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Shuttle Systems Weight and Performance

Monthly Status Report

May 18, 1982

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SHUTTLE SYSTEMS WEIGHT AND PERFORMANCE

MONTHLY STATUS REPORT

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1.0 INTRODUCTION

The purpose of this document is to present the status of Shuttle systems weight and performance to provide visibility into the injected weight margin for the STS Missions 3-13 as defined by JSC 17379, "STS Flight Definition and Requirements Directive," and the Baseline Reference Missions (BRM). Control and status weights are reported monthly and are obtained from the responsible offices specified in JSC-07700, Volume X, Appendix 10.12. These weights along with ascent performance ground rules in Appendix 10.12 for BRM are used to status Shuttle injected weight margin. Mass properties can be found in JSC-08934, "Shuttle Operational Data Book, Volume II, Mission Mass Properties." Acronyms used for this document are based on JSC-07700, Volume I. Appendix A provides Mass Properties for the vehicle configurations as defined herein.

2.0 SYSTEM WEIGHT AND PERFORMANCE - STS MISSIONS

The status of Shuttle system total injected weight margin and pending changes are summarized in this section for the STS Missions 4-13.

This section consists of the Mission Summary of Lift Capability and Margin (Table 2.1), Payload Weight Summary (Table 2.2), STS Operator Weight Summary (Table 2.3), and Injected Weight Margin Changes (Table 2.4). Time histories of injected weight margin are also included (Figure 2.1). Potential changes that affect Lift Capability and Performance Margin (Table 2.8) are also shown.

TABLE 2.1 - MISSION SUMMARY, LIFT CAPABILITY AND MARGIN 05-18-82

MISSION	STS-04	STS-05	STS-06	STS-07	STS-08	STS-09	STS-10	STS-11	STS-12	STS-13
LAUNCH DATE	06/27/2	11/11/2	01/20/3	04/20/3	07/04/3	09/30/3	11/05/3	12/23/3	01/20/4	3/23/84
ORBITER	OV-102E	OV-102E	OV-099	OV-099	OV-099	OV-102	OV-099	OV-102	OV-103	OV-099
ET	ET-4	ET-5	LWT-1	ET-6	LWT-2	LWT-3	LWT-4	LWT-5	LWT-6	LWT-7
SRB	STD	STD	LWC	LWC	LWC	STD	STD	STD	LWC	LWC
CREW/DAYS	2M/7D	4M/5D	4M/3D	4M/6D	4M/3D	6M/7D		4M/5D	4M/3D	
INCLINATION (DEGREES)	28.5	28.5	28.5	28.5	28.5	57.0		28.5	28.5	
ALTITUDE (N.M.)	165	160	150*	160	150*	135		272	150*	
Q MAX	680	680	692	680	723	718		687	692	
SRM MOTOR	78-82	231-81	231-81	231-81	HPM	HPM	HPM	HPM	HPM	HPM
SSME THROTTLE SETTING	100/107	100/107	104/109	104/109	109/109	102/109		102/109	109/109	
P/L ASSIGNMENT	DOD 82-1	SBS C, TELE-SAT-E	TDRS-A	SPAS-1, PALAPA B1, TELE-SAT-F, OSTA-2	INSAT 1B, TDRS-B	SL-1	DOD	LDEF DEP., SMM REVISIT	PALAPA B2, TDRS-C	DOD
WEIGHT SUMMARY										
MARGIN NOMINAL	6505	-337	2018	2227	-1185	328		-9877	(1) 4593	
PAYLOAD	11506	20637	47353	33497	55992	34468		45825	55125	
P/L CAPABILITY	18011	20300	49371	35724	54807	34796		35948	59718	
RESERVE	0	3000	3000	3000	3000	3000		3000	3000	
LIFT CAPABILITY	18011	23300	52371	38724	57807	37796		38948	62718	
STS OPERATOR	12843	13162	330	4390	1093	781		4903	1227	
ORBITER INERT	151544	151951	151130	151135	151135	153092		153092	148074	
SSME X 3 INERT	20709	20709	20859	20859	20859	20709		20709	20859	
PERSONNEL	3293	3539	3321	3572	3321	4539		3501	3321	
NON-PROP. CONSUMABLES	6567	6318	5483	5456	5634	5358		5445	4634	
OMS PROPELLANT	22000	20272	19300	21000	22100	15500		25156	21100	
RCS PROPELLANT	7830	7888	7508	7508	7508	7888		7888	7508	
MPS PROPELLANT UNEXPENDED	14940	13944	13901	13944	13901	13901		13901	13901	
MPS PRESSURANTS	423	423	423	423	423	423		423	423	
ET INERT	76974	77074	68910	77098	68910	68922		68878	68878	
SHUTTLE SYSTEM AT MECO	335134	338580	343536	344109	352691	328909		342844	352643	
SRB X 2 INERT	380201	380716	372320	369984	374772	381926		380032	372878	
SRB X 2 PROPELLANT	2217265	2215514	2216970	2216970	2217504	2216048		2216048	2217504	
MPS PROPELLANT EXPENDED	1551953	1558511	1558383	1555947	1561586	1560073		1570278	1555808	
SHUTTLE SYSTEM AT SRB IGNITION	4484553	4493321	4491209	4487010	4506553	4486956		4509202	4498833	

*MINIMUM REQUIREMENT (153.5 PLANNED).

(1)UNDER REVIEW USING DIRECT INSERTION TECHNIQUE.

TABLE 2.2 PAYLOAD WEIGHT SUMMARY

MISSION	STS-04	STS-05	STS-06	STS-07	STS-08	STS-09	STS-10	STS-11	STS-12	STS-13
ORBITER	OV-102E	OV-102E	OV-099	OV-099	OV-099	OV-102	OV-099	OV-102	OV-103	OV-099
PAYLOAD DETAIL										
DOD PAYLOAD	8585									
ATTACH HDW	847	OPC	451	OPC	451	1502			451	
ORBITER RETENTION FTG. ALLOW.						-675				
MV0712A-SMCH										
MV0711A-X576/X603 HNS	86									
MV0725A-STD I/F PANEL	141									
MV0719A-AFD HARNESS										
MV0721A-UNIV PATCH HARNESS										
MV0702A-P/L TIME BUFFER	3	3								
MV0704A-P/L PALT. UTIL KITS										
MV0587-UNIQUE HARNESS										
M072-790010-001 P/L REC TM CA										
INSAT 1B + SSUS-D--DEPLOY					7356					
--ASE					2394					
TDRS + IUS-2 STAGE--DEPLOY			37653		37653				37653	
IUS-ASE			6047		6047				6047	
WEIGHT GROWTH ALLOWANCE			203		203				203	
P/L RECORDER		OPC	60	OPC	60				60	
SMCH		OPC	786	OPC	786				786	
SPAS 01				3950						
OSTA-2				5350						
PALAPA B1,B2 + PAM-D--DEPLOY				7531					7531	
--ASE				2394					2394	
TELESAT E,F + PAM-D--DEPLOY		7365		7620						
--ASE		2394		2430						
SBS-C + PAM-D--DEPLOY		7351								
--ASE		2394								
SL-1 PAYLOAD/CARRIER						27698				
SL INTERFACE CABLES						937				
EPS TANK SET 4 HDW.						779				
TANK SET 4 CRYOGENICS						873				
A/L ADAPTER,MOD,DUCT						1021				
ATCS RADIATOR PANELS						355				
MID DECK SEATS						184				
LDEF								20312		
OMS KIT HARDWARE								7055		
OMS KIT PROPELLANT								12438		
SMM REPAIR PAYLOAD								4510		
MMU								600		
--PRIMARY PAYLOAD SUB-TOTAL--	9662	19507	45200	29285	54950	32674		44915	55125	
CFES EXPERIMENT	702		764	764	764					
MLR EXPERIMENT	170	170	175							
ACIP + RECORDER	278	278	278	278	278	278		278		
GET AWAY SPECIAL	635	675	804	3170		894				
TILE GAP EXPERIMENT	7	7								
NOSL EXPER.	52		52							
FWD FUSE. INSTRUMENTATION						36		36		
SUMS						85		85		
SEADS						101		101		
SILTS						410		410		
--ANCILLARY PAYLOAD SUB-TOTAL--	1844	1130	2153	4212	1042	1794		910		
TOTAL PAYLOAD------	11506	20637	47353	33497	55992	34468		45825	55125	

OPC - Operator Chargeable

TABLE 2.3 STS OPERATOR WEIGHT SUMMARY

MISSION	STS-04	STS-05	STS-06	STS-07	STS-08	STS-09	STS-10	STS-11	STS-12	STS-13
ORBITER	OV-102E	OV-102E	OV-099	OV-099	OV-099	OV-102	OV-099	OV-102	OV-103	OV-099
RMS ARM	INC	-983	-941	INC	-941	-941	INC	INC	-941	INC
RMS CLOSE-OUT PANEL	N/A	6	6	N/A	6	6	N/A	N/A	6	N/A
RMS INSTALLATION	INC	INC	INC	INC	INC	INC	INC	INC	INC	INC
GALLEY	N/A	DE	-164	-164	-164	INC	INC	INC	INC	INC
H2O DISPENSING SYSTEM	INC	INC	23	23	23					
EPS TANK SET 3 TANKS	INC	INC	INC	INC	INC	INC	INC	INC	INC	INC
ORBITER RETENTION FTG. ALLOW.	INC	INC	INC	INC	INC	INC	INC	INC	INC	INC
RENDEZVOUS RADAR	DE	DE	INC	INC	INC	INC	INC	INC	INC	INC
MISSION SPEC. SEAT	DE	92	INC	INC	INC	INC	INC	INC	INC	INC
P/L SPEC. SEAT	DE	DE	INC	INC	INC	INC	INC	INC	INC	INC
--MANIFEST SUB-TOTAL--		-885	-1076	-141	-1076	-935			-935	
MID-DECK SEAT 1		92								
ATCS RADIATOR PANELS	355	355	355	355	355	PC		355	355	
EPS TANK SET 4 HDW.	779	779	174	174	174	PC		779	779	
BALLAST PROVISIONS	22	22				22		22		
BALLAST										
AUXILIARY O2 HARDWARE	75	75								
MV055A-AFT STA CONTAINERS	48	48	48	48	48	48		48	48	
DFI	9872	9872								
IECM	1020									
102-MADS ELECTRONICS	88	88				1397		1397		
MV0400A+MV0408A-MADS 1+2			612	612	612					
S-BAND COM SEC BYPASS	1									
CCTV CAMERA	72	72		72						
DATA ACQUISITION CAMERA	157	157		157						
PDRS CAMERA CONTROL PANEL	16									
ONBOARD H2 DETECTION	26	26	26							
SPARE COMPUTER	126									
S-BAND FM	22									
P/L ATTACH HDW	518	2228	1126	2751	1915	PC		1940	1915	
ORBITER RETENTION FTG. ALLOW.	-450	-675	-675	-675	-675	PC		-675	-675	
P/L INTERFACE HDW ALLOWANCE	N/A	N/A	-451	N/A	-451				-451	
P/L RECORDER		60	PC	60	PC	60		60	PC	
MV0713A-1307 B/H P/L WIRING		80	80	80	80	80		80	80	
P/L UMBIL. + OEX PROV.	23									
MV0712A-SMCH	PC	659	2	788	2			788	2	
MV0719A-AFT FLT DECK HARNESS	PC	40	40	40	40	40		40	40	
KEEL WIRE	1									
MV0564A-STD SW PANEL + VTR	69	69	69	69	69	69		69	69	
FWD FUSE SUPT-OEX/SEADS	3									
--OPERATOR SUB-TOTAL--	12843	14047	1406	4531	2169	1716		4903	2162	
TOTAL STS OPERATOR--------	12843	13162	330	4390	1093	781		4903	1227	

INC - Included in Orbiter Inert Weight.
DE - Deferred Effectivity.
N/A - Not Applicable.
PC - Payload Chargeable.

TABLE 2.4 - SHUTTLE SYSTEM INJECTED WEIGHT MARGIN CHANGES - STATUS 05-18-82

ITEM	STS-004 OV-102 ET-04 A13 A14	STS-005 OV-102 ET-05 A15 A16	STS-006 OV-099 LWT-1 A17 A18	STS-007 OV-099 ET-06 A19 A20	STS-008 OV-099 LWT-2	STS-009 OV-102 LWT-3	STS-010 OV-099 LWT-4	STS-011 OV-102 LWT-5	STS-012 OV-103 LWT-6	STS-013 OV-099 LWT-7
INJECTED WEIGHT MARGIN 04-20-82	4379	-565	3156	2263	-1150	1227		-9911	3710	
MPS PROPELLANT UNEXPENDED (TABLE 9.1)	656									
ORBITER (TABLE 4.1)	-6	-6	123	118	118	-7		-7	127	
NON-PROP CONSUMABLES (TABLE 4.7)	-95	-115	-118	-91	-90	-6				
OMS (TABLE 4.7)										
RCS (TABLE 4.7)										
PERSONNEL (TABLE 5.1)	-69	3	41	41	41	41		41	41	
PAYLOAD (TABLE 2.6)	495					-22				
STS OPERATOR (TABLE 2.7)			85	85	85					
SSME X 3 (TABLE 6.1)										
ET (TABLE 7.1)	-41									
TOTAL ELEMENT WEIGHT UPDATES	940	-118	131	153	154	6		34	168	
TOTAL PERFORMANCE CHANGES (TABLE 2.5)	1186	346	-1269	-189	-189	-905			715	
SSPO INJECTED WT MARGIN (NOMINAL)	6505	-337	2018	2227	-1185	328		-9877	4593	

TABLE 2.5 - BRIEF DESCRIPTION OF INJECTED WEIGHT CHANGES - STATUS 05-18-82

PERFORMANCE CHANGES	STS-004	STS-005	STS-006	STS-007	STS-008	STS-009	STS-010	STS-011	STS-012	STS-013
UPDATE TO SIM (2)		346	-851							
SRB TAG DATA + I LOAD REDESIGN	1000									
ADOPT STD I LOADS			-400							
MPS UPDATE	185									
DELETE RESERVE FOR VEH ISP BIAS	3000									
BASELINE VEH ISP BIAS(-2.7SEC)	-3000									
SRB X 2 (1) (TABLE 8.1)	1		-18	-189	-189	-905	-189		715	715
SSPO RPTED PERFORMANCE CHANGES	1186	346	-1269	-189	-189	-905	-189		715	715

(1) EQUIVALENT MARGIN = WT / 10.
(2) BASED ON DATA SUBMITIALS: 670ADD2A 708ADD1

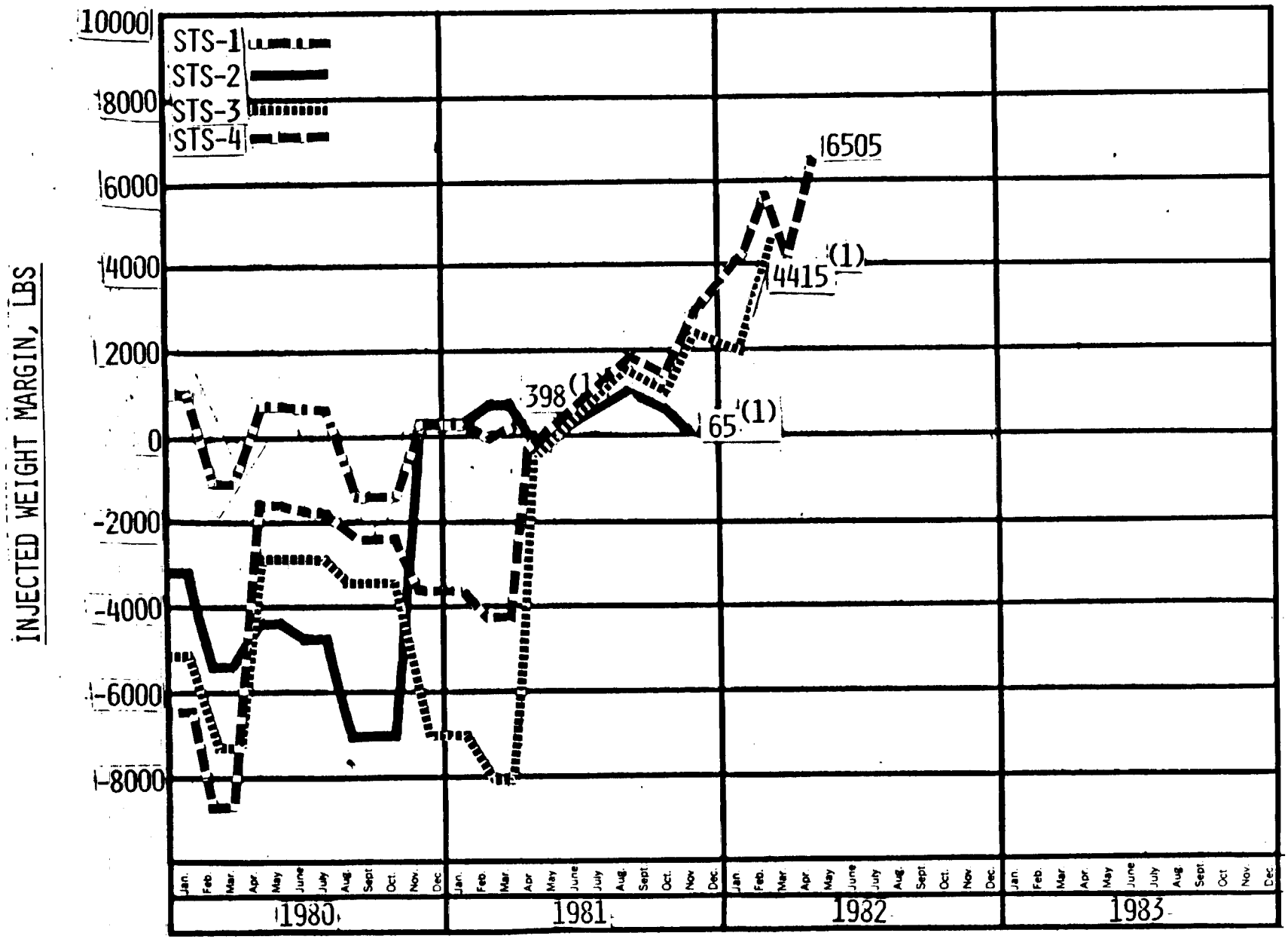
TABLE 2.6 - PAYLOAD WEIGHT CHANGES - STATUS 05-18-82

ITEM	STS-004	STS-005	STS-006	STS-007	STS-008	STS-009	STS-010	STS-011	STS-012	STS-013
P/L STATUS 04-20-82	12001	20637	47353	33497	55992	34446		45825	55125	
PAYLOAD UPDATE	-415									
CRYO UPDATE						22				
GAS UPDATE	-80									
SSPO RPTED P/L CHANGES	-495					22				
SSPO RPTED P/L STATUS	11506	20637	47353	33497	55992	34468		45825	55125	

TABLE 2.7 - STS OPERATOR WEIGHT CHANGE SUMMARY - STATUS 05-18-82

ITEM	STS-004	STS-005	STS-006	STS-007	STS-008	STS-009	STS-010	STS-011	STS-012	STS-013
STS OPERATOR STATUS 04-20-82	12843	13162	415	4475	1178	781		4903	1227	
DELETE FAMOS (XFER TO ORB)			-45	-45	-45					
UPDATE MADS (XFER TO ORB INERT)			-40	-40	-40					
TOTAL SSPO RPTED STS OP CHANGES			-85	-85	-85					
SSPO RPTED STS-OP STATUS	12843	13162	330	4390	1093	781		4903	1227	

FIGURE 2.1 TIME HISTORY INJECTED WEIGHT MARGIN - OFT



(1) FINAL PREDICTION

TABLE 2.8 - PROJECTED WEIGHT MARGINS - STS-4 THROUGH 13 MISSIONS 05-18-82

	STS-4	STS-5	STS-6	STS-7	STS-8	STS-9	STS-10	STS-11*	STS-12	STS-13
CURRENT MARGIN	6505	-337	2018	2227	-1185	328	DOD	-9877	4593	DOD
DETERMINISTIC FPR	--	--	--	--	--	--		--	--	
ORBITER INERT WEIGHT	--	--	210	210	210	-1310		-1310	1459	
SRBX2 INERT WEIGHT			-21	-21	295	295		295	295	
ADOPT STANDARD I LOADS	--	--	--	-400	-400	-400		-400	-400	
C.G. REQUIREMENTS	--	TBD	TBD	TBD	TBD	TBD		TBD	TBD	
VEHICLE ISP BIAS	--	-2300	-2300	-2300	-2300	-2300		-2300	-2300	
FILL 3RD & 4TH CRYO TK SETS	--	--	--	--	--	--		-811	-1622	
MICRO MOD-OV102 (RMS POS MECH)	--	TBD	--	--	--	--		--	--	
5.4 LOADS	--	--	-650	-1500	-1500	-1500		-1500	-1500	
ADDITIONAL EQUIP FOR 7 DAYS	--	-112	-293	-42	-293	--		-177	-293	
TOTAL PROJECTED MARGIN CHANGES	--	-2412	-3045	-4053	-3988	-5215		-6203	-4361	
PROJECTED MARGIN	6505	-2749	-1036	-1826	-5173	-4887	DOD	-16080	232	DOD

*DIRECT INSERTION TECHNIQUE WITH ET DISPOSAL IN PACIFIC OCEAN IS UNDER STUDY TO GAIN A POSITIVE MARGIN (TBD) FOR THIS MISSION.

TABLE 2.9 - BRIEF DESCRIPTION OF POTENTIAL CHANGES TO LIFT CAPABILITY STS-4 THROUGH 13

ORBITER INERT WEIGHT — VEHICLE DEPENDENT

A LIST OF ORBITER INERT WEIGHT POTENTIAL CHANGES INCLUDING WEIGHT SAVERS IS GIVEN IN TABLE 4.4.

SRBX2 INERT WEIGHT — VEHICLE DEPENDENT

A LIST OF SRB INERT WEIGHT POTENTIAL CHANGES IS GIVEN IN TABLE 8.2.

STANDARD I-LOAD — -400

THE I-LOAD DESIGN FOR OFT IS CONFIGURED FOR THE EXPECTED MONTH OF LAUNCH. IF THE I-LOAD WAS CONFIGURED BASED ON SEASONAL CHARACTERISTICS, A PENALTY OF 400 LBS COULD OCCUR FOR THE NOMINAL LAUNCH.

C. G. REQUIREMENTS — TBD

THE VEHICLE C.G. REQUIREMENTS ARE IN THE PROCESS OF BEING MODIFIED. ADDITIONAL OMS PROPELLANT MAY BE REQUIRED TO ACHIEVE THESE REQUIREMENTS.

VEHICLE ISP BIAS — -2300

ASSESSMENT OF STS-2 FLIGHT DATA CURRENTLY INDICATES A VEHICLE ISP OF -1.9 SEC LOW AS OPPOSED TO -2.7 SEC LOW REPORTED ON STS-1. THE TOTAL BIAS FOR SUBSEQUENT MISSIONS IS ESTIMATED AS -2300 LBS OF MARGIN.

FILL 3RD AND 4TH CRYO TANK SETS — -811/-1622

IF THE 3RD AND 4TH TANK SETS CANNOT BE FLOWN EMPTY THE RESULTING PAYLOAD PENALTIES ARE - 811 LBS FOR TANK SET 3 AND -811 LBS FOR TANK SET 4.

MICRO MOD-OV102 — TBD

THE MICRO MOD FOR OV102 HAS BEEN MODIFIED TO DELETE THE RMS POSITIONING MECHANISM. THIS IS STILL BEING DEFINED.

5.4 LOADS (q VS MACH CONSTRAINT) — -1500

UNTIL THE 5.4 LOADS ASSESSMENT IS COMPLETED THE ASCENT TRAJECTORY IS CONSTRAINED BY q VS MACH WHICH RESULTS IN A 1500 LB PERFORMANCE LOSS. THIS AFFECT MAY BE DIFFERENT FOR EACH MISSION.

ADDITIONAL EQUIPMENT FOR 7 DAYS — MISSION DEPENDENT

THIS IS THE PENALTY TO CARRY CREW EQUIPMENT RELATED ITEMS FOR INCREASING THE MISSION DURATION TO 7 DAYS FOR ALL MISSIONS.

3.0 SYSTEM WEIGHT AND PERFORMANCE - BRM MISSIONS

The status of Shuttle system total injected weight margin, control weights, and pending changes are summarized in this section for the BRM missions.

This section consists of BRM Mission Descriptions (Table 3.1), Level II Control Weight Changes (Table 3.2), Mission Summary of Lift Capability and Margin (Table 3.3), Injected Weight Margin Changes (Tables 3.5 and 3.6), and Projected Weight Margins (Table 3.6). Space Shuttle capability evolutions for BRM-1Y and BRM-4Y are shown in Figures 3.1.1 and 3.1.2. The variation of payload capability with orbit inclination based on groundrules defined by BRM-1Y for ETR launches, and BRM-4Y for WTR launches are shown in Figure 3.2.

TABLE 3.1 - BRM MISSION DESCRIPTIONS

Mission 1. Mission 1 is a payload delivery mission to a 150 n. mi. circular orbit. The mission will be launched due east and requires a payload capability of 65,000-lb. The purpose of this mission is either the placement in orbit of a 65,000-lb satellite or the placement in orbit of a 65,000-lb satellite and retrieval from orbit of a 32,000-lb satellite. The Orbiter-vehicle on-orbit translational delta V requirements in excess of a 50 X 100 n. mi. reference orbit are 650 ft/sec from the orbital maneuvering subsystem (OMS) and 100 ft/sec from the RCS. The injected margin is based on an SRB mean bulk temperature at 60°F and a first stage maximum dynamic pressure of 680 psf. Other ground rules are described in JSC-07700, Space Shuttle Flight and Ground System Specification, Volume X, Revision B, Appendix 10.12.

Mission 3A. Mission 3A is a payload delivery mission to an orbit at 104° inclination and return to the launch site. The boost phase shall result in an insertion into an orbit with a minimum apogee of 100 n. mi., as measured above the earth's equatorial radius. The Orbiter-vehicle on-orbit translation delta V requirements in excess of a 50 X 100 n. mi. reference orbit are 250 ft/sec from the OMS and 100 ft/sec from the RCS. The ascent payload requirement is 32,000 lb. For mission performance and consumables analyses, a return payload of 2500 lb will be assumed (the 2500 lb is included in the 32,000 lb ascent payload weight). The injected margin is based on an SRB mean bulk temperature of 52°F and a first stage maximum dynamic pressure of 650 psf. Other ground rules are described in JSC-07700, Space Shuttle Flight and Ground System Specification, Volume X, Revision B, Appendix 10.12.

