flight performance analyses of the Landsat-2 spacecraft. Previously issued documents are:

Document No.	Title	Date
75SDS4214	Landsat-2 Launch and Flight Activation Evaluation Report, 22 to 26 January 1975, Launch through Orbit 50 and Orbit Adjust Operation.	21 March 1975
75SDS4228	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 January 1975 to 23 April 1975.	15 August 1975
75SDS4255	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 April 1975 to 23 July 1975.	10 October 1975
75SDS4266	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 July 1975 to 23 October 1975.	1 December 1975
76SDS4207	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 October 1975 to 23 January 1976.	29 February 1976
76SDS4248	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 January 1976 to 23 April 1976.	14 July 1976
76SDS4263	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 April 1976 to 23 July 1976.	15 October 1976
76SDS4278	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 July 1976 to 23 October 1976	30 November 1976
77SDS4204	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 October 1976 to 22 January 1977.	22 February 1977
77SDS4228	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 January 1977 to 23 April 1977.	23 May 1977
77SDS4244	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 April to 23 July 1977	22 August 1977

Document No.	Title	Date
77SDS4258	Landsat-1 and Landsat-2 Flight Evaluation Report, 23 July 1977 to 23 October 1977	2 November 1977

This report contains analysis of performance for Orbits 14015 to 15300 for Landsat-2.

SECTION 1

SUMMARY

LANDSAT-2 OPERATIONS

SECTION 1

SUMMARY LANDSAT-2 OPERATIONS

The Landsat-2 spacecraft was launched from the Western Test Range on 22 January 1975, at 022:17:55:51.604. The launch and orbit injection phase of the space flight were nominal and deployment of the spacecraft followed predictions. All systems continue to perform normally except Forward Scanner Pressure, Forward Scanner Pressure Telemetry, and Wideband Video Tape Recorder No. 1 (WBVTR-1). The Forward Scanner Pressure had begun leaking before launch but will not affect scanner performance. The Forward Scanner Pressure (Function 1003) telemetry became erratic in Orbit 2244 on 2 July 1975.

WBVTR-1 failed to rewind during Orbit 1021, 5 April 1975, and had intermittent operation until Orbit 2238, 2 July 1975, when normal operation was resumed. WBVTR-1 had a new anomaly in Orbit 2683 on 3 August 1975 because of failure of one of the 4 heads. As a result, it could not be used with MSS data, but performed satisfactorily with RBV data (because RBV provides a synchronizing pulse which permits data from the bad head to be isolated and eliminated). After Orbit 7181 on 20 June 1976, the recorder was used regularly in service recording RBV data until failure of a second head in Orbit 10064, 13 January 1977. All operation of WBVTR-1 has been discontinued since that date.

WBVTR-2 started to rewind but stopped prematurely in Orbit 1919, 9 June 1975, and again in Orbit 3854, 26 October 1975, with the cause unknown. Unit remains operational. Occasional slippage in the power supply causes motor speed changes and high bit errors, but these are quickly corrected by a simple operational procedure.

Batteries 1, 2, 5, 6, 7 and 8 have been turned OFF one by one for restoration cycles and returned to service after a few weeks.

A long series of orbit adjust operations was begun in this report period, the first being on 2 November 1977, during Orbit 14157. About 20,000 seconds of cumulative -Y burn time will be executed to reverse the orbital precessing (about the earth's axis) of Landsat-2's orbit to bring it closer to its position at launch, and thus fit better with Landsat-3's orbit when it is launched.

The spacecraft continues to perform its mission satisfactorily. Table 1-1 shows cumulative in-orbit payload system performance.

Table 1-1. In-Orbit Payload Systems Performance Launch thru Orbit 15322 (1/25/78) Landsat-2

RBV	Total Scenes Imaged	2538
	Avg. Scenes/Day in Operation	7
	Total Area Imaged (million sq. n mi.)	22
	ON TIME (hr.)	25
	ON/OFF Cycles	318
	% Real Time Images	70
	% Recorded Images	30
MSS	Total Scenes Imaged	238,315
	Avg. Scenes/Day	219
	Total Area Imaged (million sq. n. mi.)	1,718
	ON TIME (hr.)	2,489
	ON/OFF Cycles	15,219
	% Real Time Images	78
	% Recorded Images	22
DCS	Messages at OCC	1,312,272
	Users	48
	ON TIME (hr.)	26,362
WPA-1	% Real Time Mode	69
	% Playback Mode	31
	ON TIME (hr.)	103
	ON/OFF Cycles	676
WPA-2	% Real Time Mode	72
	% P/B Mode	28
	ON TIME (hr.)	2,224
	ON/OFF Cycles	13,393
WBVTR-1	% Record Mode	38
	% Playback Mode	41
	% Rewind Mode	20
	% Standby Mode	1
	Time Head-Tape Contact (hr.)	121.7
	Cycles Head-Tape Contact	1950
	ON TIME (hr.)	154
WBVTR-2	% Record Mode	38
	% Playback Mode	41
	% Rewind Mode	20
	% Standby Mode	1
	MFSE Count in P/B	~ 10
	Time Head-Tape Contact (hr.)	866
	Cycles Head-Tape Contact	11,435
	ON TIME (hr.)	1,096

SECTION 2

ORBITAL PARAMETERS

LANDSAT-2

SECTION 2

ORBITAL PARAMETERS

At the close of this report period, Landsat-2's ground track error was -1.36 nm, longitude error at the equator. While the Pitch Position Bias program has been very effective in maintaining Landsat-2's orbit, an orbit adjust program was implemented during Orbit 14157 (2 November 1977) to change the orbital inclination from 98.95° to approximately 99.23°.

Benefits anticipated from this exercise include:

- Extended, automatic solar array sun tracking (especially during 1978 and onwards) as a result of more direct stimulation of the SAD sun sensors.
- Maintenance of adequate S/C thermal control.
- Avoidance of conflict between Landsat-2's and Landsat-3's ground station support requirements.
- Maintenance of consistent S/C heading at high latitudes for temporal registration of imagery.

The errors in longitude since launch as a function of time and orbit maintenance burns are shown in Figure 2-1. Figure 2-2 shows the mean local time at the descending equatorial crossings and indicates the effects of the orbit adjust program through 24 January 1978.

As of 24 January 1978, Landsat-2 has a descending equatorial crossing at approximately 09:01:15 MLT as opposed to 08:02:06 MLT for Landsat-1. A projection of Mean Local Time at the descending nodes for both spacecraft is given in Figure 2-3; however, it does not presently reflect the effects of Landsat-2's orbit adjust program. Updated curves will be published upon completion of Landsat-2's orbit adjust program.

Figure 2-4 shows the current phasing pattern between Landsat-2 and Landsat-1 with Landsat-2 leading Landsat-1 at their descending nodes by approximately seven minutes.

The Brouwer Mean Orbital Parameters for Landsat-2 are given in Table 2-1. Appendix B gives ground trace repeat cycle predictions.

FOLDOUT FRAME 1

FOLDOUT FRAME 2

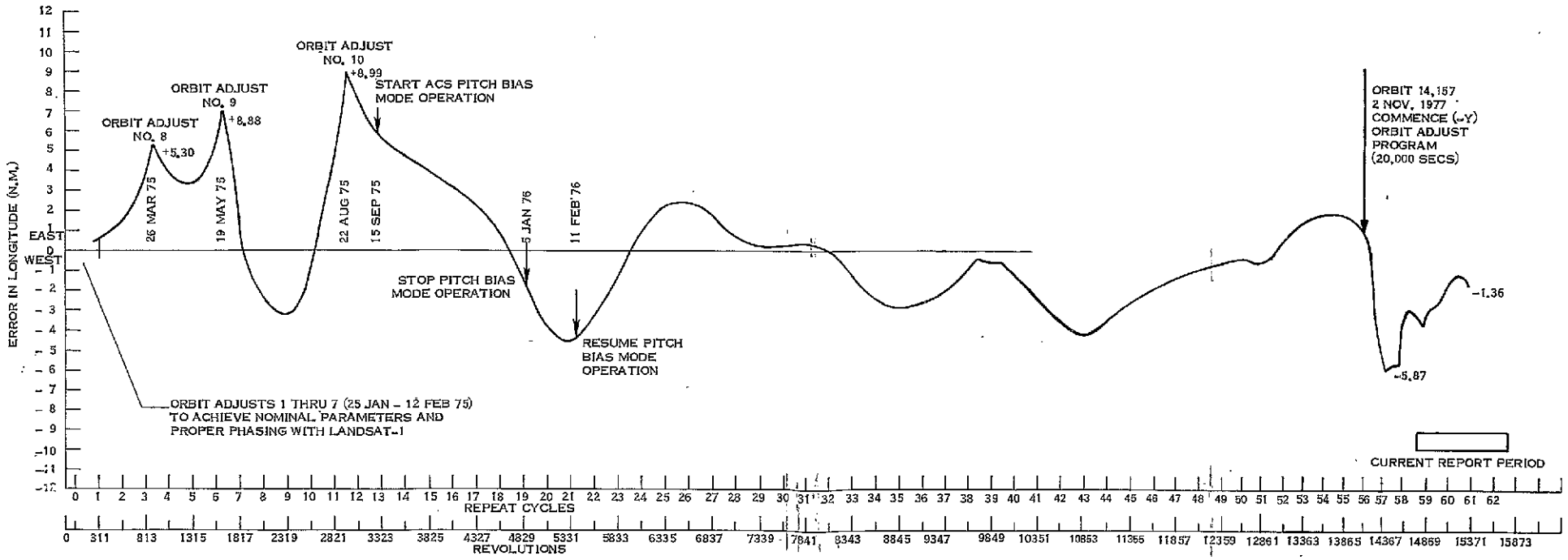

Figure 2-1. Effect of Orbit Adjusts and Pitch Position Bias Orbit Maintenance on Landsat-2's Ground Track

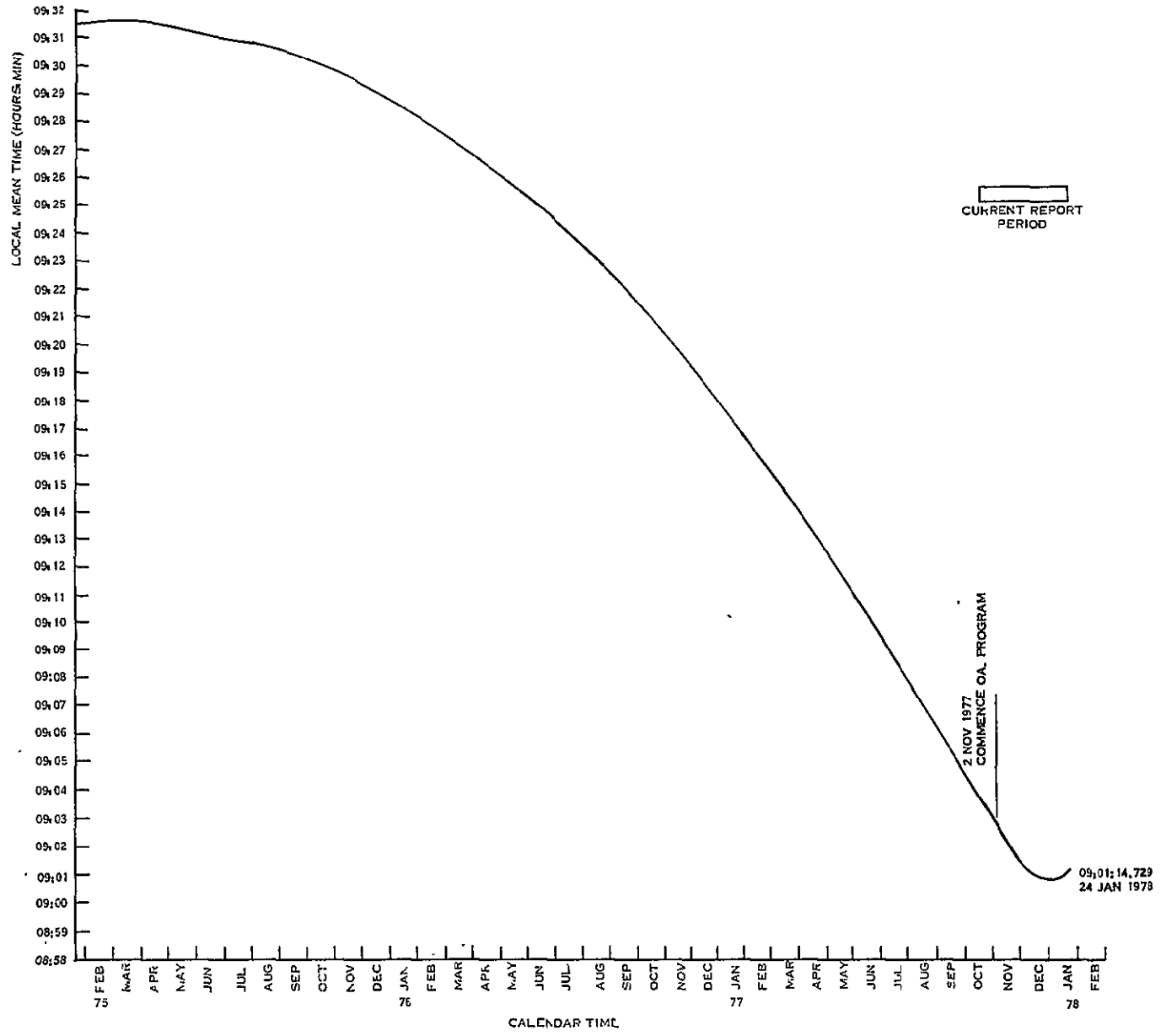

Figure 2-2. Local Mean Time of Descending Node - Landsat-2

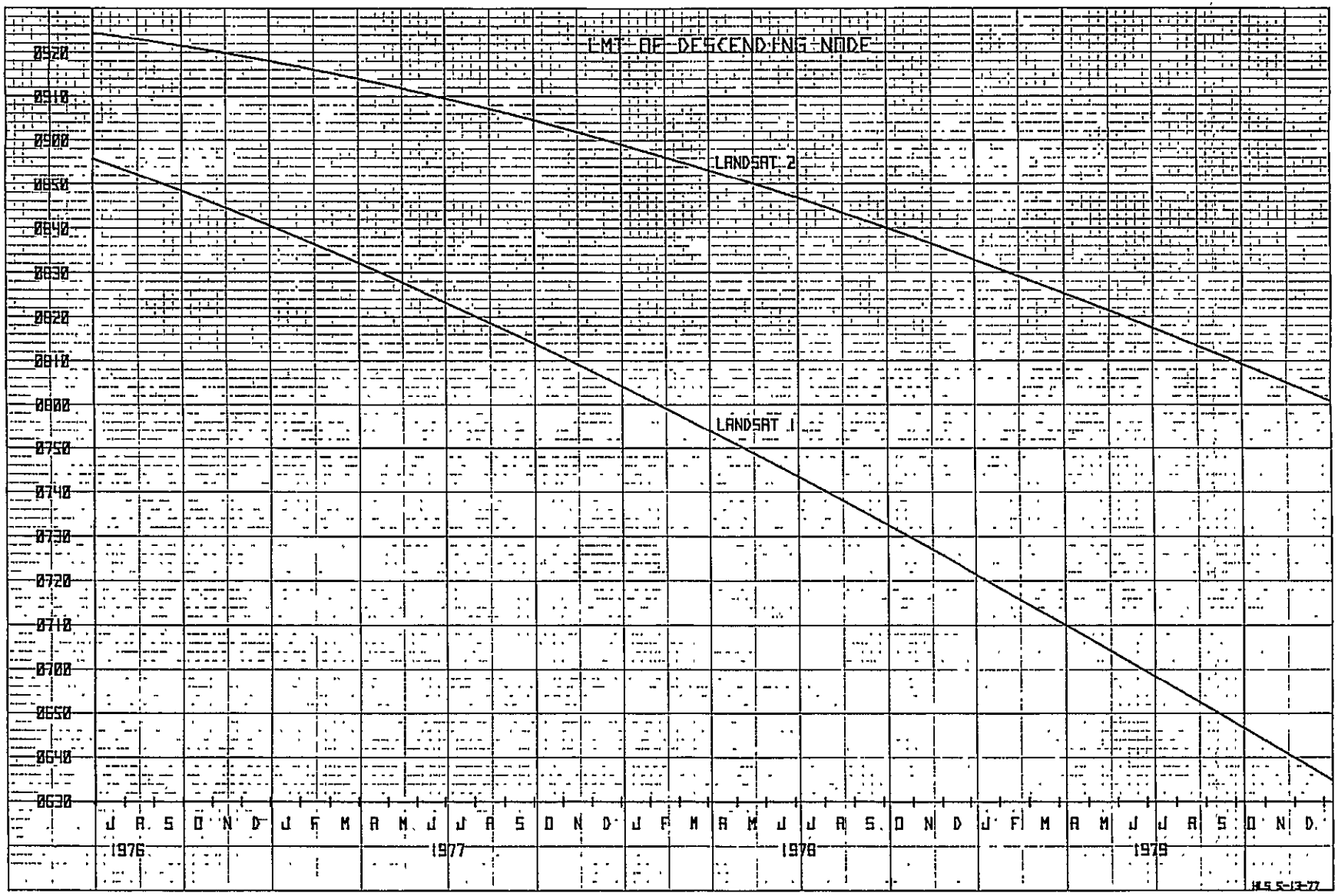

Figure 2-3. Predicted Local Mean Time of Descending Node for LS-1 and LS-2, 1976, 1977, 1978 and 1979

NOTE: These curves do not reflect the effects of the Landsat-2 orbit adjust program which commenced 2 November 1977 and is currently (1/23/78) in process. Updated curves are forthcoming.

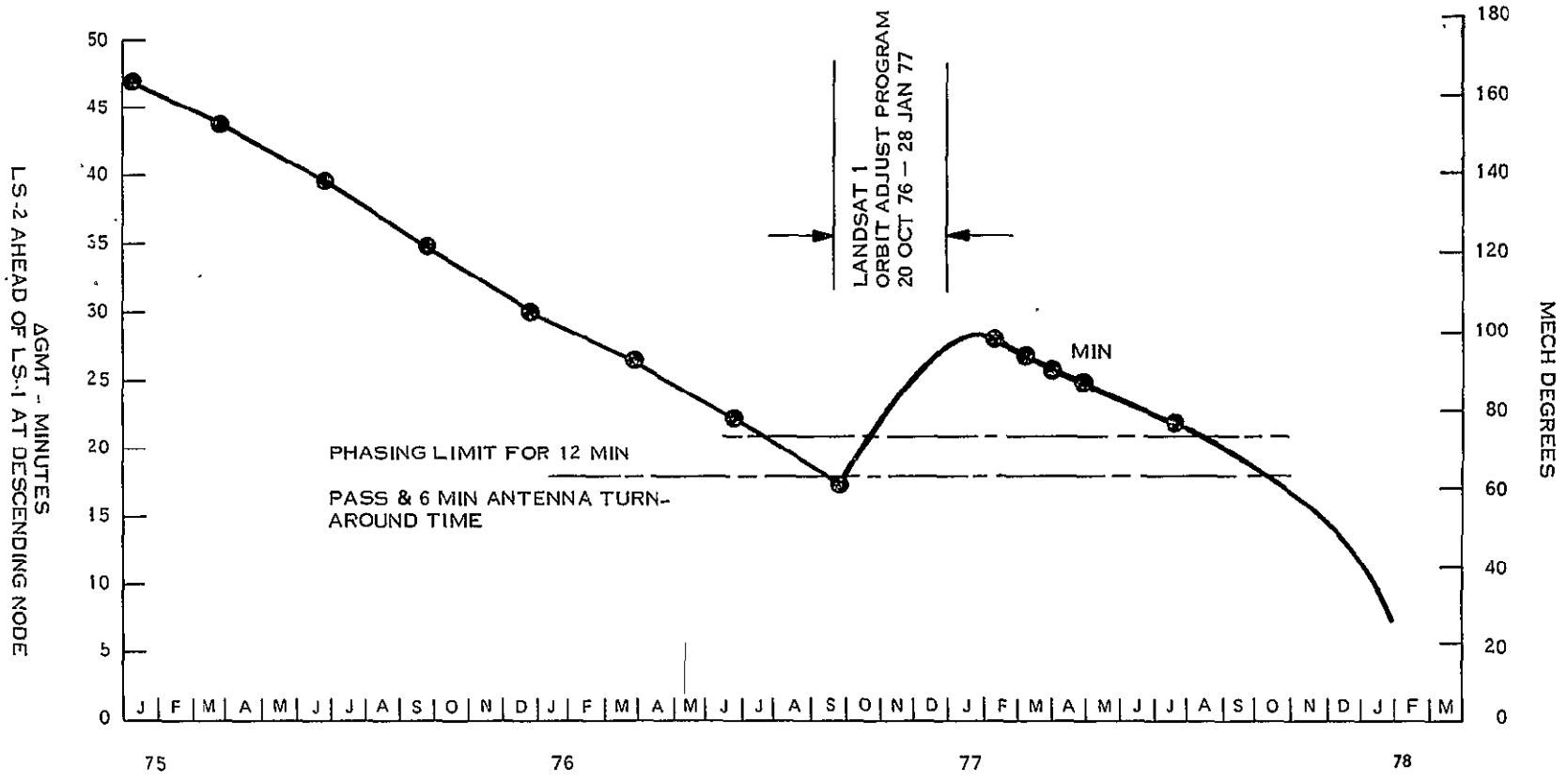

Figure 2-4. Drift in the Angular Phasing Between Landsat-1 and Landsat-2

Table 2-1. Landsat-2 Brouwer Mean Orbital Parameters

Element Date	Apogee (KM)	Perigee (KM)	Inclination (Deg.)	Semi-Major Axis (KM)	Eccentricity	Anomolistic Period (Min)	Nodal Period (Min)	Argument of Perigee (Deg)	Right Ascension (Deg)	Mean Anomaly (Deg)
25 Jan 1975[1]	915.03	901.56	99.095	7286.462	0.000925	103.165	—	272.852	86.637	139.578
6 Feb 1975[2]	916.84	898.47	99.096	7285.820	0.001260	103.151	—	256.040	99.347	134.523
24 Apr 1975	917.85	897.40	99.079	7285.788	0.001403	103.151	103.266	62.55	174.339	117.183
25 July 1975	917.45	897.68	99.071	7285.733	0.001356	103.150	103.265	166.118	264.891	13.726
23 Oct 1975	916.70	898.49	99.059	7285.762	0.00=250	103.150	103.266	282.749	353.366	257.271
24 Jan 1976	917.36	897.81	99.016	7285.751	0.001342	103.150	103.266	31.621	84.584	148.179
23 Apr 1976	917.67	897.44	99.029	7285.721	0.001389	103.149	103.265	139.745	172.774	40.033
22 July 1976	916.62	898.40	99.021	7285.677	0.001251	103.148	103.264	253.964	260.924	286.054
22 Oct. 1976	916.95	898.09	99.009	7285.683	0.001251	103.148	103.264	6.744	350.795	173.119
22 Jan. 1977	917.59	897.47	98.993	7285.693	0.001381	103.149	103.265	111.579	80.587	68.155
22 Apr 1977	916.84	898.09	98.975	7285.633	0.001287	103.147	103.263	221.210	168.277	318.768
24 Jul 1977	916.47	898.46	98.967	7285.632	0.001236	103.147	103.263	334.189	257.806	205.754
23 Oct 1977	917.40	897.52	98.955	7285.627	0.001364	103.147	103.263	81.812	347.225	97.914
22 Jan 1978[3]	915.24	900.32	99.162	7285.943	0.001024	103.154	103.269	191.142	76.302	348.761

1. Post Launch.
2. After the sequence of phasing maneuvers completed in Orbit 212.
3. Interim value - orbit adjust program commenced 2 Nov 1977 and still in process.

SECTION 3
POWER SUBSYSTEM (PWR)
LANDSAT-2

SECTION 3

POWER SUBSYSTEM (PWR)

The Power Subsystem on Landsat-2 has performed satisfactorily throughout this report period.

The solar arrays continued to provide excess energy above spacecraft and payload requirements and are expected to support the Landsat-2 mission through 1978. The percentage degradation of the arrays is plotted as a function of days in orbit in Figure 3-1, along with the pre-launch predicted array degradation. The array degradation at the end of 35 months in Orbit was 20.5%, which is higher than predicted. The projected values of midday array current are plotted in Figure 3-2. Here the array current is adjusted for sun intensity and array degradation, as well as sun angle. Along with the same curve is plotted the actual telemetry values observed until the end of the current report period.

The battery packs on-line averaged 9 to 10% depth of discharge (DOD) during this report period. When any battery reached high charge-to-discharge current ratios (C/D) it has been turned OFF for a restoration cycle of a few weeks, leaving 7 batteries on-line at all times. The history of these restoration cycles is shown in Table 3-1. Battery 5 was in such a restoration cycle at the end of this report period. All battery-pack performance remained satisfactory. Battery voltages have been maintained within suitable limits with Landsat-2 power management procedure, excess array energy being dissipated through auxiliary loads. Temperatures ranged from 16.3° to 36.7°C during this report period.

The power subsystem electronics have performed well during this report period with all regulated voltage stable. Table 3-2 shows major subsystem parameters and Table 3-3 shows power subsystem telemetry for selected orbits. Some parameters in Table 3-2 may be slightly different from those in Table 3-3 because Table 3-2 uses a power management time span (night followed by day), whereas the time span used in Table 3-3 is the playback period from the NBR.

The shunt limiter on Landsat-2 has operated several times since launch and has held the solar array bus voltage at specified levels.

Figure 3-3 shows the actual variation in sun angle to orbit plane and solar panels for Landsat-2. Figure 3-4 is a prediction of the sun angle through 1977 for Landsat-1 and 2.

