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(NASA CR 51596

IMPROVEMENT OF NICKEL-CADMIUM BATTERIES

[intl. caps.]

MONTHLY TECHNICAL PROGRESS REPORT NO. 29

COVERING THE PERIOD

20 August 1963 to 20 September 1963

20 20,

OTS PRICE

XEROX $ 2.60 ph

MICROFILM $ 0.89 mf

(Contract No. NAS 5-1048)

INLAND TESTING LABORATORIES
Cook Technological Center
Dayton, Ohio

PROGRESS REPORT NO. 29

I. INTRODUCTION

This Progress Report is submitted in accordance with Article I and Item 2 of Article II, of Contract NAS 5-1048.

II. CONTRACT OBJECTIVE

The objective of this contract is to improve nickel-cadmium batteries through testing and analysis of failures. Specifically, a number of batteries developed by manufacturers under NASA Contracts are being subjected to operational and environmental testing to determine failure rates and modes of failure. From these results specific suggestions for the proper application and possible improvement of this battery type may be made.

III. PROGRAM FOR THE REPORT PERIOD

Cycle-life tests were continued and data recorded on the following groups of cells:

Number of Cells in Original Group	Mfr.	Depth of Discharge	Temp. °C	Cycles Completed
10	Sonotone	10%	25	4600+
10	Gulton	10%	25	4600+
10	Gould	10%	25	4600+
10	Sonotone	10%	50	4400+
10	Gulton	10%	50	4400+
10	Gould	10%	50	4400+

Number of Cells in Original Group	Mfr.	Depth of Discharge	Temp. °C	Cycles Completed
10	Sonotone	25%	25	4300+
10	Gould	25%	25	1500+
10	Gulton	25%	25	4300+
10	Sonotone	10%	-10	4100+
5	Gould	10%	-10	3000+
10	Gulton	10%	-10	4100+
4	Sonotone	40%	25	3800+
5	*Gould	40%	25	1282

* - This Group removed from cycling.

During this reporting period, failures were experienced among the Gould National cells cycling at 25°C and 40% discharge and among the Sonotone cells cycling at 50°C and 10% discharge.

In the group of 3 Gould National cells cycling at 25°C and 40% discharge, the discharge voltages reached 0.60V, 1.02V, and 1.00V, respectively at the end of the 40 min. discharge part of the 4008 cycle. At this juncture, the cells were removed from cycling.

In the group of 9 Sonotone cells, cycling at 50°C and 10% discharge, Cell No. 75 was removed from cycling at 4281 cycles when the discharge voltage went negative at the end of the discharge period. Cell No. 69 was removed from cycling when the discharge voltage reached 0.90V. at the

end of the discharge period at 4008 cycles. Post failure tests were made on Cell No. 69. These tests showed that the capacity had dropped to 25% of its original value when the cell was charged at C/10 for 16 hours and then discharged at C/2 to 1.0 volts. On an open circuit stand test after a similiar charge, the cell retained an open circuit voltage of 1.26V for 24 hours, but discharged to 0.0 volts in 108 hours. A separate report on the procedure and results of this post failure test is appended.

VI. PROGRAM FOR THE NEXT PERIOD

1. Continue and record data on cycle-life tests in progress at 25°C, -10°C, and 50°C.
2. Continue evaluation of data being accumulated.
3. Continue investigation of failed cells.

FINANCIAL CONDITION

CONTRACT NAS 5-1048

MONTHLY PROGRESS REPORT NO. 29

20 AUGUST 1963 to 20 SEPTEMBER 1963

* Funds Expended During Report Period	$ 791
* Commitments	None
* Total Funds Expended Including Commitments	$54,841
* Funds Remaining	$ 1,926

* All amounts are less G & A and Fee

POST FAILURE TESTS ON SONOTONE CELL

CELL NO. 69 - NO EVIDENCE OF LEAKAGE (50°C - 10%)

Removed after 4008 cycles when discharge voltage went below 1.0 volts.

