Space Shuttle Program
FLIGHT DATA FILE

JSC–48005–86

Ascent Checklist

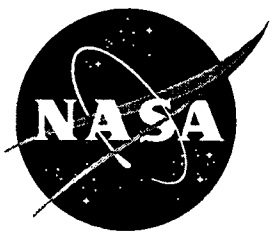
STS–86

Mission Operations Directorate
Flight Design and Dynamics Division

Final
June 13, 1997

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



JSC-48005-86

MISSION OPERATIONS DIRECTORATE

ASCENT CHECKLIST
STS-86

FINAL
June 13, 1997

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ASC/86/FIN

NOTES

1. The STS-86 trajectory data in this checklist is based on the STS-86 One Cycle to Flight load and the September environment.

2. The Handover/Ingress Switch List gives the vehicle configuration at LCC/MCC handover (SRB Ignition) and flight crew ingress (T-3:00). If there is a switch position difference between ingress and handover, the ingress position will be boxed beside the handover position.

3. The time reference used in the Prelaunch procedures is the T- (Time to Launch) that LCC uses. This time does not reflect planned holds. The second time referenced in parentheses reflects the planned holds. The mission elapsed time (MET) has MET = 0 at SRB ignition.

4. Normal Flight Procedures are for liftoff through the OMS 2 burn.

5. The Abort to Orbit (ATO) procedures and the Backup Flight System (BFS) procedures are integrated into the appropriate parts of this checklist.

6. AOA procedures terminate with ENTRY MANEUVERS Cue Cards.

7. Ascent Flip Book for the CDR and PLT will be fabricated from the FB pages in section 2.

8. Ascent related cue cards are contained in this document. The cue cards are listed in the Ascent Cue Card section. Some cards are printed in the body of the checklist for MS use and also in the Cue Card Config section for reference of crop marks and fabrication instructions. The size, shape, and Velcro location of the cue cards are controlled by the Cue Card Book Manager.

9. Mission STS-86 is flown with vehicle OV104.

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ABORT/RECYCLE PROCEDURES

NOTE
These recycle procedures will be used inside T-5 min

OTC (or NTD) will call for BFS Safing, SRB Safing, APU Shutdn, Heater Reconfig (Aerosurface positioning complete), MPS He Reconfig, OMS/RCS Reconfig, RCS Driver and OMS Safing, and Main Bus Switch Safing as reqd

C **BFS SAFING (On NTD call)**

O6 GPC MODE 5 - HALT
Report BFS Safing complete

MS1 **SRB SAFING (On NTD call - if reqd)**

O17 MEC 1 - OFF
. . . Wait 2 sec, then . . .
MEC 2 - OFF
Report SRB Safing complete

P **APU SHUTDN (On OTC call)**

R2 APU OPER (three) - OFF
FUEL TK VLV (three) - CL
✓Shutdn (Hyd Press)
CNTLR PWR (three) - OFF
HYD CIRC PUMP (three) - GPC

Report APU Shutdn complete

C **HEATER RECONFIG (On OTC call)**

L2 FLASH EVAP FDLN HTR (two) - 2

Report Heater Reconfig complete

NOTE

Numerous non time-critical steps for recycle will be individually called by OTC

P **MPS He RECONFIG (On OTC call)**

R2 MPS He ISOL A,B (six) - GPC
PNEU He ISOL - GPC

Report MPS He Reconfig complete

P **OMS/RCS RECONFIG (On OTC call)**

O8 L,R OMS
✓TK ISOL (four) - GPC (tb-OP)
✓XFEED (four) - GPC (tb-CL)
FWD RCS
He PRESS (two) - GPC (tb-OP)
✓TK ISOL (two) - GPC (tb-OP)
✓MANF ISOL 1,2,3,4,5 - GPC (tb-OP)

O7 AFT L,R RCS
He PRESS (four) - GPC (tb-OP)
✓TK ISOL (six) - GPC (tb-OP)
✓MANF ISOL 1,2,3,4,5 (ten) - GPC (tb-OP)

Report OMS/RCS Reconfig complete

C, MS2 **RCS DRIVER AND OMS SAFING (On OTC call)**

MS2	O14:F	RJD DRIVER (three)	- OFF
		LOGIC (three)	- OFF
		L OMS ENG VLV	- OFF
	O15:F	RJD DRIVER (two)	- OFF
		LOGIC (two)	- OFF
	O16:F	RJD DRIVER (four)	- OFF
		LOGIC (three)	- OFF
		R OMS ENG VLV	- OFF
C	C3	OMS ENG (two)	- OFF

Report RCS Driver and OMS Safing complete

MS2 **MAIN BUS SWITCH SAFING (On OTC call)**

	O13:A	cb ESS 1BC MNA CONTR	- op
	:C	2CA MNB CONTR	- op
	:E	3AB MNC CONTR	- op
	O14:B	MNA MNC CONTR	- op
	O15:B	MNB MNA CONTR	- op
	O16:B	MNC MNB CONTR	- op

Report Main Bus Switch Safing complete

1: GNC GPC MEMORY	2: GNC 104 GND IMU CNTL/MON
3: GNC GPC MEMORY	

-3:00:00 (Hold)

PRE-INGRESS SW RECONFIG

ASP configures OI PCMMU PWR - 1*** (C3), INST PWR - FLT/MPS (F6), INST PWR - ON (F8). ESS BUS SOURCE FC (three) - ON, AC BUS SNSR (three) - OFF (1 sec) then AUTO TRIP (R1), cb APU FU TK VLV ENA (six) - cl (R2). OTC will call: (~2 min) ESS BUS SOURCE FC (three) - OFF, AC BUS SNSR (three) - OFF (1 sec) then MON (R1), cb ESS MN CONTR (three) - cl (O13), cb MN CONTR (three) - cl (O14,O15,O16)

PAYLOAD ACTIVATION

A6U ✓PL RETEN PL SEL - MON

NAVAIDS ACTIVATION

O8 MLS CH pb/tw (three) - 6
RADAR ALTM (two) - ON
O7 TACAN CH pb/tw (three) - 059Y
ANT SEL (three) - AUTO
MODE (three) - GPC

If OV103,4,5:
A13 GPS PRE AMPL UC - MNC
LC - MNA
PWR - ON

-2:25:00 A (-3:15:00)

INGRESS ORBITER & SEATS

During seat ingress COMM
PWR - ON (L5,R6)
CCU PWR - ON (A11,A15,MO39M)

O5,O9, R10,L9, MO42F AUD VOX SENS (as needed) - adj as reqd
Contact LCC (OTC & NTD) and MCC on A/G 1

1: GNC GPC MEMORY	2: GNC 104 GND IMU CNTL/MON
3: GNC GPC MEMORY	

Install ASC Flip Cards
✓Cue Card positions

-2:10:00 (-3:00:00) **POST INGRESS SW RECONFIG**

ASP turns on RCS 1,2,3,4
DRIVERS (eight) (O14,O15,O16),
OMS ENG VLV (two) (O14,O16),
GPC OUTPUT 5 - B/U (O6)

NOTE
ASP doing C/W VOL adjust, expect MA

-1:57:00 (-2:47:00) **(DEU Equivalent)**

NOTE
IMU preflight align begins

-1:35:00 A (-2:25:00) **LCC ASTRO COMM CHECK**

LCC will contact all crew on A/G 1, A/G 2, ICOM A, ICOM B then A/A

A **MCC A/G VOICE CHECK**

B O5,O9

A/G 1 Voice Check
L,R AUD A/G 2 (two) - OFF
A/A (two) - OFF
Voice check with MCC

A/G 2 Voice Check
L,R AUD A/G 2 (two) - T/R
1 (two) - OFF
Voice check with MCC

A/A Voice Check
L,R AUD A/A (two) - T/R
A/G 2 (two) - OFF
Voice check with MCC

1: GNC GPC MEMORY	2: GNC 104 GND IMU CNTL/MON
3: GNC GPC MEMORY	

A O5,O9, Simo Voice Check (Launch Config)
R10, L,R AUD A/G 1 (two) - T/R
L9, 2 (two) - T/R
MO42F Voice check with MCC

NOTE
Side hatch closure

-1:10:00 C **CABIN LEAK CHECK**
(-2:00:00)

L2 CAB VENT ISOL - OP (tb-OP)
✓tb - CL

O1 ✓CAB PRESS - incr to 16.7 (MA)

NOTE
Flt crew functions from this point on will be initiated by a call from OTC to proceed. Flt crew will report back to OTC after completion

-45:00 C **CABIN VENT REDUNDANCY CONFIG**
(-1:35:00)

NOTE
Vent vlv operation may occur earlier or later at LCC direction

L2 CAB VENT ISOL - CL (tb-CL)
VENT - OP (tb-OP)

-40:00 C **CABIN VENT**
(-1:30:00)

L2 CAB VENT ISOL - OP (tb-OP)
(klaxon)
✓tb - OP
O1 ✓PRESS - decr

1: GNC GPC MEMORY	2: GNC 104 GND IMU CNTL/MON
3: GNC GPC MEMORY	

-32:00 C **PASS/BFS TRANSFER PREP**
(-1:22:00)

O6 ✓GPC MODE 5 - STBY (tb-RUN)
C3 ✓BFC CRT SEL - 3+1
DISP - ON

3: GNC BFS MEMORY

CRT3 PASS/BFS XFER ENA - ITEM 25 EXEC
✓ITEM 25 (*)

-30:00 C **OMS GN2 PRESS**
(-1:20:00)

C3 OMS ENG (two) - ARM/PRESS

P **WSB GN2 SUPPLY ACTIVATION**

R2 BLR N2 SPLY (three) - ON

-25:00 A **A/G VOICE CHECK**
(-1:15:00)

Simo Voice Check (Launch Config)
Voice check with MCC

Update Abort Winds Pad, ASC Flip Book, and ALTM, 1-10 (if reqd)

-22:00 C **PASS/BFS TRANSFER (DEU Equivalent)**
(-1:12:00) (ONE-SHOT TRANSFER)

CRT3 ✓ITEM 25 (no *)

3: BFS, SM SYS SUMM 1

CRT3,O1 Report cabin pressure (two) to OTC

3: BFS, GNC BFS MEMORY

NOTE
Vent vlv closure may occur earlier or later at LCC direction

C **CLOSE VENT VLVS**

L2 CAB VENT ISOL - CL (tb-CL)
VENT - CL (tb-CL)

1: GNC GPC MEMORY	2: GNC 104 GND IMU CNTL/MON
3: BFS, GNC BFS MEMORY	

NOTE
At T-20 there will be a planned 10-min hold

TRAJECTORY UPDATE
✓MCC for max rates and trajectory config, 8-5

-20:00 (-1:00:00) **OPS 1 LOAD (DEU Equivalent)**

1: GNC LAUNCH TRAJ	2: GNC LAUNCH TRAJ
1: GNC 0 GPC MEMORY	
1: GNC FAULT	

Report faults other than from unpwrd equipment

CRT1 GNC, SPEC 99 PRO

NOTE
Gnd-controlled Fuel Cell purge

-18:30 (-58:30) C **BFS TO OPS 1**

3: BFS, GNC FAULT

CRT3 GNC, SPEC 99 PRO
O6 GPC MODE 5 - RUN (tb-RUN)

CRT3 GNC, OPS 101 PRO

3: BFS, GNC LAUNCH TRAJ
3: BFS, GNC FAULT

Report faults other than from unpwrd equipment

CRT3 GNC, SPEC 99 PRO

1: GNC FAULT	2: GNC LAUNCH TRAJ
3: BFS, GNC FAULT	

	2: GNC 50 HORIZ SIT
3: BFS, GNC 50 HORIZ SIT	

-17:00 P **HORIZ SIT CONFIG**
(-57:00)

ALTM - ITEM 9 + [ ][ ].[ ][ ]

	PASS ITEM		BFS ITEM	
PTI	INH	✓1		
TAL SITE (MCC)	2(3,4)	✓40	2(3,4)	✓40
RTLS SITE	1	✓41	1	✓41
PRI (MCC)	KSC 15	✓3	KSC 15	✓3
SEC (MCC)	KSC 33	✓4	KSC 33	✓4
TAC	-59	✓5	-59	✓5
TAEM TGT				
G&N	OVHD	✓6	OVHD	✓6
HSI	blank		blank	
XEP	NEP	✓7	NEP	✓7
AIM	NOM (or CLSE)	✓8	NOM (or CLSE)	✓8
SPDBK	NOM	✓39		
TAC	INH	✓20	INH	✓20
DRAG H	AUT	✓22	AUT	✓22
ADTA H	INH	✓26	INH	✓26
ADTA TO G&C	INH	✓29	AUT	✓28
TAC	DELTA	✓35		
HUD	0	✓37		
	0	✓38		

1: GNC LAUNCH TRAJ	2: GNC SYS SUMM 1
3: BFS, GNC SYS SUMM 2	

C **CONFIG CONT ABORT YAW STEER**

CRT1 ITEM 5 [E][N][A]

1: GNC LAUNCH TRAJ	2: GNC SYS SUMM 1
3: BFS, GNC SYS SUMM 2	

-16:00 (-56:00) P **MPS He RECONFIG**

R2 MPS He ISOL A,B (six) - OP
PNEU He ISOL - OP

-15:00 (-55:00) **CONFIG OMS/RCS XFEED VLVS**

NOTE
OMS/RCS XFEED vlvs reconfigured for launch by LPS.

At T-9 there will be a planned 40-min hold

WEATHER UPDATE (if reqd)

Update Abort winds, RWY and ALTM setting

C CRT1 GPC/CRT 53 EXEC
C3 BFC CRT SEL: 2+3
CRT1 GPC/CRT 44 EXEC

Ignore possible 'I/O ERROR CRT 4' fault message

-9:00 **'GO FOR LAUNCH' (All)**

C2 EVENT TIMER - START
F7 ✓TIME ind - counting down

NOTE
GLS starts

-8:00 P **CONNECT ESS USES TO FC (GLS ✓ @ T-7:24)**

R1 ESS BUS SOURCE FC (three) - ON

-7:30

NOTE
Access arm retract

✓Seat in launch position
✓LES zippers and gloves
Cinch down shoulder harness and lap belt

3: BFS, LAUNCH TRAJ 1

2: BFS, SM SYS SUMM 2

-6:15 P **APU PRE START (GLS ✓ @ T-5:25)**

R2	✓BLR N2 SPLY (three)	- ON
	✓PWR (three)	- ON
	✓CNTLR/HTR (three)	- A
	✓APU AUTO SHUTDN (three)	- ENA
	CNTLR PWR (three)	- ON
	HYD MN PUMP PRESS (three)	- LO
	✓APU SPEED SEL (three)	- NORM
	✓OPER (three)	- OFF
	✓FUEL TK VLV (three)	- CL
	✓HYD CIRC PUMP (three)	- GPC
	✓cb APU FU TK VLV ENA (six)	- cl
	APU FUEL TK VLV (three)	- OP
	✓APU/HYD RDY tb (three)	- gray

* If any tb not gray, consult *
* LCC before continuing *

-5:00 P **APU START (GLS ✓ @ T-4:05)**

R2	APU OPER (three)	- START/RUN
F8	✓HYD PRESS ind (three)	- LO green
R2	✓APU/HYD RDY tb (three)	- bp
	HYD MN PUMP PRESS (three)	- NORM
F8	✓PRESS ind (three)	- HI green
R2	CIRC PUMP (three)	- OFF
F7	✓PRESS lt	- off

1: GNC SYS SUMM 1	2: BFS, GNC SYS SUMM 2
3: BFS, LAUNCH TRAJ 1	

C **HTR RECONFIG**

L2 FLASH EVAP FDLN HTR (two) - OFF

NOTE
Motion/Vibration may be felt in crew module due to Main Engine gmbl profile cks at -3:25 and move to start at -3:10

-2:30 P **CLEAR C/W MEMORY**

1: GNC FAULT
2: BFS, GNC FAULT

CRT2, CRT3 Verify no unexpected errors GNC, SPEC 99 PRO

1: GNC, SYS SUMM 1
2: BFS, GNC SYS SUMM 1

C3 C/W MEM - CLEAR

-2:00 A **SUIT PREP**

✓Tabs/visor - cl/LES O2 - ON

MS1 ICOM RCDR - ON (if reqd)

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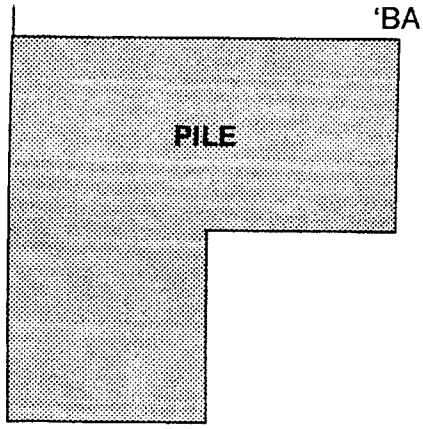
TOP
MOUNT ON LEFT SIDE OF BACKBOARD FACING
'BAILOUT MODE 8'



ASCENT FLIP BOOK (EMERGENCY EGRESS)

PRELAUNCH
MODE 1

- TABS - RELEASE
- VISOR - CLOSE / LOCK
- LES O2 - ON
- GREEN APPLE - PULL
- KNEEBOARDS - REMOVE
- COOLING - DISCONNECT
- RESTRAINT - RELEASE
- PARACHUTE (four) - RELEASE
- COMM - DISCONNECT
- LES O2 - DISCONNECT
- EGRESS SEAT
- SLIDEWIRE BASKETS

