

Entry Checklist

STS-89 Flight Supplement

**Mission Operations Directorate
Flight Design and Dynamics Division**

**Final
September 18, 1997**

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



OMS/
RCS ΔV

OMS/RCS ΔV

FS 2-5

ENT/89/FIN

OMS He PRESS/ Δ V/BURN TIME

OMS/
RCS Δ V

OMS% GAGE	OMS He Press *	OMS Δ V	RCS Δ V	RCS BURN MIN:SEC
50	3500	262	219	7:22
40	3100	205	172	5:46
38	3020	194	162	5:27
36	2940	183	153	5:08
34	2860	171	143	4:49
32	2780	160	134	4:29
30	2700	148	125	4:10
28	2620	137	115	3:51
26	2540	125	106	3:32
24	2460	114	96	3:13
22	2380	102	87	2:54
20	2300	91	77	2:34
18	2220	79	68	2:15
16	2140	68	58	1:56
14	2060	56	48	1:36
12	1980	45	38	1:16
10	1900	33	28	0:56
8	1820	22	18	0:37
6	1740	10	9	0:17
5	1700	4	4	0:07

* He pressure not valid until 1 hr after last burn

NOTE: Uses assumed vehicle weight of 230,044 lb

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

DEORBIT BURN

DEORBIT
BURN

FS 3-1

ENT/89/FIN

**STS-89
LANDING SITE TABLE
(OPS 1/6/3)
(50° to 53.5° INCLINATION)**

**DEORBIT
BURN**

S I T E	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 8978
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

◆ Available for TAL Only
* Reduced Crossrange TAL Site

STS-89
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	BEJA	BEJ 01L BEJ 19R	BEJ 105	ESP 72	- -	10319 10319
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

* Reduced Crossrange TAL Site

◆ Available for TAL Only

MSBLS Jr. Channel 6 - Requires Uplink

† MSBLS Jr. Channel 8 - Requires Uplink

This Page Intentionally Blank

FS 3-4

ENT/89/FIN

1: GNC DEORB MNVR COAST 2: GNC 50 HORIZ SIT

3: BFS, GNC 50 HORIZ SIT

HORIZ SIT CONFIG

ALTM - ITEM 9 + .

	<u>PASS ITEM</u>		<u>BFS ITEM</u>	
PTI	INH	✓1		
LAND SITE (DEL PAD)		✓41		✓41
RWY (DEL PAD)		✓3		✓3
		✓4		✓4
TACAN (DEL PAD)		✓5		✓5
TAEM TGT				
G&N	OVHD	✓6	blank	
HSI	blank		blank	
XEP	NEP	✓7	NEP	✓7
AIM (DEL PAD)	NOM	✓8	NOM	✓8
	(or CLSE)		(or CLSE)	
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
DES any failed TACANs		✓		✓
TAC	DELTA	✓35		
HUD	0	✓37		
	0	✓38		

1: GNC DEORB MNVR COAST | 2: GNC 50 HORIZ SIT

3: BFS, GNC 50 HORIZ SIT

3: GNC 51 OVERRIDE

- ✓AUTO ELEVON - ITEM 17 (*)
- ✓SSME REPOS - ITEM 19 (ENA)
- ALT FILTER - ITEM 21 EXEC (*)
- WRAP MODE - ITEM 45 EXEC (ENA)

3: BFS, GNC 51 OVERRIDE

- ✓AUTO ELEVON - ITEM 17 (*)
- ✓SSME REPOS - ITEM 19 (ENA)
- ✓ALT FILTER - ITEM 21 (*)
- ✓WRAP MODE - ITEM 45 (ENA)

* If BFS engaged: *

* Set HSD BFS ITEMS to PASS config *

* If IMU, RGA, AA, or SURF FDBK has failed: *

* | 2: GNC 51 OVERRIDE | *

* | 3: BFS, GNC 51 OVERRIDE | *

* | DES any failed LRU in BFS | *

2: GNC DEORB MNVR COAST

3: BFS, GNC DEORB MNVR COAST

✓BFS GMBL config same as PASS GMBL config

DEORBIT BURN MONITOR

OMS Pc LOW OMS ↓ and ENG VLV 1 or 2 < 70% <hr/> OMS ↓ and ENG VLV 1 and 2 > 70% and FU and OX TK P < 185 (System in Blowdown) OX IN P > 227 P ≤ 227 No OMS ↓	OMS ENG FAIL <hr/> Burn to Pc = 72% then OMS PRPLT FAIL <hr/> OMS ENG FAIL <hr/> OMS PRPLT FAIL <hr/> SENSOR FAIL
OMS TEMP L R FU IN P ≥ 230 222 P ≤ 212 207 P 213-229 208-221	OMS ENG FAIL <hr/> OMS PRPLT FAIL <hr/> SENSOR FAIL
OMS OX/FU TK P OX & FU LOW OX LOW <hr/> FU LOW <hr/> OX & FU HIGH	He PRESS/VAP ISOL (two) - OP Burn to OMS ↓, then OMS PRPLT FAIL <hr/> He PRESS/VAP ISOL (two) - CL Burn to OMS ↓, then OMS PRPLT FAIL <hr/> Cycle He to maint OMS TK P 234-284 Cycle He A(B) to isolate failed leg
OMS GMBL 1st FAIL 2nd FAIL	Select SEC GMBL (twice) if control problems or high RCS fuel usage: Aff OMS ENG - OFF XFEED if ΔVTOT > 20
RDNT FAIL, 4-WAY OR 2-2 SPLIT or Safe HP: IMU DLMA HP > or HP < 2 MN DC BUSES	Stop burn, APUs - SHUT DN <hr/> Continue burn: PASS SET FAIL only - BFS engage PASS SET SPLIT only - √MCC on Restriring IMU DLMA - Post OMS cutoff, desel IMU with 'ACC' > 0.03 +X on watch (AOA) or +X to TGT HP (EOM)
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

