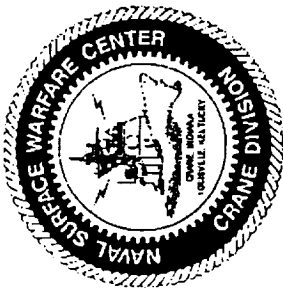


AF Ni-Cd CELL
QUALIFICATION PROGRAM UPDATE



S. Hall and H. Brown NWSC Crane
G. Collins, W. Hwang Aerospace Corporation
Lt. Q. Bui USAF

N 9 3 - 2 0 5 0 5



AIR FORCE NI-CD PROGRAM REVIEW OVERVIEW OF TEST PROGRAM

BACKGROUND

- 1976 - QUALIFIED 2505ML SEPARATOR MANUFACTURE DISCONTINUED
- 1984 - SURPLUS SUPPLY OF 2505ML DEPLETED
- 1985 - AIR FORCE/NAVY SPONSORED CRANE DIVISION TEST SEPARATOR QUALIFICATION PROGRAM
- 1986-1988 - NO GENERIC QUALIFICATION OF REPLACEMENT PELLON 2536 SEPARATOR
- 1989 - AIR FORCE SPONSOR CRANE DIVISION TEST NICKEL-CADMIUM CELL QUALIFICATION PROGRAM
- 1990 - SAFT/France VOS A (up to 30 Ah) DESIGN CELLS RECOMMENDED FOR GENERIC QUALIFICATION FOR USAF PROGRAMS.

**AIR FORCE NI-CD PROGRAM REVIEW
OVERVIEW OF TEST PROGRAM**



PURPOSE

GENERIC QUALIFICATION OF AEROSPACE NICKEL-CADMIUM CELLS

**ALL AVAILABLE MANUFACTURERS
ALL AVAILABLE DESIGNS
INCLUDES CELLS FROM PREVIOUS PROGRAM
HIGH AND LOW ORBIT LIFE CYCLING**

CHARACTERIZE BEGINNING OF LIFE PERFORMANCE



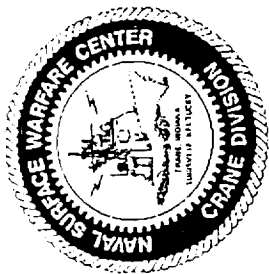
**AIR FORCE NI-CD PROGRAM REVIEW
OVERVIEW OF TEST PROGRAM**

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AIR FORCE NI-CD PROGRAM REVIEW OVERVIEW OF TEST PROGRAM

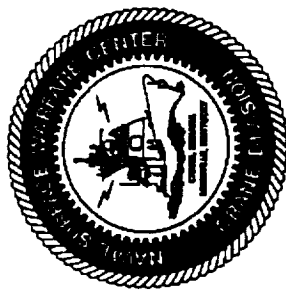
OUTLINE

ACCEPTANCE TEST - BASED ON MANUFACTURER TEST

CHARACTERIZATION TEST

CHARGE RATE	TEMPERATURE °C				
	-10	0	10	25	
C/2		X	X	X	
C/4		X	X		
C/10	X	X	X	X	
C/20	X	X		X	
C/80		X	X		

NOTE: DISCHARGES AT C/2



**STRESS TEST
PACK : 0342H**

TYPE 42 A/H SUPER NI-CD , HUGHES

TEMPERATURE 20 DEGREES CENTIGRADE

ORBIT 100 MINUTES

DISCHARGE 30.0 AMPS FOR 34 MINUTES, 40%DOD

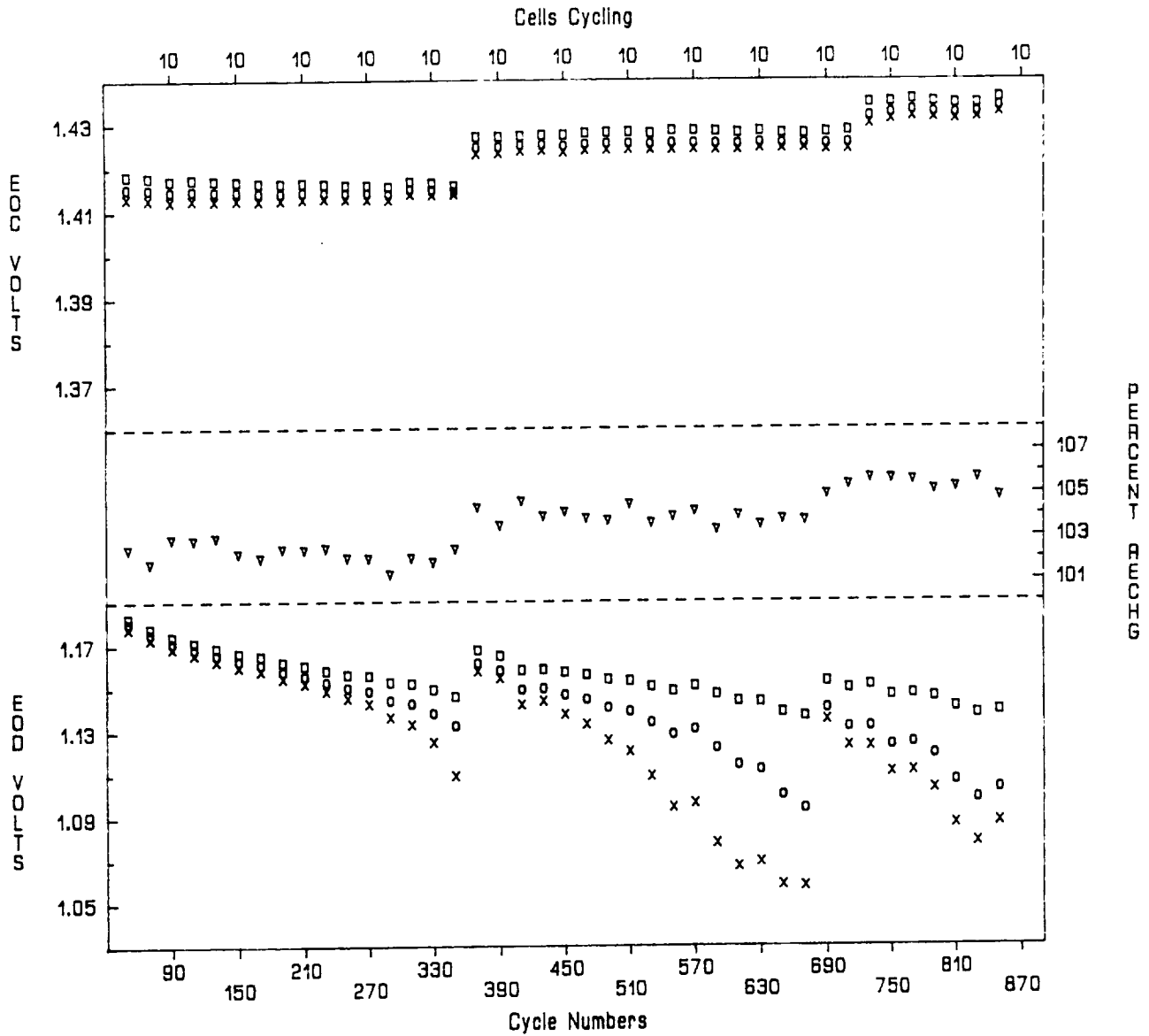
CHARGE 21.0 AMPS WITH V/T TAPER AT V/T 5.5 (1.424) V/C

TRENDPLOT

Pack: 0342H Manf: HUGHES 42.0 AH
 Orbit: LED Temp (C): 20 DOD(%): 40.0
 Discharge(Amp/Hrs): 30.0/0.56 Charge(Amp/Hrs): 21.0/1.12

Plot area #1 -- keys: Right-side:
 Left-side: OFF
 □ -- High Cell
 ○ -- Average
 x -- Low Cell
 Plot area #2 -- keys: Right-side:
 Left-side: OFF
 ▽ -- PERCENT
 Plot area #3 -- keys: Right-side:
 Left-side: OFF
 □ -- High Cell
 ○ -- Average
 x -- Low Cell

TEST DATA AS OF JUNE 30, 1992



1. CYCLE #310, INCREASED FROM VT 5 (1.414 V/C) TO VT 5.5 (1.424 V/C).
2. CYCLE #680, INCREASED FROM VT 5.5 (1.424 V/C) TO VT 6 (1.434 V/C).
3. CYCLE #722, DUE TO SOFTWARE PROBLEM, THE LAST STEP OF CHARGE WAS ONLY TO 1.424 V/C.
4. CYCLE #870, EQUIPMENT MALFUNCTION CAUSED PACK TO BE DISCHARGED FOR 1.5 HOURS. THE PACK WAS DISCONTINUED DUE TO SWELLING OF CELLS.



