

1. APPLICATION: SWITCH FROM OBC PRIMARY (8K) MEMORY TO THE BACKUP (4K) MEMORY
IMPLEMENTATION RESPONSIBILITY: OD
SUPERCEDES PRIOR FODs: E001C
RESPONDS TO SCARs: N/A

2. DIRECTIVE: THIS DIRECTIVE PROVIDES THE PROPER SEQUENCE OF COMMANDS FOR EMERGENCY SWITCHING CONTROL FROM THE PRIMARY (8K) MEMORY TO THE BACKUP (4K) MEMORY.

1. :IMP 46 /CLOSE SUN SHUTTER IF BETA IS GREATER THAN 110°
2. :OBC GO /STORE INFORMATION FOR DUMP ANALYSIS
3. :OBC RESET /ENSURE OBC NOT RUNNING - LOSE CONTROL

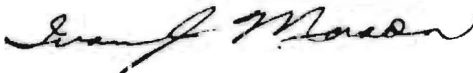
4. :OBC FIX1 /SWITCH TO BANK 1
5. :OBC GO /START OBC

6. :OBC CMND,3,0 /TURN ON H/S WORKER
7. :OBC CMND,9,0 /CMND OBC CONTROL MODE
8. :OBC CMND,3,1 /TURN ON MANEUVER PROCESSOR

PROCEDURE OBCENG PROVIDES THE ABOVE OPERATION EXCEPT THAT IT DOES NOT CLOSE THE SUN SHUTTER.

EXEC OBCENG,1 /START PROC EXECUTION
AT WAIT
GO RESET4K /SWITCHES TO (OR RESETS) 4K MEMORY AND STARTS OPERATION

3. APPROVAL SIGNED: IVAN J. MASON



16 APR. 82
DATE

1. APPLICATION: SWITCH FROM OBC BACKUP (4K) MEMORY TO THE PRIMARY (8K) MEMORY
IMPLEMENTATION RESPONSIBILITY: OD
SUPERCEDES PRIOR FODs: E002B
RESPONDS TO SCARs: N/A

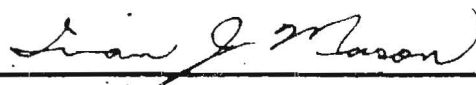
2. DIRECTIVE: THE FOLLOWING PROVIDES THE SEQUENCE OF COMMANDS TO SWITCH FROM THE OBC BACKUP (4K) MEMORY TO THE PRIMARY (8K) MEMORY.

1. :OBC RESET /ENSURE OBC NOT RUNNING
2. :OBC GO /START OBC
3. :OBC CMND,3,0 /TURN ON HOLD SLEW WORKER
4. :OBC CMND,9,0 /CMD OBC CONTROL MODE
5. :OBC CMND,3,8 /TURN ON WORKER 0 TIME OUT
6. :OBC CMND,14,1 /RATE ARREST DISARM
7. :OBC CMND,3,9 /TURN ON RATE ARREST WORKER
8. :OBC CMND,3,1 /TURN ON MANEUVER PROCESSOR WORKER
9. :OBC CMND,3,6 /TURN ON MEMORY SUM CHECK WORKER

PROCEDURE OBCENG PROVIDES THE ABOVE OPERATION.

EXEC OBCENG,1 /START PROC EXECUTION
AT WAIT
GO RESET8K /SWITCHES TO (OR RESETS) 8K MEMORY AND
STARTS OPERATION.

3. APPROVAL SIGNED: IVAN J. MASON



16 APR. 82

DATE

1. APPLICATION: SWITCH FROM ANALOG CONTROL ON WHEELS TO H/S OBC PRIMARY (8K)
MEMORY SYSTEM

IMPLEMENTATION RESPONSIBILITY:

SUPERCEDES PRIOR FODs: E004B *← should be 9A - RW*

RESPONDS TO SCARs: G0074

2. DIRECTIVE: THIS DIRECTIVE PROVIDES THE INSTRUCTIONS TO SWITCH TO OBC PRIMARY (8K) MEMORY CONTROL FROM ANY ANALOG WHEEL MODE:

- | | |
|---------------------------|--|
| 1. :OBC RESET | /ENSURE OBC NOT RUNNING |
| 2. :OBC GO | /START OBC |
| 3. EXAMINE SERIAL,RW | /ALL WHEELS SHOULD = 128 (P,Y,R) |
| 4. :RW,RWMODE=∅,RWENAB=1 | /NO CONTROL |
| 5. EXAMINE SERIAL,IRA | /VERIFY GYRO COMMAND |
| 6. :IRA,IRAMC=29,IRAQB=1 | /GYROS IN H/S MODE,PAGE ACSM |
| 7. WAIT 5 SECONDS | /VERIFY H/S MODE |
| 8. :RW,RWMODE=11,RWENAB=1 | /OBC,HARDWARE OPEN LOOP (VERIFY @S1,
PAGE ACSM) |
| 9. :OBC CMND,3,∅ | /TURN ON HOLD SLEW WORKER |
| 10. :OBC CMND,9,∅ | /CMND OBC CONTROL MODE |
| 11. :OBC CMND,3,8 | /TURN ON WORKER ∅ TIMEOUT |
| 12. :OBC CMND,14,1 | /RATE ARREST DISARM |
| 13. :OBC CMND,3,9 | /TURN ON RATE ARREST WORKER |
| 14. :OBC CMND,3,1 | /TURN ON MANEUVER PROCESSOR WORKER |
| 15. :OBC CMND,3,6 | /TURN ON MEMORY SUM CHECK WORKER |
| 16. IRAQB=∅ | /DISABLE IRA COMMANDING |

3. APPROVAL SIGNED: IVAN J. MASON

Ivan J. Mason

4 AUG. 82
DATE

1. APPLICATION: SWITCH FROM ANALOG CONTROL ON WHEELS TO H/S OBC BACKUP (4K) MEMORY.

IMPLEMENTATION RESPONSIBILITY:


SUPERCEDES PRIOR FODs: E005A

RESPONDS TO SCARs: G0074

2. DIRECTIVE: THIS DIRECTIVE PROVIDES THE INSTRUCTIONS TO SWITCH TO OBC BACKUP (4K) MEMORY CONTROL FROM ANY ANALOG WHEEL MODE:

1. :OBC RESET /ENSURE OBC NOT RUNNING
2. :OBC FIX1 /SWITCH TO BANK 1
3. :OBC GO /START OBC
4. :OBC CMND,11,1 /11,0=40KB;11,1=20KB;11,2=10KB;11,3=5KB
5. EXAMINE SERIAL,RW /ALL WHEELS SHOULD = 128
6. :RW,RWMODE=0,RWENAB=1 /NO CONTROL
7. EXAMINE SERIAL,IRA /VERIFY GYRO COMMAND
8. :IRA,IRAMC=29,IRAQB=1 /GYROS IN H/S MODE, PAGE ACSM
9. WAIT 5 SECONDS /VERIFY H/S MODE
10. :RW,RWMODE=11,RWENAB=1 /OBC,HARDWARE OPEN LOOP (VERIFY @S1, PAGE ACSM)
11. :OBC CMND,3,0 /TURN ON HOLD SLEW WORKER
12. :OBC CMND,9,0 /CMND OBC CONTROL MODE
13. :OBC CMND,3,1 /TURN ON MANEUVER PROCESSOR WORKER
14. IRAQB=0 /DISABLE IRA COMMANDING.

3. APPROVAL SIGNED: IVAN J. MASON



4 AUG. 82
DATE

1. APPLICATION: EMERGENCY SUNACQ AND HOLD ON WHEELS
IMPLEMENTATION RESPONSIBILITY: OD
SUPERCEDES PRIOR FODs: E007C
RESPONDS TO SCARs: G0074

2. DIRECTIVE: THIS DIRECTIVE IS TO BE USED WHEN DETERMINED NECESSARY TO GO TO HARDWIRE CONTROL. SUNACQ ON WHEELS AND HOLD ON WHEELS.