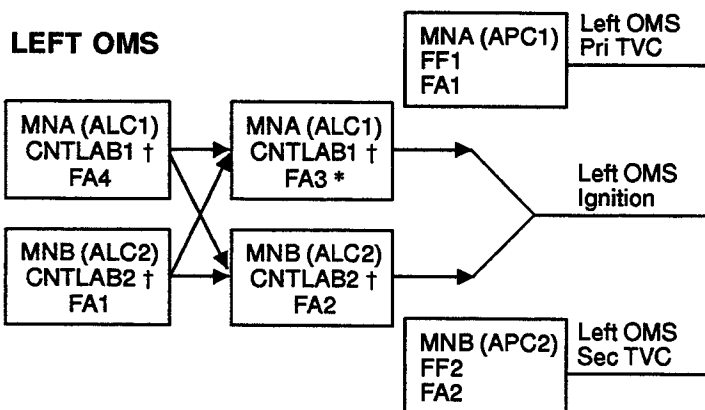
ENT-2a/89/A,O,D,E/A

MS ONLY

FS 3-29

ENT/89/FIN

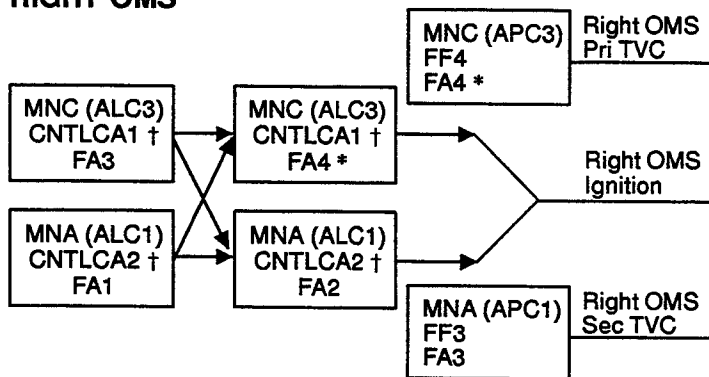
OMS FAILURES



† If CNTL AB1 or AB2 (CA1 or CA2) failed and ign path still exists at OMS fail, assume L(R) OMS ↓ is PRPLT FAIL

* If Pc failed high during burn, or FA3(4), and L(R) OMS fail, no guidance downmode after OMS ENG switch OFF (TGO slow, ADI needles in error, 6 ft/s underburn)

RIGHT OMS



If two FA MDMs lost		
MDMs	Preburn: ENG - OFF	During burn: MAN SHUTDN
1,2	LEFT (TVC)	BOTH
1,3	RIGHT (IGN)	LEFT
1,4	LEFT (IGN)	RIGHT
2,3	LEFT (IGN)	RIGHT
2,4	RIGHT (IGN)	LEFT
3,4	RIGHT (TVC)	BOTH

ENT-2b/89/A,O,D,E/B

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

- * **UNDERBURN** *
- * Determine Δ HP *
- * (CUR HP - TGT HP) *
- * Record UNDERBURN prebank on *
- * ENTRY MANEUVERS Cue Card *

* **PREBANK TABLE EDW (HA = 220 NM)** *

Δ HP	0	2	⑤	RED NOR	7	10	12	14	16
PREBANK (deg)	0	50	90	↓	105	115	130	145	180
					NOR NOT AVAIL				

Δ HP	6	9	⑭	16	18	20
PREBANK (deg)	75	90	115	125	140	170

G50 ITEM 41 +2 0, \checkmark RWY 17
 SET TACAN tw (three) 121Y

* **PREBANK TABLE KSC (HA = 222 NM)** *

Δ HP	0	2	3	⑤	7	11	13	15	17
PREBANK (deg)	0	50	65	90	105	120	130	150	180

Set TACAN tw (three) 59Y

Δ HP									
PREBANK (deg)									

POST BURN STATUS

NOMINAL

Δ TIG

	:			
--	---	--	--	--

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

C F6 INST PWR - FLT/MPS
P F7 MPS PRESS He sel - REG

C CRT1 **GNC, OPS 303 PRO**

1: GNC DEORB MNVR COAST	2: GNC DEORB MNVR COAST
-------------------------	-------------------------

C CRT1 ✓Uplinked INRTL EI-5 MM303 ATT with DEL PAD

- * If no deorbit TGT uplink, enter INRTL EI-5 *
- * MM303 ATT from DEL PAD *
- * R - ITEM 24 + _____ *
- * P - ITEM 25 + _____ *
- * Y - ITEM 26 + _____ *

Mnvr to EI-5 ATT - ITEM 27 EXEC

	TIME to EI (min)	LVLH PITCH (deg)
	20	339
		343
		347
		351
		355
	15	359
		3
		7
		11
		15
	10	19
		23
		27
		31
		35
	5	39

- * If UNDERBURN or no *
- * DEL PAD, manually *
- * mnvr to LVLH R 001; *
- * Y 358, P per table *

C **OMS GMBL PWRDN (PASS ONLY)**

CRT1 Verify GMBL positions:

	<u>L</u>	<u>R</u>
P	+5.9	+5.9
Y	+6.4	-6.4

GMBL OFF - ITEM 32 EXEC
- ITEM 33 EXEC

ENTRY ALPHA

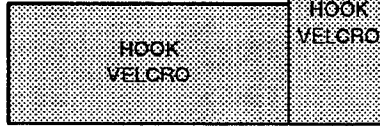
VR	α_{ref}	R	H	H _{ref}	R _{ref}
25	40	4373	400		
24	HI 40 LO	2535	238	-48	R80
23	43 40 37	2099	229	-66	71
22	43 40 37	1763	223	-85	66
21	43 40 37	1493	216	-108	63
20	43 40 37	1278	210	-126	62
19	43 40 37	1109	204	-148	62
18	43 40 37	971	198	-172	63
17	43 40 37	856	192	-193	64
16	43 40 37	762	186	-208	65

KSC 15

MAX L/D	
M	α
3	17
2	15
1	12

(89 OCF CY)

ASC-14b/89/A,E/A



15	43 40 37	684	181	-118	64
14	43 40 37	612	178	-127	62
13	43 40 37	545	175	-136	L59
12	43 40 37	483	174	-152	55
11	42 39 36	425	168	-195	54
10	41 38 35	372	161	-174	51
9	39 36 33	321	155	-208	48
8	37 34 31	271	148	-243	44
7	33 30 27	225	139	-271	R43
6	30 27 24	182	129	-273	39
5	26 23 20	141	115	-273	40
4	23 20 18	104	101	-265	41
3	19 16 15	73	88	-248	L40
2.5	14	59	80	-298	
2	10	48	72	-296	
1.5	9	37	63	-322	
1	10	30	56	-262	

