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16-141-79

STS EXPLOITATION STUDY

23 MARCH 1979

This document consists of 69 pages, including this page.

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AGENDA

STS EXPLOITATION STUDY

MARCH MEETING

1.0	STUDY OVERVIEW AND PROGRESS SUMMARY	-	[redacted] (b)(3) 10 USC ⊥ 424
2.0	QUESTIONNAIRE PROGRESS	-	
3.0	CRITICAL INCIDENT SURVEY	-	L. NEUNER
4.0	KEY INTERFACE DATA SURVEY	-	[redacted] (b)(3) 10 USC ⊥ 424
5.0	SKYLAB LESSONS	-	
6.0	MANNED FUNCTIONS		
	- CATALOG		
	- DESCRIPTION/DEFINITION		
	- RATIONALE FOR CHOICE OF PHASE I, PHASE II		
	- FUNCTIONS SELECTION FOR FURTHER DEFINITION		
	- KEY TRADEOFF AREAS		
	- IMPLICATIONS		
7.0	TEST AND DEMONSTRATION PLANNING PROGRESS	-	
8.0	STS CONFIGURATIONS	-	
9.0	APRIL MEETING OUTLINE	-	
10.0	DISCUSSION		

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STUDY SCOPE/PURPOSE

GENERAL GOAL

- DERIVE USE OF SPACE TRANSPORTATION SYSTEM SPACEBORNE DATA PROCESSING ELEMENTS IN SUPPORT OF MANNED RECONNAISSANCE MISSIONS

ASPECTS

- DEFINITION OF POTENTIAL ROLES AND FUNCTIONS MAN CAN PERFORM
- SELECTION OF THE FEASIBLE, MOST APPLICABLE SUBSET OF THESE FOR THE PROJECTED MISSIONS
- DEFINITION OF INTERFACE AND SUPPORT REQUIREMENTS (STS EXPLOITED)

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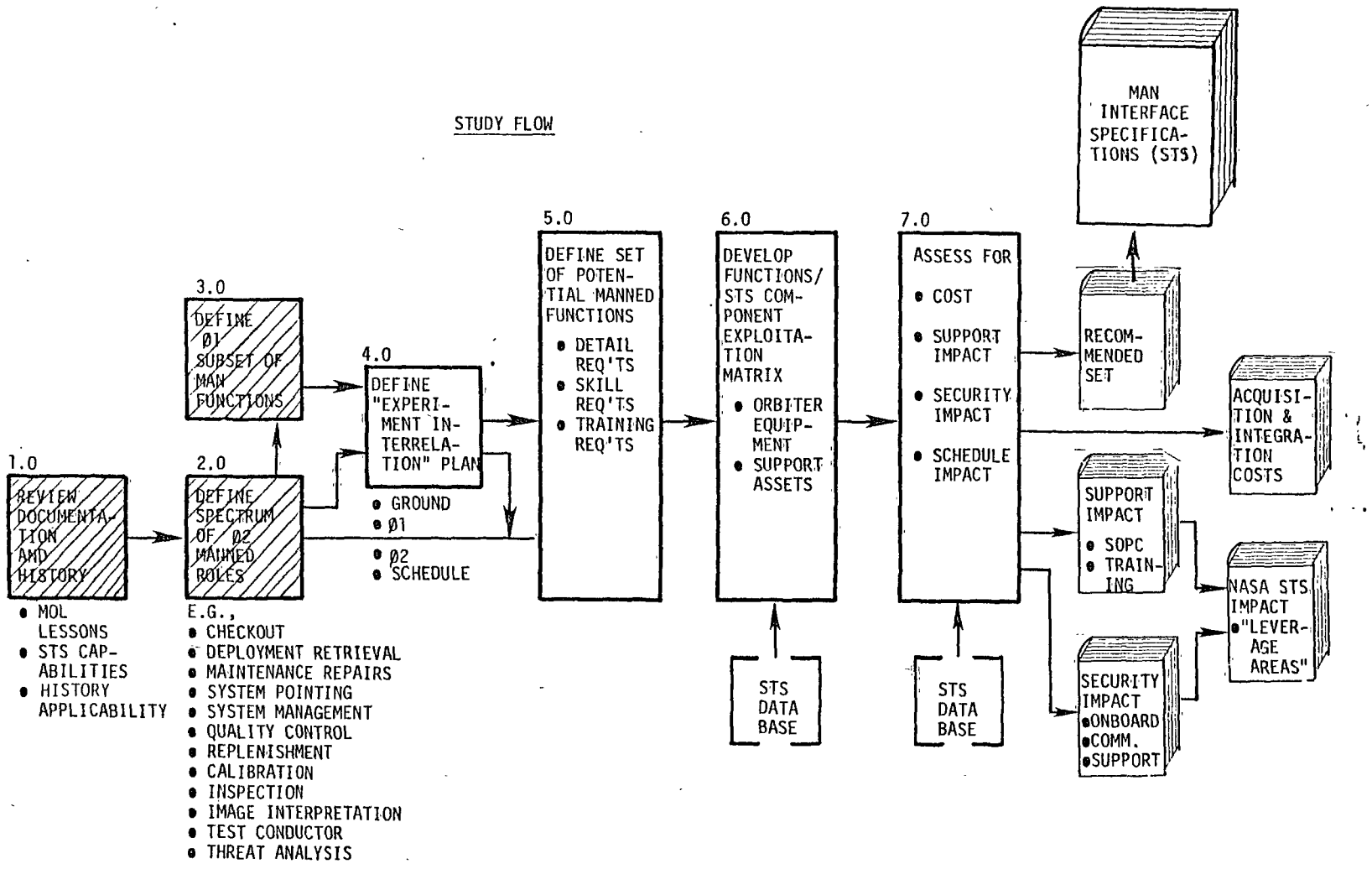
STUDY FLOW