POST LANDING
MODE 5

- TABS - RELEASE
- VISOR - CLOSE / LOCK
- LES O2 - ON
- GREEN APPLE - PULL
- KNEEBOARDS - REMOVE
- COOLING - DISCONNECT
- RESTRAINT - RELEASE
- PARACHUTE (four) - RELEASE
- COMM - DISCONNECT
- (G-SUIT CLIP - PULL)
- LES O2 - DISCONNECT
- PLT - PWR DOWN
- EGRESS SEAT
- SLIDE/ESCAPE PANEL

HOOK

ASC

BAILOUT
MODE 8

REPORT POSITION
MACH < .95, OPS 305/603
SB - AUTO; BF - AUTO
FLY 185-195 KEAS, Φ = 0°
ABORT MODE - ATO
ABORT PBI - PUSH
P,R/Y - AUTO
FLT CNTLR PWR (two) - OFF

~50K FT

TABS - RELEASE
VISOR - CLOSE / LOCK
LES O2 - ON
GREEN APPLE - PULL

~40K FT

MS3 - VENT CABIN
CDR,PLT SEATS - LOWER
KNEEBOARDS - REMOVE
COOLING - DISCONNECT
RESTRAINT - RELEASE
D-RING - UNCOVER

~30K FT

MS3 - JETTISON HATCH
COMM - DISCONNECT
(G-SUIT CLIP - PULL)
LES O2 - DISCONNECT
EGRESS SEAT
POLE - DEPLOY
D-RING - HOOK UP
BAILOUT

TOP
BACK OF 'EMERGENCY EGRESS'

BAILOUT EGRESS

PILE

SYS FLIGHT RULES

	RTLS	TAL
OMS – 2 He TKs		
– 1 OX & 1 FU TKs (diff pods)		X
– 2 OX or 2 FU TKs		X
APU/HYD – 2 ↓ & 1 failing	X	X
CABIN LEAK – (–EQ dP/dT > .15)	X	X
CRYO – All O2(H2)	X	X
2 FREON LOOPS ↓ [Accum Qty (↓ and decr) and/or Flow (↓)]	X	X
2 MAIN BUSES ↓	X	
THERMAL WINDOW PANE	X	

NO COMM MODE BOUNDARIES

NEG RETURN (104)	**8100**
PRESS TO ATO (104)	**9500**
SE OPS 3 ZZA (109)	**11600**
SE ZZA (104)	**13300**
PRESS TO MECO (104)	**14600**
NEG BEN (104)	17900
SE PRESS (104)	**18000**
NEG MRN (104)	19700
LAST PRE MECO TAL	23000
LAST TAL	
INN	23900
FFA	24100
ZZA	25000
ESN	24800
KKI	25100
JDG	25200

2 ENG ZZA (104) 5800

ABORT TAL ZZA (4)

EO VI ☐
SE OPS 3 ZZA (109) (13) ☐
SE ZZA (104) (4) ☐

2 ENG MRN (104) 5700

ABORT TAL MRN (3)

EO VI ☐
SE OPS 3 MRN (109) (12) ☐
SE MRN (104) (3) ☐

2 ENG BEN (104) 5700

ABORT TAL BEN (2)

EO VI ☐
SE OPS 3 BEN (109) (11) ☐
SE BEN (104) (2) ☐

HOOK

ASCENT PROCEDURES

R180 LVLH

0.70M	✓$P_C \rightarrow$ 67%
1.42M	✓$P_C \rightarrow$ 104%

P_C < 50 + 5 s ✓SRB SEP (Backup AUTO SEP 2:21)

✓TMECO

* If NOT STABLE (10 sec): *
* NO COMM - CSS & MAN THROT *

OMS 1 TGTING

Close suit O2, open visor

3:00 ✓EVAP OUT (T < 60)

* If Systems ABORT reqd: *
* RTLS at 3:40 or *
* TAL Select prior to 23000 *
* Otherwise Manual MECO 23700 *
* If Man Throttle (3 eng): *
* Man Shutdn at 25750 *
* If 1 eng: *
* TRAJ ✓SERC ON *
* When MPS PRPLT = 2%: *
* MAN THROT, $P_C \rightarrow$ 67% *
* Man Shutdn at C/O mark *

MECO ✓V_I = 25873
MECO+18 s ✓ET SEP

* If 'SEP INH': *
* ET SEP - MAN *
* OPS 104 - PRO (✓BFS 104) *
* If Rates > .7, .7, .7: *
* | Null rates *
* | ET SEP - SEP *
* If Rates < .7, .7, .7: *
* Assume Feedline Fail *

MM104+25 If HA > 142:
+X xlation for 11 sec

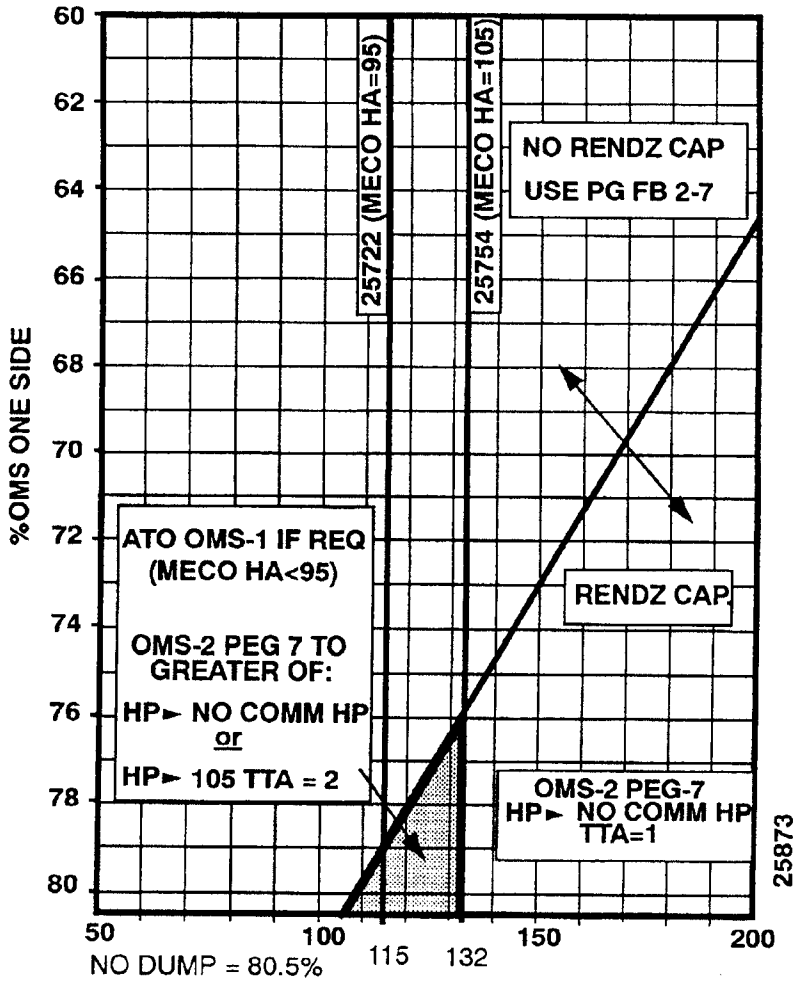
✓TGTS
✓ASC PKT for failures

If OMS 1 not reqd:
OMS ENG (two) - OFF
Go to POST OMS 1

PILE

ASC

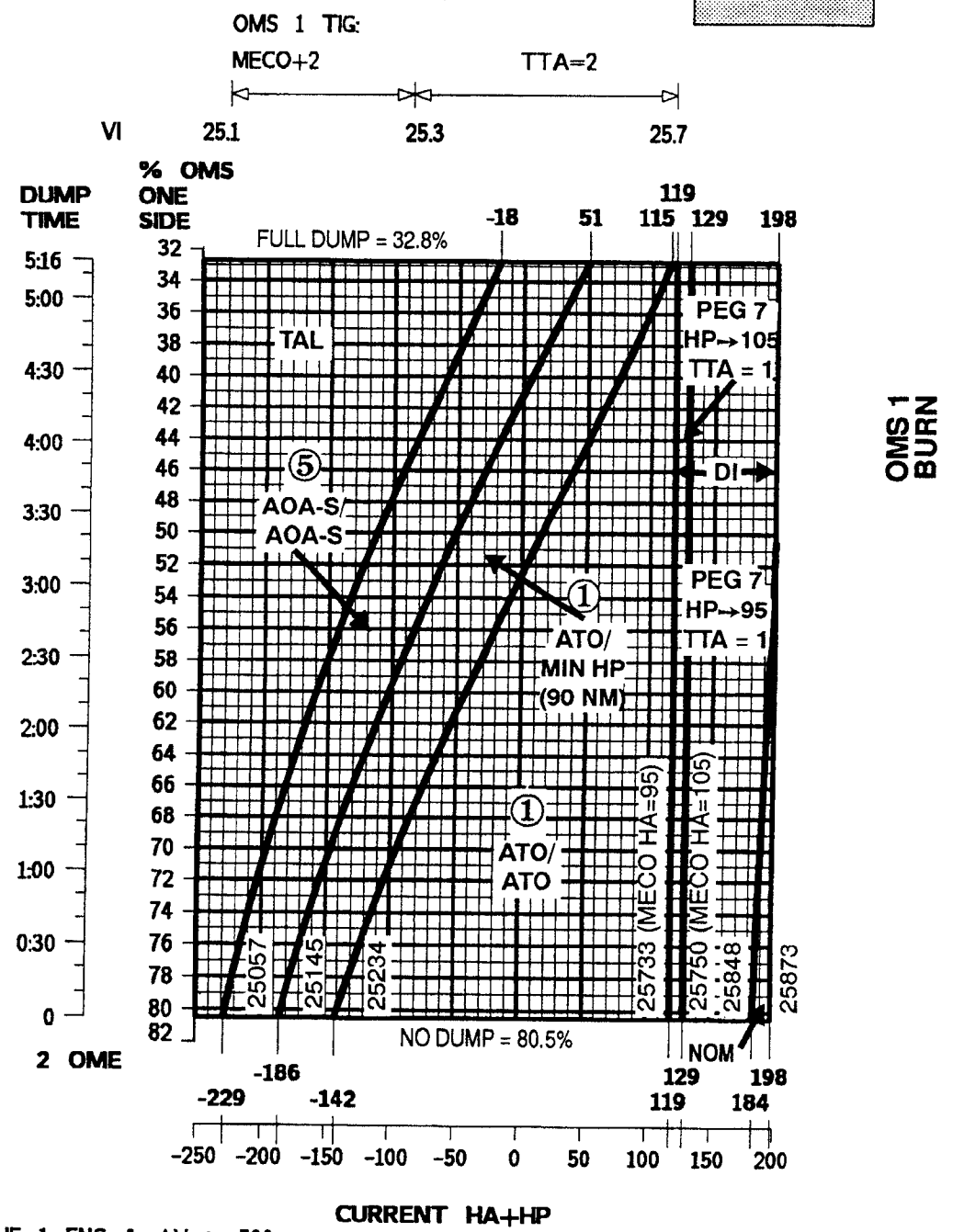
STS-086 FLT CY
OMS 1/2 TGTING
RENDEZVOUS RECOVERY



	PLANAR WINDOW	
	1	2
NOMINAL OMS-2 HT		
NO COMM OMS-2 HP		

STS-086 OCF CY
OMS 1/2 TGTING

HOOK



IF 1 ENG & ΔV > 500 :
1 OMS + FAILED OMS INTERCONNECTED TO RCS THC +X

PILE

OMS 1 BURN

OMS 1 TGTING

IF TIG LATER THAN MECO + 6 min:
MECO + 4 min: ✓BDY FLP pb - lt off
(MPS dump complete)
✓MCC for APU Shutdn (if time permits)

FEEDLINE FAIL:
If TIG > MECO + 6 min:
TIG - 1:30 or MECO + 6 min (whichever comes first):
ET SEP - SEP >>
If TIG < MECO + 6 min:
MPS PRPLT DUMP SEQ - STOP
TIG -1:30: ET SEP - SEP
Post ET SEP -Z xlation:
MPS PRPLT DUMP SEQ - GPC

MNVR - BURN ATT (✓INRTL)
✓CNTLR PWR (two) - ON
DAP - AUTO/DISC
✓OMS ENG (two) - ARM/PRESS
Note ΔVTOT ____ ____ ____ TIG [ ][ ] : [ ][ ]
-:15 EXEC
:00 TIG; start watch (✓P_C, ΔVTOT, ENG VLVs)

OMS PRPLT FAIL:
Failed ENG - OFF
XFEED (two) - CL
TK ISOL (two) - CL
He PRESS (two) - CL

OMS ENG FAIL:
Failed ENG - OFF
If ΔV < 500, OMS XFEED at
If ΔV > 500:
Interconnect failed OMS to RCS THC +X (stop when QTY = 3%) 1/2 of ΔVTOT at FAIL

RCS COMPLETION:
Interconnect to either OMS that was ENG FAIL
THC +X (OMS% vs RCS ΔV)
OMS TK SW (if reqd)

CUTOFF
+:02 OMS ENG (two) - OFF
Trim inplane X,Z residuals < 2 fps

HOOK

OMS 1 BURN MONITOR

OMS Pc LOW OMS ↓ and ENG VLV 1 or 2 < 70%	OMS ENG FAIL
OMS ↓ and ENG VLV 1 & 2 > 70% and OX IN P > 227	OMS ENG FAIL
P ≤ 227	OMS PRPLT FAIL
No OMS ↓	SENSOR FAIL
OMS TEMP L R FU IN P ≥ 227 230	OMS ENG FAIL
P ≤ 209 214	OMS PRPLT FAIL
P 210-226 215-229	SENSOR FAIL
OMS OX/FU TK P (✓ENG IN P) OX & FU LOW	He PRESS/VAP ISOL (two) - OP If TK P no incr: OMS PRPLT FAIL
OX LOW	Burn to OMS ↓, then OMS PRPLT FAIL
FU LOW	He PRESS/VAP ISOL (two) - CL Burn to OMS ↓, then OMS PRPLT FAIL
OX & FU HIGH	Cycle He to maint OMS TK P 234-284 Cycle He A(B) to isolate failed leg
OMS He TK P LOW (✓CRT & meter) P > 640 & QTY > 41%	✓Leaking OMS TK ISOL (two) - OP ✓He PRESS/VAP ISOL (two) - OP L,R OMS XFEED (four) - OP Good OMS TK ISOL (two) - CL He PRESS/VAP ISOL (two) - CL When P < 640 or QTY ≤ 41%, continue
P < 640 or QTY ≤ 41%	✓Good OMS TK ISOL (two) - OP ✓He PRESS/VAP ISOL (two) - OP L,R OMS XFEED (four) - OP Failed OMS TK ISOL (two) - CL He PRESS/VAP ISOL (two) - CL
N2 REG P HIGH or LOW	OMS ENG - ARM
N2 TK P LOW (✓CRT & meter)	When N2 TK P < 470: OMS ENG - ARM
OMS GMBL 1st FAIL	Select SEC GMBL (twice)
2nd FAIL	If control problems or high RCS fuel usage: OMS ENG FAIL
GPC1(4)	GPC1(4) MODE - STBY,HALT FF1(4) - OFF,ON L(R) OMS GMBLs - sel SEC
FA1(4)	L(R) OMS GMBLs - sel SEC

OMS 2 TGTING

TOP
BACK OF 'OMS 1 BURN MONITOR'

PILE

OMS 1 BURN

OMS 2 TARGETING
(DIR INSERTION)

FAILURE	OMS 2 TARGET
OMS – 2 N2 TKs (Perform burn Single OMS Eng)	NOM
OMS – 2 OMS ENGs – 1 He TK – 1 PRPLT TK – 2 He TKs EPS – MNA & B, MNB & C MNA & C ET SEP	PEG 7; TTA = 1 CUTOFF HP = 90
OMS – 1 OX & 1 FU TK diff PODs – 2 OX or 2 FU Tks	AOA–S
2 FREON LOOPS [Accum Qty (↓ and decr) and/or Flow (↓)] 2 H2O LOOPS CABIN LEAK (–EQ dP/dT ≥ .08)	AOA
APU/HYD – 2 ↓ & 1 failing	AOA
CRYO – All O2(H2)	AOA

OMS

He	%	He	%
4800	80.1	3200	40
4800	80	2800	30
4400	70	2400	20
4000	60	2000	10
3600	50	1600	0

ATO

HOOK

NOTE

These tables apply only after ATO OMS 1 burn
(ITGT = (1), AOA to [KSC]). Assumes OMS and ARCS deorbit

DUAL POD - OMS REQUIRED
Includes 8.5 % Unusable (4.3 % per pod)

POST OMS 1 HP	ATO OMS 2 & STEEP D/O BURN (%)	MIN HP OMS 2 & SHALLOW D/O BURN (%)	AOA STEEP D/O BURN (%)	AOA SHALLOW D/O BURN (%)
95	39.3	21.0	41.0	25.0
90	40.9	19.4	39.2	22.6
85	42.8	19.1	37.1	20.2
80	44.9	21.2	34.4	17.3
75	46.7	24.1	31.6	14.7
70	47.8	25.0	29.6	12.8
65	48.7	26.4	28.8	10.9
60	49.3	27.5	29.3	9.2
55	50.0	28.6	28.6	8.5
50	---	29.7	28.1	8.5

STS-086 OCF CY

SINGLE POD - OMS REQUIRED
Includes 4.3 % Unusable

POST OMS 1 HP	ATO OMS 2 & STEEP D/O BURN (%)	MIN HP OMS 2 & SHALLOW D/O BURN (%)	AOA STEEP D/O BURN (%)	AOA SHALLOW D/O BURN (%)
95	35.0	16.7	36.7	20.7
90	36.7	15.1	34.9	18.4
85	38.5	14.9	32.8	15.9
80	40.6	16.9	30.2	13.1
75	42.4	19.9	27.3	10.4
70	43.5	20.7	25.3	8.6
65	44.5	22.1	24.6	6.7
60	45.1	23.2	25.1	5.0
55	45.8	24.3	24.4	4.3
50	---	25.5	23.9	4.3