MS ONLY

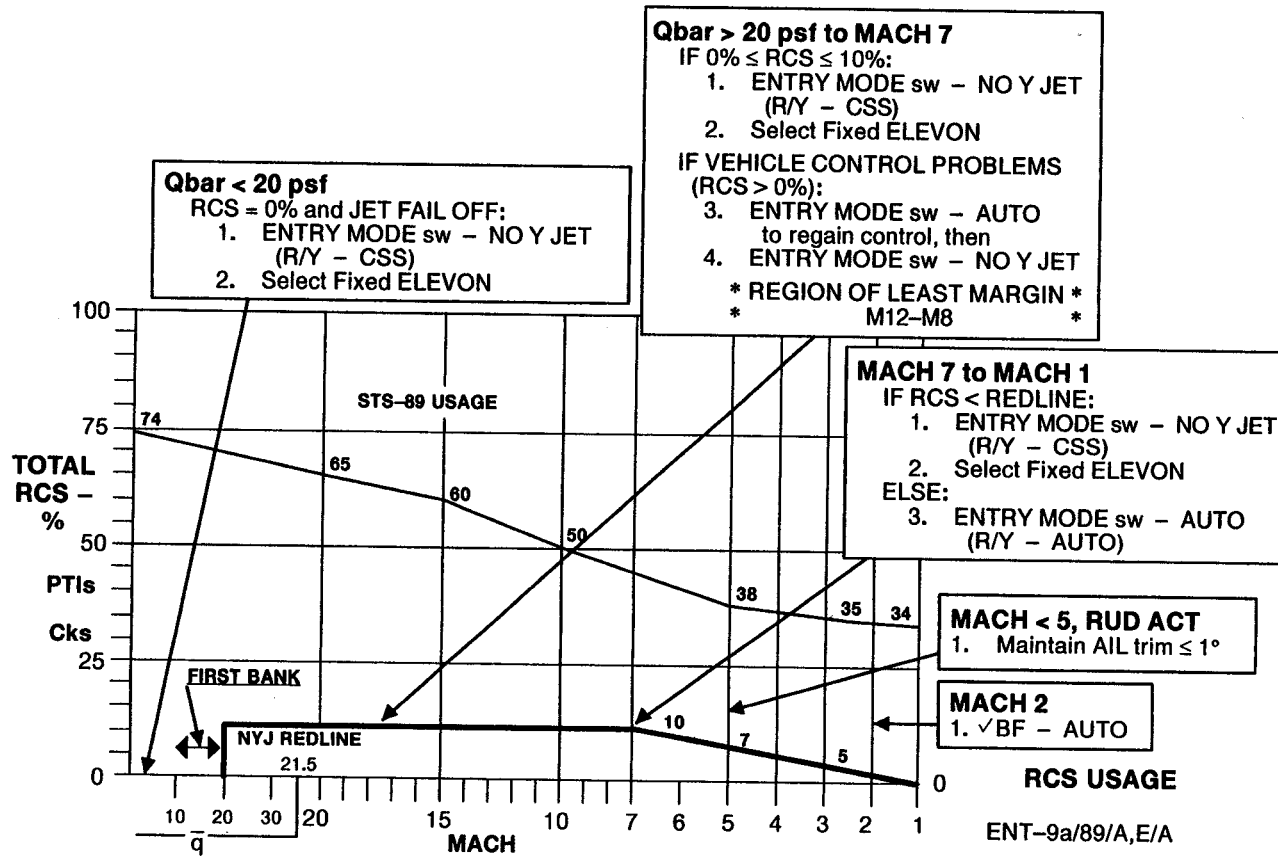
FS 4-11

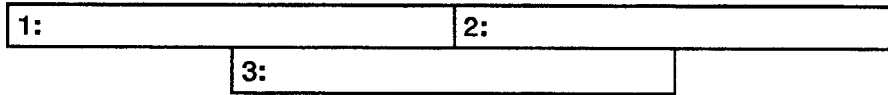
ENT/89/FIN

MS ONLY

FS 4-13

ENT/89/FIN





POST LANDING PAYLOAD ACTIVITIES

NOTE

The following payloads have pwr-off constraints:
CEBAS (15 min), BTR (45 min), TEHM (30 min), EOR/F (60 min), ADV CGBA (60 min)

R1 ✓ PL PRI MNC - ctr (tb-ON)

L1 Within 1 hr of wheelstop:
Flow PROP VLV LOOP 2 - PL HX (tb-PL)

TOP



**DEORBIT
BURN
MONITOR**

OMS Pc LOW OMS ↓ and ENG VLV 1 or 2 < 70%	OMS ENG FAIL
OMS ↓ and ENG VLV 1 and 2 > 70% and FU and OX TK P < 185 (System in Blowdown)	Burn to Pc = 72% then OMS PRPLT FAIL
OX IN P > 227	OMS ENG FAIL
P ≤ 227	OMS PRPLT FAIL
No OMS ↓	SENSOR FAIL
OMS TEMP L R FU IN P ≥ <input type="text" value="230"/> <input type="text" value="222"/>	OMS ENG FAIL
P ≤ <input type="text" value="212"/> <input type="text" value="207"/>	OMS PRPLT FAIL
P <input type="text" value="213-229"/> <input type="text" value="208-221"/>	SENSOR FAIL
OMS OX/FU TK P	
OX & FU LOW	He PRESS/VAP ISOL (two) - OP
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 GMBL 1st FAIL 2nd FAIL	Select SEC GMBL (twice) if control problems or high RCS fuel usage: Aff OMS ENG - OFF XFEED if ΔVTOT > 20
RDNT FAIL, 4-WAY OR 2-2 SPLIT	
QI Safe HP: IMU DLMA HP > <input type="text" value=""/> <input type="text" value=""/>	Stop burn, APUs - SHUT DN
QI HP < <input type="text" value=""/> <input type="text" value=""/>	Continue burn: PASS SET FAIL only - BFS engage PASS SET SPLIT only - ✓MCC on Restrung IMU DLMA - Post OMS cutoff, dese/ IMU with 'ACC' > 0.03 +X on watch (AOA) or +X to TGT HP (EOM)
2 MN DC BUSES	
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