Open Circuit Voltage as removed from cycling- - - - - - - 1.12V.
Charged at C/10 for 16 hours - End of Charge Voltage - - 1.39V.
After 1 hour stand, Open Circuit Voltage At Start
of C/2 Discharge - 1.28V.

Discharge Time (Min.)	Terminal Voltage	Capacity - AH
1	1.20V.	
20	1.11V.	
30	1.00V.	0.875
36	0.80V.	
37.1	0.60V.	1.800

At end of C/10 charge for 16 hours, Open Circuit Voltage - - 1.33V.
At end of 24 hours, O.C.V. - 1.26V.
At end of 108 hours, O.C.V. - 0.00V.

DISPOSITION OF GOULD NATIONAL CELLS - 20 SEPTEMBER 1963

Cells - Failed Initial Tests - - - - - - - - - - - 23
Cells - Failed in Cycling - - - - - - - - - - - - 10
Cells - Now Cycling - - - - - - - - - - - - - - - 30
Cells - Not Used in Cycling - - - - - - - - - - - 2*

* One cell bulged, one leaked after initial tests

CELLS FAILED INITIAL TESTS

Electrolyte Leakage - - - - - 23
Electrical Leakage - - - - - - 2 (Failed Both Initial Tests)

CELLS FAILED IN CYCLING

At 50°C - 10% Discharge (2668 cycles) - - - - - - - - - - - 1
At 50°C - 10% Discharge (2973 cycles) - - - - - - - - - - - 1
At 50°C - 10% Discharge (3216 cycles) - - - - - - - - - - - 1
At 50°C - 10% Discharge (3372 cycles) - - - - - - - - - - - 1
At 50°C - 10% Discharge (3576 cycles) - - - - - - - - - - - 1
At 25°C - 40% Discharge (864 cycles) - - - - - - - - - - - 2
At 25°C - 40% Discharge (1282 cycles) - - - - - - - - - - 3
Total 10

CELLS NOW CYCLING

At 25°C - 10% Discharge - - - - - - - - - - - 10
At 50°C - 10% Discharge - - - - - - - - - - - 5
At -10°C - 10% Discharge - - - - - - - - - - 5

At 25°C - 25% Discharge - - - - - - - - - - - 10

NOTE: This last group totaling 10 cells is from the group of 23 cells reported as having electrolyte leakage. They were sent to the manufacturer for examination, returned to this facility, and are now cycling as indicated.

DISPOSITION OF GULTON CELLS - 20 SEPTEMBER 1963

Cells - Failed Initial Tests - - - - - - - - - - - 7
Cells - Failed in Cycling - - - - - - - - - - - - 4
Cells - Now Cycling - - - - - - - - - - - - - - 36
Cells - Not Used in Cycling - - - - - - - - - - 3*

* 3 cells bulged after initial tests

CELLS FAILED INITIAL TESTS

Electrolyte Leakage - - - - - - - - - - - 5
Electrical Leakage - - - - - - - - - - - - 2

CELLS FAILED IN CYCLING TO DATE

At 25°C - 10% Discharge (2263 cycles) - - - - - - - - - - - 1
At 25°C - 25% Discharge (1298 cycles) - - - - - - - - - - - 1
At 25°C - 25% Discharge (1270 cycles) - - - - - - - - - - - 1
At 25°C - 25% Discharge (1416 cycles) - - - - - - - - - - - 1
Total 4

CELLS NOW CYCLING

At 25°C - 10% Discharge - - - - - - - - - - - 9
At 25°C - 25% Discharge - - - - - - - - - - - 7
At 50°C - 10% Discharge - - - - - - - - - - 10
At -10°C - 10% Discharge - - - - - - - - - - 10
Total 36

GENERAL DATA SHEET

TEST	SPEC:	PAR:	TEST NO:
Cycle Life at 25°C			Report 29

CONDITIONING: Chg: 125% of Dischg. 60 min; Dischg: 10% Depth, 40 min.