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STUDY MILESTONES

		FEB	MAR	APR	MAY	JUN	JUL	AUG
1.0	DOCUMENT REVIEW							
	& HISTORY							
2.0	SPECTRUM OF				Joint			
	MANNED ACTIVITIES				Milestone			
3.0	∅ I SUBSET							
4.0	DEFINE INVESTIGATIONS							
5.0	MANNED FUNCTION							
	REQUIREMENTS							
6.0	STS USAGE							
7.0	ASSESSMENTS							
8.0	DOCUMENT & FINAL BRIEFING							
	- DATA PKG.							
	- FINAL REPORT							
	- BRIEFING							
	KICKOFF MEETING							
	TECHNICAL MEETINGS							

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HISTORICAL PERSPECTIVE

- MOL REVIEW/QUESTIONNAIRE
- CRITICAL INCIDENT SURVEY
- INTERFACE DOCUMENTATION

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MANNED FUNCTIONS QUESTIONNAIRE

-STATUS-

- QUESTIONNAIRE PREPARED
  - REFERENCED TO MANNED FUNCTION CATALOG
  - REVIEWED WITH [redacted]
  - SAMPLES TAKEN TO TEST CLARITY

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- INITIATING DATA GATHERING
  - INITIALLY WITHIN CURRENT BYEMAN COMMUNITY

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HISTORICAL PERSPECTIVE

- MOL REVIEW
- CRITICAL INCIDENT SURVEY
- INTERFACE DOCUMENTATION

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THE EVALUATION OF RECENT ANOMALIES

PURPOSE: THE EVALUATION OF OPERATIONAL ANOMALIES TO DETERMINE POSSIBLE MANNED FUNCTIONS

METHODOLOGY: EACH ANOMALY WILL BE SEPARATELY ANALYZED AND AGGREGATED TO EVALUATE:

- POSSIBLE MANNED ACTIONS
- MAN/MACHINE CAPABILITIES REQUIRED
- POSSIBLE GROUND/SPACE OPERATIONAL PROCEDURES
- EVA ACTIVITIES AND EQUIPMENT
- POTENTIAL MISSION GAINS

STATUS: DATA HAS BEEN EXTRACTED FROM PET REPORTS FOR:

- 1201 THROUGH 1212
- 4342 THROUGH 4349

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CONCLUSIONS FROM 1200 & 4300 SERIES ANOMALY ANALYSIS

1. THE PAYLOAD OR MISSION SPECIALIST THROUGH SPARE REPLACEMENT OF ELECTRONIC BOXES COULD HAVE SUBSTANTIALLY INCREASED THE MISSION INTELLIGENCE RETURN. (REF. 1211, 1214) THIS IMPLIES:

   - PROPER TRAINING
   - PROPER SPARES
   - PROPER TOOLS
   - COMPONENT ACCESSIBILITY THROUGH PROPER PAYLOAD DESIGN

2. THE PAYLOAD OR MISSION SPECIALIST COULD HAVE SUBSTANTIALLY REDUCED THE TIME REQUIRED TO RECOVER FROM ANOMALOUS PAYLOAD CONDITIONS (REF. 1201, 1203, 4347, 4348) THIS IMPLIES:

   - PROPER TRAINING
   - GOOD FMEA
   - DISPLAYS, INSTRUMENTATION
   - CONTROLS
   - SECURE VOICE TO MCC
   - EVA ACCESS TO PAYLOAD DOORS

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CONCLUSIONS FROM 1200 & 4300 SERIES ANOMALY ANALYSIS (CONT'D)

3. THE PAYLOAD SPECIALIST COULD HAVE RETHREADED OR SPLICED A FILM PATH SEPARATION (REF 1202). THIS IMPLIES:

   - PROPER TRAINING
   - PROPER TOOLS
   - FILM PATH ACCESSIBILITY/MODULARITY THROUGH PROPER DESIGN

4. MAN COULD SENSE INCORRECT PAYLOAD OPERATING MODES (REF. 4346)

5. THE PAYLOAD OR MISSION SPECIALIST COULD VERY EARLY IN THE MISSION AND PERIODICALLY DURING A MISSION DETERMINE THE BEST POINT OF FOCUS. (REF. 1202, 4345) THIS IMPLIES ACCESS TO IMAGE.

6. RIGOROUS FAILURE MODE EFFECT ANALYSES (FMEA) NEED TO BE UNDERTAKEN FOR ALL SENSOR SUBSYSTEMS, ASSEMBLIES AND COMPONENTS TO FACILITATE RAPID TROUBLE SHOOTING/CORRECTION BY PAYLOAD SPECIALIST.

7. INSTRUMENTATION AND CONTROL SHOULD BE BALANCED AGAINST COST AND COMPLEXITY. INSTRUMENTATION ONLY USEFUL IF CONTROLS ALLOW COMPONENT REPLACEMENT OR BYPASS OF FAILED COMPONENT.

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1200 & 4300 SERIES OPERATIONAL ENVIRONMENT

1200 & 4300 SERIES OPERATIONAL DATA WAS COLLECTED FROM EXISTING AFSCF ENVIRONMENT. WHICH IS LIMITED BY:

- RTS CONTACT
- LIMIT TELEMETRY MODES EXCEPT MICROWAVE FROM VTS

STS OPERATING MODE WILL PROBABLY BE CONTINUOUS CONTACT [redacted] WITH WIDE-BAND REAL-TIME TELEMETRY PROCESSING.

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FUTURE AFSCF IN DATA SYSTEM MODERNIZATION (DSM) ERA WILL STILL BE RTS CONTACT LIMITED; HOWEVER, TELEMETRY WIDEBAND CAPABILITY WILL EXIST SO STC CAN PROCESS ALL TELEMETRY DATA IN REAL-TIME.

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MANNED FUNCTION SUBSTANTIATED OR SUGGESTED BY ANALYSES

2.3; 2.4; 2.7; 2.10; 3.1; 3.2; 3.4; 4.2; 4.3; 4.4; 4.7;

4.8; 4.10; 4.11; 4.20; 5.1; 6.2; 8.1; 8.2; 8.3; 8.4; 8.5;