NOTE: ASSUMES THAT THE SPACECRAFT IS IN SAFE MODE: C&M,DAC ON.

- A. SUN ACQUISITION ON WHEELS:
SIMULATIONS INDICATE THIS WOULD BE A SAFE MODE WITHOUT GYRO 1 OPERATING, UNDER MOST CONDITIONS IF GYRO 1 IS OFF AND PROVIDING \emptyset RATE INTO THE C&M ELECTRONICS.

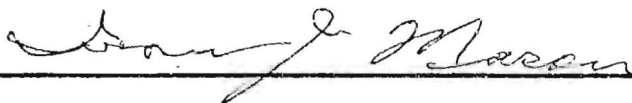
NOTE: USE AS A BACKUP TO SUN BATH.

1. PERFORM SUN ACQ. ON WHEELS AS FOLLOWS:

:IMP 46	/CLOSE SUN SHUTTER
:CRU OFF,3,14	/ASSURE JETS ARE OFF
:OBC RESET	/ASSURE OBC NOT RUNNING
IRAGYR=28,IRAMC=8,IRAQB=1	/SET UP IRA COMMAND
EXAMINE SERIAL,IRA	
:IRA	/GYRO 3&5 TO RATE MODE
RWMODE=2,RWENAB=1	/SET UP WHEEL COMMAND
EXAMINE SERIAL,RW	
:RW	/ENTER SUN ACQ MODE

THE SPACECRAFT SHOULD MOVE TO BETA=67. THIS MAY TAKE UP TO 25 MIN.

3. APPROVAL IVAN J. MASON



22 DEC. 83
DATE

1. APPLICATION: SWITCH TO OBC WHEEL HOLD FROM OBC PRIMARY (8K) MEMORY CONTROL
 IMPLEMENTATION RESPONSIBILITY: PAGE 1 OF 2
 SUPERCEDES PRIOR FODs: E008B
 RESPONDS TO SCARs: N/A

2. DIRECTIVE: USE THIS DIRECTIVE TO HOLD THE S/C FOR A SHORT TIME PERIOD
 IN THE EVENT OF GYRO PROBLEM AND RETURN TO HOLD/SLEW

A. SWITCH TO OBC WHEEL HOLD

1. :IMP 46 /CLOSE SUN SHUTTER
2. :OBC CMND,4,0 /TURN OFF HOLD/SLEW WORKER
3. :OBC CMND,3,10 /TURN ON WHEEL HOLD WORKER

NOTE: a. THIS WORKER IS NOT AVAILABLE UNDER THE OBC BACKUP (4K) MEMORY CONFIGURATION.

b. WARNING - ANY S/C DRIFT RATE BUILT UP PRIOR TO SWITCHING TO THIS MODE WILL CONTINUE AT NEARLY THE SAME RATE. OBC HOLDS WHEELS AT TACH. RATE PRESENT AT TIME WORKER 10 IS ACTIVATED.

B. ADJUST TACH REFERENCE

WORKER 10 ESTABLISHES REFERENCE WHEEL SPEEDS AT THE TIME IT IS TURNED ON. IT THEN MAINTAINS THE WHEELS AT THESE REFERENCE VALUES. THE REFERENCES MAY BE ALTERED WITH DATA BLOCK 16. FOR EXAMPLE, IF DUE TO A GYRO PROBLEM THE SPACECRAFT BEGINS MOVING SLOWLY, WORKER 10 MAY BE TURNED ON TO PREVENT THE WHEELS FROM ACCELERATING FURTHER.

USING WORKER 10 TO STABILIZE THE ATTITUDE WILL WORK ONLY IF THE SPACECRAFT HAS NOT MOVED VERY FAR. FOR THIS REASON, WORKER 10 CONTROL SHOULD NOT BE ATTEMPTED UNLESS THE SPACECRAFT HAS BEEN MOVING SLOWLY (WHEELS NOT SATURATED) FOR LESS THEN 10 MINUTES OR THE WHEELS HAVE BEEN SATURATED FOR LESS THEN 5 MINUTES.

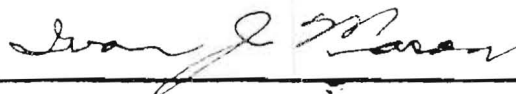
1. DETERMINE WHEEL REFERENCE TO BE USED - CONVERT WHEEL SPEEDS TO RAW COUNTS, RAW COUNTS FOR REFERENCE VALUES CAN BE ESTABLISHED BY CONVERTING THE TACH RPM'S FOUND ON PAGE ACSM USING THE TELEMETRY TABLES OR T&C BOOKS. THE VALUES USED SHOULD BE FROM A RECENT SNAP WHEN THE SPACECRAFT WAS STABLE, THEY ARE INVALID IF A MANEUVER AND/OR WHEEL UNLOAD IS PERFORMED IN BETWEEN:

2. BUILD DATA BLOCK 16

TACHR(1) = X
 TACHR(2) = Y
 TACHR(3) = Z

/PITCH TACH REFERENCE IN RAW CTS.
 /YAW TACH REFERENCE IN RAW CTS.
 /ROLL TACH REFERENCE IN RAW CTS.

3. APPROVAL SIGNED: IVAN J. MASON



28 APR. 82

DATE

1. APPLICATION: SWITCH TO OBC WHEEL HOLD FROM OBC PRIMARY (8K) MEMORY CONTROL
IMPLEMENTATION RESPONSIBILITY: PAGE 2 OF 2
SUPERCEDES PRIOR FODs: E008B
RESPONDS TO SCARs: N/A

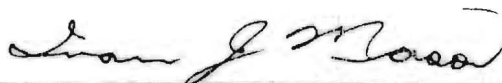
2. DIRECTIVE: USE THIS DIRECTIVE TO HOLD THE S/C FOR A SHORT TIME PERIOD
IN THE EVENT OF GYRO PROBLEM AND RETURN TO HOLD/SLEW

TACHR(4) = T /REDUNDANT TACH REFERENCE IN RAW CTS.
(NORMALLY 0)
BPARDB 16, TACHR, 4 /BUILD DATA BLOCK 16
:OBC LDBLK, 16 /UPLINK DATA BLOCK 16

- C. RETURN TO OBC H/S WORKER

1. :OBC CMND, 4, 10 /TURN OFF WORKER 10, WHEN H/S OPER.
2. :OBC CMND, 3, 0 /RETURN TO H/S WORKER, WHEN OPERATIONAL

3. APPROVAL SIGNED: IVAN J. MASON



28 APR. 82
DATE

1. APPLICATION: SWITCH FROM PRIMARY TO BACKUP WDA POWER SUPPLIES

IMPLEMENTATION RESPONSIBILITY:

SUPERCEDES PRIOR FODs: E009C

RESPONDS TO SCARs: N/A

2. DIRECTIVE: THIS DIRECTIVE PROVIDES THE INSTRUCTION FOR SWITCHING FROM THE PRIMARY WDA POWER SUPPLIES TO THE BACKUP WDA POWER SUPPLIES.