DATE: 20 Sept. 1963

MATERIAL: Ni-Cad: 10 Cell Group, Rated 3.5 A.H.

TEMP: RH:

MANUFACTURER: Gould National

M. NO:

INSTRUMENTS: Same as data page 1.

TESTED BY: D. M.

LAB SUP CHECK: H. B.

ENGRG CHECK: I. L.

Cell No.	CYCLE NUMBER 4193	4279	4395	4481	4583
	END OF CHARGE VOLTAGE				
1	1.45	1.45	1.46	1.45	1.46
6	1.46	1.46	1.46	1.46	1.47
8	1.45	1.45	1.45	1.45	1.46
9	1.46	1.46	1.46	1.46	1.47
10	1.49	1.48	1.49	1.49	1.50
12	1.43	1.43	1.43	1.43	1.44
14	1.46	1.47	1.47	1.47	1.48
15	1.45	1.45	1.45	1.45	1.46
22	1.46	1.46	1.46	1.46	1.47
24	1.45	1.45	1.45	1.45	1.46
	END OF DISCHARGE VOLTAGE				
1	1.26	1.27	1.27	1.27	1.27
6	1.27	1.28	1.28	1.28	1.28
8	1.26	1.26	1.27	1.27	1.28
9	1.27	1.28	1.27	1.28	1.28
10	1.25	1.26	1.26	1.26	1.26
12	1.26	1.27	1.26	1.26	1.27
14	1.27	1.28	1.28	1.28	1.29
15	1.26	1.26	1.27	1.27	1.28
22	1.26	1.27	1.28	1.27	1.28
24	1.27	1.28	1.27	1.28	1.28

GENERAL DATA SHEET

TEST	SPEC:	PAR:	TEST NO:
Cycle Life at 25°C			Report 29

CONDITIONING: Chg: 125% of Dischg. 60 min. Dischg: 10% Depth, 40 min.

DATE: 20 Sept. 1963

MATERIAL: Ni-Cad: 9 Cell Group, Rated 6 A.H.

TEMP: RH:

MANUFACTURER: Gulton

M. NO: VO-6HS

INSTRUMENTS: Same as data page 1.

TESTED BY: D. M.

LAB SUP CHECK: H. B.

ENGRG CHECK: I. L.

Cell No.	CYCLE NUMBER 4193	4279	4395	4481	4583
	END OF CHARGE VOLTAGE				
628	1.42	1.42	1.42	1.42	1.43
638	1.41	1.41	1.42	1.41	1.42
644	1.43	1.43	1.43	1.43	1.44
647	1.43	1.43	1.43	1.43	1.44
648	1.40	1.40	1.40	1.41	1.42
653	1.42	1.42	1.42	1.42	1.43
822	1.42	1.42	1.42	1.42	1.44
825	1.41	1.41	1.41	1.42	1.43
827	1.42	1.42	1.42	1.42	1.43
	END OF DISCHARGE VOLTAGE				
628	1.22	1.22	1.23	1.23	1.24
638	1.24	1.25	1.25	1.25	1.26
644	1.25	1.25	1.26	1.26	1.26
647	1.25	1.26	1.26	1.26	1.27
648	1.21	1.23	1.23	1.24	1.25
653	1.24	1.25	1.25	1.25	1.26
822	1.24	1.26	1.25	1.26	1.26
825	1.25	1.26	1.26	1.26	1.27
827	1.25	1.26	1.26	1.26	1.27

GENERAL DATA SHEET

TEST	SPEC:	PAR:	TEST NO:
Cycle Life at 25°C			Report 29

CONDITIONING:	DATE:
Chg: 125% of Dischg, 60 min, Dischg: 25% Depth, 40 min.	20 Sept. 1963
MATERIAL:	TEMP: RH:
Ni-Cad: 10 Cell Group, Rated 3.5 A. H.	
MANUFACTURER:	M. NO:
Sonotone	
INSTRUMENTS:	TESTED BY:
Same as data page 1.	D. M.
	LAB SUP CHECK: H. B.
	ENGRG CHECK: I. L.