**STRESS TEST
PACK : 6351A**

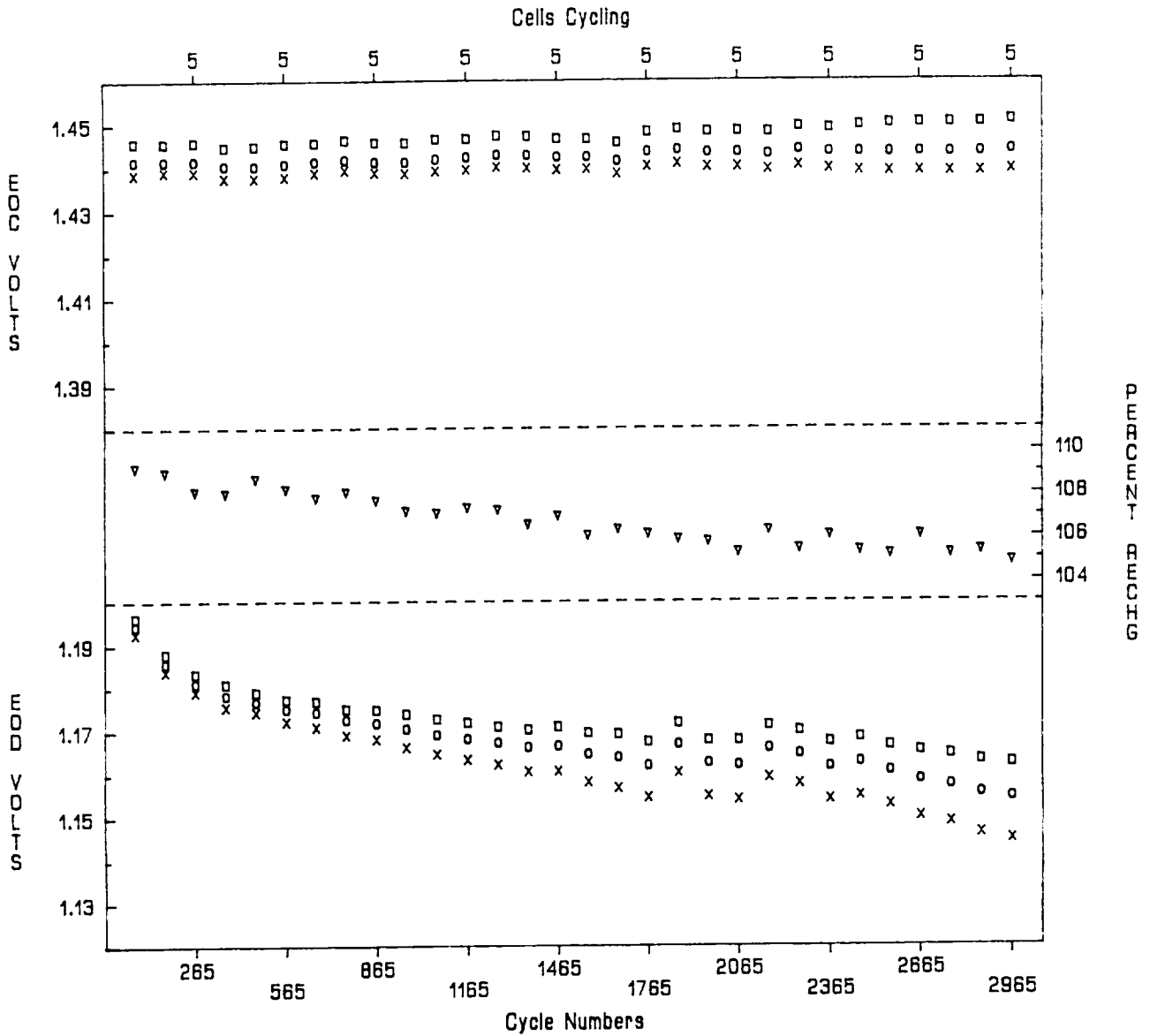
TYPE	50 A/H SUPER NI-CD , HUGHES
TEMPERATURE	20 DEGREES CENTIGRADE
ORBIT	90 MINUTES
DISCHARGE	36 AMPS FOR 34 MINUTES, 40%DOD
CHARGE	25 AMPS WITH V/T TAPER AT 6.5 (1.444 V/C)

TRENDPLOT

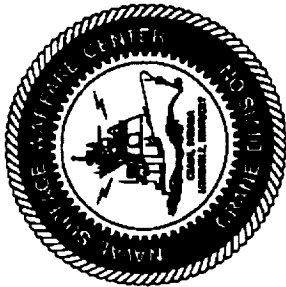
Pack: 6351A Manf: HUGHES 50.0 AH
 Orbit: LEO Temp (C): 20 DOD(%): 40.0
 Discharge(Amp/Hrs): 36.0/0.56 Charge(Amp/Hrs): 25.0/1.12

Plot area #1 -- keys: Right-side:
 Left-side: OFF
 o -- High Cell
 o -- Average
 x -- Low Cell
 Plot area #2 -- keys: Right-side:
 Left-side: OFF
 v -- PERCENT RECHARGE
 Plot area #3 -- keys: Right-side:
 Left-side: OFF
 o -- High Cell
 o -- Average
 x -- Low Cell

TEST DATA AS OF JUNE 30, 1992



1. CYCLE #18, DECREASED FROM VT 7 (1.454 V/C) TO VT 6.5 (1.444 V/C) DUE TO HIGH PERCENT RECHARGE.



PACK : 6352A

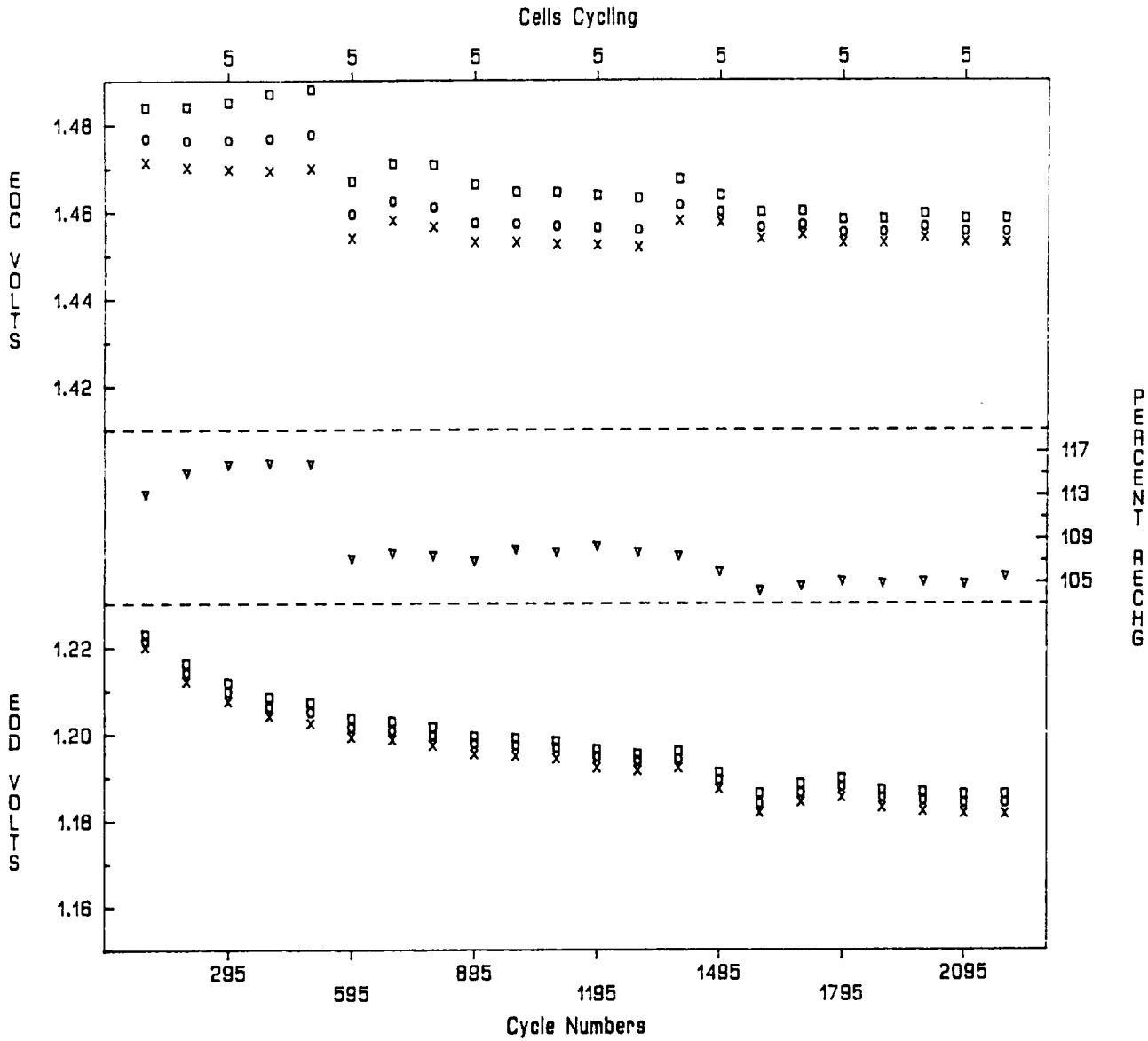
TYPE	50 A/H SUPER NI-CD , HUGHES
TEMPERATURE	5 DEGREES CENTIGRADE
ORBIT	96 MINUTES
DISCHARGE	25 AMPS FOR 30 MINUTES, 25%DOD
CHARGE	25 AMPS WITH V/T TAPER AT 5.5 (1.458 V/C)

TRENDPLOT

Pack: 6352A Manf: HUGHES 50.0 AH
 Orbit: LEO Temp (C): 5.0 DOD(%): 25.0
 Discharge(Amp/Hrs): 25.0/0.50 Charge(Amp/Hrs): 25.0/1.10

Plot area #1 -- keys: Right-side:
 Left-side: OFF
 □ -- High Cell
 ○ -- Average
 x -- Low Cell
 Plot area #2 -- keys: Right-side:
 Left-side: OFF
 v -- PERCENT REC -
 Plot area #3 -- keys: Right-side:
 Left-side: OFF
 □ -- High Cell
 ○ -- Average
 x -- Low Cell

TEST DATA AS OF JUNE 30, 1992



1. CYCLE #47, LOWERED FROM VT 7 (1.488 V/C) TO VT 6.5 (1.478 V/C) DUE TO HIGH PERCENT RECHARGE.
2. CYCLE #529, LOWERED FROM VT 6.5 (1.478 V/C) TO VT 6 (1.468 V/C) DUE TO HIGH PERCENT RECHARGE.
3. CYCLE # 569, LOWERED FROM VT 6 (1.468 V/C) TO VT 5.5(1.458 V/C) DUE TO HIGH PERCENT RECHARGE (111%).