NOTE: SI & FES SHOULD BE IN SAFE MODE

1. :IMP 46 /CLOSE SUN SHUTTER
2. :OBC RESET /RESET OBC
3. :CRU OFF,3,14 /TURN OFF EVD'S
4. :CRU OFF,26,37,48,51 /TURN OFF ALL WHL.DRIVERS
5. :CRU OFF,4 /TURN OFF PS1
6. :IMP 65,67,69,71,73,75,77 /SEND IMPULSE CMDS TO SWITCH ALL RELAYS TO
:IMP 79,81,83,85,87,89 PS1
7. :CRU ON,15 /TURN ON PS2
8. WAIT 20 SECONDS
9. :IMP 88,78,66,68,70,72,76,86 /SEND IMPULSE CMDS TO SWITCH EVCLA,DACA,
P WD,Y WD,R WD,RED WD,C&M,HTR TLM,TO PS2
10. HPUL=1,LPUL=1,EVE=1 /RESET EVCL
EVC=1,FIRE=0,
ENG=2925,VALVE=125
:EV
11. RWMODE=0,RWENAB=1, /RESET DAC
PITCH=128,YAW=128,
ROLL=128,RED=128,
:RW
12. :CRU ON,26,37,48 /TURN ON WHL. DRIVERS
13. GO TO WHEEL SUNBATHING MODE OPERATIONS DIRECTIVE NO. E019.

3. APPROVAL SIGNED: IVAN J. MASON

21 APR. 82
DATE

1. APPLICATION: CONTROL OF IRA DURING LOSS OF CONTROL CONDITION

IMPLEMENTATION RESPONSIBILITY:

SUPERCEDES PRIOR FODs: E012C

RESPONDS TO SCARs: G0074

2. DIRECTIVE : THIS DIRECTIVE PROVIDES INSTRUCTIONS ON GYRO TEMPERATURE LIMITS AND INSTRUCTION FOR GYRO TURN OFF AND TURN ON IN CASE OF EMERGENCY.

MONITOR ALL GYRO TEMPERATURES

- NOMINAL SET POINTS ARE -

GYRO 1 = 60.0	GYRO 4 = 57.0
GYRO 2 = 56.2	GYRO 5 = 57.0
GYRO 3 = 56.2	GYRO 6 = 55.9

RED-LINE LIMITS
ALL GYROS
-10°C & 65°C

A. MONITOR TEMPERATURES OF ALL GYROS

*** IF CONTROL IS NOT ACHIEVED THE ACS ENGINEER AND OD SHALL DECIDE WHETHER TO TURN OFF GYROS. SHUT DOWN GYROS ONLY IF MANDATORY. TURN OFF ANY GYRO THAT REACHES 75°C.

SET UP GYROS TO BE TURNED OFF BY OMITTING THE APPLICABLE TERM(S) FROM THE FOLLOWING EQUATION, FOR THE GYRO TO BE OFF.

$$IRAGYR = GY3 + GY4 + GY5$$

VERIFY DESIRED GYRO COMMAND CONFIGURATION BEFORE PROCEEDING.

:IRA,IRAQB=1

/TURNS OFF SELECTED GYROS

B. WHEN GYROS ARE AGAIN NEEDED FOR SPACECRAFT CONTROL, TURN ON THREE GYROS REQUIRED BY SENDING THE FOLLOWING COMMANDS IN SEQUENCE.

- :IRA,IRAGYR=GYA,IRAQB=1 /GYRO A ON
WAIT 30 SECONDS /ASSURE GYRO BEING TURNED ON IS IN SYNC
- :IRA,IRAGYR=GYA+GYB,IRAQB=1 /GYRO A&B ON
WAIT 30 SECONDS /ASSURE GYRO BEING TURNED ON IS IN SYNC
- :IRA,IRAGYR=GYA+GYB+GYC,IRAQB=1 /GYRO A,B&C ON
- IRAQB=Ø /INHIBIT IRA COMMANDING

3. APPROVAL



22 DEC. 83

DATE

1. APPLICATION: SWITCH IRA FROM COMMON ELECTRONICS 1 TO COMMON ELECTRONICS 2
 IMPLEMENTATION RESPONSIBILITY: OD PAGE 1 OF 2
 SUPERCEDES PRIOR FODs: E013C
 RESPONDS TO SCARs: GOU/4

2. DIRECTIVE : THIS DIRECTIVE PROVIDES INSTRUCTIONS FOR SWITCHING FROM GYROS 1-3-5 TO GYROS 2-4-6 WHEN USING THE ANALOG RATE MODE.

ASSUMPTION: SI AND FES ARE IN A SAFE MODE


1. :IMP 46 /CLOSE SUN SHUTTER
2. :OBC RESET /RESET OBC
3. IRAGYR= \emptyset ,IRAQB=1 /TURN OFF ALL GYROS
:IRA
4. :CRU OFF,28 /SWITCH OFF COMMON ELECTRONICS 1
5. :CRU ON,32 /SWITCH ON COMMON ELECTRONICS 2
6. SW IRA,2 /SWITCH COMMAND ADDRESS AND GROUND TELEMETRY
FOR COMMON ELECTRONICS 2 IN GROUND COMPUTER.
7. CHECK GYRO TEMPERATURES - SEE NOTES BELOW.
8. GYRO START-UP

WHEN STARTING GYROS MOVE ON TO NEXT START UP COMMAND AS SOON AS CURRENT DROPS BELOW 250ma ON THE GYRO JUST COMMANDED ON.

- a. IRAQB=1 /ENABLE IRA COMMANDING
- b. :IRA,IRAGYR=GY4 /TURN ON GYRO 4
WAIT /VERIFY CURRENT DROP
- c. :IRA,IRAGYR=GY3+GY4 /TURN ON GYRO 3
WAIT /VERIFY CURRENT DROP
- d. :IRA,IRAGYR=GY3+GY4+GY5 /TURN ON GYRO 5
WAIT /VERIFY CURRENT DROP
- e. IRAQB= \emptyset /INHIBIT IRA COMMANDING

9. PROCEED TO WHEEL SUNBATHING SEQUENCE (OPERATIONS DIRECTIVE NO. E019).

3. APPROVAL SIGNED: IVAN J. MASON



21 DEC. 83
DATE

1. APPLICATION: SWITCH IRA FROM COMMON ELECTRONICS 1 TO COMMON ELECTRONICS 2
IMPLEMENTATION RESPONSIBILITY: OD
SUPERCEDES PRIOR FODs: E013C
RESPONDS TO SCARs: G0074


PAGE 2 OF 2

2. DIRECTIVE

NOTE:

1. GYRO TEMPERATURE IS $< 26.7^{\circ}\text{C}$ (80°F), WAIT UNTIL HEATERS RAISE TEMPERATURES ABOVE 26.7°C BEFORE PROCEEDING.
2. IF GYRO TEMPERATURES ARE BETWEEN 26.7°C (80°F) AND 43°C (110°F) CMD GYROS TO RATE COLD.
:IRA,IRACOLD=1 /RATE COLD MODE
3. WHEN GYROS ARE BETWEEN 43°C (110°F) AND 46°C (115°F) CMD GYROS TO RATE NORMAL.
:IRA,IRACOLD=Ø /RATE NORMAL MODE

3. APPROVAL SIGNED: IVAN J. MASON

21 DEC. 83
DATE

1. APPLICATION: SWITCH FROM PRIMARY TO BACKUP ACS DIGITAL-TO-ANALOG CONVERTER

IMPLEMENTATION RESPONSIBILITY: OD

SUPERCEDES PRIOR FODs: E014A

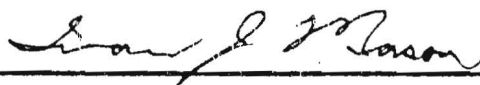
RESPONDS TO SCARs: N/A

2. DIRECTIVE : THIS DIRECTIVE PROVIDES INSTRUCTIONS FOR SWITCHING FROM THE PRIMARY TO THE BACKUP ACS DIGITAL-TO-ANALOG CONVERTER.

ASSUMPTION: SI AND FES ARE IN A SAFE MODE.