RTLS

ΔV AVAILABLE FOR OMS 2

OMS: 5 FPS/% PER POD
LIFTOFF BLDN PER POD [69]
MIXED XFD [69]
MAX BLDN (39%) PER POD [196]

AFT RCS: TO AFT QTY 1 1 [48] Rev 3
2 [104] Rev 3

FWD RCS: [73] (AVAIL FOR UPHILL IF HP ≥ 70)

TOP
BACK OF 'ATO'

PILE

RTLS CDR

Abort initiated:
After 2:30 (2 eng)
At 3:40 (3 eng)

ABORT RTLS

* No joy: *
* OPS 601 PRO *

✓GUIDANCE STATUS on RTLS TRAJ
Expect PPA when GUID % to go = 0

* If GUID 'INHB': *
* ✓UNCONVERGED GUID TABLE *
* MAN PPA per PRPLT *
* REMAINING *
* After GUID CONVERGE: *
* P,R/Y AUTO/AUTO THROTTLE *

After PPA: ✓BFS ITEM 1 (*)

✓Bugs, V_{rel}, Waypoint 1

Pitchdn (β = 0°, α = −2°)

WINDS	
50K	/
38	/
28	/
20	/
12	/
7	/
SURF	/
SPDBK @ 3000 FT	

MECO **MECO**

ET SEP (MECO + 14 sec)
✓MM602 (α > 10° and SEP + 10 sec)
✓P,R/Y, SPDBK, BDY FLP - AUTO
α = 50° until ~1.8g, maintain 2.2g
Adjust seat
If reqd, reconfig CRTs for entry

$\dot{H}$ > −320 ✓α vs Mach
V = 5 AIR DATA PROBES (two) - Deploy (✓Heat)
✓RUD, AIL TRIM
M = 3.2 ✓SPDBK → 65%
M = 2.7 L HUD PWR - ON
TRIM PANEL - OFF
RHC/PNL - ENABLE

* If M < 2.5, P CSS for ADTA to G&C incorp *

M = 2.0 Ensure ADTA to G&C else THETA limits
M = 0.9 P,R/Y - CSS, ✓SPDBK CMD vs POS
✓NWS - 1
Lock Inertia Reels

POST LANDING: ENT, POST LDG

OMS 2 TGTING

HOOK

RTLS PLT

If CSS: MAN THROT
Man MECO
✓P_C = 104% (2 eng)/69% (3 eng)
✓DUMP

UNCONVERGED GUIDANCE TABLE

ENG OUT	OUTBOUND INITIAL θ	PITCHAROUND at % (8°/sec)	FLYBACK INITIAL θ
Liftoff	60°	44%	64°
:30	56°	47%	63°
1:00	57°	47%	63°
:30	56°	48%	62°
2:00	49°	51%	61°
:30	42°	51%	52°
3:00	38°	52%	50°
:30	34°	53%	48°
4:00	Last RTLS	52%	46°

✓P_C at PPA + 20 sec

* If P_C = 104% (2 eng): *
* G51 MAX THROT - ITEM 4 *

Pitchdn: ✓$P_C \rightarrow$ 67%

MECO **MECO**

KEAS = 77 ✓SPDBK → 81%
✓ET DOORS - Closed and latched (MECO +1:30)
✓ET SEP, SRB SEP - AUTO
Adjust seat
✓TACANS, INCORPORATE
* If KSC TACAN Fail: *
* TACAN Ch 97X (COF), ITEM 5 EXEC *
G51 ✓AIR DATA, INCORPORATE
MM603 HYD MPS/TVC ISOL VLV (three) - CL
(hold 5 sec) ✓tb - CL
H = 85K MLS (three) - ON
If Rwy 33(15): MLS CH (three) - 6(8)
I/O RESET
M = 2.7 R HUD PWR - ON
TRIM PANEL - OFF
RHC/PNL - ENA
M = 0.9 ✓R FLT CNTLR PWR - ON
Lock Inertia Reels
M = 0.7 ✓LG EXTEND ISOL VLV - OP
H = 10K ✓BDY FLP - TRAIL
LES Visors - Down
POST LANDING: ENT, POST LDG

TAL

TAL PLT

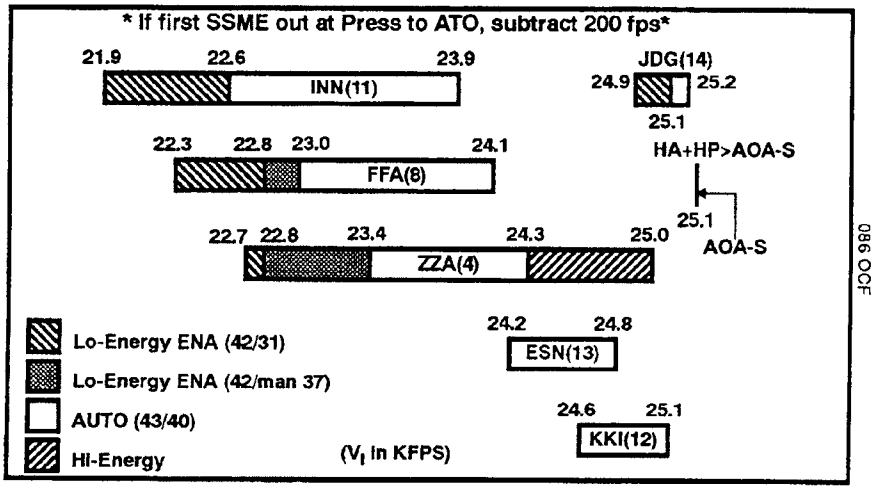
HOOK

✓OMS DUMP

```
* If second eng fail:                          *
*  G51 MAX THROT (if reqd)                     *
*       DUMP ARM, START                        *
*  If OMS He PRESS < 2K: DUMP STOP             *
*  Failed ME SHUTDN pb (two) - push            *
*  When MPS PRPLT = 2%:                        *
*     MAN THROT, Pc → 67%                      *
*     Man Shutdn at C/O mark                   *
```

✓AUTO THROT

MECO — BFS - C/O BUG (V_I ~24.0K) — **MECO**



MM304

✓OMS DUMP
✓ET DOORS - Closed and latched (MM304 +1:30)

V = 19 — HYD MPS/TVC ISOL VLV (three) - CL
(hold 5 sec) ✓tb - CL

V = 10

```
* If RCS < 48 % either side:                  *
*  G51 AFT RCS INH, ITEM 13 EXEC              *
```

V = 7 — MLS (three) - ON (✓channels)
I/O RESET
Go to ENTRY MANEUVERS (Cue Card)

HI-ENER TAL

PILE

HIGH-ENERGY TAL CDR

MM104 G51 ABORT TAL
Pull at 2°/sec to θ ~305
P, R/Y - CSS (hold pbs until MM304)

MM304

Check VREL

VREL	ALPHA	ROLL
VREL ≥ 23,800	80° (θ = 280°)	180°
23,300 ≤ VREL < 23,800	55°	180°
VREL < 23,300	55°	0°

$\dot{H}$ = -200 ↓ If Alpha = 80°, push to Alpha = 55°

$\dot{H}$ = -700 ↓ Roll Heads Up

$\dot{H}$ = -500 ↑ R/Y - AUTO (Ensure AUTO rolls towards site, limit roll to 90°)

Monitor TRAJ display:
When orbiter bug below thermal line and commanded drag < 40:
Pitch down at 0.5°/sec to Alpha Hi
When orbiter bug nominal or VREL < 15,000:
Center pitch needle, P - AUTO

V = 6 If energy still high:
Pitch down at 1°/sec to Alpha Hi

Go to ENTRY MANEUVERS (Cue Card)

TAL

HIGH-ENERGY TAL PLT

HOOK

ECAL

MM104 When CDR holds P, R/Y CSS:
PASS, OPS 301 PRO (✓304)

MM304

G51 OMS DUMP ARM, START
Monitor RCS: When < 50% either side:
G51 OMS DUMP STOP

BFS, OPS 301 PRO (✓304)
G50 ✓SITE, RWY, TACAN, SPDBK, ALT
(PASS/BFS)

✓BUGS, HDG, RANGE

Active Guid:

* If Commanded Drag (←) ≥ ZZA 35., *
* G50 Reselect ESN 03 (Site 13, secondary) *

✓ET DOORS - closed and latched
(MM304 +1:30)

V = 19 HYD MPS/TVC ISOL VLV (three) - CL
(hold 5 sec)✓tb - CL

V = 10

* If RCS < 48 % either side: *
* G51 AFT RCS INH, ITEM 13 EXEC *

V = 10 ✓SPDBK → 81%

V = 7 MLS (three) - ON (✓channels)
I/O RESET

Go to ENTRY MANEUVERS (Cue Card)

HI-ENER TAL

PILE

POWERED ECAL

G51 MAX THROT

✓ADI (two) - REF
✓θREF → 60°, Yaw → 45°
✓Roll to Heads Up

G50 Select TARGET and TACAN

When EAS > 4 and incr:
✓Yaw to course pointer
✓Pitch down at 4°/sec
✓MECO, ET SEP

ET SEP
+ 8s:

CSS, pull to $\alpha = 58°$, AUTO
✓MM602 (BFS, OPS 602 PRO)

Go to ECAL ENTRY

2 E/O ECAL (51.6 deg)

VELOCITY (Vi)	SITE	LOCATION	RWY	TACANS
*6.5–6.8 6.8–7.6 6.3 - PPA(RTLS)	5	CHERRY POINT	NKT 32L NKT 23R	NKT 75 ILM 117
*7.6–9.0	6	OCEANA	NTU 23L NTU 05R	NTU 113 NGU 48
*9.0–10.7 10.7–12.7	7	OTIS	FMH 32 FMH 14	FMH 105 LFV 94
*11.7–12.7	8	PEASE	PSM 34	PSM 112

*Probable bailout region

3 E/O ECAL (51.6 deg)

VEL (Vrel)	SITE	LOCATION	RWY	TACANS
14.2–16.0 16.1–16.9	9 9 (secondary)	HALIFAX INT'L ST. JOHN'S	YHZ 24 YYT 29	UAW 38 UYT 23
16.2–18.0 16.4–19.0	10 10 (secondary)	GANDER STEPHENVILLE	YQX 04 YJT 10	YQX 74 YJT 78

HOOK

ECAL ENTRY

✓BF SET - AUTO

RHC/PNL TRIM - ENA
If M < 5, ✓AIL/RUD TRIM
If M > 3.5, expect α = 58°

At $\dot{H}$ = -600: CSS R/Y,
Bank 2 x ΔAZ (70° max)

ABORT DUMPS

✓E/W bug on Vert Sit:
If ≥ 1/2 scale, suspect high energy
If ≤ 1/3 scale, suspect nominal to low energy

Confirm energy with $\dot{H}$, range, Δ AZ, & E/W bug trends

If reqd, reconfig CRTs for entry

High Energy	Low Energy
Bank 70° toward site (-500 to -900 max -$\dot{H}$)	When ΔAZ < 10°:
When E/W bug drops or 30° ΔAZ past site:	CSS pitch
Reverse/shallow bank to 2xΔAZ	Fly α = 31° or LO
Put primary bearing pointer on nose	

Maintain NZ < 2.5g after first pullout

When nominal energy and phugoiding complete:
Fly Href
Reverse bank at 17.5° ΔAZ
Keep E/W bug ~1/2 scale

G50 ✓TACANS, INCORPORATE

At NZ < 2g: M ≤ 5, ADTA PROBES - Deploy

When M = 3.2: OPS 603 PRO
P,R/Y AUTO

✓Air Data
G50 Incorp Air Data ASAP
✓SPDBK, SHORT FIELD (ITEM 39) if reqd

Select UHF-G T/R

NO COMM ECAL LNDG CRITERIA

@H = 70K, ✓Range

* If Range < 28 or Range > 54:
* R/Y CSS
* Bank (≤ 30°) to HDG 120°
* Go to BAILOUT

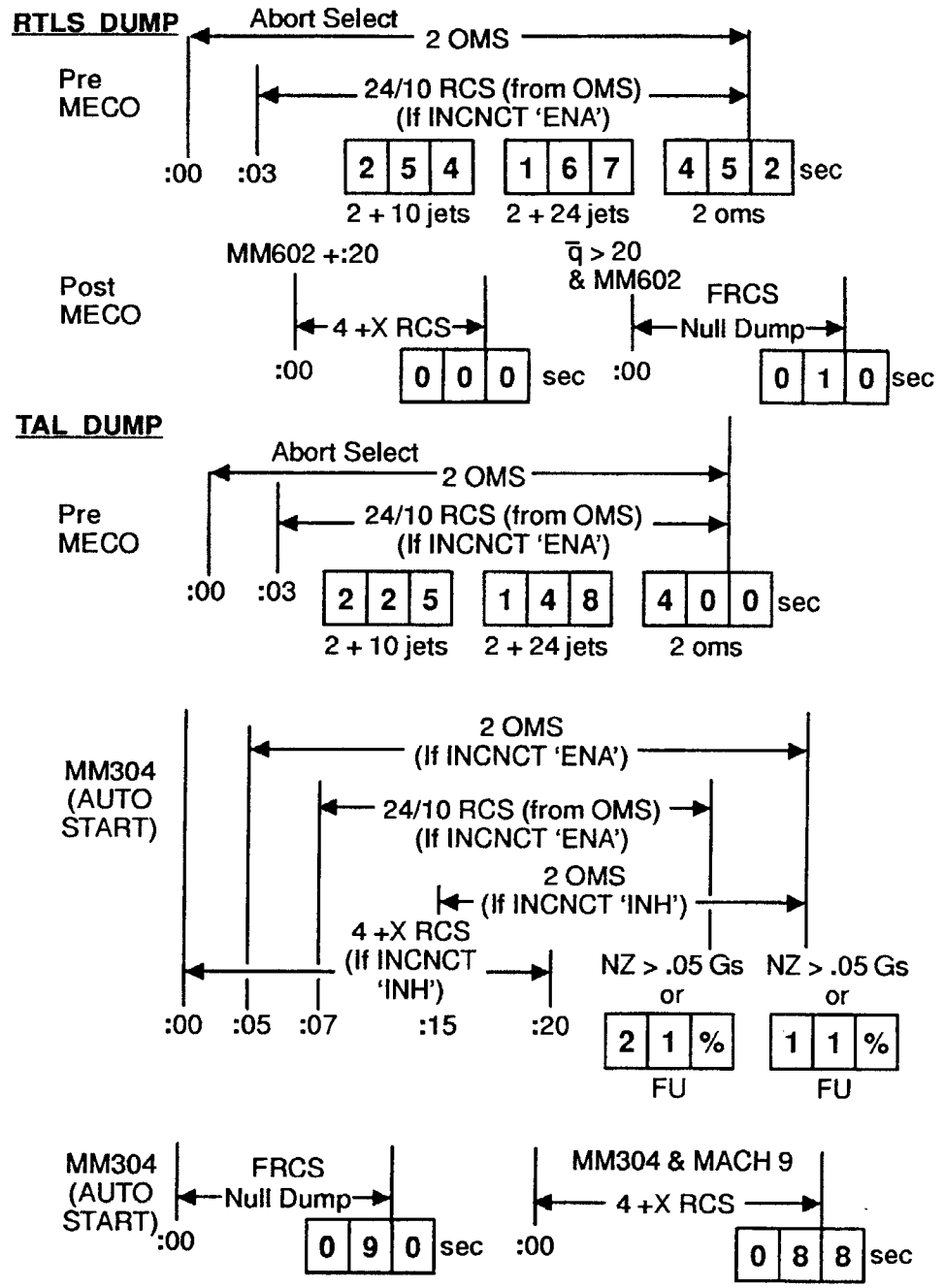
Go to RTLS (POST-MECO) or BAILOUT

TOP
BACK OF 'ECAL ENTRY'