ENT-2a/89/A,O,D,E/A

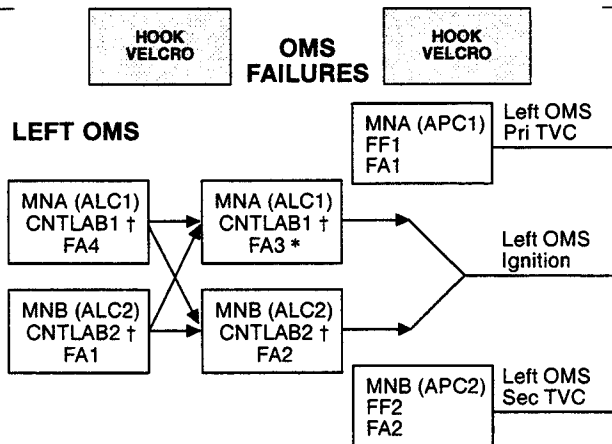
(reduced copy)

FAB USE ONLY

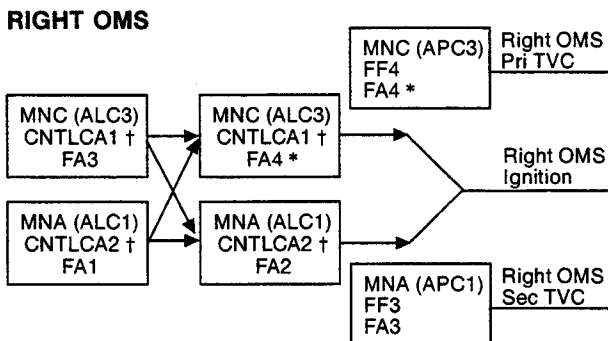
FS CC 8-23

ENT/89/FIN

TOP
BACK OF 'DEORBIT BURN MONITOR'



† If CNTL AB1 or AB2 (CA1 or CA2) failed and ign path still exists at OMS fail, assume L(R) OMS ↓ is PRPLT FAIL
 * If Pc failed high during burn, or FA3(4), and L(R) OMS fail, no guidance downmode after OMS ENG switch OFF (TGO slow, ADI needles in error, 6 ft/s underburn)



If two FA MDMs lost		
MDMs	Preburn: ENG - OFF	During burn: MAN SHUTDN
1,2	LEFT (TVC)	BOTH
1,3	RIGHT (IGN)	LEFT
1,4	LEFT (IGN)	RIGHT
2,3	LEFT (IGN)	RIGHT
2,4	RIGHT (IGN)	LEFT
3,4	RIGHT (TVC)	BOTH

ENT-2b/89/A,O,D,E/B

(reduced copy)

TOP
BACK OF THIS CARD IS IN ENTRY GENERIC C/L

APU REDLINE	
% FU REMAINING	
TIG	60
EI-20	54
-10	49
EI	41
+10	31
+20	20
TD	8

CONTROL PROBLEM OPTIONS
AIL TRIM REQD
* 1. Roll panel trim away from *
* RHC, M > 5 *
* 2. ✓RCS QTY JET FAIL ON *

RCS CRITICAL ENTRY
(50° to 53.5° Inclination)

RCS QTY	He P
100%	3300
75	2800
50	2300
29	1900
25	1810
15	1620
0	1350

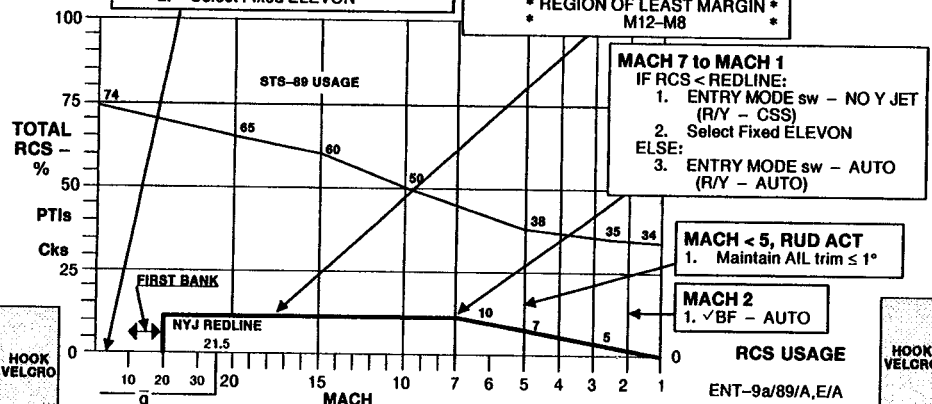
Qbar > 20 psf to MACH 7
IF 0% ≤ RCS ≤ 10%:
1. ENTRY MODE sw - NO Y JET (R/Y - CSS)
2. Select Fixed ELEVON
IF VEHICLE CONTROL PROBLEMS (RCS > 0%):
3. ENTRY MODE sw - AUTO to regain control, then
4. ENTRY MODE sw - NO Y JET
* REGION OF LEAST MARGIN *
* M12-M8 *

Qbar < 20 psf
RCS = 0% and JET FAIL OFF:
1. ENTRY MODE sw - NO Y JET (R/Y - CSS)
2. Select Fixed ELEVON

MACH 7 to MACH 1
IF RCS < REDLINE:
1. ENTRY MODE sw - NO Y JET (R/Y - CSS)
2. Select Fixed ELEVON
ELSE:
3. ENTRY MODE sw - AUTO (R/Y - AUTO)

MACH < 5, RUD ACT
1. Maintain AIL trim ≤ 1°

MACH 2
1. ✓BF - AUTO



FAB USE ONLY

(reduced copy)
FS CC 8-25

ENT/89/FIN

Refer to Generic Cue Card
for Back of RCS CRITICAL ENTRY

FAB USE ONLY

FS 8-26

ENT/89/FIN

Entry Checklist

STS-86 Flight Supplement

Mission Operations Directorate
Flight Design and Dynamics Division

Final
May 21, 1997

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



Incorporates the following:	
482#:	NONE - not required

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DM43/M. Trump	483-8029
Deorbit Burn to Entry Interface	DM43/J. Patterson	483-1987
Contingency Procedures and Entry Interface thru Rollout	DM43/J. Patterson	483-1987