1. :IMP 46 /CLOSE SUN SHUTTER
2. :OBC RESET /RESET OBC
3. :CRU OFF,26,37,48,51 /TURN OFF ALL WHEEL DRIVERS
4. :IMP 78 /TURN OFF DAC A
5. :IMP 79 /TURN OFF DAC B
6. SW RW,2 /SWITCH COMMAND FIELD FOR DAC B
7. :CRU ON, 26,37,48 /TURN ON WHEEL DRIVERS
8. RWMODE=0,RWENAB=1,PITCH=128, /RESET DAC B
YAW=128,ROLL=128,RED=128
:RW
9. PROCEED TO WHEEL SUNBATHING MODE (OPERATIONS DIRECTIVE NO. E019 IF NECESSARY).
10. BEFORE RETURNING TO HOLD/SLEW THE FOLLOWING PATCH MUST BE UPLINKED SO THE OBC WILL COMMAND DAC B.
 - a. PATCH 8K SYSTEM, TAPE 15
:OBC GO
:OBC PATCH,0'7721',0'663140' /OBC COMMANDS TO DAC B
 - b. PATCH 4K SYSTEM, TAPE 18F
:OBC GO
:OBC PATCH,0'11653',0'663140'
11. RETURN TO HOLD/SLEW OPERATION (OPERATIONS DIRECTIVE E004).

3. APPROVAL SIGNED: IVAN J. MASON

26 APR. 82
DATE

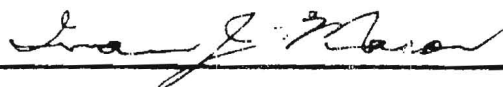
1. APPLICATION: SWITCH FROM PRIMARY TO BACKUP EVCL/EVD
IMPLEMENTATION RESPONSIBILITY:
SUPERCEDES PRIOR FODs: E015A
RESPONDS TO SCARs: N/A

2. DIRECTIVE : THIS DIRECTIVE PROVIDES INSTRUCTIONS FOR SWITCHING FROM THE PRIMARY EVCL/EVD TO THE REDUNDANT EVCL/EVD

1. :IMP 46 /CLOSE SUN SHUTTER
2. :CRU OFF,3,14 /TURN OFF EVD A,B
3. IF OUT OF CONTROL SWITCH TO WHEEL SUNBATHING MODE USING OPERATIONS DIRECTIVE E019.
4. :IMP 88 /TURN OFF EVCL A
5. :IMP 89 /TURN OFF EVCL B
6. SW EV,2 /SWITCH COMMAND FIELD FOR EVCL B
7. HPUL=1,LPUL=1,EVE=1 /RESET EVCL B
EVC=1,FIRE=0,ENG=2925,VALVE=125
:EV
8. :OBC CMND,16,X'80' /SET ACSFLG FOR EVCL B

NOTES: 1. WHEN USING EVCL B BIT 8 OF ACSFLG SHOULD ALWAYS BE SET TO 1.
2. EVD #2 IS USED WITH EVCLB.

3. APPROVAL SIGNED: IVAN J. MASON



21 APR. 82
DATE

1. APPLICATION: SINGLE AXIS SUN SEARCH USING OBC
IMPLEMENTATION RESPONSIBILITY: OD
SUPERCEDES PRIOR FODs: E016B
RESPONDS TO SCARs: N/A

PAGE 1 OF 2

2. DIRECTIVE : THIS DIRECTIVE PROVIDES INSTRUCTIONS FOR A SUN ACQUISITION SEQUENCE USING THE OBC (8K) AND JETS. THIS IS TO BE USED ONLY IF THE ANALOG SUN ACQUISITION SYSTEM BECOMES INOPERATIVE DUE TO A CSS AND/OR C&M FAILURE.

EXTREME CAUTION MUST BE USED WHILE IMPLEMENTING THIS DIRECTIVE.

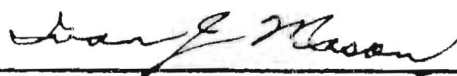
ASSUMPTION: PRIMARY OBC SYSTEM OPERATIVE
ANALOG SUN ACQUISITION SYSTEM INOPERATIVE
SI AND FES ARE IN A SAFE MODE

1. :IMP 46 /CLOSE SUN SHUTTER
2. :IMP 76 /TURN OFF C&M CARD
3. :OBC CMND,4,0 /WORKER 0 OFF
4. :IRA,IRAMC=0,IRAQB=1 /PUT ALL THE GYROS IN THE RATE MODE
5. :RW,RWMODE=0,RWENAB=1 /RW RESET, DISABLES WHEELS CONTROL
6. :CRU ON,3 /EVD 1 ENABLE
7. :OBC CMND,16,0 /SETS ACSFLG TO RATE + POSITION ON ALL AXES
8. :OBC CMND,3,19 /TURN ON WORKER 19

THE SPACECRAFT IS NOW IN RATE + POSITION CONTROL ON ALL AXES. IF THE SUN ATTITUDE IS GOOD, THE PRESENT ATTITUDE SHOULD BE MAINTAINED. IF THE SUN ATTITUDE IS NOT GOOD, THE FOLLOWING SEQUENCE SHOULD BE INITIATED.

9. EXEC DB19,0 /BUILDS DB19 WITH DEFAULT VALUES
10. THE CONTROL LAW IS NOW MODIFIED IN ORDER TO MANEUVER THE SPACECRAFT TO A MORE FAVORABLE SUN ATTITUDE. NOMINALLY, ROLL THE SPACECRAFT FIRST.
 - a. ROLL THE SPACECRAFT AT A RATE OF K* DEGS./SECOND.

3. APPROVAL SIGNED: IVAN J. MASON

22 APR. 82
DATE

1. APPLICATION: SINGLE AXIS SUN SEARCH USING OBC
 IMPLEMENTATION RESPONSIBILITY: OD
 SUPERCEDES PRIOR FODs: E016B
 RESPONDS TO SCARs: N/A

2. DIRECTIVE

EXEC MODRA, \emptyset, \emptyset, K /UPLINK ROLL BIAS
 :OBC CMND, 16, X'4 \emptyset ' /ROLL S/C
 :OBC CMND, 16, \emptyset /STOP ROLL WHEN FAVORABLE SUN ANGLE
 IS ACHIEVED, RATE + POSITION HOLD.

- b. IF NECESSARY, PITCH THE SPACECRAFT AT A RATE OF K^* DEGS./SECOND.

EXEC MODRA, K, \emptyset, \emptyset /UPLINK PITCH BIAS
 :OBC CMND, 16, X'1 \emptyset ' /PITCH S/C
 :OBC CMND, 16, \emptyset /STOP PITCH WHEN FAVORABLE SUN ANGLE
 IS ACHIEVED, RATE + POSITION HOLD

- c. IF NECESSARY, YAW THE SPACECRAFT AT A RATE OF K^* DEGS./SECOND.

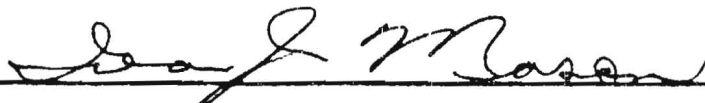
EXEC MODRA, \emptyset, K, \emptyset /UPLINK YAW BIAS
 :OBC CMND, 16, K'20' /YAW S/C
 :OBC CMND, 16, \emptyset /STOP YAW WHEN FAVORABLE SUN ANGLE
 IS ACHIEVED, RATE + POSITION HOLD

*K SHOULD BE $\pm .1$ TO ± 1 DEPENDING ON THE OD'S DISCRETION, $K = .1$ TO $.2$ IS RECOMMENDED.

NOTE: SOLAR ARRAY OUTPUT AND FSS SUN PRESENCE SHOULD BE USED AS INDICATORS OF FAVORABLE SUN ANGLE. THE FOLLOWING SEQUENCE IS RECOMMENDED.

1. ROLL UNTIL SOLAR ARRAY CURRENT IS NEAR MAXIMUM OUTPUT, IF FSS SUN PRESENCE IS INDICATED ROLL TO NEAR ZERO.
2. PITCH TO INCREASE SA CURRENT AND STOP WHEN POWER POSITIVE AND FSS SUN PRESENCE IS OBSERVED.