Mission 4. Mission 4 is a payload delivery and retrieval mission of a modular spacecraft weighing 32,000 lb at lift-off. The mission will deploy a spacecraft weighing 29,000 pounds in a 150 n. mi. circular orbit at 98 degrees inclination within two revolutions after lift-off. A passively cooperative, stabilized spacecraft, weighing 22,500 pounds, will be retrieved from a 150 n. mi. circular orbit and returned to VAFB. The mission length, including contingencies, will be 7 days. For mission performance and consumables analyses, a cradle weight of 2,500 lb will be assumed to be included in the ascent payload weight, but must be added to the retrieved payload weight. The RCS will be loaded full and the minimum on-orbit translation, delta-velocity from the OMS, including post-MECO insertion burn, is a total of 1050.5 ft/sec. The total injected margin is based on a first stage maximum dynamic pressure of 650 psf and includes 1730 lb for the SRB mean bulk temperature of 52°F. Standard provisions shall be included for personnel and stowed equipment. Contingency EVA capability shall be provided.

Mission 1Y, 4Y. The new BRM-1Y and BRM-4Y missions are assumed to have the same payload requirements as BRM-1 and BRM-4, respectively. The new missions are planned for one day with two crewmen. It is assumed that the non-propulsive consumables, personnel and RCS propellants are loaded in accordance with BRM-3A. The OMS propellants are based on delta-velocity required for orbit insertion, circularization and deorbit. For BRM-1Y, the delta-velocity requirement is 690 ft/sec and for BRM-4Y, the delta-velocity is 1000 ft/sec. The difference is attributable to MECO velocity reduction at WTR for ET disposal.

TABLE 3.2 - LEVEL II CONTROL WEIGHT CHANGES

	Level II Change Request	Control Weight, lb								
		Orbiter			SSMEX3	ET	SRBX2			
		OV-103	OV-099	OV-102 OPER		Light (LWT)	Heavy 86-80	Light 86-80	Light HPM	Heavy HPM
APR. 1982 Control Weight, lb		142483	144744	145549	21015	69927	372522	365822	369000	375600
No change this report										
May 1982 Control Weight, lb		142483	144744	145549	21015	69927	372522	365822	369000	375600

BRIEF DESCRIPTION FOR LEVEL II CONTROL WEIGHT CHANGES

RCS CONTROL WEIGHTS HAVE BEEN ADJUSTED PER PRCBD 20656 WHICH DIRECTS ALL RCS TANKS BE LOADED FULL FOR ALL MISSIONS. THIS IMPACTS BRM 3A, 1Y AND 4Y BY 1271 LBS.

TABLE 3.3 BRM MISSION SUMMARY, LIFT CAPABILITY AND MARGIN STATUS

MISSION (1)	1	1Y	3A	4	4Y
LAUNCH DATE	WINTER	WINTER	WINTER	WINTER	WINTER
ORBITER	OV-103	OV-103	OV-103	OV-103	OV-103
ET	LWT-7	LWT-7	LWT-7	LWT-7	LWT-7
SRB	LT. WT./ETR	LT. WT./ETR	LT. WT./WTR	LT. WT./WTR	LT. WT./WTR
CREW/DAYS	4M/7D	2M/1D	2M/1D	4M/7D	2M/1D
INCLINATION (DEGREES)	28.5	28.5	104	98	98
ALTITUDE (N.M.)	150	150	100	150	150
Q MAX	680	680	650	650	650
SSME THROTTLE SETTING	109/109	109/109	109/109	109/109	109/109

WEIGHT SUMMARY	CONTROL	STATUS	CONTROL	STATUS	CONTROL	STATUS	CONTROL	STATUS	CONTROL	STATUS
MARGIN (AOA)	297	-4307	2854	-1590	-580	-4947	-5818	-10452	-1698	-6172
PAYLOAD	65000	65000	65000	65000	32000	32000	32000	32000	32000	32000
P/L CAPABILITY	65297	60693	67854	63410	31420	27053	26182	21548	30302	25828
MANAGERS RESERVE	595		595		-599		565		565	
LIFT CAPABILITY (2)	65892	60693	68449	63410	30821	27053	26747	21548	30867	25828
STS OPERATOR			-444	-519	-444	-519			-444	-519
ORBITER INERT	142483	148074	142483	148074	142483	148074	142483	148074	142483	148074
SSMEX3 INERT	21015	20859	21015	20859	21015	20859	21015	20859	21015	20859
PERSONNEL	2644	3655	1465	2391	1465	2391	2644	3655	1465	2391
NON-PROP. CONSUMABLES	4749	4749	3942	3942	3942	3942	4749	4749	3942	3942
OMS PROPELLANT	19700	19700	18800	18800	15095	15095	25064	25064	23362	23362
RCS PROPELLANT	7508	7508	7508	7508	7508	7508	7508	7508	7508	7508
MPS PRESSURANT	423	423	423	423	423	423	423	423	423	423
MPS PROPELLANT UNEXPENDED	13346	13346	13346	13346	13233	13233	13233	13233	13233	13233
ET INERT	69927	68241	69927	68241	69927	68241	69927	68241	69927	68241
SHUTTLE SYSTEM AT MECO	347687	347248	346914	346475	305468	306300	313793	313354	313781	313342
SRBX2 INERT	369000	372878	369000	372878	369000	372878	369000	372878	369000	372878
SRBX2 PROPELLANT	2216742	2217504	2216742	2217504	2216742	2217504	2216742	2217504	2216742	2217504
MPS PROPELLANT EXPENDED	1564006	1569205	1561449	1566488	1564919	1569958	1570664	1575463	1566144	1571183
SHUTTLE SYSTEM AT SRB IGN.	4497435	4506835	4494105	4503345	4456129	4466640	4470199	4479199	4465667	4474907

(1) FOR BRIEF DESCRIPTION SEE TABLE 3.1.
(2) P/L LIMITED TO 65000 LBS. FOR LANDING WEIGHT.

TABLE 3.4 - SHUTTLE SYSTEM INJECTED WEIGHT MARGIN CHANGES - STATUS

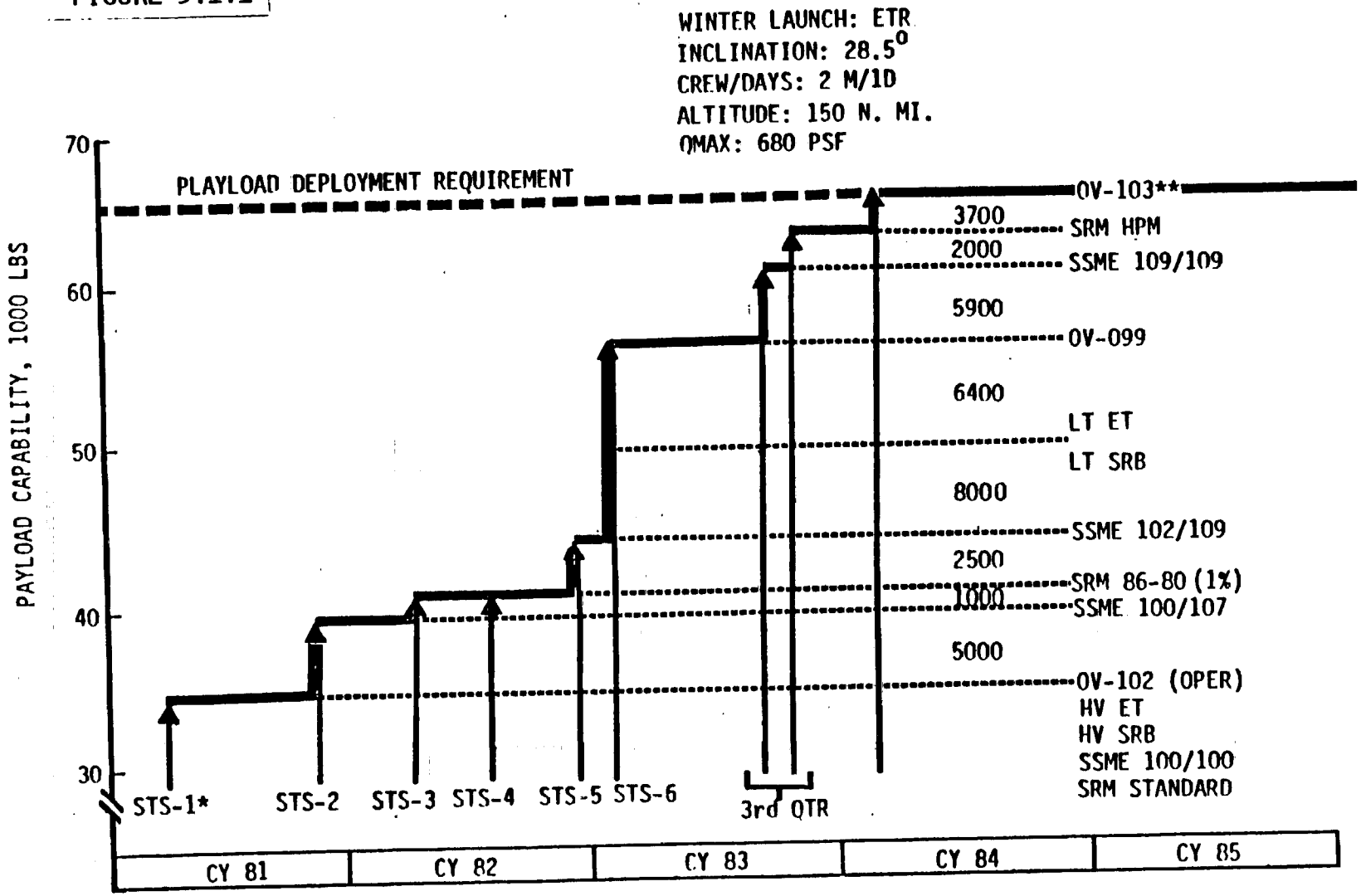
MISSION	BRM-1	BRM-1Y	BRM-3A	BRM-4	BRM-4Y
ORBITER ET/SRB	OV-103 LWT/HWT	OV-103 LWT/LWT	OV-103 LWT/LWT	OV-103 LWT/LWT	OV-103 LWT/LWT
April 1982 INJECTED WEIGHT MARGIN, LB	-4434	-446	-3803	-10579	-5028
1. ELEMENT STATUS WEIGHT UPDATES	(127)	(-1144)	(-1144)	(127)	(-1144)
ORBITER (TABLE 4.1)	-127	127	127	127	127
NON-PROP CONSUMABLES (TABLE 4.7)					
OMS (TABLE 4.7)					
RCS (TABLE 4.7)		-1271	-1271		-1271
PERSONNEL (TABLE 5.1)					
PAYLOAD (TABLE 2.6)					
STS OPERATOR (TABLE 2.7)					
SSMEX3 (TABLE 6.1)					
ET LWT-7 (TABLE 7.1)					
MPS PROP UNEXPENDED (TABLE 9.1)					
2. PERFORMANCE CHANGES	(0)	(0)	(0)	(0)	(0)
SRB X 2 (TABLE 8.1)					
MPS UPDATE					
MAY 1982 INJECTED WEIGHT MARGIN, LB (NOMINAL)	-4307	-1590	-4947	-10452	-6172

TABLE 3.6 - PROJECTED WEIGHT MARGINS

Missions Orbiter	BRM-1 OV-103	BRM-1Y OV-103	BRM-3A OV-103	BRM-4 OV-103	BRM-4-Y OV-103
Lift Capability Status	60693	63410	27053	21548	25828
Potential Changes					
Orbiter	938	938	938	938	938
SSMEX3	-18	-18	-18	-18	-18
ET	0	0	0	0	0
SRBX2	-21	-21	-21	-21	-21
Lift Capability Projected Status	61592	64309	27952	22447	26727
Performance Changes	0	0	0	0	0
Lift Capability Projected Performance	61592	64309	27952	22447	26727
Weight Savers					
Orbiter	521	521	521	521	521
SSMEX3	0	0	0	0	0
ET	0	0	0	0	0
SRBX2	0	0	0	0	0
Projected Lift Capability	62113	64830	28473	22968	27248
Projected Managers Reserve[1]	-(-2887)	190	-(-3527)	-(-3032)	-(-4752)
Projected Payload Capability	65000	65000	32000	26000	32000
Payload	65000	65000	32000	32000	32000
Projected Margin	-2887	190	-3527	-9032	-4752

[1]Managers Reserves is statused in Tables 3.7.1, 3.7.2 and 3.7.3.

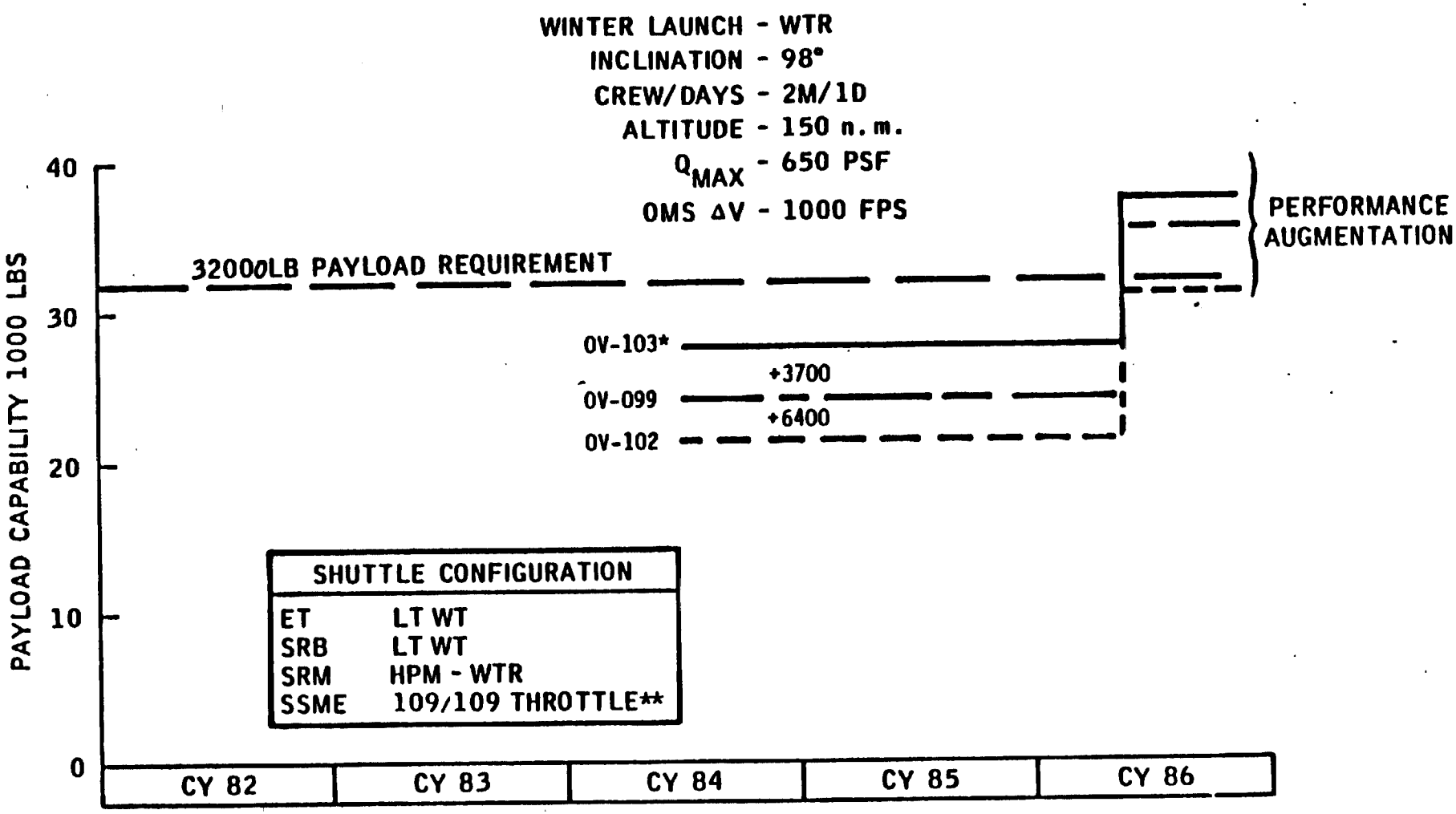
FIGURE 3.1.1 SPACE SUTTLE CAPABILITY EVOLUTION REFERENCE MISSION-1Y



* STS-1 THROUGH 6 DENOTES: ET, SRB, SRM, AND THROTTLE CONFIGURATION PER FORD JSC 17379 REV A; HOWEVER ORBITER CONFIGURATION AND ALL OTHER GROUND RULES ARE PER BRM-1Y.

** OV-103 BASED ON PROJECTED WEIGHT
OV-099 IS 3700 LBS HEAVIER THAN OV-103
OV-102 IS 6400 LBS HEAVIER THAN OV-099

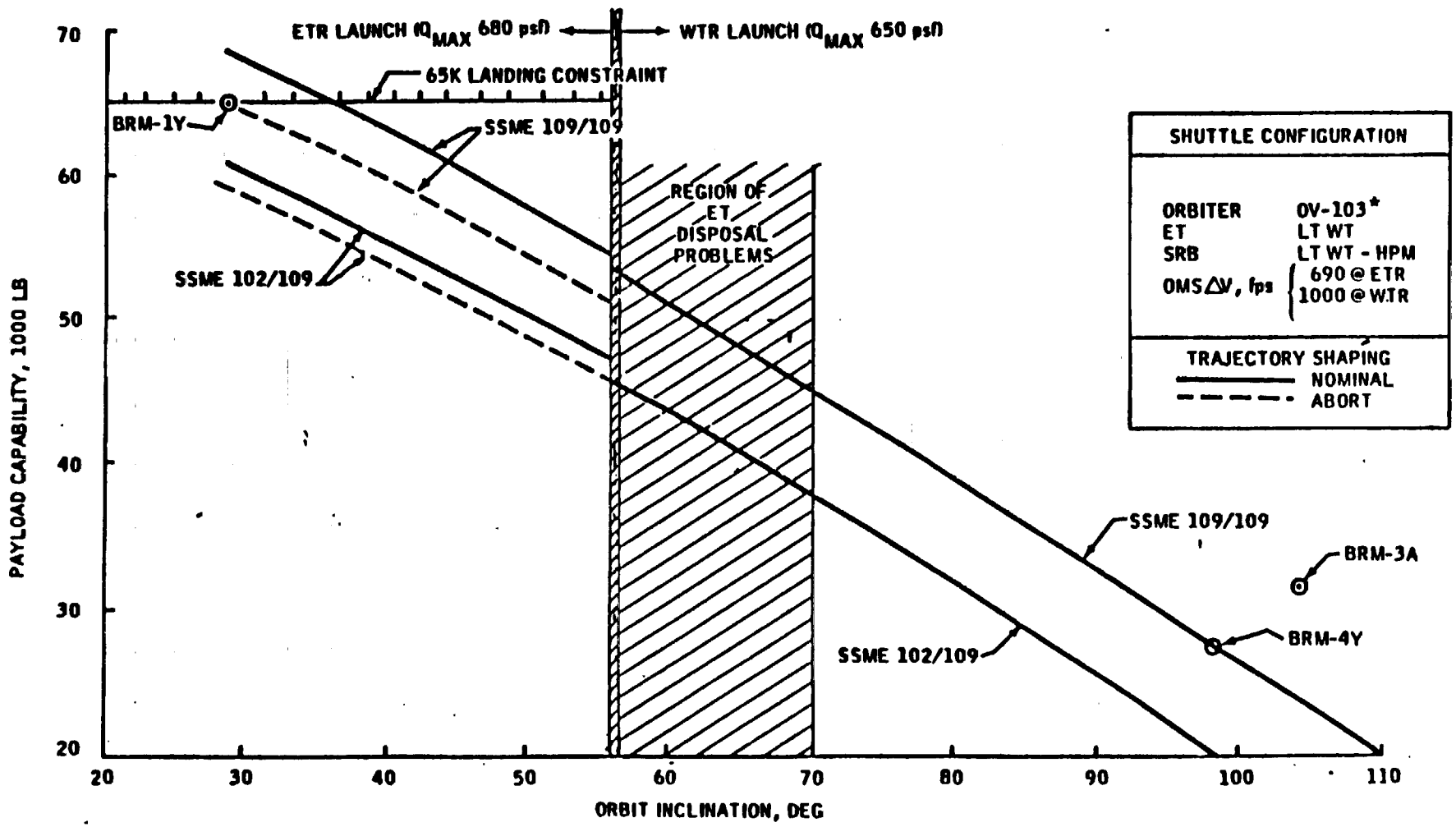
FIGURE 3.1.2 - SPACE SHUTTLE CAPABILITY EVOLUTION - REFERENCE MISSION-4Y



* BASED ON PROJECTED WEIGHTS

** CAPABILITY IS REDUCED BY 6800 LB FOR SSME THROTTLE AT 102/109

FIGURE 3.2 - SPACE SHUTTLE PAYLOAD DEPLOYMENT CAPABILITY VS INCLINATION
(CREW/DAYS 2M/1D, ORBIT ALTITUDE 150 N. MI.)