NOTE

This Flight Supplement can be integrated into the Entry Generic checklist. Insert the Flight Supplement (FS) pages in the proper numerical order in the Entry Generic Checklist by using the List of Effective Pages (LOEP) which provides the sequence for merging pages to create a complete Entry Checklist

ENTRY CUE CARDS

<u>Title</u>	<u>Ref. Page</u>	<u>Card No.</u>
Deorbit Burn Flight		
Rules (Front)	CC 8-2	generic
(Back)	CC 8-3	generic
Deorbit Burn (RCS)		
(Front)	CC 8-4	generic
(Back)	CC 8-6	generic
Deorbit Burn (2 Eng)		
(Front)	CC 8-8	generic
Deorbit Burn (1 Eng)		
(Back)	CC 8-10	generic
Unbalanced Prplt Deorbit Burn		
(Front)	CC 8-12	generic
Deorbit Burn (Mixed Xfeed) (Back)	CC 8-14	generic
Entry Maneuvers		
(Front)	CC 8-16	generic
(Back)	CC 8-17	generic
Entry NO-GO Checklist		
(Front)	CC 8-18	generic
ADTA Mgmt (Back)	CC 8-19	generic
Mach α		
(Front)	CC 8-20	generic
(Back)	CC 8-20	generic
Deorbit Burn Monitor		
(Front)	FS CC 8-23	ENT-2a/86/A,O,D,E/A
OMS Failures (Back)	FS CC 8-24	ENT-2b/86/A,O,D,E/A
RCS Critical Entry		
(Front)	FS CC 8-25	ENT-9a/86/A,E/A
Trim/Osc (Back)	CC 8-21	generic

OMS/
RCS ΔV

OMS/RCS ΔV

FS 2-5

ENT/86/FIN

OMS He PRESS/ Δ V/BURN TIME

OMS/
RCS Δ V

OMS% GAGE	OMS He Press *	OMS Δ V	RCS Δ V	RCS BURN MIN:SEC
50	3900	265	220	7:22
40	3500	207	173	5:46
38	3420	196	163	5:27
36	3340	184	154	5:08
34	3260	173	144	4:49
32	3180	161	135	4:29
30	3100	150	125	4:10
28	3020	138	116	3:51
26	2940	127	106	3:32
24	2860	115	97	3:13
22	2780	103	87	2:54
20	2700	92	77	2:34
18	2620	80	68	2:15
16	2540	69	58	1:56
14	2460	57	48	1:36
12	2380	45	38	1:16
10	2300	34	28	0:56
8	2220	22	18	0:37
6	2140	10	9	0:17
5	2100	4	4	0:07

* He pressure not valid until 1 hr after last burn

NOTE: Uses assumed vehicle weight of 228,959 lb

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

DEORBIT BURN

DEORBIT
BURN

FS 3-1

ENT/86/FIN

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

DEORBIT
BURN

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

◆ Available for TAL Only

* Reduced Crossrange TAL Site

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	NORTHROP	NOR 17 NOR 23	SNG 121Y	HMN 92	6 -	15000 15000
21	NORTHROP	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

* Reduced Crossrange TAL Site

◆ Available for TAL Only

MSBLS Jr. Channel 6 - Requires Uplink

† MSBLS Jr. Channel 8 - Requires Uplink

1: GNC DEORB MNVR COAST	2: GNC 50 HORIZ SIT
3: BFS, GNC 50 HORIZ SIT	

HORIZ SIT CONFIG

ALTM - ITEM 9 +

		.		
--	--	---	--	--

	<u>PASS ITEM</u>		<u>BFS ITEM</u>	
PTI	INH	✓1		
LAND SITE (DEL PAD)		✓41		✓41
RWY (DEL PAD)		✓3		✓3
		✓4		✓4
TACAN (DEL PAD)		✓5		✓5
TAEM TGT				
G&N	OVHD	✓6	blank	
HSI	blank		blank	
XEP	NEP	✓7	NEP	✓7
AIM (DEL PAD)	NOM	✓8	NOM	✓8
	(or CLSE)		(or CLSE)	
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
DES any failed TACANs		✓		✓
TAC	DELTA	✓35		
HUD	0	✓37		
	0	✓38		

1: GNC DEORB MNVR COAST | 2: GNC 50 HORIZ SIT

3: BFS, GNC 50 HORIZ SIT

3: GNC 51 OVERRIDE

- ✓ AUTO ELEVON - ITEM 17 (*)
- ✓ SSME REPOS - ITEM 19 (ENA)
- ALT FILTER - ITEM 21 EXEC (*)
- WRAP MODE - ITEM 45 EXEC (ENA)

3: BFS, GNC 51 OVERRIDE

- ✓ AUTO ELEVON - ITEM 17 (*)
- ✓ SSME REPOS - ITEM 19 (ENA)
- ✓ ALT FILTER - ITEM 21 (*)
- ✓ WRAP MODE - ITEM 45 (ENA)

* If BFS engaged: *

* Set HSD BFS ITEMS to PASS config *

* If IMU, RGA, AA, or SURF FDBK has failed: *

* | 2: GNC 51 OVERRIDE | *

* | 3: BFS, GNC 51 OVERRIDE | *

* DES any failed LRU in BFS *

| 2: GNC DEORB MNVR COAST |

3: BFS, GNC DEORB MNVR COAST

✓ BFS GMBL config same as PASS GMBL config

DEORBIT BURN MONITOR

OMS Pc LOW OMS ↓ and ENG VLV 1 or 2 < 70% <hr/> OMS ↓ and ENG VLV 1 and 2 > 70% and FU and OX TK P < 185 (System in Blowdown) OX IN P > 227 P ≤ 227 No OMS ↓	OMS ENG FAIL <hr/> Burn to Pc = 72% then OMS PRPLT FAIL <hr/> OMS ENG FAIL <hr/> OMS PRPLT FAIL <hr/> SENSOR FAIL
OMS TEMP L R FU IN P > 227 230 P ≤ 209 214 P 210-226 215-229	OMS ENG FAIL <hr/> OMS PRPLT FAIL <hr/> SENSOR FAIL
OMS OX/FU TK P <hr/> OX & FU LOW OX LOW <hr/> FU LOW <hr/> OX & FU HIGH	He PRESS/VAP ISOL (two) - OP Burn to OMS ↓, then OMS PRPLT FAIL <hr/> He PRESS/VAP ISOL (two) - CL Burn to OMS ↓, then OMS PRPLT FAIL <hr/> Cycle He to maint OMS TK P 234-284 Cycle He A(B) to isolate failed leg
OMS GMBL 1st FAIL 2nd FAIL	Select SEC GMBL (twice) if control problems or high RCS fuel usage: All OMS ENG - OFF XFEED if ΔVTOI > 20
RDNT FAIL, 4-WAY OR 2-2 SPLIT OR Safe HP: IMU DLMA HP > OR HP < 2 MN DC BUSES	Stop burn, APUs - SHUT DN <hr/> Continue burn: PASS SET FAIL only - BFS engage PASS SET SPLIT only - √MCC on Restrung IMU DLMA - Post OMS cutoff, desel IMU with 'ACC' > 0.03 +X on watch (AOA) or +X to TGT HP (EOM)
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