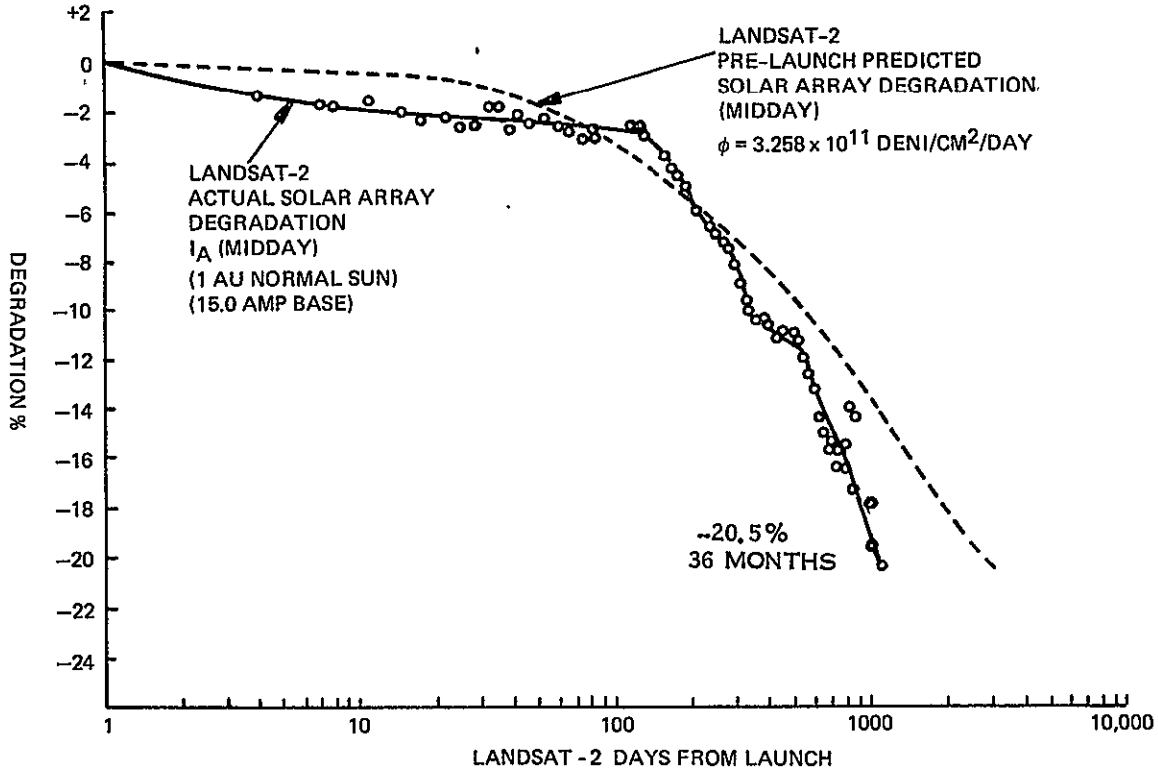

Figure 3-1. Landsat-2 I_A (Midday) Degradation Vs Days

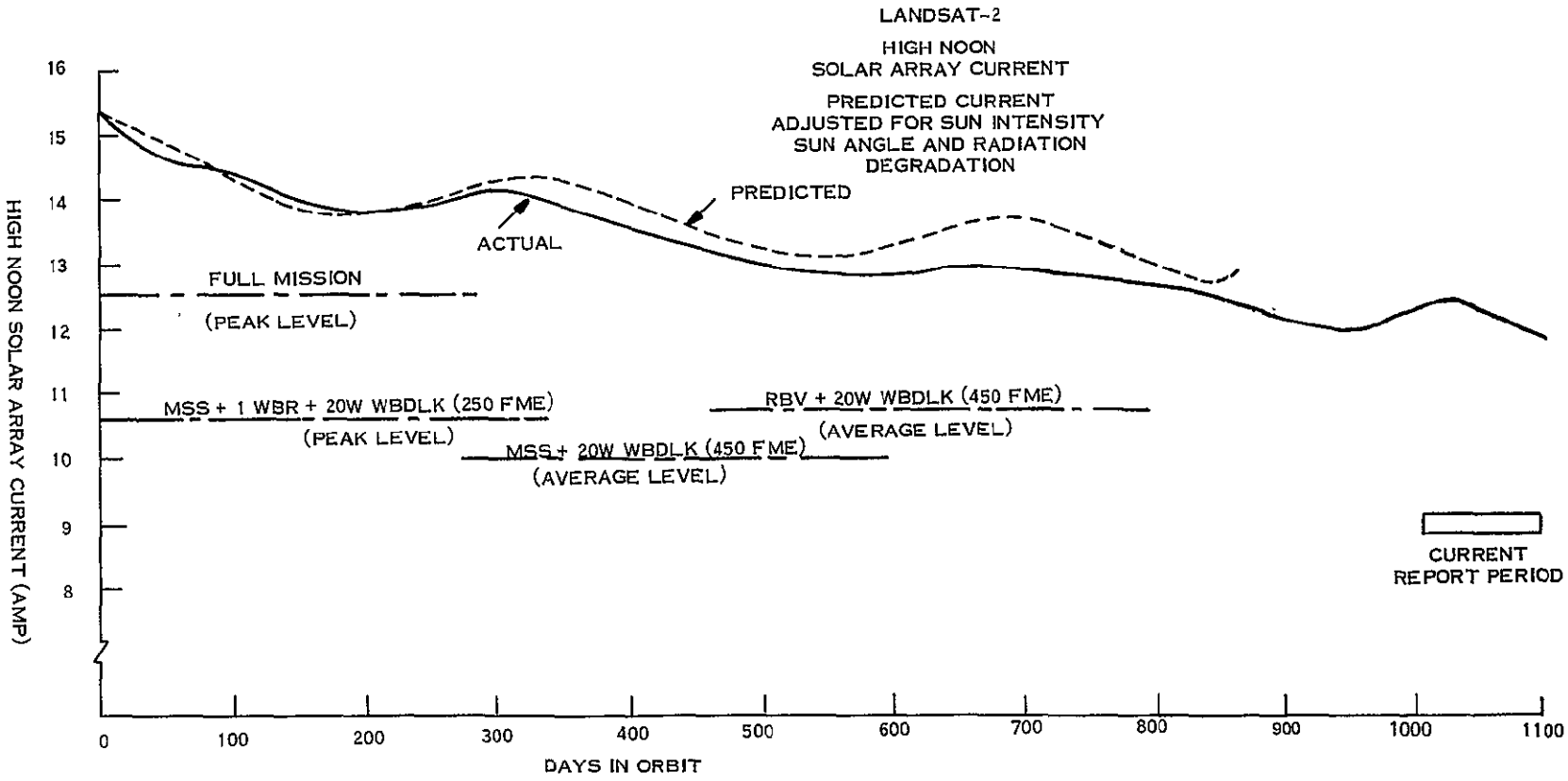

Figure 3-2. Landsat-2 Midday Solar Array Current

Table 3-1. Landsat-2 Battery Restoration Cycles

			1	2	3	4	5	6	7	8	9	10	11	12
BATT 1	OFF	ORB	8029	11420	12562	13580								
		DATE	8-20-76	4-20-77	7-11-77	9-22-77								
	ON	ORB	8509	11947	12964	13670								
		DATE	9-23-76	5-28-77	8-9-77	9-29-77								
BATT. 2	OFF	ORB	12078											
		DATE	6-6-77											
	ON	ORB	12272											
		DATE	6-20-77											
BATT. 3	OFF	ORB												
		DATE												
	ON	ORB												
		DATE												
BATT. 4	OFF	ORB												
		DATE												
	ON	ORB												
		DATE												
BATT. 5	OFF	ORB	10249	15297										
		DATE	1-26-77	1-23-78										
	ON	ORB	10657											
		DATE	2-24-77											
BATT. 6	OFF	ORB	7601	8591	9652	10962	11993	12271	12965	13454	13677	14230	14571	14710
		DATE	7-20-76	10-29-76	12-7-76	3-18-77	5-31-77	6-20-77	8-9-77	9-13-77	9-29-77	11-8-77	12-2-77	12-12-77
	ON	ORB	7992	9164	10028	11311	12077	12532	13159	13486	13836	14325	14615	14755
		DATE	8-17-76	11-9-76	1-10-77	4-12-77	6-6-77	7-9-77	8-23-77	9-15-77	10-10-77	11-15-77	12-5-77	12-15-77
BATT. 7	OFF	ORB	13489	13959										
		DATE	9-16-77	10-19-77										
	ON	ORB	13570											
		DATE	9-21-77											
BATT. 8	OFF	ORB	13161											
		DATE	8-23-77											
	ON	ORB	13444											
		DATE	9-12-77											

Table 3-2. Landsat-2 Major Power Subsystem Parameters

Pwr. Mgmt. Orbit No.	50	2540	5100	7640	10192	12722	14222	14712	15211
Batt 1 Max	33.43	33.25	32.66	33.08	32.57	F	32.40	32.48	32.48
2 Chge	33.40	33.14	32.63	33.05	32.54	-32.89	32.37	32.46	32.46
3 Volts	33.35	33.09	32.57	33.09	32.57	-32.92	32.41	32.49	32.41
4	33.45	33.20	32.68	33.20	32.59	-32.85	32.43	32.51	32.51
5	33.42	33.25	32.65	33.08	32.56	-32.91	32.39	32.56	32.56
6	33.41	33.24	32.64	28.79	32.56	-32.90	32.39	F	F
7	33.45	33.28	32.68	33.11	32.59	-32.93	32.42	32.59	32.51
8	33.45	33.27	32.68	33.10	32.59	-32.93	32.42	32.50	32.50
Average	33.42	33.21	32.65	33.10	32.57	-32.91	32.40	32.50	32.50
Batt 1 End-of-Night	29.32	29.06	29.06	29.06	28.98	F	28.98	28.80	28.55
2 Volts	29.38	29.12	29.04	29.12	28.95	-28.95	29.04	28.78	28.61
3	29.32	29.07	29.07	29.07	28.89	-28.98	28.98	28.81	28.64
4	29.34	29.09	29.09	29.09	28.91	-28.91	29.00	28.83	28.57
5	29.40	29.06	29.06	29.06	28.97	-28.97	29.06	28.80	28.63
6	29.31	28.96	28.96	28.71	28.88	-28.96	28.96	F	F
7	29.34	29.08	29.08	29.00	29.00	-29.00	29.08	28.82	28.65
8	29.34	29.00	29.00	29.00	28.91	-28.91	29.00	28.82	28.57
Average	29.34	29.05	29.04	29.06	28.94	-28.96	29.01	28.81	28.40
Batt 1 Chge	12.76	12.13	12.43	15.51	13.74	F	13.45	15.46	15.00
2 Share	11.68	12.45	11.42	13.54	11.44	13.66	11.66	13.62	13.67
3 (%)	12.24	13.67	12.48	14.13	12.41	13.84	11.72	13.65	13.64
4	11.99	12.50	11.76	13.97	11.81	13.50	11.44	13.34	13.55
5	12.84	11.52	13.24	14.32	12.95	14.15	11.68	14.68	14.48
6	13.35	13.20	14.32	F	15.14	15.62	15.98	F	F
7	12.90	12.81	12.97	14.30	11.74	13.85	12.78	14.79	14.88
8	12.24	11.72	11.38	13.14	10.77	14.25	11.35	13.38	13.78
Batt 1 Load	12.60	11.35	11.80	12.84	11.16	F	12.18	14.19	14.84
2 Share	12.70	13.99	13.34	15.60	14.14	15.83	13.81	15.59	15.41
3 (%)	12.67	14.38	13.74	15.41	13.94	15.83	12.91	15.13	13.80
4	12.44	12.99	12.48	14.71	13.00	15.06	12.38	14.47	13.80
5	12.34	11.58	12.36	13.69	9.96	14.05	11.97	12.48	13.80
6	12.70	11.30	11.56	F	15.27	15.46	11.16	F	F
7	12.47	12.35	12.70	14.03	11.33	12.63	13.17	13.93	14.46
8	12.04	12.06	12.02	13.72	11.21	11.15	12.42	14.21	13.88
Batt 1 Temp	21.46	21.34	21.94	21.47	22.71	19.31	21.82	22.33	21.78
2 in	20.25	21.44	19.94	19.90	20.30	19.69	20.41	20.62	19.60
3 (°C)	18.60	19.18	17.86	17.79	17.52	17.01	17.29	17.56	17.22
4	20.83	20.91	20.36	20.37	20.36	19.83	20.09	20.52	20.97
5	24.98	22.31	27.27	22.64	30.49	23.13	26.33	29.91	34.34
6	24.26	23.01	27.28	20.49	27.69	22.99	27.15	28.17	30.39
7	24.71	23.62	26.32	22.90	27.01	24.22	25.41	27.39	29.26
8	23.63	22.71	24.41	22.40	24.55	23.54	23.59	24.60	25.66
Average	22.34	21.81	23.17	21.00	23.83	21.21	22.76	23.89	25.90
S/C Reg Bus Pwr. (W)	N	185.0	149.3	146.12	154.49	134.0	156.5	156.1	143.6
Comp Load Pwr. (W)	N	41.2	24.8	17.64	6.64	6.64	6.64	6.64	0.00
P/L Reg Bus Pwr. (W)	N	9.6	9.8	11.81	9.59	11.9	9.8	9.8	9.9
C/D Ratio	1.15	1.10	1.11	1.15	1.24	1.17	1.14	1.14	1.46
Total Charge (A-M)	271.9	267.55	223.46	239.11	223.51	222.41	219.06	210.54	243.06
Total Discharge (A-M)	237.2	244.33	201.45	207.47	180.84	189.59	192.77	183.98	166.79
Solar Array (A-M)	1106	981	1003	892	939	860.8	891.8	892.8	821.9
S.A. Peak I (Amp)	16.05	14.67	14.43	13.41	13.25	12.55	12.86	12.78	11.99
Midday Array I (Amp)	N	13.88	13.72	12.78	12.86	12.31	12.55	12.24	11.92
Sun Angle (Deg)	N	-1.22	8.35	0.3	10.7	3.0	6.7	10.0	14.8
Max R Pad Temp (°C)	N	59.60	63.20	58.40	58.40	54.18	59.60	59.60	53.27
Min R Pad Temp (°C)	N	-38.00	-35.00	-38.00	-34.40	-30.80	-34.40	-33.80	-36.80
Max L Pad Temp (°C)	N	56.92	62.15	56.92	62.15	56.92	62.15	62.23	56.92
Min L Pad Temp (°C)	N	-45.00	-42.14	-45.71	-39.43	-38.29	-40.71	-39.43	-38.86

N - Data Not Available
F - Unit Off

Table 3-3. Landsat-2 Power Subsystem Analog Telemetry
(Average Value for Data Received in NBTR Playback)

Function	Description	Unit	Orbits								
			50	2532	5102	7641	10192	12722	14222	14722	15211
6001	Batt 1 Disc I	Amp	1.01	0.85	0.74	0.85	0.52	.00	0.56	0.66	0.66
6002	2		1.01	0.97	0.84	1.02	0.65	.96	0.62	0.75	0.71
6003	3		1.00	0.99	0.87	1.01	0.64	.99	0.58	0.69	0.62
6004	4		1.00	0.93	0.78	0.97	0.60	.94	0.58	0.68	0.63
6005	5		0.99	0.85	0.78	0.91	0.47	.87	0.54	0.61	0.63
6006*	6		1.02	0.86	0.73	F	0.70	.95	0.50	F	F
6007	7		1.00	0.91	0.80	0.92	0.52	.77	0.60	0.66	0.66
6008	8		0.97	0.87	0.75	0.90	0.52	.68	0.56	0.68	0.64
6011	Batt 1 Chg I	Amp	0.47	0.57	0.42	0.52	0.46	.03	0.50	0.52	0.52
6012	2		0.43	0.57	0.38	0.46	0.37	.43	0.43	0.45	0.45
6013	3		0.45	0.61	0.42	0.48	0.40	.46	0.43	0.44	0.47
6014	4		0.44	0.57	0.39	0.47	0.39	.45	0.42	0.43	0.48
6015	5		0.47	0.54	0.44	0.48	0.45	.47	0.43	0.47	0.51
6016*	6		0.49	0.60	0.47	F	0.49	.52	0.50	F	F
6017	7		0.47	0.60	0.43	0.48	0.40	.46	0.48	0.49	0.52
6018	8		0.45	0.55	0.38	0.44	0.36	.46	0.43	0.44	0.49
6021	Batt 1 Volt	VDC	31.50	30.92	31.11	31.42	30.79	-28.63	-30.88	-30.69	-30.71
6022	2		31.48	30.90	31.09	31.41	30.80	-31.41	-30.87	-30.67	-30.68
6023	3		31.49	30.91	31.10	31.43	30.81	-31.43	-30.89	-30.69	-30.70
6024	4		31.49	30.91	31.10	31.43	30.81	-31.42	-30.89	-30.69	-30.70
6025	5		31.50	30.92	31.11	31.43	30.79	-31.43	-30.90	-30.70	-30.73
6026*	6		31.49	30.90	31.08	28.69	30.80	-31.41	-30.85	F	F
6027	7		31.52	30.94	31.14	31.46	30.83	-31.45	-30.92	-30.72	-30.74
6028	8		31.49	30.92	31.11	31.43	30.81	-31.39	-30.89	-30.70	-30.71
6031	Batt 1 Temp	DGC	21.59	20.93	21.91	21.45	22.67	19.39	21.78	22.08	21.73
6032	2		20.53	20.75	19.90	19.86	20.36	19.54	20.44	20.37	19.51
6033	3		18.80	18.66	17.77	17.43	17.54	16.84	17.36	17.42	17.06
6034	4		20.90	20.88	20.33	20.34	20.43	19.67	20.09	20.38	20.94
6035	5		25.16	22.22	27.18	22.62	30.52	23.13	26.31	29.19	34.20
6036	6		24.37	22.55	27.19	20.42	27.67	23.01	27.14	26.11	30.32
6037	7		24.83	23.26	26.19	22.89	26.95	24.26	25.42	26.71	29.20
6038	8		23.75	22.52	24.36	22.36	24.49	23.56	23.57	24.23	25.63
6040	Rt. Pad Temp	DGC	28.96	26.16	30.90	25.34	26.11	31.84	27.77	23.71	24.98
6041	Rt. Pad VM	VDC	33.72	33.56	32.86	34.00	31.44	33.56	32.25	32.12	30.33
6042	Rt. Pad VN	VDC	33.46	33.18	32.44	33.45	31.27	34.30	31.76	30.72	31.60
6044	Lt. Pad Temp	DGC	25.56	21.16	28.22	22.53	26.41	31.03	27.78	24.68	27.99
6045	Lt. Pad VF	VDC	34.40	33.80	33.82	34.39	33.36	34.38	33.51	33.25	33.24
6046	Lt. Pad VG	VDC	34.48	33.91	33.91	34.48	33.45	34.46	33.60	33.35	33.32
6050	S/C UR Bus V	VDC	31.73	31.14	31.33	31.69	30.93	-31.66	-31.04	-30.87	-30.99
6051	S/C RG Bus V	VDC	24.57	24.57	24.58	24.58	24.57	-24.58	-24.58	-24.58	-24.58
6052	Aux Reg AV	VDC	23.36	23.40	23.44	23.43	23.44	-23.44	-23.44	-23.43	-23.44
6053	Aux Reg BV	VDC	23.37	23.39	23.44	23.44	23.43	-23.44	-23.44	-23.45	-23.44
6054	Solar I	Amp	14.81	13.76	13.40	12.37	12.25	11.93	11.94	11.80	10.57
6056	S/C RG Bus I	Amp	7.23	7.17	6.28	5.98	6.41	5.47	6.39	6.37	5.86
6058	PC Mod T1	DGC	21.67	21.98	20.77	20.49	20.08	18.97	20.20	20.76	20.37
6059	PC Mod T2	DGC	20.44	20.53	19.56	19.39	19.16	18.41	19.12	19.05	18.94
6070	P/L RG Bus V	VDC	24.61	24.60	24.60	24.62	24.59	-24.62	-24.59	-24.59	-24.59
6071	P/L UR Bus V	VDC	31.85	31.21	31.40	31.79	30.97	-31.75	-31.09	-30.91	-31.03
6073	P Aux AV	VDC	23.47	23.51	23.51	23.50	23.50	-23.51	-23.50	-23.50	-23.50
6074	P Aux BV	VDC	23.46	23.51	23.51	23.50	23.50	-23.51	-23.50	-23.50	-23.50
6075	PR Mod T1	DGC	20.84	21.39	20.32	20.21	20.82	19.83	20.93	20.65	20.23
6076	PR Mod T2	DGC	22.13	22.38	21.79	21.72	22.14	21.32	22.21	22.08	21.77
6079	Fuse Blow V	VDC	24.48	24.48	24.49	24.51	24.48	-24.47	-24.49	-24.48	-24.49
6080	Shunt 1 I	Amp	F	F	F	F	F	F	F	F	F
6081	2		F	F	F	F	F	F	F	F	F
6082	3		F	F	F	F	F	F	F	F	F
6083	4		F	F	F	F	F	F	F	F	F
6084	5		F	F	F	F	F	F	F	F	F
6085	6		F	F	F	F	F	F	F	F	F
6086	7		F	F	F	F	F	F	F	F	F
6087	8		F	F	F	F	F	F	F	F	F
6100	P/L RG Bus I	Amp	0.38	0.80	0.54	0.43	0.40	.49	0.40	0.40	0.41
Total No.	Major Frames	Frm	396	387	785	384	697	747	784	582	725

F - Unit Off

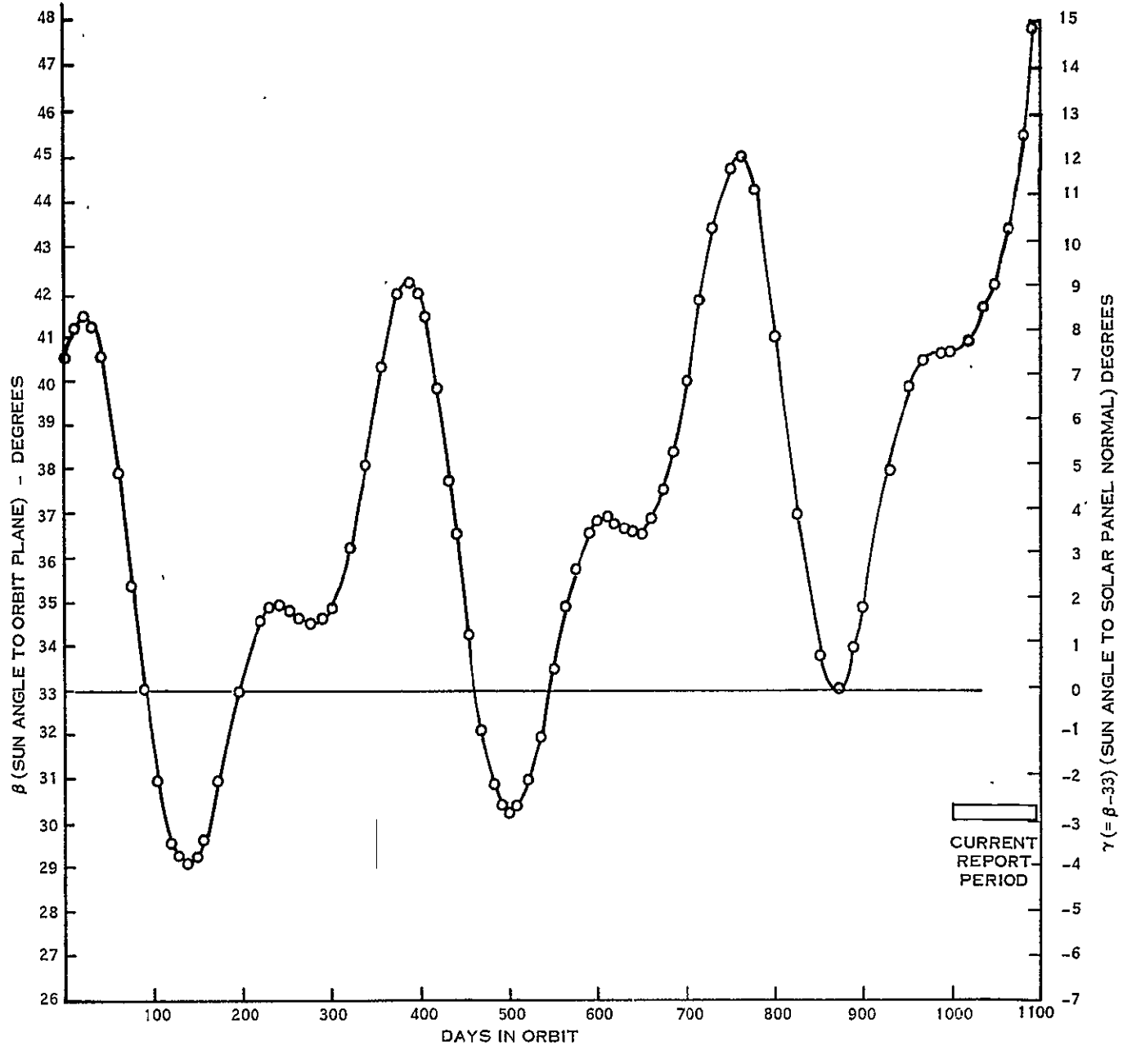

Figure 3-3. Landsat Actual β and α (Paddle) Sun Angles

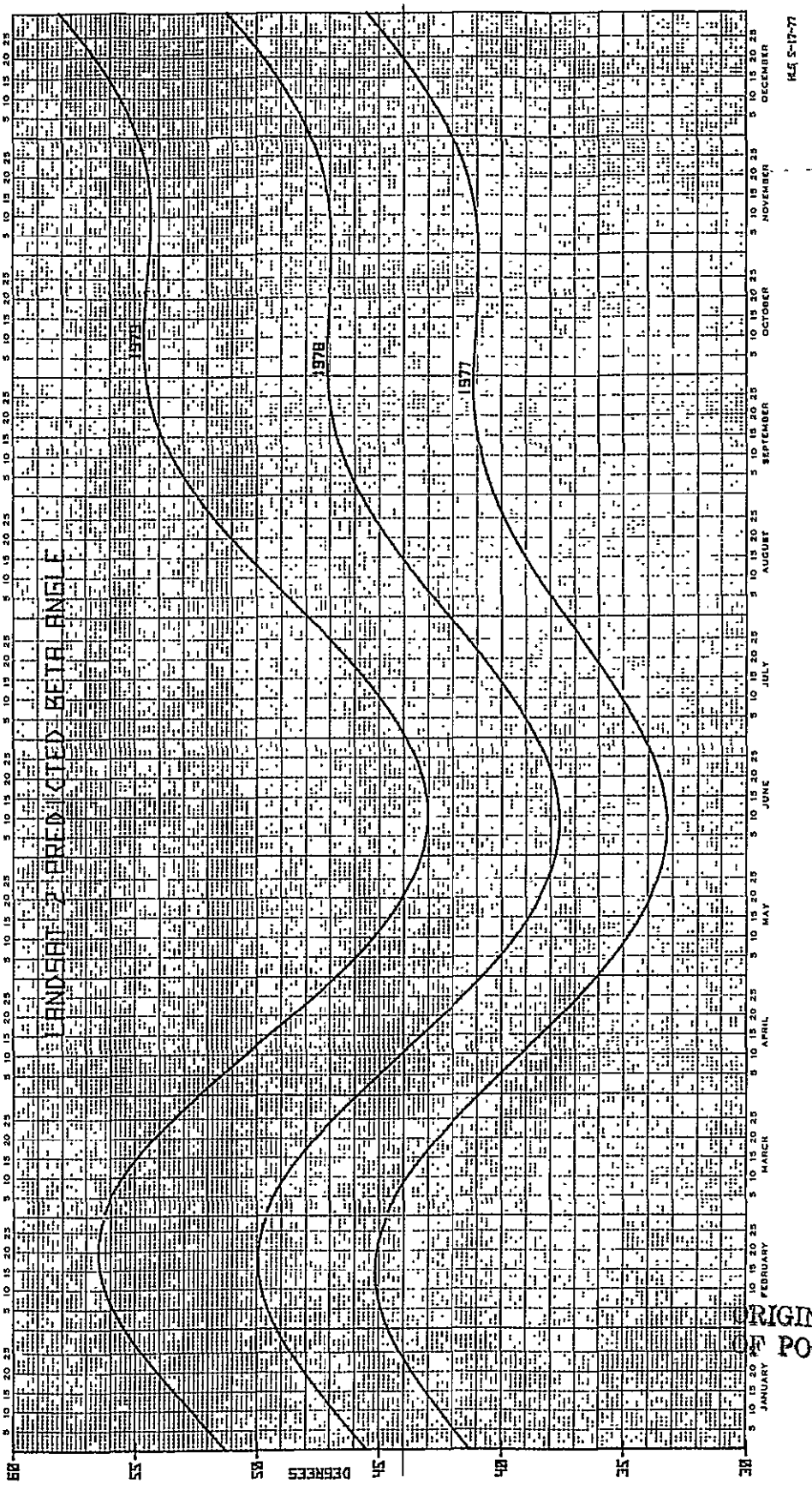

Figure 3-4. Predicted Beta Angle for LS-2 - 1977, 1978, 1979

SECTION 4

ATTITUDE CONTROL SUBSYSTEM (ACS)
LANDSAT-2

SECTION 4

ATTITUDE CONTROL SYSTEM (ACS)

Landsat-2's Attitude Control System has performed normally since launch and has consistently maintained correct spacecraft attitude.

A 'cross orbit adjust' program commenced during Orbit 14157 (2 November 1977) and is currently in progress (see Sections 2 and 7).

Through 23 January 1978, twenty-seven out of approximately thirty scheduled 600 second duration (-Y) REA orbit adjusts have been successfully conducted.

This program is a 'first of its kind' in the lives of both Landsat spacecrafts as its purpose is to change the inclination of Landsat-2's orbit and this effort requires the use of the (-Y) REA thruster.

By design, the (-Y) REA thrust vector is initially misaligned with the spacecraft's center of mass so that as hydrazine is consumed, the spacecraft's center of mass will move toward (and eventually through) the (-Y) REA thrust vector instead of away from it.

Firing the (-Y) REA with a relativelly full load of hydrazine and with the blow down characteristics of the (-Y) REA still near maximum, creates torques about the spacecraft's center of mass that must be cancelled by the ACS system in order to maintain proper spacecraft attitude during a burn.

Landsat-2's ACS system performed this task successfully.

Figures 4-1 through 4-8 are actual telemetry brush records of the orbit adjust maneuvers conducted during Orbits 14570 (2 December 1977) and 15225 (18 January 1978), respectively. These brush records demonstrate the change in location of the spacecraft's center of mass as a function of hydrazine consumption. Note the significant differences between the signatures of the same functions recorded in the earlier orbit as compared to the later orbit; particularly

- ROLL FINE ERROR
- ROLL REAR FLYWHL SPEED
- YAW TACH OUTPUT
- PITCH FLYWHL SPD.
- RMP RESPONSE

(-Y) REA thrust misalignment produced a thrust component that affected the orbit's altitude, consequently, it was necessary to fire the (+X) thruster to correct this condition. Most of the orbit adjust maneuvers were compound burns, i.e., the (+X) thruster was ignited during the trailing portion of the (-Y) burn and both thrusters were terminated simultaneously.

Freon consumed over the span of the orbit adjust program, through 23 January 1978, has been within the predicted limits.

During an orbit adjust maneuver, the ACS system was commanded into the following modes:

- LSAD stopped at the midnight position to eliminate (-Y) REA plume impingement.
- RLNA out (normally in)
- (-1.0^{o}) Yaw Bias in (normally out)

- Pitch Position Bias out (normally in during spacecraft night)
- Aux and Comp loads out
- 400 RPM interlock disabled (normally enabled)
- OA Heaters turned off prior to burn start (normally off)
- RMP #1 in standby (normally off)
- OA ACQ mode (usually normal mode)
- Pneumatics enabled (normally disabled)
- Pneumatics interlock bypass enabled (normally disabled)

The program implemented in September 1975 to minimize spacecraft ground track drift by controlling Pitch gating was continued during this quarter. Table 4-1 summarizes the Pitch Position Bias mode sequences implemented this quarter as part of this program, and Figure 2-1 in Section 2 shows the effects of Pitch gating control on the spacecraft's orbital ground track drift. As a result of the ground track drift maintenance program, Freon Usable Impulse consumption rate is relatively low (excluding the orbit adjust effects) as shown in Figure 4-9 and 4-10.

RMP2, commanded into operation shortly after ACS acquisition as the primary control of the Yaw subsystem, has functioned normally.

Both Solar Array Drives (SAD's) performed normally; however, a seasonally large Beta angle has limited the response of the Sun Sensors and both arrays are leading the sun by approximately 30^{o} clockwise.

Typically, flywheel duty cycles have averaged seven percent or less. Pitch and Yaw flywheel speeds have averaged less than -150 RPM while the Roll flywheels have averaged 760 RPM. Sun transient response due to dual scanner mode operation is normal.

Tables 4-2, 4-3, and 4-4 show typical telemetry values. All are nominal.