RESULTS OF "SUPER NICD" CELLS LEO TEST

* CAPACITY LOSS DUE TO STORAGE/HANDLING

PROCEDURES

o 50-Ah CELL, 40% DOD & 20 C: EODV > 1.14

AFTER 2900 CYCLES

o 50-Ah CELL, 25% DOD & 5 C: EODV > 1.18

AFTER 2100 CYCLES

o 42-Ah CELL, 40% DOD & 20 C: EODV > 1.05

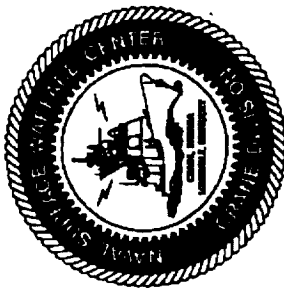
FIRST 800 CYCLES WHILE OPTIMIZING V/T

LEVEL



SUMMARY OF RESULTS OF "SUPER NICD" CELLS

- * THERE IS A STORAGE/HANDLING ISSUE
- * NO PROBLEMS ON LIFE TEST
 - o STILL IN EARLY PART OF TEST



**STRESS TEST
PACK : 6340S**

TYPE 40 A/H NI-CD , SAFT

TEMPERATURE 20 DEGREES CENTIGRADE

ORBIT 100 MINUTES

DISCHARGE 28.6 AMPS FOR 34 MINUTES, 40%DOD

CHARGE 20.0 AMPS WITH V/T TAPER AT V/T 9 (1.494 V/C)

POST CYCLING C/2, CAPACITY CHECK

1.00 VOLT C-1 25.0, C-2 31.0, C-3 29.6, C-4 ,31.6

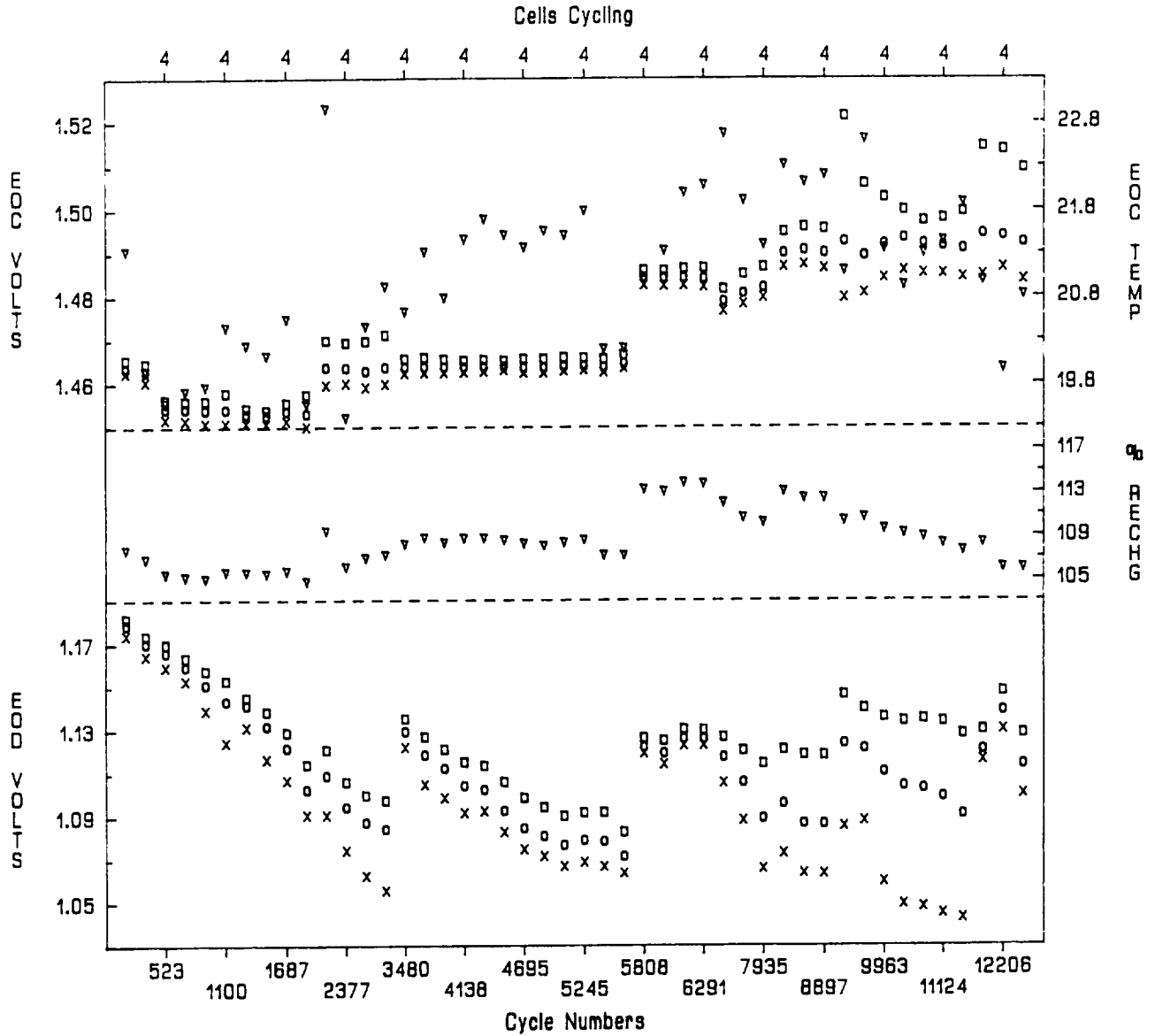
0.75 VOLT C-1 46.5, C-2 51.0, C-3 49.2, C-4 ,51.6

TRENDPLOT

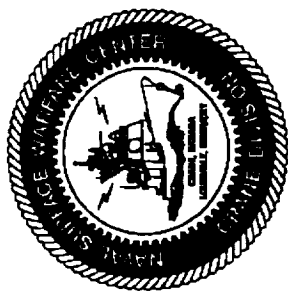
Pack: 6340S Manf: SAFT 40.0 AH AIR FORCE
 Orbit: LED Temp (C): 20 DOD(%): 40.0
 Discharge(Amp/Hrs): 28.6/ .56 Charge(Amp/Hrs): 20.0/1.12

Plot area #1 -- keys: Right-side:
 Left-side: o -- High Cell v -- EOC TEMP
 o -- Average
 x -- Low Cell
 Plot area #2 -- keys: Right-side:
 Left-side: OFF v -- % RECHG
 Plot area #3 -- keys: Right-side:
 Left-side: OFF
 o -- High Cell
 o -- Average
 x -- Low Cell

TEST DATA AS OF JUNE 30, 1992



1. Cycle # 467, lowered VT to 7.5 (1.454 V/C) due to slight temperature rise of 1 degree C.
2. Cycle # 2080, raised VT to 8.0 (1.464 V/C).
3. Cycles # 2793 thru 3200, Special Testing performed.
4. Cycle # 5752, raised VT to 9.0 (1.484 V/C) due to low EOD's.
5. Cycle # 8091, raised VT to 9.5 (1.494 V/C).
6. Cycle #7257, Voltage clamp changed to temperature controlled voltage limit.
7. Cycle #12416, pack discontinued per Aerospace instructions.



**STRESS TEST
PACK : 6324S**

TYPE 24 A/H NI-CD , SAFT

TEMPERATURE 20 DEGREES CENTIGRADE

ORBIT 100 MINUTES

DISCHARGE 17.2 AMPS FOR 34 MINUTES, 40%DOD

CHARGE 12.0 AMPS WITH V/T TAPER AT V/T 8.5 (1.484 V/C)