3. APPROVAL



22 APR. 82

DATE

1. APPLICATION: RECOVERY FROM UNDERVOLTAGE OR OVERCURRENT AUTOMATIC SYSTEM SHUTDOWN
 IMPLEMENTATION RESPONSIBILITY: OD PAGE 1 OF 3
 SUPERCEDES PRIOR FODs: E017E
 RESPONDS TO SCARs: G0074

2. DIRECTIVE: THIS DIRECTIVE PROVIDES INSTRUCTIONS FOR RECOVERY FROM AUTOMATIC SYSTEMS SHUTDOWN IN THE EVENT OF UNDER VOLTAGE OR OVER CURRENT. AUTOMATIC SYSTEM SHUTDOWN WOULD BE CAUSED FROM THE FOLLOWING:

<26.5V BUSS VOLTAGE
 <17 V BATTERY VOLTAGE
 >12 A BUSS CURRENT

A. CHECK FOR AUTOMATIC SYSTEM SHUT-DOWN

THE INDICATION OF AN AUTOMATIC SHUTDOWN WOULD BE LOSS OF TELEMETRY, INCLUDING RF CARRIER, FROM THE SPACECRAFT.

1. CAREFULLY VERIFY ALL GROUND SYSTEMS
2. HAVE GREENBELT SEARCH FOR CARRIER
3. HAVE GREENBELT BRING UP VHF TLM SYSTEM
4. TURN ON VHF SYSTEM
 :IMP 112,120 /CMD DECODERS ON
 EXEC VHF,1 /VHF 1 ON, RANGING OFF
 EXEC TLM,FES2ROM,5 /FORMAT 2A, 5Kb
5. HAVE GREENBELT SEARCH FOR VHF CARRIER AND CHECK FOR MODULATION
6. IF THERE IS NO SIGNAL, HAVE GREENBELT REVERSE THE CMD POLARIZATION AND REPEAT THE ABOVE DECODER, VHF, AND TLM COMMANDS
7. VERIFY THE COMMANDS ARE BEING TRANSMITTED FROM GREENBELT AND CHECK GROUND VERIFICATION.

IF THE ABOVE RESULTS IN A VHF CARRIER BUT NO MODULATION AN AUTOMATIC SPACECRAFT SHUT-DOWN PROBABLY HAS OCCURRED. PROCEED WITH PARA. B.

IF NO RF SIGNAL IS ACHIEVED FROM THE ABOVE, REPEAT THE CHECK USING VHF SYSTEM 2.

:IMP 112,120 /CMD DECODERS ON
 EXEC VHF,0 /VHF 1 SYSTEM OFF
 EXEC VHF,2 /VHF 2 ON, RANGING OFF
 EXEC TLM,FES2ROM,5 /FORMAT 2A, 5Kb

REPEAT STEPS A.5, 6 & 7 ABOVE USING VHF SYSTEM 2.

3. APPROVAL SIGNED: IVAN J. MASON

Ivan J. Mason

21 DEC. 83
DATE

1. APPLICATION: RECOVERY FROM UNDERVOLTAGE OR OVERCURRENT AUTOMATIC SYSTEM SHUTDOWN

IMPLEMENTATION RESPONSIBILITY: OD

PAGE 2 OF 3

SUPERCEDES PRIOR FODs: E017E

RESPONDS TO SCARs: G0074

2. DIRECTIVE

B. RETURN SYSTEMS ON-LINE AS FOLLOWS:

AS SYSTEMS ARE SWITCHED BACK ON-LINE, CAREFULLY OBSERVE THE S/C CURRENT AND VOLTAGE PARAMETERS TO TRY TO DETERMINE THE CAUSE FOR THE AUTOMATIC SHUTDOWN. WHEN THE FAILED SYSTEM IS TURNED ON THE AUTOMATIC UNLOAD MAY BE REPEATED. REPEAT THIS TURN-ON SEQUENCE, BUT USE THE REDUNDANT SYSTEM FOR THE SYSTEM THAT CAUSED THE FAILURE. ALSO, IF AN UNUSUALLY HIGH INCREASE IN S/C CURRENT OCCURS WHEN A SYSTEM IS TURNED ON, SWITCH IT OFF AND BRING UP THE REDUNDANT SYSTEM.

NOTE: ONCE TELEMETRY IS RESTORED, CAREFUL OBSERVATION OF SYSTEMS STATUS AND PERFORMANCE SHOULD BE MADE BEFORE PROCEEDING, AT EACH STEP.

- | | | |
|-----------------------|-----------------------|---|
| 1. :IMP 112,120 | /CMD DECODER ON | |
| 2. :CRU ON,9 | /SUN SHUTTER ELECT ON | |
| 3. :IMP 46 | /CLOSE SUN SHUTTER | |
| 4. :CRU ON,6 | /TURN ON DMU 1 | IF REQUIRED,
MAY BE ON
FROM PARA. A |
| 5. :IMP 31,34,35 | /VHF #1 ON | |
| 6. EXEC TLM,FES2ROM,5 | /FORMAT 2A, 5Kb | |

STOPBEFORE PROCEEDING

.TELEMETRY SHOULD BE PRESENT

.VERIFY ACS SYSTEMS HAVE BEEN SHUT DOWN AND SUN ACQ. IS REQUIRED.

THE FOLLOWING SEQUENCE TURNS ON THE ACS AND INITIATES WHEEL SUNBATHING MODE:

- | | |
|----------------------------|---|
| 7. :CRU OFF,3,14 | /TURN OFF EVD A,B |
| 8. :CRU OFF,26,37,48,51 | /TURN OFF WHEEL DRIVERS |
| 9. :CRU ON,21 | /TURN ON FSS1 |
| 10. :IMP 113 | /SELECT FSS1 HEAD 2 |
| 11. :CRU ON,53 | /TURN ON FSS2 |
| 12. :IMP 114 | /SELECT FSS2 HEAD 1 (IF REQUIRED) |
| 13. :CRU ON,4 | /TURN ON ACS PS1 |
| 14. :IMP 77,87,75,65,67,69 | /TURN ON C&M, DAC1, EVCL1, PWD, YWD,
RWD |
| 15. :CRU ON,28 | /TURN ON GYRO CE#1 |

3. APPROVAL SIGNED: IVAN J. MASON

21 DEC. 83
DATE

1. APPLICATION: RECOVERY FROM UNDERVOLTAGE OR OVERCURRENT AUTOMATIC SYSTEM SHUTDOWN
 IMPLEMENTATION RESPONSIBILITY: OD PAGE 3 OF 3
 SUPERCEDES PRIOR FODs: E017E
 RESPONDS TO SCARs: G0074

2. DIRECTIVE

16. :CRU ON,27 /GYRO 3 POWER ON
 17. :CRU ON,38 /GYRO 4 POWER ON
 18. :CRU ON,44 /GYRO 5 POWER ON
 19. GYRO START-UP:
 WHEN STARTING GYROS MOVE ON TO NEXT START-UP COMMAND AS SOON AS
 CURRENT DROPS BELOW 250ma ON THE GYRO JUST COMMANDED ON.

- a. :IRA,IRAQB=1,IRAGYR=GY3 /START UP GYRO 3
 WAIT /VERIFY CURRENT DROP
- b. :IRA,IRAGYR=GY3+GY5 /START UP GYROS 3-5
 WAIT /VERIFY CURRENT DROP
- c. :IRA,IRAGYR=GY3+GY4+GY5 /START UP GYROS 3-4-5
 WAIT /VERIFY CURRENT DROP
- d. IRAQB=Ø /INHIBIT IRA COMMANDING

20. :CRU ON,26,37,48 /ARM PY & R WHEEL DRIVERS

PROCEED WITH WHEEL SUNBATH MODE, FOD E019.