Table 4-1. Landsat 2 Pitch Position Bias Quarterly Pneumatic Gating Summary

Period		PPB Implementation Sequence			Centered About Satellite Midnight (minutes)	Resulting Average Number of Pitch Gates Per Day
From Orbit	To Orbit	N_o	$N_o + 1$	$N_o + 2$		
14019 24 Oct 77	14069 27 Oct 77	+ 2.0	+ 2.9	+ 2.0	50	2 to 3 (-P)
14070 27 Oct 77	14752 15 Dec 77	+ 2.0	+ 2.0	+ 2.0	40	1 to 3 (-P)
14753 15 Dec 77	15301 23 Jan 78	+ 2.0	+ 2.0	+ 2.0	35	0 to 1 (-P)

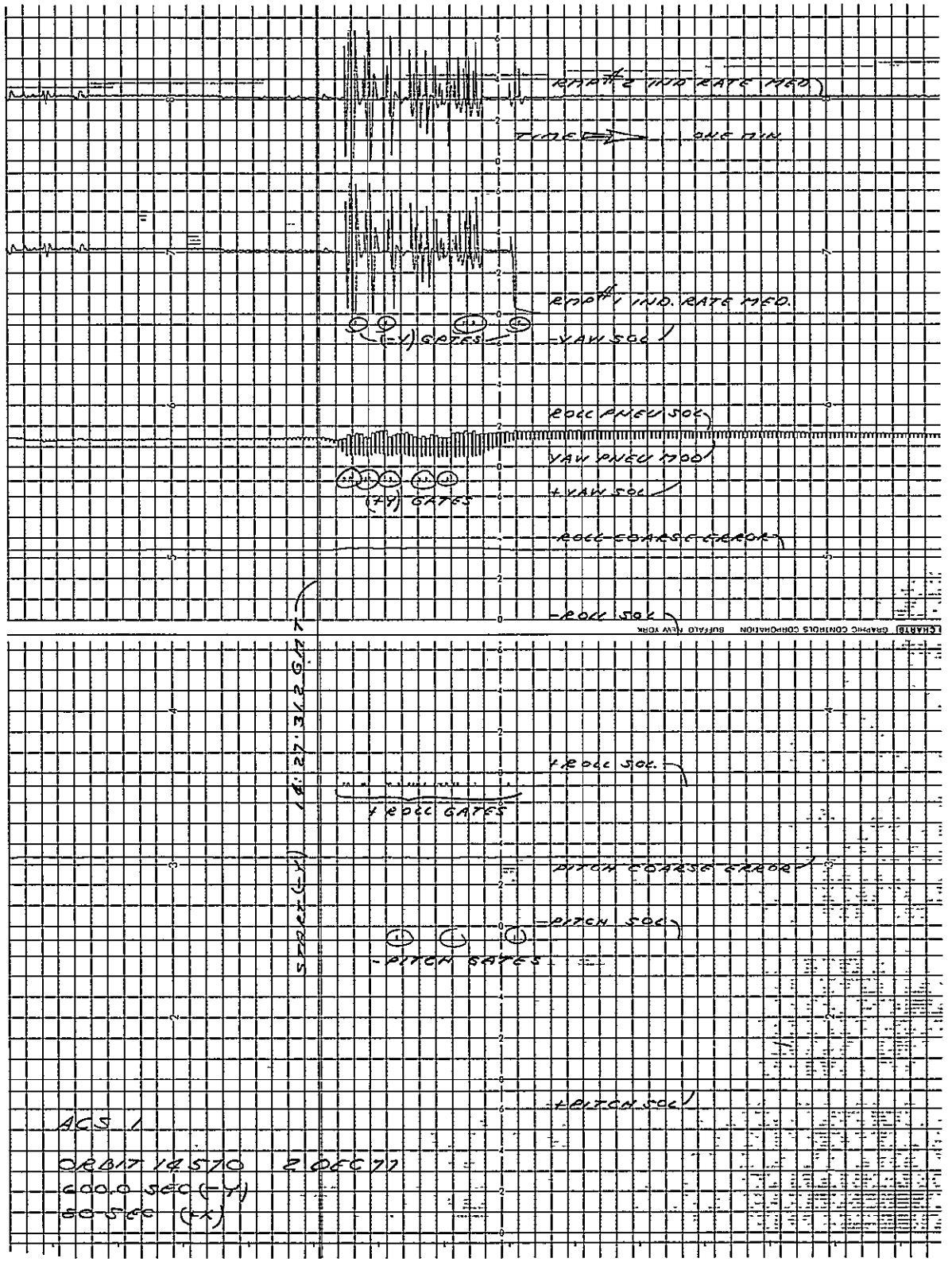

Figure 4-1. Orbit Adjust 14570 - ACS 1

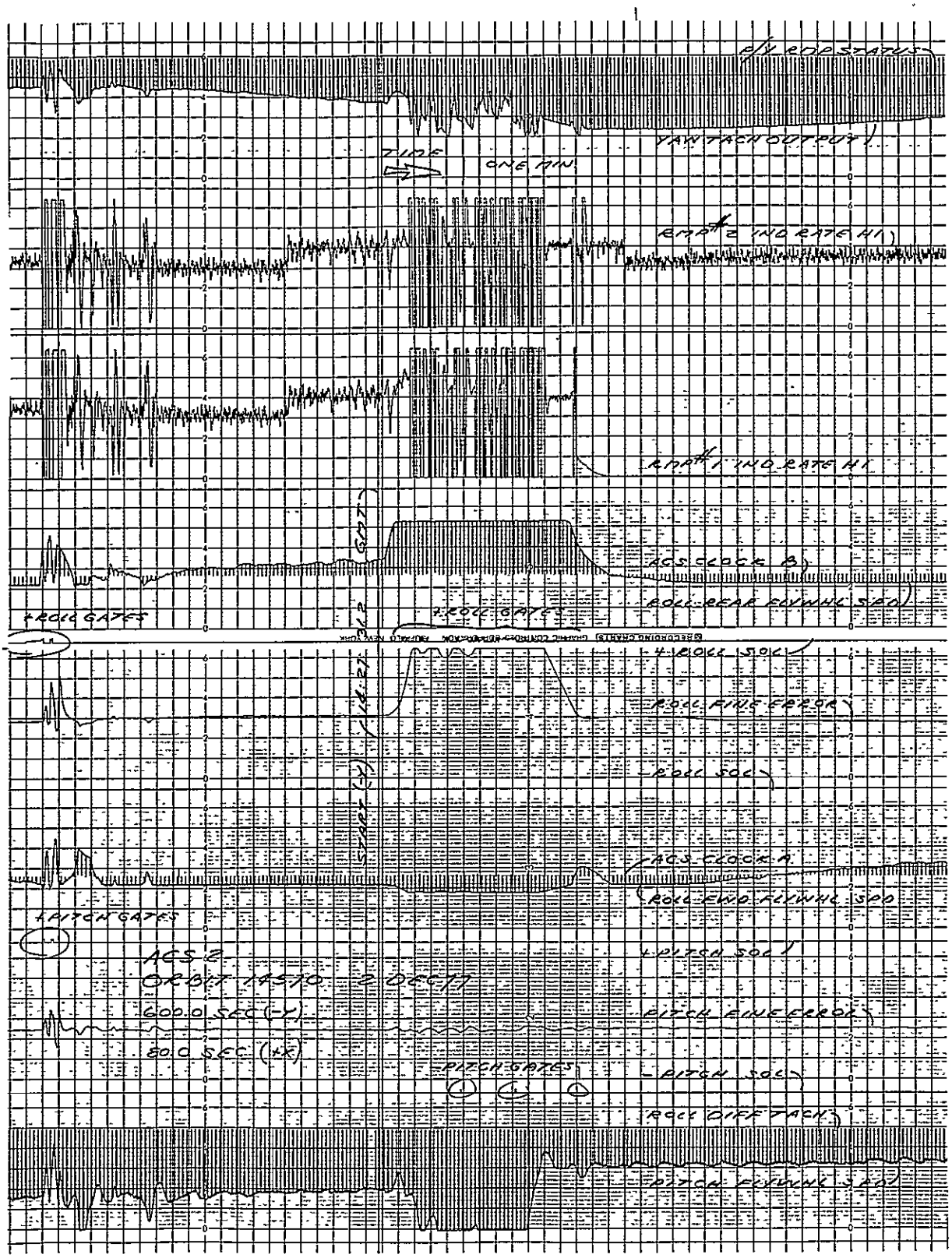

Figure 4-2. Orbit Adjust 14570 - ACS 2

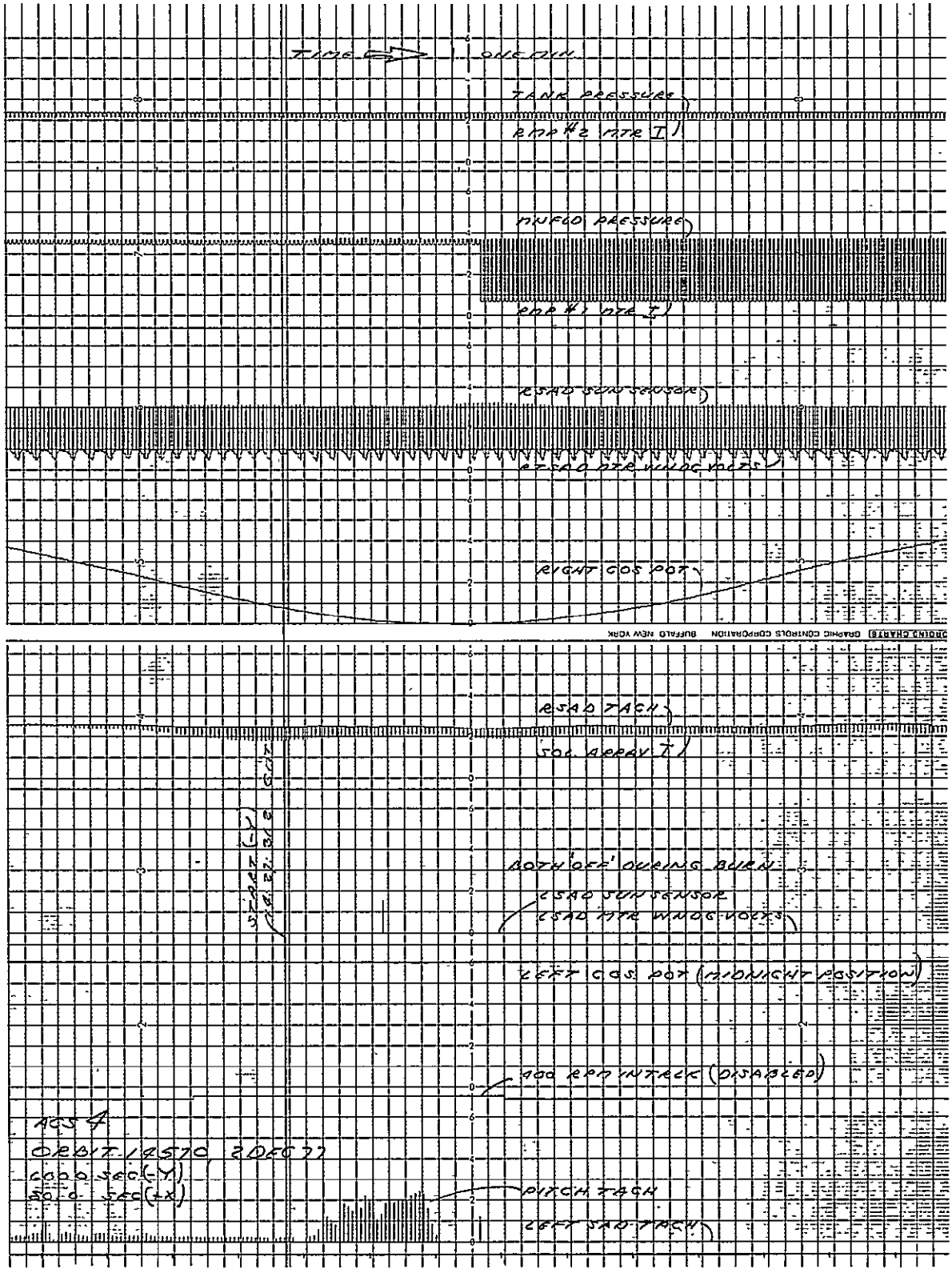

Figure 4-3. Orbit Adjust 14570 - ACS 4

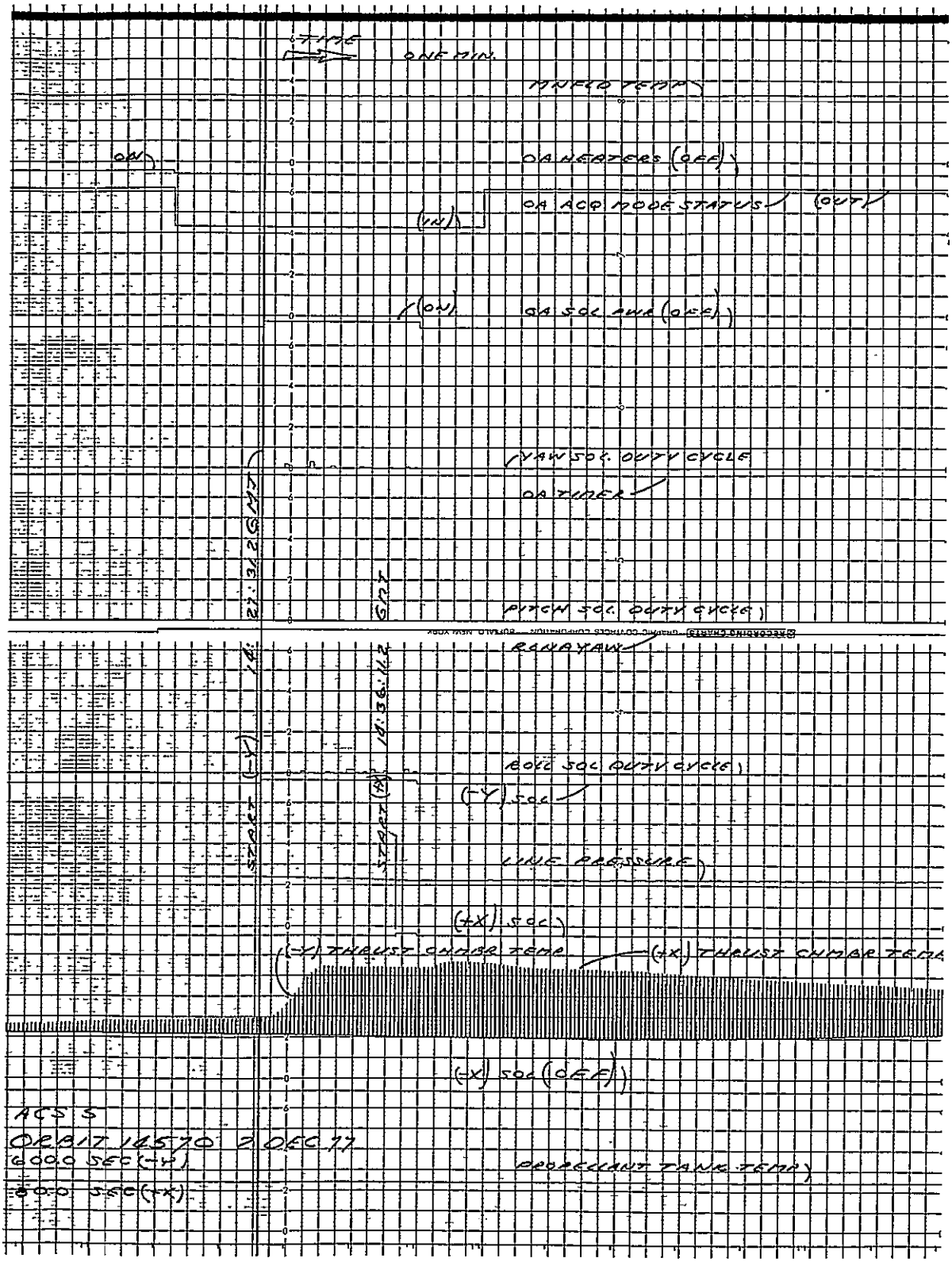

Figure 4-4. Orbit Adjust 14570 - ACS 5

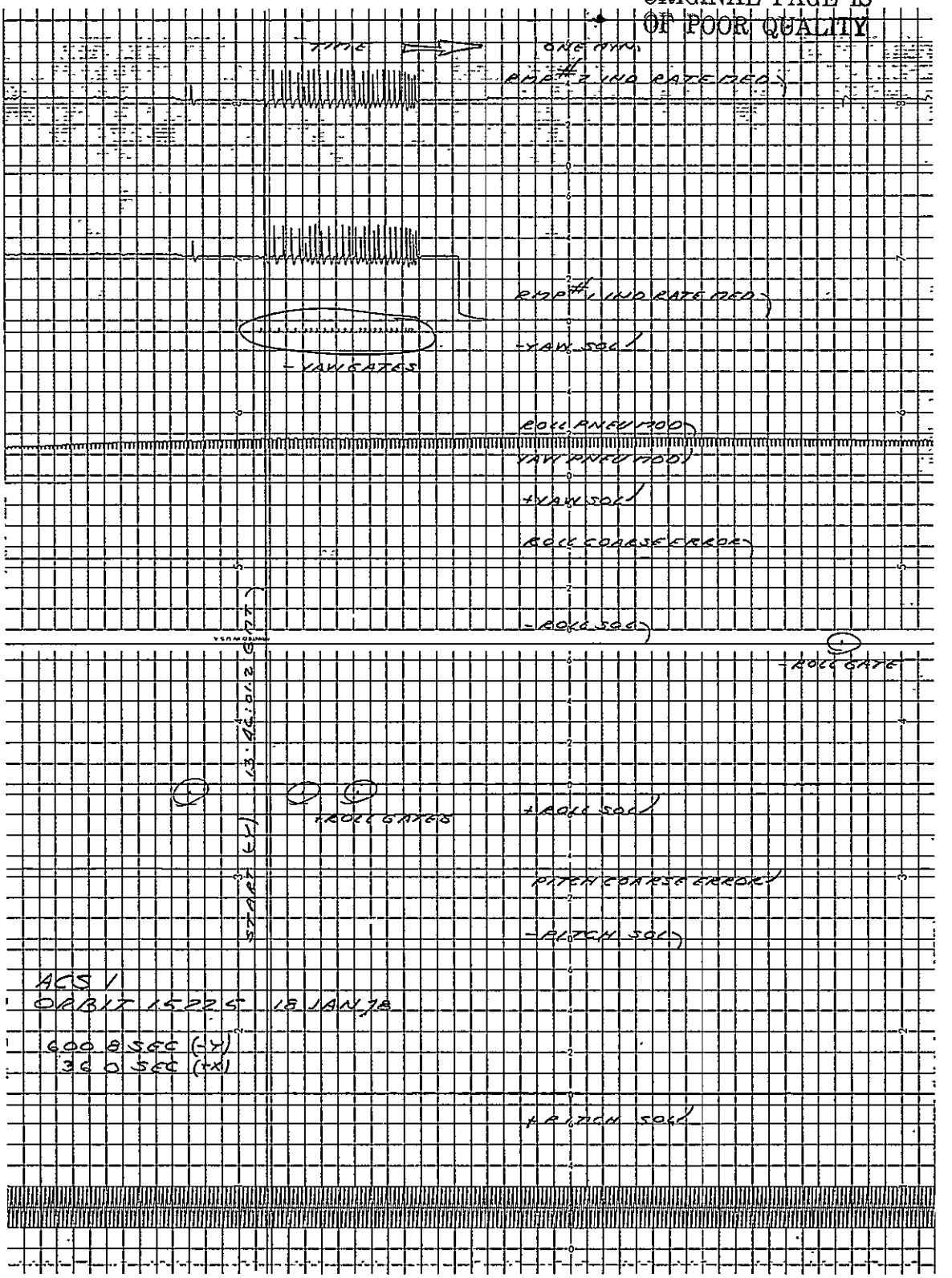

Figure 4-5. Orbit Adjust 15225 - ACS 1

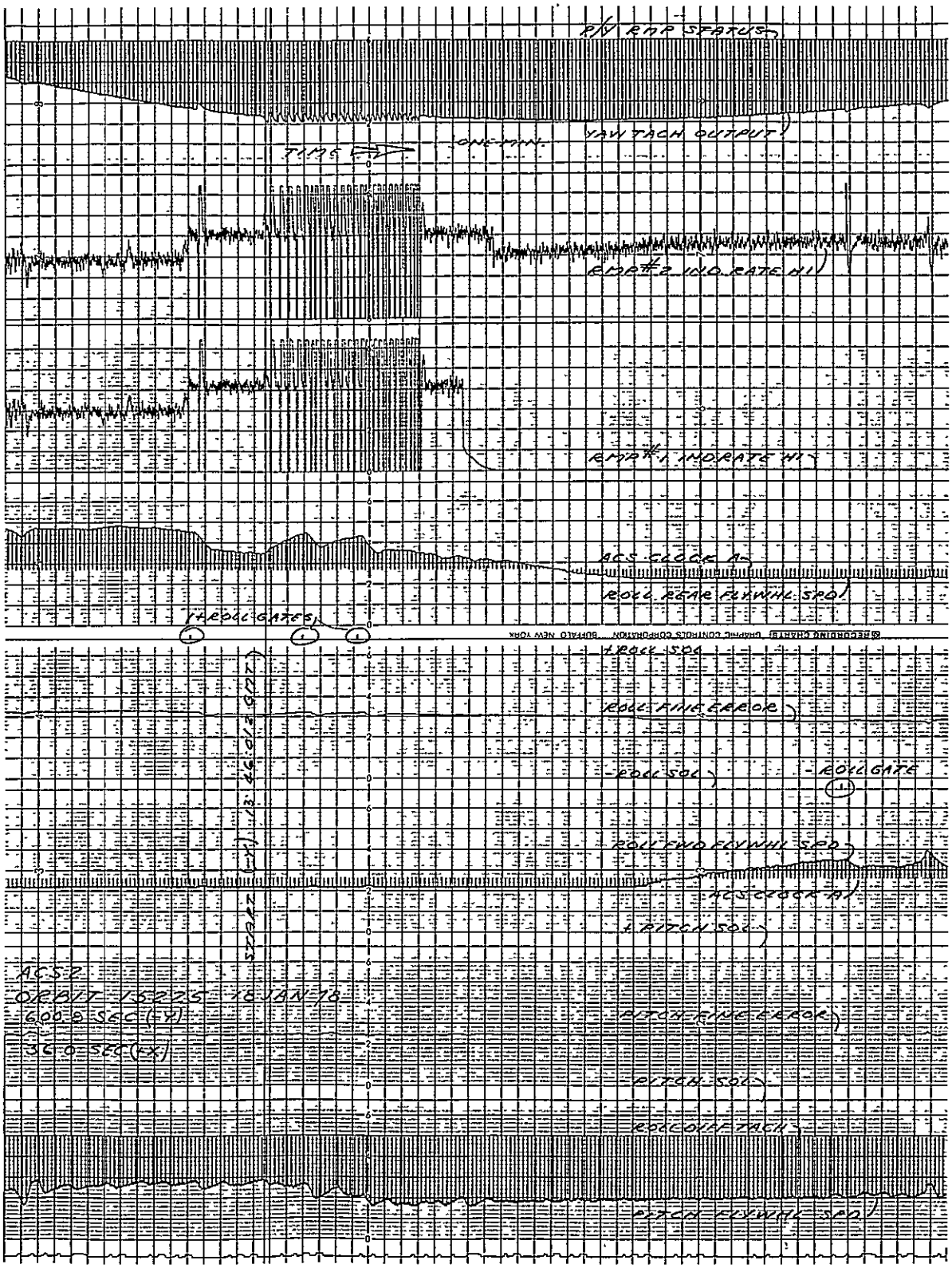

Figure 4-6. Orbit Adjust 15225 - ACS 2

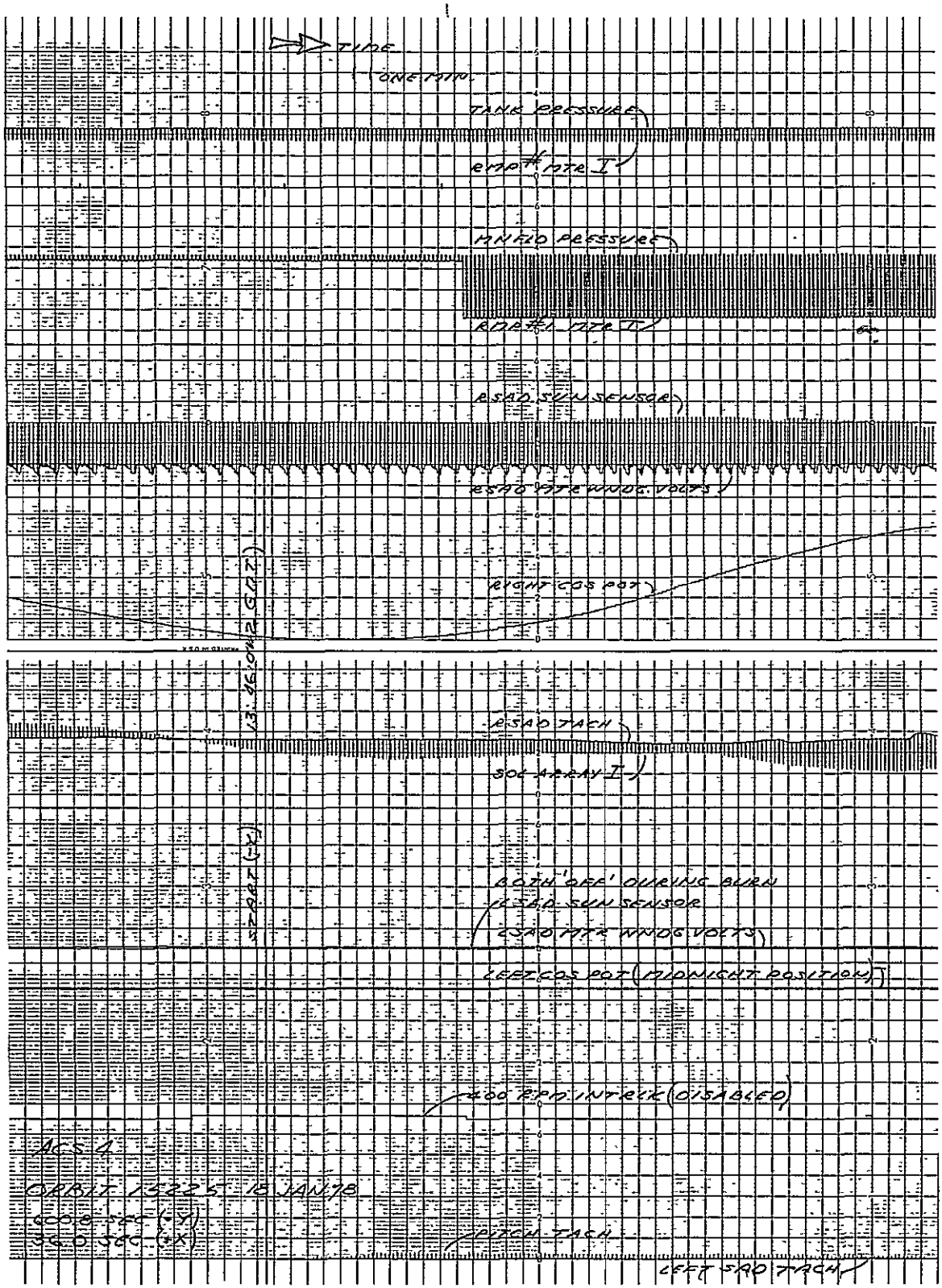

Figure 4-7. Orbit Adjust 15225 - ACS 4

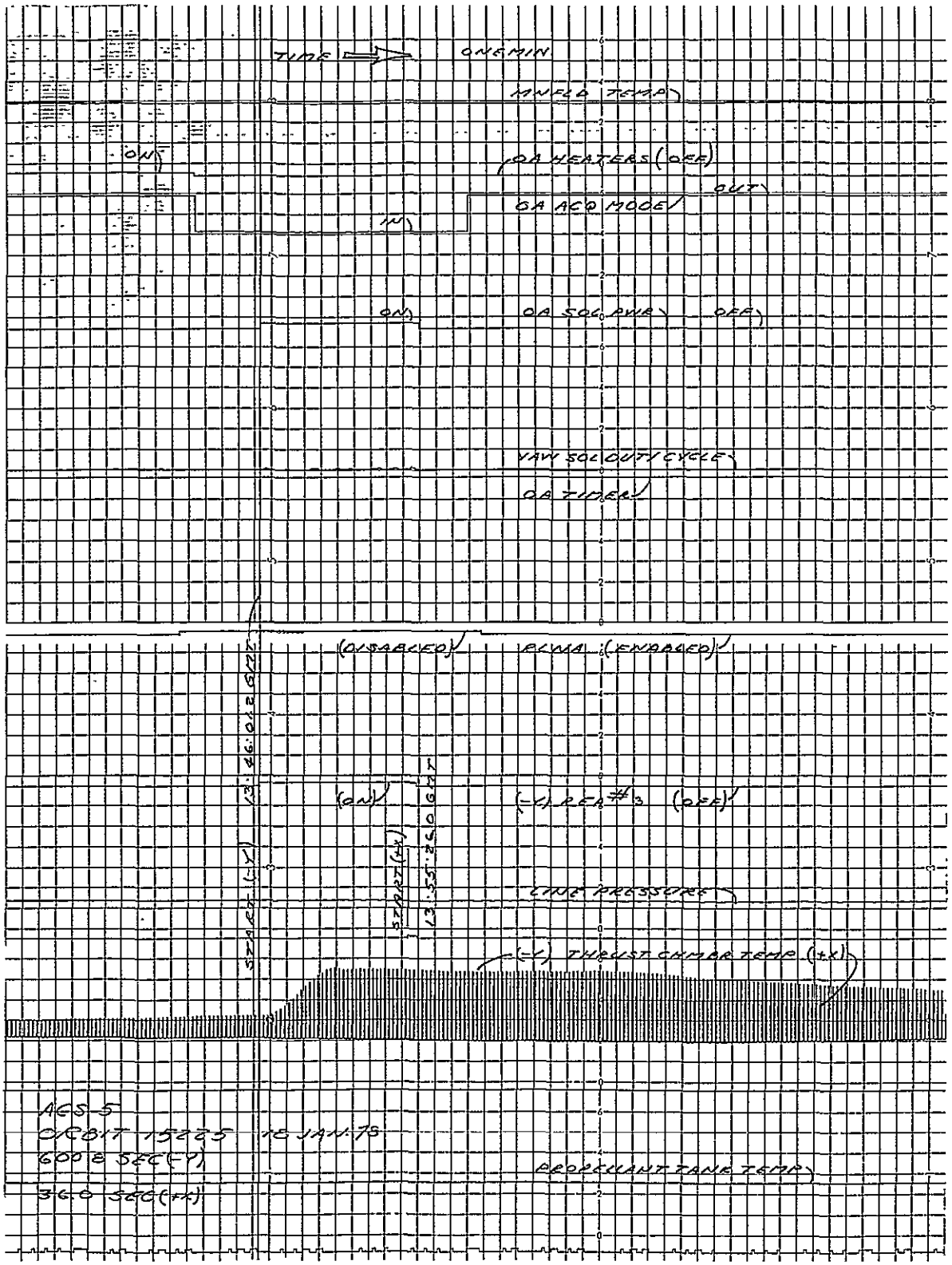

Figure 4-8. Orbit Adjust 15225 – ACS 5

FOLDOUT FRAME 2

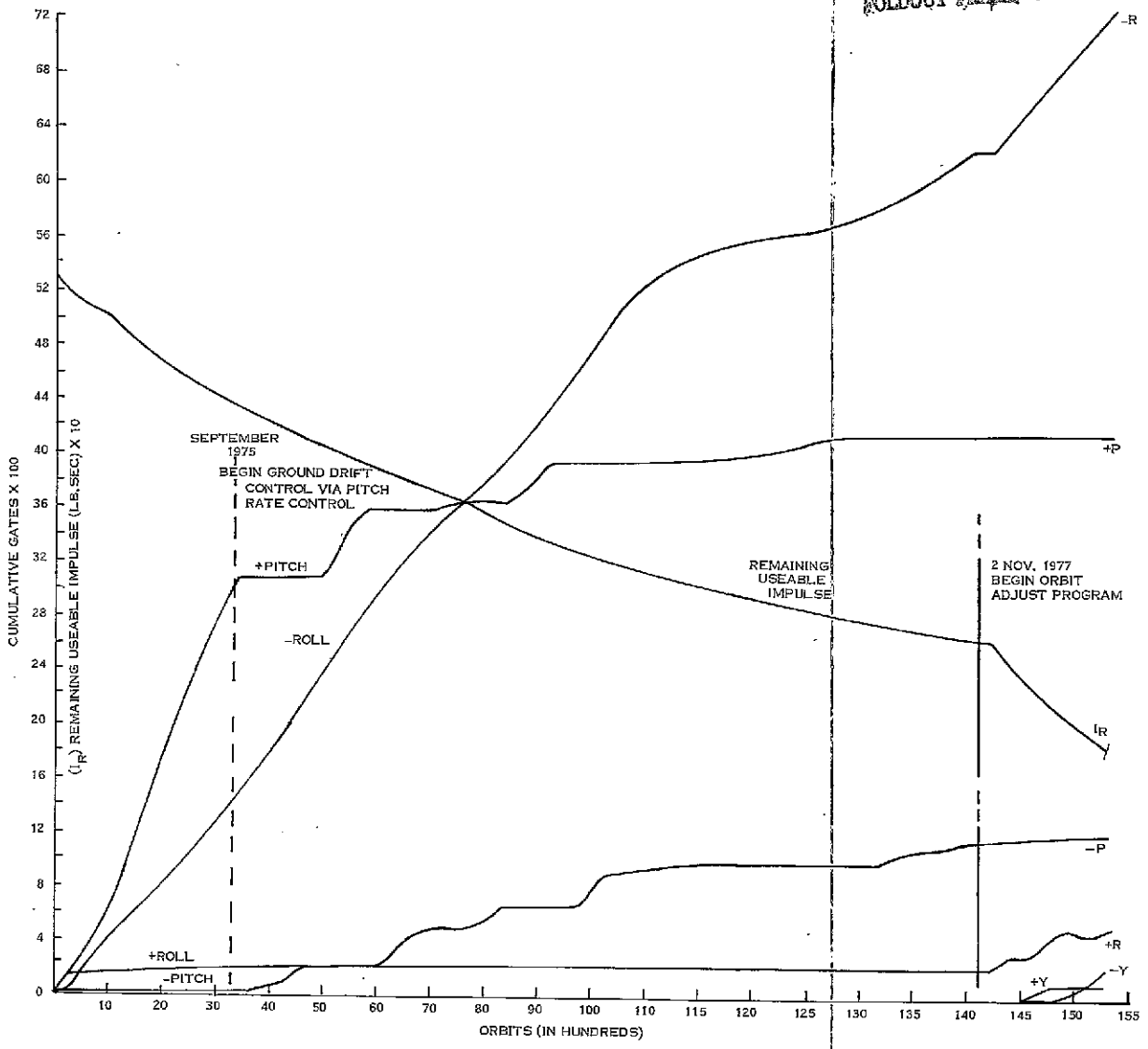

Figure 4-9. Landsat-2 Gating History

FOLDOUT FRAME 1

Table 4-2. Landsat-2 Subsystem Temperature and Pressure Averages

Function	Units	Orbits								
		29	2532	5102	7641	10191	12720	14222	14722	15211
1084 RMP 1 Gyro Temperature	DGC	19.33(1)	21.02	22.69	22.45	22.70	22.54	23.55(3)	23.47(3)	20.21(3)
1094 RMP 2 Gyro Temperature	DGC	74.00	74.00	74.26	74.45	74.50	74.67	74.89	74.65	65.14
1222 SAD RT MTR HSNG Temp.	DGC	19.50	22.23	22.98	23.62	22.73	23.43	24.16	23.81	20.08
1242 SAD LT MTR HSNG Temp.	DGC	26.87	27.54	29.79	28.94	30.26	29.30	30.96	31.06	28.17
1223 SAD RT MTR WNDNG Temp.	DGC	21.76	24.23	24.36	25.23	23.72	24.84	25.08	24.68	20.87
1243 SAD LT MTR WNDNG Temp.	DGC	30.23	30.32	32.83	31.68	33.15	31.92	33.87	34.09	30.47
1228 SAD RT HSG Pressure	PSI	7.26	7.25	7.18	7.13	7.00	6.94	6.94	6.94	6.77
1248 SAD LT HSG Pressure	PSI	7.28	7.27	7.21	7.02	6.91	6.73	6.66	6.60	6.46
1007 FWD Scanner MTR Temp.	DGC	22.07	22.25	23.80	23.39	23.97	23.31	24.77	24.53	21.18
1016 Rear Scanner MTR Temp.	DGC	24.19	23.62	25.04	24.59	24.83	24.59	25.70	25.61	22.87
1003 FWD Scanner Pressure	PSI	9.59(2)	D	D	D	D	D	D	D	D
1012 Rear Scanner Pressure	PSI	6.21	6.00	5.62	5.35	5.11	4.82	4.71	4.71	4.47
1212 Gas Tank Pressure	PSI	1948.0	1672.12	1517.04	1381.12	1256.98	1134.50	1078.25(4)	961.07(4)	863.19(4)
1210 Gas Tank Temperature	DGC	20.66	22.33	24.25	23.75	24.43	24.00	25.33	25.29	22.25
1213 Manifold Pressure	PSI	53.98	54.83	54.56	54.78	55.26	56.00	55.56	56.07	56.49
1211 Manifold Temperature	DGC	19.18	20.50	22.59	21.91	22.78	22.07	23.71	23.56	20.51
1059 CLG Power Supply Card Temp	DGC	39.00	39.52	41.47	40.71	41.81	41.05	42.41	42.38	39.93
1260 TH01 EBP	DGC	24.29	25.01	27.21	26.43	27.58	26.75	28.33	28.39	25.58
1261 TH02 EBP	DGC	20.29	21.36	23.25	22.79	23.48	22.98	24.36	24.29	21.32
1262 TH03 EBP	DGC	18.29	20.05	21.46	21.34	21.29	21.33	22.42	22.35	18.99
1263 TH01 STS	DGC	6.54	-6.22	0.52	-2.62	-1.66	-2.48	- 0.16	- 0.53	- 3.67
1264 TH02 STS	DGC	D	D	D	D	D	D	D	D	D
1265 TH03 STS	DGC	8.46	-.48	8.67	5.75	11.66	7.09	11.32	12.40	9.78
1266 TH04 STS	DGC	-2.78	-9.65	-3.26	-3.63	-0.08	-2.87	0.32	2.76	- 3.56
1267 TH05 STS	DGC	9.62	-2.64	5.57	2.20	4.24	1.98	5.04	5.18	0.97
1224 SAD R FSST	DGC	35.00	36.57	35.81	40.86	34.24	3.71	41.43	36.91	7.91(5)
1244 SAD L FSST	DGC	50.00	46.29	49.13	51.71	55.24	53.20	56.57	55.84	52.49

(1) RMP-1 Left off after initial test in Orbit 1
(2) Prelaunch leak - refer to text
(3) RMP1 in standby mode during orbit adjust maneuvers
(4) Pressure drop due to freon consumed during orbit adjust maneuvers
(5) Low temperature caused by large beta angle shadowing
D Defective telemetry point

Table 4-3. Landsat-2 ACS Voltages and Currents

Function	Units	Orbit								
		29	2532	5102	7641	10191	12720	14222	14722	15211
1081 RMP 1 MTR Volts	VDC	F	F	F	F	F	F	F	F	F
1082 RMP 1 MTR Current	Amps	F	F	F	F	F	F	F	F	F
1080 RMP 1 Supply Volts	VDC	F	F	F	F	F	F	F	F	F
1091 RMP 2 MTR Volts	VDC	29.99	29.94	29.92	29.87	29.87	29.91	29.88	29.88	29.90
1092 RMP 2 MTR Current	Amps	0.10	0.10	0.10	0.11	0.10	0.10	0.10	0.10	0.10
1090 RMP 2 Supply Volts	VDC	-23.63	-23.61	-23.59	-23.59	-23.58	-23.59	-23.57	-23.57	-23.61
1220 SAD RT MTR WNDNG Volts	VDC	- 5.47	- 4.51	- 4.47	- 4.22	- 4.09	- 4.20	- 4.19	- 4.15	- 4.23
1240 SAD LT MTR WNDNG Volts	VDC	- 5.08	- 4.70	- 4.72	- 4.54	- 4.57	- 4.65	- 4.72	- 4.72	- 4.53
1227 SAD RT -15 VDC Conv	VDC	15.14	15.15	15.16	15.13	15.15	15.13	15.13	15.13	15.18
1247 SAD LT -15 VDC Conv	VDC	15.23	15.22	15.21	15.20	15.22	15.22	15.22	15.21	15.21
1056 CLB ± 6 VDC	TMV	2.35	2.35	2.38	2.38	2.40	2.40	2.40	2.40	2.40
1055 CLB ± 10 VDC	TMV	2.88	2.90	2.92	2.93	2.94	2.94	2.94	2.95	2.94
1057 CLB Power Supply Volts	TMV	2.97	2.94	2.96	2.96	2.97	2.96	2.97	2.97	2.96

Table 4-4. Landsat-2 ACS Attitude Errors and Driver Duty Cycles

Function	Units	Orbit								
		26	2532	5102	7641	10191	12720	14222	14722	15211
1041 Pitch Fine Error	DEG	- 0.15	- 0.14	- 0.13	- 1.48*	- 0.82	- 1.37*	- 1.13*	- 0.99	- 0.78
1043 Pitch Flywheel Speed	RPM	-156.12	-198.41	-162.97	214.14	3.39	-157.35	-110.80	122.52	51.87
1038 Pitch Mtr Drvr CCW	PCT	6.64	7.35	6.05	4.24	4.33	7.77	6.45	2.57	1.76
1039 Pitch Mtr Drvr CW	PCT	2.03	2.60	1.80	8.51	3.87	0.04	3.45	5.96	4.59
1030 Roll Fine Error	DEG	- 0.13	- 0.09	- 0.14	- 0.14	- 0.21	- 0.18	- 0.16	- 0.21	- 0.20
1027 Roll Rear Flywheel SPD	RPM	729.30	739.75	748.56	742.88	792.27	785.40	749.13	772.45	796.70
1026 Roll Fwd Flywheel SPD	RPM	703.02	725.23	735.81	721.03	737.44	756.66	734.88	728.56	767.93
1022 Roll Rear Mtr Drvr CCW	PCT	0.67	0.39	0.63	0.41	0.87	0.66	0.93	0.83	0.01
1025 Roll Rear Mtr Drvr CW	PCT	7.54	5.47	6.34	6.80	6.09	7.57	6.44	6.52	6.07
1023 Roll Fwd Mtr Drvr CCW	PCT	0.70	0.37	0.87	0.68	0.72	0.70	1.15	1.04	0.03
1024 Roll Fwd Mtr Drvr CW	PCT	5.46	4.74	4.01	3.82	4.34	3.71	3.83	3.63	3.20
1035 Yaw Tach	RPM	- 95.73	- 41.57	-38.16	- 11.03	-163.04	-108.28	- 99.31	-189.07	- 34.38
1033 Yaw Mtr Drvr CW	PCT	1.98	1.77	2.01	1.76	1.91	2.10	2.17	1.87	1.81
1034 Yaw Mtr Drvr CCW	PCT	2.10	1.72	1.90	1.64	2.49	2.13	100.00	2.63	1.50
1221 SAD Right Tach	D/M	3.38	3.38	3.38	3.38	3.37	3.36	3.36	3.31	3.42
1241 SAD Left Tach	D/M	3.68	3.63	3.56	3.55	3.48	3.56	3.53	3.47	3.55

* Pitch Pos. Bias Implemented During This Orbit
F = Unit OFF

SECTION 5

COMMAND/CLOCK SUBSYSTEM (CMD)

LANDSAT-2

SECTION 5

COMMAND/CLOCK SUBSYSTEM (CMD)

The Command Clock Subsystem operated nominally in this report period. During Orbit 14981 both S/C clock and GMT were set ahead one second for a Δt change of zero. Figure 5-1 shows the history of the S/C clock drift since launch. Figure 5-2 shows the cumulative clock drift, 15,950 seconds faster in 36 months; and Figure 5-3 gives drift rate of S/C clock. The clock of Landsat-2 drifts in opposite direction from the clock of Landsat-1.