9.3; 10.1; 10.5; 10.6; 10.12

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MSM#	REV	ANOMALIES	REMARKS
1201	314	PAYLOAD EMERGENCY SHUT DOWN (ESD) FINE FILM DRIVE (AFT)	12 REV TO CORRECT 18 HR.
	322	CONSTANT VELOCITY TEST "COOK"	
	323	ENGINEERING TEST "COOK"	
	326	NORMAL OPS	
1201	402	PAYLOAD ESD COURSE FILM PATH AFT CAMERA	18 REV TO CORRECT 27 HR.
	411	MINI-CREEP "COOK" OK	
	417	MINI-CREEP "BOSS" OK	
	419	CONSTANT VELOCITY "COOK" OK	
	420	NORMAL OPS	
1201	445	PAYLOAD ESD FINE FILM PATH AFT CAMERA	22 REV TO CORRECT 33 HR.
	452	MINI-CREEP "COOK" DRIVE CAPSTAN NOT ROTATING	
	459	OPTICAL BARS WERE CYCLED SAME STATUS	
	465	MINI-CREEP "POGO" SAME STATUS	
	466	MINI-CREEP "BOSS" SAME STATUS	
	468	20 INCH/SEC CONSTANT VELOCITY SAME STATUS	
	472	MONOSCOPIC B SIDE RUN SYSTEM NORMAL	
	476	STEREO ENGINEERING SEQUENCE "COOK" DRIVE CAPSTAN OK	
	477	NORMAL OPS	
1201	2	HOT AFT SECTION BAY 12 BATTERY "CONTAMINATION"	NOT APPLICABLE TO CURRENT ANALYSIS
	492	PAYLOAD ESD DECODER A LOGIC DESIGN ERROR SW. SCC II	
	82	RV-1 CHUTE DAMAGE	
	179	RV-2 CHUTE DAMAGE	
	405	RV-3 CHUTE FAILURE	
	435-476	RCS THRUSTER THRUST LEVEL SHIFT	
	484	PYRO BATTERY DEPLETION	

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MSM#	REV	ANOMALIES	REMARKS
1202	1	SS PNEUMATIC SYSTEM LEAK A-SIDE	LIMITATION OF INST.
	2	CLOSE A SIDE PRESSURE ISOLATION VALVE	DOES NOT PERMIT ISOLATION TO SINGLE POINT
	16	TU BRAKE IN RV1 NOT ACTUATING	
	22	SWITCH TO SCCI TO ELIMINATE	6 REV TO CORRECT 9 HOURS
	38-39	INADVERTENT OB SHUTDOWN ELECTRICAL NOISE INTERPRETED AS ESD	
	98	RV-1 RETURN - THROUGH FOCUS TEST INDICATE -12 MICRONS CAMERA A &-8MICRONS ON CAMERA B -SAME RESULT FOR 1201	EARLY FOCUS COULD ENHANCE MISSION RESULT
	144	ESD COARSE FILM PATH CONSTANT VELOCITY TEST	10 REV TO CORRECT
	154	NORMAL OPS	15 HR
	272	LOSS OF TENSION B-SIDE BREAKAGE OF B SIDE FILM	49% of CAMERA B FILM NOT RECOVERED
	318	RCS 1 REM LEAK	NOT APPLICABLE TO CURRENT ANALYSIS
	369	RCS 2 REM LEAK	
	465	SV TUMBLED SV CAPTURED WITH RCS 1	
	466	RCS 1 PROPELLANT USAGE INCREASE	
	610	RCS 2 LEAKAGE & THRUSTER DEGRADATION - SV TUMBLE	
	614	CAPTURE RCS-1 RV-4 RECOVERY NEXT DAY; LBII DEBOOST	

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MSM#	REV	ANOMALIES	REMARKS
1203	364	PAYLOAD ESD	8 REV TO RECOVER 12 HR.
	371	CONSTANT VELOCITY TEST	
	372	NORMAL OPS RESTRICT RWV TO 15 IPS	
	719	PAYLOAD ESD FWD CAMERA	12 REV TO RECOVER 18 HR.
	728	MINI-CREEP TEST	
	730	CONSTANT VELOCITY TEST	
	731	NORMAL OPS - AFT MONO - FOLD IN FWD TU	
	RV-1	BPF THROUGH FOCUS TEST + 8 MICRON FWD -8M AFT	EARLY THROUGH FOCUS WOULD IMPROVE PRODUCT
	DAY 1	LEFT SOLAR ARRAY ERECTION DELAY	NOT APPLICABLE TO CURRENT ANALYSIS
	DAY 1	AMP-HOUR UNIT READ ERRATIC	
	DAY 19	RCS-1 REM LEAK SW TO RCS-2	
	DAY 51	RCS-2 REM LEAK	
	DAY 68	TUMBLE RCS-2 CAPTURE	