CELL NO.	CYCLE NUMBER 3893	3979	4095	4181	4283
	END OF CHARGE VOLTAGE				
60	1.48	1.48	1.48	1.48	1.48
61	1.48	1.48	1.47	1.48	1.49
R49	1.46	1.46	1.46	1.46	1.46
R50	1.48	1.48	1.48	1.48	1.49
R51	1.49	1.49	1.49	1.49	1.50
R52	1.47	1.47	1.47	1.47	1.48
R53	1.46	1.46	1.45	1.46	1.46
R55	1.47	1.46	1.46	1.47	1.47
R56	1.48	1.48	1.48	1.47	1.48
R57	1.47	1.47	1.47	1.47	1.48
	END OF DISCHARGE VOLTAGE				
60	1.16	1.16	1.16	1.17	1.17
61	1.16	1.16	1.16	1.16	1.17
R49	1.14	1.15	1.14	1.14	1.15
R50	1.16	1.16	1.16	1.17	1.17
R51	1.17	1.17	1.18	1.18	1.17
R52	1.16	1.16	1.16	1.16	1.17
R53	1.15	1.16	1.16	1.16	1.17
R55	1.16	1.16	1.16	1.17	1.17
R56	1.16	1.17	1.17	1.17	1.18
R57	1.15	1.15	1.16	1.16	1.17

GENERAL DATA SHEET

TEST	SPEC:	PAR:	TEST NO:
Cycle Life at 25°C			Report 29

CONDITIONING: Chg: 125% of Dischg. 60 min; Dischg: 25% Depth, 40 min.

DATE: 20 Sept. 1963

MATERIAL: Ni-Cad; 10 Cell Group, Rated 3.5 A.H.

TEMP: RH:

MANUFACTURER: Gould National

M. NO:

INSTRUMENTS: Same as data page 1.

TESTED BY: D. M.

LAB SUP CHECK: H. B.

ENGRG CHECK: I. L.

CELL NO.	CYCLE NUMBER 1080	1166	1282	1368	1470
	END OF CHARGE VOLTAGE				
3	1.48	1.48	1.48	1.48	1.48
5	1.48	1.48	1.48	1.48	1.48
7	1.54	1.55	1.55	1.55	1.56
11	1.49	1.48	1.48	1.48	1.48
13	1.52	1.53	1.52	1.53	1.52
16	1.49	1.49	1.49	1.49	1.49
30	1.49	1.49	1.48	1.49	1.48
37	1.56	1.55	1.56	1.57	1.56
39	1.51	1.52	1.51	1.52	1.51
40	1.49	1.48	1.48	1.48	1.48
	END OF DISCHARGE VOLTAGE				
3	1.24	1.24	1.25	1.24	1.25
5	1.22	1.22	1.22	1.21	1.21
7	1.17	1.16	1.17	1.16	1.10
11	1.24	1.25	1.25	1.25	1.25
13	1.16	1.15	1.15	1.14	1.13
16	1.23	1.24	1.24	1.24	1.24
30	1.23	1.24	1.24	1.24	1.24
37	1.02	1.00	0.97	0.95	0.93
39	1.22	1.22	1.23	1.22	1.22
40	1.23	1.24	1.24	1.24	1.24

GENERAL DATA SHEET

TEST	SPEC:	PAR:	TEST NO:
Cycle Life at 25°C			Report 29
CONDITIONING: Chg: 125% of Dischg, 60 min; Dischg: 25% Depth, 40 min.			DATE: 20 Sept. 1963
MATERIAL: Ni-Cad; 7 Cell Group, Rated 6 A. H.			TEMP: RH:
MANUFACTURER: Gulton			M. NO: VO-6HS
INSTRUMENTS: Same as data page 1.			TESTED BY: D. M.
			LAB SUP CHECK: H. B.
			ENGRG CHECK: I. L.