Table 5-1 shows typical telemetry values since launch. All are nominal.

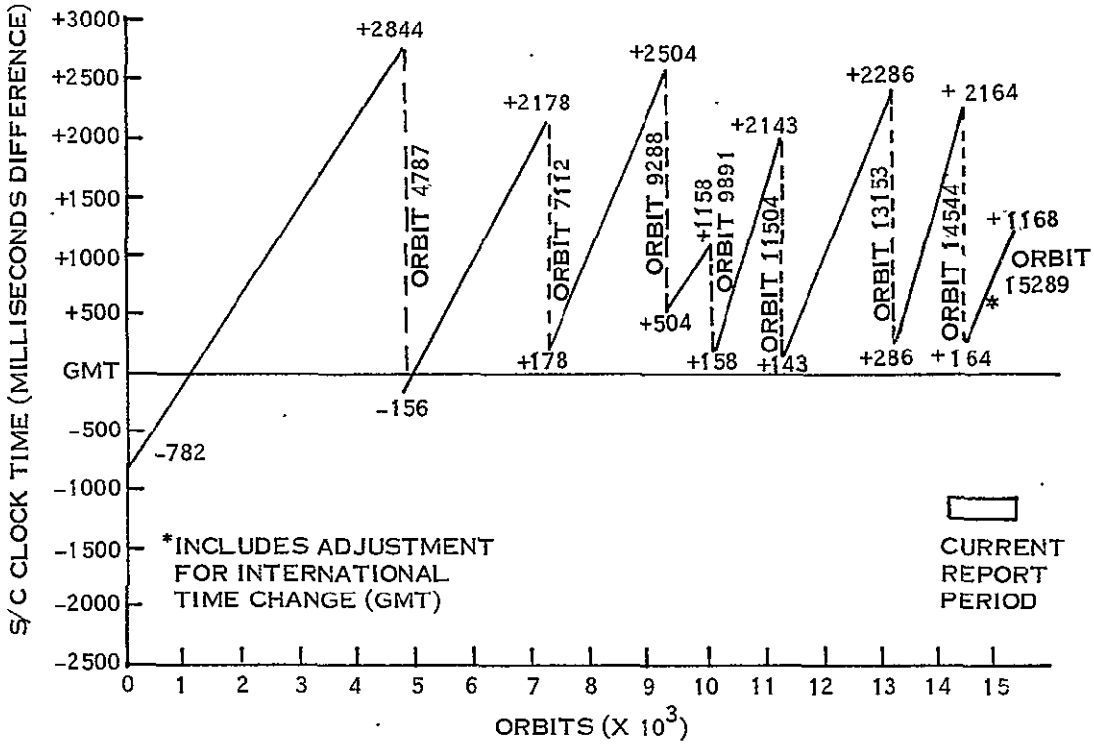

Figure 5-1. Landsat-2 Drift History

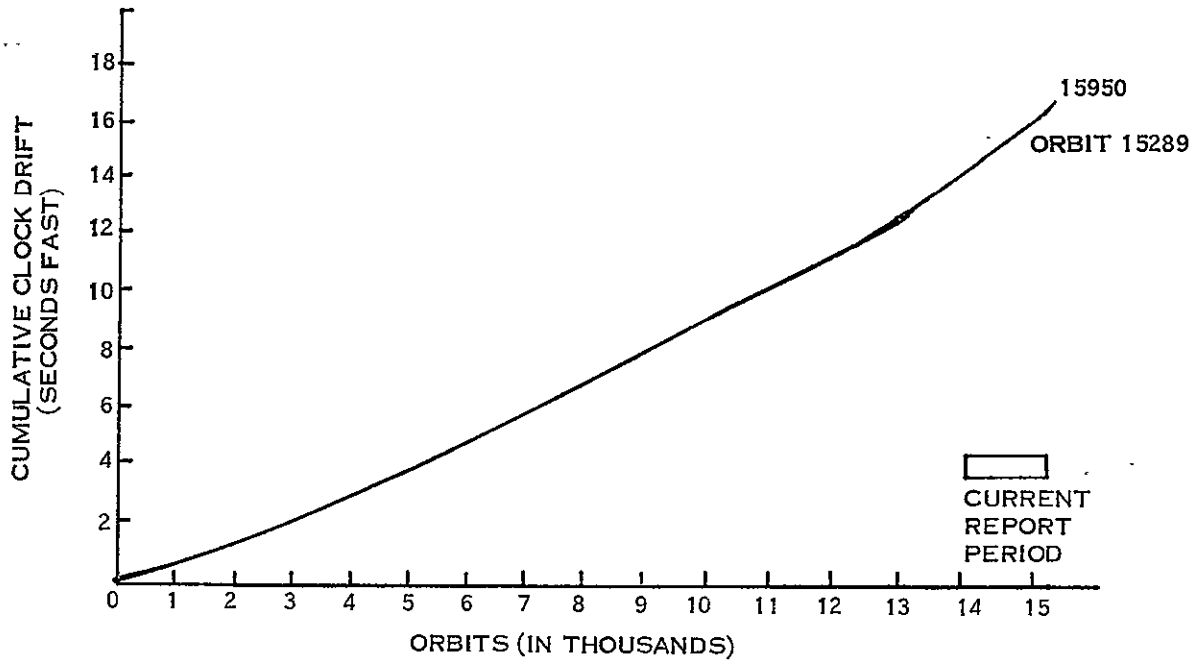

Figure 5-2. Cumulative Clock Drift

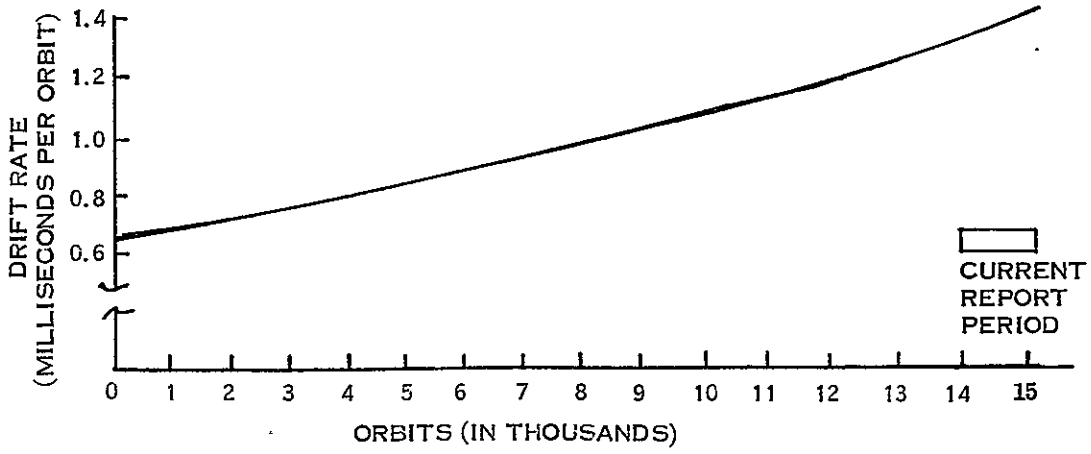

Figure 5-3. Drift Rate of S/C Clock

Table 5-1. Command/Clock Telemetry Summary, Landsat-2

Function No.	Name	Mode	Units	Orbit 35	2462	5091	7640	10,192	14015	14222	14722	15211
8005	Pri. Power Supply Temp	-	DGC	38.82	40.43	39.43	39.94	39.08	39.08	39.14	39.12	39.12
8006	Red. Power Supply Temp	-	DGC	36.93	38.70	38.00	38.52	37.85	37.89	37.97	37.92	37.91
8007	Pri. Osc. Temp	-	DGC	28.70	29.35	28.70	28.69	28.56	28.11	28.27	28.67	28.69
8008	Red Osc. Temp	-	DGC	27.82	28.68	27.26	27.60	26.97	26.96	26.96	27.13	27.40
8009	Pri. Osc. Output	-	TMV	1.06	1.06	1.05	1.05	1.05	1.05	1.06	1.05	1.06
8010	Red. Osc. Output	-	TMV	1.17	1.20	1.18	1.19	1.18	1.18	1.18	1.19	1.18
8011	100 KHz	Pri. - Red	TMV	3.17	3.16	3.15	3.15	3.15	3.15	3.15	3.15	3.15
8012	10 KHz	Pri. - Red	TMV	3.08	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05
8013	2.5 KHz	Pri. - Red	TMV	3.01	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95
8014	400 Hz	Pri. - Red	TMV	4.17	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45
8015	Pri. +4V Power Supply	Pri. Clk ON	TMV	N	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05
8016	Red. +4V Power Supply	Red Clk ON	TMV	N	2.01	2.00	2.00	2.00	2.00	2.00	2.00	2.00
8017	Pri. +6V Power Supply	Pri. Clk ON	TMV	N	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
8018	Red. +6V Power Supply	Red Clk ON	TMV	N	2.31	2.30	2.30	2.30	2.30	2.30	2.30	2.30
8019	Pri. -6V Power Supply	Pri. Clk ON	TMV	N	5.23	5.23	5.22	5.23	5.23	5.23	5.23	5.23
8020	Red. -6V Power Supply	Red. Clk ON	TMV	N	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23
8021	Pri. -23V Power Supply	Pri. Clk ON	TMV	N	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70
8022	Red -23V Power Supply	Red Clk ON	TMV	N	5.65	5.65	5.65	5.65	5.65	5.65	5.65	5.65
8023	Pri. -29V Power Supply	Pri. Clk ON	TMV	N	5.30	5.29	5.29	5.29	5.30	5.30	5.30	5.30
8024	Red -29V Power Supply	Red Clk ON	TMV	N	5.29	5.29	5.29	5.28	5.29	5.29	5.29	5.29
8101	CIU A - 12V	CIU A ON	TMV	3.79	3.97	3.97	3.96	3.96	3.97	3.97	3.97	3.97
8102	CIU B - 12V	CIU B ON	TMV	3.78	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95
8103	CIU A - 5V	CIU A ON	TMV	3.93	4.15	4.15	4.15	4.15	4.14	4.14	4.14	4.14
8104	CIU B - 5V	CIU B ON	TMV	3.90	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
8105	CIU A Temp	CIU A ON	DGC	26.01	22.50	21.67	21.62	21.67	21.34	21.40	21.75	22.29
8106	CIU B Temp	CIU B ON	DGC	23.35	20.38	19.70	19.65	19.71	19.43	19.46	19.78	20.21
8201	Receiver RF-A Temp	-	DGC	N	30.02	29.14	29.22	28.83	28.65	28.71	28.81	28.86
8202	Receiver RF-B Temp	-	DGC	29.09	F	F	24.04	22.66	22.49	22.53	22.56	22.67
8203	D MOD A Temp	-	DGC	28.95	39.20	38.56	39.08	38.25	38.17	38.16	38.27	38.33
8204	D MOD B Temp	-	DGC	37.73	27.56	26.72	28.11	26.31	26.16	26.21	26.28	26.34
8205	Receiver A AGC	Receiver A ON	DBM	F	-92.18	-91.43	-89.93	-90.78	-91.82	-92.21	-88.47	-89.02
8206	Receiver B AGC	Receiver B ON	DBM	-87.83	F	F	-88.46	F	F	F	F	F
8207	Amp. A Output	Receiver A ON	TMV	F	2.51	2.54	2.58	2.75	2.46	2.60	2.77	2.66
8208	Amp. B Output	Receiver B ON	TMV	2.10	F	F	2.51	F	F	F	F	F
8209	Freq. Shift Key A Out	Receiver A ON	TMV	F	1.08	1.08	1.08	1.09	1.08	1.08	1.08	1.08
8210	Freq. Shift Key B Out	Receiver B ON	TMV	1.11	F	F	1.13	F	F	F	F	F
8211	Amp. A Output	Receiver A ON	TMV	F	1.12	1.13	1.11	1.14	1.13	1.13	1.14	1.13
8212	Amp. B Output	Receiver B ON	TMV	1.13	F	F	1.16	F	F	F	F	F
8215	D MOD A - 15V	Receiver A ON	TMV	F	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87
8216	D MOD B - 15V	Receiver B ON	TMV	4.77	F	F	4.77	F	F	F	F	F
8217	Regulator A - 10V	Receiver A ON	TMV	F	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40
8218	Regulator B - 10V	Receiver B ON	TMV	5.32	F	F	5.31	F	F	F	F	F
8311	ECAM Mem. Tmp	ECAM ON	DGC	N	18.03	18.41	18.10	18.44	18.38	18.45	18.40	18.38
8312	ECAM Pwr Spply Temp	ECAM ON	DGC	N	23.13	23.13	22.45	23.00	22.91	23.06	23.01	22.97

N - Data Not Available.
F - Unit Off

SECTION 6

TELEMETRY SUBSYSTEM (TLM)

LANDSAT-2

SECTION 6

TELEMETRY SUBSYSTEM (TLM)

The TLM has operated nominally in this report period.

Table 6-1 shows typical telemetry values since launch. All are nominal. Functions 1264 (Thermal Shield 5 Temperature), 4002 (MMCA Board 2 Temperature) and 13200 (APU 24 Volt Input) were defective before launch but verification of these functions is acceptable by adjacent temperature and downstream voltage measurements respectively.

The memory section of the telemetry matrix remains in the 0.0 mode.

Table 6-1. Landsat-2 TMP Telemetry Values

Func. No.	Function Name	Unit	Orbit								
			35	2467	5091	7641	10,192	12,712	14222	14722	15211
9001	Memory Sequencer A Converter	VDC	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45
9002	Memory Sequencer B Converter	VDC	F	F	F	F	F	F	F	F	F
9003	Memory Sequencer Temp	°C	20.00	20.77	21.37	20.46	21.34	21.13	21.43	21.26	21.87
9004	Formatter A Converter	VDC	4.52	4.51	4.52	4.50	4.52	4.52	4.52	4.52	4.54
9005	Formater B Converter	VDC	F	F	F	F	F	F	F	F	F
9006	Dig. Mux A Converter	VDC	4.22	4.22	4.22	4.21	4.22	4.22	4.22	4.22	4.23
9007	Dig. Mux B Converter	VDC	F	F	F	F	F	F	F	F	F
9008	Formatter/Dig Mux Temp	°C	25.00	23.98	27.80	22.51	29.75	26.15	27.74	29.54	32.56
9009	Analog Mux A Converter	VDC	4.02	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05
9010	Analog Mux B Converter	VDC	F	F	F	F	F	F	F	F	F
9011	A/D Converter A Voltage	VDC	4.02	4.02	4.03	4.04	4.04	4.04	4.05	4.03	4.05
9012	A/D Converter B Voltage	VDC	F	F	F	F	F	F	F	F	F
9013	Analog Mux, A/D Conv. Temp	°C	25.00	24.91	27.33	25.00	27.44	26.99	27.11	27.46	29.72
9014	Preregulator A Voltage	VDC	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
9015	Preregulator B Voltage	VDC	F	F	F	F	F	F	F	F	F
9016	Reprogrammer Temp	°C	22.50	22.27	24.74	21.89	25.47	22.77	24.15	24.63	28.98
9017	Memory A Converter	VDC	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45
9018	Memory A Temp	°C	17.50	17.33	17.17	15.62	17.16	16.54	17.10	17.04	16.66
9019	Memory B Converter	VDC	F	F	F	F	F	F	F	F	F
9020	Memory B Temp	°C	17.50	17.28	17.41	17.45	17.50	16.51	17.42	17.32	17.52
9100	Reflected Power	dBm	18.29	13.68	14.18	13.88	14.53	14.07	14.21	14.42	15.24
9101	Xmtr A-20 VDC	VDC	3.80	3.98	3.97	3.97	3.98	3.97	3.98	3.97	3.98
9102	Xmtr B-20 VDC	VDC	F	F	F	F	F	F	F	F	F
9103	Xmtr A Temp	°C	27.73	20.97	26.40	21.06	30.37	21.92	26.18	28.73	36.69
9104	Xmtr B Temp	°C	N	22.07	27.74	22.13	31.74	22.99	27.53	30.12	37.80
9105	Xmtr A Power Output	dBm	27.73	26.19	26.29	26.19	26.41	26.30	26.37	26.40	26.59
9106	Xmtr B Power Output	dBM	F	F	F	F	F	F	F	F	F

N - Data Not Available.
F - Unit Off.