21. AFTER THE SPACECRAFT IS SAFE AND POWER POSITIVE TURN ON GYROS 1, 2
 AND 6 HEATERS.

- a. :CRU ON,5 /GYRO 1 POWER ON
- b. :CRU ON,16 /GYRO 2 POWER ON
- c. :CRU ON,60 /GYRO 6 POWER ON

3. APPROVAL IVAN J. MASON



21 DEC. 83
 DATE

1. APPLICATION: GENERAL EMERGENCY OPERATIONS INSTRUCTIONS

PAGE 1 OF 7

IMPLEMENTATION RESPONSIBILITY: OD

SUPERCEDES PRIOR FODs: E018C

RESPONDS TO SCARs: #0074

2. DIRECTIVE

ENGINEERING MEETINGS AND SIMULATIONS ARE CONTINUING WITH REGARD TO PROPER EMERGENCY OPERATIONS SINCE GYRO 1 FAILED.

IF IT BECOMES NECESSARY TO GO TO AN EMERGENCY CONTROL MODE USE THE ATTACHED FLOW DIAGRAM TO ESTABLISH WHICH OF THE FOLLOWING RECOVERY MODES TO USE. TABLE 1 GIVES PRIMARY AND SECONDARY CONTROL MODES TO BE USED.

A. SUN BATH:

1. LIMIT THE MOMENTUM STORED IN THE SPACECRAFT WHEELS DURING OPERATIONS SO THIS EMERGENCY CONTROL MODE WILL PERFORM PROPERLY. CONTROL THE WHEEL SPEEDS DURING NORMAL OPERATIONS AS FOLLOWS:
YAW AND ROLL WHEEL SPEEDS APPROXIMATELY ≤ 1500 RPM
PITCH WHEEL SPEED ≤ 1000 RPM

2. ENTER THE SUN BATH MODE:

:IMP 46	/CLOSE SUN SHUTTER
:CRU OFF,3,14	/ENSURE EVD'S OFF
:OBC RESET	/ENSURE OBC NOT RUNNING
RWMODE=10,RWENAB=1	/SET WHEEL COMMAND FOR SUNBATH
EXAMINE SERIAL,RW	/VERIFY COMMAND FIELD
:RW	/ENTER THE SUN BATH MODE

ALL WHEELS MAY GO IN AND OUT OF SATURATION UNTIL THE S/C REACHES BETA 67° . THEN THE YAW OR ROLL WHEEL MAY REMAIN SATURATED. THE S/C PROBABLY WILL SPIN AROUND THE BETA 67° SUN LINE, AT A VERY SLOW RATE.

3. RETURN TO OBC H/S MODE WHEN CONDITIONS PERMIT. USE FOD E004 OR E005.

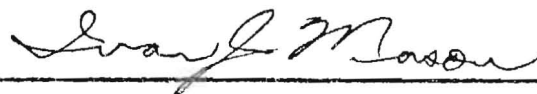
B. SUN ACQUISITION WHEELS:

SIMULATIONS INDICATE THIS WOULD BE A SAFE MODE WITHOUT GYRO 1 OPERATING, UNDER MOST CONDITIONS IF GYRO 1 IS TURNED OFF AND PROVIDING \emptyset RATE INTO THE C&M ELECTRONICS. DO NOT USE WITH GYRO 1 OPERATING.

NOTE: USE AS A BACKUP TO SUN BATH.

1. PERFORM SUN ACQ. ON WHEELS AS FOLLOWS:

3. APPROVAL SIGNED: IVAN J. MASON


22 DEC. 83
DATE

1. APPLICATION: GENERAL EMERGENCY OPERATIONS INSTRUCTION

PAGE 2 OF 7

IMPLEMENTATION RESPONSIBILITY: OD

SUPERCEDES PRIOR FODs: E018C

RESPONDS TO SCARs: G0074

2. DIRECTIVE

:IMP 46	/CLOSE SUN SHUTTER
:CRU OFF,3,14	/ASSURE JETS ARE OFF
:OBC RESET	/ASSURE OBC NOT RUNNING
IRAGYR=28,IRAMC=8,IRAQB=1,	/SET UP IRA COMMAND
EXAMINE SERIAL,IRA	
:IRA	/GYRO 3&5 TO RATE MODE
RWMODE=2,RWENAB=1	/SET UP WHEEL COMMAND
EXAMINE SERIAL,RW	
:RW	/ENTER SUN ACQ MODE

2. WHEN POSSIBLE RETURN TO THE OBC H/S MODE PER FOD E004 OR E005.

C. OBC WHEEL HOLD MODE (FOD E008)

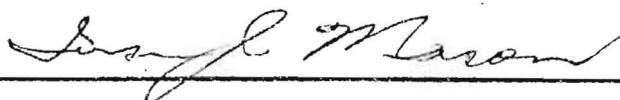
THIS MODE SHOULD ONLY BE USED WHEN THE SPACECRAFT HAS 0 TO VERY LOW BODY RATES.

D. OBC RATE & POSITION HOLD AND SINGLE AXIS SUN SEARCH (FOD E016)

THIS MODE WOULD PRIMARILY BE USED IF THE C&M ELECTRONICS, CSS OR WHEELS FAIL. SUN BATH AND SUN ACQ. MODES ARE PREFERRED, BUT CAN NOT BE USED IF THE C&M, CSS OR WHEEL DEVICES FAIL.

STEPS 1-10 OF FOD E016 PLACE THE S/C IN THE RATE & POSITION MODE, USED FOR STATION KEEPING MANEUVERS. IT WILL CAPTURE AND STABILIZE THE S/C FOR ANY RATES THAT MIGHT BE INTRODUCED DURING NORMAL OPERATIONS.