POST CYCLING C-1 29.7, C-2 25.1, C-3 24.0
C/2, CAPACITY CHECK

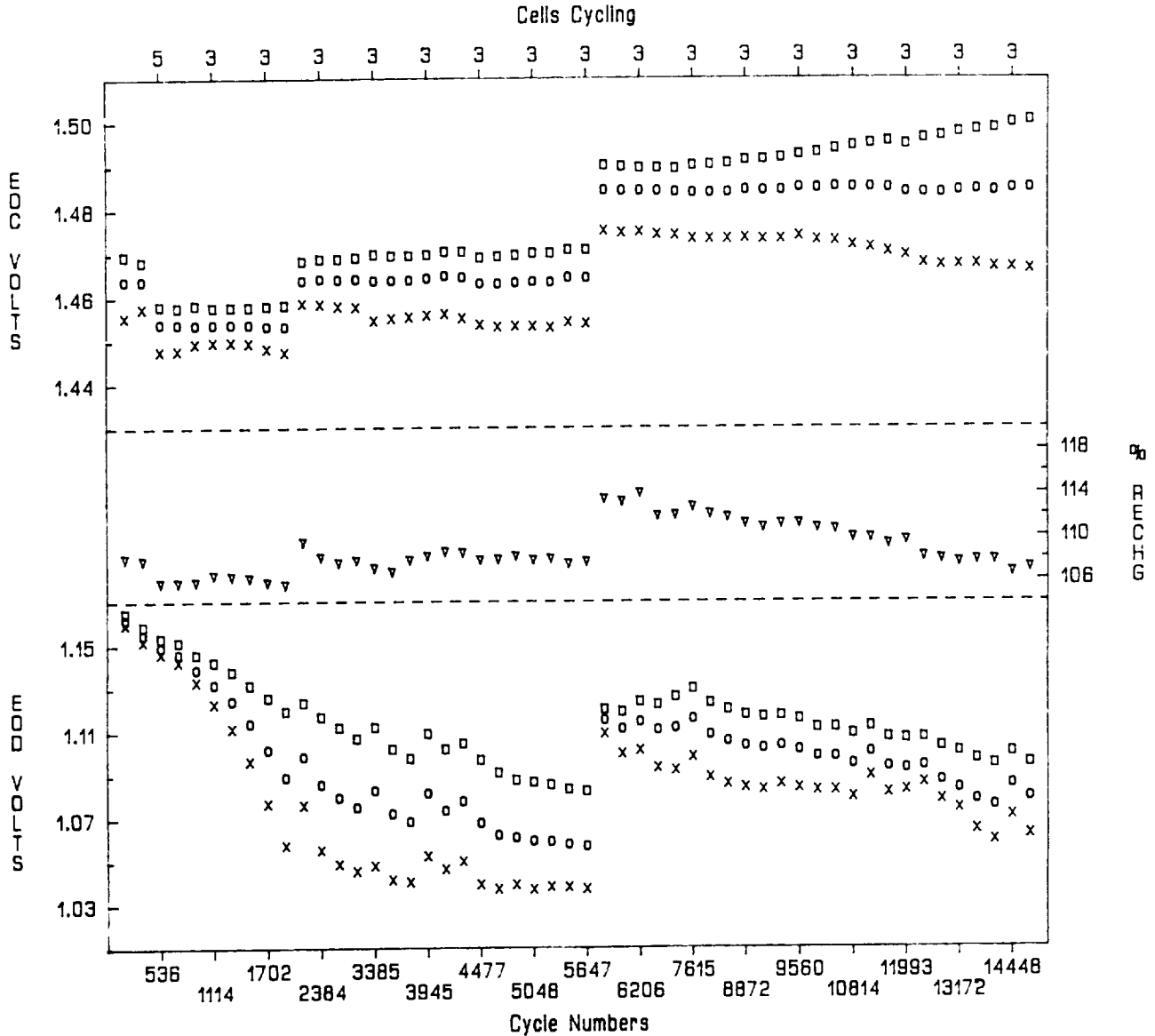
AFREV 30 June 92

TRENDPLOT

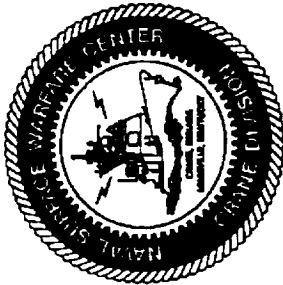
Pack: 6324S Manf: SAFT 24.0 AH AIR FORCE
 Orbit: LEO Temp (C): 20 DOD(%): 40.0
 Discharge(Amp/Hrs): 17.2/ .56 Charge(Amp/Hrs): 19.2/1.12

Plot area #1 -- keys:
 Left-side: Right-side:
 □ -- High Cell OFF
 ○ -- Average
 x -- Low Cell
 Plot area #2 -- keys:
 Left-side: Right-side:
 OFF v -- % RECHG
 Plot area #3 -- keys:
 Left-side: Right-side:
 □ -- High Cell OFF
 ○ -- Average
 x -- Low Cell

TEST DATA AS OF JUNE 30, 1992



1. Cycle # 481, lowered VT to 7.5 (1.454 V/C) due to slight temperature rise.
2. Cycle # 740, cells # 4 & 5 were removed for vibration cycle.
3. Cycle # 2100, VT raised to 8.0 (1.464 V/C).
4. Cycles # 2803 thru 3215, Special Testing performed.
5. Cycle # 5764, VT raised to 9.0 (1.484 V/C) due to low EOD's.
6. Cycle # 14,821, pack was discontinued.



**COMPRESSED TIME GEO
PACK : 6240S**

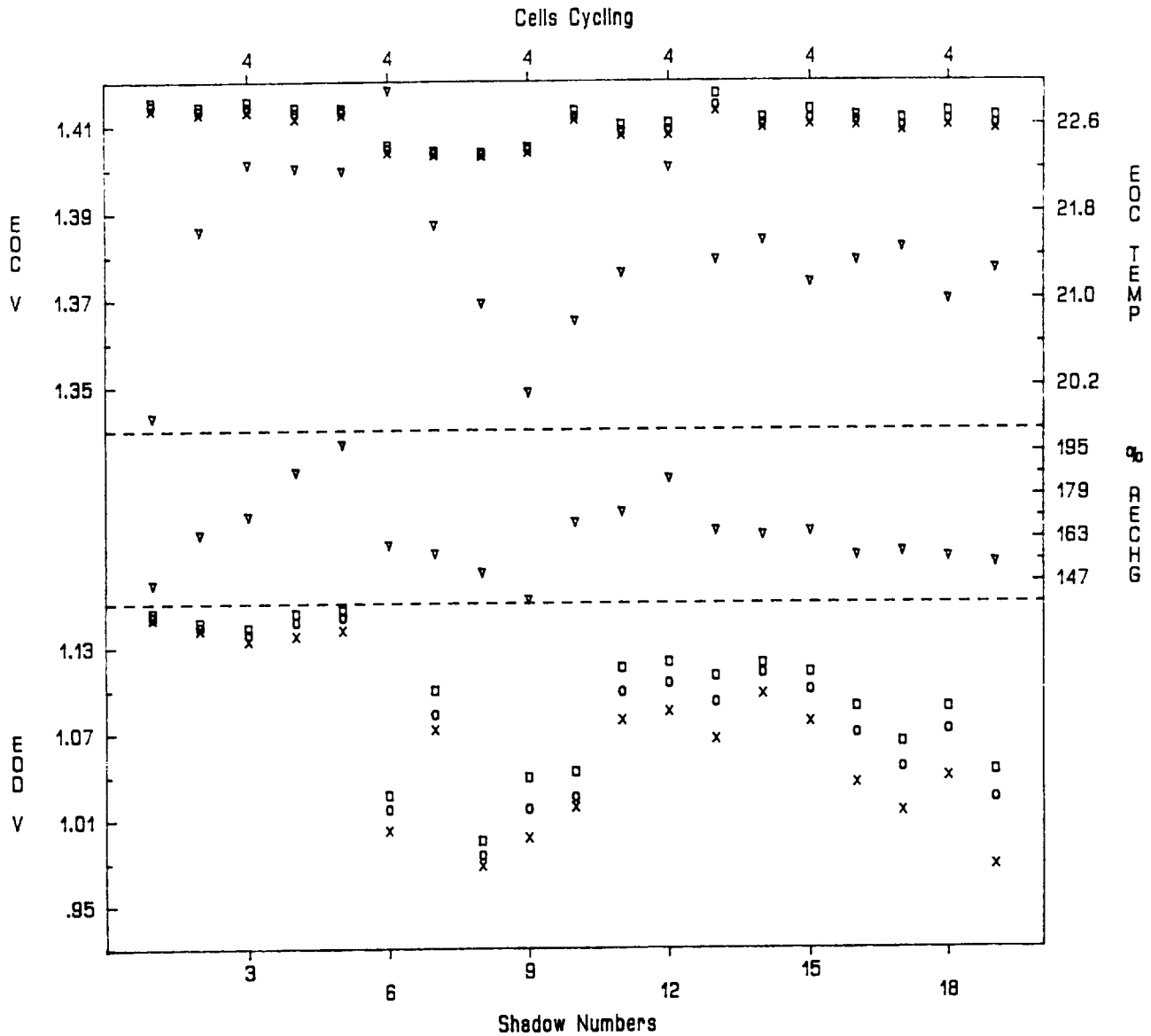
TYPE	40 A/H NI-CD , SAFT
TEMPERATURE	20 DEGREES CENTIGRADE
ORBIT	24 HOURS
DISCHARGE	26.7 AMPS FOR MAXIMUM OF 80%DOD
CHARGE	4.0 AMPS WITH V/T TAPER AT V/T 5 (1.414 V/C)

GEOAIR FORCE
 TRENDS OF MID SHADOW
 Pack: 6240S Manf: SAFT 40.0 AH
 Orbit: GEO Temp (C): 20 DOD(%): 80.0

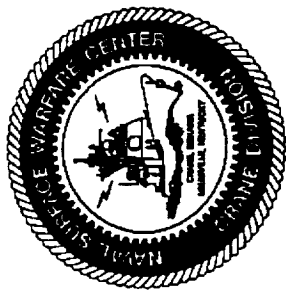
DISCHARGE (26.7 AMPS)
 CHARGE (4.0 AMPS)

SHADOWS 1 THRU 19

Plot area #1 -- keys:
 Left-side: Right-side:
 o -- High Cell v -- EOC TEMP
 o -- Average
 x -- Low Cell
 Plot area #2 -- keys:
 Left-side: Right-side:
 OFF v -- % RECHG
 Plot area #3 -- keys:
 Left-side: Right-side:
 o -- High Cell OFF
 o -- Average
 x -- Low Cell



1. Shadow # 1, VT 5 (1.414 V/C).
2. Shadow # 4, DOD changed from 86 to 80 per cent recharge.
3. Shadow # 6, VT 4.5 (1.404 V/C) due to cells warming during charge.
4. During Shadow # 9, the pack was using a 2 step V/T. The first ten days and the last nine days of the shadow period were at VT 4.0 (1.394 V/C). During days 11 thru 33 (mid-shadow) the pack ran at VT 4.5 (1.404 V/C).
5. Shadow # 10, voltage clamp changed to voltage/temperature controlled voltage limit at VT 5 (1.414 V/C).