CELL NO.	3893	3979	4095	4181	4283
		CYCLE NUMBER			
		END OF CHARGE VOLTAGE			
660	1.46	1.46	1.46	1.46	1.47
661	1.47	1.47	1.47	1.47	1.47
804	1.50	1.50	1.50	1.50	1.52
812	1.47	1.47	1.47	1.47	1.46
816	1.46	1.46	1.45	1.45	1.46
818	1.45	1.45	1.45	1.45	1.46
820	1.46	1.46	1.46	1.46	1.46
		END OF DISCHARGE VOLTAGE			
660	1.16	1.17	1.18	1.18	1.18
661	1.16	1.16	1.17	1.18	1.18
804	1.15	1.16	1.16	1.16	1.17
812	1.16	1.17	1.18	1.18	1.18
816	1.16	1.17	1.18	1.18	1.18
818	1.15	1.16	1.17	1.18	1.19
820	1.16	1.17	1.18	1.18	1.19

GENERAL DATA SHEET

TEST	SPEC:	PAR:	TEST NO:
Cycle Life at 25°C			Report 29
CONDITIONING: Chg: 125% of Dischg, 60 min; Dischg: 40% Depth, 40 min.			DATE: 20 Sept. 1963
MATERIAL: Ni-Cad, 3 Cell Group, Rated 3.5 A.H.			TEMP: RH:
MANUFACTURER: Sonotone			M. NO:
INSTRUMENTS: Same as data page 1.			TESTED BY: D. M.
			LAB SUP CHECK: H. B.
			ENGRG CHECK: L. F. L.

CELL NO.	2893	CYCLE NUMBER 2979	3095	3181	3239
		END OF CHARGE VOLTAGE			
57	1.51	1.52	1.51	1.51	1.53
58	1.51	1.52	1.51	1.52	1.54
59	1.52	1.51	1.51	1.51	1.55
		END OF DISCHARGE VOLTAGE			
57	1.14	1.13	1.14	1.15	1.14
58	1.15	1.16	1.15	1.17	1.16
59	1.16	1.15	1.16	1.17	1.16

GENERAL DATA SHEET

TEST: Cycle Life at 25°C	SPEC:	PAR:	TEST NO: Report 29
CONDITIONING: Chg: 125% of Dischg, 60 min; Dischg: 40% Depth, 40 min.			DATE: 20 Sept. 1963
MATERIAL: Ni-Cad; 3 Cell Group, Rated 3.5 A.H.			TEMP: RH:
MANUFACTURER: Gould National			M. NO:
INSTRUMENTS: Same as data page 1.			TESTED BY: D. M.
			LAB SUP CHECK: H. B.
			ENGRG CHECK: I. L.

CELL NO.	1080	1166	1282	*
	CYCLE NUMBER			
	END OF CHARGE VOLTAGE			
43	1.54	1.54	1.57	*
45	1.54	1.55	1.56	*
49	1.57	1.56	1.54	*
	END OF DISCHARGE VOLTAGE			
43	0.94	0.94	0.60	*
45	1.12	1.05	1.02	*
49	1.00	0.99	1.00	*

* - Group removed from cycling test at 1282 cycles

GENERAL DATA SHEET

TEST	SPEC:	PAR:	TEST NO:
Cycle Life at 50°C			Report 29

CONDITIONING:
Chg: 150% of Dischg, 60 min; Dischg: 10% Depth, 40 min.

DATE: 20 Sept. 1963

MATERIAL:
Ni-Cad, 9 Cell Group, Rated 3.5 A. H.

TEMP: RH:

MANUFACTURER:
Sonotone

M. NO:

INSTRUMENTS:
Same as data page 1.

TESTED BY: D. M.

LAB SUP CHECK: H. B.

ENGRG CHECK: I. L.