* BASED ON PROJECTED WEIGHT

FIGURE 3.3.1 TIME HISTORY INJECTED WEIGHT MARGIN BRM-1

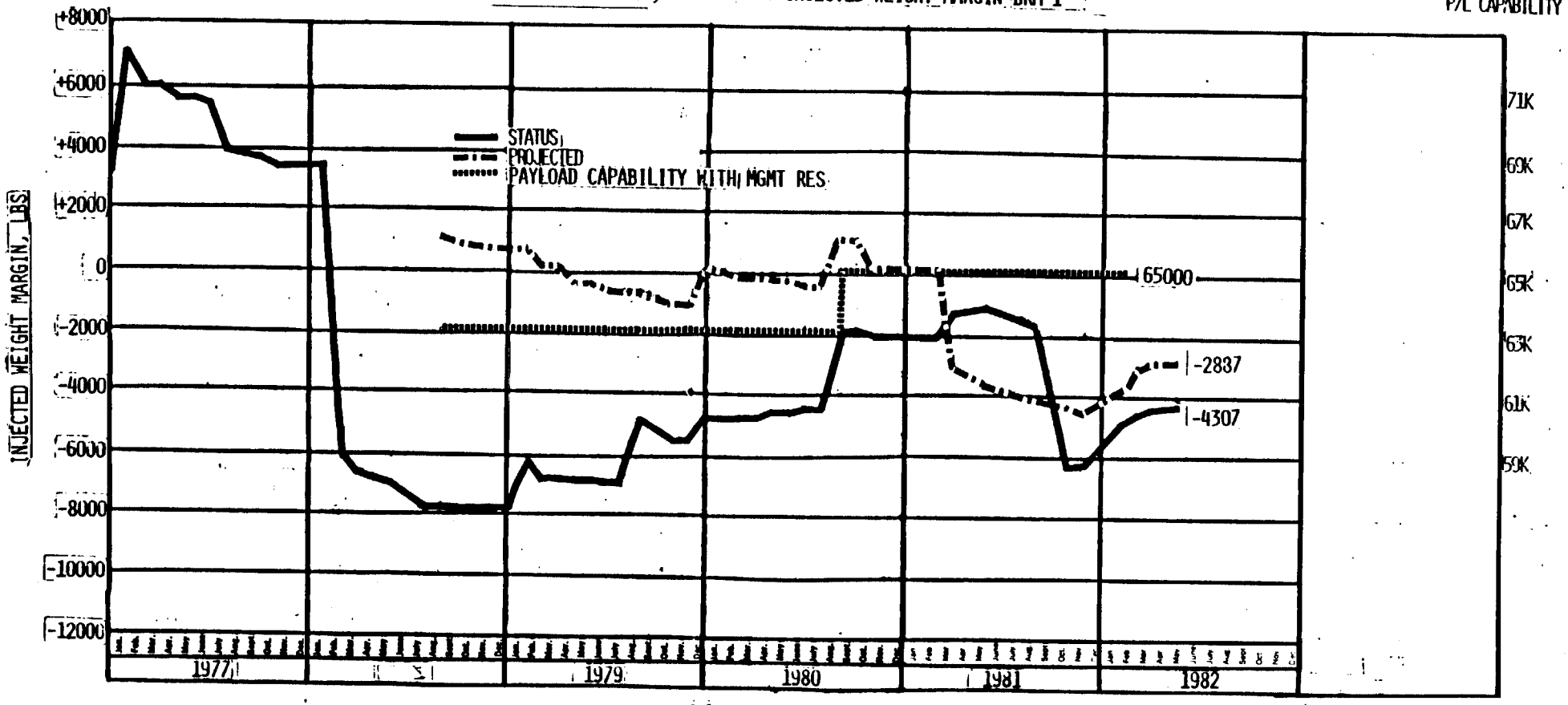


FIGURE 3.3.2 TIME HISTORY INJECTED WEIGHT MARGIN BRM-3A

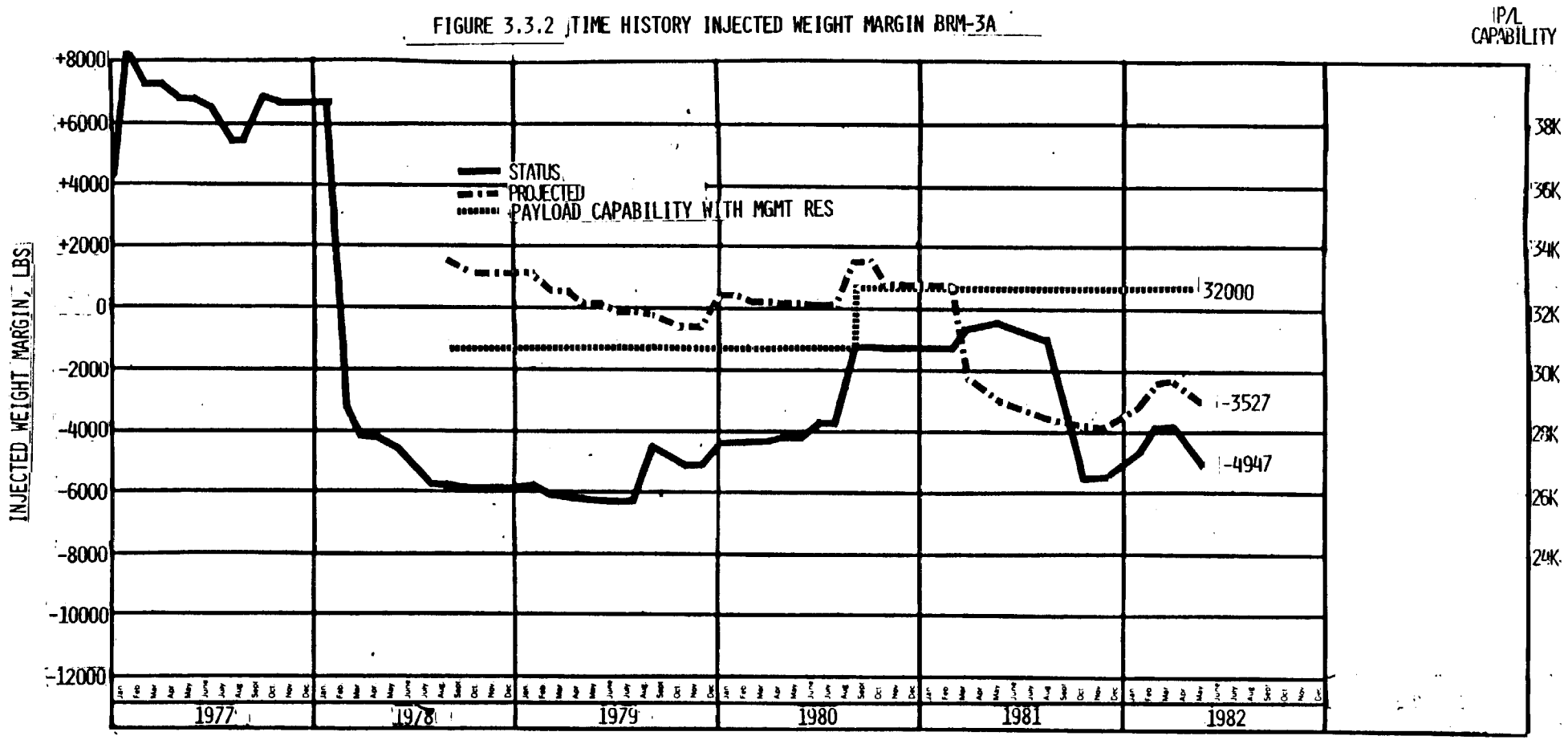


FIGURE 3.3.3 TIME HISTORY INJECTED WEIGHT MARGIN BRM-4

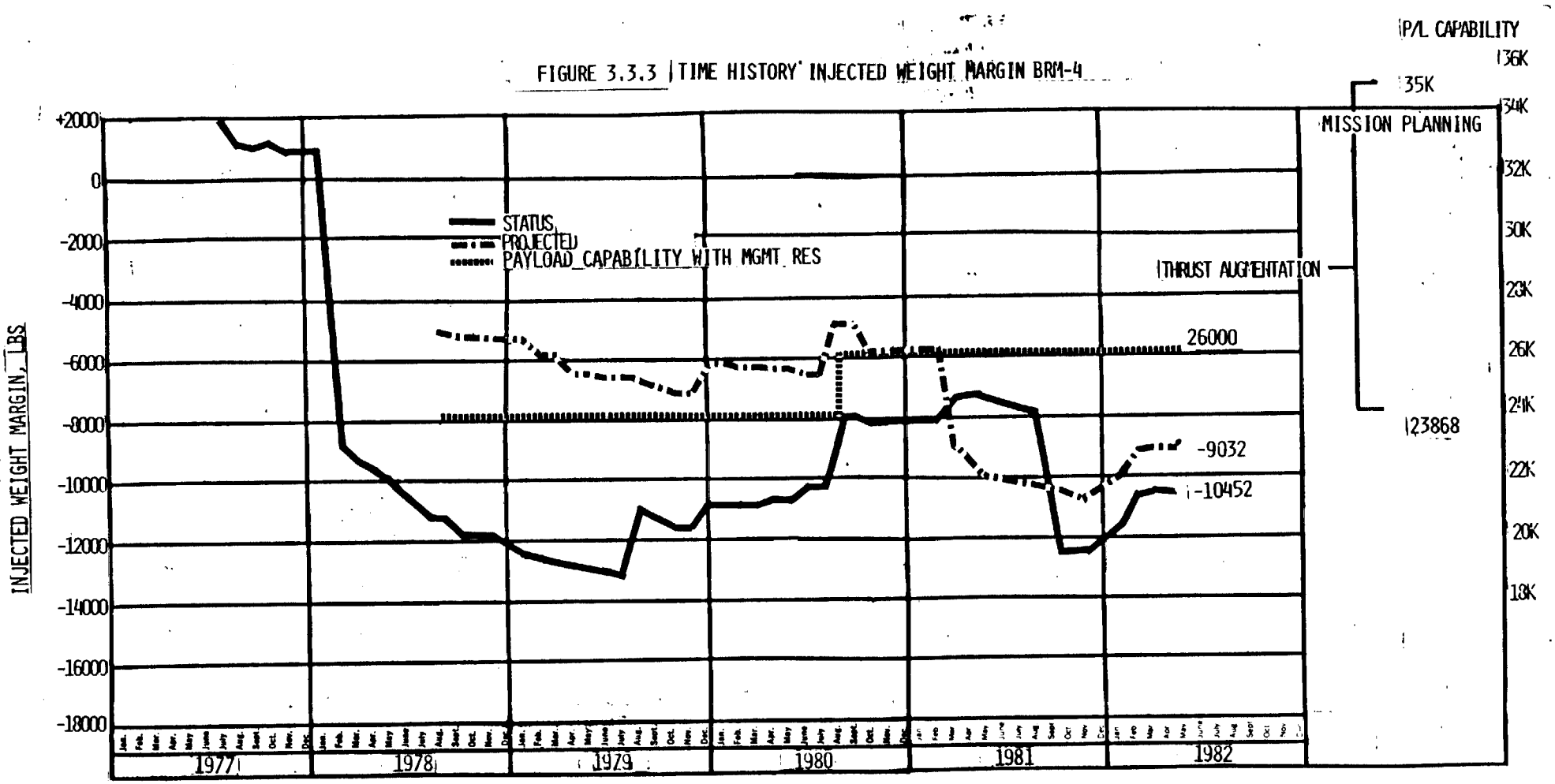


TABLE 3.7.1 - MANAGEMENT RESERVE HISTORY - MISSION 1

		SYSTEM	ORBITER	PERSONNEL	SSME	ET LW-7	SRB	STS OPERATOR	MARGIN
STATUS (SEP 78)			144842	2644	20340	73088	366130		
POTENTIAL			736	115	225	-183	2808		
STATUS + POTENTIAL			145578	2759	20565	72905	368938		
WEIGHT SAVERS			-4757	0	0	-2000	-8600		
PROJECTED			140821	2759	20565	70905	360338		3000
LEVEL II APPROVED CHANGES									
SINCE SEPT. 1978		-952	+358	0	+12	+68	+91	0	
1/80	MPS PROPELLANT LOAD	+341							
7/80	COMPUTER UPDATE	+229							
	SVB IGNITION DELAY	-585							
9/80	WIRE ROUTE ET AFT HEAT		+ 2						
11/80	NON-PROPULSIVE CONSUM.	-40							
	REDESIGN P/L PATCH PANEL		+6						
	ORB/ET ATTACH HOLE PLUG		+9						
	ADD WIRING THRU T-0 UMBIL		-3						
	ADD ORB AFD RF WIRING		+2						
3/81	IN-FLIGHT SSME SHUTDOWN		+16						
	FOUR P/L FEEDS FROM ORB		+8						
	INCREASE P/L ATTACH HDW ALLOC		+225						
	REALLOCATE 3RD CRYO SET	+1608							
	ADD 3RD CRYO TK SET TO ORB		+735						
	NON PROP CONSUM (3 TK SET)	-873							
4/81	SSME CONTROL WEIGHT UPDATE				+1005				
8/81	LET CONTROL WT UPDATE					-500			
	SOFI ICE/FROST PROTECTION					+40			
9/81	APU FUEL PUMP H_2O COOL		+ 98						
11/81	FAMOS		+ 35		+18				
	FUEL CELL ENHANCEMENT		+ 203						
2/82	STABILIZER TUBES IN CARGO BAY		+ 2						
	ANTI-SLAM FILL & DRAIN LINE		+ 2						
	AIRLOCK ISOLATION VALVE		- 3						
3/82	MPS UPDATE	-85							
4/82	SLOSH BAFFEL REMOVAL					-550			
	UPDATE LT. WT. DESIGN					-50			
	LH_2 SENSOR					-3			
	SRB UPDATE						+222		
		-357	+1695	0	+1035	-995	+313	0	595
GROWTH TO MAY 82		-17	+4099	+896	-723	-1669	+862		
PROJECTED			146615	3655	20877	68241	373086	0	-2887

TABLE 3.7.2 - MANAGEMENT RESERVE HISTORY - MISSION 3A

		SYSTEM	ORBITER	PERSONNEL	SSME	ET LWT-7	SRB	STS OPERATOR	MARGIN
STATUS (SEP 78)			144842	1465	20340	73088	366130		
POTENTIAL			736	38	225	-183	2808	0	
STATUS + POTENTIAL			145578	1503	20565	72905	368938		
WEIGHT SAVERS			-4757	0	0	-2000	-8600	0	
PROJECTED			140821	1503	20565	70905	360338	291	3000
LEVEL II APPROVED CHANGES									
SINCE SEPT. 1978		-929	+358	0	+12	+68	+91	0	
1/80	MPS PROPELLANT LOAD	+340							
7/80	COMPUTER UPDATE	+304							
	SYB IGNITION DELAY	-570							
9/80	WIRE ROUTE ET AFT HEAT		+ 2						
11/80	NON-PROPULSIVE CONSUM	-40							
	REDESIGN P/L PATCH PANEL		+ 6						
	ORB/ET AFT ATTACH HOLE PLUG		+ 9						
	ADD WIRING THRU T-O UMBIL		- 3						
	ADD ORB AFD RF WIRING		+ 2						
3/81	IN-FLIGHT SSME SHUTDOWN		+16						
	FOUR P/L FEEDS FROM ORB		+ 8						
	INCREASE P/L ATTACH HDW ALLOC		+225						
	REALLOCATE 3RD CRYO TK SET	+291							
	ADD 3RD TK SET TO ORB		+291						
4/81	SSME CONTROL WEIGHT UPDATE				+1005				
8/81	LET CONTROL WT UPDATE					-500			
	SOFI ICE/FROST PROTECTION					+40			
9/81	APU FUEL PUMP H_2O COOL		+ 98						
11/81	FAMOS		+ 35		+18				
	FUEL CELL ENHANCEMENT		+203						
2/82	STABILIZER TUBES IN CARGO BAY		+ 2						
	ANTI-SLAM FILL & DRAINLINE		+ 2						
	AIRLOCK ISOLATION VALVE		- 3						
3/82	MPS UPDATE	-120							
4/82	SLOSH BAFFEL REMOVAL					-550			
	UPDATE LT. WT. DESIGN					-50			
	LH_2 SENSOR					-3			
	SRB UPDATE						+222		
5/82	RCS UPDATE TO FULL	-1271							
		-1995	+1251	0	+1035	-995	+313		-599
GROWTH TO MAY 82		+454	+4024	+888	-723	-1669	+862		
			146096	2391	20877	68241	373086	0	-3527

TABLE 3.7.2 - MANAGEMENT RESERVE HISTORY - MISSION 4

	SYSTEM	ORBITER	PERSONNEL	SSME	ET LWT-7	SRB	STS OPERATOR	MARGIN
STATUS (SEP 78)		144842	2644	20340	73088	366130	0	
POTENTIAL		736	115	225	-183	2808		
STATUS + POTENTIAL		145578	2759	20565	72905	368938		
WEIGHT SAVERS		-4757	0	0	-2000	-8600		
PROJECTED		140821	2759	20565	70905	360338	0	3000
LEVEL II APPROVED CHANGES								
SINCE SEPT. 1978	-949	+358	0	+12	+68	+91	0	
1/80 MPS PROPELLANT LOAD	+340							
7/80 COMPUTER UPDATE	+272							
SVB IGNITION DELAY	-625							
9/80 WIRE ROUTE ET AFT HEAT		+ 2						
11/80 NON-PROPULSIVE CONSUM	-40							
REDESIGN P/L PATCH PANEL		+ 6						
ORB/ET AFT ATTACH HOLE PLUG		+ 9						
ADD WIRING THRU T-0 UMBIL		- 3						
ADD ORB AFD RF WIRING		+ 2						
3/81 IN-FLIGHT SSME SHUTDOWN		+16						
FOUR P/L FEEDS FROM ORB		+ 8						
INCREASE P/L ATTACH HDW ALLOC		+225						
REALLOCATE 3RD CRYO TK SET	+1608							
ADD 3RD TK SET TO ORB		+735						
NON-PROP CONSUM (3 TK SET)	-873							
4/81 SSME CONTROL WEIGHT UPDATE				+1005				
8/81 LET CONTROL WT UPDATE					-500			
SOFI ICE/FROST PROTECTION					+40			
9/81 APU FUEL PUMP H_2O COOL		+ 98						
11/81 FAMOS		+ 35		+18				
FUEL CELL ENHANCEMENT		+203						
2/82 STABILIZER TUBES IN CARGO BAY		+ 2						
ANTI-SLAM FILL & DRAINLINE		+ 2						
AIRLOCK ISOLATION VALVE		- 3						
3/82 MPS UPDATE	-120							
4/82 SLOSH BAFFEL REMOVAL					-550			
UPDATE LT. WT. DESIGN					-50			
LH_2 SENSOR					-3			
	-387	+1695	0	+1035	-995	+331		565
GROWTH TO MAY 82	-132	+4099	+896	-723	-1669	+862		
PROJECTED		146615	3655	20877	68241	373086	0	-3032

TABLE 3.8.1 - ORBITER/SSME CONTROL WEIGHT ARITHMETIC

September 1974	
Orbiter Inert Control Weight, lb	132139
Orbiter Closed Loop Fluids, lb	-1369
Orbiter Dry, lb	130770
Personnel Allocation From Orbiter, lb	+225
SSMEX3, lb	+19017
Total Dry, lb	150012*

*SSME3 Control Weight Increased 12 lb Per PRCBD S00780: 6-18-74

April 1982 - May 1982	Mission 1	Mission 3A
Orbiter Inert Control Weight, lb	142483	142039
Changes		
No change this report		
New Orbiter Inert Control, lb	142483	142039
Closed Loop Fluids, lb	-1598	-1598
Orbiter Dry, lb	140884	140440
Personnel Allocation From Orbiter, lb	+277	+277
SSMEX3, lb	+20997	+20997
FASCOS	18	18
Total Dry, lb	162176	161732
Transferred From Level II - Management Reserve, lb	-12176	-11732
Orbiter Dry Weight, lb	150000	150000

TABLE 3.8.2 - ET CONTROL WEIGHT ARITHMETIC

September 1974

ET Inert Control - Level III	70910
ET Inert - CFE	(70387)
ET/Orbiter Umbilical Hdw-GFE	(523)
Separation - GFE	380
SRB Supports - GFE	(375)
Orbiter Ftg - GFE	(5)
ET Inert Control - Level II	71290
Residuals - Nominal	3710
ET at MECO	75000

April 1982 - May 1982

	LWT
ET Inert - CFE	68644
Changes	
None this Report	
New ET Inert CFE	68644
ET/Orb Unbilical - GFE	+474
ET Inert Control Level III	69118
Separation - GFE	809
SRB Supports - GFE	(750)
ORB Ftgs - GFE (EO-1. 2. & 3)	(59)
New ET Inert Control Level II	69927
Residuals - AOA	8231
- Non Prop Gas	423
Total at MECO	78581
Transferred from Level II Mgmt. Reserve	-3581
ET at MECO	75000

TABLE 3.8.3 - SRB CONTROL WEIGHT ARITHMETIC

SRM PDR November 1974		April 1982 - May 1982	Hvy. Wt.	Lt. Wt.	Lt.-HPM	Hvy. Wt. - HPM
SRBX2 Inert Control	361020	SRBX2 Inert Control	372522	365822	369000	375600
		Changes				
		None this Report				
		New SRBX2 Inert	372522	365822	369000	375600
		Transferred from Level II Mgmt Reserve -	-11502	-4802	-7980	-14580
		SRBX2 Inert	361020	361020	361020	361020

TABLE 3.11 - BASELINE CAPABILITY VARIATIONS LISTS - STS-14 AND SUBSEQUENT, INCLUDING BRM'S

TITLE	MARGIN IMPACT (LBS)	ACTIONEE
ET TPS	+500	ES/MSFC-ET/MMC
*Aft Dome TPS	+270	ES/MSFC-ET/MMC
*Reduce SLA Thickness	+500	ES/MSFC-ET/MMC
*Reroute He Injection Lines	+30	MSFC-ET/MMC
*Move ECO Sensor to Orbiter	0	ORB-MSFC-ET/MMC
Delete SSME-TVC Force Limiters	+30	RIRO/MSFC
*SSME Insulation	+ 42	ES/MSFC-SSME/
*SSME Interstage Seal	+1675	MSFC-SSME/
MADS Scar (OV-102)	-453	RI-Orbiter
(OV-099)	-235	
Non-propulsive Consumables	-926	MPAD
Personnel Weight Growth	-930	LA3
DFI SCAR	-1330	JSC-Orbiter OV-102
*Orbiter Weight Savers (OV-103)	+ 854	JSC-Orbiter
(OV-104)	+1772	
*WTR Motor at ETR	+2000	MSFC-SRB
Deletion of SRB ignition delay	+585	
Delete SRB Recovery System	+1259	
*Reposition SSME Bell's	+900	
2σ/1σ FPR at Mode Boundary	+1785	JSC-SSPO
Reduced FPR for MPS Loading	+530	RI-SSG
Delete Range Safety Systems	+431	Level I
Performance Enhancement Studies	+5500	Level I

*Items Included In Additional Payload Performance Increase For Flight Availability (4000 LB Goal)

BRIEF DESCRIPTION OF BASELINE CAPABILITY VARIATIONS LIST

ET TPS WEIGHT UPDATE +500

The maximum thrust imbalance between the SRB's of 720,000 lbs could occur at tailoff and cause a side slip angle (β) of 11°. The associated increase in aerodynamic heating in the vicinity of protuberances requires the addition of SLA to the LH_2 tank, intertank and protuberances and the addition of SLA and SOFI to the LO_2 tank.

OFT data may indicate β max is less than 11°; therefore, the thermal environment will be appreciably less and the amount of SLA may be reduced.

AFT DOME TPS +270

The current configuration has CPR (Chemical Polimer Research) over SLA on the aft dome. If a new spray insulation is used, the weight reduction is 270 lbs.

REDUCE SLA THICKNESS +500

If the SLA thickness is reduced from 0.2 to 0.1 at station 2060 and from 0.4 to 0.3 at stations 1569.3, 1699.4 and 1763, a 500 lb weight reduction is obtained.

REROUTE He INJECTION LINE + 30

The He injection line is currently routed from the intertank to the bottom of the H_2 tank. If the line is routed across the Orbiter/ET umbilical, a weight savings of 30 lbs can be obtained.

MOVE ECO SENSOR TO ORBITER 0

The current location of the ECO sensor is in the ET. If this sensor is moved to the Orbiter (probably a 30 lb weight increase for Orbiter) and a flight recurring cost can be eliminated.

DELETE SSME-TVC FORCE LIMITERS + 30

The original design of the SSME/TVC actuators was limited to 3.21M in-lbs. This design required incorporation of a force limiter. Rocketdyne analysis of the TVC side loads during engine start indicates the engine gimbal hinge moments are 1.8M in-lbs. Therefore, the force limiter could be eliminated. This would result in a 5-lb weight decrease per actuator or 30 lbs per vehicle with a corresponding increase to the injected weight margin.

SSME NOZZLE INSULATION +42

If the thermal environment is less than projected, the insulation and secondary structure might be removed. The total potential increase to the injected weight margin is 42 lbs.

REDESIGN OF SSME LOX INTERMEDIATE SEAL +1675

The SSME contractor is currently conducting a design study to reduce the helium flow required as a pressure barrier between the HPOTP LOX and the hot gases of the turbine drive. The incorporation of the SSME seal purge resulted in a 1675 lb increase. This should be the target for the weight reduction study.

MADS SCAR -453/-235

The Modular Auxiliary Data System (MADS) was designed to meet the basic requirements of OEX, payloads, Air Force and OFT testing. The current MADS scar weight is 1347 lbs on OV-102 and could be increased 453 lbs. The scar weight is 235 lbs. on OV-099.

BRIEF DESCRIPTION OF BASELINE CAPABILITY VARIATIONS LISTS (CONT)

NON-PROPULSIVE CONSUMABLES -926

Potable Water (-241)

The current load for operational missions will support either an AOA or a nominal mission; however, if abort from orbit capability is required, the potable water load which supports equipment cooling must be increased. This increase is predicated on flight procedures defined for STS-1.

Waste Water (-314)

Same as potable water.

APU N_2H_2 (-300)

The current load for operational missions is 702 lbs. Using STS-1 procedures such as pre-deorbit maneuver APU startup and APU's on continuously for AOA, full APU systems are required.

HYDRAULIC WATER (-71)

The current load for operational missions is 353 lbs. Assuming STS-1 philosophy, the load could be increased to full.

PERSONNEL WEIGHT GROWTH +930

The personnel status weight has been higher than the control weight for a considerable length of time. If a personnel scrub does not occur, a penalty of 930 lbs for baseline reference missions will result.

ORBITER WEIGHT SAVERS +854/+1172

A new list of potential weight savers is being carried by the Orbiter Project Office. These items could increase performance capability by 854 lbs and 1172 lbs for OV-103 and OV-104 respectively.

WTR MOTOR AT ETR +2000

The WTR Motor defined as 86-80 or HPM can be used at ETR December through March. This results in a payload improvement of approximately 2000 lbs. The use of this motor is dependent upon a 14-month lead time for production.

SVB IGNITION DELAY +585

A 2.75 sec SRB ignition delay was incorporated into the launch procedure to minimize the base bending moment at liftoff due to the ignition of the SSME's (TWANG). If data from OFT indicates the TWANG is less than projected the deletion of the time delay would regain 585 lbs in performance for BRM-1. BRM 3A performance gain is 570 and BRM-4 gain is 625 lbs.

DELETE SRB RECOVERY SYSTEM +1259

The present program groundrule requires that the SRB's be recovered and refurbished for future use to minimize the cost per flight. To increase the injected weight capability for selected flights, the booster recovery system could be deleted for an increase in the injected weight margin of 1259 lbs per mission. The systems that wouldbe deleted are the pilot parachute assembly, drogue parachute assembly, main parachute assembly, frustrum flotation, altitude switch, water impact, SRB location aids, frustum location aids, towing pendant, and ordinance items with a resultant weight savings of 1259 lbs. This performance improvement option can be incorporated at any time during the operational phases of the Space Shuttle Program without impacting hardware of software requirements.

REPOSITION SSME BELL'S +900

The SSME's nodrmally gimbal about the null position (-16°, -10°, -10°) in the pitch plane. If these engines can be reorientated to an initial position of 6° bell down (-10°, -4°, -4°) to reduce cosine losses. This results in a performance improvement of 900 lbs at the 109% power level dependent on results of heating analysis.

2σ/1σ FPR AT MODE BOUNDARY +1785

The current OFT groundrules for STS 3 and 4 utilize a 1σ dispersion in the FPR for AOA. If the current 2σ used for operational AOA is decreased to 1σ, the corresponding gain in performance is 1785 lbs.

REDUCED FLIGHT PERFORMANCE RESERVE FOR MPS LOADING +530

The flight performance reserve defined for ET loading accuracy is ±0.54 percent for the liquid oxygen and ±0.69 percent for the liquid hydrogen, when considering the combined errors within the ET, Orbiter and ground control. The current flight performance reserve is based upon the best estimate for the ET and a combined factor for the remaining terms of Orbiter and ground control. MCR 899 documented the modeling of the loading system to determine component inaccuracies and accuracy was as follows:

	Liquid Oxygen	Liquid Hydrogen
External Tank Accuracy, percent	0.46	0.53
Boiloff Variation, percent	0.0004	0.046
Orbiter Variation, percent	0.002	--
Ground Control Variation, percent	0.003	0.005
RSS	0.46	0.53

This model shows the liquid oxygen loading accuracy increases 0.08 percent and the liquid hydrogen accuracy increases 0.16 percent, both of which will result in a 330-lb performance increase. The incorporation of a capacitance probe for MPTA (PCIN S01615) will further decrease loading errors and has a potential increase of 200 lb performance for a total increase of 530 lbs to the injected weight margin.

DELETION OF RANGE SAFETY SYSTEM (RSS) +431

The potential manifest reduction list (Table 8.1) reflects the weight reduction to be achieved for a particular mission, by the deletion of an already incorporated RSS. This weight reduction is 367 lbs (Orbiter 37, ET 283, SRB 47). If the RSS requirement is deleted prior to fabrication, the injected weight margin would be increased 431 lbs (Orbiter 41, ET 343, SRB 47).

PERFORMANCE ENHANCEMENT STUDIES +5500

Filament wound (Composite) SRM Case

4.0 ORBITER WEIGHT SUMMARY

This section provides the inert weight status along with pending changes, a comparison of STS to the Operational OV-102, post STS-5 KSC rework and a time history of Orbiter inert weight. The inert weight data was taken from SD72-SH-0120-112, "Space Shuttle Mass Properties Status," dated May 2, 1982. The non-propulsive consumables are based on the control weights specified in JSC-07700, Volume X, Appendix 10.12.

TABLE 4.1 - ORBITER INERT WEIGHT CHANGE SUMMARY - STATUS 05-18-82

SEQ NO (MCR NO)	ITEM	STS-004 OV-102	STS-005 OV-102	STS-006 OV-099	STS-007 OV-099	STS-008 OV-099	STS-009 OV-102	STS-010 OV-099	STS-011 OV-102	STS-012 OV-103	STS-013 OV-099	OV-103
	RI-SPACE DIV PREV INERT STATUS 04-02-82	151458	151865	151173	151173	151173	153005	151173	153005	148121	151173	148121
9/4-5	* MPS - INSTALL LH2 PREVALVES	6	6									
81/10-1	* INCR III MCA OPTIMIZATION				5	5	5	5	5	5	5	5
7/12-13	* MID BODY IN PROCESS WT CONTROL									-100		-100
7/12-16A	* RED MAT AT PORT TO CYL INTER			-6	-6	-6		-6		-6	-6	-6
7/12-16C	* RED GAGES ON WAFFEL PNL			-2	-2	-2		-2		-2	-2	-2
7/12-16D	* RED HINGE AND HANDHOLD BOSS			-2	-2	-2		-2		-2	-2	-2
8/8-4	* FAMOS			45	45	45						
8/9-2	* TVC SERVO ACT WT			-22	-22	-22		-22		-22	-22	-22
81/12-1	* XFER OMS POD MADS INSTR TO INERT			40	40	40		40			40	
82/4-1	* OMS POD ACT WT			-176	-176	-176		-176			-176	
	* WATER DISPENSOR						2		2			
	TOTAL RI NEW CHANGES	6	6	-123	-118	-118	7	-163	7	-127	-163	-127
	RI-SPACE DIV RPT INERT STATUS 05-02-82	151464	151871	151050	151055	151055	153012	151010	153012	147994	151010	147994
	CHANGES NOT INCORPORATED											
	BOUYANCY	80	80	80	80	80	80	80	80	80	80	80
	TOTAL SSPO RPT CHANGES	6	6	-123	-118	-118	7	-163	7	-127	-163	-127
	SSPO RPT INERT STATUS	151544	151951	151130	151135	151135	153092	151090	153092	148074	151090	148074

* NEW CHANGE THIS REPORT.