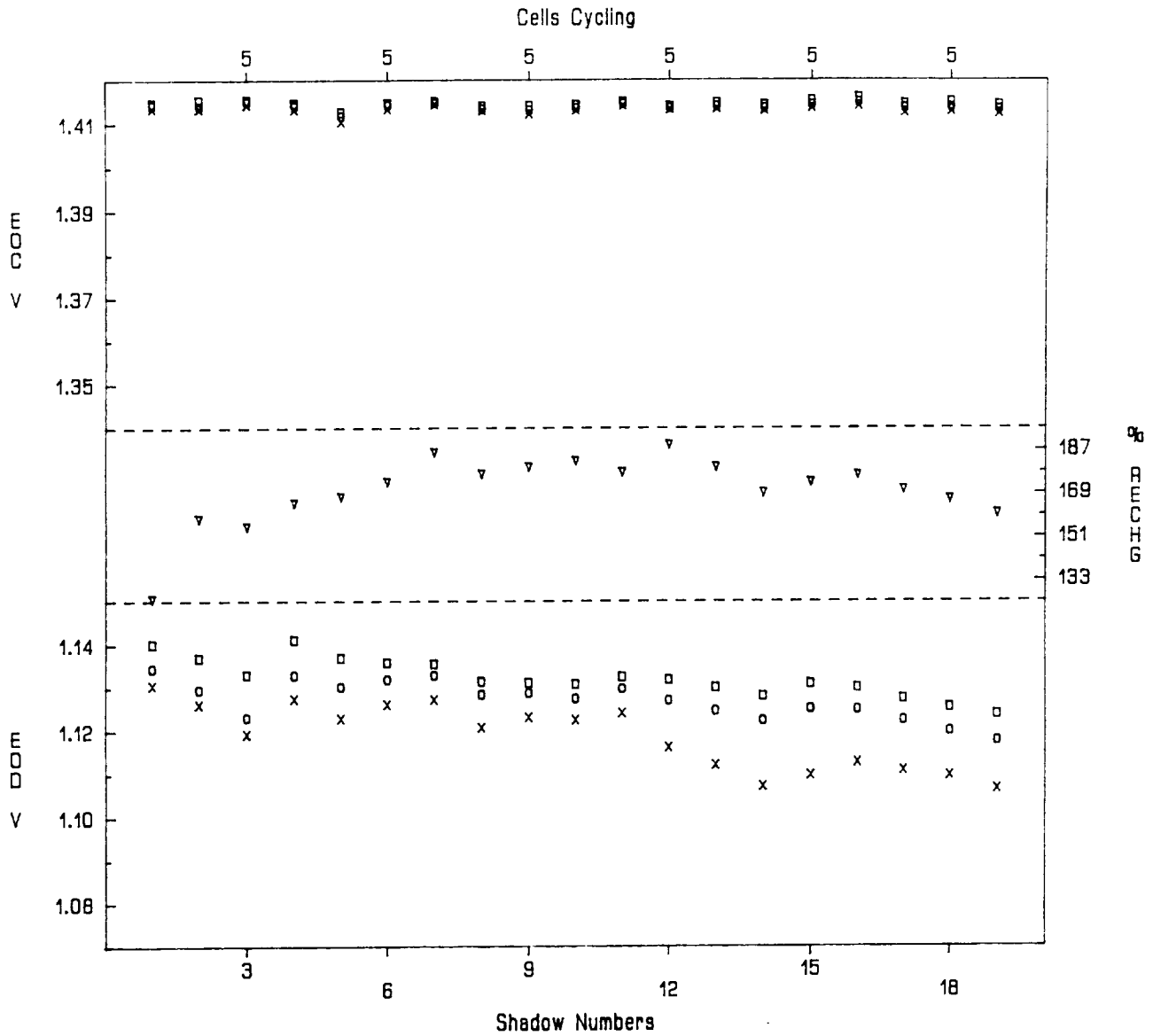
**COMPRESSED TIME GEO
PACK : 6224S**

TYPE	24 A/H NI-CD , SAFT
TEMPERATURE	20 DEGREES CENTIGRADE
ORBIT	24 HOURS
DISCHARGE	16.0 AMPS FOR MAXIMUM OF 80%DOD
CHARGE	2.4 AMPS WITH V/T TAPER AT V/T 5 (1.414 V/C)

GEO AIR FORCE
 TREND OF MID SHADOW
 Pack: 62245 Manf: SAFT 24.0 AH
 Orbit: GEO Temp (C): 20 DOD(%): 80.0

DISCHARGE (16.0 AMPS).
 CHARGE (2.4 AMPS) WITH 1.414 V/C
 SHADOWS 1 THRU 19

Plot area #1 -- keys:
 Left-side: Right-side:
 o -- High Cell OFF
 o -- Average
 x -- Low Cell
 Plot area #2 -- keys:
 Left-side: Right-side:
 OFF v -- % RECHG.
 Plot area #3 -- keys:
 Left-side: Right-side:
 o -- High Cell OFF
 o -- Average
 x -- Low Cell



1. Shadow # 4, DOD changed from 86 to 80 per cent recharge.



RESULTS FOR SAFT CELLS

- * COMPRESSED TIME GEO: 80% DOD, 20 C
 - o EODV > 1.00 AFTER 18 ECLIPSE SEASONS
 - o TERMINAL & THERMAL TEST PROBLEMS FOR 40-Ah CELLS
 - o C/D AS HIGH AS 185 % TO MAINTAIN

- * LEO: 40% DOD, 20 C
 - o EODV > 1.03 AFTER 14800 CYCLES FOR 24-Ah CELLS
 - o EODV > 1.03 AFTER 12400 CYCLES FOR 40-Ah CELLS
 - o TEST DISCONTINUED



SUMMARY OF RESULTS OF SAFT 24-Ah & 40-Ah CELLS

*** C/D HIGHER THAN THAT OF PRE-1986 GATES CELLS
* LEO RESULTS VERIFY GENERIC QUALIFICATION OF
VOS A CELLS**

**GPS STRESS TEST
PACK : 6335A**



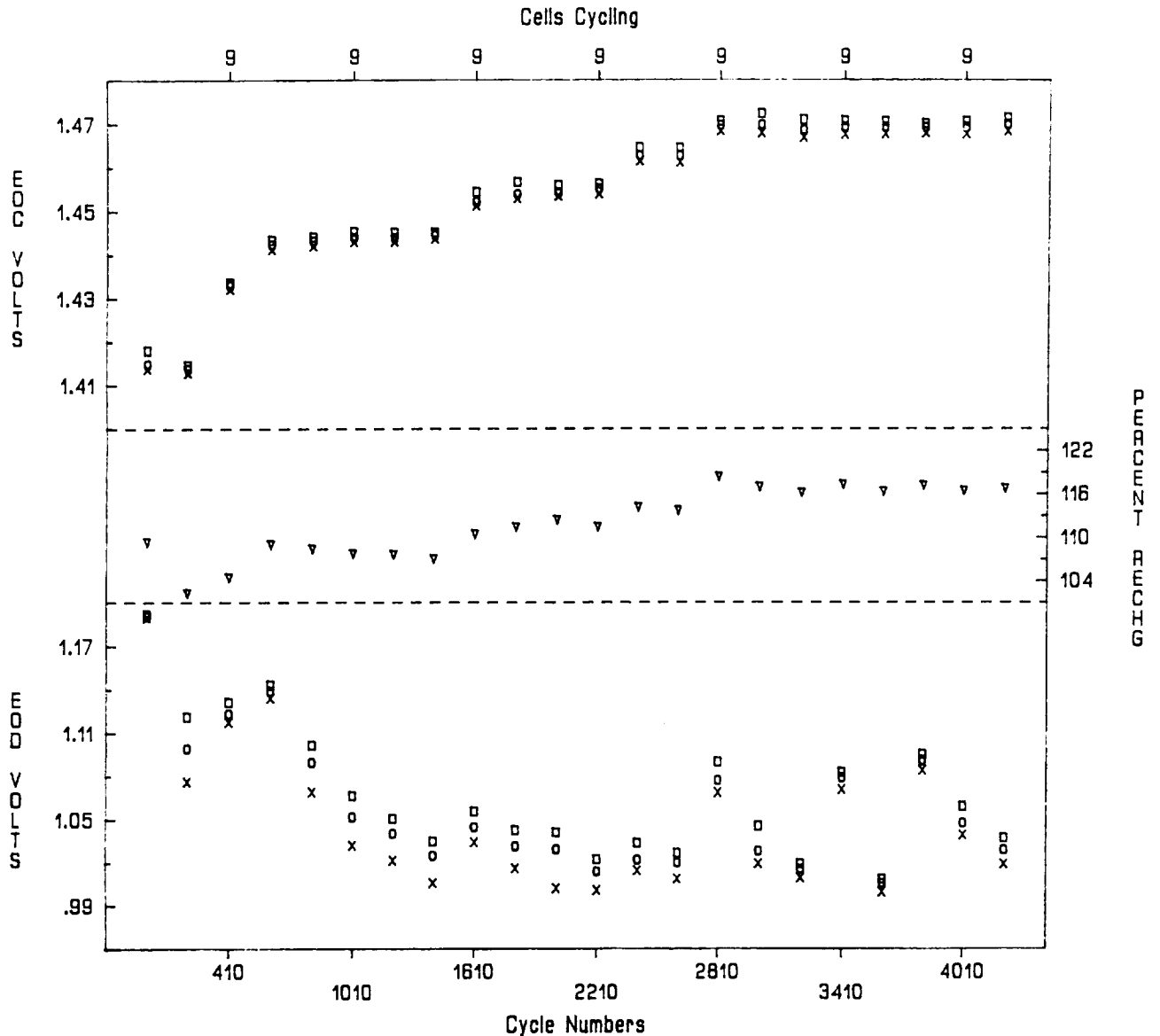
TYPE	35 A/H NI-CD , GATES
TEMPERATURE	20 DEGREES CENTIGRADE
ORBIT	100 MINUTES
DISCHARGE	25 AMPS FOR 34 MINUTES, 40%DOD
CHARGE	17.5 AMPS WITH V/T TAPER AT V/T 8 (1.474 V/C)