ECAL

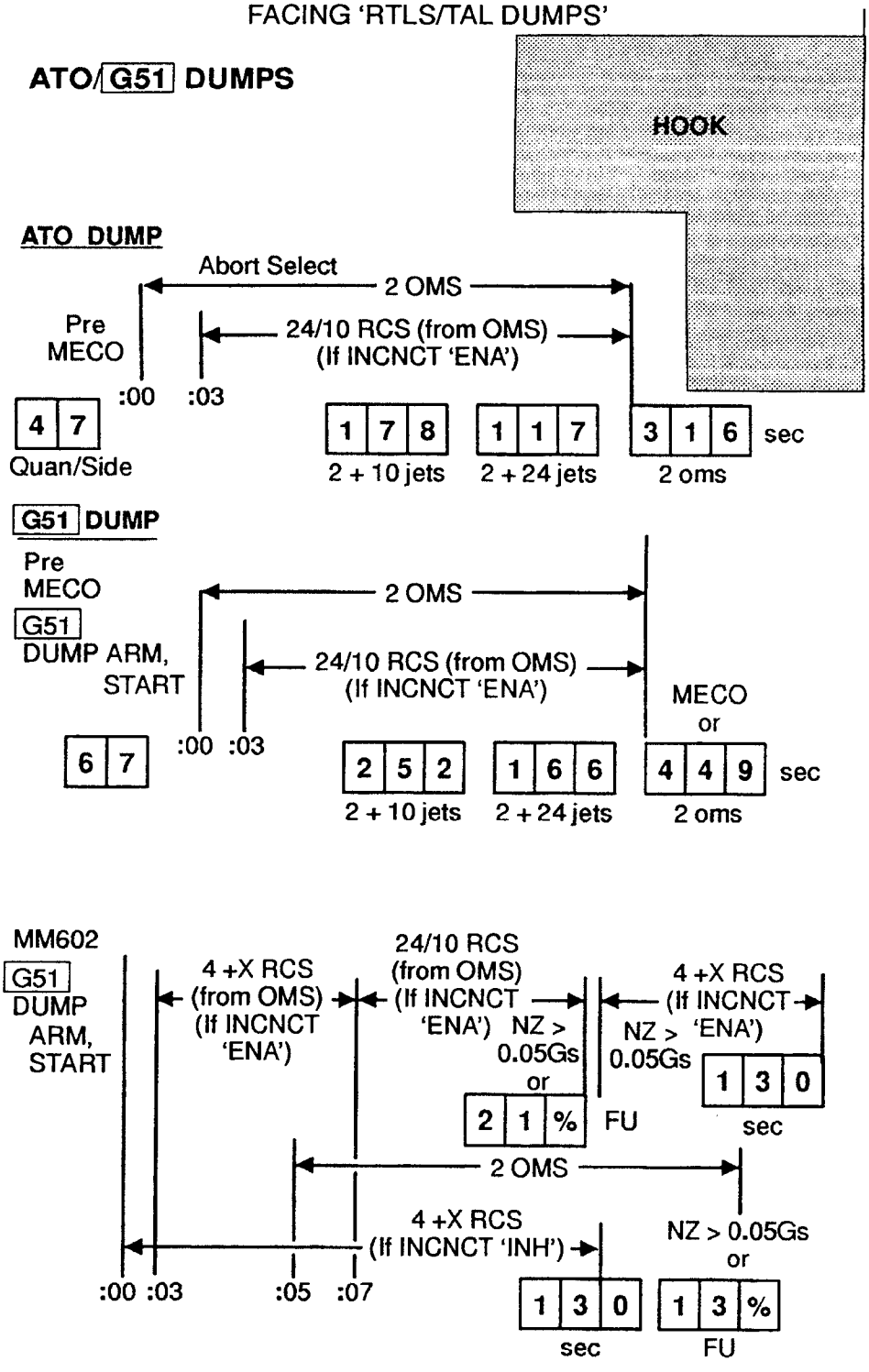
PILE

RTLS/TAL DUMPS



TAB TITLE REMOVED FROM THIS PAGE ONLY
TOP
MOUNT ON RIGHT SIDE OF BACKBOARD
FACING 'RTLS/TAL DUMPS'

ATO/G51 DUMPS

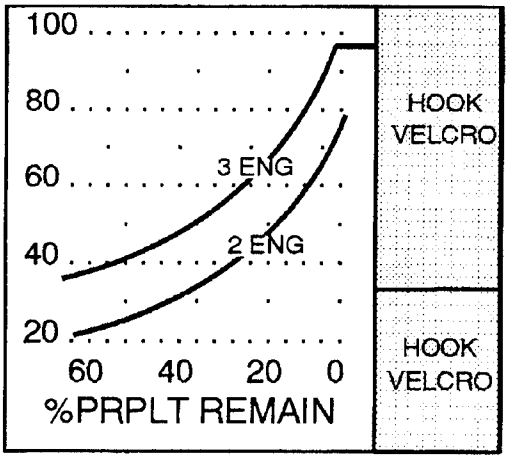


ASC CUE CARDS

ASCENT ADI - NOMINAL

TIME	θ	$\dot{H}$	H
0:30	70	683	10K
0:50	62	1001	27K
1:10	54	1404	50K
1:30	40	1890	84K
1:50	32	2210	125K

(86 OCF CY)



-STAGING-

V_I	θ	$\dot{H}$	H
6	21	1626	39 nm
7	18	1215	48
8	15	898	53
9	12	644	57
10	10	435	59
12	6	129	61
14	3	-64	62
16	1	-160	61
18	-1	-177	61
20	-2	-123	60
22	-2	-26	60
24	-3	103	60
25873	-1	272	61

ASC-14a/86/A/A

ENTRY ALPHA

VR	αref	R	H	Href	Rref
25	40	4464	400		
24	HI 40 LO	2583	245	-47	R80
23	43 40 37	2130	236	-64	71
22	43 40 37	1772	230	-85	65
21	43 40 37	1496	224	-108	63
20	43 40 37	1278	217	-126	62
19	43 40 37	1107	210	-149	62
18	43 40 37	969	204	-173	63
17	43 40 37	856	201	-194	L63
16	43 40 37	764	193	-200	64

KSC 15

MAX L/D	
M	α
3	17
2	15
1	12

(86 OCF CY)

HOOK VELCRO

ASC-14b/86/A,E/A

HOOK VELCRO

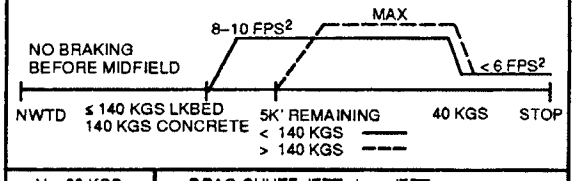
HOOK VELCRO

15	43 40 37	687	186	-118	64	
14	43 40 37	615	181	-126	63	
13	43 40 37	547	178	-136	61	
12	43 40 37	484	173	-152	59	
11	43 40 37	426	168	-195	57	
10	41 38 35	373	162	-174	52	
9	39 36 33	325	157	-207		R47
8	37 34 31	276	152	-240		39
7	33 30 27	228	143	-266		39
6	30 27 24	184	131	-272		40
5	26 23 20	142	118	-274		42
4	23 20 18	106	105	-265	L40	
3	19 16 15	74	90	-247	35	
2.5	13	60	82	-301		
2	13	50	76	-263		
1.5	11	39	68	-312		
1	11	29	56	-261		

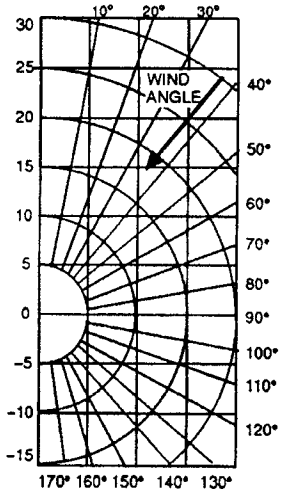
ENTRY MANEUVERS

FLIGHT CONDITIONS	MANEUVER
EI-5	✓LVLH ATT GNC, OPS 304 PRO * If PREBANK, R/Y - CSS * * Roll at 1°/sec to ☐☐☐ * * Maintain PREBANK ± 5° * If previous OMS OX TK or He TK or RCS OX TK leak: [G51] VENT DOORS - OP PTI - ENA at EI-5 when applicable
$\bar{q}$ = 1	(AOA) HYD MN PUMP PRESS (three) - NORM
'Guidance Box' @ $\bar{q}$ ~8 or D ~3	CLOSED LOOP GUIDANCE ____:____:____ * If PREBANK: P,R/Y - AUTO *
D = 11	✓DRAG H (FORCE if editing)
V = 19K	✓MPS/TVC ISOL VLV - CL
V = 15K	✓NAVAIDS (I/O RESET if reqd) * If ELS: UHF MODE - G T/R *
V = 12K	RAD BYP VLV MODE (two) - AUTO CNTLR LOOP (two) - AUTO B(A) * If no YAW JET, begin lateral trim * * monitoring *
V = 10K	✓SPDBK to 81% * If three yaw jets failed on same side: * * Perform remaining roll reversals in * * R/Y - CSS *
ΔAz = 10.5°	FIRST ROLL REVERSAL ☐☐☐☐☐

ENT-6a/E/J

FLIGHT CONDITIONS	MANEUVER
V = 7K	✓TACAN status
V = 5K	ADTA PROBES – DEPLOY (✓HEAT) Begin AIL and RUD trim monitoring
M = 2.7	✓APUs HUD PWR (two) – ON TRIM PANEL (two) – OFF RHC/PNL (two) – ENA
* If M < 2.5; P CSS for ADTA to G&C incorp *	
M = 2.0	Ensure ADTA to G&C else ✓Theta limits
M = 0.9	P, R/Y – CSS as reqd ✓SPDBK CMD vs POS ✓R FLT CNTLR – ON ✓NWS – 1 Lock Inertia Reels MAX N_Z [ ] . [ ]
M = 0.7	✓LG EXTEND ISOL VLV – OP
h = 15K	✓MLS
h = 10K	✓A/L, TABS/VISORS – CL/LES O2 – ON (KSC)
MAIN GEAR TD	✓SPDBK – 100%
DEROT INIT	DRAG CHUTE pb (two) – ARM,DPY (simo)
NOSE GEAR TD	SRB SEP – MAN/AUTO and depress pb ✓Auto Load Relief ✓HYD BRAKE ISOL VLV (three) – OP
	
V = 60 KGS	DRAG CHUTE JETT pb – JETT
STOP	Go to ENT C/L, POST LANDING PROCEDURES

ORBITER XWIND LIMITS

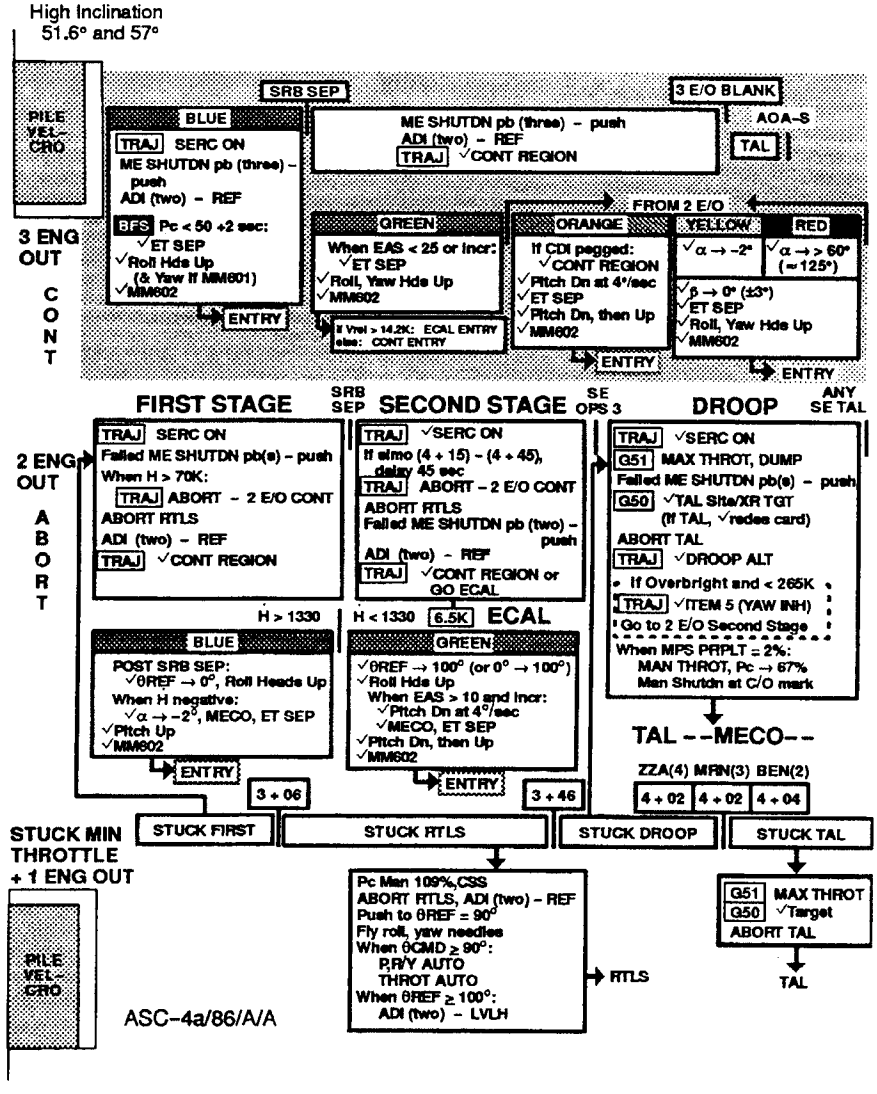


Enter chart using max Gust Velocity

50K	/
38K	/
28K	/
20K	/
12K	/
7K	/
SURF	/

ENT-6b/E/M

CONTINGENCY ABORT



CONTINGENCY ABORT

PILE VEL-CRO

ENTRY/MM602

Before NZ Hold
RHC/PNL TRIM - ENA
If M < 5,
✓AIL/RUD TRIM
If M < 3, S/B = 65%

BF SET - AUTO

If M > 3.5, expect $\alpha = 58^{\circ}$

After NZ Hold (NZ < 2g)
M ≤ 5, ADTA PROBES - Deploy
Monitor - M/α

M	> 12	9	6	3	.95
α	40	35	26	18	12

✓Air Data

G50 Incorp Air Data ASAP

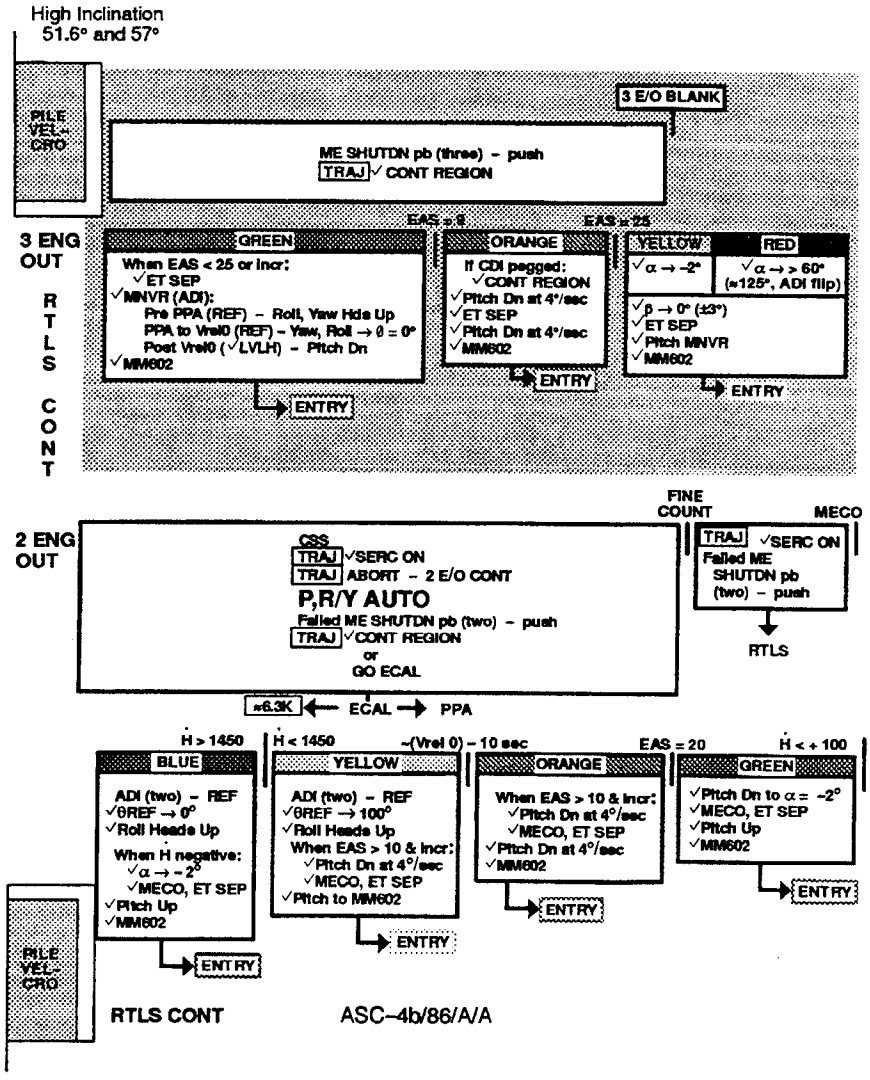
Select UHF-G T/R
M = 1: ✓EAS and θ

BAILOUT
When M = .95:
P,R/Y CSS
OPS 603 PRO

Go to BAILOUT

ASC-4a/86/A/A

RTLS CONTINGENCY



RTLS CONT

ENTRY/MM602

PILE VEL-CRO

Before NZ Hold
RHC/PNL TRIM - ENA
✓AIL/RUD TRIM

If M < 3, S/B = 65%

BF SET - AUTO

If M > 3.5, expect $\alpha = 58°$

After NZ Hold (NZ < 2g)
M ≤ 5, ADTA PROBES - Deploy
Monitor - M/α

M	> 8	6	4	2	.95
α	32	26	20	15	12

✓Air Data
G50 Incorp Air Data ASAP

Select UHF-G T/R
M = 1: ✓EAS and θ

BAILOUT
When M = .95:
P,R/Y CSS
OPS 603 PRO

Go to BAILOUT

ASC-4b/86/A/A

$\dot{H}$ > + 100

RED

✓$\dot{H} \rightarrow$ + 400 (θmax = 75°)
TRAJ AT FINE COUNT:
✓Pitch Dn to $\alpha = -2°$
✓MECO, ET SEP
✓Pitch Up
✓MM602

RTLS

PILE VEL-CRO

ZZA TAL REDESIGNATION
(86 OCF CYC)

1st E.O. VI		5800	5900	6000	6100	6200	6300	6400
SE OPS 3 ZZA 109	(14)	10900	10900	11000	11000	11000	11100	11100
SE ZZA 104	(4)	17700	17500	17200	16900	16700	16400	16100

1st E.O. VI		6500	6600	6700	6800	6900	7000	7100
SE OPS 3 ZZA 109	(14)	11200	11200	11200	11300	11300	11300	11400
SE ZZA 104	(4)	15900	15600	15400	15100	14900	14700	14500

1st E.O. VI		7200	7300	7400	7500	7600	7700	7800
SE OPS 3 ZZA 109	(14)	11400	11400	11400	11400	11500	11500	11500
SE ZZA 104	(4)	14300	14100	14000	13800	13700	13700	13600