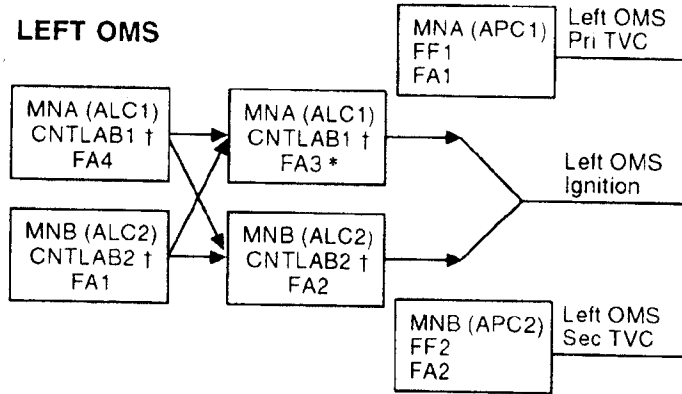
ENT-2a/86/A,O,D,E/A

MS ONLY

FS 3-29

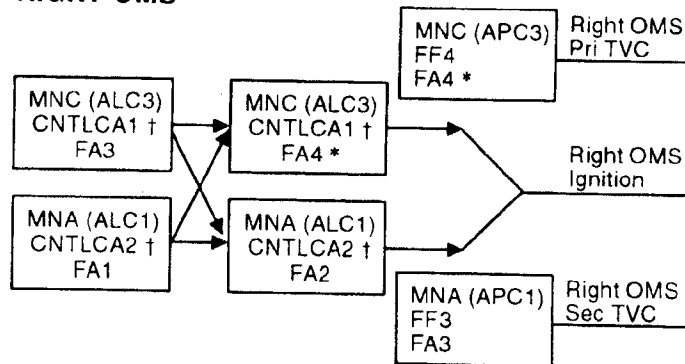
ENT/86/FIN

OMS FAILURES



† If CNTL AB1 or AB2 (CA1 or CA2) failed and ign path still exists at OMS fail, assume L(R) OMS ↓ is PRPLT FAIL
 * If FA3(4) or Pc failed high and L(R) OMS fail, no guidance downmode after OMS ENG switch OFF (TGO slow, ADI needles in error, 6 ft/s underburn)

RIGHT OMS



If two FA MDMs lost		
MDMs	Preburn: ENG - OFF	During burn: MAN SHUTDN
1,2	LEFT (TVC)	BOTH
1,3	RIGHT (IGN)	LEFT
1,4	LEFT (IGN)	RIGHT
2,3	LEFT (IGN)	RIGHT
2,4	RIGHT (IGN)	LEFT
3,4	RIGHT (TVC)	BOTH

ENT-2b/86/A,O,D,E/A

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

* **UNDERBURN** *

* Determine Δ HP *

* (CUR HP - TGT HP) *

* Record UNDERBURN prebank on *

* ENTRY MANEUVERS Cue Card *

* PREBANK TABLE EDW (HA = 211 NM) *

Δ HP	0	3	5	RED	7	10	13	15	16
PREBANK (deg)	0	60	85	NOR	95	110	130	155	170
				NOR NOT AVAIL					

↓

Δ HP	6	10	12	14	17	20
PREBANK (deg)	75	95	105	110	130	175
G50 ITEM 41 +2 0, ✓RWY 17 SET TACAN tw (three) 121Y						

* PREBANK TABLE KSC (HA = 213 NM) *

Δ HP	0	1	3	5	6	8	12	14	16
PREBANK (deg)	0	25	60	85	90	105	125	145	180
Set TACAN tw (three) 59Y									

Δ HP									
PREBANK (deg)									

POST BURN STATUS

NOMINAL

Δ TIG :

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

C F6 INST PWR - FLT/MPS
P F7 MPS PRESS He sel - REG

C CRT1 **GNC, OPS 303 PRO**

1: GNC DEORB MNVR COAST	2: GNC DEORB MNVR COAST
-------------------------	-------------------------

C CRT1 ✓Uplinked INRTL EI-5 MM303 ATT with DEL PAD

* If no deorbit TGT uplink, enter INRTL EI-5 *
* MM303 ATT from DEL PAD *
* R - ITEM 24 + _____ *
* P - ITEM 25 + _____ *
* Y - ITEM 26 + _____ *

Mnvr to EI-5 ATT - ITEM 27 EXEC

* If UNDERBURN or no *
* DEL PAD, manually *
* mnvr to LVLH R 001; *
* Y 358, P per table *

TIME to EI (min)	LVLH PITCH (deg)
20	339
	343
	347
	351
	355
15	359
	3
	7
	11
	15
10	19
	23
	27
	31
	35
5	39

C **OMS GMBL PWRDN (PASS ONLY)**

CRT1 Verify GMBL positions:

	<u>L</u>	<u>R</u>
P	+5.9	+5.9
Y	+6.4	-6.4

GMBL OFF - ITEM 32 EXEC
- ITEM 33 EXEC

ENTRY ALPHA

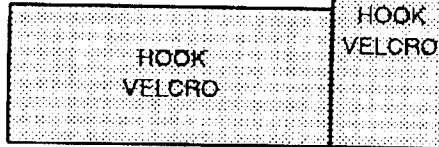
VR	Qref	R	H	Href	Rref
25	40	4464	400		
24	HI 40 LO	2583	245	-47	R80
23	43 40 37	2130	236	-64	71
22	43 40 37	1772	230	-85	65
21	43 40 37	1496	224	-108	63
20	43 40 37	1278	217	-126	62
19	43 40 37	1107	210	-149	62
18	43 40 37	969	204	-173	63
17	43 40 37	856	201	-194	L63
16	43 40 37	764	193	-200	64