TRENDPLOT

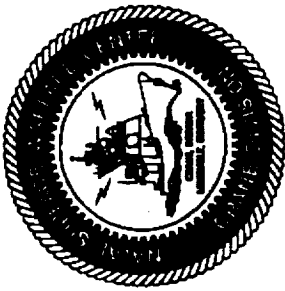
Pack: 6335A Manf: GPS 35.0 AH
 Orbit: LEO Temp (C): 20 DOD(%): 40.0
 Discharge(Amp/Hrs): 25.0/0.56 Charge(Amp/Hrs): 17.5/1.12

Plot area #1 -- keys: Right-side:
 Left-side: OFF
 □ -- High Cell
 ○ -- Average
 x -- Low Cell
 Plot area #2 -- keys: Right-side:
 Left-side: OFF
 ○ -- High Cell
 ○ -- Average
 x -- Low Cell

TEST DATA AS OF JUNE 30, 1992



1. CYCLE #8, VT INCREASED TO VT5 (1.414 V/C) DUE TO LOW EOD.
2. CYCLE #223, VT INCREASED TO VT6 (1.434 V/C) DUE TO LOW % RECHG.
3. CYCLE #607, VT INCREASED TO VT6.5 (1.444 V/C).
4. CYCLE #1424, VT INCREASED TO VT7 (1.454 V/C) PER AEROSPACE INSTRUCTIONS
5. CYCLE #2235, VT INCREASED TO VT7.5 (1.464 V/C) PER AEROSPACE INSTRUCTIONS.
6. CYCLE #2627, VT INCREASED TO VT8 (1.474 V/C) DUE TO LOW EOD.
7. A PERCENT OF RECHARGE INCREASE WAS NOTICED AFTER EXTENDED OPEN CIRCUIT TIMES DURING CHAMBER PROBLEMS.
8. CYCLE #3840, PACK HALTED BECAUSE ALL CELL CASES FOUND SWOLLEN DUE TO HIGH PERCENT OF RECHARGE (117%).
9. ON JUNE 30, 1992, PACK RETURNED TO AUTOMATIC CYCLING PER AEROSPACE INSTRUCTIONS.



**GPS SIMULATED ORBIT TEST
PACK : 6335B**

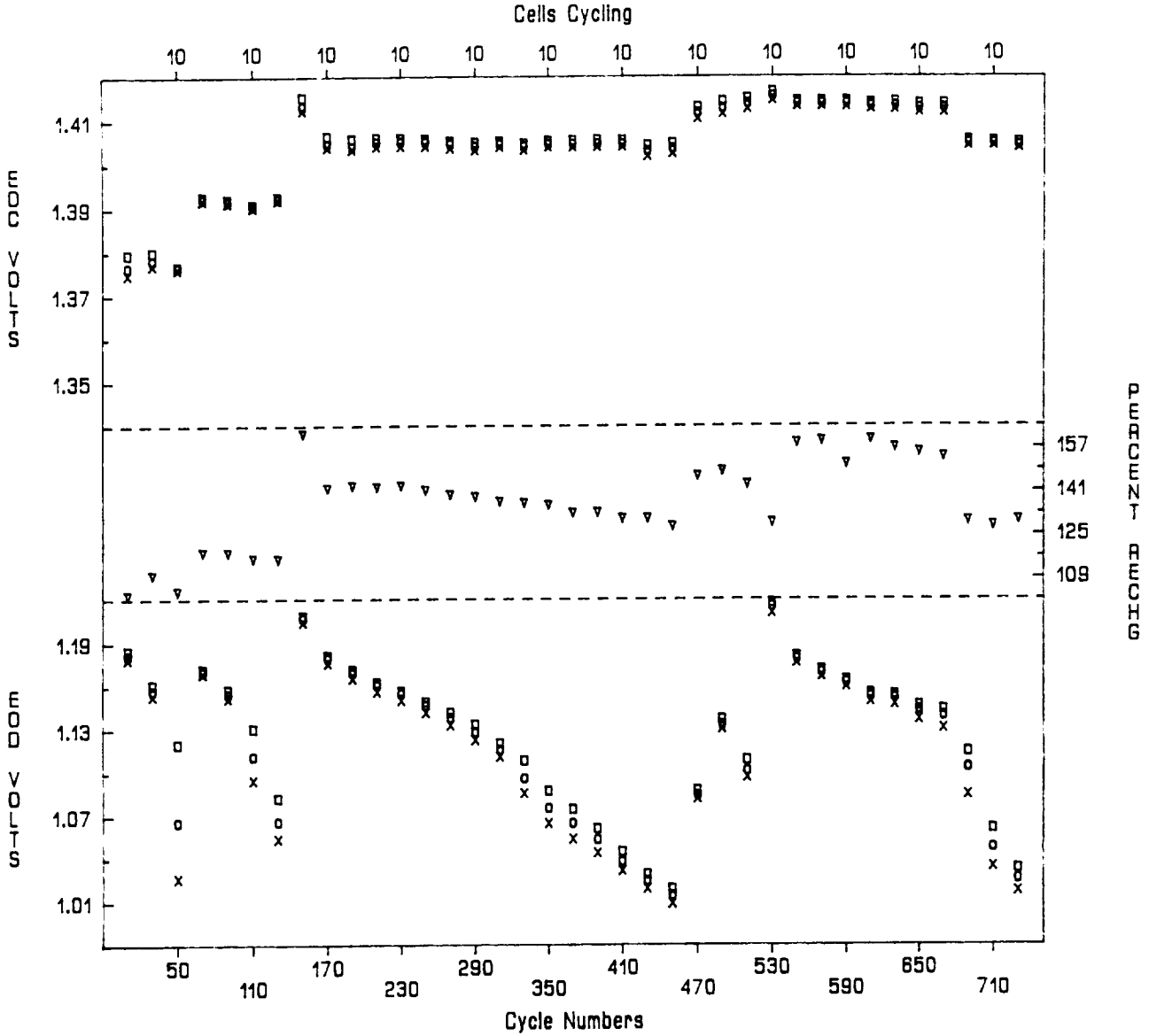
TYPE	35 A/H NI-CD , GATES
TEMPERATURE	20 DEGREES CENTIGRADE
ORBIT	10 HOURS ,26 MINUTES
DISCHARGE	15.8 AMPS FOR 56 MINUTES, 42%DOD
CHARGE	3.5 AMPS WITH V/T TAPER AT V/T 6 (1.444 V/C)

TRENDPLOT

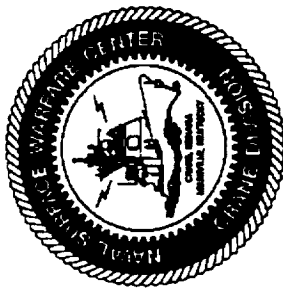
Pack: 6335B Manf: GPS 35.0 AH
 Orbit: LEO Temp (C): 20 DOD(%): 41.4
 Discharge(Amp/Hrs): 15.8/0.92 Charge(Amp/Hrs): 03.5/9.50

Plot area #1 -- keys:
 Left-side: Right-side:
 o -- High Cell OFF
 o -- Average
 x -- Low Cell
 Plot area #2 -- keys:
 Left-side: Right-side:
 OFF v -- PERCENT RECH-
 Plot area #3 -- keys:
 Left-side: Right-side:
 o -- High Cell OFF
 o -- Average
 x -- Low Cell

TEST DATA AS OF JUNE 30, 1992



1. CYCLE #52, INCREASED TO V/T 4.5(1.390 V/C) DUE TO LOW EOD VOLTS.
2. CYCLE #137, INCREASED TO V/T 5(1.414 V/C) DUE TO LOW EOD VOLTS.
3. CYCLE #160, DECREASED TO V/T 4.5(1.404 V/C) DUE TO HIGH % RECHARGE.
4. CYCLE #467, INCREASED TO V/T 5.0(1.414 V/C) DUE TO LOW EOD.
5. CYCLE #528, PACK WAS RECONDITIONED WITH A/HO 20.12.
6. CYCLE #894, DECREASED TO V/T 4.5(1.404 V/C) DUE TO HIGH EOC TEMP.