1st E.O. VI		7900	8000	8100	8200	8300	8400	8500
SE OPS 3 ZZA 109	(14)	11500	11500	11500	11500	11500	11500	11500
SE ZZA 104	(4)	13500	13500	13500	13500	13500	13500	13500

1st E.O. VI		8600	8700	8800	8900	9000	9100	9200
SE OPS 3 ZZA 109	(14)	11500	11500	11500	11500	11500	11500	11500
SE ZZA 104	(4)	13500	13500	13500	13500	13500	13500	13500

1st E.O. VI		9300	9400	9500
SE OPS 3 ZZA 109	(14)	11500	11500	11500
SE ZZA 104	(4)	13500	13500	13500

ASC-9a/86/A/A

ECAL – ZZA or MRN PRIME TAL

1ST E.O. TIME		2:40	2:50	3:00	3:10	3:20
CHERRY PT	(5)	3:45 – 4:25	3:35 – 4:15	3:30 – 4:10	3:25 – 4:05	3:20 – 4:00
OTIS	(7)	7:00 – 7:20	6:50 – 7:15	6:40 – 7:10	6:30 – 7:05	6:20 – 7:00

1ST E.O. TIME		3:30	3:40	3:50	4:00	4:10
CHERRY PT	(5)	3:30 – 3:55	3:40 – 3:50	- - - -	- - - -	- - - -
OTIS	(7)	6:10 – 6:50	6:00 – 6:45	5:50 – 6:40	5:45 – 6:35	5:40– 6:30

1ST E.O. TIME		4:20	4:30	4:40	4:50	5:00
CHERRY PT	(5)	- - - -	- - - -	- - - -	- - - -	- - - -
OTIS	(7)	5:30 – 6:25	5:25 – 6:20	5:20 – 6:15	5:15– 6:10	5:10– 6:10

1ST E.O. TIME		5:10	5:20	5:30	5:40	5:50
CHERRY PT	(5)	- - - -	- - - -	- - - -	- - - -	- - - -
OTIS	(7)	5:10 – 6:05	5:20 –6:00	5:30 – 6:00	5:40 – 5:50	5:50

ASC–9b/86/A/A

MRN TAL REDESIGNATION
(86 OCF CYC)

1st E.O. VI		5700	5800	5900	6000	6100	6200	6300
SE OPS 3 MRN 109	(13)	10800	10800	10900	10900	11000	11000	11000
SE MRN 104	(3)	17300	17100	16900	16600	16400	16200	15900

1st E.O. VI		6400	6500	6600	6700	6800	6900	7000
SE OPS 3 MRN 109	(13)	11100	11100	11200	11200	11200	11300	11300
SE MRN 104	(3)	15700	15400	15200	15000	14800	14600	14400

1st E.O. VI		7100	7200	7300	7400	7500	7600	7700
SE OPS 3 MRN 109	(13)	11300	11400	11400	11400	11400	11500	11500
SE MRN 104	(3)	14200	14000	13900	13800	13700	13600	13500

1st E.O. VI		7800	7900	8000	8100	8200	8300	8400
SE OPS 3 MRN 109	(13)	11500	11500	11500	11500	11500	11500	11500
SE MRN 104	(3)	13500	13400	13400	13400	13400	13300	13300

1st E.O. VI		8500	8600	8700	8800	8900	9000	9100
SE OPS 3 MRN 109	(13)	11500	11500	11500	11500	11500	11500	11500
SE MRN 104	(3)	13400	13400	13400	13400	13400	13400	13400

1st E.O. VI		9200	9300	9400	9500
SE OPS 3 MRN 109	(13)	11500	11500	11500	11500
SE MRN 104	(3)	13400	13400	13400	13400

ASC-10a/86/A/A

ECAL – ZZA or MRN PRIME TAL

1ST E.O. TIME		2:40	2:50	3:00	3:10	3:20
CHERRY PT	(5)	3:45 – 4:25	3:35 – 4:15	3:30 – 4:10	3:25 – 4:05	3:20 – 4:00
OTIS	(7)	7:00 – 7:20	6:50 – 7:15	6:40 – 7:10	6:30 – 7:05	6:20 – 7:00

1ST E.O. TIME		3:30	3:40	3:50	4:00	4:10
CHERRY PT	(5)	3:30 – 3:55	3:40 – 3:50	- - - -	- - - -	- - - -
OTIS	(7)	6:10 – 6:50	6:00 – 6:45	5:50 – 6:40	5:45 – 6:35	5:40– 6:30

1ST E.O. TIME		4:20	4:30	4:40	4:50	5:00
CHERRY PT	(5)	- - - -	- - - -	- - - -	- - - -	- - - -
OTIS	(7)	5:30 – 6:25	5:25 – 6:20	5:20 – 6:15	5:15– 6:10	5:10– 6:10

1ST E.O. TIME		5:10	5:20	5:30	5:40	5:50
CHERRY PT	(5)	- - - -	- - - -	- - - -	- - - -	- - - -
OTIS	(7)	5:10 – 6:05	5:20 –6:00	5:30 – 6:00	5:40 – 5:50	5:50

ASC–10b/86/A/A

BEN TAL REDESIGNATION
(86 OCF CYC)

1st E.O. VI		5700	5800	5900	6000	6100	6200	6300
SE OPS 3 BEN 109	(12)	10600	10600	10700	10700	10800	10800	10800
SE BEN 104	(2)	17400	17200	17000	16700	16500	16300	16000

1st E.O. VI		6400	6500	6600	6700	6800	6900	7000
SE OPS 3 BEN 109	(12)	10900	10900	11000	11000	11000	11100	11100
SE BEN 104	(2)	15800	15500	15300	15100	14900	14700	14500

1st E.O. VI		7100	7200	7300	7400	7500	7600	7700
SE OPS 3 BEN 109	(12)	11100	11200	11200	11200	11200	11300	11300
SE BEN 104	(2)	14300	14100	14000	13900	13800	13700	13600

1st E.O. VI		7800	7900	8000	8100	8200	8300	8400
SE OPS 3 BEN 109	(12)	11300	11300	11300	11300	11300	11300	11300
SE BEN 104	(2)	13600	13500	13500	13500	13500	13400	13400

1st E.O. VI		8500	8600	8700	8800	8900	9000	9100
SE OPS 3 BEN 109	(12)	11300	11300	11300	11300	11300	11300	11300
SE BEN 104	(2)	13500	13500	13500	13500	13500	13500	13500

1st E.O. VI		9200	9300	9400	9500
SE OPS 3 BEN 109	(12)	11300	11300	11300	11300
SE BEN 104	(2)	13500	13500	13500	13500

ASC-12a/86/A/A

ECAL - BEN PRIME TAL

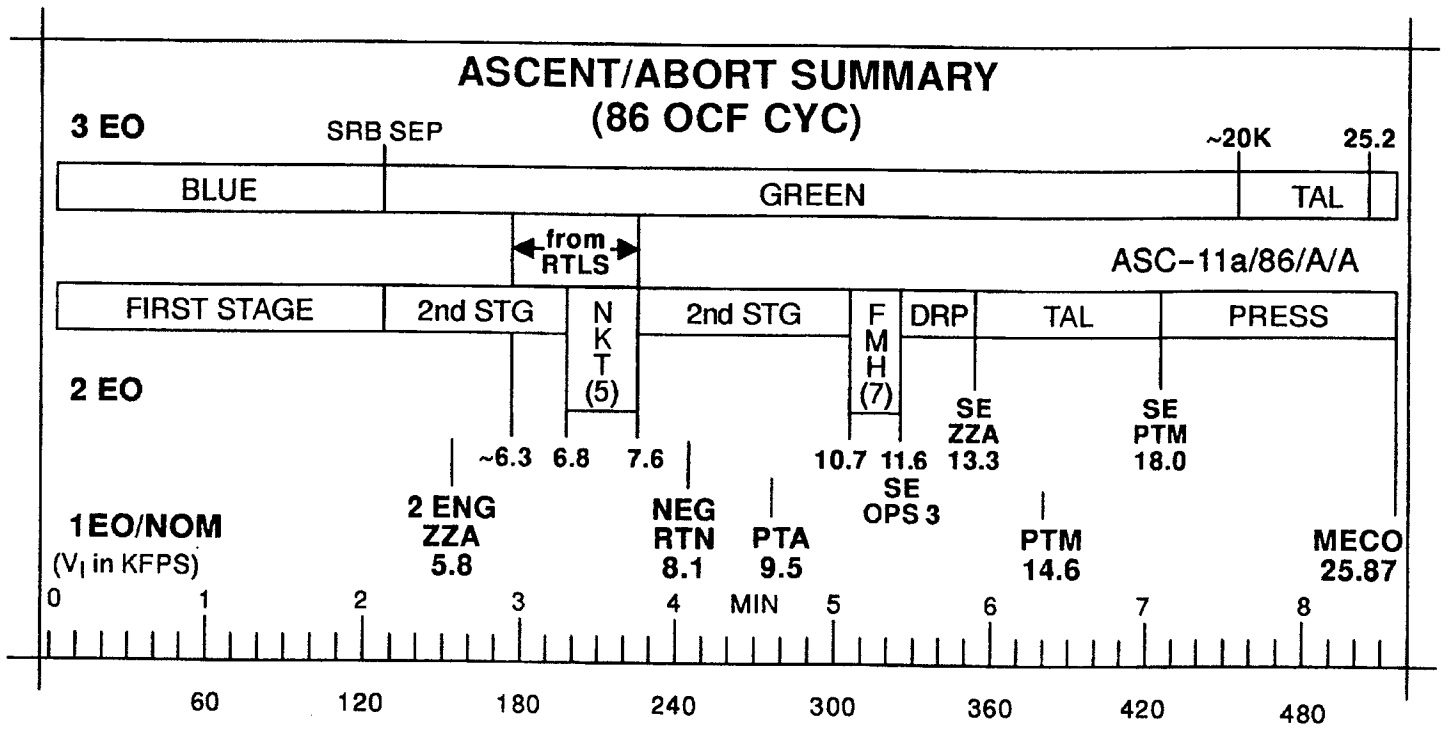
1ST E.O. TIME		2:40	2:50	3:00	3:10	3:20
CHERRY PT	(5)	3:40 - 4:15	3:35 - 4:10	3:30 - 4:05	3:25 - 4:05	3:20 - 4:00
OTIS	(7)	- - - -	- - - -	- - - -	- - - -	- - - -

1ST E.O. TIME		3:30	3:40	3:50	4:00	4:10
CHERRY PT	(5)	3:30 - 3:55	3:40 - 3:50	3:50	- - - -	- - - -
OTIS	(7)	- - - -	- - - -	- - - -	- - - -	5:55-6:10

1ST E.O. TIME		4:20	4:30	4:40	4:50	5:00
CHERRY PT	(5)	- - - -	- - - -	- - - -	- - - -	- - - -
OTIS	(7)	5:40 - 6:10	5:30 - 6:05	5:20 - 6:05	5:10- 6:00	5:05- 6:00

1ST E.O. TIME		5:10	5:20	5:30	5:40	5:50
CHERRY PT	(5)	- - - -	- - - -	- - - -	- - - -	- - - -
OTIS	(7)	5:10 - 6:00	5:20 -5:55	5:30 - 5:55	5:40 - 5:55	5:50

ASC-12b/86/A/A


ASCENT/ABORT SUMMARY
(86 OCF CYC)
3 EO
SRB SEP
~20K
25.2
BLUE
GREEN
TAL
from RTLS
ASC-11a/86/A/A
FIRST STAGE
2nd STG
NKT (5)
2nd STG
FMH (7)
DRP
TAL
PRESS
2 EO
~6.3
6.8
7.6
10.7
11.6
SE ZZA 13.3
SE PTM 18.0
1EO/NOM
(V_I in KFPS)
2 ENG ZZA 5.8
NEG RTN 8.1
PTA 9.5
SE OPS 3
PTM 14.6
MECO 25.87
0
1
2
3
4
MIN
5
6
7
8
60
120
180
240
300
360
420
480

1: GNC OMS 1 MNVR EXEC	2: GNC OMS 1 MNVR EXEC
3: BFS, GNC SYS SUMM 2	

C **POST BURN STATUS**

NOMINAL [ ] OMS 1 TIG TO MCC [ ][ ][:][ ][ ]

* C **ALPHA MANAGEMENT (if reqd)** *
*
* If underspeed (ATO or AOA-S) OMS 1 *
* and Post OMS 1 HP ≤ 75 nm: *
* Maneuver to LVLH R180, P340, Y000 *
* (maintain LVLH P = 0 ± 20) *
* After 10 min: *
* Maneuver to LVLH P = 340 *
* After 10 min: *
* Maneuver to Burn Attitude *

MAJOR MODE CHANGE

CRT1 GNC, OPS 105 PRO

POST OMS 1

1: GNC OMS 2 MNVR EXEC	2: GNC OMS 2 MNVR EXEC
3: BFS, GNC OMS 2 MNVR EXEC	

P **MPS DUMP**

B F7,F8 FLT CNTLR PWR (two) - OFF
C3 ✓DAP - AUTO

F4 ✓BDY FLP pb - lt off (MPS dump complete)
(MECO +4 min)

* If Feedline Fail: *
* MECO + 6 min (~14:30 Nom), *
* ET SEP - SEP *

IF AOA

If two Freon Loops ↓ or two H2O Loops ↓:
Go to SYS AOA
Otherwise, go to AOA

1: GNC OMS 2 MNVR EXEC	2: GNC OMS 2 MNVR EXEC
3: BFS, GNC OMS 2 MNVR EXEC	

* If no comm and MPS dump complete: *
* HYD MN PUMP PRESS (three) - *
* LO (MA) *

B OMS 2 BURN SETUP

✓OMS 2 TARGETING, Flip Book

CRT1 TRIM LOAD - ITEM 6 +0.4 -5.7 +5.7 EXEC

* For single eng burn (good eng): *
* TRIM LOAD LY - ITEM 7 +5.2 EXEC *
* RY - ITEM 8 -5.2 EXEC *
* OMS L - ITEM 2 EXEC *
* R - ITEM 3 EXEC *
* For RCS burn: *
* RCS SEL - ITEM 4 EXEC *

NOTE
Onboard computed TIG may vary slightly but is acceptable

✓Targets, OMS TARGETS

LOAD - ITEM 22 EXEC
TIMER - ITEM 23 EXEC

CRT3 ✓BFS TGT

1: GNC OMS 2 MNVR EXEC	2: GNC OMS 2 MNVR EXEC
3: BFS, GNC OMS 2 MNVR EXEC	

OMS 2 BURN ATTITUDE MNVR

B F6,F7 ✓ADI ATT (two) - INRTL
F8 RATE (two) - 1
C ✓FLT CNTLR PWR (two) - OFF
✓MCC GO for mnvr - ITEM 27 EXEC (*)

3: BFS, GNC SYS SUMM 2

P **APU/HYD SHUTDN (✓MCC)**

R4 HYD MPS/TVC ISOL VLV (1,2,3; 5 sec interval) - CL (hold each 5 sec)✓tb - CL
R2 ✓APU AUTO SHUTDN (three) - ENA
BLR PWR (three) - OFF
N2 SPLY (three) - OFF
APU OPER (1,2,3; 5 sec interval) - OFF (MA)
FUEL TK VLV (three) - CL
✓Shutdn (Hyd Press)
CNTLR PWR (three) - OFF

FES & HEATER ACTIVATION

C L1 FLASH EVAP CNTLR PRI A - ON
L2 FDLN HTR (two) - 1

P R1 O2 TK1,2 HTRS B (two) - AUTO
H2 TK1,2 HTRS B (two) - AUTO

MS1 A12 APU HTR TK/FU LINE/H2O SYS 1A,2A,3A (three) - AUTO

AC BUS SNSR

R1 AC BUS SNSR (three) - OFF (1 sec), then AUTO TRIP

CRT RECONFIG (If reqd)

C CRT1 GPC/CRT 04 EXEC
C3 BFC CRT SEL: 3 + 1
CRT1 GPC/CRT 33 EXEC

1: GNC OMS 2 MNVR EXEC	2: GNC OMS 2 MNVR EXEC
3: BFS, GNC OMS 2 MNVR EXEC	

P **MPS PWRDN/ISOL**

R2 MPS ENG PWR L (two) - OFF
CTR (two) - OFF
R (two) - OFF
He ISOL (six) - GPC
✓I'CNCT (three) - GPC

NOTE
Expect multiple MAs for MPS He P as regs bleed down

MPS GH2 INERTING

R4 MPS H2 PRESS LINE VENT - OP
(Start watch)
After 1 min:
MPS H2 PRESS LINE VENT - GND

1: GNC OMS 2 MNVR EXEC	2: GNC OMS 2 MNVR EXEC
3: BFS, GNC OMS 2 MNVR EXEC	

P ET UMBILICAL DOOR CLOSURE

* If Feedline fail, ✓MCC before closure *

WARNING
ET CTRLINE LATCHES must be stowed prior to L,R DR closure to prevent door drive damage

NOTE
Double times for single motor operation

R2 ET UMB
DR MODE - GPC/MAN
CTRLINE LAT - STO
✓After 6 sec, DR CTRLINE LAT tb - STO

* If DR CTRLINE LAT does not stow within 14 sec, DR CTRLINE LAT - GND ✓MCC *

L,R DR (two) - CL (tb-bp)
After 24 sec, L,R DR tb - CL

* If doors do not close: ✓MCC *

L,R LAT (two) - LAT (tb-bp)
After 6 sec, L,R LAT tb - LAT

* If doors do not latch: ✓MCC *

DR MODE - GPC
CTRLINE LAT - GND
L,R DR (two) - OFF
LAT (two) - OFF

1: GNC OMS 2 MNVR EXEC	2: GNC OMS 2 MNVR EXEC
3: BFS, GNC OMS 2 MNVR EXEC	

OMS BURN PREP

* For single eng burn/No PROP failures: XFEED failed eng PROP to good eng *

P O8 L,R OMS
✓He PRESS/VAP ISOL A (two) - GPC
B (two) - CL
✓TK ISOL (four) - GPC (tb-OP)
✓XFEED (four) - GPC (tb-CL)