TABLE 4.2 OV-102,OV-099---INERT WEIGHT COMPARISON-STATUS

MISSION	STS-04	STS-05	OPER	STS-06	STS-07	STS-08	OPER
ORBITER	OV-102E	OV-102E	OV-102	OV-099	OV-099	OV-099	OV-099
STATUS	151464	151464	151464	151050	151050	151050	151050
WIRE REROUTE FOR ET AFT HEAT		2	2				
PAYLOAD BAY LINER		18	18				
P/L INTERG,INTERL+SIG PROCESS		162	162				
INCREASE P/L ATTACH ALLOW		225	225				
ACTIVE PAYLOAD RETENTION MECH			6				
VERT LCD INDICATOR			-2				
INCR. WING TRUSS TUBES			8				
CHANGE EFF OF OVHED FLDLITES			7				
KSC REWORK			-1125				
DEL FASCOS,ADD FAMOS			13				
SW BEAM ANT+WIRE TO-1307(8+7)			15				
DELETE COMM B SCAR			-43				
REMOVE MID DECK CLOSEOUT INLS			-30				
ADD WIRING FOR SMCH			5				
MPS PREVALVE SLAM PREVENTION			32				
ADD TIMING BUFFER			11				
NEW MEAS TO ORBITER OI			91				
REPLACE H2 TANK MT STRUTS			-4				
ADD 4 P/L FEED FROM ORB			10				
ADD ORBITER AFD RF WIRING			2				
REMOVE ALT EMU LCG H2O LINE			-15				
PGHM ATTACH POINTS			2				
CABIN+AVION FAN DELTA P XDUCER			3				
WATER PUMP PKG-DELTA P XDUCER			2				
REV CREW STA CAMERA MTS			2				
REDESIGN P/L PATCH PANEL			6				
REDESIGN LDG ISO+MPS SHUT VLV			-22				
INCR STR STAB TUBE P/L			2				
ADD OFI FOR INCREMENT APU			1				
RMS MEASUREMENT TO OI			7				
DFI SCAR			460				
ELBOW CAM. KIT+RMS DFI UPDAT			-42				
CHANGE CLAMPS FOR PVD DUCTS			-8				
HYD SYS DRAIN PORTS+GAS WIRING			9				
P/L SINGLE LATCH CONTROL			6				
MID FUSE MOD-THERMAL STRESS			-75				
COMSEC			41				
ESCAPE APRON			2				
ADD GALLEY			164				
DELETE H2O DISPENSER			-21				
ADD KU BAND ANTENNA ROTATION			2				
RENDZ RADAR (KU BAND)			359				
HARD COPIER			100				
SEAT RECONFIGURATION			184				
GLOBAL POSITIONING SYSTEM			47				
ADD GP3 3 + 4 STRING PROV			9				
REMOVE DECOMP CONVERS+IMU MUF			-21				
HEADS UP DISPLAY			191				
5.4 LOADS ASSESSMENT			526				
TPS DESIGN PRODUCIBILITY			11				
ANTI-SLAM FILL + DRAIN VALVE			-4				
OMS PROP TK PRESS LINE SUPT.			4				
INSIDE AIRLOCK/TUNNEL ADTL CAP			5				
3 SUB-STACK,FUEL CELLS			203				203
INCR III MCA OPTIMIZATION			5		5	5	5
FAMOS DELTA							-45
INERT	151464	151871	153012	151050	151055	151055	151213

TABLE 4.3 - OV-102 OPERATIONAL KSC REWORK (POST STS-5)

Remove Ejection Seats and Rail	-664
Add Operational Seats	318
Add Emergency Egress Provision Through Right-hand Observation Window	88
Remove Emergency Escape Hatch and Provision	(-929)
Redesign CM/FF Escape Panel and Provision	-214
Ejection Panel Support Structure, Baffles & TCS	- 52
Seat Rail Support Beam and Fitting	- 52
Support Struts to Mid-Deck Floor	- 44
Seat Torque Box	-182
Pyrotechnic System	-385
Remove Escape Suit Ventilation System Kit	- 14
Ejection Seat Removal Mod	-1201
Add Multiple Attached Payloads	5
Add Command Authentication Provisions	1
Add Payload Wiring from 1307 to Umbilical	2
Remove C-Band Antenna Switch (OFT Only)	- 5
Add Keel Mounted TV	57
Add C-Band Antenna for Operational	3
Change OFT Egress to Operational Egress	8
Single Zeroize Switch	1
P/L Data Bus Relocation	- 2
FCP & Power Contractor Redundant Control Power	2
EMU Incompat With Airlock Power Supply/Battery Charger	4
ORBITER INERT TOTAL	-1125

TABLE 4.4 - ORBITER POTENTIAL INERT WEIGHT CHANGES

SEQ. NO. (MCR NO)	ITEM	STS-4/OV-102E WEIGHT, LB	STS-5/OV-102E WEIGHT, LB	OV-102 OPER WEIGHT, LB	OV-099 WEIGHT, LB	OV-099 OPER WEIGHT, LB	OV-103 WEIGHT, LB
				1310	-56	-56	-938
8/3-13	Remove Mech. MLG Ext. Boosters						-32
8/4-4	Payload Bay Door Deflection				+5	+5	+5
8/5-4	Remove Heat Sink				-50	-50	-50
8/5-10	TPS Update						-1010
8/5-14	Delete SSME TV Actuator Force Limiter			-20	-20	-20	-20
80/12-3	RCS PROP TNK Config. Diaphram						TBD
80/5-3	OMS Pod GR/EP Skin Panel Moisture Prot						+160
81/7-2	Residual DFI Wiring			+1330			
81/8-6	RMS Measurement to OML				+9	+9	+9
	Weight Reduction Candidates			-1212 (1)	-154	-154	-521

	STATUS WEIGHT	151544	151951	153012	151050	151213	148074
	Projected Inert Changes	--	--	1310	-210	-210	-1459
	PROJECTED WEIGHT	151544	151951	154322	150080	151003	146615

(1) CANCELLED - Hold for Future Consideration.

FIGURE 4.1 ORBITER -102 INERT WEIGHT HISTORY

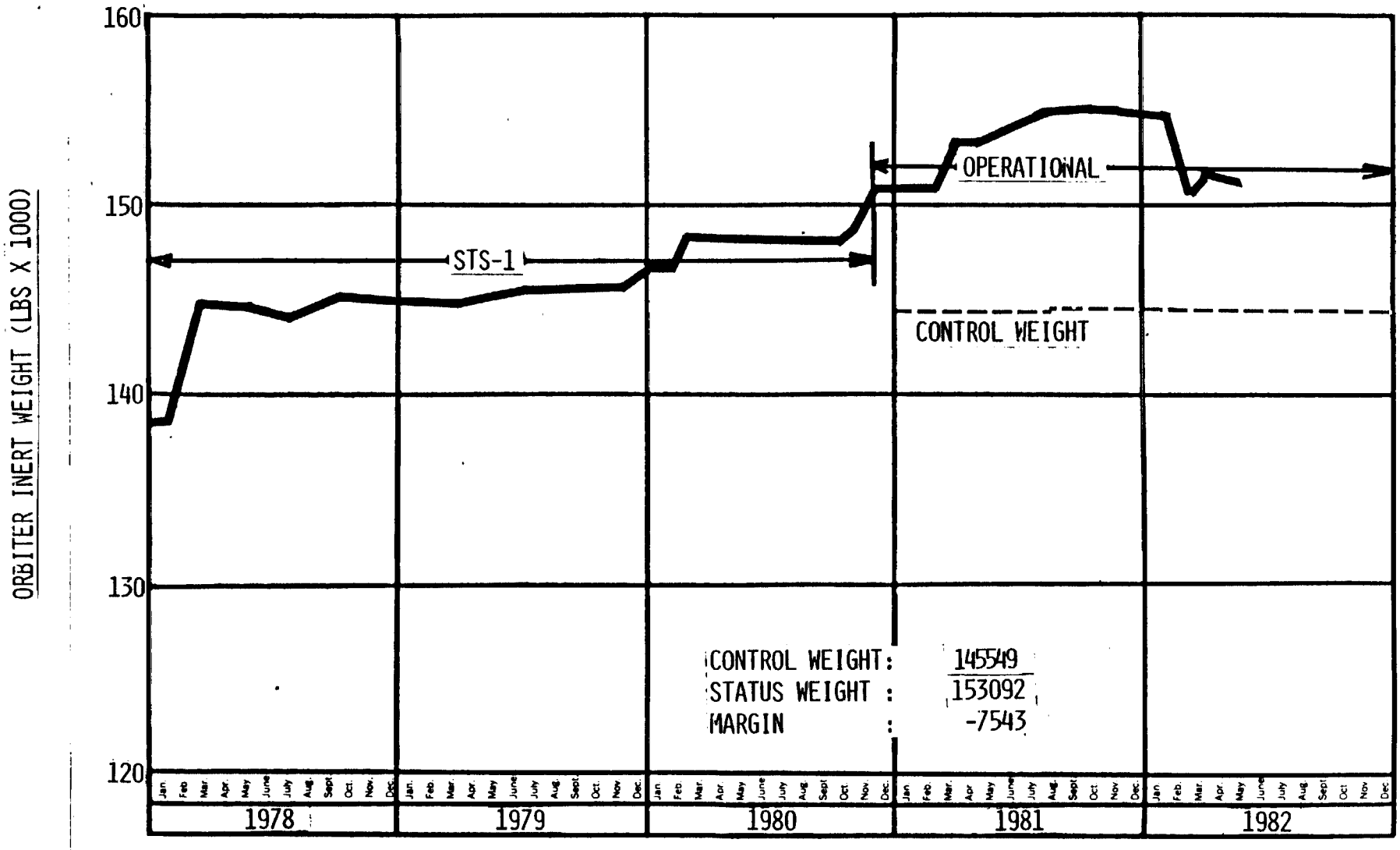


FIGURE 4.2 ORBITER -099 INERT WEIGHT HISTORY

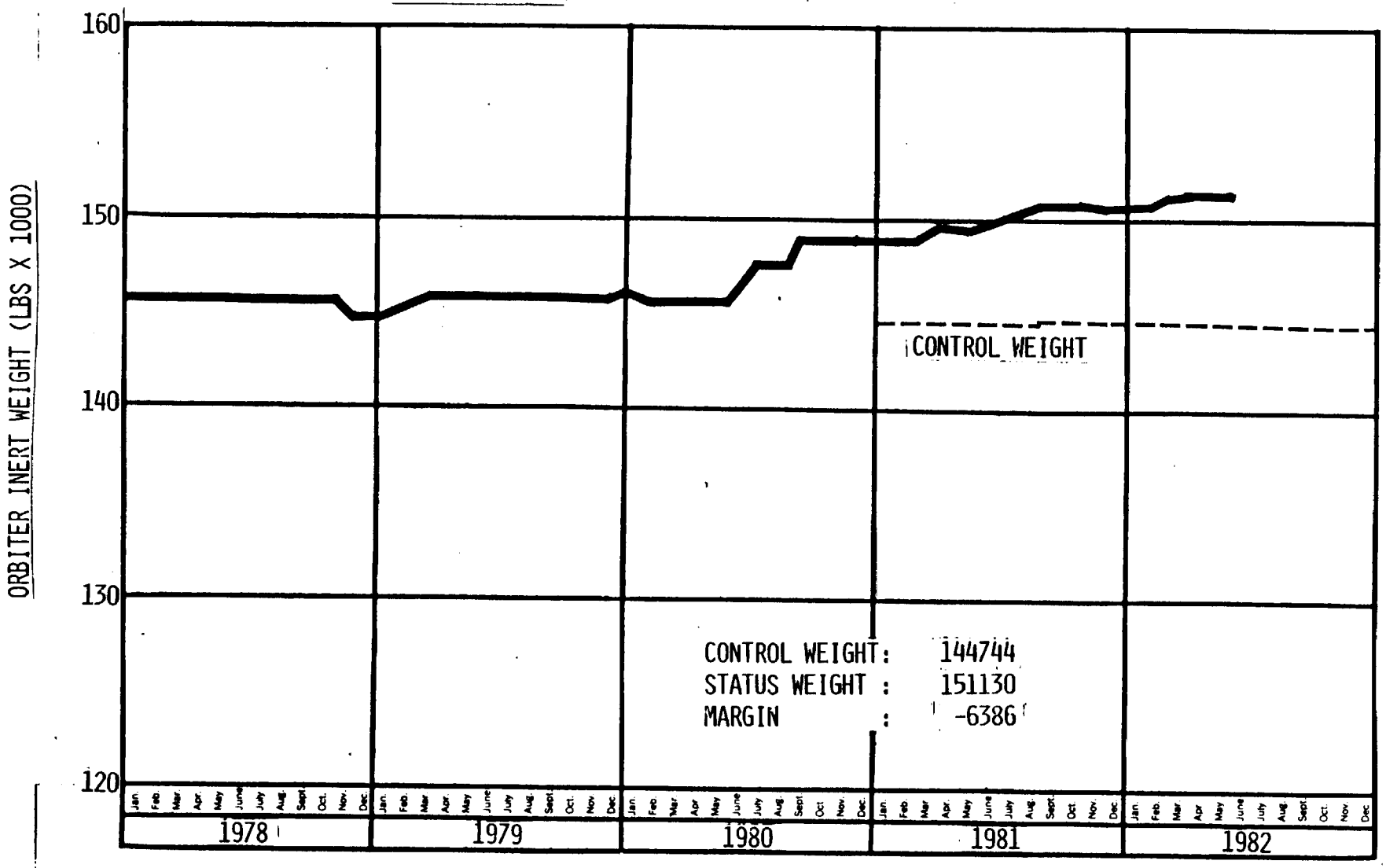


FIGURE 4.3 ORBITER -103 INERT WEIGHT HISTORY

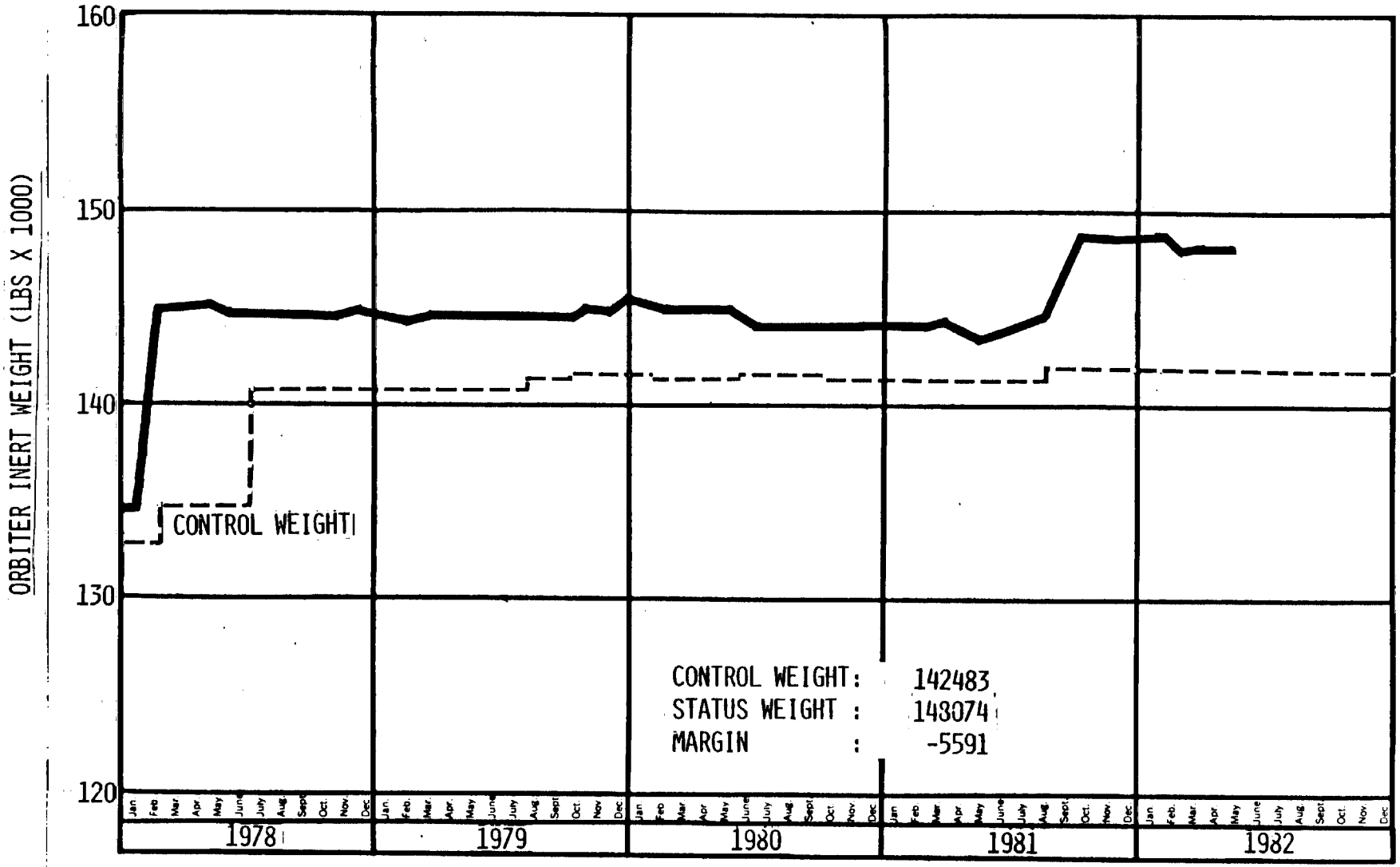


TABLE 4.6 - ORBITER PROPELLANT AND NON-PROPULSIVE CONSUMABLES FLUID CHANGES - STATUS 05-18-82

ITEM	STS-004	STS-005	STS-006	STS-007	STS-008	STS-009	STS-010	STS-011	STS-012	STS-013	BRM-1	BRM-3A	BRM-4
PREV RPTED NON-PROP CONSUMABLES	6472	6203	5365	5365	5544	5352		5445	4634		4749	3942	4749
* POTABLE WATER	22	-9	-31	-17	-48	-55							
* WASTE WATER	-16	50	88	47	77								
* CRYO	89	89	66	66	66	66							
* APU N2H4 LOAD		-5	-5	-5	-5	-5							
* AUX O2		-10											
TOTAL SSPO RPTED CHANGES	95	115	118	91	90	6							
SSPO RPTED NON-PROP CONSUMABLES	6567	6318	5483	5456	5634	5358		5445	4634		4749	3942	4749
PREV RPTED OMS PROPELLANT	22000	20272	19300	21000	22100	15500		25156	21100		19700	15095	25064
* OMS PROPELLANT CHANGES													
SSPO RPTED OMS PROPELLANT	22000	20272	19300	21000	22100	15500		25156	21100		19700	15095	25064
PREV RPTED RCS PROPELLANT	7830	7888	7508	7508	7508	7888		7888	7508		7508	6237	7508
* RCS PROPELLANT CHANGES												1271	
SSPO RPTED RCS PROPELLANT	7830	7888	7508	7508	7508	7888		7888	7508		7508	7508	7508

* NEW CHANGE THIS REPORT.

TABLE 4.7 - ORBITER PROPELLANT AND NON-PROPULSIVE CONSUMABLES FLUID LOADINGS SUMMARY AT SRB IGNITION

Mission	STS-4	STS-5	STS-6	STS-7	STS-8
Vehicle	OV-102E	OV-102E	OV-099	OV-099	OV-099
Propellant-Main Ascent Total	----------SEE SECTION 9----------				
Propellant - OMS Load	22000	20272	19300	21000	22100
Insertion	7590	10207	10008	10546	10534
On Orbit	5932	3016	1545	2640	2458
De Orbit	6539	5217	6067	5828	6978
Dispersions & Contingency	1048	941	881	1187	1231
Residuals	891	891	789	799	799
Ballast (R Pod/L Pod)	%	%	%	%	%
Propellant - RCS Fwd	2446	2464	2477	2477	2477
On Orbit	1715	1814	2026	N/A	N/A
Dispersions and Contingency	339	258	194	N/A	N/A
Residuals	392	392	257	257	257
RCS Dump (X CG)	Yes(1)	Yes(1)	Yes(1)	Yes(1)	Yes(1)
Propellant - RCS Aft	5384	5424	5031	5031	5031
On Orbit	1500	1870	2060	N/A	N/A
Dispersion & Contingency	736	606	649	N/A	N/A
Residuals	748	748	322	322	322
Entry & Allowance	2400	2200	2000	N/A	1158
Non-Propulsive Consumables	6567	6318	5483	5456	5634
N_2 Gaseous-Launch Load	262	262	262	262	262
Water-Potable Launch Load	573	426	426	440	588
Water-Waste Load	84	53	91	50	80
NH_3-Launch Load	98	98	98	98	98
O_2 Cryogenic-Load (Tank sets)	3124(4)	3124(4)	2343(3)	2343(3)	2343(3)
H_2 Cryogenic-Load (Tank sets)	368(4)	368(4)	276(3)	276(3)	276(3)
APU N_2H_4-Load	1001	996	996	996	996
Hydraulic Water-Launch Load	424	424	424	424	424
APU H_2O-Gas Gen. Cool	6	6	6	6	6
APU H_2O-Fuel Pump Cool	42	42	42	42	42
Auxiliary O_2	66	0	0	0	0
MPS Pressurants	43	43	43	43	43
OMS Pressurants	114	114	114	114	114
RCS Pressurants	28	28	28	28	28
Water Pressurants	1	1	1	1	1
NH_3 Pressurants	0	0	0	0	0
APU Pressurants	6	6	6	6	6
Cabin Air	174	174	174	174	174
SSME Shutdown & Seal Purge (He)	151	151	151	151	151
ECLSS Pressurant (GN_2)	2	2	2	2	2

(1) AS REQUIRED FOR X CG CONTROL

TABLE 4.7 - ORBITER PROPELLANT AND NON-PROPULSIVE CONSUMABLES FLUID LOADINGS SUMMARY AT SRB IGNITION (CONTINUED)

Mission	STS-9	STS-11	STS-12	1 Due East	3A Deploy	4 Perform Cap. Asses
Vehicle	OV-102	OV-102	OV-103	OV-103	OV-103	OV-103
Propellant-Main Ascent Total	----------SEE SECTION 9----------					
Propellant - OMS Load	15500	25156	21100	19700	15095	25064
Insertion	7749	TBD	TBD	5462	9209	12083
On Orbit		TBD	TBD	6107	774	4726
De Orbit	5697	TBD	TBD	6523	3638	6132
Dispersions & Contingency	1163	TBD	TBD	809	675	1324
Residuals	891	891	891	799	799	799
Ballast (R POD/L POD)	0/0	0/0	0/0	0/0	0/0	0/0
Propellant - RCS Fwd Load	2464	2464	2477	2477	2477	2477
On Orbit	N/A	TBD	1960	1960	1960	1960
Dispersions & Contingency	N/A	TBD	260	260	260	260
Residuals	392	392	257	257	257	257
RCS Dump (X CG)	Yes(1)	Yes(1)	Yes(1)	Yes(1)	Yes(1)	Yes(1)
Propellant - RCS Aft	5424	5424	5031	5031	5031	5031
On Orbit	TBD	TBD	2908	2908	2908	2908
Dispersions & Contingency	N/A	TBD	643	643	643	643
Residuals	748	748	322	322	322	322
Entry Allowance	TBD	TBD	1158	1158	1158	1158
Non-Propulsive Consumables	5358*	5445	4634	4749	3942	4749
N_2 Gaseous-Launch Load	262	262	262	262	262	262
Water-Potable Launch Load	389	440	440	185.0	185.0	185.0
Water-Waste Load	3	3	3	11.0	11.0	11.0
NH_3-Launch Load	98	98	98	97.6	97.6	97.6
O_2 Cryogenic-Load (Tank sets)	2343(3)*	2379(3)	1655(2)	2334.0(3)	1552.5(2)	2334.0(3)
H_2 Cryogenic-Load (Tank sets)	276(3)*	271(3)	184(2)	274.3(3)	182.8(2)	274.3(3)
APU N_2H_4-Load	996	1001	1001	702.0	702.0	702.0
Hydraulic Water-Launch Load	424	424	424	353.0	353.0	353.0
APU H_2O-Gas Gen. Cool	6	6	6	6.0	6.0	6.0
APU H_2O-Fuel Pump Cool	42	42	42	42.0	42.0	42.0
(2)Auxiliary O_2	0	0	0	0.0	66.0	0.0
Cabin Air	174	174	174	190.0	190.0	190.0
MPS Pressurants	43	43	43	44.0	44.0	44.0
OMS Pressurants	114	114	114	113.0	113.0	113.0
RCS Pressurants	28	28	28	28.0	28.0	28.0
Water Pressurants	1	1	1	1.0	1.0	1.0
NH_3 Pressurants	0	0	0	0.1	0.1	0.1
APU Pressurants	6	6	6	3.0	3.0	3.0
SSME Shutdown & Seal Purge (He)	151	151	151	152.0	152.0	152.0
ECLSS Pressurant (GN_2)	2	2	2	1.0	1.0	1.0

* Tank set 4 Cryos ARE Charged to P/L
(1) AS REQUIRED FOR X CG CONTROL.
(2) NOT REQUIRED WITH 3 OR MORE EPS TANK SETS, EXCEPT FOR OFT.

5.0 PERSONNEL AND FLIGHT CREW EQUIPMENT

This section presents the weight status and definition of Personnel Elements for BRM and STS Missions. A matrix of crew size versus mission duration for operational missions along with crew equipment changeout items necessary when manifesting is also presented.

TABLE 5.1 - CURRENT PERSONNEL AND FLIGHT CREW EQUIPMENT WEIGHT CHANGE SUMMARY - STATUS 05-18-82

ITEM	STS-004	STS-005	STS-006	STS-007	STS-008	STS-009	STS-010	STS-011	STS-012	STS-013	BRM-1	BRM-3A
PERSONNEL 04-20-82	3224	3542	3362	3613	3362	4580		3542	3362		3655	2391
* FREEZER UPDATE	15											
* EXERCISER												54
* FLIGHT DATA FILE UPDATE												20
* MISC UPDATES	-1	10										-4
* DELETE POS		-41	-41	-41	-41	-41		-41	-41		-41	
* VCD'S		4										
* ANTI G SUITS AND ACCESS		17										
* THEODLITE		21										
* SUPPLEMENTAL STOWAGE PROV		-80										
* ADD 1 LOCKER		16										
* SOFT STOWAGE CONTAINER	10											
* OFK	45											
* PEAP SUPPORT KIT		5										
* RETAINER ASSY		15										
* VIDEO TAPE CASSETTE ASSY		15										
* WET TRASH ASSY		8										
* CAMERA BRKTS		7										
TOTAL PERSONNEL AND GFE CHANGES	69	-3	-41	-41	-41	-41		-41	-41		-41	70
TOTAL PERSONNEL AND GFE	3293	3539	3321	3572	3321	4539		3501	3321		3614	2461

* NEW CHANGE THIS REPORT.

TABLE 5.2 - PERSONNEL AND FLIGHT CREW EQUIPMENT MATRIX - OPERATIONAL MISSIONS (1)(2)

CONTROL WEIGHTS

Crewmembers \ Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	20	30
2	2709	274	2867		2925		2996									
3		3038	3150		3229		3372									
4		3318	3407	3545 (3)	3588	3658 (3)	3700									
5																
6							4626									
7																

STATUS WEIGHTS

Crewmembers \ Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	20	30
2	2670	2683	2822		2879		2950									
3		2989	3073		3183		3326									
4		3269	3362	3493	3542	3613	3655									
5																
6							4580									
7																

(1) This matrix should not be used for "Y" or BRM-3A 2 Crewmember/1 Day Missions.

(2) Based on JSC-17858, Standard Flight Crew Equipment for STS Operations.

(3) Not approved, under review.