SECTION 7

ORBIT ADJUST SUBSYSTEM (OAS)

LANDSAT-2

SECTION 7

ORBIT ADJUST SUBSYSTEM (OAS)

An orbit adjust program was implemented during Orbit 14157 (2 November 1977) in order to change Landsat-2's orbit inclination from 98.95° to approximately 99.23° (see Sections 2 and 4 also).

Approximately 20000 seconds of (-Y) REA burn time will be accumulated over the span of this program and approximately 30 (-Y) orbit adjust burns will be conducted. All of the (-Y) orbit adjust burns will be conducted with the spacecraft located within ±25° of the descending node and with payload operations suspended.

Shorter duration (+X) axis burns will be scheduled with the (-Y) axis burns in order to maintain "in plane" orbital parameters. In most cases, the (-Y) and (+X) burns will be compound burns, i.e., the (+X) thruster will be ignited during the trailing portion of the (-Y) burn and both burns will terminate simultaneously.

Approximately 36 pounds of hydrazine will be consumed by these maneuvers.

Twenty seven burns - representing 12820.8 seconds of (-Y) burn time and 862.6 seconds of (+X) burn time - were successfully conducted from program commencement (2 November 1977) through 23 January 1978, and the OAS system performed normally in every event.

Orbital changes resulting from the program to date are satisfactory.

Hydrazine consumed during this program was within the predicted limits and there are 32.96 pounds of hydrazine remaining. Nitrogen pressure after the burn in Orbit 15295 (23 January 1978) was recorded at 194.14 PSIA. Table 7-1 shows the propellant status initialized shortly before program commencement.

Table 7-1. Pre-Program Propellant Initial Conditions

Orbit # 14152 2 Nov. 1977	Pressure (PSIA)	Temp (°C)	Mass (lbs)	Remaining Usable Impulse (lb sec)
Freon	1082.74	25.33	6.06	261.49
Hydrazine			61.74	N/A
Nitrogen	425.55	22.22	.79	N/A

Table 7-2 is a compilation of all of Landsat-2's orbit adjust operations since launch with burns 11 through 37 reflecting this quarter's activities.

Table 7-3 shows typical telemetry values for the OAS during quiescent periods. Variations in thrust chamber temperatures shown in Table 7-3 are consistent with variations in sun intensity and sun angle.

Table 7-2. Landsat 2 Orbit Adjust Summary

Orbit Adjust No.	Orbit No.	Epoch (Burn Start Time)	Burn Axis (-Y)	Burn Axis (+X)	Burn Duration (Seconds) (-Y)	Burn Duration (Seconds) (+X)	Post Burn Freon Status (PSIA)	Hydrazine Consumed (Lbs)	Post Burn Hydrazine Tank P. (PSIA)	Burn Efficiency (%)	Δn (Meters)	Δi (Degrees)
1	32	26 Jan 75 00:34:00.8		-X		4.8	1947.19	0.02	539.96	104.3	39	0.0
2	71	27 Jan 75 19:57:00.8		+X		4.8	1923.78	0.02	547.46	90.1	-36	0.0
3	79	28 Jan 75 09:49:00.8		-X		420.0	1910.50	1.62	547.46	107.0	3455	0.0
4	86	28 Jan 75 21:13:00.8		-X		420.0	1916.40	1.51	502.46	107.0	3233	0.0
5	168	3 Feb 75 10:36:00.8		+X		420.0	1884.35	1.42	468.75	97.0	-2974	0.0
6	191	5 Feb 75 10:15:00.8		+X		300.0	1874.51	1.15	438.71	97.5	-2421	0.0
7	212	6 Feb 75 22:31:00.8		+X		308.8	1865.15	0.95	416.21	98.6	-2009	0.0
8	880	26 Mar 75 21:44:00.8		-X		12.8	1837.05	0.04	397.47	107.6	82	0.0
9	1632	19 May 75 18:54:00.8		-X		24.0	1767.46	0.07	401.21	107.6	154	0.0
10	2958	22 Aug 75 22:11:58.8		-X		22.0	1640.00	0.07	404.96	110.3	146	0.0
11	14157	2 Nov 77 23:47:01.2	-Y		5.2		1085.19	0.02	425.22	*	2.1	0.0
12	14171	3 Nov 77 23:47:07.2	-Y		60.0		1097.50	0.18	419.94	125.2	23.8	0.002
13	14185	4 Nov 77 23:52:49.2	-Y		60.0		1085.19	0.16	417.14	130.7	28.7	0.002
14	14324	14 Nov 77 23:07:01.2 23:11:42.4	-Y	+X	300.0	18.8	1065.50	0.97	401.19	97.1	128.4	0.007
15	14352	16 Nov 77 23:18:01.2 23:22:42.4	-Y	+X	300.0	18.8	1047.79	0.82	388.54	115.8	104.6	0.009
16	14382	19 Nov 77 02:06:01.2		+X		50.0	1048.00	0.18	385.80	100.9	-311.9	0.0
17	14514	28 Nov 77 14:08:01.2	-Y		300.0		1036.87	0.87	373.95	99.6	197.3	0.007
18	14542	30 Nov 77 14:17:01.2 14:22:41.2	-Y	+X	420.0	80.0	1025.30	1.43	356.13	103.8	-208.0	0.010
19	14570	2 Dec 77 14:27:31.2 14:36:11.2	-Y	+X	600.0	80.0	999.87	1.74	336.17	103.0	-131.0	0.014
20	14617	5 Dec 77 23:22:01.2	-Y		600.0		986.50	1.56	319.94	99.0	261.5	0.013
21	14645	7 Dec 77 23:32:01.2 23:41:05.2	-Y	+X	600.0	60.0	986.50	1.56	305.16	100.1	-17.6	0.012
22	14673	9 Dec 77 23:43:31.2 23:52:43.2	-Y	+X	600.0	46.0	963.00	1.47	292.22	103.8	9.8	0.012
23	14714	12 Dec 77 22:23:00.2 22:26:14.0	-Y	+X	599.8	46.0	961.19	1.65	278.20	100.8	31.0	0.011
24	14628	13 Dec 77 22:23:00.2 22:32:14.0	-Y	+X	599.8	46.0	949.67	1.24	269.30	103.4	31.3	0.011
25	14807	18 Dec 77 14:21:01.2 14:30:13.2	-Y	+X	600.0	48.0	937.19	1.39	259.92	101.0	30.6	0.011
26	14812	19 Dec 77 22:57:30.2 23:06:42.0	-Y	+X	599.8	48.0	935.99	1.48	250.36	104.7	23.1	0.011
27	14840	21 Dec 77 23:09:00.2 23:18:04.0	-Y	+X	599.8	48.0	922.21	1.36	242.44	99.4	-42.5	0.010
28	15058	6 Jan 78 14:21:32.2 14:30:18.2	-Y	+X	589.0	42.0	900.08	1.59	236.39	98.8	31.9	0.009
29	15105	9 Jan 78 23:14:31.2 23:23:43.2	-Y	+X	600.0	48.0	887.88	0.77	232.22	97.0	-12.0	0.009
30	15119	10 Jan 78 23:20:31.2 23:29:46.0	-Y	+X	600.8	46.0	887.88	1.47	224.68	101.8	-32.8	0.010
31	15127	11 Jan 78 13:06:01.2 13:15:16.0	-Y	+X	600.6	46.0	878.71	1.33	218.32	101.2	-30.8	0.009
32	15133	11 Jan 78 23:26:01.2	-Y		600.8		877.61	0.70	215.55	101.9	109.4	0.009
33	15155	13 Jan 78 13:18:01.2 13:27:46.0	-Y	+X	600.8	14.0	863.19	1.31	209.91	99.5	43.6	0.009
34	15197	16 Jan 78 13:35:01.2 13:44:42.0	-Y	+X	600.8	20.0	863.19	1.11	205.20	98.5	15.9	0.008
35	15211	17 Jan 78 13:41:01.2 13:50:56.0	-Y	+X	601.8	7.0	854.24	0.71	202.49	96.2	61.5	0.008
36	15225	18 Jan 78 13:46:01.2 13:55:26.0	-Y	+X	600.8	36.0	838.57	1.27	197.50	94.8	-43.0	0.008
37	15235	23 Jan 78 14:15:01.2 14:24:46.0	-Y	+X	600.8	16.0	835.90	0.91	194.14	99.8	27.7	0.008

* - Burn too short to influence tracking data.

FOLDOUT FRAME 1

FOLDOUT FRAME 2

FOLDOUT FRAME 3

Table 7-3. Landsat-2 OAS Telemetry Values

Function No.	Name	Units	Orbit							
			50	2532	5102	7641	10191	14222	14722	15211
2001	Prop. Tank Temp.	°C	23.03	23.05	23.89	22.22	23.05	22.22	23.05	24.48
2003	Thrust Chamber No. 1 (-X) Temp.*	°C	24.84	30.14	25.12	28.57	21.75	25.10	23.20	20.83
2004	Thrust Chamber No. 2 (+X) Temp.*	°C	37.34	38.41	38.55	39.29	37.60	37.86	37.34	35.32
2005	Thrust Chamber No. 3 (-Y) Temp.*	°C	47.22	34.20	46.35	34.82	49.78	45.66	57.71	78.50
2006	Line Pressure	psia	545.60	404.97	413.25	415.39	419.94	417.79	279.12	205.21

*Widespread of temperature is due to nozzle locations and satellite day/night transitions relative to data averaged. Typical orbital range is from 19 to 59 DGC.

SECTION 8

MAGNETIC MOMENT COMPENSATING ASSEMBLY (MMCA)

LANDSAT-2

SECTION 8

MAGNETIC MOMENT COMPENSATING ASSEMBLY (MMCA)

The spacecraft was corrected for unbalanced magnetic moments in Orbits 293 and 321 as reported earlier. These adjustments were made on the pitch magnetic rod of the MMCA.

No adjustment to the MMCA dipoles was made during this report period.

Orbital averages of MMCA telemetry functions for selected orbits are given in Table 8-1.

Table 8-1. Landsat-2 MMCA Telemetry Values

Function	Name	Units	Orbit								
			50	2532	5102	7641	10191	12721	14222	14722	15211
4001	A1 Board Temp	°C	20.56	19.82	19.47	19.20	19.12	18.79	18.94	18.83	18.82
4002	A2 Board Temp	°C	*	*	*	*	*	*	*	*	*
4003	Hall Current	TMV	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
4004	Yaw Flux Density	TMV	3.05	3.07	3.07	3.07	3.07	3.07	3.07	3.07	3.07
4005	Pitch Flux Density	TMV	3.15**	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
4006	Roll Flux Density	TMV	2.99	2.98	2.97	2.97	2.97	2.97	2.97	2.97	2.97

*Defective Telemetry Function (Pre-launch)
**Post Launch Telemetry Drift.

SECTION 9

UNIFIED S-BAND/PREMODULATION PROCESSOR (USB/PMP)

LANDSAT-2

SECTION 9

UNIFIED S-BAND/PREMODULATION PROCESSOR (USB/PMP)

The USB Subsystem has operated nominally in this report period.

Table 9-1 shows telemetry values since launch. All are nominal. The transmitter has maintained a steady indicated power output of about 1.4 watts since launch. Figure 9-1 shows AGC readings of Goldstone for 2 constant positions in space. The scatter of data points reflect variations in the ground station calibration and readout.

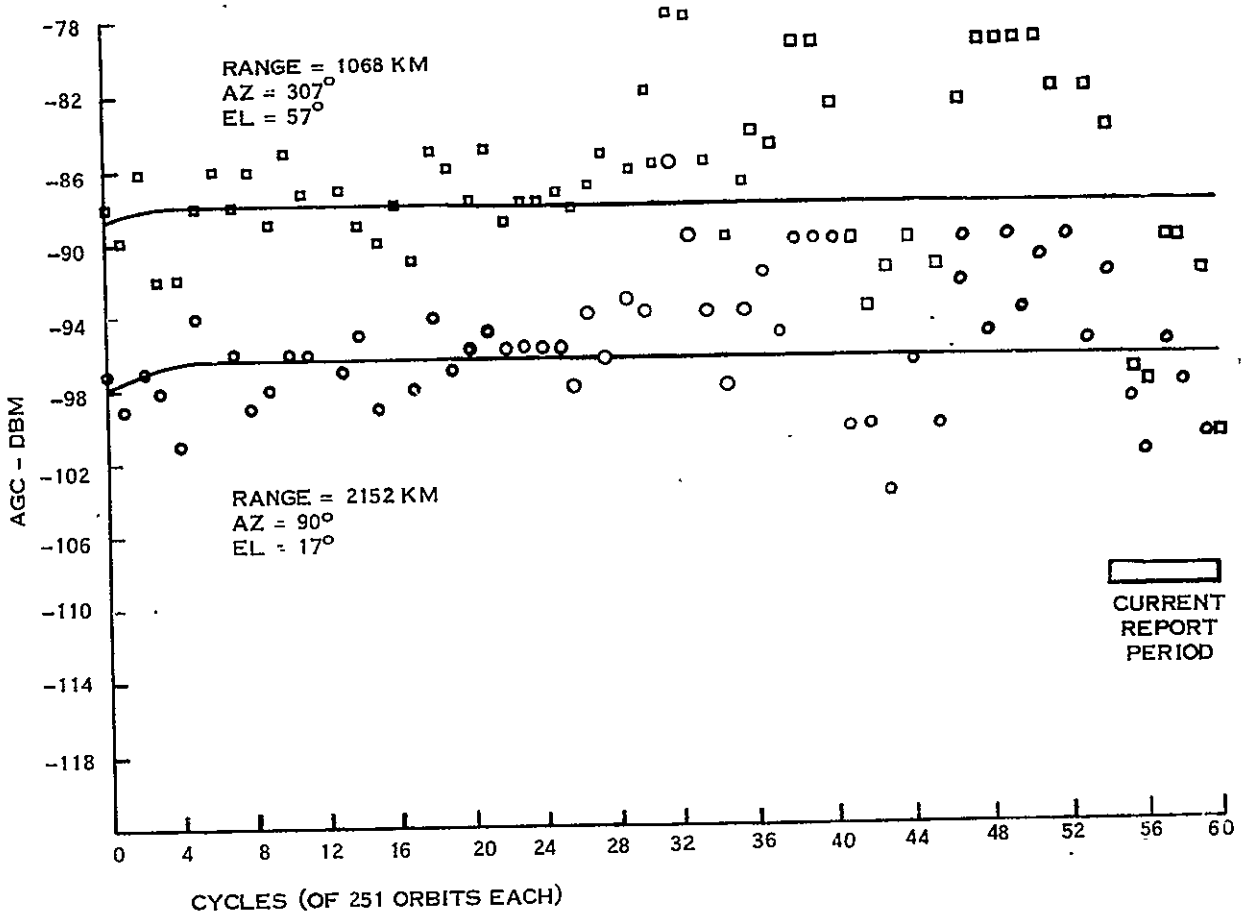

Figure 9-1. USB (Link 4) AGC Readings at Goldstone with 30' Antenna – Landsat-2

Table 9-1. Landsat-2 USB/PMP Telemetry Values

No.	Function Name	Units	T/V (20°C)	Orbits								
				15	2462	5091	7641	10641	12720	14222	14722	15211
11001	USB Rcvr AGC	DBM	NA	-112.72	-128.8	-124.29	-122.37	-124.85	-131.50	-127.90	-131.50	-126.13
11002	USB Xmtr Pwr	WTS	1.40	1.36	1.43	1.38	1.37	1.39	1.37	1.41	1.40	1.39
11003	USB Rcvr Error	KHz	- 2.15	- 2.15	- 4.64	- 2.97	- 4.30	- 3.43	- 4.09	-3.80	-4.66	-4.98
11004	USB Xpond Temp	DGC	22.93	25.88	24.37	27.49	24.12	29.06	24.63	27.92	29.27	33.03
11005	USB Xpond Press	PSI	16.99	17.08	16.74	16.49	15.94	15.96	15.62	15.67	15.82	16.03
11007	USB Xmtr A -15V	VDC	2.35	2.36	F	F	F	F	F	F	F	F
11008	USB Xmtr B -15V	VDC	2.39	F	2.40	2.42	2.39	2.39	2.41	2.38	2.39	2.36
11009	USB Range -15V	VDC	2.07	2.07	2.07	2.06	2.05	2.06	2.05	2.06	2.06	2.06
11101	PMP Pwr A Volt	VDC	-15.22	- 15.10	F	F	F	F	F	F	F	F
11102	PMP Pwr B Volt	VDC	-15.07	F	- 15.02	- 14.99	- 14.99	- 14.99	- 15.01	-14.93	-14.93	-14.96
11103	PMP Temp A	DGC	N/A	37.30	29.12	34.67	28.38	37.49	29.59	34.43	37.10	43.12
11104	PMP Temp B	DGC	N/A	28.34	30.57	36.08	29.62	38.64	30.90	36.17	38.64	44.11

F = Unit OFF

SECTION 10

ELECTRICAL INTERFACE SUBSYSTEM (EIS)

LANDSAT-2

SECTION 10

ELECTRICAL INTERFACE SUBSYSTEM (EIS)
LANDSAT-2

The Auxiliary Processing Unit (APU) consisting of Search Track Data, Time Code Data, and Back-up Timers operated satisfactorily throughout this report period. Telemetry for the APU is shown in Table 10-1, and is nominal.

Table 10-1. Landsat-2 APU Telemetry Functions

Function	Description	Unit	Orbit					
			21	10192	12720	14222	14722	15211
13200	APU, -24.5 VDC	TMV	D	D	D	D	D	D
13201	APU, -12 Volts	TMV	2.42	2.45	2.45	2.45	2.45	2.45
13202	APU Temp	DGC	27.44	28.78	26.20	27.67	28.58	30.64

D - Defective Telemetry (Prelaunch)

The Power Switching Module (PSM) containing the switching relays for power to the OAS, MSS, WBPA-1, WBPA-2, WBVTR-1, WBVTR-2, RBV and PRM, functioned normally. During this report perod, the MSS WBPA-2 and WBVTR-2 power circuits, have been operated on a regular basis. RBV and WBPA-1 power circuits have been used for limited operation.

The Interface Switching Module performed all switchings normally during this report period.

SECTION 11

THERMAL SUBSYSTEM (THM)

LANDSAT-2

SECTION 11

THERMAL SUBSYSTEM (THM)

The Thermal Control Subsystem in Landsat-2 has provided satisfactory control of all spacecraft equipments since launch.

Table 11-1 gives average subsystem telemetry values for several representative orbits during the 36 months of operation of Landsat-2. Average temperatures of the sensory ring bays are plotted in Figure 11-1.

During this report period, the sun intensity varied from 1,010 to 1,032 times the mean value and the average spacecraft temperatures increased.

A history of compensation load switching since launch is shown in Table 11-2.

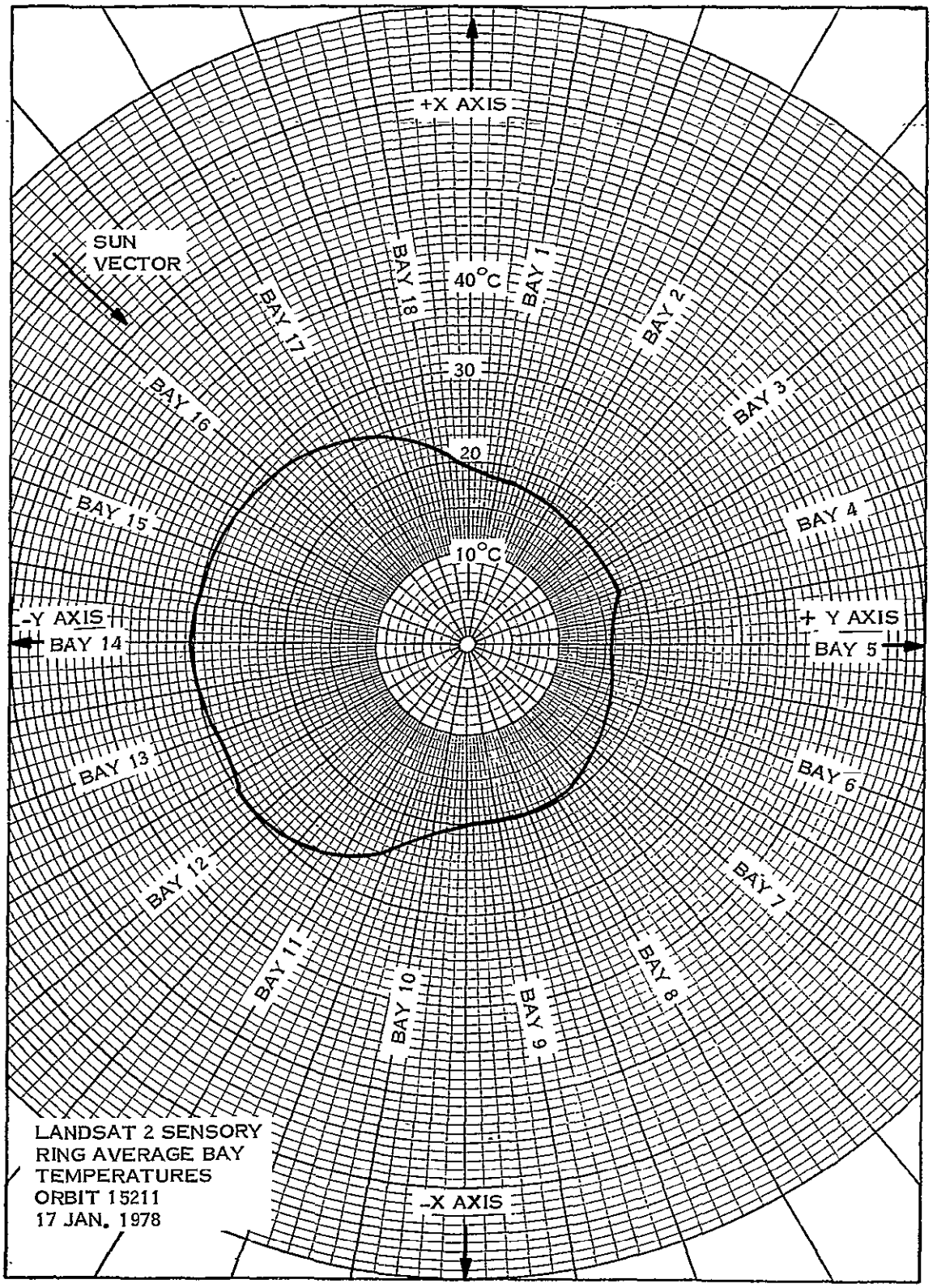

Figure 11-1. Landsat-2 Sensory Ring Thermal Profile

Table 11-1. Landsat-2 Thermal Subsystem Analog Telemetry (Average Value for Frames of Data Received in NBTR Playback)