3. APPROVAL IVAN J. MASON



22 DEC. 83
DATE

1. APPLICATION: GENERAL EMERGENCY OPERATIONS INSTRUCTION

IMPLEMENTATION RESPONSIBILITY: OD

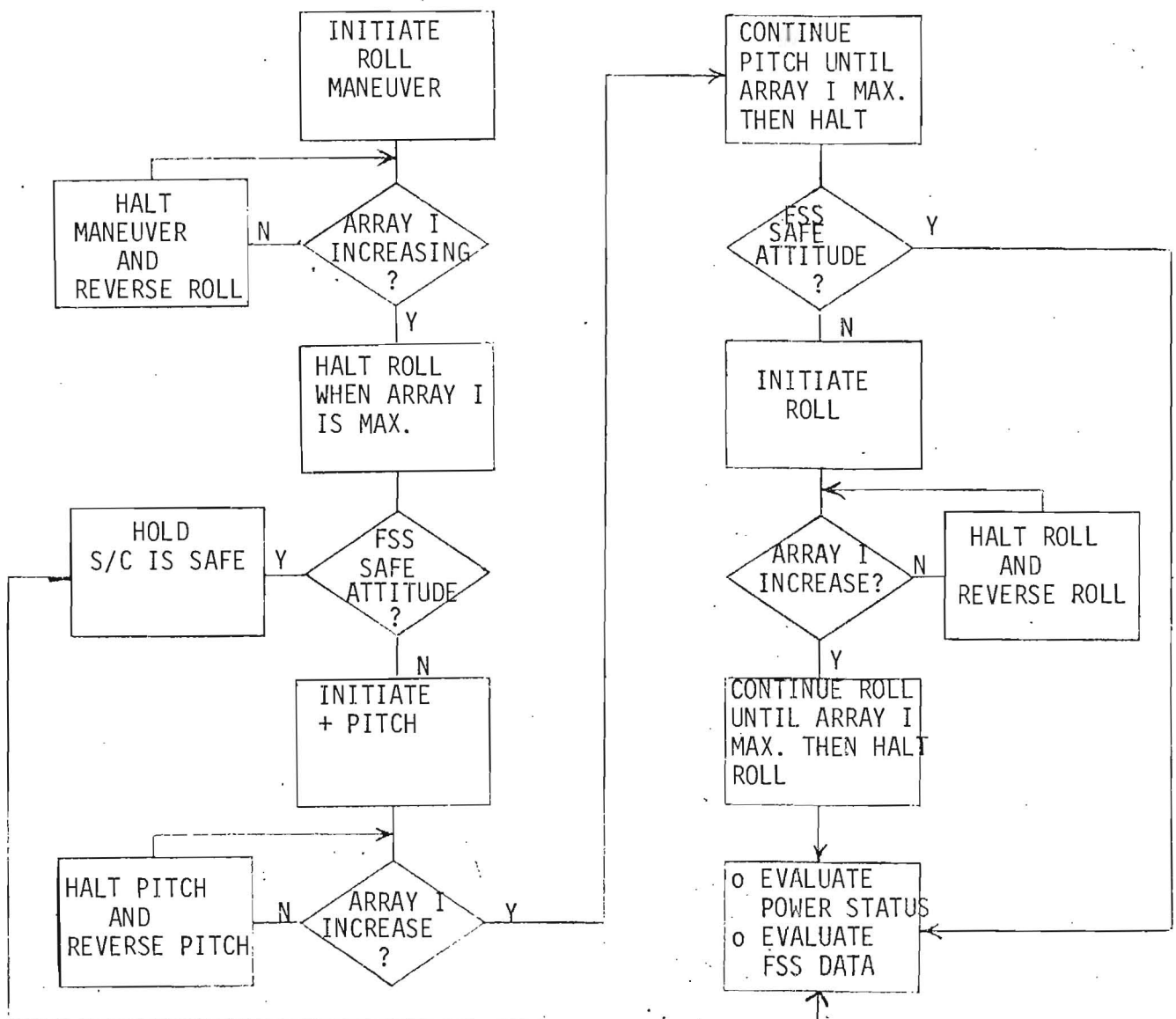
SUPERCEDES PRIOR FODs: E018C

RESPONDS TO SCARs: 60074

2. DIRECTIVE

IF A C&M, CSS OR WHEEL FAILURE IS SUSPECTED USE STEP 10 WITH GREAT CARE. BUT DO NOT HESITATE TO USE IT IF NECESSARY TO GET THE S/C UNDER CONTROL AND POWER POSITIVE.

ACQUIRE A SAFE ATTITUDE AS FOLLOWS:



3. APPROVAL IVAN J. MASON

Ivan J. Mason

22 DEC. 83
DATE

1. APPLICATION: GENERAL EMERGENCY OPERATIONS INSTRUCTIONS

IMPLEMENTATION RESPONSIBILITY: OD

SUPERCEDES PRIOR FODs: E018C

RESPONDS TO SCARs: G0074

2. DIRECTIVE

E. IN THE EVENT OF A MAJOR SUB-SYSTEM FAILURE (E.G. DMU, POWER, ETC.) AND THE S/C IS OUT OF CONTROL IT MAY BECOME NECESSARY TO REDUCE POWER LOADS TO CONSERVE BATTERY POWER UNTIL BACK-UP SYSTEMS ARE ACTIVATED AND THE S/C IS AGAIN UNDER CONTROL, IN A POWER - POSITIVE POSITION. IF YOU ARE CERTAIN THAT A REDUCTION IN S/C LOAD IS NECESSARY SHUT DOWN THE SI AND OTHER S/C NON-ESSENTIAL EQUIPMENT, AS FOLLOWS:

:IMP 46

/CLOSE SUN SHUTTER

EXEC ALLOFF,Ø

/POWER DOWN SI

EXEC SHADOW,Ø

/TURN OFF NON-ESSENTIAL EQUIPMENT

EXEC VHF,1

/BRING UP VHF SYSTEM

DECLARE A S/C EMERGENCY AND HAVE GREENBELT BRING UP VHF SYSTEMS IMMEDIATELY.

NOTE: IF VHF IS NOT AVAILABLE UPON ENTERING SHADOW PROC, ENSURE THAT YOU SKIP THE SECTION WHICH TURNS OFF THE S BAND SYSTEM.

3. APPROVAL IVAN J. MASON

22 DEC. 83
DATE

1. APPLICATION: GENERAL EMERGENCY OPERATIONS INSTRUCTIONS
 IMPLEMENTATION RESPONSIBILITY: OD
 SUPERCEDES PRIOR FODs: E018C
 RESPONDS TO SCARs: G0074

2. DIRECTIVE

TABLE 1: PRIMARY & SECONDARY EMERGENCY CONTROL MODES

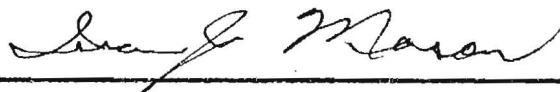
TABLE 1

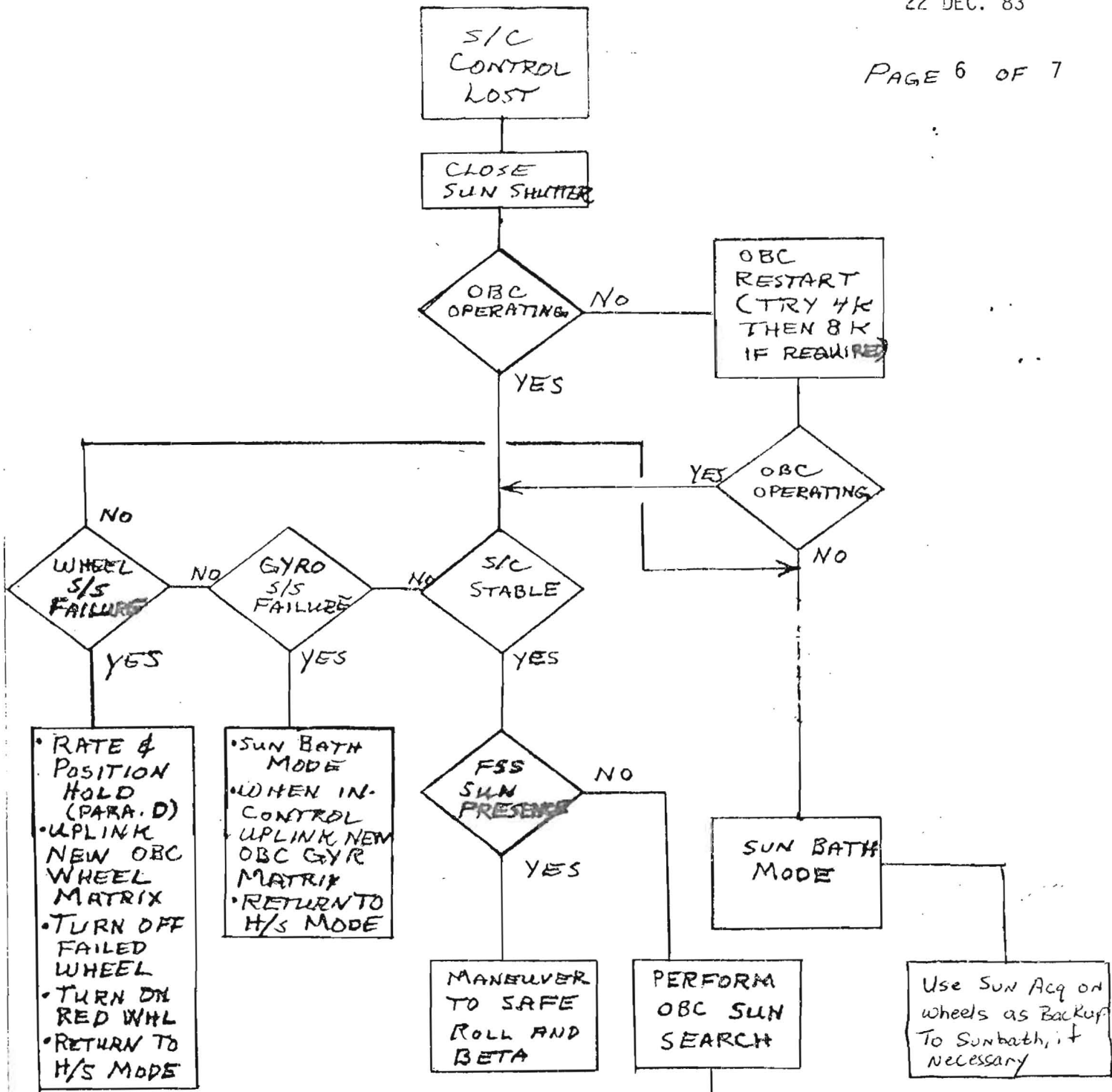
	SUBSYSTEM FAILURE							FOD
	NONE	GYRO	WHEEL	JETS	C&M	CSS	COMPUTER	
RECOVERY MODE								
1. OBC MANEUVERS	Pa			Pa	P	P		N/A
2. SUN ACQ ON WHLS								E007
3. SUN BATH	Pb	P		Pb			P	E019
4. OBC WHEEL HOLD		Pc		S	S	S		E008
5. R&P & SUN SEARCH			P		Pd	Pd		E016