TABLE 5.3.- FLIGHT CREW EQUIPMENT CHANGEOUT ITEMS - OPERATIONAL MISSIONS

Deletions		Additions		
Item	Wt/Item, lb	Item	Requirements	Wt/Item,lb
1. Galley (1)	164.0	Food tray	1/crewmember	2.0
		Food accessories	1/set/mission	3.8
		Food Warmer	1/mission	14.4
		Wet wipe disp. assy.	2/14 mandays	.4
		Water dispensing sys.	1/mission	23.0 (2)
		Locker volume	1+1 locker/14 mandays	16.1
2. Sleep Stations (1)	128.0	Sleeping bags	1/crewmember	3.8
		Locker volume	1/6 locker/crewmember	2.7
3. Hygiene Stowage Container (1)	15.0	No changeouts required		
4. Passenger Seats (1) (3)	92.0	No changeouts required		

Notes:
1 - Weights for these items are preliminary planning weights only.
2 - Charged to Orbiter dry weight.
3 - For nominal missions, 4 seats charged to Orbiter dry weight.
4 - Used only for missions with second Orbiter rescue capability.

6.0 SSME INERT WEIGHT

This section contains the inert weight status pending changes, and a time history for the SSME. Propellant data can be found in Section 9.0. The inert weight data was taken from SSME-82-0660 IL 2126-8025 "SSME Mass Properties Report (82-4)", April 29, 1982.

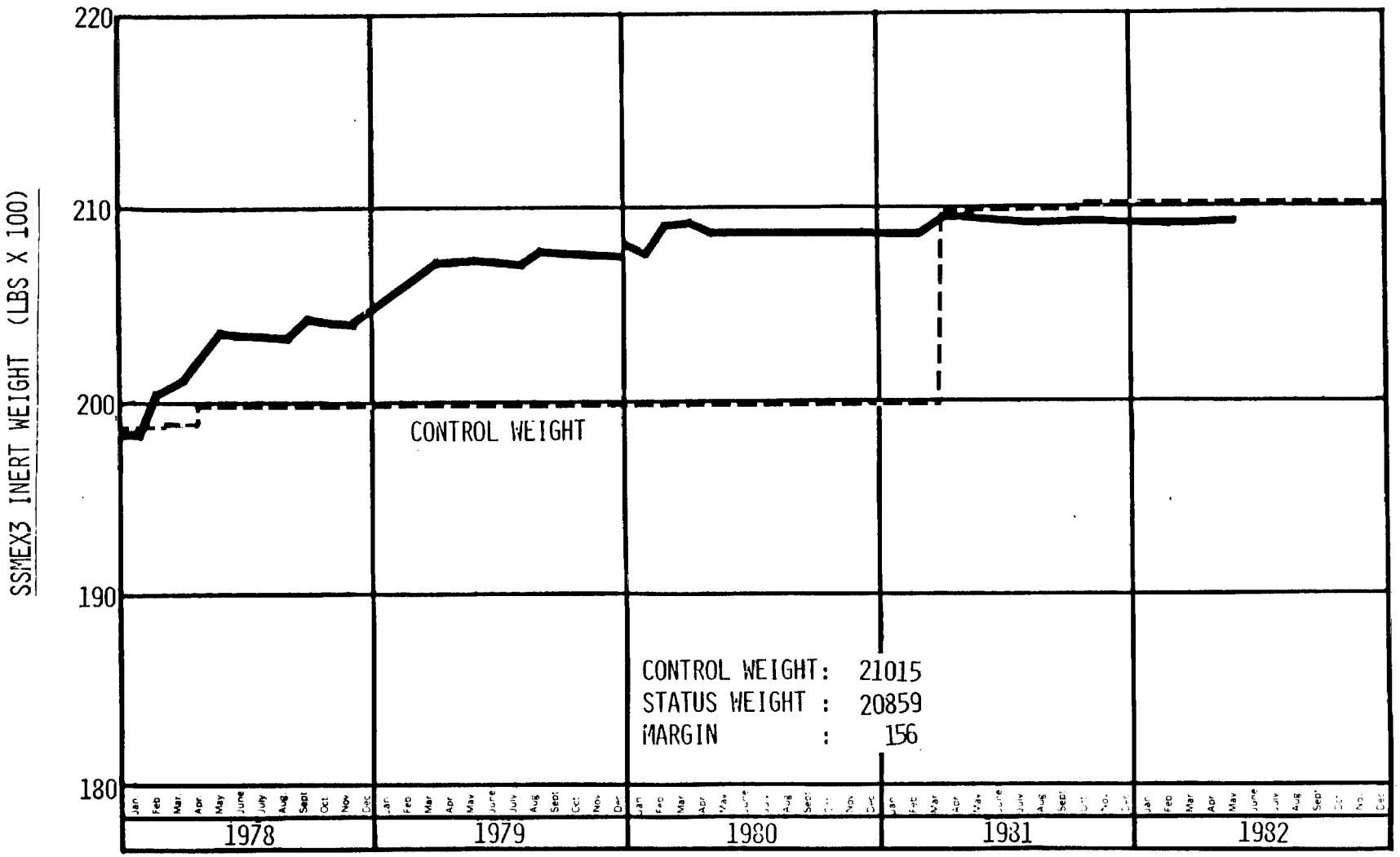
TABLE 6.1 - SSME X 3 WEIGHT CHANGE SUMMARY - STATUS 05-18-82

ITEM	STS-004 2005 2006 2007	STS-005 2005 2006 2007	STS-006 2013 2014 2015	STS-007 2013 2014 2015	STS-008 2013 2014 2015	STS-009 2005 2006 2007	STS-010 2013 2014 2015	STS-011 2005 2006 2007	STS-012 2019 2109 2020	STS-013 2013 2014 2015	BRM
RI-ROCKETDYNE PREV STATUS 03-25-82	20709	20709	20859	20859	20859	20709	20859	20709	20859	20859	20859
NO CHANGE THIS REPORT.											
RI-ROCKETDYNE RPTED CHANGES											
RI-ROCKETDYNE RPTED INERT 04-29-82	20709	20709	20859	20859	20859	20709	20859	20709	20859	20859	20859
CHANGES NOT INCORPORATED											
NONE THIS REPORT.											
TOTAL SSPO RPTED SSME CHANGES											
SSPO RPTED SSME X 3 STATUS	20709	20709	20859	20859	20859	20709	20859	20709	20859	20859	20859

TABLE 6.2 - SSMEX3 POTENTIAL INERT WEIGHT CHANGES

ECP	ITEM	WEIGHT CHANGE, LB
	DEVELOPMENT PROBLEMS	18
	PRIMARY NOZZLE	
	ADDITION OF BAND TO TUBE BUNDLE (2023 & SUBS)	6
	MAIN FUEL VALVE	
	INCREASE STRUCTURAL CAPABILITY (2018 & SUBS)	6
	THERMAL PROTECTION	
	INCREASE SHIELD FOIL THICKNESS	21
	LOW PRESS OX TURBO PUMP	-12
	REMOVE 8 OF 12 KICKER BLADES FROM INDUCER	
	HEAT EXCHANGER	- 3
	PRIMARY TUBE BRAZED ON DOUBLERS AND SUSPENSION CHANGE (2021 & SUBS)	

FIGURE 6.1 - SSMEX3 INERT WEIGHT HISTORY



7.0 EXTERNAL TANK INERT WEIGHT

This section provides the inert weight status, pending changes and a time history for the External Tank. Propellant data can be found in Section 9.0. Operational ET vehicles are designated LWT and subsequent. DFI vehicles are designated ET-1 through 6. The inert weight data was taken from the quarterly report, MMC-ET-SE02-76, "Mass Properties Status Report," dated March 15, 1982.

TABLE 7.1 - ET WEIGHT CHANGE SUMMARY - STATUS 05-18-82

ITEM	STS-004 ET-04	STS-005 ET-05	STS-006 LWT-1	STS-007 ET-06	STS-008 LWT-2	STS-009 LWT-3	STS-010 LWT-4	STS-011 LWT-5	STS-012 LWT-6	STS-013 LWT-7
MMC PREV INERT STATUS L III 03-15-82	75895	76036	67872	76060	67872	67884	67840	67840	67840	67203
* FLIGHT INSTRUMENTATION	41									
TOTAL MMC CHANGES	41									
MMC STATUS LEVEL III 04-15-82	75936	76036	67872	76060	67872	67884	67840	67840	67840	67203
CHANGES NOT INCORPORATED										
BOUYANCY	155	155	155	155	155	155	155	155	155	155
SSPO RPTED STATUS LEVEL III	76091	76191	68027	76215	68027	68039	67995	67995	67995	67358
SEPARATION	883	883	883	883	883	883	883	883	883	883
TOTAL CHANGES	41									
SSPO RPTED STATUS LEVEL II	76974	77074	68910	77098	68910	68922	68878	68878	68878	68241

* NEW CHANGE THIS REPORT.

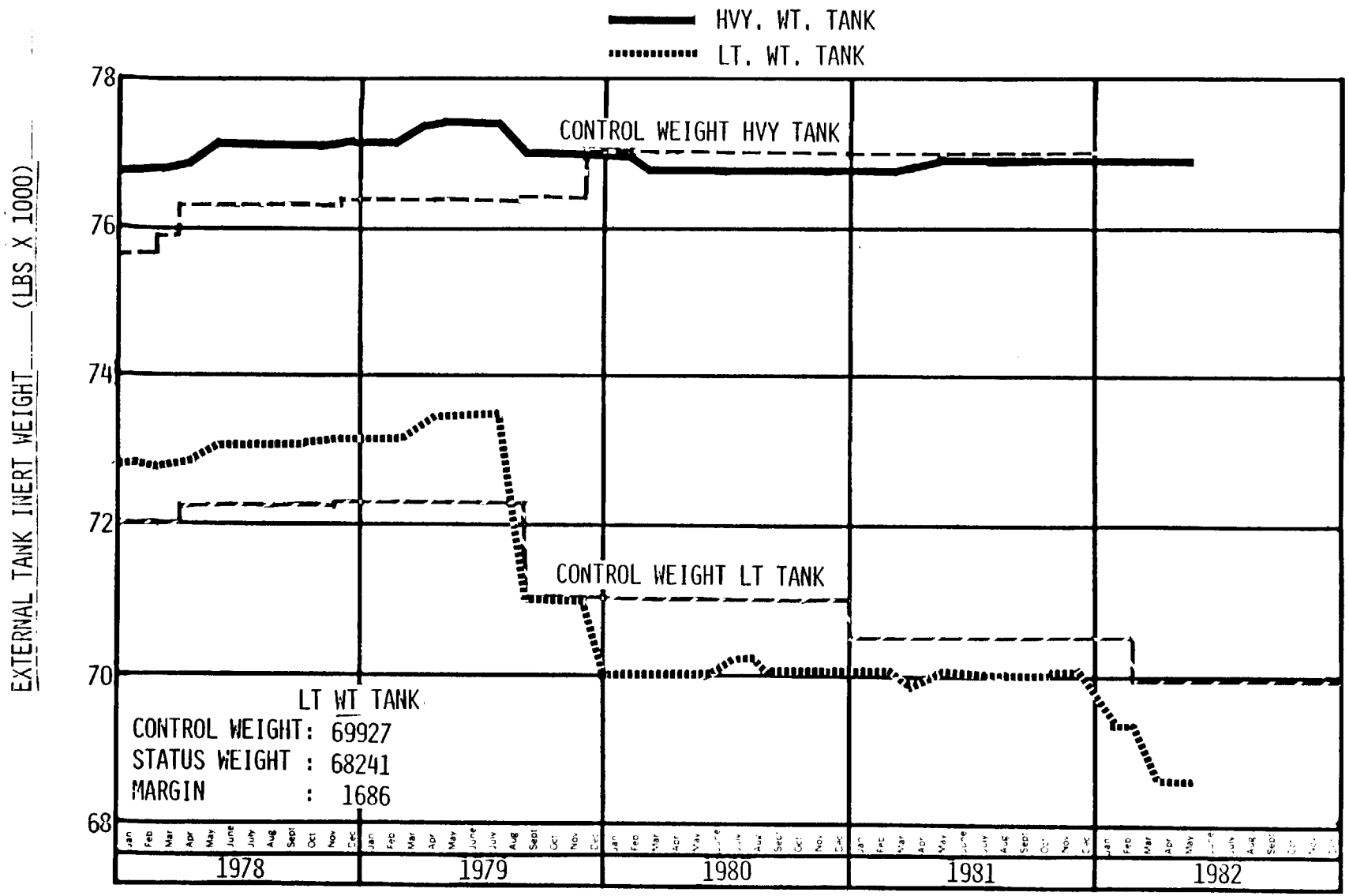
TABLE 7.2 LIGHT WEIGHT ET---INERT WEIGHT COMPARISON-STATUS

MISSION	STS-06	STS-08	STS-09	STS-10	STS-11	STS-12	STS-13
ORBITER	LWT-1	LWT-2	LWT-3	LWT-4	LWT-5	LWT-6	LWT-7
STATUS	67872	67872	67872	67872	67872	67872	67872
LO2 PRESSURE TRANSDUCER			12	12	12	12	12
CAPACITANCE PROBE				10	10	10	10
REDESIGN HE INJ. SYSTEM				-4	-4	-4	-4
REDESIGN LO2 BBL PNSL				-50	-50	-50	-50
PARTIAL BAFFLE ELIMINATION							-630
LO2 F/L AFT ELBOW							-7
INERT	67872	67872	67884	67840	67840	67840	67203

TABLE 7.3 - ET POTENTIAL INERT WEIGHT CHANGES

REF	ITEM	LWT-3	LWT-4	LWT-7	LWT-16	LWT-23	LWT-26	LWT-46
B00546G Sup 'BQ'	LH_2 F/L Siphon				-28	-28	-28	-28
B00546 Sup 'W'	Bi-Pod Strut Tk. FTGS (2)					-22	-22	-22
Sup 'W'	Bi-Pod Yoke & Strut LWR FTGS					-8	-8	-8
Sup 'W'	Diagonal Strut Tk. FTG					-2	-2	-2
Sup 'W'	Vertical Strut Tk. FTG (2)					-18	-18	-18
Sup 'W'	EB AFT UPR FTGS (2)					-20	-20	-20
Sup 'W'	EB AFT LWR FTGS (2)					-20	-20	-20
Sup 'E'	Thrust Strut (2)						-40	-40
J30611	LWR Diag. Strut							-22
	N/C Redesign				-15	-15	-15	-15
	Naflex to RACO Seals					-8	-8	-8
	TOTALS	0	0	0	-43	-141	-141	-163

FIGURE 7.1 - EXTERNAL TANK (7 & SUBS) INERT WEIGHT HISTORY



8.0 SOLID ROCKET BOOSTER INERT WEIGHT AND PROPELLANT SUMMARY

This section provides the inert weight status, pending changes, a time history, and a propellant summary for the SRB. Operational SRB vehicles are designated A51 (left hand) and A52 (right hand). DFI vehicles are designated A07-A17 (left hand) and A08-A18 (right hand). The inert weight data was taken from "Solid Rocket Booster Mass Properties Status Report" Number 64, March 26, 1982. STS-6 data was taken from "Addendum A to SRB Mass Properties Report Number 64", dated April 29, 1982.

TABLE 8.1 - SRB WEIGHT CHANGE SUMMARY - STATUS 05-18-82

ITEM	STS-004 A13 A14	STS-005 A15 A16	STS-006 A17 A18	STS-007 A19 A20	STS-008	STS-009	STS-010	STS-011	STS-012	STS-013	BRM
SSPO RPTED SRB INERT 04-20-82	380209	380716	372144	368090	372878	372878	380032	380032	380032	380032	372878
* UPDATE TO STD/LWC CASE						7154			-7154	-7154	
* ELECTRICAL/INSTRUMENTATION				1894	1894	1894	1894				
* MISC UPDATES / ACTUAL WTS.	-8		176								
TOTAL SSPO RPTED SRB CHANGES (1)	-8		176	1894	1894	9048	1894		-7154	-7154	
SSPO RPTED SRB INERT STATUS	380201	380716	372320	369984	374772	381926	381926	380032	372878	372878	372878

* NEW CHANGE THIS REPORT.

(1) DIVIDED BY 10 = VALUES SHOWN IN TABLE 2.4 AND TABLE 2.5.

TABLE 8.2 - SRBX1 POTENTIAL WEIGHT CHANGES

PCIN	CODE	ITEM	STS-4	STS-5	STS-6	STS-7	STS-8	STS-9	STS-10	STS-11	STS-12	STS-13
		REPLACE STRAPS WITH RETAINERS AND RUBBER WITH CORK ISSOLATION			-121	-121	-121	-121	-121	-121	-121	-121
		REINFORCE SEVERANCE CABLE			17	17	17	17	17	17	17	17
		INSULATION - SRM					-1373	-1373	-1373	-1373	-1373	-1373
					-104	-104	-1477	-1477	-1477	-1477	-1477	-1477

FIGURE 8.1 - SRBX2 (A51 & 52) INERT WEIGHT HISTORY

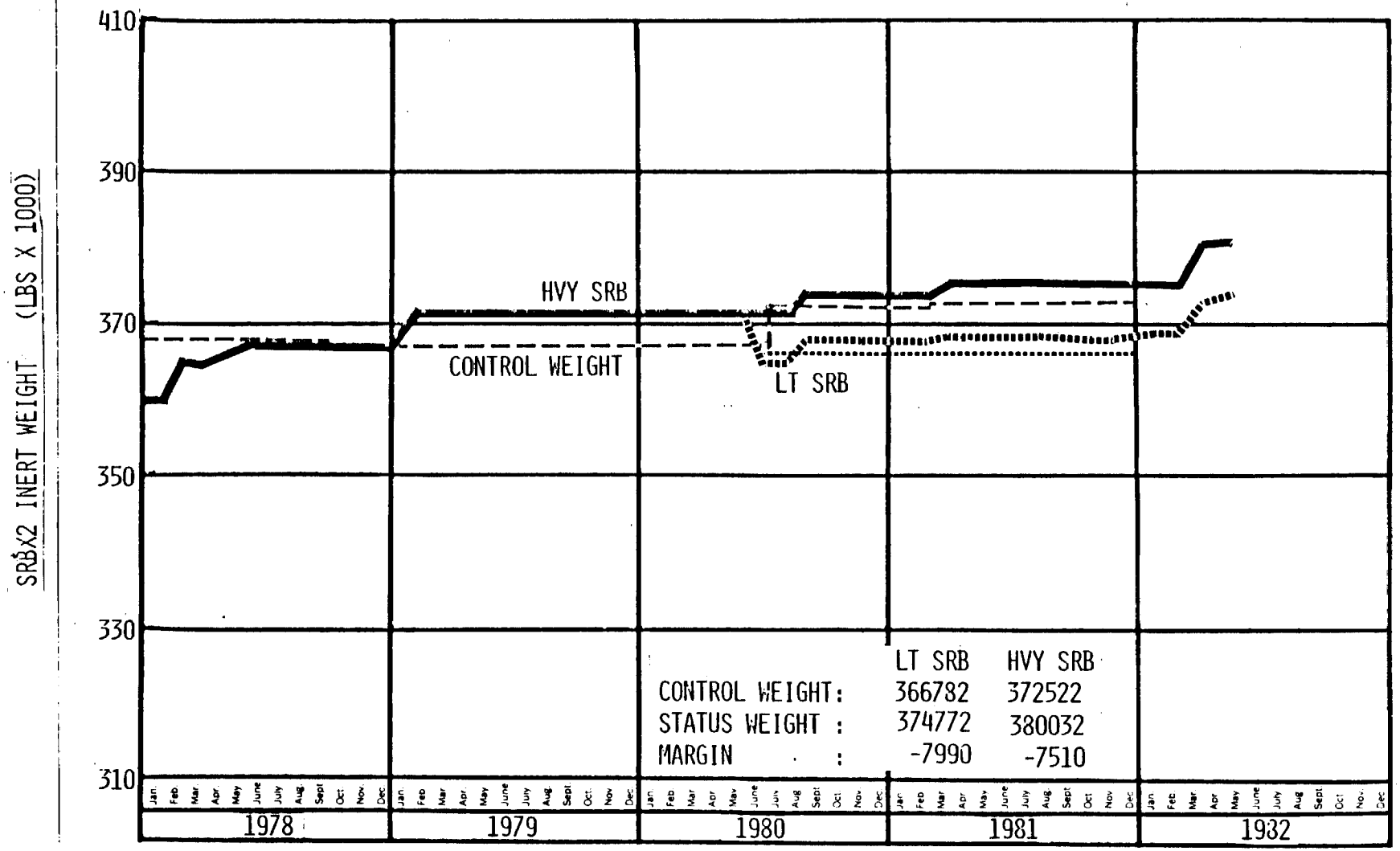


TABLE 8.3 - SRB PROPELLANT CONSUMED SUMMARY - STATUS 05-18-82

ITEM	STS-004 A13 A14	STS-005 A15 A16	STS-006 A17 A18	STS-007 A19 A20	STS-008	STS-009	STS-010	STS-011	STS-012	STS-013	BRM
PREV RPTED SRB PROP CONSUMED 04-20-82	2217265	2215514	2216970	2216970	2217504	2217504	2216048	2215948	2215948	2216048	2217504
* UPDATE								100	100		
* UPDATE TO STD/LWC CASE						-1456			1456	1456	
TOTAL SSPO RPTED SRB PROP CONS CHANGES						-1456		100	1556	1456	
SSPO RPTED SRB PROP CONSUMED	2217265	2215514	2216970	2216970	2217504	2216048	2216048	2216048	2217504	2217504	2217504

9.0 MPS PROPELLANT INVENTORIES

The Main Propulsion System (MPS) propellant inventories for STS-4 through 13 and BRM Missions are summarized in Tables 9.1 through 9.5. This accounts for propellants on the vehicle, Orbiter, SSME and ET.

TABLE 9.1

05/12/82 10.11.24

MPS PROPELLANT INVENTORY STS 4 REV K1

NOM T = T1 + 0.00

FUEL BIAS = 1474. MR = 6.0192
FPR = 6210. ULLAGE O2 = 2.96 SIGMA = 3. OBMR = 6.0376
DET FPR = 798. ULLAGE H2 = 2.86

	LH2	LO2	TOTAL
LOADED	228357.	1361267.	1589624.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET(HXT=1070.0 HUP= .3 LXT=446.6 LUP=2.4)	228050.	1356638.	1584688.
LOSS PRIOR TO ENG START CMD DBT 4M: 0S	104.	4955.	5059.
BOILOFF,BLEED,SEAL LEAK,POGO FLUSH	104.	4955.	5059.
LOADED AT ENGINE START COMMAND	228253.	1356312.	1584565.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET	227946.	1351683.	1579629.
TRANSFERED FROM ET	58.	172.	230.
USED FOR THR BUILDUP AND SRB IGN DELAY	1733.	9434.	11167.
LOADED AT SRB IGNITION COMMAND	226520.	1346878.	1573398.
ORB LINES	249.	3304.	3553.
SSME X 3	116.	1497.	1613.
ET	226155.	1342077.	1568232.

****

UNUSABLE	2228.	4798.	7026.
ORB LINES(LOX ECO T=3.398,NPSP= 7.2)	249.	550.	799.
SSME X 3	58.	1325.	1383.
ET WET WALLS,BELLOWS	0.	175.	175.
ET : LOX LINES ; LH2 LINES AND TANK	785.	0.	785.
FLIGHT PRESS	1136.	2748.	3884.
USABLE RESERVES	2357.	5327.	7684.
ORB LINES (FPR)	0.	2754.	2754.
SSME X 3	0.	0.	0.
ET (FPR)	882.	2573.	3455.
BIAS	1474.	0.	1474.
USABLE IMPULSE	221935.	1336753.	1558688.
USED AT OBMR	221160.	1335282.	1556442.
SHUTDOWN CONSUMPTION	717.	1299.	2016.
0 SSME FROM 100 PERCENT	0.	0.	0.
3 SSME FROM 65 PERCENT	717.	1299.	2016.
VENTED AFTER SSME VALVE CLOSURE	58.	172.	230.

TABLE 9.2

02/17/82 09.47.35

MPS PROPELLANT INVENTORY STS 5 REV W

NCM T = T1 + 0.00

FUEL BIAS = 1050. MR = 6.0000

FPR = 5638. ULLAGE O2 = 3.00 SIGMA = 3. OBMR = 6.0182

DET FPR = 0. ULLAGE H2 = 2.64

	LH2	LO2	TOTAL
LOADED	228851.	1368804.	1597655.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET(HXT=1066.5 HUP= .3 LXT=436.1 LUP=2.4)	228544.	1364175.	1592719.
LOSS PRIOR TO ENG START CMD DBT 9M:29S	104.	11266.	11370.
BOILOFF,BLEED,SEAL LEAK,POGO FLUSH	104.	11266.	11370.
LOADED AT ENGINE START COMMAND	228747.	1357537.	1586284.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET	228440.	1352908.	1581348.
TRANSFERED FROM ET	58.	172.	230.
USED FOR THR BUILDUP AND SRB IGN DELAY	1733.	9434.	11167.
LOADED AT SRB IGNITION COMMAND	227014.	1348103.	1575117.
ORB LINES	249.	3304.	3553.
SSME X 3	116.	1497.	1613.
ET	226649.	1343302.	1569951.
UNUSABLE	2228.	4798.	7026.
ORB LINES(LOX ECO T=3.398,NPSP= 7.2)	249.	550.	799.
SSME X 3	58.	1325.	1383.
ET WET WALLS,BELLOWS	0.	175.	175.
ET : LOX LINES ; LH2 LINES AND TANK	785.	0.	785.
FLIGHT PRESS	1136.	2748.	3884.
USABLE RESERVES	1853.	4835.	6688.
ORB LINES (FPR)	0.	2754.	2754.
SSME X 3	0.	0.	0.
ET (FPR)	803.	2081.	2884.
BIAS	1050.	0.	1050.
USABLE IMPULSE	222933.	1338471.	1561404.
USED AT OBMR	222158.	1337000.	1559158.
SHUTDOWN CONSUMPTION	717.	1299.	2016.
0 SSME FROM 100 PERCENT	0.	0.	0.
3 SSME FROM 65 PERCENT	717.	1299.	2016.
VENTED AFTER SSME VALVE CLOSURE	58.	172.	230.

TABLE 9.3

04/09/82 16.44.02

MPS PROPELLANT INVENTORY STS 6, 8-13 REV V3H2

NOM T = T1 + 0.00

FUEL BIAS = 1119. MR = 6.0000
FPR = 5526. ULLAGE O2 = 2.70 SIGMA = 3. OBMR = 6.0182
DET FPR = 0. ULLAGE H2 = 2.59

	LH2	LO2	TOTAL
LOADED	229222.	1370601.	1599823.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET(HXT=1064.6 HUP= .3 LXT=430.5 LUP=2.4)	228915.	1365972.	1594887.
LOSS PRIOR TO ENG START CMD DBT 9M:28S	104.	11250.	11354.
BOILOFF,BLEED,SEAL LEAK,POGO FLUSH	104.	11250.	11354.
LOADED AT ENGINE START COMMAND	229118.	1359351.	1588469.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET	228811.	1354722.	1583533.
TRANSFERED FROM ET	58.	172.	230.
USED FOR THR BUILDUP AND SRB IGN DELAY	1733.	9434.	11167.
LOADED AT SRB IGNITION COMMAND	227385.	1349917.	1577302.
ORB LINES	249.	3304.	3553.
SSME X 3	116.	1497.	1613.
ET	227020.	1345116.	1572136.