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MSM#	REV	ANOMALIES	REMARKS
1204	DAY 1 DAY 6	IMPROPER OB STOWAGE CORRECTED BY MODIFYING SOFTWARE	6 DAY TO CORRECT 144 HOURS
	474 508	FORWARD CAMERA ESD MONO OPS RESUME NORMAL OPS	34 REV TO CORRECT 51 HR
	RV-1	FOCUS 8 MICRONS FWD - ZERO AFT	NEW PROCEDURE PITCHING VEH. IN COLLIMATOR
	RV-2 & RV-3	LATERAL SEPARATION FOCUS SENSOR (LSFS) TELEMETRY INDICATED -11 MICRONS FWD & +12 MICRO AFT LINE TGT DID NOT HELP FOCUS SETTING PROBLEM	LSFS SHOULD BE IGNORED AT THIS POINT IN TIME
	DAY 1 DAY 11 DAY 17 DAY 17 DAY 35 DAY 48	RIGHT SOLAR ARRAY DEPLOYMENT DELAYED PACS PITCH RATE NOISE RCS-1 REM LEAK PYRO BATTERY 2 FAILURE RACS YAW BIAS OFFSET TRANSFER RACS TO PACS NO PAYLOAD REV 570 TO REV 582 FORWARD CAMERA INTERLOCK SOURCE SIGNAL FAILURE (CIRCUIT DISABLED)	NOT APPLICABLE TO CURRENT ANALYSIS

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MSM#	REV	ANOMALIES	REMARKS
1205	DAY 1	CAMERA INSTRUMENTATION FAILURE - INDICATED NO PNEUMATICS	DELAYED START OF P/L
	DAY 1	STELLAR TERRAIN THERMAL DOOR FAILED TO OPEN	DELAYED START ST
	430	STELLAR TERRAIN DID NOT SHUT DOWN AS COMMAND	MISSION
	510	SWITCHED TO BACK UP MODE ST	
	519	ACS-2 YAW RATE BIAS	REDUCED RESOLUTION AT OBLIQUITIES GREATER THAN + 10 DEG
	RV-1	FOCUS AFT CAMERA -12 MICRON FWD ZERO	PROBLEMS WITH NEW FOCUS PROCEDURES
	230-272	PACS PITCH BIAS ERRORS - P/L ERASED REV 272	NOT APPLICABLE TO CURRENT ANALYSIS
	DAY 1	DOPPLER BEACON FAILED TO DEPLOY (NO MISS IMPACT)	
	DAY 32	RCS REM LEAK - SW TO RCS-1	
	DAY 36	ACS-1 PITCH ERROR	
	DAY 42	TERRAIN THERMAL DOOR WOULD NOT OPEN (SOLO TESTS)	

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MSM#	REV	ANOMALIES	REMARKS
1206	DAY 6	TERRAIN CAMERA PLATEN PRESS MONITOR INTERMITTENT	NO OPERATIONAL EFFECTS
	DAY 9	TERRAIN CAMERA PLATEN PRESS MONITOR FAILED	NO OPERATIONAL EFFECTS
	DAY 4 TO 22 DAY 22 RV-1	INCREASE IN OPTICAL BAR B TORQUE ONE OPS/REV, NO REWIND, NO NESTED OPS TORQUE DECREASED NORMAL OPS RESUMED NO CHANGE IN FOCUS REQUIRED	DEGRADED OPERATING MODE FOR 288 REV 432 HOURS
	47 DAY 33 TO 91	PACS YAW BIAS - SW TO RACS DECREASED THRUST FROM PRIMARY RCS THRUSTERS	NOT APPLICABLE TO CURRENT ANALYSIS

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MSM#	DAY	ANOMALIES	REMARKS
1207	15	SOLAR ARRAY LEG 1 REDUCED BY 1/2 PANEL	NOT APPLICABLE TO CURRENT ANALYSIS
	RV-1	NO CHANGE IN FOCUS REQUIRED	
	18	FWD CAMERA RESONACE AT PEAK Vx/h	
	31	SOLAR ARRAY LEG 2 REDUCED BY 1 PANEL	
	58	LIGHT LEAK ST CHUTE	
	65	AFT FILM TEAR	
	89	HORIZON SENSOR INHIB	
	103	RV-4 MISSING ONE VHF ANTENNA	
	103	RV-4 MAIN BATTERY VENTED	