**STRESS TEST
PACK : 0350G**

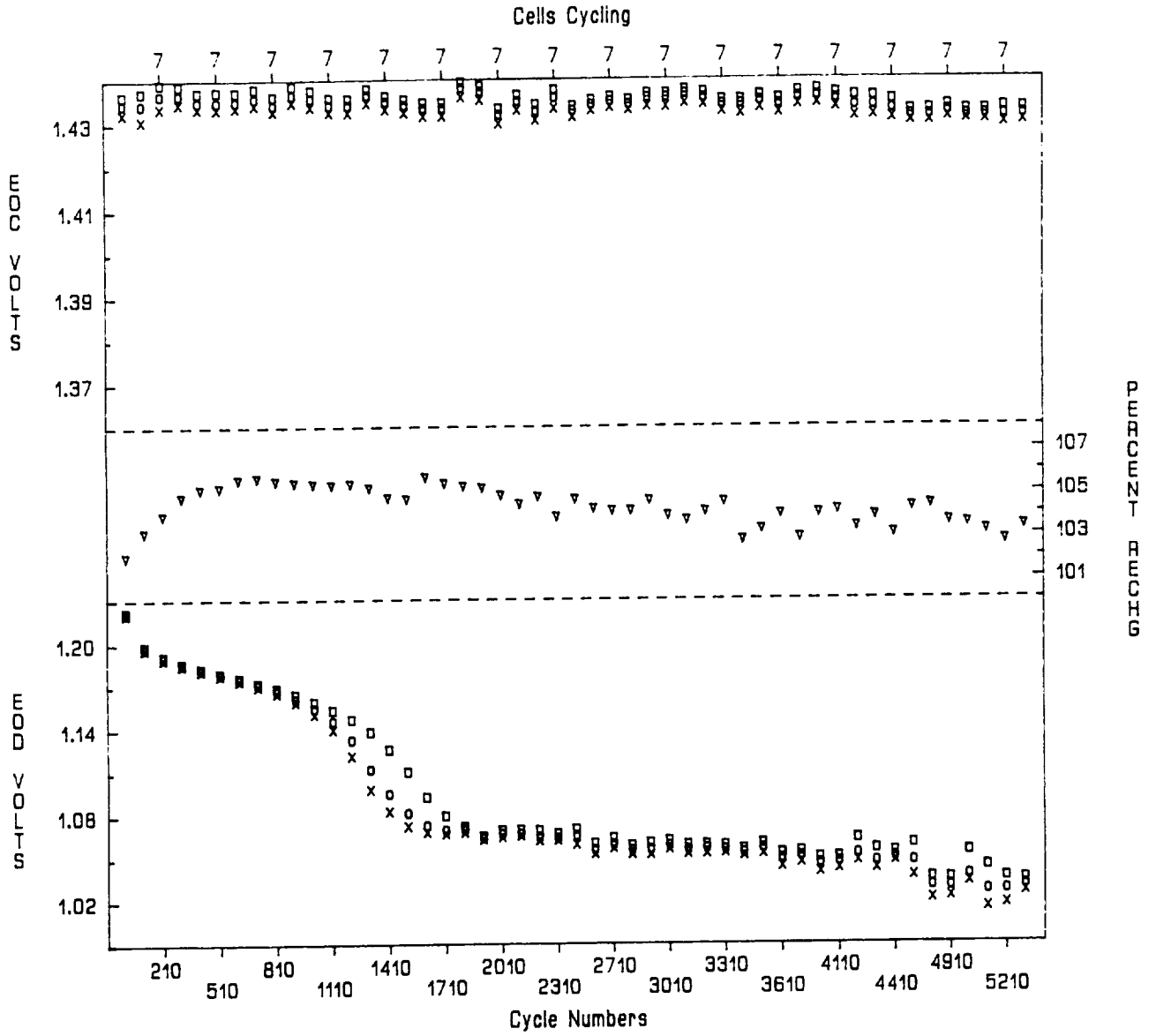
TYPE	50 A/H NI-CD , GATES, WITH 2505ML SEPARATOR
TEMPERATURE	20 DEGREES CENTIGRADE
ORBIT	100 MINUTES
DISCHARGE	35.7 AMPS FOR 34 MINUTES, 40%DOD
CHARGE	25.0 AMPS WITH V/T TAPER AT V/T 6 (1.434 V/C)

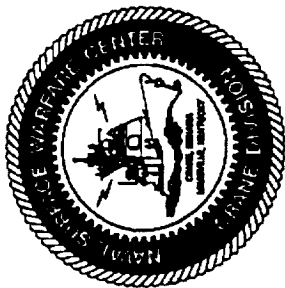
TRENDPLOT

Pack: D350G Manf: GATES 50.0 AH
 Orbit: LED Temp (C): 20 DOD(%): 40.0
 Discharge(Amp/Hrs): 35.71/0.56 Charge(Amp/Hrs): 25.0/1.12

Plot area #1 -- keys:
 Left-side: Right-side:
 o -- High Cell OFF
 o -- Average
 x -- Low Cell
 Plot area #2 -- keys:
 Left-side: Right-side:
 OFF v -- PERCENT REC-
 Plot area #3 -- keys:
 Left-side: Right-side:
 o -- High Cell OFF
 o -- Average
 x -- Low Cell

TEST DATA AS OF JUNE 30, 1992





**STRESS TEST
PACK : 0351G**

TYPE	50 A/H NI-CD , GATES, WITH 2536 SEPARATOR
TEMPERATURE	20 DEGREES CENTIGRADE
ORBIT	100 MINUTES
DISCHARGE	35.7 AMPS FOR 34 MINUTES, 40%DOD
CHARGE	25.0 AMPS WITH V/T TAPER AT V/T 6 (1.434 V/C)

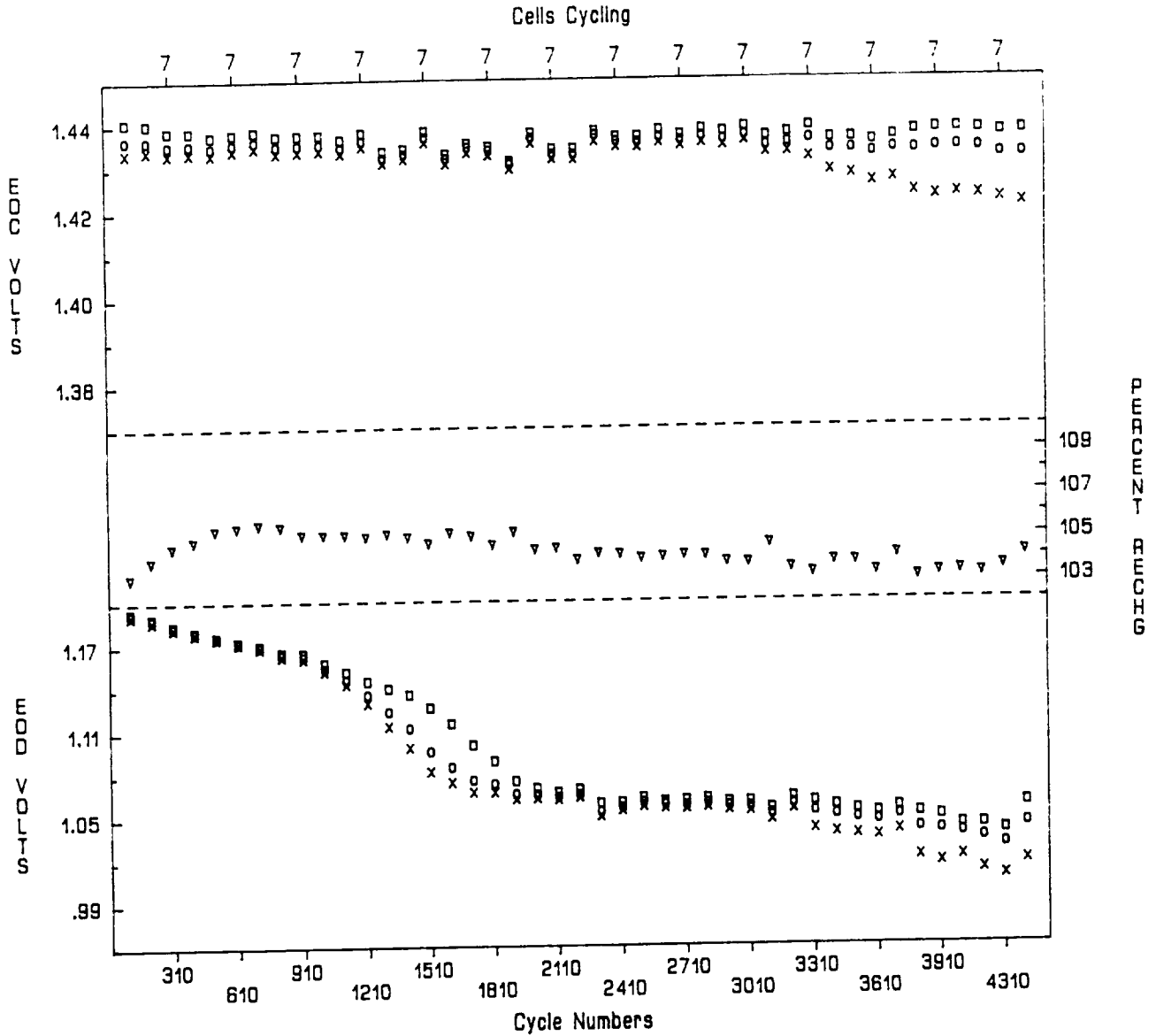
TRENDPLOT

Pack: 0351G Manf: GATES 50.0 AH
 Orbit: LEO Temp (C): 20 DOD(%): 40.0
 Discharge(Amp/Hrs): 35.71/0.56 Charge(Amp/Hrs): 25.0/1.12

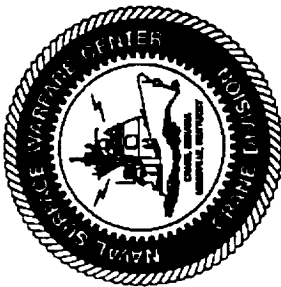
PELLON 2536 SEPARATOR

TEST DATA AS OF JUNE 30, 1992

Plot area #1 -- keys:
 Left-side: Right-side:
 o -- High Cell OFF
 o -- Average
 x -- Low Cell
 Plot area #2 -- keys:
 Left-side: Right-side:
 OFF v -- PERCENT RECHG
 Plot area #3 -- keys:
 Left-side: Right-side:
 o -- High Cell OFF
 o -- Average
 x -- Low Cell



1. CYCLE #4424, DUE TO EQUIPMENT MALFUNCTION, PACK WAS DISCHARGED FOR 2.0 HOURS, CAUSING SWELLING OF CELLS. PACK WAS DISCONTINUED.