Function No.	Function Description	Unit	Orbits 21	2532	5102	7641	10192	12720	14229	14722	15211
7001	THM TH01 STI	DGC	19.40	19.59	19.97	18.63	19.59	18.17	19.42	19 51	19.68
7002	THM TH02 SBO	DGC	17.18	18.05	17.47	17.21	17.65	17.28	17.78	17.85	17.36
7003	THM TH03 STI	DGC	18.73	19.49	18.50	17.73	18.65	17.95	18.73	18 42	18.02
7004	THM TH10 TCB	DGC	19.39	19.01	19.34	18.64	19.94	18.22	19.17	19 62	21.20
7005	THM TH04 STI	DGC	17.19	17.92	16.76	16.30	17.37	16.83	17.47	17.19	16.70
7006	THM TH05 SBO	DGC	17.42	17.46	16.68	16.52	16.65	16.41	16.61	16 53	16.38
7007	OA-X Thruster	DGC	19.65	20.58	19.65	20.02	19.44	19.30	19.44	19.33	19.70
7008	THM TH06-STO	DGC	14.78	14.77	13.94	13.78	13.57	13.39	13.49	13.40	13.34
7009	THM TH06 SBI	DGC	19.15	19.18	18.41	18.06	18.10	17.64	17.86	17.93	17.91
7010	THM TH07 STI	DGC	18.08	18.26	17.44	17.56	17.11	16.62	16.92	16.99	17.10
7011	THM TH08 STO	DGC	19.34	20.22	19.23	19.74	19.00	18.98	19 02	18.78	18.92
7012	THM TH09 SBI	DGC	21.44	21.80	20.93	20.68	20.94	20.12	20.59	20.39	21.45
7013	THM TH10 SBO	DGC	18.58	18.56	18.39	18.05	18.59	17.72	18.19	18.21	19.12
7014	THM TH11 STI	DGC	21.65	21.13	21.93	20.61	22.75	20 26	21 69	22.53	24.58
7015	THM TH12 SBO	DGC	23.93	22.13	24.68	21.83	26.86	22.23	24.71	25 29	29.56
7016	THM TH13 STI	DGC	22.21	20.51	23.62	20.24	25.73	20.41	23.43	25.08	29 30
7017	RBV Beam Ctr Ln	DGC	20.38	20.33	19.92	19.09	20.16	18.58	19.46	20.08	21.25
7018	THM TH14 STO	DGC	24.12	21.29	26.43	21.40	29.64	22.11	25.91	28.30	33 01
7019	NBR Rad Outbd B4	DGC	2.72	3.26	2.93	2.31	2.44	1.89	2 18	2 29	2.65
7020	THM TH15 SBI	DGC	23.07	21.13	25.56	20.11	27.07	21.20	24.77	26.10	31.02
7021	THM TH16 STI	DGC	23.26	22.29	25.46	21.07	25.87	21.71	24 37	25 31	29.22
7022	THM TH17 SBI	DGC	21.77	21.22	23.74	20.21	23.75	21.00	22.70	23.48	25.97
7023	THM TH18 SBO	DGC	21.67	21.49	23.36	21.30	23.69	21.57	22.89	24.12	25.27
7030	THM TH03 Bur	DGC	15.50	16.28	15.14	15.21	15.59	15.48	15 87	15 58	15 08
7033	THM TH12 Bur	DGC	23.05	21.70	24.59	21.44	27.14	21.99	24.92	25.66	31.18
7035	THM TH18 Bur	DGC	19.53	19.32	20.39	19.05	20.20	18.51	19.86	20.91	21.03
7040	THM TH01 TCB	DGC	19.42	19.78	19.72	18.82	19.96	18.82	19.84	19.97	19.66
7041	THM TH02 TCB	DGC	17.55	18.02	17.39	17.06	17.42	17.06	17.50	17.33	16.94
7042	THM TH03 TCB	DGC	16.85	18.23	16.32	16.37	18.04	17.78	18.56	17.95	17.08
7043	THM TH04 TCB	DGC	19.90	20.05	19.33	19.21	19.65	19.34	19.67	19.51	19.16
7044	THM TH05 TCB	DGC	16.42	16.21	15.75	15.47	15.44	15.20	15.36	15.35	15.17
7045	THM TH07 TCB	DGC	17.76	18.12	17.33	17.64	17.01	16.78	16.93	16.90	16.92
7046	THM TH09 TCB	DGC	19.30	19.31	18.81	18.83	18.82	18.32	18.56	18.93	19.31
7048	THM TH11 TCB	DGC	23.27	22.45	23.74	22.07	24.99	22.08	23.71	24.50	27.06
7049	THM TH12 TCB	DGC	23.04	20.62	23.94	20.34	26.83	20.88	24.33	25.83	30 59
7050	THM TH13 TBC	DGC	22.89	20.34	24.67	20.46	27.61	20.77	24 61	26.47	31.99
7051	THM TH14 TCB	DGC	25.07	22.11	27.69	22.22	31.17	22.99	26.96	29.75	36.18
7052	THM TH16 TCB	DGC	22.22	21.59	24.29	20.64	25.62	21.97	24.47	25 40	29.18
7053	THM TH17 TCB	DGC	23.52	22.79	24.86	22.53	25.00	23.64	24.05	25.01	26.83
7054	THM TH18 TCB	DGC	20.01	20.05	20.99	20.27	21.41	18.93	20.83	21.34	21.17
7060	THM Shutter By 1	DEG	22.54	24.43	26.65	15.42	27.36	14.94	25.05	25 63	24.93
7061	THM Shutter By 2	DEG	19.34	24.75	21.13	17.50	17.89	17.34	20.89	14.23	11.72
7062	THM Shutter By 3	DEG	22.75	31.67	11.99	12.70	28.91	26.94	31.61	27.07	19.01
7063	THM Shutter By 4	DEG	33.89	36.32	33.00	33.02	32.90	33.22	34.51	30.72	27.37
7064	THM Shutter By 5	DEG	7.50	8.67	2.90	2.88	2.42	1.87	1.88	1.83	1.79
7065	THM Shutter By 7	DEG	17.06	22.52	14.11	13.98	8.88	8.18	8.18	7.18	6.89
7067	THM Shutter By 9	DEG	33.75	38.22	34.12	33.75	33.70	31.46	31.50	33.34	36.71
7068	THM Shutter By 10	DEG	37.46	34.96	37.09	33.32	40.64	30.67	36.40	40.09	48.39
7069	THM Shutter By 11	DEG	52.25	10.16	17.39	3.29	22.81	0.04	19.10	25.67	46.32
7070	THM Shutter By 12	DEG	61.38	46.20	67.46	45.57	80.70	48.06	69.95	79.94	83.62
7071	THM Shutter By 13	DEG	63.60	45.76	74.14	47.35	81.89	49.06	73.93	81.55	81 89
7072	THM Shutter By 14	DEG	59.44	40.40	72.14	40.22	72.91	44.59	67.65	71.57	71.60
7073	THM Shutter By 15	DEG	67.79	53.78	82.12	48.88	83.87	59.18	81.42	82.62	83.96
7074	THM Shutter By 16	DEG	45.20	43.68	61.13	36.55	68.30	46.48	62.09	66.24	76 93
7075	THM Shutter By 17	DEG	57.88	52.10	67.62	50.12	68.67	58.64	61.78	67 62	78 13
7076	THM Shutter By 18	DEG	40.49	39.32	45.84	40.47	47.49	32.22	44 37	46.21	46 15
7080	THM Q1 T Zener V	VDC	4.85	4.85	4.85	4.85	4.85	4.85	4.85	4.85	4 85
7081	THM Q2 T Zener V	VDC	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4 90
7082	THM Q3 T Zener V	VDC	5.05	5.04	5.05	5.04	5.04	5.03	5 03	5.04	5.04
7083	THM Q1 S Zener V	VDC	4.97	4.96	4.96	4.95	4.96	4.95	4.95	4.96	4.97
7084	THM Q2 S Zener V	VDC	4.98	4.98	4.99	4.98	4.98	4.98	4.98	4.98	5 00
7085	THM Q3 S Zener V	VDC	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5 15
7090	THM PSM Mount	DGC	21.02	21.05	21.71	19.63	21.28	19.10	20.42	21.09	22 79
7091	THM Ind Attitude	DGC	17.79	17.86	17.24	16.55	16.95	16.20	16.57	16.67	16.98
7092	THM RBV Radiator	DGC	18.01	18.06	16.24	14.46	16.71	14.53	15.79	15.90	18.06
7093	THM RBVC Ctr Bm	DGC	20.74	20.82	19.31	17.95	19.44	17.58	18.66	19.30	20.64
7094	THM WBVTR Root	DGC	13.77	14.71	15.72	11.86	13.90	12.06	13.33	13.59	14.91
7095	THM WBVTR Rad Ct	DGC	3.64	4.99	5.55	3.24	4.45	3.43	4.26	4.56	5.38
7096	THM WBVTR Strap	DGC	15.90	16.95	17.63	13.48	15.29	13.59	14.82	15.02	15.98
7097	THM WB Mt Bay 1	DGC	22.91	22.60	22.49	21.29	16.47	15.29	16.92	16.52	16.44
7098	THM WB Mat Bay 1	DGC	22.07	19.25	20.14	18.71	16.20	14.79	16.64	16.35	16.50
7099	THM WBVTR Sep 3	DGC	18.03	18.76	18.12	16.69	17.79	16.93	17.76	17.58	17.38
7100	THM WBVTR Sep 17	DGC	21.83	21.55	23.51	19.96	22.98	20.39	22.06	22.62	24.85
7101	THM WBVTR 1 Cent	DGC	22.45	23.13	23.78	18.59	20.33	18.56	19.91	20.03	20.91
7102	THM WBVTR 2 Bay	DGC	17.34	17.69	17.29	16.15	17.04	16.12	16 84	16 79	16.92
7103	THM WBVTR 2 Bay 15	DGC	21.77	20.99	23.87	19.11	23.50	19.50	22.02	22.84	26.26
7104	THM WBVTR 2 Ctr	DGC	20.74	21.08	22.34	17.73	19.94	17.56	19.14	19.55	21 14
7105	THM NBTR B Sep 6	DGC	17.82	17.96	17.86	16.61	17.29	16.14	16.96	17.10	17.67
7106	THM NBTR B Sep 1	DGC	22.11	20.70	23.85	19.82	24.92	19.97	22.75	24.24	28.10
7107	THM NBTR Bm Ctr	DGC	20.32	20.44	21.21	18.38	20.59	18.30	19.55	20.15	21.90
7108	THM MSS Mount 14	DGC	20.59	19.40	22.86	18.20	23.83	18.86	21.77	23.00	26.90
7109	THM OA - Y Thruster	DGC	25.64	21.99	27.51	21.88	29.91	22.63	26.67	28.81	36.27
7110	THM MSS WBVTR Bm	DGC	16.75	17.54	18.21	14.97	16.84	15.07	16.25	16.38	17.55
7111	THM OA +X Thruster	DGC	20.33	19.72	20.43	19.28	17.54	16.41	17.98	17.72	17.84
7130	THM Aux P1 T	DGC	34.18	6.21	29.67	8.42	12.01	9.38	10.38	8.19	8.87
7131	THM Aux P2 T	DGC	2.90	2.22	6.97	22.95	28.16	6.23	18.06	22.86	8.49

Table 11-2. Landsat-2 Compensation Load History

	Compensation Load Status*							
Orbits	1	2	3	4	5	6	7	8
Launch	0	0	0	0	0	0	0	0
2	X	X	X	X	X	0	X	X
237	X	X	X	X	X	0	0	0
272	X	X	X	X	X	0	X	X
306	X	X	0	X	X	0	0	0
572	X	X	0	X	X	0	0	X
1367	X	X	X	X	X	0	0	X
1645	X	X	0	X	X	0	0	X
1657	X	X	X	X	X	0	0	X
4202	0	0	X	X	0	0	0	0
4372	0	0	X	X	0	0	0	X
6735	0	X	X	0	0	X	0	0
8312	X	X	0	0	X	0	0	0
9753	X	X	0	0	0	0	0	0
14727	0	0	0	0	0	0	0	0

*NOTE X = ON
0 = OFF

SECTION 12

NARROWBAND TAPE RECORDERS (NBR)

Landsat-2

SECTION 12

NARROWBAND TAPE RECORDERS (NBR)

The Narrowband Recorder Subsystem operated satisfactorily throughout the entire period, both Recorders alternating in Record and Playback modes with a nominal one minute overlap.

Table 12-1 gives cumulative operating hours for both Recorders by mode, and Table 12-2 gives typical telemetry values.

Table 12-1. NBR Operating Hours by Mode

NBR	ON	OFF	PLAYBACK	RECORD
A	13840	12440	554	13286
B	13840	12440	554	13286

Table 12-2. Narrowband Tape Recorder Telemetry Values, Landsat-2

Function		Typical Telemetry Values - Orbits								
No.	Name	36/37	2111/2112	4980/4981	7631/7632	11460/11461	12720/12721	14221/14222	14720/14722	15211/15212
10001	A - Motor Cur. (ma)									
	Record	132.0	133.3	130.2	128.6	125.50	131.74	115.46	115.46	114.68
	P/B	108.0	95.2	93.7	90.5	92.30	90.50	122.48	100.79	99.47
10101	B - Motor Cur. (ma)									
	Record	148.5	141.7	135.7	129.6	129.10	128.12	120.25	119.47	119.27
	P/B	143.6	138.7	135.7	125.1	127.65	130.68	119.60	119.09	119.09
10002	A - Pwr Sup. Cur. (ma)									
	Record	170.5	167.5	162.5	155.9	152.13	158.40	151.66	151.66	152.92
	P/B	410.0	399.3	399.3	396.0	472.26	478.12	154.27	142.21	143.31
10102	B - Pwr Sup. Cur. (ma)									
	Record	260.0	261.3	264.5	261.4	264.47	268.12	268.95	269.81	270.12
	P/B	481.0	479.7	489.2	470.2	479.80	479.80	270.87	270.87	270.87
10003	A - Rec. Temp (DGC)	26.1	26.1	24.2	21.8	21.64	22.44	24.49	22.85	25.40
10103	B - Rec. Temp. (DGC)	27.0	27.0	26.2	25.4	24.71	24.15	23.40	24.72	23.68
10004	A - Supply (VDC)	-24.87	-25.1	-25.1	-25.1	-25.09	-25.09	-25.07	-25.09	-25.08
10104	B - Supply (VDC)	-24.55	-24.6	-24.6	-24.4	-24.61	-24.62	-24.73	-24.62	-24.73

SECTION 13

WIDEBAND TELEMETRY SUBSYSTEM (WBTS)
LANDSAT-2

SECTION 13

WIDEBAND TELEMETRY SUBSYSTEM (WBTS)
LANDSAT-2

The WBTS has operated nominally in this report period.

Table 13-1 shows typical telemetry values. All are nominal.

Figure 13-1 is the AGC history recorded at Goldstone with the spacecraft successively at the same two points in space. The scatter of data points reflect variations in the ground station calibration and readout. WBPA-2 has been used more consistently and is presented in this figure. Values from WBPA-1 are nearly identical when that power amplifier is used.

Table 13-1. Typical Wideband Subsystem Telemetry

Function (1)	Name	20W	Orbit 47	2462	5091	7501	10641	12340	14222	14722	15211
12001	Temp TWT Coll. (DGC)	33.6	34.38	35.00	F	35.65	20.00	19.46	32.50	19.19	33.12
12101		31.2	30.00	37.14	32.16	26.69	34.65	33.67	32.86	31.42	30.00
12002	Cur. Helix (MA)	3.85	4.29	4.51	F	4.06	F	3.49	3.90	3.90	3.90
12102		4.56	4.41	4.48	4.59	4.63	4.61	4.71	4.70	4.70	4.70
12003	Cur. Cath (MA)	46.10	46.04	45.12	F	45.05	F	40.44	44.93	44.93	44.93
12103		46.78	46.42	45.24	46.00	44.66	44.07	44.91	44.84	44.52	44.62
12004	Fwd. Pwr. (DBM)	42.68	42.83	42.77	F	42.78	F	42.48	42.87	42.87	42.87
12104		43.71	43.81	43.69	43.61	43.56	43.51	43.64	43.60	43.63	43.61
12005	Refl. Pwr (DBM)	27.0	26.50	26.10	F	25.85	F	25.32	25.44	25.44	25.44
12105		36.45	37.50	37.14	37.08	36.50	36.90	37.23	37.17	37.14	37.17
12227	Mod A Volt Loop Stress (MHz)	1.54	2.14	1.12	F	1.60	1.60	1.39	1.50	1.38	1.77
12228	Mod B Loop Stress (MHz)	2.53	1.51	-0.01	-0.22	0.41	0.28	-0.10	-0.24	-0.66	-0.66
12229	Temp. Mod (DGC)	19.5	18.51	20.88	17.97	17.71	17.41	19.33	18.60	17.56	16.00
12232	+15 VDC Pwr Sply (TMV)	2.65	2.65	2.65	2.65	2.60	2.65	2.63	2.63	2.65	2.65
12234	-15 VDC Pwr Sid (TMV)	4.07	4.27	3.94	4.04	4.04	3.99	4.04	4.07	4.10	4.10
12236	+5 VDC Pwr Sply (TMV)	3.55	3.57	3.54	3.51	3.50	3.50	3.51	3.50	3.52	3.55
12238	-5 VDC Pwr Sid (TMV)	4.08	4.20	4.01	4.07	4.02	4.02	4.04	4.04	4.08	4.08
12240	-24 VDC Unreg Pwr (TMV)	5.86	6.20	5.66	5.90	5.91	5.92	5.86	5.87	5.90	5.92
12242	Temp. Inv. (DGC)	23.7	24.12	23.79	22.53	20.90	22.18	22.47	22.74	22.59	22.17

F - Unit Off

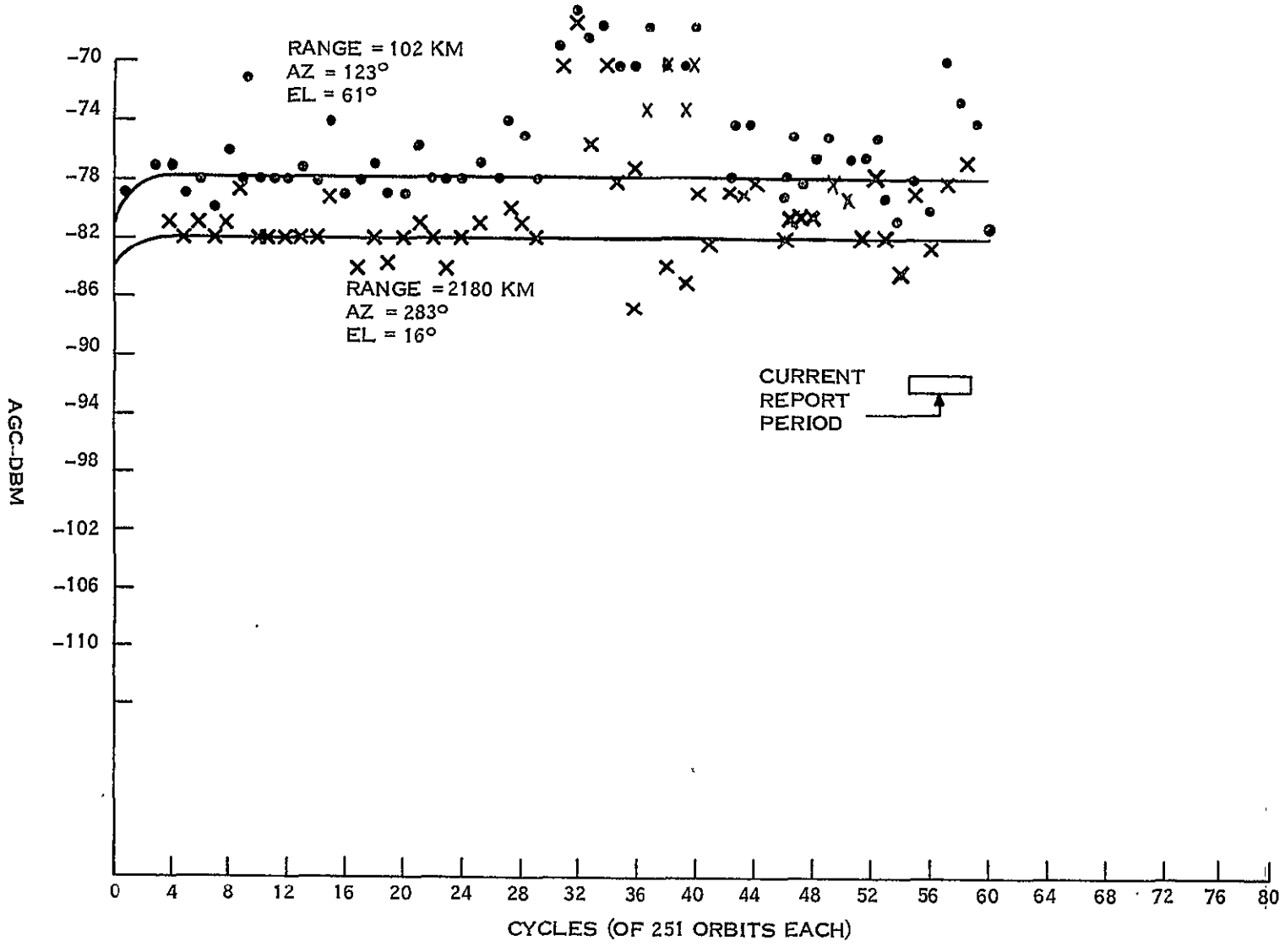

Figure 13-1. WPA-2 (Link 3) AGC Readings at Goldstone with 30' Antenna, Landsat-2

SECTION 14

ATTITUDE MEASUREMENT SENSOR (AMS)
LANDSAT-2

SECTION 14

ATTITUDE MEASUREMENT SENSOR (AMS)

The AMS is a passive radiometric balance sensor which operates in the 14-16 micron IR band. AMS Telemetry Values are shown in Table 14-1.

The AMS was launched in the OFF mode (CMD 774), turned ON during Orbit 6, and has been performing normally since then.

Table 14-1. Landsat-2 AMS Temperature Telemetry

Function	Description	Units	Orbit Number								
			50	2532	5102	7641	10191	12720	14222	14722	15211
3004	Case Temp 1	DGC	19.00	19.02	18.68	17.87	18.36	17.48	18.03	18.18	18.67
3005	Assembly-Temp-2	DGC	18.70	18.71	18.30	17.45	17.97	17.09	17.70	17.87	18.28

SECTION 15

WIDEBAND VIDEO TAPE RECORDERS (WBVTR)
LANDSAT-2

SECTION 15

WIDEBAND VIDEO TAPE RECORDERS (WBVTR)

WBVTR-1 has not been in use during this reporting period because of failures of two of its Record/Playback heads (head 1, Orbit 2683, 3 August 1975; head 3, Orbit 10064 on 13 January 1977).

Twice in 1975, for an undetermined reason, WBVTR-2 stopped Rewind prematurely: once during Orbit 1913 on 9 June and again during Orbit 3854 on 26 October. This abnormality has not occurred since.

The power-supply frequency count-down chain of WBVTR-2 occasionally slips phase, increasing motor speed, resulting in high bit error counts and footage over-runs. Simple operational procedures correct this condition when it occurs and normal operation can be resumed.

Table 15-1 gives typical non-modal telemetry values for WBVTR-1 and WBVTR-2. Tables 15-2 and 15-3 show the modal telemetry values for Record, Playback, Rewind, and Standby operational modes.

Figure 15-1 shows tape usage for WBVTR-2.

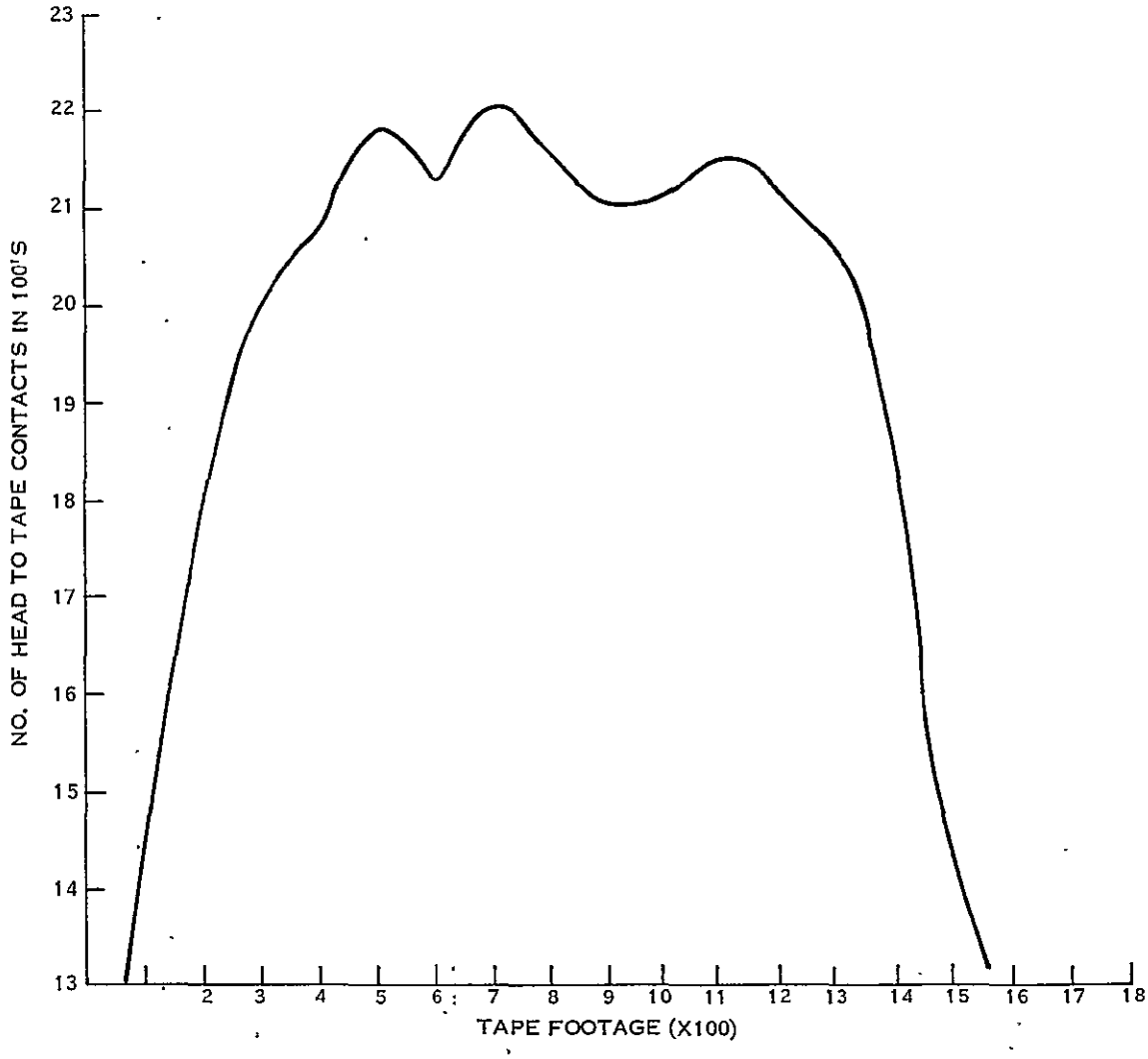

Figure 15-1. Landsat-2 WBR-2 Tape Usage thru Orbit 15287

Table 15-1. WBVTR Telemetry Values

WBVTR-1 Functions		Telemetry Values In Orbits								
Number	Name	45/46	2642	4879 (ET)	7628	11871	12320	12720	14993/14995	15286
13022	Pressure Trans	16.52	16.51	16.39	16.14	16.12	16.12	16.12	16.12	16.12
13023	Temp Trans	20.74	20.62	20.12	18.70	16.69	16.94	16.69	18.18	19.11
13024	Temp Elec	25.00	24.57	21.68	19.05	13.85	14.16	13.71	13.85	14.26
13032	Limiter Volt	1.48	1.51	1.41	1.48	F	F	F	F	F
13034	+5.6 VDC Conv	5.70	5.54	5.67	5.67	F	F	F	F	F
13201	+12 VDC APU	2.44	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45
13202	Temp APU	29.06	26.76	27.29	26.44	26.36	26.22	26.19	29.30	30.78

F - Unit Off
(ET) - Engineering Test of WBVTR-1

WBVTR-2 Functions		Telemetry Values In Orbits							
Number	Name	45/46	2642	5071	7621	10199	12722	14993/14995	15286
13122	Pressure Trans	16.12	15.81	15.33	14.67	14.54	13.98	13.75	13.82
13123	Temp Trans	21.50	20.00	23.08	19.41	19.92	17.07	20.83	23.50
13124	Temp Elec	23.50	18.31	22.72	22.07	16.63	15.07	17.79	19.41
13132	Limiter Volt	1.30	1.32	1.28	1.35	1.34	1.33	1.34	1.31
13134	+5.6 VDC Conv	5.71	5.69	5.85	5.87	5.66	5.81	5.59	5.64
13201	-12 VDC APU	2.44	2.45	2.45	2.45	2.45	2.45	2.45	2.45
13202	Temp APU	29.06	26.76	27.63	26.36	28.78	26.19	29.30	30.78

Table 15-2. Function Values by Mode, Landsat-2 WBVTR-1 Telemetry

WBVTR-1 Function/Description	Orbit					
	31/46	2642	4878(ET)	7628/7643	10050/10081	10249
13029 - Input P/B Voltage						
Record	0.0	0.0	0.0	0.0	0.0	0.0
Playback	0.60	0.32	0.30	0.32	0.35	0.35
Rewind	0.0	0.0	0.0	0.0	0.0	0.0
Standby	0.0	0.0	0.0	0.0	0.0	0.0
13028 - Capstan Motor Current						
Record	0.31	0.33	0.31	0.33	0.31	0.32
Playback	0.26	0.31	0 30	0.35	0.30	0.35
Rewind	0.19	0.23	0 28	0.31	0.28	0.30
Standby	0.0	0.0	0.0	0.0	0.0	0.0
13030 - Headwheel Motor Current						
Record	0.50	0.50	0.53	0.50	0.56	0.52
Playback	0.49	0.49	0.53	0.53	0.44	0.45
Rewind	0.44	0.44	0.47	0.47	0.45	0.44
Standby	0.45	0.45	0.46	0.44	0.44	0.44
13031 - Recorder Input Current						
Record	3.69	3.69	3.62	3.62	3.62	3.52
Playback	3.37	3.86	3.86	3.34	3.86	3.86
Rewind	2.23	2.19	2.23	2.28	2.23	3.21
Standby	1.78	1.95	1 95	1.81	1.95	1.86
13033 - Servo Voltage						
Record	0.0	0.0	0.0	0.0	0.0	0.0
Playback	50.01	50.08	50.37	50.04	49.61	50.08
Rewind	0.0	0.0	0.0	0.0	0.0	0.0
Standby	0.0	0.0	0.0	0.0	0.0	0.0
13026 - Capstan Motor Speed						
Record	88.61	88.03	85.13	85.03	87.45	88.61
Playback	88.35	86.87	85.13	87.45	94.90	88.87
Rewind	100.2	98.48	96.73	98.48	96.00	96.52
Standby	0.0	0.0	0.0	0.0	0.0	0.0
13027 - Headwheel Motor Speed						
Record	96.72	95.07	93.96	94.07	94.16	94.28
Playback	97.28	94.52	92.86	92.86	94.44	94.80
Rewind	98.6	96.73	96.73	96.73	96.73	96.60
Standby	98.39	95.62	95 07	93.96	95.07	93.96

(ET) - Engineering Test of WBVTR-1

Table 15-3. Function Values by Mode - Landsat-2 WBVTR-2 Telemetry

WBVTR-2 Function/Description	Orbit 31/46	2642	4878	7626/7631	10198/10199	12722/3	14244/14245	14993/14995	15303/15286
13129 - Input P/B Voltage									
Record	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
Playback	0.35	0.33	0.34	0.34	0.34	0.33	0.33	0.31	0.33
Rewind	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
Standby	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
13128 - Capstan Motor Current									
Record	0.33	0.37	0.38	0.34	0.32	0.35	0.34	0.39	0.34
Playback	0.33	0.34	0.35	0.34	0.35	0.35	0.35	0.35	0.36
Rewind	0.20	0.18	0.15	0.19	0.18	0.18	0.17	0.17	0.18
Standby	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
13130 - Headwheel Motor Current									
Record	0.47	0.47	0.48	0.50	0.49	0.48	0.50	0.47	0.47
Playback	0.48	0.47	0.48	0.48	0.49	0.47	0.48	0.46	0.47
Rewind	0.44	0.42	0.41	0.49	0.43	0.41	0.41	0.40	0.41
Standby	0.43	0.43	0.41	0.42	0.44	0.42	0.41	0.40	0.40
13131 - Recorder Input Current									
Record	2.90	2.90	2.90	2.96	2.90	2.93	2.93	2.93	2.93
Playback	3.14	3.08	3.11	3.08	3.20	3.11	3.14	3.11	3.11
Rewind	1.80	1.80	1.80	1.83	1.80	1.78	1.75	1.78	1.78
Standby	1.51	1.48	1.62	1.53	1.49	1.48	1.46	1.48	1.48
13133 - Servo Voltage									
Record	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
Playback	49.00	49.52	49.43	49.52	49.45	49.40	49.43	49.62	49.71
Rewind	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
Standby	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
13126 - Capstan Motor Speed									
Record	112.10	105.33	105.33	105.33	105.30	105.00	103.96	103.96	103.96
Playback	112.10	105.33	103.96	105.33	105.07	105.33	103.96	102.59	102.59
Rewind	120.43	116.31	117.68	117.68	117.14	117.68	116.31	115.62	116.31
Standby	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
13127 - Headwheel Motor Speed									
Record	98.08	96.52	95.48	94.44	95.01	95.12	93.40	93.40	93.40
Playback	97.04	94.44	94.44	94.44	94.80	94.47	93.92	93.40	93.40
Rewind	98.6	95.48	96.52	97.04	96.81	95.72	94.44	94.44	94.44
Standby	100.79	94.96	96.00	94.44	95.95	96.13	93.44	93.40	94.96

SECTION 16

RETURN BEAM VIDICON (RBV)

LANDSAT-2

SECTION 16

RETURN BEAM VIDICON (RBV)

RBV was used only four times during this report period, in the real-time mode only. Telemetry data was normal.

Table 16-1 gives typical telemetry values for the RBV Subsystem. Tables 16-2, 16-3 and 16-4 give telemetry values for Prepare, Hold, and Read modes of the three RBV cameras.