P - PRIME
 S - SECONDARY

- a. IF FSS SUN PRESENCE
 b. NO FSS SUN PRESENCE
 c. IF VERY LOW S/C BODY RATES & FSS SUN PRES.
 d. C&M OR CSS OR WHEEL FAILURE

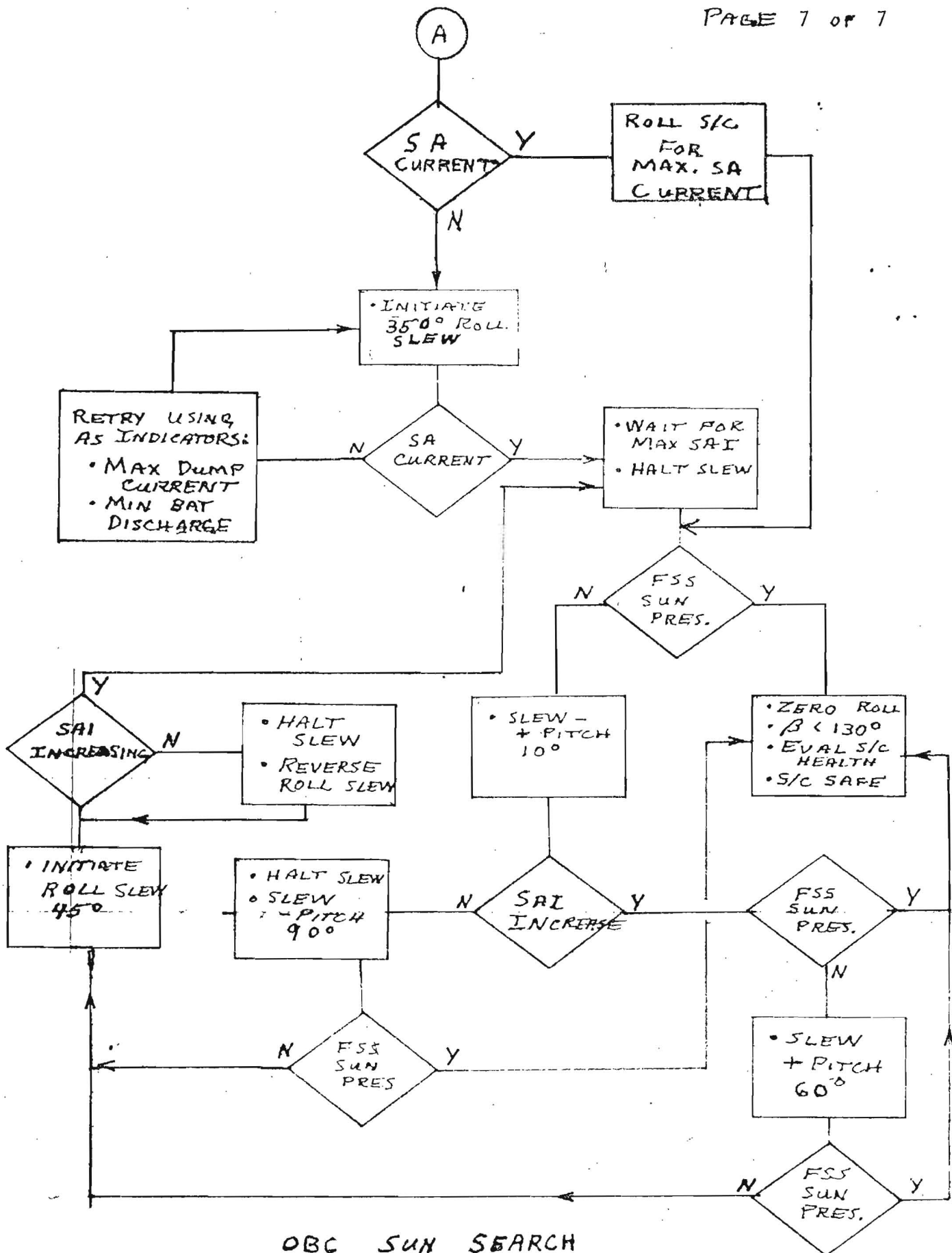
3. APPROVAL IVAN J. MASON


22 DEC. 83
DATE



A
PAGE 8

EMERGENCY MODE SELECTION



1. APPLICATION: SUN BATH, SUN ACQUISITION AND HOLD ON WHEELS
 IMPLEMENTATION RESPONSIBILITY: OD
 SUPERCEDES PRIOR FODs: NONE
 RESPONDS TO SCARs: NONE

2. DIRECTIVE: THIS PROCEDURE PERFORMS A SUN ACQUISITION AND HOLD AT BETA 67⁰ USING THE CSS AND WHEEL SYSTEM.

A. SUN BATH:

1. LIMIT THE MOMENTUM STORED IN THE SPACECRAFT WHEELS DURING OPERATIONS SO THIS EMERGENCY CONTROL MODE WILL PERFORM PROPERLY. CONTROL THE WHEEL SPEEDS DURING NORMAL OPERATIONS AS FOLLOWS:

YAW AND ROLL WHEEL SPEEDS APPROXIMATELY $\leq |500|$ RPM

PITCH WHEEL SPEED $\leq |1000|$ RPM

2. ENTER THE SUN BATH MODE:

:IMP 46	/CLOSE SUN SHUTTER
:CRU OFF,3,14	/ASSURE JETS ARE OFF
:OBC RESET	/ENSURE OBC NOT RUNNING
RWMODE=10,RWENAB=1	/SET WHEEL COMMAND FOR SUN BATH

EXAMINE SERIAL,RW	/VERIFY COMMAND FIELD
:RW	/ENTER THE SUN BATH MODE

SUN ACQUISITION AT BETA 67⁰ MAY TAKE ABOUT 20 MINUTES. ALL WHEELS MAY GO IN AND OUT OF SATURATION UNTIL THE S/C REACHES BETA 67⁰. THEN THE YAW OR ROLL WHEEL MAY REMAIN SATURATED. THE S/C WILL SPIN AROUND THE BETA 67⁰ SUN LINE, AT A VERY SLOW RATE.

3. RETURN TO OBC.H/S MODE WHEN CONDITIONS PERMIT. USE FOD E004 OR E005.

3. APPROVAL SIGNED: IVAN J. MASON



23 APR. 82
DATE