B Wedge Install OMS 2/ORBIT BURN and OMS BURN MONITOR Cue Cards (F6,F8)

If FRCS reqd,
Go to OPS 1 RCS BURN Cue Card

B **SEAT SAFING AND ADJUSTMENT**

Adjust Back Angle

TIG-2> B Go to OMS 2/ORBIT BURN (Cue Card)

OMS BURN MONITOR

OMS P_c LOW OMS ↓ and ENG VLV 1 or 2 < 70%	OMS ENG FAIL
OMS ↓ and ENG VLV 1 & 2 > 70% and OX IN P ≥ 227	OMS ENG FAIL
P ≤ 227	OMS PRPLT FAIL
No OMS ↓	SENSOR FAIL
OMS TEMP FU IN L R P ≥ 227 230	OMS ENG FAIL
P ≤ 209 214	OMS PRPLT FAIL
P 210-226 215-229	SENSOR FAIL
OMS OX/FU TK P (✓ENG IN P) OX & FU LOW	He PRESS/VAP ISOL (two) - OP If TK P no incr: OMS PRPLT FAIL
OX LOW	If HP > 90: OMS PRPLT FAIL If HP < 90: Burn to OMS ↓, then OMS PRPLT FAIL
FU LOW	If HP > 90: OMS PRPLT FAIL If HP < 90: He PRESS/VAP ISOL (two) - CL Burn to OMS ↓ or HP = 90, then OMS PRPLT FAIL
OX & FU HIGH	Cycle He to maint OMS TK P 234-284 Cycle He A(B) to isolate failed leg
OMS He TK P LOW (✓CRT & meter) P > 640 & QTY > 41%	✓Leaking OMS TK ISOL (two) - OP ✓He PRESS/VAP ISOL(two) - OP L,R OMS XFEED (four) - OP Good OMS TK ISOL (two) - CL He PRESS/VAP ISOL (two) - CL When P < 640 or QTY ≤ 41%, continue
P < 640 or QTY ≤ 41%	✓Good OMS TK ISOL (two) - OP ✓He PRESS/VAP ISOL(two) - OP L,R OMS XFEED (four) - OP Failed OMS TK ISOL (two) - CL He PRESS/VAP ISOL(two) - CL
N2 REG P HIGH or LOW	OMS ENG - ARM
N2 TK P LOW (✓CRT & meter)	When N2 TK P < 470: OMS ENG - ARM
OMS GMBL 1st FAIL 2nd FAIL	Select SEC GMBL (twice) If control problems or high RCS fuel usage: OMS ENG FAIL
GPC1(4) with String 1(4)	Affected GPC MODE - STBY,HALT FF1(4) - OFF,ON L(R) OMS GMBLs - sel SEC
FA1(4)	L(R) OMS GMBLs - sel SEC

ASC-5a/86/A,O/A

OMS 2

OMS 2/
ORBIT OMS
BURNS

✓MM105/202(302)
✓BURN ATT (INRTL) then REF, pb - push
✓ENG SEL ✓DAP TRANS - NORM (MM202)
CNTL PWR (two) - ON ✓DAP - AUTO(PASS)/DISC
✓GMBL TRIM
2 engine: P = +0.4 LY = -5.7 RY = +5.7
1 engine: P = +0.4 LY = +5.2 RY = -5.2
L,R OMS He PRESS/VAP ISOL A (two) - OP
...Wait 2 sec...
L,R OMS HE PRESS/VAP ISOL B (two) - GPC (OP for SE burn)

	GPC	OP	CL
ORB BURN A			
B			

TIG-2 SEL OMS ENG(s) - ARM/PRESS (✓P VLVs OP)
If P VLV CL: Aff OMS ENG - OFF

WARNING
Do not burn aff engine if:
OMS N2 TK P < 470(564) (NONCRIT BURN)
He TK P < 640
FU ENG IN P < 216(244)
OX ENG IN P < 151(244)

ΔVTOT:OMS XFEED RETURN (Planned Single Engine)

-:15 EXEC
If OMS ENG P_C MSG and non critical burn: Aff ENG - OFF
If Leaking OMS PROP, burn RCS +X TIG - 15 sec to OMS IGN + 1 sec
:00 TIG; start watch (✓P_C, ΔVTOT, ENG VLVs)

OMS PRPLT FAIL:
HP < 90 (CONTINUE BURN):
Failed OMS ENG - OFF
✓XFEED (two) - CL
TK ISOL (two) - CL
He PRESS (two) - CL
HP ≥ 90 (STOP BURN):
OMS ENG (two) - OFF
✓Failed OMS XFEED (two) - CL
TK ISOL (two) - CL
He PRESS (two) - CL
OMS ENG FAIL:
ASCENT or CRIT O/O (Continue Burn)
Failed ENG - OFF
OMS XFEED at → 1/2 ΔVTOT at FAIL | | |
RCS COMPLETION: (Hp < 90 or CRIT O/O)
Interconnect to either OMS that was ENG FAIL
THC +X (Hp = 90)
Post burn, AFT RCS RECONFIG

CUTOFF
+:02 OMS ENG(s) - OFF
If Orbit Critical Burn,
| Trim all axes residuals < 0.2 fps
Otherwise:
Trim all axes residuals < 2 fps

ASC-6a/86/A,O/A

OPS 1
RCS BURN

AFT RCS

✓RCS BURN CONFIG:
OMS TK ISOL (all) - OP — OMS TK
L(R) OMS XFEED (two) - OP — switch at
R(L) OMS XFEED (two) - CL — 1/2 ΔVTOT
AFT L,R RCS XFEED (four) - OP (If reqd)
TK ISOL (six) - CL ☐☐☐

TIG-2 L,R OMS He PRESS/VAP ISOL A - OP
... Wait 2 sec ...
L,R OMS He PRESS/VAP ISOL B - OP
✓MM105
✓CNTLR PWR (two) - ON
✓BURN ATT (INRTL) then REF, pb - push
✓RCS SEL
:00 +X
Maintain PITCH ATT ERR ± 3°
Monitor OMS data
Monitor ΔVTOT
CUTOFF Release THC

FWD RCS

FRCS BURN PREP
Load DUMMY target for FRCS attitude
RCS SEL - ITEM 4 EXEC
TIG @ TTA = 2:00 or as reqd
ΔVX = -2.1 (ITEM 19)
ΔVY = 0 (ITEM 20)
ΔVZ = -1.0 (ITEM 21)
LOAD - ITEM 22 EXEC
TIG-10 Mnvr to ATT (error needles)
When in attitude:
ADI ATT - REF (push)
Load External ΔV Burn Target
ΔVX = +80
ΔVY = 0
ΔVZ = 0
LOAD - ITEM 22 EXEC
TIMER - ITEM 23 EXEC
✓VGOX = negative
✓VGOY = 0
✓VGOZ = +21 ± 2
✓REF ball - 0,0,0

NOTE
Error needles invalid during burn
Burn time = ~2X TGO
TGT Hp = [90] for ASCENT

:00 -X
CUTOFF CUR HP = TGT HP ☐☐☐, release THC

ASC-6b/86/A,O/A

1: GNC OMS 2 MNVR EXEC	2: GNC OMS 2 MNVR EXEC
3: BFS, GNC SYS SUMM 2	

C **POST BURN STATUS**

NOMINAL ☐

ΔTIG ☐☐:☐☐

B F7,F8 FLT CNTLR PWR (two) - OFF
C3 ✓DAP: AUTO

C **OMS TVC GMBL CHECK**

CRT1 SECONDARY CHECK
Perform SEC L,R then PRI L,R GMBL CK

P **OMS/RCS POST BURN RECONFIG**

O7 AFT L,R RCS
- He PRESS A (two) - GPC (tb-OP)
- B (two) - CL (tb-CL)
- TK ISOL (six) - OP (tb-OP)
- MANF ISOL 1,2,3,4 (eight) - OP (tb-OP)
- XFEED (four) - CL (tb-CL)

O8 FWD RCS
- He PRESS A - GPC (tb-OP)
- B - CL (tb-CL)
- TK ISOL (two) - OP (tb-OP)
- MANF ISOL 1,2,3,4 (four) - OP (tb-OP)

L,R OMS
- He PRESS/VAP ISOL (four) - CL
- TK ISOL (four) - OP (tb-OP)
- XFEED (four) - CL (tb-CL)

POST OMS 2

1: GNC OMS 2 MNVR EXEC	2: GNC OMS 2 MNVR EXEC
3: BFS, GNC SYS SUMM 2	

MPS LH2 VACUUM INERTING/MANF PRESS CHECKOUT

R4	1.	MPS FILL/DRAIN LH2 OUTBD - CL
		. . .Wait 15 sec, then. . .
	2.	MPS FILL/DRAIN LH2 OUTBD - OP
	3.	INBD - OP
		. . .Wait 1 min, then. . .
	4.	MPS FILL/DRAIN LH2 OUTBD - CL
		. . .Wait 15 sec, then. . .
	5.	MPS FILL/DRAIN LH2 OUTBD - GND
	6.	INBD - GND
R2	7.	MPS He I'CNCT CTR - OUT OP
R4	8.	LH2 MANF PRESS - OP (start watch)
		. . .Wait 8 to 10 sec, then. . .
	9.	LH2 MANF PRESS - GPC
R2	10.	PNEU He ISOL - GPC
	11.	MPS He I'CNCT CTR - GPC

MAJOR MODE CHANGE

CRT1 GNC, OPS 106 PRO

1: GNC OMS 2 MNVR COAST	2: GNC OMS 2 MNVR COAST

B C4A, Stow ASC PKT (Helmet Bag)
R3A Unstow ORBIT Cue Cards & ORB PKT

* If ATO, ✓MCC for procedure changes *
* If Rev 3 deorbit reqd, go to CONT *
* DEORB, LAUNCH DAY ORBIT 3 *

Go to POST INSERT, POST INSERTION

DIRECT INSERTION AOA DEL PAD

DEORBIT

PRPLT ( )

BURN CUE CARD:

TOT AFT QTY 1 (%) 170

TOT AFT QTY 2 (%) 53

FLIP ΔV 76

AFT ΔV 27

B/U SITE N/A

FRCS: DUMP TO % ☐OX ☐FU

ENTRY/LANDING

EI-5 MM303
INRTL ATT (6-30) R P Y

EI-5 MM304
PREBANK (ENT MNVR Cue Card) L R

ALTM SET (6-34) .

VREL 1ST REVERSAL

RWY

☐L ☐OVHD
☐R ☐STRT deg

AIM POINT
☐NOM
☐CLOSE-IN

SPDBK
☐☐ % @ 3K

WINDS:
(ENT MNVR Cue Card)

50K	/
38K	/
28K	/
20K	/
12K	/
7K	/
SURFACE	/

REMARKS:

AOA PADS

W/OMS 1 AOA DEL PAD

DEORBIT

PRPLT ( )

BURN CUE CARD:

TOT AFT QTY 1 (%) 170

TOT AFT QTY 2 (%) 53

FLIP HP = ( ) + TGT HP [ΔHP (REDES SITE) OR 06 STEEP 02 SHALLOW ΔHP (PRI SITE) + 38 (FLIP ΔV / 2)] =

AFT HP = ( ) + 14 (AFT ΔV / 2) =

TGT HP

B/U SITE N/A

FRCS: DUMP TO % ☐ OX ☐ FU

ENTRY/LANDING

EI-5 MM303 INRTL ATT (6-30) R P Y

EI-5 MM304 PREBANK (ENT MNVR Cue Card) L R

ALTM SET (6-34)

VREL 1ST REVERSAL

RWY

☐ L ☐ OVHD
☐ R ☐ STRT deg

AIM POINT
☐ NOM
☐ CLOSE-IN

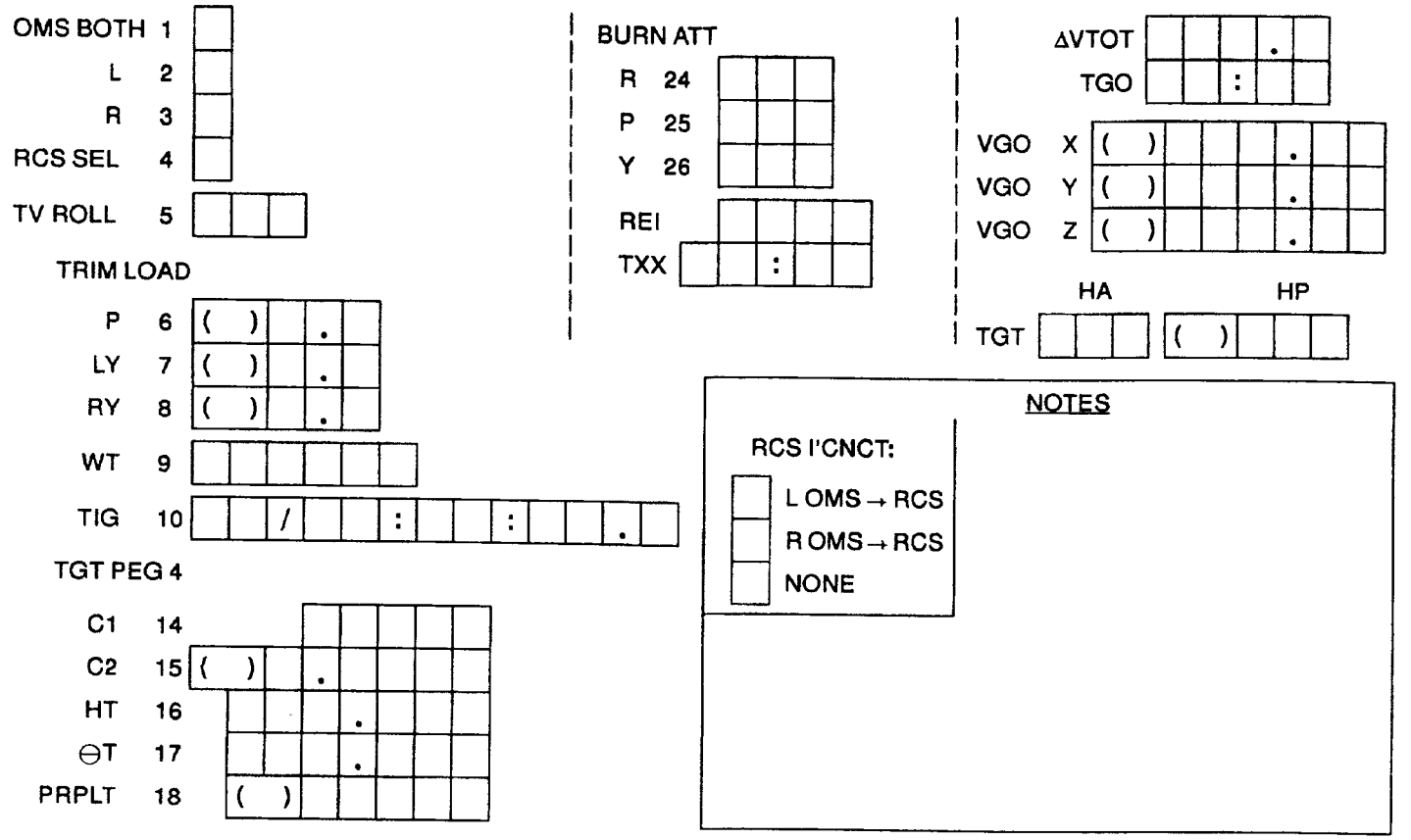
WINDS: (ENT MNVR Cue Card)

50K	/
38K	/
28K	/
20K	/
12K	/
7K	/
SURFACE	/

SPDBK ☐☐ % @ 3K

REMARKS:

DEORBIT MNVR PAD



BURN CARD	OMS PRPLT PAD
DEORBIT BURN (2 ENG)	OMS ENG FAIL: XFEED QTY CUE ☐☐ %L ☐☐ %R
DEORBIT BURN (1 ENG)	OMS XFEED RETURN at ΔVTOT = ☐☐☐ or ☐ ☐☐ at ☐☐ %
DEORBIT BURN (RCS)	RCS I'CNCT TK SW at ΔVTOT = ☐☐☐ OMS PRPLT LOW: ΔVTOT = ☐☐☐
UNBALANCED PRPLT DEORBIT BURN	INITIAL CONFIG: ☐ TK ISOLs - CL While feeding 2 OMS from 1 POD: OMS PRPLT FAIL: Interconnect ☐ OMS to RCS THC +X for ☐ : ☐☐ If ☐ (XFEED) ENG '↓' If ☐ (STRAIGHT FEED) ENG '↓' OMS ENG FAIL: At ΔVTOT = ☐☐☐ or ☐ ☐☐ at ☐☐ % ☐ TK ISOL (two) - OP ☐ TK ISOL (two) - CL Return to 2 ENG, 2 POD FLOW: At ΔVTOT = ☐☐☐ ☐ TK ISOLs - OP OMS ENG FAIL: (XFEED CUE) OMS QTY ☐☐ %L or ☐☐ %R
DEORBIT BURN (MIXED XFEED)	FEED FROM GOOD POD: At ΔVTOT = ☐☐☐ or ☐ ☐☐ at ☐☐ % ☐ OMS He PRESS (two) - OP TK ISOL (two) - OP XFEED (two) - OP Secure ☐ OMS OMS PRPLT LOW: AFT RCS RECONFIG at ΔVTOT = ☐☐☐ OMS ENG FAIL: ☐ OMS He PRESS (two) - OP TK ISOL (two) - OP ☐ OMS XFEED (two) - CL