Table 16-1. RBV Telemetry Values

Function			Orbits								
No.		Name	54	2371	5662	7671	10157	13790	14224	14349	15228
14001		CCC Board Temp. (DgC)	19.65	20.27	20.41	19.17	20.15	19.29	19.75	19.51	21.57
14002		CCC Pwr. Sup. Temp (DgC)	20.52	21.46	20.80	19.84	20.17	20.16	20.65	20.29	22.79
14003		15 VDC Sup. (TMV)	3.92	3.92	4.00	3.44	3.84	3.83	3.77	3.53	3.77
14004		+6V, -5.25 VDC Sup. (TMV)	2.92	3.07	3.13	2.69	3.03	2.98	2.93	2.76	2.93
14100	*	VID Output V (TMV)	**	0.70	0.70	1.20	1.95	2.98	1.15	0.77	1.18
14200	*	VID Output V (TMV)	1.05	1.23	1.26	1.15	0.88	1.06	1.13	0.76	1.18
14300	*	VID Output V (TMV)	1.03	1.27	1.31	1.05	1.10	1.07	1.11	0.75	1.17
14102	*	Comb. Align Cur. (TMV)	3.85	3.81	3.82	3.82	3.70	3.74	3.69	3.84	3.85
14202	*	Comb. Align Cur. (TMV)	3.91	3.92	3.88	3.92	3.92	3.91	3.91	3.89	3.91
14302	*	Comb. Align Cur. (TMV)	3.90	3.80	3.83	3.40	3.75	3.78	3.73	3.48	3.74
14103	*	Elec Temp. (DgC)	24.24	24.49	26.51	22.41	23.00	24.27	24.93	24.48	29.43
14203	*	Elec Temp. (DgC)	19.84	22.40	22.05	20.01	20.18	19.26	19.89	19.29	19.86
14303	*	Elec Temp. (DgC)	25.05	24.15	20.42	22.46	23.42	25.82	26.71	29.09	35.07
14104	*	LV Pwr Sup T. (DgC)	23.44	24.13	26.28	21.83	23.15	25.82	24.28	23.78	28.66
14204	*	LV Pwr Sup T. (DgC)	18.14	20.87	20.61	18.32	18.90	17.83	18.12	17.53	18.07
14304	*	LV Pwr Sup T. (DgC)	26.36	24.12	29.47	22.22	24.00	26.13	26.96	26.40	35.25
14105	*	Defl. Pwr. Sup. +10 VDC (TMV)	4.00	3.94	3.96	3.50	3.84	3.88	3.83	3.61	3.84
14205	*	Defl. Pwr. Sup. +10 VDC (TMV)	3.97	3.92	3.94	3.98	3.82	3.86	3.81	3.97	3.81
14305	*	Defl. Pwr. Sup. +10 VDC (TMV)	4.00	3.95	3.96	4.00	3.96	3.89	3.84	4.00	4.00
14106	*	L.V.P.S. +6V, -6.3 VDC (TMV)	3.67	3.59	3.63	3.23	3.26	3.58	3.52	3.31	3.54
14206	*	L.V.P.S. +6V, -6.3 VDC (TMV)	3.65	3.61	3.62	3.19	3.34	3.55	3.50	3.28	3.50
14306	*	L.V.P.S. +6V, -6.3 VDC (TMV)	3.70	3.66	3.68	3.71	3.42	3.60	3.55	3.71	3.72
14107	*	Ther. Elec. Cur. (TMV)	2.61	2.54	2.61	2.53	2.60	2.68	2.60	2.57	2.51
14207	*	Ther. Elec. Cur. (TMV)	2.49	2.44	2.51	2.31	2.44	2.53	2.45	2.39	2.40
14307	*	Ther. Elec. Cur. (TMV)	2.57	2.52	2.57	2.85	2.71	2.57	2.54	2.77	2.44
14108	*	Vid. Fil. Cur. (TMV)	2.43	2.48	2.50	2.23	2.46	2.48	2.44	2.30	2.44
14208	*	Vid. Fil. Cur. (TMV)	2.40	2.34	2.36	2.12	2.39	2.34	2.30	2.18	2.30
14308	*	Vid. Fil. Cur. (TMV)	2.58	2.54	2.54	2.27	2.59	2.50	2.47	2.34	2.47
14110	*	Vid. Tgt. Volt (TMV)	2.98	2.95	2.96	2.98	2.98	2.90	2.86	2.98	2.98
14210	*	Vid. Tgt. Volt (TMV)	2.86	2.93	2.96	2.64	2.60	2.92	2.89	2.70	2.88
14310	*	Vid. Tgt. Volt (TMV)	2.63	2.56	2.58	2.31	2.37	2.56	2.52	2.36	2.52
14113	*	Vert Def V (TMV)	2.92	2.79	2.81	3.22	2.98	2.86	3.06	3.56	2.79
14213	*	Vert Def V (TMV)	3.15	2.99	3.05	3.79	3.16	3.06	3.20	3.43	3.12
14313	*	Vert Def V (TMV)	3.59	3.48	3.44	3.09	3.04	3.52	3.50	3.56	3.47
14114	*	Vid FPT (DgC)	19.87	20.67	19.21	16.32	19.85	17.01	17.86	17.30	19.82
14214	*	Vid FPT (DgC)	20.55	21.14	19.80	17.77	20.46	18.04	18.68	18.43	20.24
14314	*	Vid FPT (DgC)	20.65	21.12	20.56	18.05	20.38	18.81	19.49	19.04	21.57
14115	*	Foc Coil T (DgC)	21.04	22.41	21.31	17.79	21.02	18.50	19.36	18.79	21.41
14215	*	Foc Coil T (DgC)	20.67	22.22	21.26	18.16	19.17	18.56	19.39	18.84	21.06
14315	*	Foc Coil T (DgC)	22.25	23.08	22.89	19.17	20.61	20.26	21.23	20.71	24.14

* 141XX refers to Camera 1
142XX refers to Camera 2
143XX refers to Camera 3

** Data not Available

FOLDOUT FRAME 1

Table 16-2. Camera #1 (Blue) Telemetry (Values in TMV)

Function No.	Function Name	Mode	Orbit 054	2371	5663	7671	10157	12340	14224	14349	15228
		Hold	0.65	0.70	0.69	0.63	0.65	0.65	0.65	0.65	0.75
14101	Focus I	Prep	1.68	1.75	1.74	1.67	1.67	1.67	1.70	1.70	1.77
		Read	2.80	2.90	2.85	2.80	2.80	2.80	2.82	2.80	2.90
		Prep	0.80	0.80	0.78	0.77	0.80	0.77	0.77	0.77	0.77
14109	Grid V	Read	2.42	2.44	2.42	2.45	2.45	2.45	2.45	2.45	2.45
		Hold	3.95	4.00	3.98	3.95	3.95	3.95	3.95	3.97	3.97
		Hold	0.38	0.40	0.37	0.37	0.37	0.37	0.37	0.37	0.37
14111	Cath I	Read	0.88	0.85	0.88	*	0.85	0.82	0.82	0.82	0.82
		Prep	3.05	3.10	3.02	3.02	3.05	3.02	3.02	3.02	3.02
		Hold	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14112	Hor Def	Prep	1.75	1.80	1.77	1.80	1.77	1.77	1.77	1.77	1.77
		Read	3.25	3.30	3.25	*	3.21	3.22	3.25	3.25	3.25
14120	+500 V	Hold	0.23	0.90	0.90	0.91	0.92	0.90	0.90	0.90	0.90
		Read	4.05	4.10	4.05	4.03	4.05	4.05	4.05	4.02	4.05

* No data due to slow TLM sample rate (1/16) which does not always get a sample for short "on time."

FOLDOUT FRAME 2

Table 16-3 Camera #2 (Yellow) Telemetry (Values in TMV)

Function No.	Function Name	Mode	Orbit 054	2371	5663	7671	10157	12340	14224	14349	15228
		Hold	0.54	0.60	0.53	0.50	0.54	0.50	0.52	0.47	0.50
14201	Focus I	Prep	1.56	1.60	1.54	1.50	1.50	1.50	1.52	1.50	1.50
		Read	2.65	2.70	2.65	2.62	2.65	2.62	2.65	2.60	2.65
		Prep	0.75	0.85	0.80	0.77	0.80	0.77	0.80	0.75	0.75
14209	Grid V	Read	2.25	2.30	2.22	2.25	2.25	2.25	2.20	2.22	2.20
		Hold	4.05	4.10	4.11	4.07	4.11	4.07	4.10	4.07	4.10
		Hold	0.37	0.35	0.35	0.37	0.35	0.35	0.37	0.35	0.35
14211	Cath I	Read	0.95	1.00	0.95	*	0.95	0.95	0.95	0.95	0.95
		Prep	3.05	3.10	3.05	3.05	3.05	3.05	3.05	3.05	3.05
		Hold	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14212	Hor Def	Prep	1.85	1.90	1.87	1.87	1.87	1.85	1.87	1.85	1.85
		Read	3.25	3.30	3.31	*	3.24	3.30	3.30	3.30	3.30
14220	+500 V	Prep	1.15	1.20	1.14	1.14	1.15	1.12	1.12	1.12	1.12
		Read	4.25	4.30	4.27	4.27	4.27	4.27	4.27	4.27	4.27

* No data due to slow TLM sample rate (1/16) which does not always get a sample for short "on time"

Table 16-4. Camera #3 (Red) Telemetry (Values in TMV)

Function No.	Function Name	Mode	Orbit 054	2371	5663	7671	10157	12340	14224	14349	15228
		Hold	0.65	0.70	0.72	0.65	0.69	0.65	0.72	0.70	0.80
14301	Focus I	Prep	1.79	1.83	1.85	1.77	1.77	1.75	1.82	1.80	1.95
		Read	2.85	2.90	2.93	2.85	2.85	2.85	2.92	2.87	3.02
		Prep	0.75	0.80	0.75	0.77	0.77	0.77	0.77	0.77	0.77
14309	Grid V	Read	2.65	2.70	2.66	2.71	2.66	2.72	2.70	2.70	2.72
		Hold	4.08	4.18	4.13	4.09	4.12	4.10	4.10	4.10	4.12
		Hold	0.39	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
14311	Cath I	Read	0.54	0.55	0.55	*	0.55	0.55	0.55	0.55	0.55
		Prep	3.25	3.30	3.22	3.23	3.23	3.22	3.22	3.22	3.22
		Hold	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14312	Hor Def	Prep	2.05	2.10	2.07	2.06	2.07	2.02	2.02	2.02	2.07
		Read	3.35	3.45	3.42	*	3.42	3.40	3.40	3.40	3.40
14320	+500 V	Prep	1.15	1.20	1.15	1.15	1.15	1.15	1.15	1.15	1.15
		Read	4.25	4.30	4.27	4.27	4.27	4.25	4.25	4.26	4.27

* No Data due to slow TLM sample rate (1/16) which does not always get a sample for short "on time".

FOLDOUT FRAME 3 LS-2

SECTION 17

MULTISPECTRAL SCANNER SUBSYSTEM (MSS)

LANDSAT-2

SECTION 17

MULTISPECTRAL SCANNER SUBSYSTEM (MSS)

The MSS Subsystem has operated nominally in this period without incident. Figure 17-1 shows the number of scenes imaged at each geographic location this quarter, and Figure 17-2 shows images since launch. In these maps, only those scenes received by U. S. and Pakistan ground stations are shown. Scenes transmitted to Canada, Brazil and Italy (46% of total) are not shown.

Table 17-1 shows typical telemetry values since launch. All are nominal.

Table 17-2 shows the history of sensor response to a constant input radiance level. Each sensor is sampled at 5 radiance levels and all show essentially the same trends. Only one of these levels (the second highest) is listed in Table 17-2. Line length history is also shown in Table 17-2; it dropped slightly in this quarter, but is still satisfactory.

Sun calibrations, performed every two weeks, show nominal performance.

FOLDOUT FRAME 1

ORIGINAL PAGE IS
OF POOR QUALITY

FOLDOUT FRAME 2

ORIGINAL PAGE IS
OF POOR QUALITY

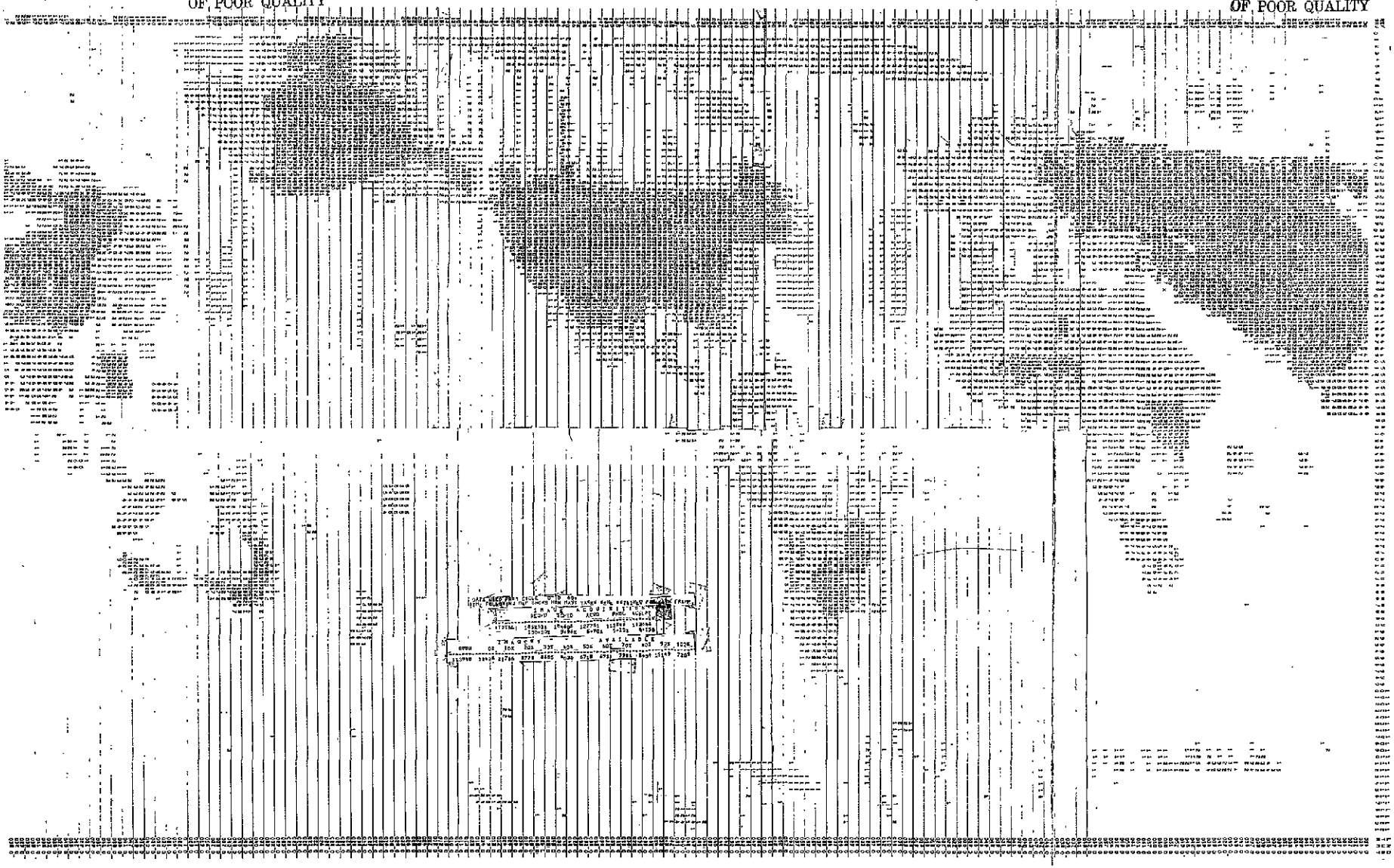

Figure 17-2. Computer Map of MSS Scenes Since Launch - Landsat-2

C3

Table 17-1. MSS Telemetry - Landsat-2

Function	Name	*T.V. Norm	Orbit								
			27	2500	5091	7641	10192	12720	14222	14722	15211
15040	MUX -6 VDC (TMV)	3.92	4.05	4.04	4.04	4.07	4.05	4.06	4.05	4.05	4.05
15041	A/D SUPPLY (TMV)	5.74	5.95	5.95	5.95	5.93	5.95	5.95	5.94	5.95	5.95
15042	AVERAGE DENSITY (TMV)	1.72	1.71	2.39	1.95	2.16	2.62	2.29	2.41	1.96	1.98
15043	FIBER OPTICS PLATE 1 TEMP (DGC)	22.30	18.13	20.41	21.75	17.21	20.15	18.05	19.38	19.56	21.04
15044	FIBER OPTICS PLATE 2 TEMP (DGC)	22.30	17.87	18.86	20.28	15.29	18.54	16.26	17.75	17.91	19.50
15045	MUX TEMP (DGC)	25.59	23.38	20.57	23.63	19.57	24.68	21.31	23.94	24.40	28.27
15046	ELEC COVER TEMP (DGC)	23.09	20.25	21.40	22.96	16.63	20.01	17.81	19.35	19.47	21.02
15047	PWR. SUP. TEMP (DGC)	23.85	19.45	19.83	21.62	16.51	20.66	18.14	19.93	20.00	21.75
15048	SCAN MIR REG. TEMP (DGC)	23.44	18.30	18.29	21.13	15.93	20.94	17.52	19.85	20.06	22.37
15049	SCAN MIR DRIVE ELEC. TEMP (DGC)	24.34	18.96	18.49	21.42	16.01	21.25	17.80	20.25	20.54	22.64
15050	SCAN MIR DRIVE COVER TEMP (DGC)	22.50	17.26	18.28	21.21	16.02	20.85	17.48	19.75	20.07	22.25
15051	SCAN MIR TEMP (DGC)	21.87	17.26	18.09	20.89	15.87	20.46	17.17	19.28	19.51	22.06
15052	ROT. SHUT HOUSING TEMP (DGC)	22.58	23.26	18.91	20.28	15.29	18.58	16.31	17.76	17.93	19.58
15053	SCAN MIR REG VOLT (TMV)	4.56	4.7	4.57	4.57	4.39	4.63	4.64	4.63	4.62	4.63
15054	CAL LAMP CURRENT (TMV)	1.18	1.17	1.20	1.17	1.17	1.17	1.17	1.17	1.17	1.17
15055	BAND 1 15 VDC (TMV)	4.97	4.98	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97
15056	BAND 2 15 VDC (TMV)	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.99	5.00	5.00
15057	BAND 3 15 VDC (TMV)	4.88	4.95	4.95	4.95	4.95	4.95	4.95	4.94	4.95	4.95
15058	BAND 4 15 VDC (TMV)	4.83	5.00	5.00	5.00	5.00	5.00	5.00	4.99	5.00	5.00
15059	TLM 15 VDC (TMV)	5.04	5.06	5.07	5.07	5.07	5.07	5.07	5.07	5.07	5.07
15060	+12 VDC +6 VDC (TMV)	4.92	5.03	5.02	5.02	5.01	5.01	5.02	5.01	5.02	5.02
15061	LOGIC +5 VDC (TMV)	4.86	4.81	4.80	4.83	4.83	4.85	4.84	4.84	4.83	4.83
15062	RECT. +19 VDC (TMV)	4.97	5.03	5.05	5.05	5.05	5.05	5.06	5.05	5.05	5.05
15063	RECT. -19 VDC (TMV)	3.54	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
15064	BAND 1 HVA (TMV)	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95
15065	BAND 1 HVB (TMV)	5.03	F	F	F	F	F	F	F	F	F
15066	BAND 2 HVA (TMV)	4.72	4.70	4.72	4.75	4.71	4.73	4.72	4.72	4.72	4.73
15067	BAND 2 HVB (TMV)	4.70	F	F	F	F	F	F	F	F	F
15068	BAND 3 HVA (TMV)	4.75	4.72	4.76	4.73	4.75	4.75	4.75	4.75	4.75	4.75
15069	BAND 3 HVB (TMV)	4.65	F	F	F	F	F	F	F	F	F
15070	SHUT MOT. CONTR. INTEG (TMV)	2.49	2.60	2.60	2.60	2.60	2.60	2.61	2.59	2.59	2.58
15071	SCAN MIRROR DRIVE CLOCK (TMV)	1.93	2.0	2.00	2.00	1.99	2.01	2.01	2.00	2.00	2.00

*Thermal Vacuum Test Data at 20°C
F = Unit OFF

Table 17-2. MSS Response History - Landsat-2

Quantum Level for Selected Work
(0 = Black; 63 = White)

Band	Sensor	Launch	Average Value				% Change Since Launch
			1st Year	2nd Year	3rd Year		
					9-11 Quar	This Quar	
1	1	43	40	39	38	37	-14
	2	41	40	39	37	37	-10
	3	46	43	42	41	42	- 9
	4	46	45	45	44	44	- 4
	5	44	40	39	38	38	-14
	6	46	43	43	42	42	- 9
2	7	47	45	45	45	45	- 4
	8	44	40	41	41	41	- 7
	9	48	46	46	45	45	- 6
	10	50	48	48	46	47	- 6
	11	48	47	47	47	47	- 2
	12	47	44	44	42	42	-11
3	13	42	40	40	39	39	- 7
	14	44	43	42	41	41	- 7
	15	47	46	47	47	47	0
	16	47	45	46	46	46	- 2
	17	48	46	46	46	47	- 2
	18	46	44	45	45	46	0
	19	25	25	25	25	25	0
	20	26	27	27	26	26	0
	21	32	32	32	31	31	- 3
	22	29	30	30	29	29	0
	23	32	33	33	32	32	0
	24	28	28	28	28	28	0
Line Length		3250	3249	3248	3246	3242	-0.2

SECTION 18

DATA COLLECTION SYSTEM (DCS)

LANDSAT-2

SECTION 18

DATA COLLECTION SUBSYSTEM (DCS)

The DCS Subsystem performed nominally during this report period, continuing message collection at the normal rate.

Figure 18-1 shows the number of DCS messages received in each 18-day cycle at OCC. The large number of messages shown for cycle 21 (February 1975) was due to an accidental mode selection for one of the ground transmitters, DCS-6402. The percentage of good messages is about 96%.

There are 48 users in the data base. Two hundred and fifty six ground platforms (DCP's) are in the data base, with about 85 active per day.

Table 18-1 shows telemetry values since launch. All are nominal.

Table 18-1. DCS Telemetry Values

Func. No.	Name	Orbits								
		5	2462	5091	7641	10192	12721	14222	14722	15211
16001	Receiver 1 Sig Strength (DBM)*	-123 34	-124.81	-122.02	-123.16	-123.06	-124.99	-121.50	-119.67	120.74
16002	Receiver 1 Temp (DGC)	22.54	24.20	24 37	25.12	24.82	23.12	24 07	24.78	26.07
16003	Rec-1 Pwr Input Volt (VDC)	2.35	2.36	2.36	2.37	2.37	2.35	2.36	2.36	2.39
16004	Receiver 2 Sig Strength (DBM)	F	F	F	F	F	F	F	F	F
16005	Receiver 2 Temp (DGC)	F	F	F	F	F	F	F	F	F
16006	Receiver 2 Input Volt (VDC)	F	F	F	F	F	F	F	F	F

*This value is for a CW carrier only; it is not valid during DCS message reception

F = Receiver 2 was OFF

FOLDOUT FRAME 1

FOLDOUT FRAME 2

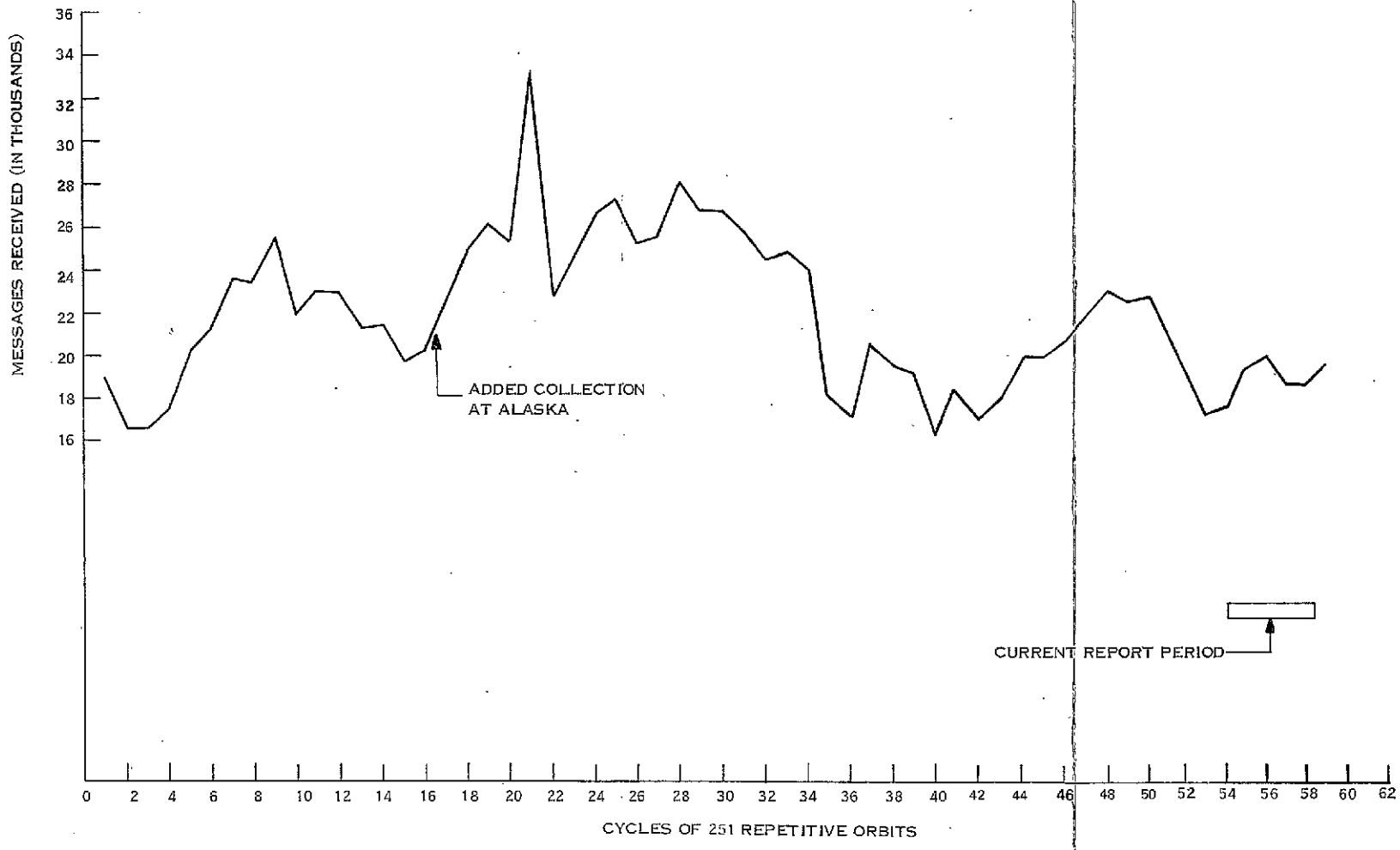

Figure 18-1. DCS Message History

APPENDIX A

LANDSAT-2 ANOMALY LIST

Appendix A. Landsat-2 Anomalies and Observations

Date	Anomaly/Observation	How Observed	Comments
Prelaunch	Forward Scanner Pressure Leak	Spacecraft Integration	Before launch pressure increased. After launch pressure decreased. No anticipated effect on Scanner or S/C mission
Prelaunch	Defective TLM Functions 1264, 4002, 13200	Spacecraft Integration	Functions measure non-critical temperatures Sensors failed prior to launch Mission unaffected.
3/8/75	Unencoded command 781, CIU Channel B Off, received by spacecraft from RF Interference. Commands 782 or 786, switch comedecs; and commands 780 or 784, switch PWM regulator, received at other times.	On-Line	Non-Landsat OCC Authorized Unencoded commands received in Orbit 619, 640, 743, 1575, 1700, 2605, 3161, 4769, 5025, 7925 8721, 8804, 9523, 9863, 10268, 10466, 10533, 10583, 10603, 13309, 14508, 14864.
3/17/75	MMCA Pitch Flux Density TLM Drift	Off-Line	Telemetry decreased 5 counts and indicates increase flux density on charged magnet Probable sensor drift. No apparent effect on S/C performance.
4/5/75	WBVTR-1 Rewind Failure (MDR E01252)	On-Line	WBVTR-1 failed to execute Rewind command or prematurely terminated rewinds due to false BOT signal. Subsequent commands or Fool-Logic techniques allowed return to operation Investigation Committee report issued Problems occurred Orbit 1021, 1532, 1568, 2238. Operation restricted to 300 thru 1500 feet.
6/9/75	WBVTR-2 had Short Rewind (MDR E01255)	On-Line	WBVTR-2 started rewind but stopped prematurely in Orbit 1919 and again in Orbit 3854. Investigation Committee did not define a probable cause but assigned a momentary False BOT as reason for short rewind Unit remains operational.
8/3/75	WBVTR-1 data did not provide sync to ground station (MDR D04930)	On-Line	One head circuit of WBVTR-1 failed to operate. 25% of data lost in data stream. Operation discontinued until early 1976, when it was used with RBV only
11/14/75	MSS False End-of-Line Codes (MDR D04940)	Off-Line	Occasional End-of-Line codes occurring in preamble or along video data. Creates 4 black and 4 white words in scene data Occurs over magnetic anomalies with low incidence rate. Operation continued.
1/25/76	Solar Array Current Notch (MDR D04934)	On-Line	In Orbit 5123, abnormal drops in solar array current appeared for portion of satellite day. S/C operation unaffected because solar array has excess power to date.
7/20/76	Battery 6 Turned Off	On-Line & Off-Line	Battery 6 decreased in load share and rose in charge share thereby causing overcharge. Temperature increased and unit was turned off in Orbit 7601. (Returned to service in Orbit 7992.) See Table 3-2 for history of all battery restoration cycles.
7/29/76	WBVTR-2 Automatic Shutdown by SMART	On-Line	SMART circuits detected high headwheel currents in Orbit 7720 and shutdown WBVTR-2. WBVTR-2 operation was normal; high headwheel current assigned to slipped phase. Normal operation resumed.
12/21/76	WBVTR-2 had 30% high P/B speed (MDRD04936)	On-Line	Ground equipment would not synch on WBVTR-2 P/B data during Orbit 9738 P/B Analysis showed P/B speed was 30% high. Toggling, record to P/B, restored normal operation Recurred and cured by toggling in Orbits 9930, 10199, 10466, 11635, 12191, 12377, 13924 and 14630.
1/15/77	WBVTR-1 second head failed (MDR D04937)	On-Line	Observation of CRT trace during WBVTR-1 RBV P/B data in Orbit 10086 showed second head failed. Operation discontinued.
9/12/77	Payload Automatic Inhibit from ECAM by SMART	On-Line	SMART circuits detected S/C unreg bus low voltage on Orbit 13342 caused by operation problems. Inhibited further payload operation from ECAM. Reset returned S/C to normal. Recurred during Orbits 14865, 15013, 15156. Reset returned S/C to normal each time.