**STRESS TEST
PACK : 0352G**

TYPE 50 A/H NI-CD , GATES, WITH 2538 SEPARATOR

TEMPERATURE 20 DEGREES CENTIGRADE

ORBIT 100 MINUTES

DISCHARGE 35.7 AMPS FOR 34 MINUTES, 40%DOD

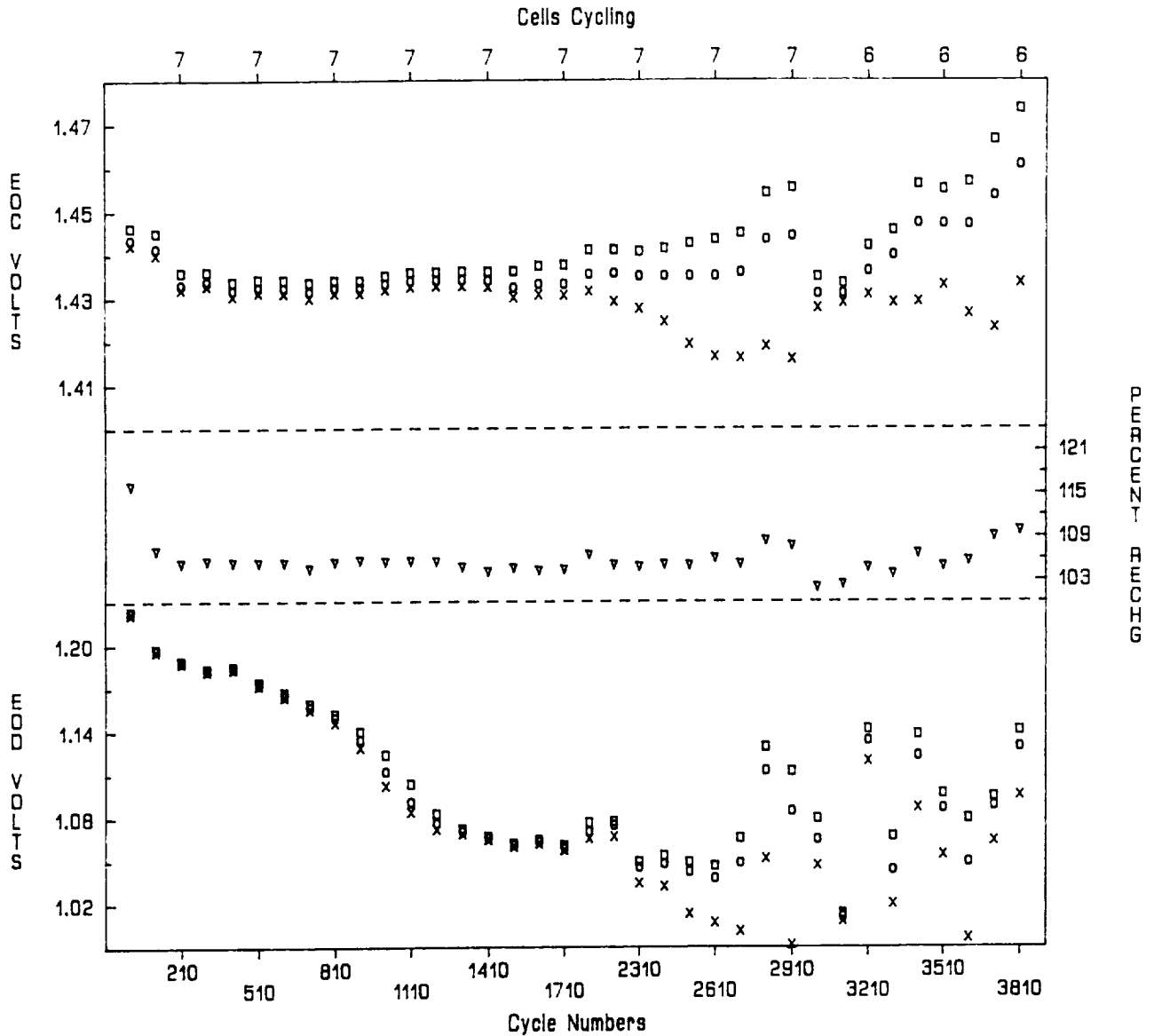
CHARGE 25.0 AMPS WITH V/T TAPER AT V/T 6 (1.434 V/C)

TRENDPLOT

Pack: 0352G Manf: GATES 50.0 AH
 Orbit: LED Temp (C): 20 DOD(%): 40.0
 Discharge(Amp/Hrs): 35.71/0.56 Charge(Amp/Hrs): 25.0/1.12

Plot area #1 -- keys: Right-side:
 Left-side: OFF
 o -- High Cell
 o -- Average
 x -- Low Cell
 Plot area #2 -- keys: Right-side:
 Left-side: OFF
 v -- PERCENT RECH
 Plot area #3 -- keys: Right-side:
 Left-side: OFF
 o -- High Cell
 o -- Average
 x -- Low Cell

TEST DATA AS OF JUNE 30, 1992



1. CYCLE #2789, INCREASED VT 6.0 (1.434 V/C) TO VT 6.5 (1.444 V/C) DUE TO LOW EOD.
2. CYCLE #3004, REMOVED CELL #2 DUE TO LOW END OF CHARGE AND END OF DISCHARGE. LOWERED VT 6.5 (1.444 V/C) TO VT 6.0 (1.434 V/C).
3. CYCLE #3190, INCREASED VT 6.0 (1.434 V/C) TO VT 6.5 (1.444 V/C) DUE TO LOW END OF DISCHARGE.
4. CYCLE #3389, INCREASED VT 6.5 (1.444 V/C) TO T 7 (1.454 V/C) DUE TO LOW END OF DISCHARGE VOLTAGES.
5. CYCLE #3701, INCREASED VT 7 (1.454 V/C) TO VT 7.5(1.464 V/C) PER AEROSPACE INSTRUCTIONS.
6. CYCLE #3838, EQUIPMENT MALFUNCTION CAUSED PACK TO BE DISCHARGE FOR 2.0 HOURS. THE PACK WAS DISCONTINUED DUE TO SWELLING OF CELLS.



RESULTS FOR GATES 50-Ah CELLS

LEO TEST: 40% DOD , 20 C

- * 2538 SEPARATOR CELLS: CELL #2
 - o SOFT SHORT CHARACTERISTICS (LOW EOCV & EODV) AFTER 2500 CYCLES
 - o BELOW 1.0 V (FAILED) AFTER 3000 CYCLES

- * 2536 SEPARATOR CELLS: CELLS #1 & #3
 - o SOFT SHORT CHARACTERISTICS AFTER 3300 CYCLES

- * 2505 SEPARATOR CELLS
 - o AS LOW AS 1.02 V AFTER 5000 CYCLES



SUMMARY OF RESULTS OF GATES CELLS COMPARISON WITH PRE-1986 (GE/BBD)

- * EARLY FAILURE OF PRESENT 2538 50-Ah CELL**
- * EARLIER SIGN OF SOFT SHORTS FOR PRESENT
50-Ah CELLS**
- * NOT ABLE TO GENERICALLY QUALIFY CELL WITH
2538 MATERIAL**

STATUS OF PACKS AS OF 11/9/92

PACK ID	MFG	REGIME	SIZE (AH)	QTY	D.O.D (%)	TEMP (C)	START DATE	CYCLE NUMBER
0350S	SAFT	LEO	50	10	40	20	12/15/92	
0250S	SAFT	GEO	50	10	80	20	12/15/92	
6240S	SAFT	GEO	40	4	80	20	7/ 5/89	892
6224S	SAFT	GEO	24	5	80	20	7/ 5/89	977
6335A	GEP	LEO	35	9	40	20	7/25/91	5143
6335B	GEP	GPS (GEO)	35	10	41.4	20	7/25/91	859
0350G	GEP	LEO	50ST	7	40	20	7/17/91	6478
6351A	HUGHES	LEO	50	5	40	20	12/27/91	4253
6352A	HUGHES	LEO	50	5	25	5	12/27/91	3439
6321H	HUGHES	LEO	21	10	40	20	12/15/92	