****

UNUSABLE	2228.	4798.	7026.
ORB LINES(LOX ECO T=3.398,NPSP= 7.2)	249.	550.	799.
SSME X 3	58.	1325.	1383.
ET WET WALLS,BELLOWS	0.	175.	175.
ET : LOX LINES ; LH2 LINES AND TANK	785.	0.	785.
FLIGHT PRESS	1136.	2748.	3884.
USABLE RESERVES	1906.	4739.	6645.
ORB LINES (FPR)	0.	2754.	2754.
SSME X 3	0.	0.	0.
ET (FPR)	787.	1985.	2772.
BIAS	1119.	0.	1119.
USABLE IMPULSE	223251.	1340380.	1563631.
USED AT OBMR	222476.	1338909.	1561385.
SHUTDOWN CONSUMPTION	717.	1299.	2016.
0 SSME FROM 100 PERCENT	0.	0.	0.
3 SSME FROM 65 PERCENT	717.	1299.	2016.
VENTED AFTER SSME VALVE CLOSURE	58.	172.	230.

TABLE 9.4

02/17/82 09.47.35

MPS PROPELLANT INVENTORY STS 7 REV W

NOM T = T1 + 0.00

FUEL BIAS = 1050. MR = 6.0000
FPR = 5638. ULLAGE O2 = 3.00 SIGMA = 3. OBMR = 6.0182
DET FPR = 0. ULLAGE H2 = 2.64

	LH2	LO2	TOTAL
LOADED	228851.	1368804.	1597655.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET(HXT=1066.5 HUP= .3 LXT=436.1 LUP=2.4)	228544.	1364175.	1592719.
LOSS PRIOR TO ENG START CMD DBT 9M:29S	104.	11266.	11370.
BOILOFF,BLEED,SEAL LEAK,POGO FLUSH	104.	11266.	11370.
LOADED AT ENGINE START COMMAND	228747.	1357537.	1586284.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET	228440.	1352908.	1581348.
TRANSFERED FROM ET	58.	172.	230.
USED FOR THR BUILDUP AND SRB IGN DELAY	1733.	9434.	11167.
LOADED AT SRB IGNITION COMMAND	227014.	1348103.	1575117.
ORB LINES	249.	3304.	3553.
SSME X 3	116.	1497.	1613.
ET	226649.	1343302.	1569951.
UNUSABLE	2228.	4798.	7026.
ORB LINES(LOX ECO T=3.398,NPSP= 7.2)	249.	550.	799.
SSME X 3	58.	1325.	1383.
ET WET WALLS,BELLOWS	0.	175.	175.
ET : LOX LINES ; LH2 LINES AND TANK	785.	0.	785.
FLIGHT PRESS	1136.	2748.	3884.
USABLE RESERVES	1853.	4835.	6688.
ORB LINES (FPR)	0.	2754.	2754.
SSME X 3	0.	0.	0.
ET (FPR)	803.	2081.	2884.
BIAS	1050.	0.	1050.
USABLE IMPULSE	222933.	1338471.	1561404.
USED AT OBMR	222158.	1337000.	1559158.
SHUTDOWN CONSUMPTION	717.	1299.	2016.
0 SSME FROM 100 PERCENT	0.	0.	0.
3 SSME FROM 65 PERCENT	717.	1299.	2016.
VENTED AFTER SSME VALVE CLOSURE	58.	172.	230.

TABLE 9.5

02/19/32 10.31.25 MPS PROPELLANT INVENTORY BRM 1 REV W

AOA T = T1 + 0.00

FUEL BIAS = 1150. MR = 6.0000
FPR = 3735. ULLAGE O2 = 3.36 SIGMA = 2. OBMR = 6.0182
DET FPR = 0. ULLAGE H2 = 2.42

	LH2	LO2	TOTAL
LOADED	229357.	1371408.	1600765.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET(HXT=1063.0 HUP= .3 LXT=441.8 LUP= .3)	229050.	1366779.	1595829.
LOSS PRIOR TO ENG START CMD DBT 9M:28S	104.	11250.	11354.
BOILOFF,BLEED,SEAL LEAK,POGO FLUSH	104.	11250.	11354.
LOADED AT ENGINE START COMMAND	229253.	1360158.	1589411.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET	228946.	1355529.	1584475.
TRANSFERED FROM ET	58.	172.	230.
USED FOR THR BUILDUP AND SRB IGN DELAY	1733.	9434.	11167.
LOADED AT SRB IGNITION COMMAND	227520.	1350724.	1578244.
ORB LINES	249.	3304.	3553.
SSME X 3	116.	1497.	1613.
ET	227155.	1345923.	1573078.
UNUSABLE	2298.	5933.	8231.
ORB LINES(LOX ECO T=2.598,NPSP= 9.0)	249.	1685.	1934.
SSME X 3	58.	1325.	1383.
ET WET WALLS,BELLOWS	0.	175.	175.
ET : LOX LINES ; LH2 LINES AND TANK	855.	0.	855.
FLIGHT PRESS	1136.	2748.	3884.
USABLE RESERVES	1682.	3203.	4885.
ORB LINES (FPR)	0.	1619.	1619.
SSME X 3	0.	0.	0.
ET (FPR)	532.	1584.	2116.
BIAS	1150.	0.	1150.
USABLE IMPULSE	223540.	1341588.	1565128.
USED AT OBMR	222543.	1339316.	1561859.
SHUTDOWN CONSUMPTION	939.	2100.	3039.
3 SSME FROM 100 PERCENT	939.	2100.	3039.
0 SSME FROM 65 PERCENT	0.	0.	0.
VENTED AFTER SSME VALVE CLOSURE	58.	172.	230.

TABLE 9.6

02/19/82 10.51.28 MPS PROPELLANT INVENTORY BRM 3A,4 REV W

AOA T = T1 + 0.00

FUEL BIAS = 1150. MR = 6.0000
FPR = 3622. ULLAGE O2 = 3.36 SIGMA = 2. OBMR = 6.0182
DET FPR = 0. ULLAGE H2 = 2.42

	LH2	LO2	TOTAL
LOADED	229357.	1371408.	1600765.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET(HXT=1063.0 HUP= .3 LXT=441.8 LUP= .3)	229050.	1366779.	1595829.
LOSS PRIOR TO ENG START CMD DBT 9M:28S	104.	11250.	11354.
BOILOFF,BLEED,SEAL LEAK,POGO FLUSH	104.	11250.	11354.
LOADED AT ENGINE START COMMAND	229253.	1360158.	1589411.
ORB LINES	249.	3304.	3553.
SSME X 3	58.	1325.	1383.
ET	228946.	1355529.	1584475.
TRANSFERED FROM ET	58.	172.	230.
USED FOR THR BUILDUP AND SRB IGN DELAY	1733.	9434.	11167.
LOADED AT SRB IGNITION COMMAND	227520.	1350724.	1578244.
ORB LINES	249.	3304.	3553.
SSME X 3	116.	1497.	1613.
ET	227155.	1345923.	1573078.
UNUSABLE	2298.	5933.	8231.
ORB LINES(LOX ECO T=2.599,NPSP= 9.0)	249.	1685.	1934.
SSME X 3	58.	1325.	1383.
ET WET WALLS,BELLOWS	0.	175.	175.
ET : LOX LINES ; LH2 LINES AND TANK	855.	0.	855.
FLIGHT PRESS	1136.	2748.	3884.
USABLE RESERVES	1666.	3106.	4772.
ORB LINES (FPR)	0.	1619.	1619.
SSME X 3	0.	0.	0.
ET (FPR)	516.	1487.	2003.
BIAS	1150.	0.	1150.
USABLE IMPULSE	223556.	1341685.	1565241.
USED AT OBMR	222559.	1339413.	1561972.
SHUTDOWN CONSUMPTION	939.	2100.	3039.
3 SSME FROM 100 PERCENT	939.	2100.	3039.
0 SSME FROM 65 PERCENT	0.	0.	0.
VENTED AFTER SSME VALVE CLOSURE	58.	172.	230.

10.0 PAYLOAD WEIGHT CHARGEABLE OPTIONS

This section offers a list of items that would be charged to the payload if it is required and would be considered as part of the total payload allocation.

TABLE 10.1 - HARDWARE PAYLOAD WEIGHT CHARGEABLE OPTIONS

ITEM	JSC 07700 Vol X Reference	Control Weight			Center of Gravity			Current Status			Maturity (%)			Remarks
		Dry	Wet	Expend	X_0	Y_0	Z_0	Dry	Wet	Expend	Est	Cal	Act	
CFE														
P/L Bay Service Panels	3.2.1.1.2.1.4	TBD						TBD						Payload Unique
Docking Module Kit	3.2.1.1.2.1.5	3900									100			Baseline Docking Module Plus Orbiter Modification. (Baseline Airlock of 912 lbs In Cabin Can Be Removed)
A/L Tunnel Adapter Kit		900									100			EVA Airlock Mounts On Top Of Tunnel Adapter
Kit To Modify Orbiter & Airlock For Payload Bay Mounted Airlock		112												
Payload ARS Duct Kit	3.2.1.1.2.1.6	21									100			Supply Includes Orbiter-Cabin Air Duct and Valves
Additional ATCS Radiator Panel Kit	3.2.1.1.2.1.7		387						355			100		Increase Rejection Capacity By 7500 Btu/hr
Closed					1214.9	±61.5	473.0							
Open					1214.9	±150.0	366.0							
Second Manipulator System	3.2.1.1.2.1.16	905			957.2	88.9	443.9	855			0	0	100	
RMS Installation		266			985.2	96.6	416.4	379						
P/L Bay Purge and Vent Kit	3.2.1.1.2.1.4	TBD												Payload Unique
Ballast Locations														
Nose Wheel Well		1926			292.0	0.0	326.3							
Bay 2		1365			655.0	±91.0	408.0							Maximum/side
Bay 12		1388			1225.0	±91.0	408.0							Maximum/side
Bay 13		1349			1277.5	±91.0	408.0							Maximum/side
Aft Body		1000			1507.0	±51.0	310.0							Maximum/side

TABLE 10.1 - HARDWARE PAYLOAD WEIGHT CHARGEABLE OPTIONS (CONTINUED)

ITEM	JSC 07700 Vol X Reference	Control Weight			Center of Gravity			Current Status			Maturity (%)			Remarks
		Dry	Wet	Expend	X_0	Y_0	Z_0	Dry	Wet	Expend	Est	Cal	Act	
CFE														
Bridge Fitting (Pair*)(1)	3.2.1.1.2.1.15													Any Special Equipment Added To The Baseline Attach Fitting Structure Such As A Unique Deployment Guide Is P/L Chargeable. * Passive Attach fittings Weight included in control wt. For each Active Attach fitting add 77 lbs. (1) Status weights do not include Passive attach fittings weight of 28.1 lbs. For each active fitting add 110 lbs.
1		262			609.0	±94	404.0				100			
2		234			664.5	±94	404.0	149.6				100		
3		250			721.5	±94	404.0	214.0				100		
4		262			778.5	±94	404.0	240.2				100		
5		278			835.0	±94	404.0	279.4				100		
6		278			891.0	±94	404.0	185.2				100		
7		326			949.3	±94	404.0	247.0				100		
8		294			1009.8	±94	404.0	251.6				100		
9		270			1065.2	±94	404.0	206.8				100		
10		290			1115.5	±94	404.0	248.2				100		
11		290			1165.9	±94	404.0	224.2				100		
12		338			1220.0	±94	404.0	268.2				100		
13		390			1275.3	±94	404.0	190.4				100		
14		186			1304.3	±94	404.0				100			
Keel Fitting* (2)														* Keel fitting control weight includes active retention fitting weight. (2) Status weights include active retention fitting weight of 80 lbs.
1		127			609.0	0	305.0				100			
2		131			664.5	0	305.0	222.0			100			
3		168			721.5	0	305.0	222.0			100			
4		191			778.5	0	305.0	222.0			100			
5		190			835.0	0	305.0	222.0			100			
6		188			891.0	0	305.0	273.5				100		
7		216			949.3	0	305.0	277.3				100		
8		239			1009.8	0	305.0	252.7				100		
9		219			1065.2	0	305.0	258.5				100		
10		240			1115.5	0	305.0	249.9				100		
11		233			1165.9	0	305.0	265.0				100		
12		327			1220.0	0	305.0	222.0			100			
Less P/L Fitting Allocation		-675			1074.0	26.0	395.0							
KU-band Comm Kit	3.2.1.1.2.1.11	290			590	-90	480.0	263			100			Second Set
GFE														
Aft Upper Deck Displays & Controls	3.2.1.1.2.1.11	TBS												P/L Peculiar
MSS PCM Recorder Kit	3.2.1.1.2.1.11	60												

TABLE 10.2 - CREW EQUIPMENT/LIFE SUPPORT PAYLOAD WEIGHT CHARGEABLE OPTIONS

ITEM	JSC 07700 Vol X Reference	Control Weight			Center of Gravity			Current Status			Maturity (%)			Remarks
		Dry	Wet	Expend	X_0	Y_0	Z_0	Dry	Wet	Expend	Est	Cal	Act	
GFE														
Crew Equipment	3.2.1.1.2.1.10													For Additional Crewmen or
Trash Container		.5/M									100			Mission Over 7-Day Duration
Seats & Restraints		92/M			499	10	340				100			Seat No. 5
Seats & Restraints		92/M			499	-10	340				100			Seat No. 6
Seats & Restraints		92/M			533	-49	340				100			Seat No. 7
Seats & Restraints		92/M			471	41	340				100			Seat No. 8 (Rescue only)
Seats & Restraints		92/M			506	52	342				100			Seat No. 9 (Rescue only)
Seats & Restraints		92/M			506	32	342				100			Seat No. 10 (Rescue only)
Stowage - Containers		TBS			437	-18	370	735			100			
Stowage - Containers		TBS			525	51	315	209			100			
Stowage - Packaging		SEE			437	-18	370	110			100			30% of Each Stowed Item's Wt.
Stowage - Packaging		NOTE			525	51	315	50			100			30% of Each Stowed Item's Wt.
Fecal Bags		1.0/M									100			Contingency Only
Urine Bags		1.0/M									100			Contingency Only
Vomitus Bags		1.0/M									100			
ARS Expendables & Hardware														
Aux O_2 Sys		75	141		794	89	329				100			Required when only 2 EPS tank sets are used.
OXYGEN				1.92/D						1.92/D				Airlock in Cabin & Cabin Leakage 8 lb/day.
Orbiter Cabin Leakage	3.2.1.1.2.1.19			2.4/D						2.4/D				Airlock Outside Cabin on Tunnel Adapter & Cabin Leakage 10 lb/day.
Crewman metabolic consumption	3.2.1.1.2.1.9			2.08/MD	750	0	308			2.08/MD	100			
EVA Support														Orbiter provides 2-Man Capability With Expendables for 3 EVA's (Including Rescue)
(1) ALSA O_2 Recharge				1.6							100			
(2) EVA Airlock Repressurization				2.7							100			
(3) Prebreathe Cycle				1.5/M							100			
(4) Suit Purge Cycle				1.0/M							100			
NITROGEN														
N_2 Tank Kit (Dry) Including Tank Mounting Brackets & Plumbing		83	143								100			
Gaseous N_2 Per Tank				60							100			40 lb Minimum Usable/Tank
Orbiter Cabin Leakage	3.2.1.1.2.1.19			6.08/D						6.08/D	100			Airlock in Cabin & Cabin Leakage 8.0 lb/day.
Airlock Repress				7.6/D						7.6/D	100			Airlock Outside Cabin on Tunnel
LIOH Canisters		7.0/2MD			490	0	315	7.0/2MD			100			Above 28 md & 96 hr Contingency. Each Canister Has 2-man-day.

TABLE 10.2 - CREW EQUIPMENT/LIFE SUPPORT PAYLOAD WEIGHT CHARGEABLE OPTIONS (CONTINUED)

ITEM	JSC 07700 Vol X Reference	Control Weight			Center of Gravity			Current Status			Maturity (%)			Remarks
		Dry	Wet	Expend	X_0	Y_0	Z_0	Dry	Wet	Expend	Est	Cal	Act	
GFE														
EVA Hardware & Expendables	3.2.1.1.2.1.3													
Extravehicular Mobility Unit (EMU) Including One charge of Expendables.			202.9						202.9		100			Additional Units. Water not included.
LIOH Recharge		5.5												
Spare Battery		9.8												
Crewman W/O Personal Equip	3.2.1.1.2.1.10	170			495	10	344				100			No. 5
					495	-10	344							No. 6
					529	-49	345							No. 7
					467	41	343							No. 8 Rescue Only
					502	52	344							No. 9 Rescue Only
					502	32	344							No. 10 Rescue Only
Crew Equipment	3.2.1.1.2.1.10													
Clothing Module		22.0 lb/man									100			7 Day Mission
Survival Kit		42						42			100			Up to 6 Crewmen.
Crew Life Vest		2.5/M						2.5/M			100			
Tissue W/Dispenser		1.5/M									100			7 Day Mission.
Ancillary Crew Provisions Shipset		41.5/2 men												
Orbiter Stowage Provisions Shipset		172/42 man-day												Stowage Packaging Such as Trays, Locker Inserts, Bags, Straps

TABLE 10.2 - CREW EQUIPMENT/LIFE SUPPORT PAYLOAD WEIGHT CHARGEABLE OPTIONS (CONCLUDED)

ITEM	JSC 07700 Vol X Reference	Control Weight			Center of Gravity			Current Status			Maturity (%)			Remarks
		Dry	Wet	Expend	X_0	Y_0	Z_0	Dry	Wet	Expend	Est	Cal	Act	
GFE														
Crew Equipment (Continued)	3.2.1.1.2.1.9 /.10													
Personal Hygiene Kit		5.0/M			557	-43	356				100			
Galley Equipment Food Tray		5.0/M												
Personal Rescue System (PRS)	3.2.1.1.2.1.10													PRS Assembly Includes the PRE and the POS.
Personal Rescue Enclosure (PRE)		24.5						24.5			100			
Portable Oxygen System (POS)			15.0						15.0		100			
Recharge Kit for POS				4.0							100			Recharge Kit for 3 Hour Capability.
FOOD														
Normal Consumption				3.33	465	-65	368	3.33/ md			100			Per Man-Day.
Contingency Consumption				2.06	465	-70	368	2.06/ md			100			Per Man-Day.

TABLE 10.3 - ELECTRICAL ENERGY PAYLOAD WEIGHT CHARGEABLE OPTIONS

ITEM	JSC 07700 Vol X Reference	Control Weight			Center of Gravity			Current Status			Maturity (%)			Remarks
		Dry	Wet	Expend	X_0	Y_0	Z_0	Dry	Wet	Expend	Est	Cal	Act	
Electrical Energy Supply	3.2.1.1.2.1.13													
EPS Kits Under Payload Bay Liner														56 lb O_2 available to ARS From Each Cryogenic O_2 Tank Added
														C.G.'s Reflect Tank Set Wet Condition
Tank Set #4 Lift-off Wt.		770	1643	844	997.9	-37.4	299.1	779	1644	838	100			
Tank Set #4 Landing Wt.		770	799	0	945.4	-11.7	299.0	779	806	0	100			
Tank Set #5 Lift-off Wt.		930	1803	844	1028.8	31.3	300.4	930	1810	846	100			
Tank Set #5 Landing Wt.		930	959	0	1052.8	13.8	298.9	930	957	0	100			
Tank Set #6 Lift-off Wt.														P/L Bay Location TBD
Tank Set #6 Landing Wt.														P/L Bay Location TBD
Tank Set #7 Lift-off Wt.														P/L Bay Location TBD
Tank Set #7 Landing Wt.														P/L Bay Location TBD
EPS Tank Sets in Cargo Bay		TBD	TBD	TBD										Kits With P/L Unique Mounting
Electrical Power Umbilical Harness		TBD												

TABLE 10.4 - PROPULSION HARDWARE & PROPELLANTS PAYLOAD WEIGHT CHARGEABLE OPTIONS

ITEM	JSC 07700 Vol X Reference	Control Weight			Center of Gravity			Current Status			Maturity (%)			Remarks
		Dry	Wet	Expend	X_0	Y_0	Z_0	Dry	Wet	Expend	Est	Cal	Act	
GFE														
RCS Propellants	3.2.1.1.2.1.1			TBD						TBD				As Required by P/L Within Restraints of Orbiter RCS Tank Volumes
OMS V Kits		TBD	TBD	TBD										
V 500 ft/sec Lift-off Wt.														
V 500 ft/sec Landing Wt.														
V 1000 ft/sec Lift-off Wt														
V 100o ft/sec Landing Wt.														
V 1500 ft/sec Lift-off Wt														
V 1500 ft/sec Landing Wt.														
Payload Propellant Dump System														
Removable Kit (Storage Prop)		TBD												
Removable Kit (Cryo Prop)		TBD												

APPENDIX A MASS PROPERTIES

This Appendix provides Mass Properties for the missions defined in Section 1 of this document. Each mission consists of two pages; Cargo Module (Payload/STS operator) and the vehicle elements and consumables.

Table A-9 contains the Orbiter weight and c.g. data to be used for performance analysis of the Operational Missions STS-5 and subsequent.

TABLE STS-4 A-1.1 — VEHICLE SUMMARY WEIGHT STATEMENT -- 82/05/20 16.14.09

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
ORBITER OV-102 STS-4 INERT	151464	1059.8	-.2	366.5	831862	5244987	5551011	3383	79175	-1277
SSME X3 INERT	20709	1494.0	.4	384.7	23580	19223	17589	-22	-2482	95
BOUYANCY	80	1113.7	-.8	368.5	0	0	0	0	0	0
PERSONNEL	3293	530.6	15.0	385.0	2060	10278	10445	1684	874	205
ORBITER W/O CONSUMABLES	175546	1101.1	.2	369.0	859151	6253084	6556314	-64	102027	-761
NON-PROP CONSUM AT SRB IGN	6567	989.9	-4.8	339.0	11511	138359	140102	-2868	16386	26
OMS PROPELLANT-LEFT	11000	1422.0	-94.8	476.0	2396	2212	2192	0	34	829
OMS PROPELLANT-RIGHT	11000	1422.0	94.8	476.0	2396	2212	2192	0	34	-829
RCS PROPELLANT-FWD	2446	317.8	5.4	365.4	286	17	299	-2	5	-1
RCS PROPELLANT-AFT	5384	1345.0	0.0	470.1	9546	1079	10013	0	100	0
MPS PROPELLANT AT SRB IGN	5166	1404.5	6.8	352.7	4149	5527	5037	-1004	1041	-418
ORBITER MODULE TOTAL AT SRB IGN	217109	1134.7	.2	381.0	993272	7412815	7708184	-3434	293114	-1198
CARGO MODULE TOTAL	24349	1002.7	-2.4	389.1	40460	358096	360153	-6798	13127	396
ORBITER PLUS CARGO AT SRB IGN	241458	1121.4	-.1	381.8	1034073	7853573	8150722	-8607	301194	-901
ET-4 INERT	76819	1373.5	3.4	428.6	394592	4436984	4425127	1485	196361	9244
BOUYANCY	155	1373.5	3.4	428.6	0	0	0	0	0	0
MPS FUEL AT SRB IGN	226155	1615.4	0.0	400.0	0	3588388	3588388	0	0	0
MPS LOX AT SRB IGN	1342077	734.6	.6	401.4	74475	4422895	4372299	135342	313622	26976
MPS PRESSURANT	423	753.6	0.0	400.0	0	17697	17697	-12	-27	0
ET MODULE TOTAL AT SRB IGN	1645629	885.5	.6	402.5	481188	49037698	48963418	138146	680608	37508
SRB-13 LEFT SEPARATION	182947	1802.5	-250.9	401.0	186302	11490769	11494650	-25648	7272	617
SRB-13 LEFT INFLIGHT LOSSES	1115266	1696.9	-250.5	400.0	733157	35356059	35356042	1268	56	0
SRB-13 LEFT MODULE TOTAL	1298213	1711.8	-250.6	400.1	919498	47225146	47228982	-25812	10910	603
SRB-14 RIGHT SEPARATION	182666	1802.7	251.0	401.0	186385	11499821	11503870	22877	9532	-969
SRB-14 RIGHT INFLIGHT LOSSES	1116587	1697.0	250.5	400.0	734048	35387787	35387805	-1332	-157	-1
SRB-14 RIGHT MODULE TOTAL	1299253	1711.9	250.6	400.1	920475	47266206	47270247	23336	12956	-952

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-4 A-1.2 — VEHICLE SUMMARY WEIGHT STATEMENT — 82/05/18 10.59.23

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
DOD 82-1 PAYLOAD	8585	985.2	3.1	406.8	4829	6380	3867	231	2	88
ATTACH HARDWARE	847	987.1	2.7	372.7	1472	974	1730	-19	215	-32
X576/X603 HARNESS	86	927.1	-83.3	445.0	82	9362	9421	-377	-22	16
STD. I/F PANEL	141	973.1	-89.5	410.9	160	4521	4402	-110	193	0
PAYLOAD TIMING BUFFER	3	516.0	-62.0	432.0	0	0	0	0	0	0
PRIMARY PAYLOAD	9662	984.5	.9	404.2	7162	21673	20022	-130	322	-10
ACIP + RECORDER	278	929.2	2.7	337.8	26	6224	6210	9	273	0
GET AWAY SPECIAL—BF12	635	1226.7	82.3	400.8	29	34	42	0	0	0
MLR	170	433.8	14.9	355.7	4	1	3	0	0	0
CFES	702	466.1	-57.0	365.2	25	25	10	0	0	0
TILE GAP EXPERIMENT	7	594.0	.4	295.0	2	0	2	0	0	0
NOSL EXPERIMENT	52	433.8	-9.3	385.4	0	0	0	0	0	0
ANCILLARY PAYLOAD	1844	794.4	8.2	372.8	1701	55822	56997	7583	2226	365
PAYLOAD CHARGEABLE CARGO	11506	954.1	2.1	399.2	9211	89903	89114	6993	4547	279
ATCS RADIATOR KIT	355	1214.9	-.1	473.3	360	237	550	0	0	0
EPS TANK SET 4 HDW	779	945.4	3.3	300.6	1015	2069	2999	-945	-28	22
DFI AFT	9872	1054.1	-6.0	374.6	21440	206769	210169	-12090	7388	144
IECM	1020	1181.0	0.0	458.0	45	63	60	0	0	0
OV-102 MADS ELECTRONICS	88	1054.1	-6.0	374.6	0	0	0	0	0	0
AUXILIARY O2 SYS HDW	75	794.0	89.0	329.0	2	2	2	0	0	0
S-BAND COMSEC BYPASS	1	560.0	0.0	350.0	0	0	0	0	0	0
STD. SWITCH PANEL + VTR	69	560.0	-49.9	440.0	1	1	1	0	0	0
AFT STATION CONTAINERS	48	541.0	-54.0	445.0	2	5	4	0	0	0
P/L ATTACH HDW	518	1027.8	0.0	368.8	3820	6309	7971	0	114	0
ORB RET FTG ALLOW	-450	1074.0	26.0	395.0	2	45	45	0	0	0
SPARE COMPUTER	126	550.0	-46.0	371.5	2	3	1	0	0	0
S-BAND FM	22	553.9	57.6	398.0	2	1	1	0	0	1
H2 SAMPLES	26	1375.0	0.0	375.0	55	0	55	0	0	1
P/L UMBIL. PROV. + OEX PROV.	23	808.9	0.0	399.2	23	919	939	0	37	1
PDRS CAMERA CONTROL PANEL	16	562.0	0.0	457.0	0	0	0	0	0	0
KEEL WIRE	1	1168.0	0.0	305.0	0	0	0	0	0	0
FWD. FUSELAGE SUPTS.-OEX	3	290.0	-12.0	445.0	0	0	0	0	0	0
CCTV	72	968.6	-14.3	438.0	98	1915	2012	-432	-1	0
DAC	157	901.4	-53.8	439.5	28	7867	7870	-125	-104	8
BALLAST PROVISIONS	22	1508.0	0.0	278.0	0	0	0	0	0	0
STS OPER CHARGEABLE CARGO	12843	1046.2	-6.4	380.0	30673	256592	259824	-12767	10893	-96
PRIMARY PAYLOAD	9662	984.5	.9	404.2	7162	21673	20022	-130	322	-10
ANCILLARY PAYLOAD	1844	794.4	8.2	372.8	1701	55822	56997	7583	2226	365
STS OPER CHARGEABLE CARGO	12843	1046.2	-6.4	380.0	30673	256592	259824	-12767	10893	-96
CARGO MODULE TOTAL	24349	1002.7	-2.4	389.1	40460	358096	360153	-6798	13127	396