CELL NO.	CYCLE NUMBER 3993	4079	4195	4281	4383
	END OF CHARGE VOLTAGE				
67	1.41	1.42	1.41	1.41	1.41
69	1.41	*			
70	1.42	1.42	1.42	1.42	1.42
71	1.40	1.38	1.39	1.39	1.40
75	1.40	1.40	1.40	**	
R45	1.37	1.37	1.37	1.37	1.37
R46	1.36	1.37	1.36	1.36	1.37
R47	1.37	1.35	1.38	1.38	1.38
R48	1.38	1.38	1.37	1.38	1.38
	END OF DISCHARGE VOLTAGE				
67	1.17	1.18	1.18	1.17	1.18
69	1.02	*			
70	1.17	1.18	1.18	1.17	1.17
71	1.15	1.06	1.08	1.06	0.94
75	1.00	0.98	0.93	**	
R45	1.20	1.20	1.20	1.20	1.19
R46	1.19	1.20	1.18	1.20	1.21
R41	1.20	1.18	1.21	1.20	1.20
R48	1.19	1.20	1.19	1.20	1.19

* Cell No. 69 removed from cycling at 4008 cycles when end of discharge voltage reached 0.90 volts.

** Cell No. 75 removed from cycling at 4281 cycles when the discharge voltage went negative at the end of the discharge cycle.

GENERAL DATA SHEET

[redacted] Life at 50°C	SPEC:	PAR:	TEST NO: Report 29
[redacted]ONING: [redacted] 150% of Dischg, 60 min; Dischg: 10% Depth, 40 min.			DATE: 20 Sept. 1963
[redacted]IAL: Ni-Cad, 5 Cell Group, Rated 3.5 A.H.			TEMP: RH:
MANUFACTURER: Gould National			M. NO:
INSTRUMENTS: Same as data page 1.			TESTED BY: D. M.
			LAB SUP CHECK: H. B.
			ENGRG CHECK: I. L.

CELL NO.	3993	4079	4195	4281	4383
		CYCLE NUMBER			
		END OF CHARGE VOLTAGE			
23	1.42	1.42	1.42	1.43	1.43
28	1.42	1.43	1.43	1.42	1.42
31	1.40	1.41	1.42	1.41	1.42
32	1.46	1.46	1.45	1.43	1.43
33	1.42	1.44	1.43	1.40	1.40
		END OF DISCHARGE VOLTAGE			
23	1.21	1.20	1.20	1.19	1.18
28	1.20	1.20	1.22	1.19	1.19
31	1.21	1.21	1.23	1.21	1.22
32	1.23	1.22	1.23	1.22	1.23
33	1.14	1.17	1.16	1.17	1.16

GENERAL DATA SHEET

TEST	SPEC:	PAR:	TEST NO:
Cycle Life at 50°C			Report 29

CONDITIONING:	DATE:
Chg: 150% of Dischg, 60 min. Dischg: 10% Depth, 40 min.	20 Sept. 1963
MATERIAL:	TEMP: RH:
Ni-Cad: 10 Cell Group, Rated 6 A. H.	
MANUFACTURER:	M. NO:
Gulton	VO-6HS
INSTRUMENTS:	TESTED BY:
Same as data page 1.	D. M.
	LAB SUP CHECK: H. B.
	ENGRG CHECK: I. L.

