

McDonnell Douglas Space Systems Company - Engineering Services Division

TRANSMITTAL MEMO

SUBJECT: STS-30 POST-FLIGHT ANALYSIS

ENCL: STS-30 ORBIT INSERTION/DEORBIT GUIDANCE POST
FLIGHT ANALYSIS REPORT (MECO through OMS-2, Deorbit)

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REMARKS:

A detailed post flight assessment of the STS-30 Orbit Insertion and Deorbit maneuvers has been completed. The enclosed data presents this assessment and summarizes the performance and accuracy of STS orbit insertion and deorbit guided maneuvers.

All flight critical parameters that were analyzed for both orbit insertion and deorbit phases of STS-30 compared well to Space Vehicle Dynamics Simulation (SVDS) and Shuttle Avionics Integration Laboratory (SAIL) data. No problems were found to exist in the performance of the orbit insertion or deorbit guidance software.

The analysis was conducted using actual flight data and data derived from simulations using the SVDS program, and the SAIL.

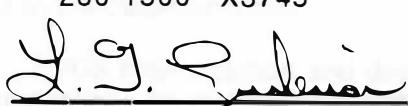
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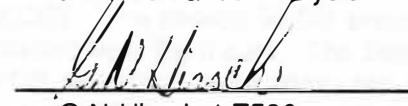
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APPENDIX A
MANEUVER SOLUTIONS

	OMS-1	SVDS/OMS-1	OMS-2	SVDS/OMS-2
OMS BOTH 1	*	*	*	*
2				
3				
RCS SEL 4				
TV ROLL	180.0	180.0	180.0	180.0
TRIM LOAD P	+ 0.4	+ 0.4	+ 0.4	+ 0.4
LY	- 5.8	- 5.8	- 5.8	- 5.7
RY	+ 5.8	+ 5.8	+ 5.8	+ 5.7
WT	254558.4	254558	248935.4	248935.4
TIG	0/00:10:29.	0/00:10:29.1	0/0:44:27.0	0/0:44:27.0
C1	0 0.0	0.0	0.0	0.0
C2	0.0	0.0	0.0	0.0
HT	165.38	165.39	166.38	166.38
θT	165.124	165.124	341.79	341.79
DVX	226.0	228.3	196.72	195.5
DVY	-0.0	-0.0	0.0	- 0.0
DVZ	0.99	0.3	16.79	17.5
BURN ATT R	242.7	243.0	120.45	120.
P	165.9	165.0	4.22	3
Y	352.6	351.0	333.73	335
GMBL	LP	+ 0.45	+ 0.744	+ 0.5
	RP	+ 0.46	+ 0.727	+ 0.0
	LY	- 5.8	- 5.73	- 5.6
	RY	+ 5.8	+ 6.1	+ 6.0
DVTOT	225.94	228.3	197.4	196.3
VGO	X	214.17	187.4	185.68
	Y	3.12	4.28	-5.33
	Z	71.5	-20.76	63.46
TGT	HA	160	161	161
	HP	51	160	160
CUR	HA	84.26	160.56	160.
	HP	3.65	50.77	52.
TGO		2:27.2	2:06.5	2:06

APPENDIX A CONT'D
MANEUVER SOLUTIONS

	DEORBIT	SVDS/DEORBIT
OMS BOTH 1	*	*
2	30.00000	
3	30.00000	
RCS SEL 4	0.081	0.081
TV ROLL	180.0	180.0
TRIM LOAD P	*****	+ 0.4
LY	*****	- 5.8
RY	*****	+ 5.8
WT	201148.	201148.
TIG	3/23:53:50	3/23:53:50
C1	14991.7	14991.7
C2	-0.60173	-0.60173
HT	65.831	65.831
θT	131.499	131.499
DVX	-272.1	-279.0
DVY	-0.0	-0.0
DVZ	-180.0	-168.8
BURN ATT R	58.	58.
P	183.7	185.
Y	52.9	54.
GMBL	LP	+ 0.4
RP	+ 0.6	+ 0.4
LY	- 5.6	- 5.7
RY	+ 5.9	+ 5.7
DVTOT	326.2	326.1
VGO	X	304.7
Y	4.6	14.94
Z	107.81	115.13
TGT	HA	165
HP	*****	9
CUR	HA	177
HP	160.8	161
TGO	2:48.2	2:48

APPENDIX C
POST BURN ORBITAL ELEMENTS

The orbital elements that describe the trajectory of the vehicle are given following the completion of the orbit insertion and deorbit burns in the table below.

ORBITAL ELEMENTS	MANEUVER					
	OMS-1	OMS-1/SVDS	OMS-2	OMS-2/SVDS	DEORBIT	DEORBIT/SVDS
MET	776.576	776.78	2805.57	2805.2	345398.6	345400.7
HA	160.513	160.38	161.22	160.69	165.18	164.95
HP	50.54	51.163	160.73	159.85	9.32	9.36
I	28.79	28.79	28.79	28.79	28.78	28.79
ASCN	*****	117.89	*****	117.76	*****	88.5
TA	46.78	46.13	0.0	347.38	167.8	168.0
ARPER	69.05	70.3	-107.7	-94.5	92.65	92.96
ECN	0.0161	0.016	7.48E-04	6.55E-04	0.02135	0.0213

MET = MISSION ELAPSED TIME, sec.

HA, HP = MEAN APOGEE, PERIGEE ALTITUDE ABOVE
 REFERENCE EARTH, nmi.

I = ORBITAL INCLINATION (M50), deg.

ASCN = LONGITUDE OF ASCENDING NODE (M50), deg.

TA = TRUE ANOMALY, deg.

ARPER = ARGUMENT OF PERIGEE, deg.

ECN = ECCENTRICITY, nd.

APPENDIX F
MANEUVER PERFORMANCE

The following table provides the maneuver performance data achieved. The burn time is computed by subtracting the time of ignition (TIG) from the time of cutoff (TCUTOF). The sensed velocity is computed by taking the Root Sum Square (RSS) of the accumulated sensed velocity before and after a given burn.

OMS MANEUVER	ACTUAL BURN TIME, sec.		SENSED VELOCITY ft/sec		PROPELLANT(*) USED lbs.	
	FLIGHT	SVDS	FLIGHT	SVDS	FLIGHT	SVDS
OMS-1	142.0	145.12	226.39	****	5431.2	5550.5
OMS-2	125.0	128.15	196.95	****	4781.	4785.
DEORBIT	167.	170.7	325.68	****	6387.4	6528.93

(*) PROPELLANT USED IS COMPUTED AS BURN TIME X MDOT X g.