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-5 A-2.1 — VEHICLE SUMMARY WEIGHT STATEMENT — 82/05/19 16.10.54

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
ORBITER OV-102 STS-5 INERT	151871	1059.1	-.1	366.6	832098	5261942	5567990	3247	78706	-1235
SSME X3 INERT	20709	1494.0	.4	384.7	23580	19223	17589	-22	-2482	95
BOUYANCY	80	1113.7	-.8	368.5	0	0	0	0	0	0
PERSONNEL 4M/5D	3539	518.5	11.0	383.0	1725	10121	10106	1470	841	154
ORBITER W/O CONSUMABLES	176199	1099.4	.2	369.1	858935	6299722	6602773	652	101715	-832
NON-PROP CONSUM AT SRB IGN	6318	1011.4	-5.9	340.1	11333	121220	122904	-2442	15312	62
OMS PROPELLANT - LEFT	10136	1424.8	-94.9	476.1	2205	1900	1885	5	26	762
OMS PROPELLANT - RIGHT	10136	1424.8	94.9	476.1	2205	1900	1885	-5	26	-762
RCS PROPELLANT - FWD	2464	317.8	5.4	365.4	286	17	299	-2	5	-1
RCS PROPELLANT - AFT	5424	1345.0	0.0	470.1	9546	1079	10013	0	100	0
MPS PROPELLANT AT SRB IGN	5166	1404.5	6.8	352.7	4149	5527	5037	-1004	1041	-418
ORBITER MODULE TOTAL AT SRB IGN	215843	1131.9	.2	380.4	985755	7412833	7708208	-2322	281976	-1196
CARGO MODULE TOTAL	33799	1011.5	3.1	373.0	36823	299856	303084	-13078	11248	1426
ORBITER PLUS CARGO AT SRB IGN	249642	1115.6	.6	379.4	1022974	7804499	8102813	-17602	298821	95
ET-5 INERT	76919	1374.4	2.9	428.0	394845	4465603	4455404	31	194902	8483
BOUYANCY	155	1374.4	2.9	428.0	0	0	0	0	0	0
MPS FUEL AT SRB IGN	226649	1614.3	0.0	400.0	0	3614777	3614777	0	0	0
MPS LOX AT SRB IGN	1343302	734.3	.6	401.4	74476	4441792	4391196	135383	313717	26977
MPS PRESSURANT	423	753.6	0.0	400.0	0	17697	17697	-12	-27	0
ET MODULE TOTAL AT SRB IGN	1647448	885.3	.6	402.5	480900	49141465	49069302	132725	675105	36510
SRB-15 LEFT SEPARATION	183279	1802.7	-250.9	401.0	187299	11601104	11604896	-25261	7246	619
SRB-15 LEFT INFLIGHT LOSSES	1114779	1687.5	-250.5	400.0	732639	35120546	35120534	1339	-286	0
SRB-15 LEFT MODULE TOTAL	1298058	1703.8	-250.6	400.1	919977	47172547	47176299	-25486	10874	605
SRB-16 RIGHT SEPARATION	183390	1802.7	251.0	401.0	187213	11602050	11606028	22258	94651	-971
SRB-16 RIGHT INFLIGHT LOSSES	1114782	1696.8	250.5	400.0	732643	35190550	35190525	-1365	-198	19
SRB-16 RIGHT MODULE TOTAL	1298172	1711.8	250.6	400.1	919898	47173838	47177766	22693	98053	-934

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-5 A-2.2 -- VEHICLE SUMMARY WEIGHT STATEMENT -- 82/05/19 14.21.26

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
SBS PAYLOAD	7351	935.1	0.0	380.6	2141	2179	563	4	0	0
TELESAT E PAYLOAD	7365	1061.1	0.0	381.0	2248	2263	658	-5	0	0
DEPLOYABLE PAYLOAD	14716	998.2	0.0	380.8	4389	17049	13828	-0	40	0
SBS ASE	2394	934.5	11.5	368.8	2106	1024	1896	0	0	152
TELESAT E ASE	2394	1060.3	11.5	368.8	2106	1024	1896	0	152	0
P/L TIMING BUFFER	3	516.0	-62.0	432.0	0	0	0	0	0	0
PRIMARY PAYLOAD	19507	997.9	2.8	377.9	8821	23451	21965	12	182	42
ACIP + RECORDER	278	929.2	2.7	337.8	26	6224	6210	9	273	0
GET AWAY SPECIAL--BF12	675	1210.0	80.9	393.8	0	0	0	0	0	0
MIR	170	433.8	14.9	355.7	4	1	3	0	0	0
TILE GAP EXPERIMENT	7	594.0	.4	295.0	2	0	2	0	0	0
ANCILLARY PAYLOAD	1130	1020.3	51.2	373.7	511	25020	25174	1909	1463	221
PAYLOAD CHARGEABLE CARGO	20637	999.1	5.5	377.6	9877	48591	47796	2171	1623	217
RMS ARM	-983	927.1	-83.3	445.0	82	9362	9421	-377	-22	16
	TBD									
RMS CLOSE-OUT PANEL	6	560.5	-30.8	453.0	1	1	0	0	0	0
FLIGHT DECK SEAT	92	564.0	32.0	429.0	0	0	0	0	0	0
MANIFEST ITEMS	-885	967.3	-95.6	446.6	-220	6254	6023	574	-145	56
ATCS RADIATOR KIT	355	1214.9	-.1	473.3	360	237	550	0	0	0
EPS TANK SET 4 HDW	779	945.4	3.3	300.6	1015	2069	2999	-945	-28	22
DFI LESS IECM	9872	1054.1	-6.0	374.6	21440	206769	210169	-12090	7388	144
1307 B/H PAYLOAD WIRING	80	1305.0	0.0	390.0	0	0	0	0	0	0
AUXILIARY O2 SYS HDW	75	794.0	89.0	329.0	2	2	2	0	0	0
SMCH CABLE	659	901.0	-13.0	340.0	0	0	0	0	0	0
AFD WIRING HARNESS	40	527.0	0.0	440.0	0	0	0	0	0	0
STD. SWITCH PANEL + VTR	69	560.0	-49.9	440.0	1	1	1	0	0	0
AFT STATION CONTAINERS	48	541.0	-54.0	445.0	2	5	4	0	0	0
P/L ATTACH HDW	2228	1027.8	0.0	368.8	3820	6309	7971	0	114	0
ORB RET FTG ALLOW	-675	1074.0	26.0	395.0	2	45	45	0	0	0
P/L RECORDER	60	421.0	-6.0	378.0	0	0	0	0	0	0
MID DECK SEAT	92	499.0	-10.0	340.0	0	0	0	0	0	0
H2 SAMPLES	26	1375.0	0.0	375.0	55	0	55	0	0	0
CCTV + DAC	229	922.5	-41.4	439.0	143	9830	9947	-529	-106	7
BALLAST PROVISIONS	22	1508.0	0.0	278.0	0	0	0	0	0	0
OV-102 MADS ELECTR.	88	1054.1	-6.0	374.6	0	0	0	0	0	0
STS OPER CHARGEABLE CARGO	14047	1027.0	-6.7	370.7	29200	257405	261823	-13255	9220	-238
PRIMARY PAYLOAD	19507	997.9	2.8	377.9	8821	23451	21965	12	182	42
ANCILLARY PAYLOAD	1130	1020.3	51.2	373.7	511	25020	25174	1909	1463	221
MANIFEST ITEMS	-885	967.3	-95.6	446.6	-220	6254	6023	574	-145	56
STS OPER CHARGEABLE CARGO	14047	1027.0	-6.7	370.7	29200	257405	261823	-13255	9220	-238
CARGO MODULE TOTAL	33799	1011.5	3.1	373.0	36823	299856	303084	-13078	11248	1426

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-6 A-3.1 — VEHICLE SUMMARY WEIGHT STATEMENT -- 82/05/19 16.08.33

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
ORBITER OV-099 STS-6 INERT	151050	1063.3	-.5	365.0	820715	5907199	6217139	3965	83111	-1168
SSME X3 INERT	20859	1495.0	.3	384.7	23734	19371	17736	-24	-2497	104
BOUYANCY	80	1117.0	-.5	367.1	0	0	0	0	0	0
PERSONNEL 4M/3D	3321	534.0	17.0	392.0	1755	8930	9140	1360	715	170
ORBITER W/O CONSUMABLES	175310	1104.7	-.1	367.9	848381	6912646	7219416	-451	104905	-529
NON-PROP CONSUM AT SRB IGN	5483	994.6	3.0	346.5	9884	129692	130644	-1497	16201	-455
MPS PROPELLANT AT SRB IGN	5166	1404.5	6.8	352.7	4149	5527	5037	-1004	1041	-418
OMS PROPELLANT - LEFT	9650	1426.5	-94.9	476.2	2099	1739	1727	7	21	725
OMS PROPELLANT - RIGHT	9650	1426.5	94.9	476.2	2099	1739	1727	-7	21	-725
RCS PROPELLANT - FWD	2477	317.2	5.4	365.4	196	17	210	-2	5	-1
RCS PROPELLANT - AFT	5031	1347.7	0.0	470.9	6160	956	6718	0	97	0
ORBITER MODULE TOTAL AT SRB IGN	212767	1134.9	.2	379.2	965905	8007460	8302868	-3684	277784	-1729
CARGO MODULE TOTAL	47683	1088.8	-.8	395.1	20955	231199	235209	5887	16099	410
ORBITER PLUS CARGO AT SRB IGN	260450	1126.4	.1	382.1	989002	8258644	8555938	2608	287713	-1458
ET LWT-1 INERT	68755	1354.8	3.0	424.9	367006	4120553	4115550	2657	162428	8003
BOUYANCY	155	1354.8	3.0	424.9	0	0	0	0	0	0
MPS FUEL AT SRB IGN	227020	1613.4	0.0	400.0	0	3634679	3634679	0	0	0
MPS LOX AT SRB IGN	1345116	734.0	.6	401.4	74476	4470290	4419694	135444	313856	26977
MPS PRESSURANT	423	753.6	0.0	400.0	0	17697	17697	-12	-27	0
ET MODULE TOTAL AT SRB IGN	1641469	881.7	.6	402.2	449673	48149383	48085800	133472	591443	35855
SRB-17 LEFT SEPARATION	178815	1800.8	-250.9	401.0	182029	11358038	11361771	-25227	7320	617
SRB-17 LEFT INFLIGHT LOSSES	1115773	1696.9	-250.5	400.0	733932	35363122	35363132	1270	59	0
SRB-17 LEFT MODULE TOTAL	1294588	1711.3	-250.6	400.1	916000	47080290	47084005	-25338	10835	604
SRB-18 RIGHT SEPARATION	178924	1800.9	251.1	401.0	182160	11358875	11362876	22364	9537	-973
SRB-18 RIGHT INFLIGHT LOSSES	1115778	1696.9	250.5	400.0	733937	35363201	35363240	-1396	-170	-1
SRB-18 RIGHT MODULE TOTAL	1294702	1711.3	250.6	400.1	916142	47082087	47086106	23045	12828	-953

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-6 A-3.2 — VEHICLE SUMMARY WEIGHT STATEMENT — 82/05/19 14.24.21

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
TWO-STAGE IUS	32653	1132.8	.1	399.9	6665	17967	18105	73	-18	-3
TDRS-A SPACECRAFT	5000	965.4	.3	399.6	1188	1734	1779	34	9	12
DEPLOYABLE PAYLOAD	37653	1110.6	.1	399.9	7853	45927	46110	76	38	9
IUS-ASE (LAUNCH - RETURN)	6047	1136.2	-1.1	395.7	6189	20758	24602	-2536	1428	-71
SMCH CABLE	786	758.0	-13.0	340.0	64	5141	5102	0	0	0
P/L RECORDER	60	421.0	-6.0	378.0	0	1	1	0	0	0
P/L RETENTION FITTINGS	451	1224.8	-38.9	360.8	1760	107	1163	571	683	-130
WT GROWTH ALLOWANCE	203	1136.2	-1.1	395.7	773	6549	6541	0	0	0
PRIMARY PAYLOAD	45200	1108.2	-.7	397.8	17559	108577	113042	-1543	5300	82
CFES	764	463.5	-56.2	362.3	0	0	0	0	0	0
MLR	175	433.8	14.9	355.7	4	1	3	0	0	0
ACIP + RECORDER	278	929.2	2.7	337.8	26	6224	6210	9	273	0
GET AWAY SPECIAL--BF4	884	778.5	-78.8	395.5	29	72	72	0	0	0
NOSL EXPERIMENT	52	433.8	28.1	363.0	0	0	0	0	0	0
ANCILLARY PAYLOAD	2153	649.8	-50.1	372.2	820	22353	22698	-342	730	-274
PAYLOAD CHARGEABLE CARGO	47353	1087.4	-2.9	396.7	19751	224417	230019	8156	11230	367
RMS ARM	-941	926.2	-83.5	444.6	80	9309	9368	-378	-25	15
RMS CLOSE-OUT PANEL	6	560.5	-30.8	453.0	1	1	0	0	0	0
GALLEY	-164	469.0	-67.0	367.0	14	14	3	0	0	0
H2O DISPENSING SYSTEM	23	470.1	-69.0	367.3	2	2	1	0	0	0
MANIFEST ITEMS	-1076	868.3	-81.6	434.4	254	14894	14789	-561	922	-20
ATCS RADIATOR KIT	355	1214.9	-.1	473.3	355	238	546	0	0	0
EPS TANK SET 4 HDW-PARTIAL	174	895.8	-12.0	297.6	180	586	737	-63	-5	-16
1307 B/H PAYLOAD WIRING	80	1305.0	0.0	390.0	0	0	0	0	0	0
SMCH CABLE	2	941.0	0.0	307.0	0	0	0	0	0	0
AFD WIRING HARNESS	40	527.0	0.0	440.0	0	0	0	0	0	0
STD. SWITCH PANEL + VTR	69	560.0	-49.9	440.0	1	1	1	0	0	0
AFT STATION CONTAINERS	48	541.0	-54.0	445.0	2	5	4	0	0	0
P/L ATTACH HDW	1126	1134.4	0.0	381.3	2076	1541	2781	0	382	0
ORB RET FTG ALLOW	-675	1074.0	26.0	395.0	2	45	45	0	0	0
P/L I/F HDW ALLOW	-451	1224.8	-38.9	360.8	1760	107	1163	-571	-683	130
MINI MADS	612	895.1	30.1	318.1	839	11919	12387	210	-91	-78
H2 SAMPLES	26	1375.0	0.0	375.0	0	0	0	0	0	0
STS OPER CHARGEABLE CARGO	1406	969.2	7.3	373.7	3102	28798	28358	1569	3024	-629
PRIMARY PAYLOAD	45200	1108.2	-.7	397.8	17559	108577	113042	-1543	5300	82
ANCILLARY PAYLOAD	2153	649.8	-50.1	372.2	820	22353	22698	-342	730	-274
MANIFEST ITEMS	-1076	868.3	-81.6	434.4	254	14894	14789	-561	922	-20
STS OPER CHARGEABLE CARGO	1406	969.2	7.3	373.7	3102	28798	28358	1569	3024	-629
CARGO MODULE TOTAL	47683	1088.8	-.8	395.1	20955	231199	235209	5887	16099	410

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-7 A-4.1 — VEHICLE SUMMARY WEIGHT STATEMENT -- 82/05/21 14.56.34

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
ORBITER OV-099 STS-7 INERT	151055	1063.3	-.5	365.0	820719	5907270	6217214	3948	83115	-1168
SOME X3 INERT	20859	1495.0	.3	384.7	23734	19371	17736	-24	-2497	104
BOUYANCY	80	1117.0	-.5	367.1	0	0	0	0	0	0
PERSONNEL 4M/5D	3572	529.0	15.7	390.3	1811	9329	9537	1456	821	196
ORBITER W/O CONSUMABLES	175566	1103.7	-.1	367.9	848394	6935118	7241902	-388	104931	-526
NON-PROP CONSUM AT SRB IGN	5456	997.0	3.0	346.6	9878	128267	129225	-1505	16106	-456
MPS PROPELLANT AT SRB IGN	5166	1404.5	6.8	352.7	4149	5527	5037	-1004	1041	-418
OMS PROPELLANT - LEFT	10500	1423.6	-94.9	476.1	2285	2027	2010	4	30	790
OMS PROPELLANT - RIGHT	10500	1423.6	94.9	476.1	2285	2027	2010	-4	30	-790
RCS PROPELLANT - FWD	2477	317.2	5.4	365.4	196	17	210	-2	5	-1
RCS PROPELLANT - AFT	5031	1347.7	0.0	470.9	6160	956	6718	0	97	0
ORBITER MODULE TOTAL AT SRB IGN	214696	1136.2	.2	379.9	972923	8057198	8352588	-3629	286940	-1733
CARGO MODULE TOTAL	37887	1044.6	-1.4	383.3	15131	293736	295712	8121	295	-659
ORBITER PLUS CARGO AT SRB IGN	252583	1122.5	-.0	380.4	988152	8414331	8706636	5536	285086	-2429
ET 6 INERT	76943	1374.5	2.0	428.1	395031	4467664	4457954	390	195159	8327
BOUYANCY	155	1374.5	2.0	428.1	0	0	0	0	0	0
MPS FUEL AT SRB IGN	226649	1614.3	0.0	400.0	0	3614777	3614777	0	0	0
MPS LOX AT SRB IGN	1343302	734.3	.6	401.4	74476	4442142	4391547	135383	313717	26977
MPS PRESSURANT	423	753.6	0.0	400.0	0	17697	17697	-12	-27	0
ET MODULE TOTAL AT SRB IGN	1647472	885.3	.6	402.5	481119	49146832	49075015	125768	676284	35974
SRB-19 LEFT SEPARATION	177966	1800.9	-251.0	401.0	132507	11266848	11270644	-21874	7759	953
SRB-19 LEFT INFLIGHT LOSSES	1115510	1697.0	-250.5	400.0	733722	35354580	35354577	1329	-56	0
SRB-19 LEFT MODULE TOTAL	1293476	1711.3	-250.6	400.1	866270	46979076	46982844	-22265	11145	936
SRB-20 RIGHT SEPARATION	177966	1800.9	251.0	401.0	132507	11266848	11270644	21874	7759	-953
SRB-20 RIGHT INFLIGHT LOSSES	1115510	1697.0	250.5	400.0	733722	35354580	35354577	-1329	-56	0
SRB-20 RIGHT MODULE TOTAL	1293476	1711.3	250.6	400.1	866270	46979076	46982844	22266	11145	-935

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-7 A-4.2 — VEHICLE SUMMARY WEIGHT STATEMENT -- 82/05/19 14.28.52

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
TELESAT-F SPACECRAFT	7620	1096.5	0.0	381.6	2246	2262	657	-5	0	0
PALAPA-B1 SPACECRAFT	7531	1242.1	0.0	385.4	2250	2260	650	0	0	0
DEPLOYABLE PAYLOAD	15151	1168.9	0.0	382.5	4499	21856	18638	-4	214	0
SPAS-01	3960	903.5	-.2	385.6	0	0	0	0	0	0
OSTA-2 SPACECRAFT	5350	995.7	-3.7	411.2	0	0	0	0	0	0
TELESAT-F/ASE	2430	1095.7	11.5	368.8	0	0	0	0	0	0
PALAPA-B1/ASE	2394	1242.1	11.5	368.8	0	0	0	0	0	0
PRIMARY PAYLOAD	29285	1101.3	1.2	385.9	5725	94447	90293	1283	-4765	-312
CFES	764	463.5	-56.2	362.3	0	0	0	0	0	0
ACIP + RECORDER	278	929.2	2.7	337.8	26	6224	6210	9	273	0
GET AWAY SPECIALS (7)	3170	750.7	-8.3	395.2	0	0	0	0	0	0
ANCILLARY PAYLOAD	4212	710.4	-16.3	385.4	644	20550	20574	2104	859	151
TOTAL PAYLOAD CHARGEABLE	33497	1052.1	-1.0	385.8	6611	236432	232545	8809	-3763	-153
GALLEY	-164	469.0	-67.0	367.0	14	14	3	0	0	0
H2O DISPENSING SYSTEM	23	470.1	-69.0	367.3	2	2	1	0	0	0
MANIFEST ITEMS	-141	468.8	-66.7	367.0	12	12	2	0	0	0
ATCS RADIATOR KIT	355	1214.9	-.1	473.3	360	237	550	0	0	0
EPS TANK SET 4 HDW.-PARTIAL	174	895.8	-12.0	297.2	180	586	737	-63	-5	-16
1307 B/H PAYLOAD WIRING	80	1305.0	0.0	390.0	0	0	0	0	0	0
SMCH CABLE	788	758.0	-13.0	340.0	64	5141	5102	0	0	0
AFD WIRING HARNESS	40	527.0	0.0	440.0	0	0	0	0	0	0
STD. SWITCH PANEL + VTR	69	560.0	-49.9	440.0	1	1	1	0	0	0
AFT STATION CONTAINERS	48	541.0	-54.0	445.0	2	5	4	0	0	0
P/L ATTACH HDW	2751	1075.2	0.0	367.8	4676	10417	12393	0	798	0
ORB RET FTG ALLOW	-675	1074.0	26.0	395.0	2	45	45	0	0	0
P/L RECORDER	60	421.0	-6.0	378.0	0	0	0	0	0	0
DATA ACQUISTION CAMERA	157	955.5	-59.5	436.2	13	4213	4205	-63	-80	3
CCTV CAMERA	72	968.1	-14.2	437.9	98	1913	2009	-431	-1	0
MINI MADS	612	895.1	30.1	318.1	839	11919	12387	210	-91	-78
STS OPER CHARGEABLE CARGO	4531	971.1	-6.2	364.3	8246	66329	67686	86	2843	-570
PRIMARY PAYLOAD	29285	1101.3	1.2	385.9	5725	94447	90293	1283	-4765	-312
ANCILLARY PAYLOAD	4212	710.4	-16.3	385.4	644	20550	20574	2104	859	151
MANIFEST ITEMS	-141	468.8	-66.7	367.0	12	12	2	0	0	0
STS OPER CHARGEABLE CARGO	4531	971.1	-6.2	364.3	8246	66329	67686	86	2843	-570
CARGO MODULE TOTAL	37887	1044.6	-1.4	383.3	15131	298736	295719	8121	295	-659

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-8 A-5.2 — VEHICLE SUMMARY WEIGHT STATEMENT — 82/05/19 14.31.44

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
TWO-STAGE IUS	32653	1132.8	.1	399.9	6665	17967	18105	73	-18	-3
TDRS-B SPACECRAFT	5000	965.6	.3	389.6	1188	1734	1779	34	9	12
INSAT 1-B/SSUS-D	7356	754.3	0.0	385.2	0	0	0	0	0	0
DEPLOYABLE PAYLOAD	45009	1052.4	.1	397.5	8139	214766	214664	136	6976	11
IUS-ASE (LAUNCH - RETURN)	6047	1136.2	-1.1	395.7	6189	20758	24602	-2536	1428	-71
SMCH CABLE	786	758.0	-13.0	340.0	64	5141	5102	0	0	0
P/L RECORDER	60	421.0	-6.0	378.0	0	0	0	0	0	0
P/L RETENTION FITTINGS	451	1224.8	-38.9	360.8	1760	107	1163	571	683	-130
WT GROWTH ALLOWANCE	203	1136.4	-1.1	395.7	773	6549	6541	0	0	0
INSAT 1-B/ASE	2394	753.5	11.5	368.8	0	0	0	0	0	0
PRIMARY PAYLOAD	54950	1045.4	-.0	394.9	18216	326184	330136	-3688	15513	-91
ACIP + RECORDER	278	929.2	2.7	337.8	26	6224	6210	9	273	0
CFES	764	463.5	-56.2	362.3	0	0	0	0	0	0
ANCILLARY PAYLOAD	1042	587.7	-40.5	355.8	205	15792	15904	1216	-228	-62
TOTAL PAYLOAD CHARGEABLE	55992	1036.9	-.8	394.1	19120	388542	392629	1612	19234	195
RMS ARM	-941	927.4	-83.5	444.8	82	12957	13013	-384	65	13
RMS CLOSE-OUT PANEL	6	560.5	-30.8	453.0	1	1	0	0	0	0
GALLEY	-164	469.0	-67.0	367.0	14	14	3	0	0	0
H2O DISPENSING SYSTEM	23	470.1	-69.0	367.3	2	2	1	0	0	0
MANIFEST ITEMS	-1076	869.4	-81.6	434.6	257	18571	18462	-567	1017	-22
ATCS RADIATOR KIT	355	1214.9	-.1	473.3	360	237	550	0	0	0
EPS TANK SET 4 HDW.-PARTIAL	174	895.8	-12.0	297.2	180	586	737	-63	-5	-16
1307 B/H PAYLOAD WIRING	80	1305.0	0.0	390.0	0	0	0	0	0	0
SMCH CABLE	2	941.0	0.0	307.0	0	0	0	0	0	0
AFD WIRING HARNESS	40	527.0	0.0	440.0	0	0	0	0	0	0
STD. SWITCH PANEL + VTR	69	560.0	-49.9	440.0	1	1	1	0	0	0
AFT STATION CONTAINERS	48	541.0	-54.0	445.0	2	5	4	0	0	0
P/L ATTACH HDW	1915	973.5	0.0	379.2	3497	17335	19309	0	689	0
ORB RET FTG ALLOW	-675	1074.0	26.0	395.0	2	30	30	0	0	0
P/L I/F HDW ALLOW	-451	1224.8	-38.9	360.8	1760	107	1163	-571	-683	130
MINI MADS	612	895.1	30.1	318.1	839	11919	12387	210	-91	-78
STS OPERATOR	2169	882.4	4.7	374.5	4534	33527	33831	1761	3068	-631
PRIMARY PAYLOAD	54950	1045.4	-.0	394.9	18216	326184	330136	-3688	15513	-91
ANCILLARY PAYLOAD	1042	587.7	-40.5	355.8	205	15792	15904	1216	-228	-62
MANIFEST ITEMS	-1076	869.4	-81.6	434.6	257	18571	18462	-567	1017	-22
STS OPERATOR	2169	882.4	4.7	374.5	4534	33527	33831	1761	3068	-631
CARGO MODULE TOTAL	57085	1034.2	.9	392.6	21631	407839	411029	455	24227	327