KSC 15

MAX L/D	
M	α
3	17
2	15
1	12

(86 OCF CY)

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



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	

MS ONLY

FS 4-11

ENT/86/FIN

MS ONLY

FS 4-12

ENT/86/FIN

APU REDLINE	
% FU REMAINING	
TIG	60
EI-20	54
-10	49
EI	41
+10	31
+20	20
TD	8

CONTROL PROBLEM OPTIONS

AIL TRIM REQD

- * 1. Roll panel trim away from *
- * RHC, M > 5 *
- * 2. ✓ RCS QTY JET FAIL ON *

RCS CRITICAL ENTRY

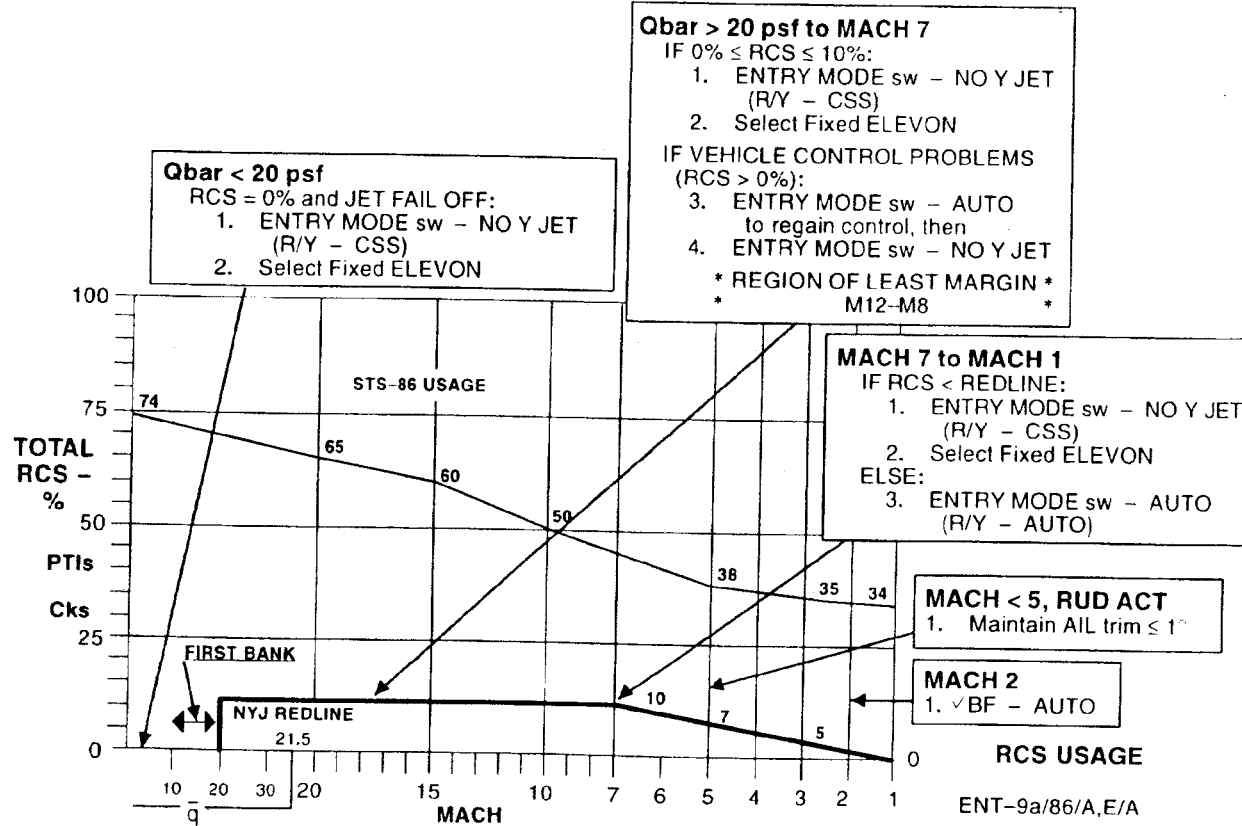
(50° to 53.5° Inclination)

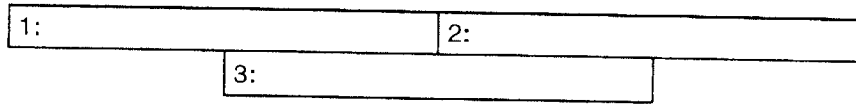
RCS QTY	He P
100%	3300
75	2800
50	2300
29	1900
25	1810
15	1620
0	1350

MS ONLY

FS 4-13

ENT/86/FIN





POST LANDING PAYLOAD ACTIVITIES

TBD

TOP

HOOK
VELCRO

**DEORBIT
BURN
MONITOR**

HOOK
VELCRO

OMS Pc LOW OMS ↓ and ENG VLV 1 or 2 < 70% ----- OMS ↓ and ENG VLV 1 and 2 > 70% and FU and OX TK P < 185 (System in Blowdown) OX IN P > 227 P > 227 ----- No OMS ↓	OMS ENG FAIL ----- Burn to Pc = 72% then OMS PRPLT FAIL ----- OMS ENG FAIL ----- OMS PRPLT FAIL ----- SENSOR FAIL
OMS TEMP L R FU IN P ≥ <input type="text" value="227"/> <input type="text" value="230"/> P ≤ <input type="text" value="209"/> <input type="text" value="214"/> P <input type="text" value="210-226"/> <input type="text" value="215-229"/>	OMS ENG FAIL ----- OMS PRPLT FAIL ----- SENSOR FAIL
OMS OX/FU TK P OX & FU LOW OX LOW ----- FU LOW ----- OX & FU HIGH	He PRESS/VAP ISOL (two) - OP Burn to OMS ↓, then OMS PRPLT FAIL ----- He PRESS/VAP ISOL (two) - CL Burn to OMS ↓, then OMS PRPLT FAIL ----- Cycle He to maint OMS TK P 234-284 Cycle He A(B) to isolate failed leg
OMS GMBL 1st FAIL 2nd FAIL	Select SEC GMBL (twice) ----- If control problems or high RCS fuel usage: A# OMS ENG - OFF XFEED if ΔVTOT > 20
RDNT FAIL, 4-WAY OR 2-2 SPLIT QI Safe HP: IMU DLMA HP > <input type="text"/> <input type="text"/> QI HP < <input type="text"/> <input type="text"/> 2 MN DC BUSES	Stop burn, APUs - SHUT DN ----- Continue burn: PASS SET FAIL only - BFS engage PASS SET SPLIT only - MCC on Restring IMU DLMA - Post OMS cutoff, desel IMU with ACC > 0.03 +X on watch (AOA) or +X to TGT HP (EOM)
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