APPENDIX B

LANDSAT-2 SPACECRAFT ORBIT REFERENCE TABLES

LANDSAT-2

SPACECRAFT ORBIT REFERENCE TABLES

FROM AUGUST 1977 THROUGH DECEMBER 1978

ORBITS 12847 THROUGH 20069

FLIGHT DAY 922 THROUGH 1439

LANDSAT-2

AUG, 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	213	922	12847-12860	238-251	18	50
2	214	923	12861-12874	1- 14	1	51
3	215	924	12875-12888	15- 28	2	51
4	216	925	12889-12902	29- 42	3	51
5	217	926	12903-12916	43- 56	4	51
6	218	927	12917-12930	57- 70	5	51
7	219	928	12931-12944	71- 84	6	51
8	220	929	12945-12958	85- 98	7	51
9	221	930	12959-12972	99-112	8	51
10	222	931	12973-12986	113-126	9	51
11	223	932	12987-12999	127-139	10	51
12	224	933	13000-13013	140-153	11	51
13	225	934	13014-13027	154-167	12	51
14	226	935	13028-13041	168-181	13	51
15	227	936	13042-13055	182-195	14	51
16	228	937	13056-13069	196-209	15	51
17	229	938	13070-13083	210-223	16	51
18	230	939	13084-13097	224-237	17	51
19	231	940	13098-13111	238-251	18	51
20	232	941	13112-13125	1- 14	1	52
21	233	942	13126-13139	15- 28	2	52
22	234	943	13140-13153	29- 42	3	52
23	235	944	13154-13167	43- 56	4	52
24	236	945	13168-13181	57- 70	5	52
25	237	946	13182-13195	71- 84	6	52
26	238	947	13196-13209	85- 98	7	52
27	239	948	13210-13223	99-112	8	52
28	240	949	13224-13237	113-126	9	52
29	241	950	13238-13250	127-139	10	52
30	242	951	13251-13264	140-153	11	52
31	243	952	13265-13278	154-167	12	52

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SEP. 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	244	953	13279-13292	168-181	13	52
2	245	954	13293-13306	182-195	14	52
3	246	955	13307-13320	196-209	15	52
4	247	956	13321-13334	210-223	16	52
5	248	957	13335-13348	224-237	17	52
6	249	958	13349-13362	238-251	18	52
7	250	959	13363-13376	1- 14	1	53
8	251	960	13377-13390	15- 28	2	53
9	252	961	13391-13404	29- 42	3	53
10	253	962	13405-13418	43- 56	4	53
11	254	963	13419-13432	57- 70	5	53
12	255	964	13433-13446	71- 84	6	53
13	256	965	13447-13460	85- 98	7	53
14	257	966	13461-13474	99-112	8	53
15	258	967	13475-13488	113-126	9	53
16	259	968	13489-13501	127-139	10	53
17	260	969	13502-13515	140-153	11	53
18	261	970	13516-13529	154-167	12	53
19	262	971	13530-13543	168-181	13	53
20	263	972	13544-13557	182-195	14	53
21	264	973	13558-13571	196-209	15	53
22	265	974	13572-13585	210-223	16	53
23	266	975	13586-13599	224-237	17	53
24	267	976	13600-13613	238-251	18	53
25	268	977	13614-13627	1- 14	1	54
26	269	978	13628-13641	15- 28	2	54
27	270	979	13642-13655	29- 42	3	54
28	271	980	13656-13669	43- 56	4	54
29	272	981	13670-13683	57- 70	5	54
30	273	982	13684-13697	71- 84	6	54

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ORIGINAL PAGE IS
OF POOR QUALITY

OCT. 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	274	983	13698-13711	85- 98	7	54
2	275	984	13712-13725	99-112	8	54
3	276	985	13726-13739	113-126	9	54
4	277	986	13740-13752	127-139	10	54
5	278	987	13753-13766	140-153	11	54
6	279	988	13767-13780	154-167	12	54
7	280	989	13781-13794	168-181	13	54
8	281	990	13795-13808	182-195	14	54
9	282	991	13809-13822	196-209	15	54
10	283	992	13823-13836	210-223	16	54
11	284	993	13837-13850	224-237	17	54
12	285	994	13851-13864	238-251	18	54
13	286	995	13865-13878	1- 14	1	55
14	287	996	13879-13892	15- 28	2	55
15	288	997	13893-13906	29- 42	3	55
16	289	998	13907-13920	43- 56	4	55
17	290	999	13921-13934	57- 70	5	55
18	291	1000	13935-13948	71- 84	6	55
19	292	1001	13949-13962	85- 98	7	55
20	293	1002	13963-13976	99-112	8	55
21	294	1003	13977-13990	113-126	9	55
22	295	1004	13991-14003	127-139	10	55
23	296	1005	14004-14017	140-153	11	55
24	297	1006	14018-14031	154-167	12	55
25	298	1007	14032-14045	168-181	13	55
26	299	1008	14046-14059	182-195	14	55
27	300	1009	14060-14073	196-209	15	55
28	301	1010	14074-14087	210-223	16	55
29	302	1011	14088-14101	224-237	17	55
30	303	1012	14102-14115	238-251	18	55
31	304	1013	14116-14129	1- 14	1	56

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NOV. 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	305	1014	14130-14143	15- 28	2	56
2	306	1015	14144-14157	29- 42	3	56
3	307	1016	14158-14171	43- 56	4	56
4	308	1017	14172-14185	57- 70	5	56
5	309	1018	14186-14199	71- 84	6	56
6	310	1019	14200-14213	85- 98	7	56
7	311	1020	14214-14227	99-112	8	56
8	312	1021	14228-14241	113-126	9	56
9	313	1022	14242-14254	127-139	10	56
10	314	1023	14255-14268	140-153	11	56
11	315	1024	14269-14282	154-167	12	56
12	316	1025	14283-14296	168-181	13	56
13	317	1026	14297-14310	182-195	14	56
14	318	1027	14311-14324	196-209	15	56
15	319	1028	14325-14338	210-223	16	56
16	320	1029	14339-14352	224-237	17	56
17	321	1030	14353-14366	238-251	18	56
18	322	1031	14367-14380	1- 14	1	57
19	323	1032	14381-14394	15- 28	2	57
20	324	1033	14395-14408	29- 42	3	57
21	325	1034	14409-14422	43- 56	4	57
22	326	1035	14423-14436	57- 70	5	57
23	327	1036	14437-14450	71- 84	6	57
24	328	1037	14451-14464	85- 98	7	57
25	329	1038	14465-14478	99-112	8	57
26	330	1039	14479-14492	113-126	9	57
27	331	1040	14493-14505	127-139	10	57
28	332	1041	14506-14519	140-153	11	57
29	333	1042	14520-14533	154-167	12	57
30	334	1043	14534-14547	168-181	13	57

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DEC, 1977

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	335	1044	14548-14561	182-195	14	57
2	336	1045	14562-14575	196-209	15	57
3	337	1046	14576-14589	210-223	16	57
4	338	1047	14590-14603	224-237	17	57
5	339	1048	14604-14617	238-251	18	57
6	340	1049	14618-14631	1- 14	1	58
7	341	1050	14632-14645	15- 28	2	58
8	342	1051	14646-14659	29- 42	3	58
9	343	1052	14660-14673	43- 56	4	58
10	344	1053	14674-14687	57- 70	5	58
11	345	1054	14688-14701	71- 84	6	58
12	346	1055	14702-14715	85- 98	7	58
13	347	1056	14716-14729	99-112	8	58
14	348	1057	14730-14743	113-126	9	58
15	349	1058	14744-14756	127-139	10	58
16	350	1059	14757-14770	140-153	11	58
17	351	1060	14771-14784	154-167	12	58
18	352	1061	14785-14798	168-181	13	58
19	353	1062	14799-14812	182-195	14	58
20	354	1063	14813-14826	196-209	15	58
21	355	1064	14827-14840	210-223	16	58
22	356	1065	14841-14854	224-237	17	58
23	357	1066	14855-14868	238-251	18	58
24	358	1067	14869-14882	1- 14	1	59
25	359	1068	14883-14896	15- 28	2	59
26	360	1069	14897-14910	29- 42	3	59
27	361	1070	14911-14924	43- 56	4	59
28	362	1071	14925-14938	57- 70	5	59
29	363	1072	14939-14952	71- 84	6	59
30	364	1073	14953-14966	85- 98	7	59
31	365	1074	14967-14980	99-112	8	59

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JAN. 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	1	1075	14981-14994	113-126	9	59
2	2	1076	14995-15007	127-139	10	59
3	3	1077	15008-15021	140-153	11	59
4	4	1078	15022-15035	154-167	12	59
5	5	1079	15036-15049	168-181	13	59
6	6	1080	15050-15063	182-195	14	59
7	7	1081	15064-15077	196-209	15	59
8	8	1082	15078-15091	210-223	16	59
9	9	1083	15092-15105	224-237	17	59
10	10	1084	15106-15119	238-251	18	59
11	11	1085	15120-15133	1- 14	1	60
12	12	1086	15134-15147	15- 28	2	60
13	13	1087	15148-15161	29- 42	3	60
14	14	1088	15162-15175	43- 56	4	60
15	15	1089	15176-15189	57- 70	5	60
16	16	1090	15190-15203	71- 84	6	60
17	17	1091	15204-15217	85- 98	7	60
18	18	1092	15218-15231	99-112	8	60
19	19	1093	15232-15245	113-126	9	60
20	20	1094	15246-15258	127-139	10	60
21	21	1095	15259-15272	140-153	11	60
22	22	1096	15273-15286	154-167	12	60
23	23	1097	15287-15300	168-181	13	60
24	24	1098	15301-15314	182-195	14	60
25	25	1099	15315-15328	196-209	15	60
26	26	1100	15329-15342	210-223	16	60
27	27	1101	15343-15356	224-237	17	60
28	28	1102	15357-15370	238-251	18	60
29	29	1103	15371-15384	1- 14	1	61
30	30	1104	15385-15398	15- 28	2	61
31	31	1105	15399-15412	29- 42	3	61

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FEB. 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	32	1106	15413-15426	43- 56	4	61
2	33	1107	15427-15440	57- 70	5	61
3	34	1108	15441-15454	71- 84	6	61
4	35	1109	15455-15468	85- 98	7	61
5	36	1110	15469-15482	99-112	8	61
6	37	1111	15483-15496	113-126	9	61
7	38	1112	15497-15509	127-139	10	61
8	39	1113	15510-15523	140-153	11	61
9	40	1114	15524-15537	154-167	12	61
10	41	1115	15538-15551	168-181	13	61
11	42	1116	15552-15565	182-195	14	61
12	43	1117	15566-15579	196-209	15	61
13	44	1118	15580-15593	210-223	16	61
14	45	1119	15594-15607	224-237	17	61
15	46	1120	15608-15621	238-251	18	61
16	47	1121	15622-15635	1- 14	1	62
17	48	1122	15636-15649	15- 28	2	62
18	49	1123	15650-15663	29- 42	3	62
19	50	1124	15664-15677	43- 56	4	62
20	51	1125	15676-15691	57- 70	5	62
21	52	1126	15692-15705	71- 84	6	62
22	53	1127	15706-15719	85- 98	7	62
23	54	1128	15720-15733	99-112	8	62
24	55	1129	15734-15747	113-126	9	62
25	56	1130	15748-15760	127-139	10	62
26	57	1131	15761-15774	140-153	11	62
27	58	1132	15775-15788	154-167	12	62
28	59	1133	15789-15802	168-181	13	62

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MAR. 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	60	1134	15803-15816	182-195	14	62
2	61	1135	15817-15830	196-209	15	62
3	62	1136	15831-15844	210-223	16	62
4	63	1137	15845-15858	224-237	17	62
5	64	1138	15859-15872	238-251	18	62
6	65	1139	15873-15886	1- 14	1	63
7	66	1140	15887-15900	15- 28	2	63
8	67	1141	15901-15914	29- 42	3	63
9	68	1142	15915-15928	43- 56	4	63
10	69	1143	15929-15942	57- 70	5	63
11	70	1144	15943-15956	71- 84	6	63
12	71	1145	15957-15970	85- 98	7	63
13	72	1146	15971-15984	99-112	8	63
14	73	1147	15985-15998	113-126	9	63
15	74	1148	15999-16011	127-139	10	63
16	75	1149	16012-16025	140-153	11	63
17	76	1150	16026-16039	154-167	12	63
18	77	1151	16040-16053	168-181	13	63
19	78	1152	16054-16067	182-195	14	63
20	79	1153	16068-16081	196-209	15	63
21	80	1154	16082-16095	210-223	16	63
22	81	1155	16096-16109	224-237	17	63
23	82	1156	16110-16123	238-251	18	63
24	83	1157	16124-16137	1- 14	1	64
25	84	1158	16138-16151	15- 28	2	64
26	85	1159	16152-16165	29- 42	3	64
27	86	1160	16166-16179	43- 56	4	64
28	87	1161	16180-16193	57- 70	5	64
29	88	1162	16194-16207	71- 84	6	64
30	89	1163	16208-16221	85- 98	7	64
31	90	1164	16222-16235	99-112	8	64

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APR. 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	91	1165	16236-16249	113-126	9	64
2	92	1166	16250-16262	127-139	10	64
3	93	1167	16263-16276	140-153	11	64
4	94	1168	16277-16290	154-167	12	64
5	95	1169	16291-16304	168-181	13	64
6	96	1170	16305-16318	182-195	14	64
7	97	1171	16319-16332	196-209	15	64
8	98	1172	16333-16346	210-223	16	64
9	99	1173	16347-16360	224-237	17	64
10	100	1174	16361-16374	238-251	18	64
11	101	1175	16375-16388	1- 14	1	65
12	102	1176	16389-16402	15- 28	2	65
13	103	1177	16403-16416	29- 42	3	65
14	104	1178	16417-16430	43- 56	4	65
15	105	1179	16431-16444	57- 70	5	65
16	106	1180	16445-16458	71- 84	6	65
17	107	1181	16459-16472	85- 98	7	65
18	108	1182	16473-16486	99-112	8	65
19	109	1183	16487-16500	113-126	9	65
20	110	1184	16501-16513	127-139	10	65
21	111	1185	16514-16527	140-153	11	65
22	112	1186	16528-16541	154-167	12	65
23	113	1187	16542-16555	168-181	13	65
24	114	1188	16556-16569	182-195	14	65
25	115	1189	16570-16583	196-209	15	65
26	116	1190	16584-16597	210-223	16	65
27	117	1191	16598-16611	224-237	17	65
28	118	1192	16612-16625	238-251	18	65
29	119	1193	16626-16639	1- 14	1	66
30	120	1194	16640-16653	15- 28	2	66

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MAY, 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	121	1195	16654-16667	29- 42	3	66
2	122	1196	16668-16681	43- 56	4	66
3	123	1197	16682-16695	57- 70	5	66
4	124	1198	16696-16709	71- 84	6	66
5	125	1199	16710-16723	85- 98	7	66
6	126	1200	16724-16737	99-112	8	66
7	127	1201	16738-16751	113-126	9	66
8	128	1202	16752-16764	127-139	10	66
9	129	1203	16765-16778	140-153	11	66
10	130	1204	16779-16792	154-167	12	66
11	131	1205	16793-16806	168-181	13	66
12	132	1206	16807-16820	182-195	14	66
13	133	1207	16821-16834	196-209	15	66
14	134	1208	16835-16848	210-223	16	66
15	135	1209	16849-16862	224-237	17	66
16	136	1210	16863-16876	238-251	18	66
17	137	1211	16877-16890	1- 14	1	67
18	138	1212	16891-16904	15- 28	2	67
19	139	1213	16905-16918	29- 42	3	67
20	140	1214	16919-16932	43- 56	4	67
21	141	1215	16933-16946	57- 70	5	67
22	142	1216	16947-16960	71- 84	6	67
23	143	1217	16961-16974	85- 98	7	67
24	144	1218	16975-16988	99-112	8	67
25	145	1219	16989-17002	113-126	9	67
26	146	1220	17003-17015	127-139	10	67
27	147	1221	17016-17029	140-153	11	67
28	148	1222	17030-17043	154-167	12	67
29	149	1223	17044-17057	168-181	13	67
30	150	1224	17058-17071	182-195	14	67
31	151	1225	17072-17085	196-209	15	67

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JUN. 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	152	1226	17086-17099	210-223	16	67
2	153	1227	17100-17113	224-237	17	67
3	154	1228	17114-17127	238-251	18	67
4	155	1229	17128-17141	1- 14	1	68
5	156	1230	17142-17155	15- 28	2	68
6	157	1231	17156-17169	29- 42	3	68
7	158	1232	17170-17183	43- 56	4	68
8	159	1233	17184-17197	57- 70	5	68
9	160	1234	17198-17211	71- 84	6	68
10	161	1235	17212-17225	85- 98	7	68
11	162	1236	17226-17239	99-112	8	68
12	163	1237	17240-17253	113-126	9	68
13	164	1238	17254-17266	127-139	10	68
14	165	1239	17267-17280	140-153	11	68
15	166	1240	17281-17294	154-167	12	68
16	167	1241	17295-17308	168-181	13	68
17	168	1242	17309-17322	182-195	14	68
18	169	1243	17323-17336	196-209	15	68
19	170	1244	17337-17350	210-223	16	68
20	171	1245	17351-17364	224-237	17	68
21	172	1246	17365-17378	238-251	18	68
22	173	1247	17379-17392	1- 14	1	69
23	174	1248	17393-17406	15- 28	2	69
24	175	1249	17407-17420	29- 42	3	69
25	176	1250	17421-17434	43- 56	4	69
26	177	1251	17435-17448	57- 70	5	69
27	178	1252	17449-17462	71- 84	6	69
28	179	1253	17463-17476	85- 98	7	69
29	180	1254	17477-17490	99-112	8	69
30	181	1255	17491-17504	113-126	9	69

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JUL, 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	182	1256	17505-17517	127-139	10	69
2	183	1257	17518-17531	140-153	11	69
3	184	1258	17532-17545	154-167	12	69
4	185	1259	17546-17559	168-181	13	69
5	186	1260	17560-17573	182-195	14	69
6	187	1261	17574-17587	196-209	15	69
7	188	1262	17588-17601	210-223	16	69
8	189	1263	17602-17615	224-237	17	69
9	190	1264	17616-17629	238-251	18	69
10	191	1265	17630-17643	1- 14	1	70
11	192	1266	17644-17657	15- 28	2	70
12	193	1267	17658-17671	29- 42	3	70
13	194	1268	17672-17685	43- 56	4	70
14	195	1269	17686-17699	57- 70	5	70
15	196	1270	17700-17713	71- 84	6	70
16	197	1271	17714-17727	85- 98	7	70
17	198	1272	17728-17741	99-112	8	70
18	199	1273	17742-17755	113-126	9	70
19	200	1274	17756-17768	127-139	10	70
20	201	1275	17769-17782	140-153	11	70
21	202	1276	17783-17796	154-167	12	70
22	203	1277	17797-17810	168-181	13	70
23	204	1278	17811-17824	182-195	14	70
24	205	1279	17825-17838	196-209	15	70
25	206	1280	17839-17852	210-223	16	70
26	207	1281	17853-17866	224-237	17	70
27	208	1282	17867-17880	238-251	18	70
28	209	1283	17881-17894	1- 14	1	71
29	210	1284	17895-17908	15- 28	2	71
30	211	1285	17909-17922	29- 42	3	71
31	212	1286	17923-17936	43- 56	4	71

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AUG, 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	213	1287	17937-17950	57- 70	5	71
2	214	1288	17951-17964	71- 84	6	71
3	215	1289	17965-17978	85- 98	7	71
4	216	1290	17979-17992	99-112	8	71
5	217	1291	17993-18006	113-126	9	71
6	218	1292	18007-18019	127-139	10	71
7	219	1293	18020-18033	140-153	11	71
8	220	1294	18034-18047	154-167	12	71
9	221	1295	18048-18061	168-181	13	71
10	222	1296	18062-18075	182-195	14	71
11	223	1297	18076-18089	196-209	15	71
12	224	1298	18090-18103	210-223	16	71
13	225	1299	18104-18117	224-237	17	71
14	226	1300	18118-18131	238-251	18	71
15	227	1301	18132-18145	1- 14	1	72
16	228	1302	18146-18159	15- 28	2	72
17	229	1303	18160-18173	29- 42	3	72
18	230	1304	18174-18187	43- 56	4	72
19	231	1305	18188-18201	57- 70	5	72
20	232	1306	18202-18215	71- 84	6	72
21	233	1307	18216-18229	85- 98	7	72
22	234	1308	18230-18243	99-112	8	72
23	235	1309	18244-18257	113-126	9	72
24	236	1310	18258-18270	127-139	10	72
25	237	1311	18271-18284	140-153	11	72
26	238	1312	18285-18298	154-167	12	72
27	239	1313	18299-18312	168-181	13	72
28	240	1314	18313-18326	182-195	14	72
29	241	1315	18327-18340	196-209	15	72
30	242	1316	18341-18354	210-223	16	72
31	243	1317	18355-18368	224-237	17	72

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SEP, 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	244	1318	18369-18382	238-251	18	72
2	245	1319	18383-18396	1- 14	1	73
3	246	1320	18397-18410	15- 28	2	73
4	247	1321	18411-18424	29- 42	3	73
5	248	1322	18425-18438	43- 56	4	73
6	249	1323	18439-18452	57- 70	5	73
7	250	1324	18453-18466	71- 84	6	73
8	251	1325	18467-18480	85- 98	7	73
9	252	1326	18481-18494	99-112	8	73
10	253	1327	18495-18508	113-126	9	73
11	254	1328	18509-18521	127-139	10	73
12	255	1329	18522-18535	140-153	11	73
13	256	1330	18536-18549	154-167	12	73
14	257	1331	18550-18563	168-181	13	73
15	258	1332	18564-18577	182-195	14	73
16	259	1333	18578-18591	196-209	15	73
17	260	1334	18592-18605	210-223	16	73
18	261	1335	18606-18619	224-237	17	73
19	262	1336	18620-18633	238-251	18	73
20	263	1337	18634-18647	1- 14	1	74
21	264	1338	18648-18661	15- 28	2	74
22	265	1339	18662-18675	29- 42	3	74
23	266	1340	18676-18689	43- 56	4	74
24	267	1341	18690-18703	57- 70	5	74
25	268	1342	18704-18717	71- 84	6	74
26	269	1343	18718-18731	85- 98	7	74
27	270	1344	18732-18745	99-112	8	74
28	271	1345	18746-18759	113-126	9	74
29	272	1346	18760-18772	127-139	10	74
30	273	1347	18773-18786	140-153	11	74

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OCT 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	274	1348	18787-18800	154-167	12	74
2	275	1349	18801-18814	168-181	13	74
3	276	1350	18815-18828	182-195	14	74
4	277	1351	18829-18842	196-209	15	74
5	278	1352	18843-18856	210-223	16	74
6	279	1353	18857-18870	224-237	17	74
7	280	1354	18871-18884	238-251	18	74
8	281	1355	18885-18898	1- 14	1	75
9	282	1356	18899-18912	15- 28	2	75
10	283	1357	18913-18926	29- 42	3	75
11	284	1358	18927-18940	43- 56	4	75
12	285	1359	18941-18954	57- 70	5	75
13	286	1360	18955-18968	71- 84	6	75
14	287	1361	18969-18982	85- 98	7	75
15	288	1362	18983-18996	99-112	8	75
16	289	1363	18997-19010	113-126	9	75
17	290	1364	19011-19023	127-139	10	75
18	291	1365	19024-19037	140-153	11	75
19	292	1366	19038-19051	154-167	12	75
20	293	1367	19052-19065	168-181	13	75
21	294	1368	19066-19079	182-195	14	75
22	295	1369	19080-19093	196-209	15	75
23	296	1370	19094-19107	210-223	16	75
24	297	1371	19108-19121	224-237	17	75
25	298	1372	19122-19135	238-251	18	75
26	299	1373	19136-19149	1- 14	1	76
27	300	1374	19150-19163	15- 28	2	76
28	301	1375	19164-19177	29- 42	3	76
29	302	1376	19178-19191	43- 56	4	76
30	303	1377	19192-19205	57- 70	5	76
31	304	1378	19206-19219	71- 84	6	76

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NOV. 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	306	1379	19220-19233	85- 98	7	76
2	306	1380	19234-19247	99-112	8	76
3	307	1381	19248-19261	113-126	9	76
4	308	1382	19262-19274	127-139	10	76
5	309	1383	19275-19288	140-153	11	76
6	310	1384	19289-19302	154-167	12	76
7	311	1385	19303-19316	168-181	13	76
8	312	1386	19317-19330	182-195	14	76
9	313	1387	19331-19344	196-209	15	76
10	314	1388	19345-19358	210-223	16	76
11	315	1389	19359-19372	224-237	17	76
12	316	1390	19373-19386	238-251	18	76
13	317	1391	19387-19400	1- 14	1	77
14	318	1392	19401-19414	15- 28	2	77
15	319	1393	19415-19428	29- 42	3	77
16	320	1394	19429-19442	43- 56	4	77
17	321	1395	19443-19456	57- 70	5	77
18	322	1396	19457-19470	71- 84	6	77
19	323	1397	19471-19484	85- 98	7	77
20	324	1398	19485-19498	99-112	8	77
21	325	1399	19499-19512	113-126	9	77
22	326	1400	19513-19525	127-139	10	77
23	327	1401	19526-19539	140-153	11	77
24	328	1402	19540-19553	154-167	12	77
25	329	1403	19554-19567	168-181	13	77
26	330	1404	19568-19581	182-195	14	77
27	331	1405	19582-19595	196-209	15	77
28	332	1406	19596-19609	210-223	16	77
29	333	1407	19610-19623	224-237	17	77
30	334	1408	19624-19637	238-251	18	77

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DEC. 1978

DATE	GMT DAY	FLIGHT DAY	SPACECRAFT ORBITS	REFERENCE ORBITS	REF DAY	CYCLE NO.
1	335	1409	19638-19651	1- 14	1	78
2	336	1410	19652-19665	15- 28	2	78
3	337	1411	19666-19679	29- 42	3	78
4	338	1412	19680-19693	43- 56	4	78
5	339	1413	19694-19707	57- 70	5	78
6	340	1414	19708-19721	71- 84	6	78
7	341	1415	19722-19735	85- 98	7	78
8	342	1416	19736-19749	99-112	8	78
9	343	1417	19750-19763	113-126	9	78
10	344	1418	19764-19776	127-139	10	78
11	345	1419	19777-19790	140-153	11	78
12	346	1420	19791-19804	154-167	12	78
13	347	1421	19805-19818	168-181	13	78
14	348	1422	19819-19832	182-195	14	78
15	349	1423	19833-19846	196-209	15	78
16	350	1424	19847-19860	210-223	16	78
17	351	1425	19861-19874	224-237	17	78
18	352	1426	19875-19888	238-251	18	78
19	353	1427	19889-19902	1- 14	1	79
20	354	1428	19903-19916	15- 28	2	79
21	355	1429	19917-19930	29- 42	3	79
22	356	1430	19931-19944	43- 56	4	79
23	357	1431	19945-19958	57- 70	5	79
24	358	1432	19959-19972	71- 84	6	79
25	359	1433	19973-19986	85- 98	7	79
26	360	1434	19987-20000	99-112	8	79
27	361	1435	20001-20014	113-126	9	79
28	362	1436	20015-20027	127-139	10	79
29	363	1437	20028-20041	140-153	11	79
30	364	1438	20042-20055	154-167	12	79
31	365	1439	20056-20069	168-181	13	79

APPENDIX C

LANDSAT-2 DOCUMENTS ISSUED THIS REPORT PERIOD

APPENDIX C

LANDSAT-2 DOCUMENTS ISSUED THIS REPORT PERIOD

No.	Document No.	Title and Data
1	PIR-14N5-42-207	Landsat-2 (-Y) Orbit Adjust Program Outline and Burn Summary dated 12/12/77.

GENERAL ELECTRIC

Space Division

Headquarters: Valley Forge, Pennsylvania ☐ Daytona Beach, Fla. ☐ Evendale, Ohio

☐ Huntsville, Ala. ☐ Bay St. Louis, Miss. ☐ Houston, Texas ☐ Sunnyvale, Calif.

☐ Beltsville, Md. ☐ Tacoma, Wash. ☐ Palmdale, Calif. ☐ Bedford, Mass.

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