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-8 A-5.1 -- VEHICLE SUMMARY WEIGHT STATEMENT -- 82/05/24 11.25.50

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
ORBITER OV-099 STS-8 INERT	151055	1063.3	-.5	365.0	820719	5907270	6217214	3948	83115	-1168
SS4E X3 INERT	20859	1495.0	.3	384.7	23734	19371	17736	-24	-2497	104
BOUYANCY	80	1117.0	-.5	367.1	0	0	0	0	0	0
PERSONNEL 4M/3D	3321	534.0	17.0	392.0	1755	8930	9140	1360	715	170
ORBITER W/O CONSUMABLES	175315	1104.7	-.1	367.9	848385	6912719	7219492	-468	104910	-529
NON-PROP CONSUM AT SRB IGN	5634	982.2	2.9	345.3	9954	136527	137420	-1453	16856	-451
MPS PROPELLANT AT SRB IGN	5166	1404.5	6.8	352.7	4149	5527	5037	-1004	1041	-418
OMS PROPELLANT - LEFT	11050	1421.8	-94.8	476.0	2406	2231	2210	2	36	832
OMS PROPELLANT - RIGHT	11050	1421.8	94.8	476.0	2406	2231	2210	-2	36	-832
RCS PROPELLANT - FWD	2477	317.2	5.4	365.4	196	17	210	-2	5	-1
RCS PROPELLANT - AFT	5031	1347.7	0.0	470.9	6160	956	6718	0	97	0
ORBITER MODULE TOTAL AT SRB IGN	215723	1137.8	.2	380.4	977516	8064035	8359141	-3735	293831	-1741
CARGO MODULE TOTAL	57085	1034.2	.9	392.6	21631	407839	411029	455	24227	327
ORBITER PLUS CARGO AT SRB IGN	272808	1116.1	.4	382.9	1000611	8577824	8874664	-3944	305706	-1334
ET LWT-2 INERT	68755	1354.8	3.0	424.9	367006	4120553	4115550	2657	162428	8003
BOUYANCY	155	1354.8	3.0	424.9	0	0	0	0	0	0
MPS FUEL AT SRB IGN	227020	1613.4	0.0	400.0	0	3634679	3634679	0	0	0
MPS LOX AT SRB IGN	1345116	734.0	.6	401.4	74476	4470290	4419694	135444	313856	26977
MPS PRESSURANT	423	753.6	0.0	400.0	0	17697	17697	-12	-27	0
ET MODULE TOTAL AT SRB IGN	1641469	881.7	.6	402.2	449673	48149383	48085800	133472	591443	35855
SRB LEFT SEPARATION	178974	1804.2	-250.9	401.0	133417	11242158	11245946	-21677	7632	949
SRB LEFT INFLIGHT LOSSES	1117164	1696.8	-250.5	400.0	738056	35510044	35510062	875	-39	0
SRB LEFT MODULE TOTAL	1296138	1711.6	-250.6	400.1	871512	47136293	47140071	-22231	11169	936
SRB RIGHT SEPARATION	178974	1804.2	250.9	401.0	133417	11242158	11245946	21677	7632	-949
SRB RIGHT INFLIGHT LOSSES	1117164	1696.8	250.5	400.0	738056	35510014	35510062	-875	-39	0
SRB RIGHT MODULE TOTAL	1296138	1711.6	250.6	400.1	871512	47136263	47140071	22232	11169	-935

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-9 A-6.1 -- VEHICLE SUMMARY WEIGHT STATEMENT -- 82/05/21 10.46.27

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
ORBITER OV-102 STS-9 INERT	153012	1060.1	0.0	366.4	833719	527.866	5578665	1503	88294	-549
SSME X3 INERT	20709	1494.0	.4	384.7	23580	19223	17589	-22	-2482	95
BOUYANCY	80	1059.8	-0.0	364.8	0	0	0	0	0	0
PERSONNEL 6M/7D	4539	520.1	12.1	390.2	1771	9049	8962	1123	733	156
ORBITER W/O CONSUMABLES	178340	1096.7	.4	369.1	860974	6378437	6680889	-3520	105596	-19
NON-PROP CONSUM AT SRB IGN	5358	1005.7	3.0	347.4	9842	123370	124364	-1536	15694	-459
MPS PROPELLANT AT SRB IGN	5166	1404.5	6.8	352.7	4149	5527	5037	-1004	1041	-418
OMS PROPELLANT - LEFT	7750	1432.7	-95.0	476.4	1685	1205	1202	11	9	580
OMS PROPELLANT - RIGHT	7750	1432.7	95.0	476.4	1685	1205	1202	-11	9	-580
RCS PROPELLANT - FWD	2464	317.2	5.4	365.4	196	17	210	-2	5	-1
RCS PROPELLANT - AFT	5424	1347.7	0.0	470.9	6160	956	6718	0	97	0
ORBITER MODULE TOTAL AT SRB IGN	212252	1123.8	.6	378.6	962342	7414206	7705979	-7030	259395	-1368
CARGO MODULE TOTAL	35249	1026.6	-1.3	384.3	43871	267452	267972	605	14250	979
ORBITER PLUS CARGO AT SRB IGN	247501	1110.0	.3	379.4	1006451	7743554	8035657	-5218	270012	-459
ET LWT-3 INERT	68767	1354.8	3.0	424.9	367006	4120553	4115550	2657	162428	8003
BOUYANCY	155	1354.8	3.0	424.9	0	0	0	0	0	0
MPS FUEL AT SRB IGN	227020	1613.4	0.0	400.0	0	3634679	3634679	0	0	0
MPS LOX AT SRB IGN	1345116	734.0	.6	401.4	74476	4470290	4419694	135444	313856	26977
MPS PRESSURANT	423	753.6	0.0	400.0	0	17697	17697	-12	-27	0
ET MODULE TOTAL AT SRB IGN	1641481	881.7	.6	402.2	449674	48149964	48086380	133475	591471	35855
SRB LEFT SEPARATION	182551	1806.6	-250.9	401.0	185801	11363238	11367021	-21655	7537	949
SRB LEFT INFLIGHT LOSSES	1116436	1697.0	-250.5	400.0	737230	35500269	35500285	872	-38	-1
SRB LEFT MODULE TOTAL	1298987	1712.4	-250.6	400.1	923070	47270328	47274098	-22267	11211	934
SRB RIGHT SEPARATION	182551	1806.6	250.9	401.0	185801	11363238	11367021	21655	7537	-949
SRB RIGHT INFLIGHT LOSSES	1116436	1697.0	250.5	400.0	737230	35500269	35500285	-872	-38	1
SRB RIGHT MODULE TOTAL	1298987	1712.4	250.6	400.1	923070	47270328	47274098	22268	11211	-933

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-09 A-6.2 -- VEHICLE SUMMARY WEIGHT STATEMENT -- 82/05/11 11.24.48

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
S/L 1 CARRIER	17043	1006.0	-.5	391.6	15482	65689	66253	-69	-17	-128
S/L 1 PAYLOAD	10655	1139.6	.3	402.0	16737	49686	52008	-750	1168	-197
S/L INTERFACE CABLE	937	941.8	-34.9	357.8	590	2292	1152	0	0	0
ARS DUCT	21	660.0	0.0	357.0	1	1	1	0	0	0
AIRLOCK TUNNEL ADAPTER	900	621.0	0.0	357.9	228	333	221	0	0	0
AIRLOCK INSIDE MOD	100	632.0	0.0	366.0	6	3	3	0	0	0
P/L ATTACH HDW	1502	1144.5	9.5	372.7	2616	4587	5830	-615	369	96
ORB RET FTG ALLOW	-675	1074.0	26.0	395.0	2	30	30	0	0	0
ATCS RADIATOR KIT	355	1214.9	-.1	473.3	360	237	550	0	0	0
EPS TANK SET 4 HDW	779	945.4	3.3	300.7	1016	2069	2999	-945	-28	22
EPS TANK SET 4 CRYO	873	1046.8	-61.3	299.1	420	540	958	-475	-24	21
MID-DECK SEATS	184	495.0	0.0	344.0	0	0	0	0	0	0
PRIMARY PAYLOAD	32674	1039.8	-2.8	388.0	42633	216148	217170	-1973	10339	935
GET-AWAY-SPECIAL BF 4	884	778.5	-78.8	395.5	0	0	0	0	0	0
ACIP + RECORDER	278	929.2	2.7	337.8	26	6224	6210	9	273	0
FWD. FUSE. INSTRUMENTATION	36	435.0	-52.0	365.0	0	0	0	0	0	0
SUMS	85	280.0	-11.0	337.0	0	0	0	0	0	0
SEADS	101	455.6	0.0	336.9	0	0	0	0	0	0
SILTS	410	1196.8	0.0	417.0	0	0	0	0	0	0
ANCILLARY PAYLOAD	1794	848.8	-40.0	384.8	957	29250	29484	1360	1867	-150
TOTAL PAYLOAD CHARGEABLE	34468	1029.8	-4.8	387.9	44100	258791	260551	1992	12434	828
RMS ARM	-941	927.4	-83.5	444.8	82	12957	13013	-384	65	13
RMS CLOSE-OUT PANEL	6	560.5	-30.8	453.0	1	1	0	0	0	0
MANIFEST ITEMS	-935	929.8	-83.8	444.7	77	12780	12834	-358	69	12
OV-102 MADS	1397	940.0	32.0	331.0	352	5581	5663	178	325	-146
1307 B/H PAYLOAD WIRING	80	1305.0	0.0	390.0	0	0	0	0	0	0
BALLAST PROVISIONS	22	1508.0	0.0	278.0	0	0	0	0	0	0
AFD WIRING HARNESS	40	527.0	0.0	440.0	0	0	0	0	0	0
STD. SWITCH PANEL + VTR	69	560.0	-49.9	440.0	1	1	1	0	0	0
AFT STATION CONTAINERS	48	541.0	-54.0	445.0	2	5	4	0	0	0
P/L RECORDER	60	421.0	-6.0	378.0	0	0	0	0	0	0
STS OP CHARGEABLE CARGO	1716	910.1	22.3	344.8	992	18294	18122	971	-1085	-408
PRIMARY PAYLOAD	32674	1039.8	-2.8	388.0	42633	216148	217170	-1973	10339	935
ANCILLARY PAYLOAD	1794	848.8	-40.0	384.8	957	29250	29484	1360	1867	-150
MANIFEST ITEMS	-935	929.8	-83.8	444.7	77	12780	12834	-358	69	12
STS OP CHARGEABLE CARGO	1716	910.1	22.3	344.8	992	18294	18122	971	-1085	-408
CARGO MODULE TOTAL	35249	1026.6	-1.3	384.3	43871	267452	267972	605	14250	979

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-11 A-7.1 — VEHICLE SUMMARY WEIGHT STATEMENT -- 82/05/19 16.00.14

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
ORBITER OV-102 STS-11 INERT	153012	1060.1	.1	366.4	833719	5272866	5578665	1503	88294	-549
SSME X3 INERT	20709	1494.0	.4	384.7	23580	19223	17589	-22	-2482	95
BOUYANCY	80	1059.8	-0.0	364.8	0	0	0	0	0	0
PERSONNEL 4M/5D	3501	529.0	15.7	390.3	1811	9329	9537	1456	821	196
ORBITER W/O CONSUMABLES	177302	1100.3	.4	369.0	860958	6295943	6598828	-3269	108521	14
NON-PROP CONSUM AT SRB IGN	5445	1004.1	1.5	346.6	9998	125529	126602	-1658	15822	-375
MPS PROPELLANT AT SRB IGN	5166	1404.5	6.8	352.7	4149	5527	5037	-1004	1041	-418
OMS PROPELLANT - LEFT	12578	1417.1	-94.7	475.9	2733	2873	2844	-9	56	950
OMS PROPELLANT - RIGHT	12578	1417.1	94.7	475.9	2733	2873	2844	9	56	-950
RCS PROPELLANT - FWD	2464	317.2	5.4	365.4	196	17	210	-2	5	-1
RCS PROPELLANT - AFT	5424	1347.7	0.0	470.9	6160	956	6718	0	97	0
ORBITER MODULE TOTAL AT SRB IGN	220957	1138.4	.6	382.7	1001819	7487260	7779239	-7157	312563	-1352
CARGO MODULE TOTAL	50728	1050.5	1.5	372.4	19788	389528	380950	8956	-33175	-2147
ORBITER PLUS CARGO AT SRB IGN	271685	1122.0	.8	380.8	1022560	7946604	8229066	1103	287459	-3580
ET LWT-5 INERT	68723	1354.8	3.0	424.9	367006	4120553	4115550	2657	162428	8003
BOUYANCY	155	1354.8	3.0	424.9	0	0	0	0	0	0
MPS FUEL AT SRB IGN	227020	1613.4	0.0	400.0	0	3634679	3634679	0	0	0
MPS LOX AT SRB IGN	1345116	734.0	.6	401.4	74476	4470290	4419694	135444	313856	26977
MPS PRESSURANT	423	753.6	0.0	400.0	0	17697	17697	-12	-27	0
ET MODULE TOTAL AT SRB IGN	1641437	881.7	.6	402.2	449669	48147834	48084254	133464	591369	35855
SRB LEFT SEPARATION	181604	1809.4	-250.8	401.1	185009	11266086	11269711	-22594	5508	929
SRB LEFT INFLIGHT LOSSES	1116436	1697.0	-250.5	400.0	737230	35500316	35500306	853	-48	0
SRB LEFT MODULE TOTAL	1298040	1712.7	-250.5	400.2	922283	47192371	47195948	-22877	9628	918
SRB RIGHT SEPARATION	181604	1809.4	250.8	401.1	185009	11266086	11269711	22594	5508	-929
SRB RIGHT INFLIGHT LOSSES	1116436	1697.0	250.5	400.0	737230	35500316	35500306	-853	-48	0
SRB RIGHT MODULE TOTAL	1298040	1712.7	250.5	400.2	922283	47192371	47195948	22878	9628	-917

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-11 A-7.2 — VEHICLE SUMMARY WEIGHT STATEMENT — 82/04/21 16.12.58

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
LDEF	20312	897.0	0.0	400.0	0	0	0	0	0	0
OMS KIT PROPELLANT	12438	1240.2	9.1	323.4	0	0	0	0	0	0
DEPLOYED/USEABLE PAYLOAD	32750	1027.3	3.5	370.9	9908	205888	196257	5200	-43771	-1160
SMM REPAIR PAYLOAD	4510	1112.3	0.0	377.3	0	0	0	0	0	0
MMU	600	610.0	-80.0	400.0	0	0	0	0	0	0
OMS KIT HARDWARE	7055	1249.5	0.0	388.0	0	0	0	0	0	0
PRIMARY PAYLOAD	44915	1065.2	1.5	374.6	11261	297196	287996	8991	-40396	-1513
ACIP + RECORDER	278	929.2	2.7	337.8	26	6224	6210	9	273	0
FWD. FUSE. INSTRUMENTATION	36	435.0	-52.0	365.0	0	0	0	0	0	0
SUMS	85	280.0	-11.0	337.0	0	0	0	0	0	0
SEADS	101	455.6	0.0	336.9	0	0	0	0	0	0
SILTS	410	1196.8	0.0	417.0	0	0	0	0	0	0
ANCILLARY PAYLOAD	910	917.0	-2.3	374.4	347	27350	27060	334	2150	5
TOTAL PAYLOAD CHARGEABLE	45825	1062.3	1.4	374.6	11610	328773	319286	9431	-38238	-1506
OV-102 MADS	1397	940.0	32.0	331.0	352	5581	5663	178	325	-146
P/L ATTACH HDW	1940	1035.4	0.0	377.3	3511	5755	7648	0	416	0
ORB RET FTG ALLOW	-675	1074.0	26.0	395.0	2	30	30	0	0	0
ATCS RADIATOR KIT	355	1214.9	-.1	473.3	360	237	550	0	0	0
EPS TANK SET 4 HDW	779	945.4	3.3	299.2	1016	2069	2999	-945	-28	22
SMCH CABLE	788	758.0	-13.0	340.0	64	5141	5102	0	0	0
1307 B/H PAYLOAD WIRING	80	1305.0	0.0	390.0	0	0	0	0	0	0
BALLAST PROVISIONS	22	1508.0	0.0	278.0	0	0	0	0	0	0
AFD WIRING HARNESS	40	527.0	0.0	440.0	0	0	0	0	0	0
STD. SWITCH PANEL + VTR	69	560.0	-49.9	440.0	1	1	1	0	0	0
AFT STATION CONTAINERS	48	541.0	-54.0	445.0	2	5	4	0	0	0
P/L RECORDER	60	421.0	-6.0	378.0	0	0	0	0	0	0
STS OP CHARGEABLE CARGO	4903	940.3	2.7	352.0	7689	46060	47455	-325	2432	-612
PRIMARY PAYLOAD	44915	1065.2	1.5	374.6	11261	297196	287996	8991	-40396	-1513
ANCILLARY PAYLOAD	910	917.0	-2.3	374.4	347	27350	27060	334	2150	5
STS OP CHARGEABLE CARGO	4903	940.3	2.7	352.0	7689	46060	47455	-325	2432	-612
CARGO MODULE TOTAL	50728	1050.5	1.5	372.4	19788	389528	380950	8956	-33175	-2147

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-12 A-8.1 — VEHICLE SUMMARY WEIGHT STATEMENT — 82/05/19 15.59.33

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
ORBITER OV-103 STS-12 INERT	147994	1060.2	-.6	363.6	619351	4872279	5347582	5548	88237	-855
SSME X3 INERT	20859	1495.0	.3	384.7	23724	19371	17736	-24	-2497	104
BOUYANCY	80	1061.3	-.9	364.5	0	0	0	0	0	0
PERSONNEL 4M/3D	3321	534.0	17.0	392.0	1755	8930	9140	1360	715	170
ORBITER W/O CONSUMABLES	172254	1102.7	-.2	366.7	647283	5885248	6357119	1299	112144	-188
NON-PROP CONSUM AT SRB IGN	4634	987.0	-5.1	355.2	8821	122853	123736	-2695	16824	17
MPS PROPELLANT AT SRB IGN	5166	1404.5	6.8	352.7	4149	5527	5037	-1004	1041	-418
OMS PROPELLANT - LEFT	10550	1423.5	-94.9	476.1	2296	2045	2027	4	30	794
OMS PROPELLANT - RIGHT	10550	1423.5	94.9	476.1	2296	2045	2027	-4	30	-794
RCS PROPELLANT - FWD	2477	317.2	5.4	365.4	196	17	210	-2	5	-1
RCS PROPELLANT - AFT	5031	1347.7	0.0	470.9	6160	956	6718	0	97	0
ORBITER MODULE TOTAL AT SRB IGN	210662	1136.3	-.0	379.5	771466	7005182	7465319	-1781	295274	-638
CARGO MODULE TOTAL	56352	1041.0	1.3	392.1	21532	347551	350666	-4433	23960	431
ORBITER PLUS CARGO AT SRB IGN	267014	1116.2	.3	382.2	794529	7441415	7903169	-7408	307744	-49
ET LWT-6 INERT	68723	1354.8	3.0	424.9	367006	4120553	4115550	2657	162428	8003
BOUYANCY	155	1354.8	3.0	424.9	0	0	0	0	0	0
MPS FUEL AT SRB IGN	227020	1613.4	0.0	400.0	0	3634679	3634679	0	0	0
MPS LOX AT SRB IGN	1345116	734.0	.6	401.4	74476	4470290	4419694	135444	313856	26977
MPS PRESSURANT	423	753.6	0.0	400.0	0	17697	17697	-12	-27	0
ET MODULE TOTAL AT SRB IGN	1641437	881.7	.6	402.2	449669	48147834	48094254	133464	591369	35855
SRB LEFT SEPARATION	178028	1807.0	-250.8	401.1	132625	11145535	11149154	-22604	5608	929
SRB LEFT INFLIGHT LOSSES	1117163	1696.8	-250.5	400.0	738057	35510098	35510105	825	-44	0
SRB LEFT MODULE TOTAL	1295191	1711.9	-250.5	400.2	870725	47058174	47061763	-22874	9582	918
SRB RIGHT SEPARATION	178028	1807.0	250.8	401.1	132625	11145535	11149154	22604	5608	-929
SRB RIGHT INFLIGHT LOSSES	1117163	1696.8	250.5	400.0	738057	35510098	35510105	-825	-44	0
SRB RIGHT MODULE TOTAL	1295191	1711.9	250.5	400.2	870725	47058174	47061763	22875	9582	-917

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE STS-12 A-8.2 -- VEHICLE SUMMARY WEIGHT STATEMENT -- 82/04/02 14.35.27

DESCRIPTION	WEIGHT LB	CENTER-OF-GRAVITY, IN. X	Y	Z	MOMENTS-OF-INERTIA, SF2 IXX	IYY	IZZ	PRODUCTS-OF-INERTIA, SF2 PXY	PXZ	PYZ
TWO-STAGE IUS	32653	1133.0	.1	399.9	6665	17967	18105	73	-18	-3
TDRS-B SPACECRAFT	5000	965.6	.3	399.6	1188	1734	1779	34	9	12
PALAPA B2/SSUS-D	7531	754.3	0.0	378.5	123	142	587	-4	0	-1
DEPLOYABLE PAYLOAD	45184	1051.4	.1	396.3	8594	218814	218824	133	10352	12
IUS-ASE (LAUNCH - RETURN)	6047	1136.4	-1.1	395.7	6189	20758	24602	-2536	1428	-71
SMCH CABLE	786	758.0	-13.0	340.0	64	5141	5102	0	0	0
P/L RECORDER	60	421.0	-6.0	378.0	0	0	0	0	0	0
P/L RETENTION FITTINGS	451	1224.8	-38.9	360.8	1760	107	1163	571	683	-130
WT GROWTH ALLOWANCE	203	1136.4	-1.1	395.7	773	6549	6541	0	0	0
PALAPA B2/ASE	2394	754.3	11.5	368.8	0	0	0	0	0	0
TOTAL PAYLOAD CHARGEABLE	55125	1044.6	-.0	393.9	18616	329850	333970	-3687	18778	-92
RMS ARM	-941	927.4	-83.5	444.8	82	12957	13013	-384	65	13
RMS CLOSE-OUT PANEL	6	560.5	-30.8	453.0	1	1	0	0	0	0
MANIFEST ITEMS	-935	929.8	-83.8	444.7	77	12780	12834	-358	69	12
ATCS RADIATOR KIT	355	1214.9	-.1	473.3	360	237	550	0	0	0
EPS TANK SET 4 HDW	779	945.4	3.3	299.2	1016	2069	2999	-945	-28	22
1307 B/H PAYLOAD WIRING	80	1305.0	0.0	390.0	0	0	0	0	0	0
SMCH CABLE	2	941.0	0.0	307.0	0	0	0	0	0	0
AFD WIRING HARNESS	40	527.0	0.0	440.0	0	0	0	0	0	0
STD. SWITCH PANEL + VTR	69	560.0	-49.9	440.0	1	1	1	0	0	0
AFT STATION CONTAINERS	48	541.0	-54.0	445.0	2	5	4	0	0	0
P/L ATTACH HDW	1915	973.5	0.0	379.2	3497	17335	19309	0	689	0
ORB RET FTG ALLOW	-675	1074.0	26.0	395.0	2	30	30	0	0	0
P/L I/F HDW ALLOW	-451	1224.8	-38.9	360.8	1760	107	1163	-571	-683	130
STS OPER CHARGEABLE CARGO	2162	900.4	-1.6	369.6	4714	23877	24080	673	2513	-371
TOTAL PAYLOAD CHARGEABLE	55125	1044.6	-.0	393.9	18616	329850	333970	-3687	18778	-92
MANIFEST ITEMS	-935	929.8	-83.8	444.7	77	12780	12834	-358	69	12
STS OPER CHARGEABLE CARGO	2162	900.4	-1.6	369.6	4714	23877	24080	673	2513	-371
CARGO MODULE TOTAL	56352	1041.0	1.3	392.1	21532	347551	350666	-4433	23960	431

ORBITER AND CARGO IN ORBITER COORDINATE SYSTEM, ET AND SRB IN SHUTTLE COORDINATE SYSTEM

TABLE A-9 - ORBITER DEFINITION - WEIGHT & C.G.

VEHICLE	REFERENCE	WEIGHT (LBS)	X0 (IN.)	Y0 (IN.)	Z0 (IN.)
OV-102E STS-5 INERT	STATUS - TABLE 4.1	151871	1059.1	-0.1	366.6
OV-102 OPERATIONAL INERT	STATUS - TABLE 4.1	153012	1060.1	0.0	366.4
OV-099 INERT	STATUS - TABLE 4.1	151050	1063.3	-0.5	365.0
OV-103/104 INERT	STATUS - TABLE 4.1	147994	1061.2	-0.6	363.6

INCLUDED IN INERT WEIGHT*				MANIFEST MODIFICATIONS ITEM	WEIGHT (LBS)	X0 (IN.)	Y0 (IN.)	Z0 (IN.)
OV102E STS-5	OV-102 OPER	OV-099	OV-103/104					
X	X	X	X	ORBITER RETENTION FTG ALLOWANCE	675	1074.0	26.0	395.0
	X	X	X	RENDEZVOUS RADAR (Ku BAND)	359	589.0	69.0	424.0
	X	X	X	MISSION SPEC SEAT	92	541.0	23.0	433.0
	X	X	X	P/L SPEC SEAT	92	543.0	0.0	433.0
X	X	X	X	RMS INSTALLATION	379	973.1	-89.5	410.9
				RMS CLOSEOUT PANEL (1)	6	560.5	30.5	453.0
X				RMS	983	927.1	-83.3	445.0
	X	X	X	RMS	941	926.2	-83.5	444.6
X	X			EPS TNK SET 3-TANKS	604	1048.4	-14.8	299.4
		X	X	EPS TNK SET 3-TANKS	594	1048.4	-14.8	299.4
	X	X	X	GALLEY	164	469.0	-67.0	367.0
X				H^2O DISPENSING SYSTEM	21	470.1	-69.0	367.3

*X Denotes items included in Inert Weight
(1) When RMS installation is removed closeout panel added.

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