CELL NO.	3993	CYCLE NUMBER 4079	4195	4281	4383
		END OF CHARGE VOLTAGE			
602	1.42	1.42	1.42	1.42	1.41
604	1.40	1.40	1.39	1.38	1.38
610	1.43	1.38	1.38	1.36	1.38
611	1.39	1.39	1.39	1.38	1.39
616	1.40	1.41	1.40	1.41	1.41
624	1.40	1.40	1.40	1.39	1.40
719	1.40	1.40	1.40	1.40	1.40
765	1.41	1.40	1.41	1.40	1.40
778	1.40	1.40	1.40	1.40	1.40
779	1.41	1.41	1.41	1.41	1.40
		END OF DISCHARGE VOLTAGE			
602	1.23	1.24	1.24	1.24	1.23
604	1.20	1.20	1.20	1.19	1.18
610	1.15	1.17	1.16	1.17	1.17
611	1.21	1.22	1.23	1.22	1.23
616	1.22	1.23	1.23	1.23	1.23
624	1.19	1.20	1.20	1.20	1.20
719	1.19	1.20	1.20	1.21	1.20
765	1.20	1.21	1.21	1.21	1.21
778	1.19	1.19	1.20	1.20	1.20
779	1.18	1.19	1.20	1.20	1.20

GENERAL DATA SHEET

TEST	SPEC:	PAR:	TEST NO:
Cycle Life at -10°C			Report 29
CONDITIONING: Chg: 115% of Dischg, 60 min; Dischg: 10% Depth, 40 min.			DATE: 20 Sept. 1963
MATERIAL: Ni-Cad; 10 Cell Group, Rated 3.5 A.H.			TEMP: RH:
MANUFACTURER: Sonotone			M. NO:
INSTRUMENTS: Same as data page 1.			TESTED BY: D. M.
			LAB SUP CHECK: H. B.
			ENGRG CHECK: L. I.

CELL NO.	3693	CYCLE NUMBER 3779	3895	3981	4083
		END OF CHARGE VOLTAGE			
51	1.51	1.52	1.52	1.52	1.52
52	1.49	1.50	1.50	1.49	1.50
53	1.55	1.55	1.55	1.55	1.55
54	1.64	1.64	1.64	1.66	1.66
55	1.61	1.62	1.61	1.62	1.62
73	1.50	1.50	1.50	1.50	1.51
R34	1.51	1.51	1.51	1.52	1.52
R35	1.59	1.60	1.59	1.59	1.59
R36	1.50	1.51	1.50	1.51	1.52
R38	1.62	1.62	1.62	1.63	1.63
		END OF DISCHARGE VOLTAGE			
51	1.24	1.24	1.24	1.24	1.25
52	1.23	1.23	1.23	1.24	1.24
53	1.24	1.24	1.24	1.25	1.25
54	1.24	1.24	1.24	1.25	1.26
55	1.24	1.25	1.25	1.25	1.25
73	1.25	1.24	1.24	1.24	1.26
R34	1.25	1.25	1.25	1.26	1.26
R35	1.26	1.26	1.26	1.26	1.25
R36	1.24	1.25	1.24	1.25	1.26
R38	1.25	1.26	1.25	1.26	1.26

GENERAL DATA SHEET

TEST	SPEC:	PAR:	TEST NO:
Cycle Life at -10°C			Report 29

CONDITIONING: Chg: 115% of Dischg, 60 min; Dischg: 10% Depth, 40 min.	DATE: 20 Sept. 1963
MATERIAL: Ni-Cad; 5 Cell Group, Rated 3.5 A.H.	TEMP: RH:
MANUFACTURER: Gould National	M. NO:
INSTRUMENTS: Same as data page 1.	TESTED BY: D. M. LAB SUP CHECK: H. B. ENGRG CHECK: L. F. L.

CELL NO.	2578	CYCLE NUMBER 2649	2765	2851	2953
		END OF CHARGE VOLTAGE			
25	1.53	1.53	1.52	1.53	1.53
26	1.55	1.54	1.54	1.55	1.54
27	1.57	1.58	1.57	1.58	1.57
35	1.56	1.57	1.56	1.56	1.56
38	1.57	1.55	1.54	1.55	1.55
		END OF DISCHARGE VOLTAGE			
25	1.32	1.30	1.30	1.30	1.30
26	1.32	1.30	1.30	1.30	1.30
27	1.30	1.26	1.25	1.25	1.25
35	1.31	1.28	1.27	1.27	1.28
38	1.31	1.30	1.29	1.29	1.29