ENT-2a/86/A, O, D, E/A

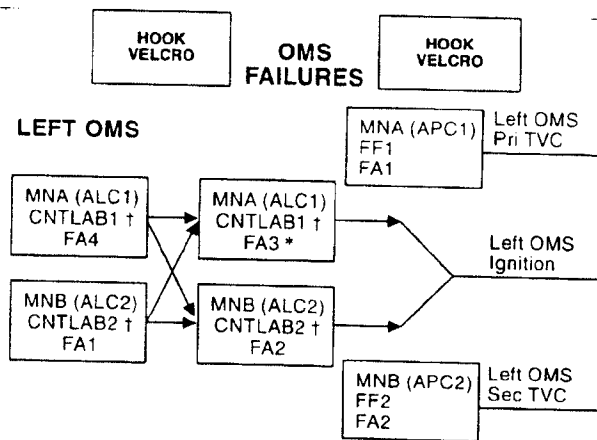
(reduced copy)

FAB USE ONLY

FS CC 8-23

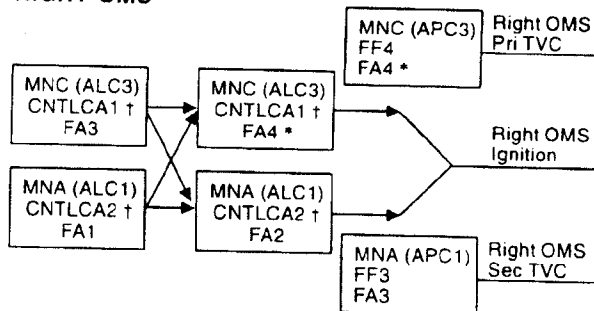
ENT/86/FIN

TOP
BACK OF 'DEORBIT BURN MONITOR'



† If CNTL AB1 or AB2 (CA1 or CA2) failed and ign path still exists at OMS fail, assume L(R) OMS ↓ is PRPLT FAIL
 * If FA3(4) or Pc failed high and L(R) OMS fail, no guidance downmode after OMS ENG switch OFF (TGO slow, ADI needles in error, 6 ft/s underburn)

RIGHT OMS



If two FA MDMs lost		
MDMs	Preburn: ENG - OFF	During burn: MAN SHUTDN
1,2	LEFT (TVC)	BOTH
1,3	RIGHT (IGN)	LEFT
1,4	LEFT (IGN)	RIGHT
2,3	LEFT (IGN)	RIGHT
2,4	RIGHT (IGN)	LEFT
3,4	RIGHT (TVC)	BOTH

ENT-2b/86/A,O,D,E/A

(reduced copy)

FAB USE ONLY

FS CC 8-24

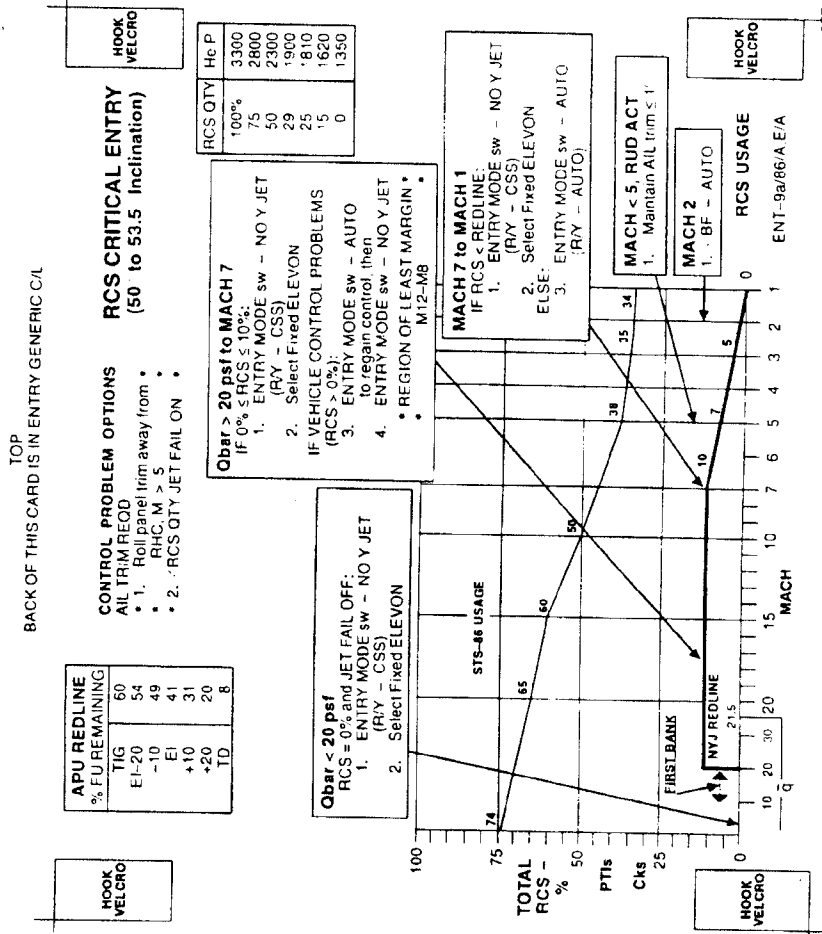
ENT/86/FIN

FAB USE ONLY

(reduced copy)

FS CC 8-25

ENT/86/FIN



Refer to Generic Cue Card
for Back of RCS CRITICAL ENTRY

FAB USE ONLY

FS 8-26

ENT/86/FIN