1: GNC OMS 2 MNVR EXEC	2: GNC OMS 2 MNVR EXEC
3: BFS, GNC OMS 2 MNVR EXEC	

P **HYD DEPRESS**

R4 HYD MPS/TVC ISOL VLV (three) - CL
(hold 5 sec) ✓tb - CL

R2 ✓APU SPEED SEL (three) - NORM
✓AUTO SHUTDN (three) - ENA
HYD MN PUMP PRESS (three) - LO (MA)

FES AND HEATER ACTIVATION

C L2 FLASH EVAP FDLN HTR (two) - 1

P R1 O2 TK1,2 HTRS B (two) - AUTO
H2 TK1,2 HTRS B (two) - AUTO

MS1 A12 APU HTR TK/FU LINE/H2O SYS 1A,2A,3A (three) - AUTO

AC BUS SNSR

R1 AC BUS SNSR (three) - OFF (1 sec), then AUTO TRIP

MAJOR MODE CHANGE

CRT1 GNC, OPS 105 PRO

Select any AOA I_TGT (3-12) to set AOA flag, but <u>do not</u> load until OPS 3

OMS He PRESS/ΔV/BURN TIME

OMS% GAGE	OMS He Press	OMS ΔV	RCS ΔV	RCS BURN MIN:SEC
80.1	4800	413	342	12:12
80	4800	412	341	12:11
75	4600	386	319	11:23
70	4400	359	297	10:35
65	4200	332	275	9:47
60	4000	305	253	8:59
55	3800	278	231	8:11
50	3600	251	208	7:23
45	3400	224	186	6:35
40	3200	197	164	5:47
35	3000	169	141	4:59
30	2800	142	119	4:11
25	2600	115	96	3:23
20	2400	87	73	2:35
15	2200	59	50	1:46
10	2000	32	27	0:57
5	1800	4	3	0:07

NOTE: Uses assumed vehicle weight of 245,094 lb

OMS/
RCS ΔV

ΔV CAPABILITY			
RCS		OMS	
1%	fps	#/fps	fps/%
FWD(-x)	1.00		
AFT(+x)	0.90	21	6

STS-86
LANDING SITE TABLE
(OPS 1/6/3)
(50° to 53.5° INCLINATION)

SITE	LOCATION	RWY	TACANS		MLS CH	LG
				ITEM 5		
14	*ZARAGOZA DIEGO GARCIA	ZZA 30L JDG 31	ZZA 64 –	– NKW 57	◆6 –	12397 12003
15	SANTIAGO	EST 17 EST 35	STG 111 (DME)	LRA 98 (DME)	– –	9499 9499
16	LAJES	LAJ 15 LAJ 33	LAJ 45	TRM 109	– –	10865 10865
17	AMBERLEY DARWIN	AMB 15 DDN 29	AMB 94 –	– DAR 84	– –	10000 10906
18	GUAM HAO	GUA 06L HAO 12	UAM 54 –	– HAO 85 (DME)	– –	10755 10089
19	HONOLULU	HNL 08R HNL 26L	HNL 95	CKH 86	– –	10700 11500
20	NORTHRUP	NOR 17 NOR 23	SNG 121Y	HMN 92	6 –	15000 15000
21	NORTHRUP	NOR 05 NOR 35	SNG 121Y	HMN 92	– –	15000 15000
22	EDWARDS	EDW 15 EDW 33	EDW 111	LHS 21	6 #	16300 16300
23	EDWARDS	EDW 22 EDW 04	EDW 111	LHS 21	8/† 6	14995 13995
24	EDWARDS	EDW 23L EDW 18L	EDW 111	LHS 21	# #	15000 15000
25	KSC	KSC 15 KSC 33	COF 97	LAL 107	8 6	15000 15000

 # MSBLS Jr. Channel 6 - Requires Uplink FADS version O02
† MSBLS Jr. Channel 8 - Requires Uplink

STS-86
LANDING SITE TABLE
(OPS 1/6/3)
(50° to 53.5° INCLINATION)

SITE	LOCATION	RWY	TACANS		MLS CH	LG
				ITEM 5		
1	KSC	KSC 15 KSC 33	TTS 59Y	OMN 73	8 6	15000 15000
2	BEN GUERIR	BEN 36 BEN 18	◆BEN 108	CBA 116 (DME)	◆6 –	13720 12720
3	MORON	MRN 20 MRN 02	MRN 100	AOG 23	◆6 –	12000 11800
4	ZARAGOZA	ZZA 30L ZZA 12R	ZZA 64	ZZA 77 (DME)	◆6 –	12397 12197
5	CHERRY POINT	NKT 32L NKT 23R	NKT 75	ILM 117	– –	8400 9000
6	OCEANA	NTU 23L NTU 05R	NTU 113	NGU 48	– –	11997 10997
7	OTIS	FMH 32 FMH 14	FMH 105	LFV 94	– –	9500 9500
8	PEASE FAIRFORD	PSM 34 FFA 27	PSM 112 –	– BZN 56	– –	11318 9996
9	HALIFAX INT'L ST JOHNS	YHZ 24 YYT 29	UAW 38 –	– UYT 23	– –	8800 8500
10	GANDER STEPHENVILLE	YQX 22 YJT 10	YQX 74 –	– YJT 78	– –	9495 11000
11	SHANNON	INN 06 INN 24	SHA 80 (DME)	CRN 37 (DME)	– –	9499 9035
12	*BEN GUERIR KING KHALID	BEN 36 KKI 15R	◆BEN 108 –	– RIY 92	◆6 –	13720 12779
13	*MORON ESENBOGA	MRN 20 ESN 03R	MRN 100 –	– BAG 78 (DME)	◆6 –	12000 11310

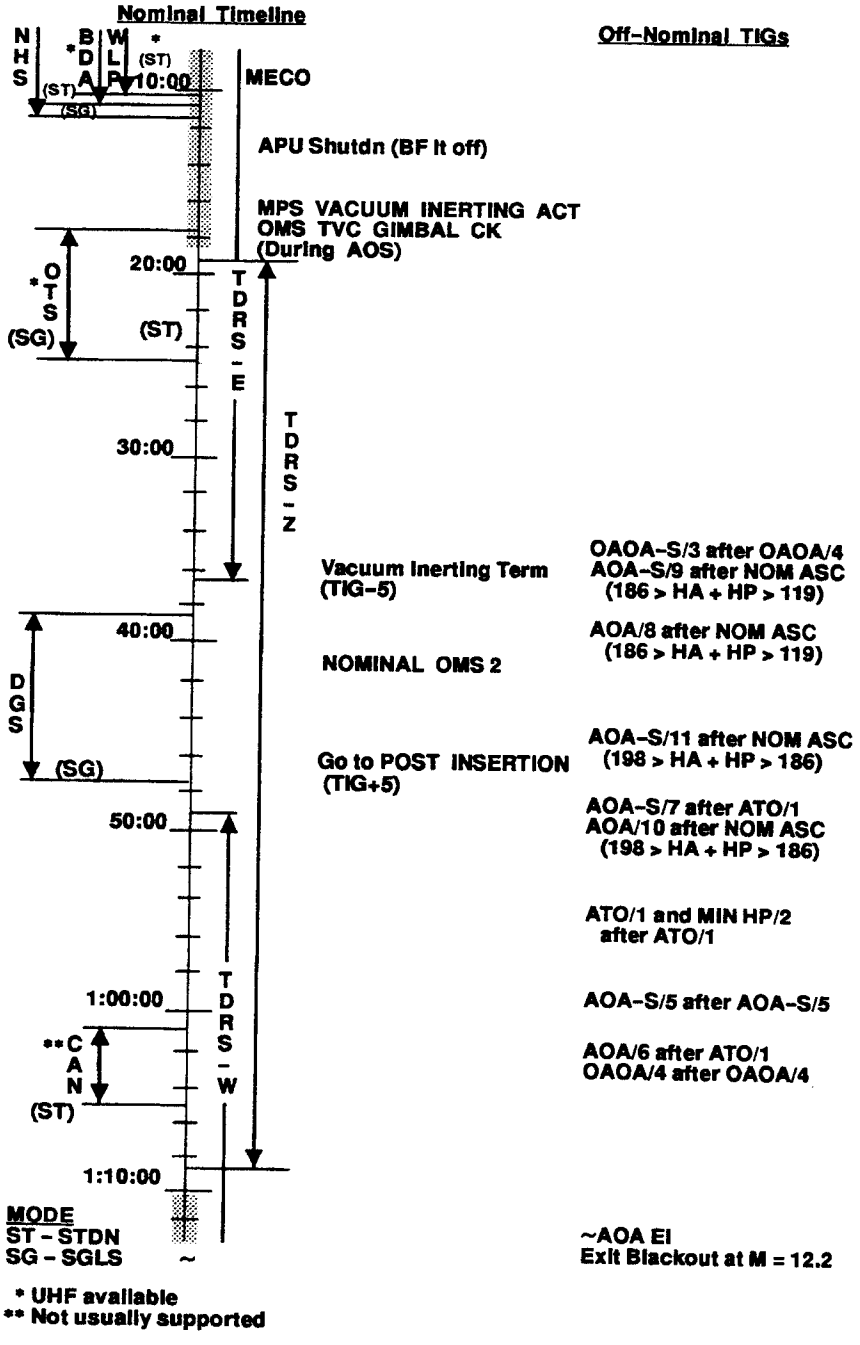
*Reduced Crossrange TAL Site

FADS version O02

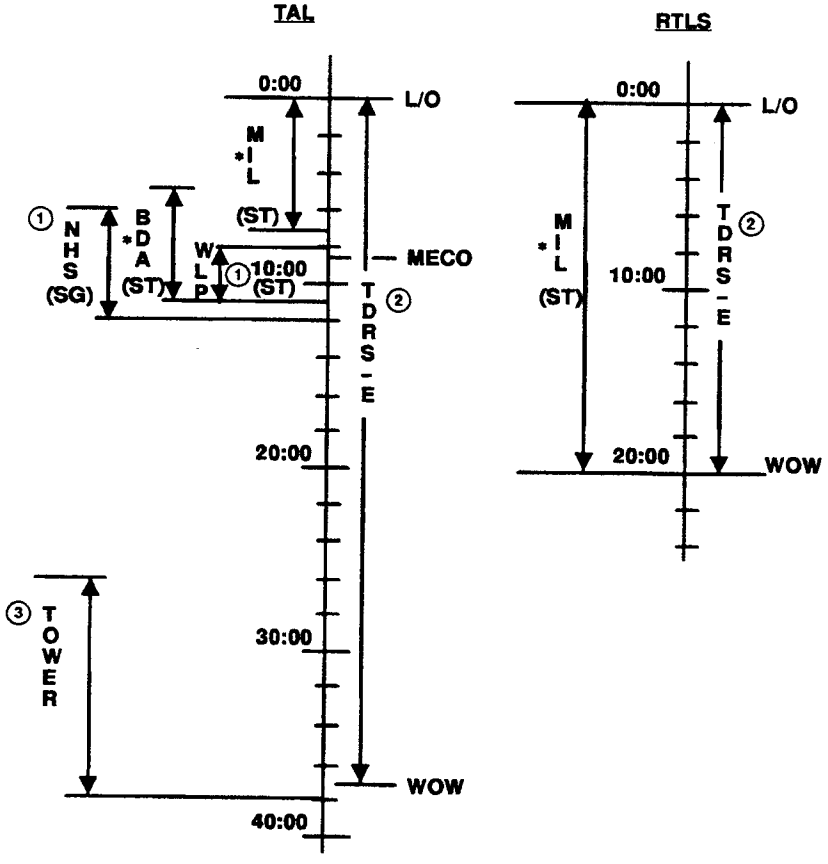
◆Available for TAL Only

COMMUNICATION COVERAGE – (AOA to KSC)

LAND SITE



COMMUNICATION COVERAGE - (TAL/RTLS)



MODE

ST - STDN
SG - SGLS

*UHF available

NOTE:

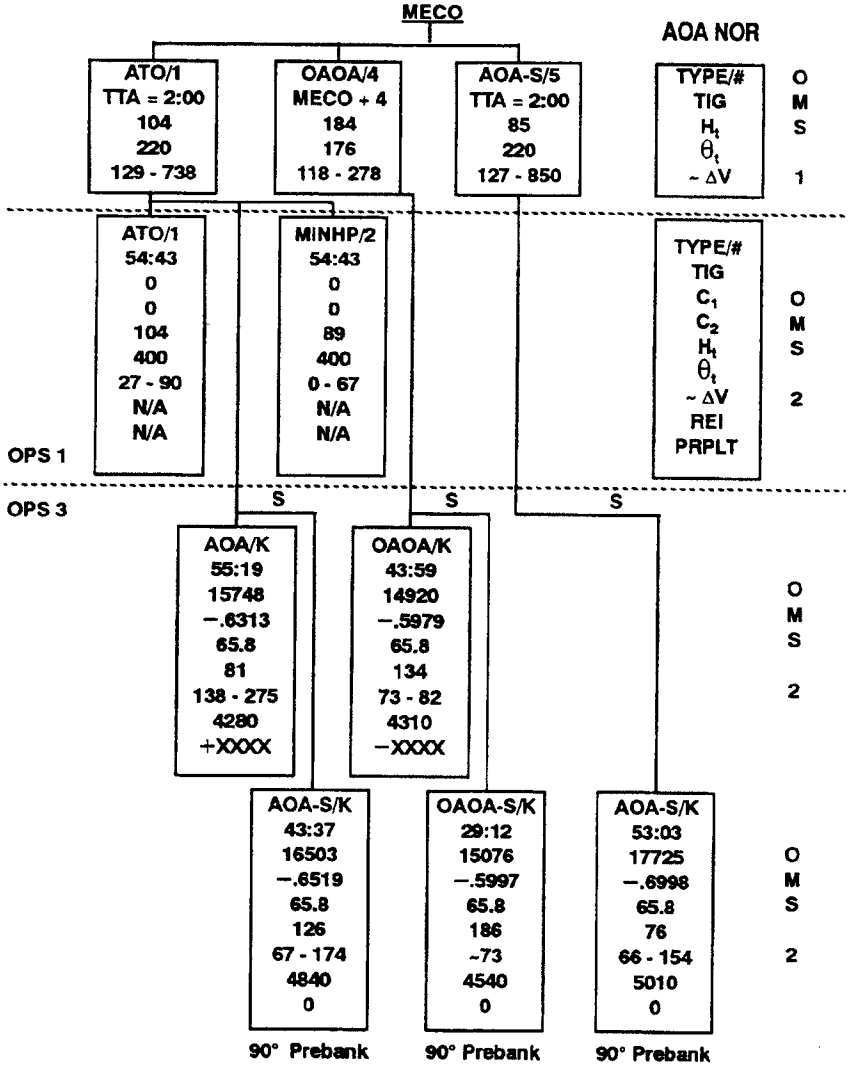
① NHS/WLP coverage only on high inclinations

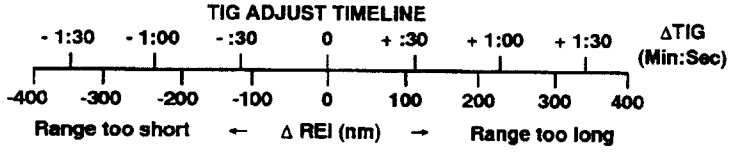
② ET blocks coverage until vehicle upright

