McDonnell Douglas Space Systems Company - Engineering Services Division

TRANSMITTAL MEMO

TM NO	TM-FM9-BC-43
DATE	22 JUNE 1989
CONTRACT NO.	NAS 9-17885
TASK ORDER NO.	FM9BC080
TASK ASSIGNMENT NO.	

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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AASC LIB T300-1

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
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	+ 0.4	+ 0.744	+ 0.5
	RP	+ 0.46	+ 0.4	+ 0.727	+ 0.0
	LY	- 5.8	- 5.7	- 5.73	- 5.6
	RY	+ 5.8	+ 5.7	+ 6.1	+ 6.0
DVTOT		225.94	228.3	197.4	196.3
VGO	X	214.17	225.22	187.4	185.68
	Y	3.12	31.32	4.28	-5.33
	Z	71.5	-20.76	61.87	63.46
TGT	HA	160	160	161	161
	HP	51	51	160	160
CUR	HA	84.26	84	160.56	160.
	HP	3.65	3	50.77	52.
TGO		2:27.2	2:30	2:06.5	2:06

APPENDIX A CONT'D

MANEUVER SOLUTIONS

		DEORBIT	SVDS/DEORBIT
OMS BOTH	1	*	*
	2		
	3		
RCS SEL	4		
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	+ 0.3	+ 0.4
	RP	+ 0.6	+ 0.4
	LY	- 5.6	- 5.7
	RY	+ 5.9	+ 5.7
DVTOT		326.2	326.1
VGO	X	307.83	304.7
	Y	4.6	14.94
	Z	107.81	115.13
TGT	HA	*****	165
	HP	*****	9
CUR	HA	176.0	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.