③ Tower UHF installed at all TAL sites

COMM COVER

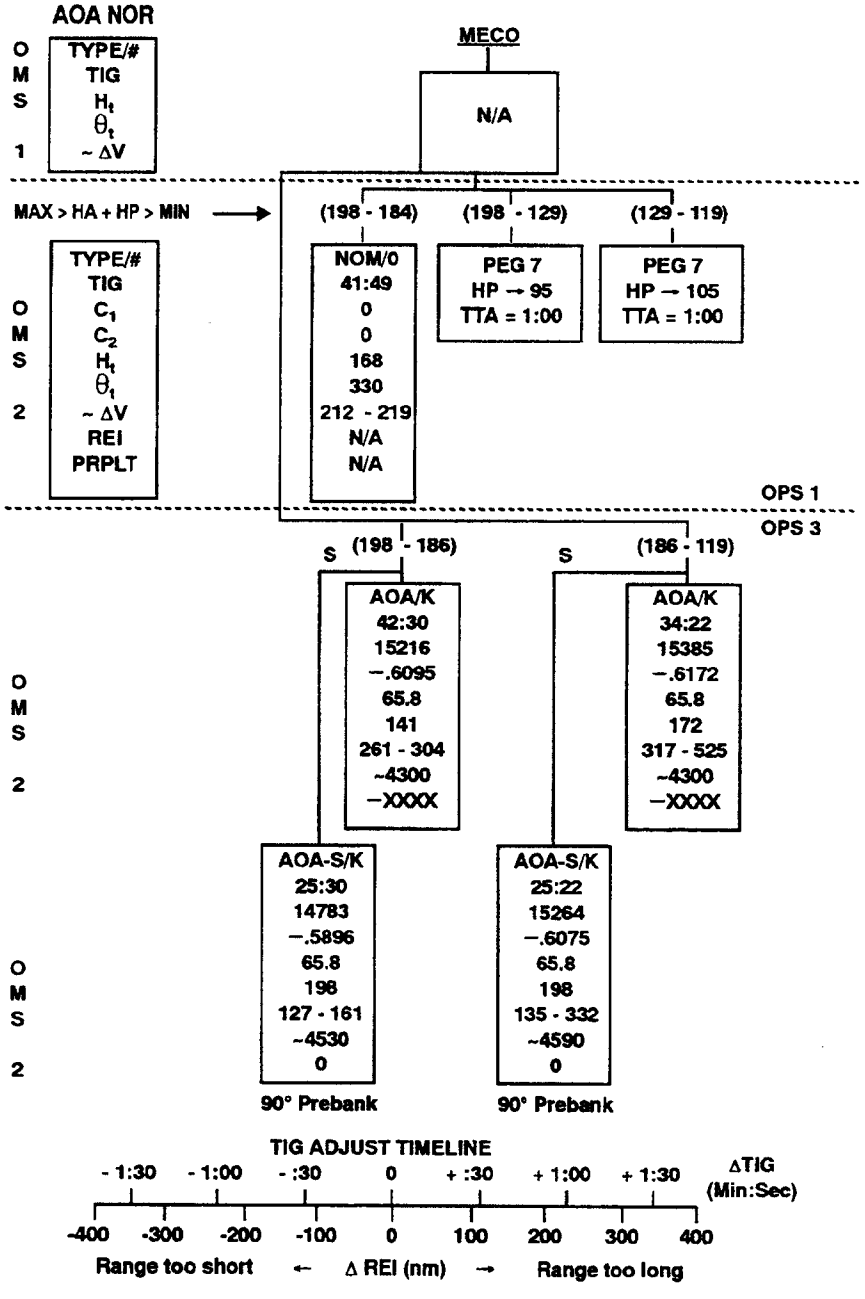
STS-86 OCF CY
OMS TARGETS - W/OMS 1



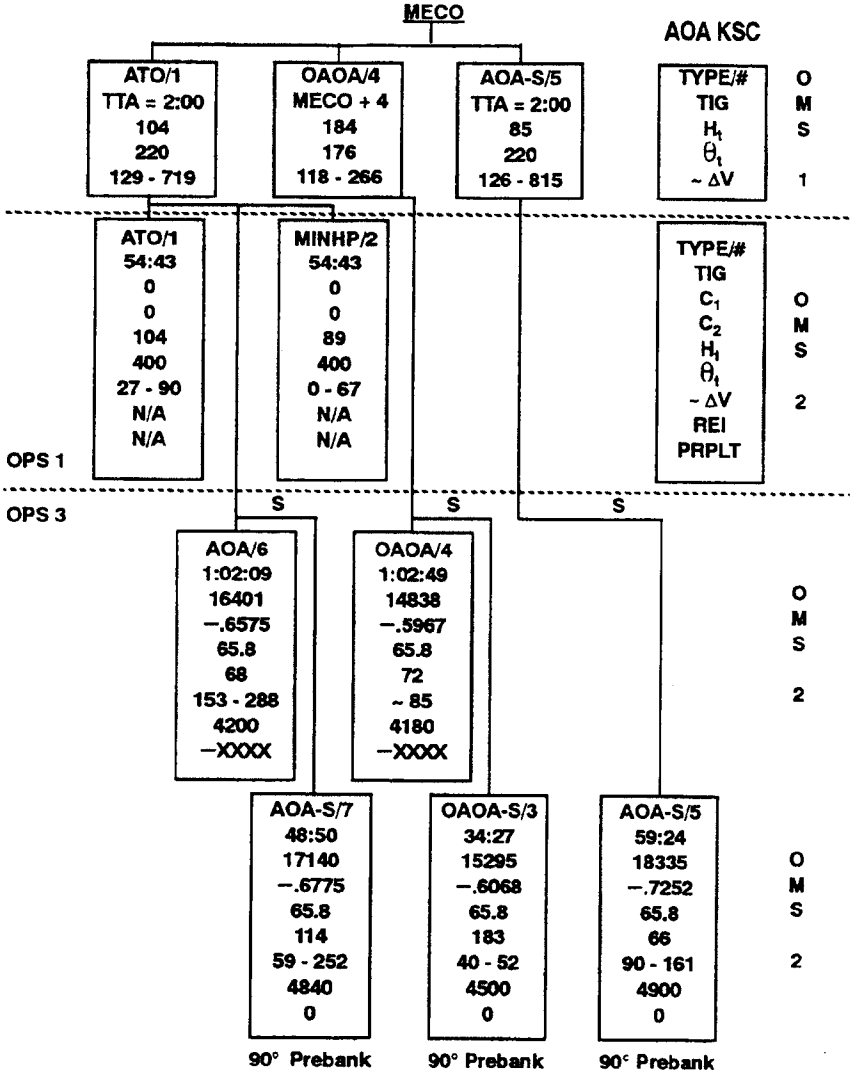


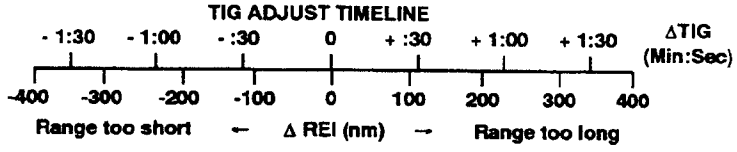
COMM COVER

STS-86 OCF CY
OMS TARGETS - DIRECT INSERTION

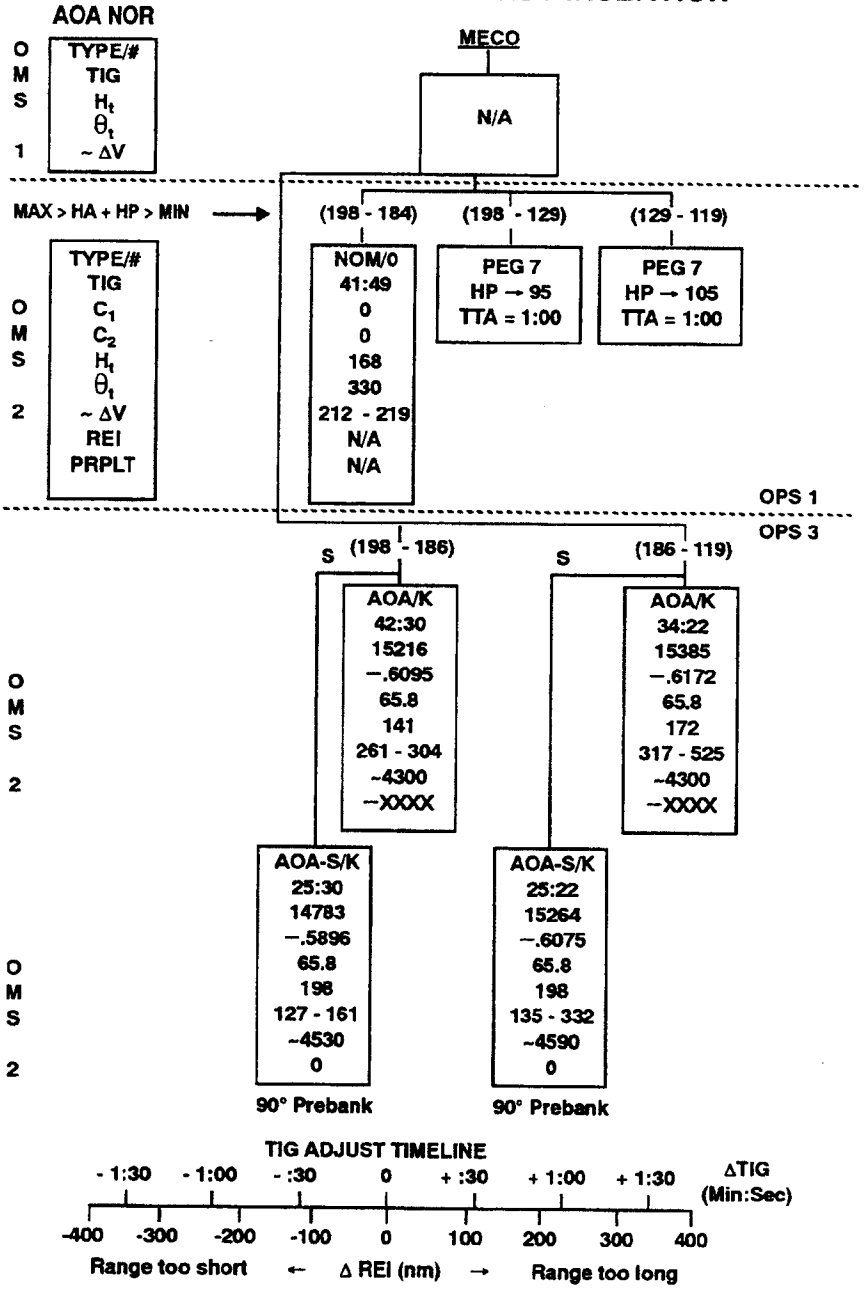


STS-86 OCF CY
OMS TARGETS - W/OMS 1

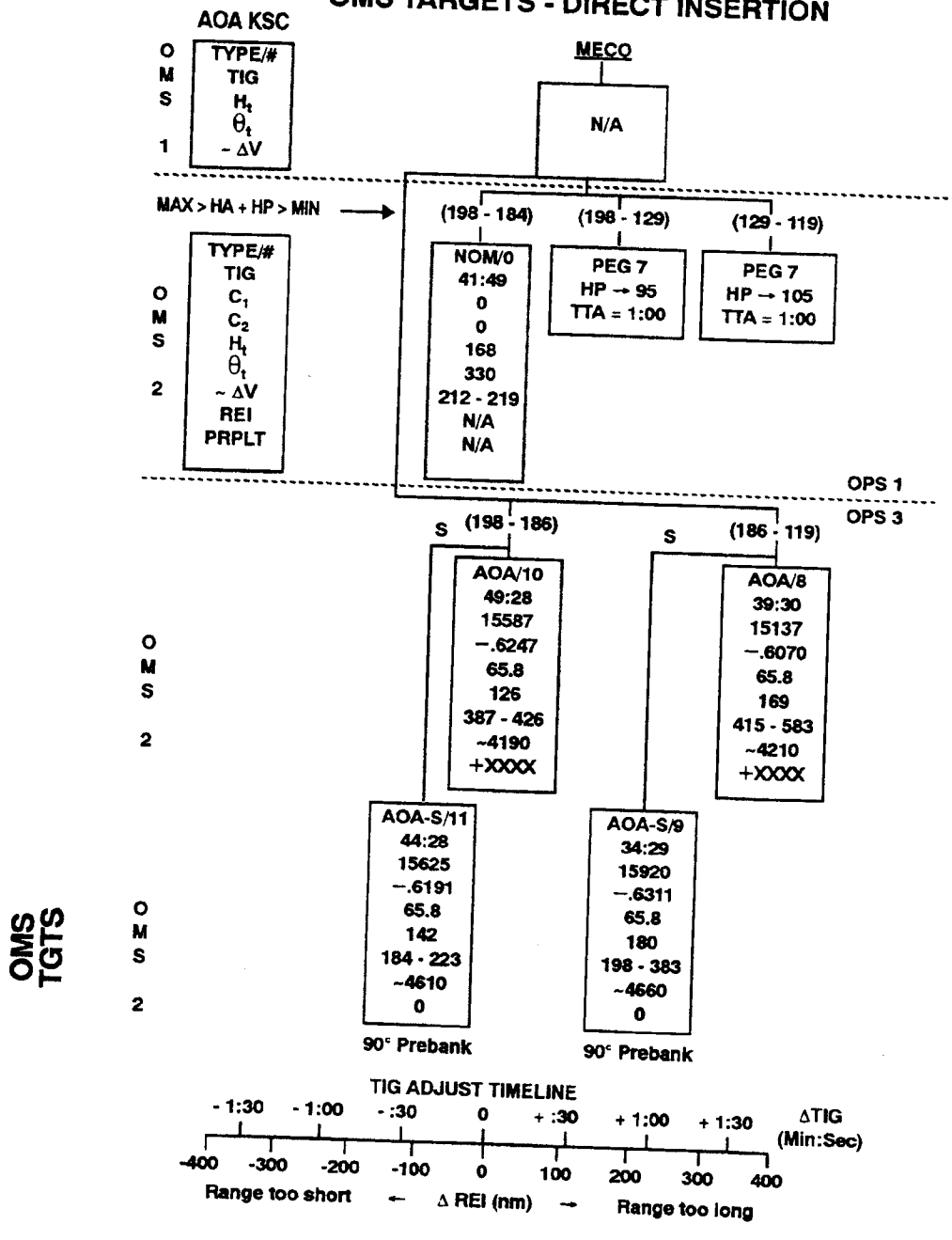




STS-86 OCF CY
OMS TARGETS - DIRECT INSERTION



STS-86 OCF CY
OMS TARGETS - DIRECT INSERTION



TOP

EMERGENCY EGRESS

PRELAUNCH
MODE 1

- TABS - RELEASE
- VISOR - CLOSE / LOCK
- LES O2 - ON
- GREEN APPLE - PULL
- KNEEBOARDS - REMOVE
- COOLING - DISCONNECT
- RESTRAINT - RELEASE
- PARACHUTE (four) - RELEASE
- COMM - DISCONNECT
- LES O2 - DISCONNECT
- EGRESS SEAT
- SLIDEWIRE BASKETS

POST LANDING
MODE 5

- TABS - RELEASE
- VISOR - CLOSE / LOCK
- LES O2 - ON
- GREEN APPLE - PULL
- KNEEBOARDS - REMOVE
- COOLING - DISCONNECT
- RESTRAINT - RELEASE
- PARACHUTE (four) - RELEASE
- COMM - DISCONNECT
- (G-SUIT CLIP - PULL)
- LES O2 - DISCONNECT
- PLT - PWR DOWN
- EGRESS SEAT
- SLIDE/ESCAPE PANEL

BAILOUT
MODE 8

- REPORT POSITION
- MACH < .95, OPS 305/603
- SB - AUTO; BF - AUTO
- FLY 185-195 KEAS, Φ = 0°
- ABORT MODE - ATO
- ABORT PBI - PUSH
- P,R/Y - AUTO
- FLT CNTLR PWR (two) - OFF

~50K FT

- TABS - RELEASE
- VISOR - CLOSE / LOCK
- LES O2 - ON
- GREEN APPLE - PULL

~40K FT

- MS3 - VENT CABIN
- CDR,PLT SEATS - LOWER
- KNEEBOARDS - REMOVE
- COOLING - DISCONNECT
- RESTRAINT - RELEASE
- D-RING - UNCOVER

~30K FT

- MS3 - JETTISON HATCH
- COMM - DISCONNECT
- (G-SUIT CLIP - PULL)
- LES O2 - DISCONNECT
- EGRESS SEAT
- POLE - DEPLOY
- D-RING - HOOK UP
- BAILOUT

ASC-15a/A,E/C

(reduced copy)

TOP

ESCAPE PANEL EGRESS

CLEAR WINDOW

✓TABS / VISOR / GREEN APPLE

PULL PANEL JETT HANDLE

PRYBAR/VENT - IF REQD

PLT - EMERGENCY POWERDOWN

DEPLOY & ATTACH SKY GENIE

EGRESS

ASC-16a/A,E/C

TOP
BACK OF 'ESCAPE PANEL EGRESS'

HOOK VELCRO

HOOK VELCRO

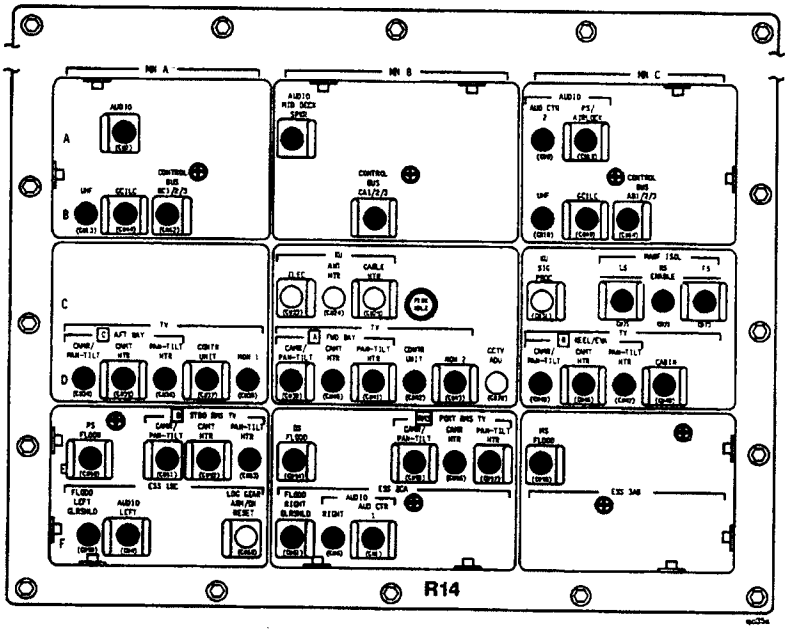
ASC-16b/A,E/A

(reduced copy)

FAB USE ONLY CC 10-29 ASC/86/FIN

TOP
PANEL R14 - OV103/104 ONLY

OV103/104 ONLY



ASC-18a/A,O,E/A

(reduced copy)

TOP

LOC/BREAK-UP

BEFORE 'GO AT THROTTLEUP'

- GREEN APPLE
- JETTISON HATCH
- BAILOUT
- PULL RIP CORD

'GO AT THROTTLEUP' TO SRB SEP

- GREEN APPLE
- VENT
- 'G' SPIKE
- JETTISON HATCH

✓ALT/SUIT

- BAILOUT (BELOW 40 K)
- PULL RIP CORD

AFTER SRB SEP

- GREEN APPLE
- GO TO MIDDECK
- VENT
- 'G' SPIKE
- JETTISON HATCH

✓ALT/SUIT

- BAILOUT (BELOW 40 K)
- PULL RIP CORD

ASC-21a/A/A

NOTE: This crew kneeboard card is optional and has no back facing

(reduced copy)