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MSM#	REV	ANOMALIES	REMARKS
1208	RV-1	FOCUS FWD CAMERA +8 MICRONS	EARLY BPF WOULD ENHANCE RV-1 FILM
	453	STAR TRACKER NO.1 -15 VOLT POWER FAILED	LOSS OF SENSOR
	980	ESD FWD CAMERA VERIFICATION INTERLOCK SIGNAL FAILURE	16 REV TO CORRECT 24 HOURS
	996	OPS RESUMED ON SCC II - INTERLOCK DISABLED	
	1268	ESD AFD CAMERA FAILURE OF TAKE-UP INTEGRATOR TO RESET ON TU BRAKE RELEASE	32 REV TO CORRECT 48 HOURS
	1300	OPS RESUMED NO NESTED OPERATIONS	
	1023	PCM REMOTE UNIT 4A FAILURE - PAN CAMERA DATA - REDUNDANT UNIT SELECTED	
	1083	RCS-1 REA #8 DEGRADATION - SW TO RCS-2	NOT APPLICABLE TO CURRENT ANALYSIS
	1426	SGLS-2 TRANSMITTER DOWN 20 DBM	
	1479	ACS-1 ROLL GYRO NOISY - SW TO ACS-2	
	1586	ACS-1 PITCH AND ROLL DEVIATIONS - ON ACS-2	

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MSM#	REV	ANOMALIES	REMARKS
1209	RV-1	FOCUS OF SYSTEMS AT BPF	NO MISSION IMPACT NOT APPLICABLE TO CURRENT ANALYSIS
	13	RCS THRUSTERS HAD ANOMALOUS TEMPERATURE INSTRUMENTATION BAD	
	154	ABNORMAL MAPPING CAMERA STELLAR PLATEN PRESSURE	
	950	INCREASED PITCH RATES DURING PAN OPS	
	1113 1118	HORIZON SENSORS INHIBITED IN ACS-1 ROLL CHANNEL TRANSFER TO ACS-2	
	1311	RCS-1 THRUSTER DEGRADATION SW TO RCS-2	

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MSM#	REV	ANOMALIES	REMARKS
1210	RV-1	GROUND FOCUS FOR BOTH SYSTEMS WERE OPTIMUM	SECOND FLIGHT IN A ROW
	433	ESD AFT CAMERA - RELAY FAILURE IN POWER DISTRIBUTION SYSTEM - SPECIAL COMMAND SEQUENCES WERE CONSTRUCTED	28 REV TO CORRECT
	461	RESUMED NORMAL OPS	42 HOURS
	852	AFT CAMERA TU INTEGRATOR RESET NOT FUNCTIONING	15 REV TO CORRECT
	867	AFT CAMERA OPS RESUMED - NO NESTED OPS	22.5 HOURS
1210-4	1416	AFT CAMERA OPS NORMAL WITH SW TO RV-4	

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MSM#	REV	ANOMALIES	REMARKS
1211	16	FWD CAMERA SUPPLY SEAL DOOR FAILED TO OPEN	39 REV TO CORRECT 58.5 HOURS
	55	NORMAL OPS RESTORED BY SW TO SCC-2	
	302	FWD CAMERA INCREASE IN TORQUE - PLATEN HIT MECHANICAL STOPS AND STOWED (TACHOMETER ANOMALY)	11 REV TO RESUME 16.5 HOURS
	313	DUAL OPS RESUMED	
	335	FWD CAMERA INCREASE IN TORQUE - PLATEN HIT MECHANICAL STOPS AND STOWED (TACHOMETER ANOMALY)	13 REV TO RESUME 19.5 HOURS
	348	OPS CONSTRAINED TO AFT CAMERA MONOSCOPIC UNTIL DEPLETION OF AFT SUPPLY	
	RV-1	PRE-LAUNCH FOCUS SETTINGS WERE OPTIMUM	THREE MISSIONS IN ROW
	RV-2	MONOSCOPIC AFT CAMERA	RV-2,RV-3 & RV-4 COULD HAVE BEEN STEREO HAD TACHOMETER FAILED UNIT BEEN REPLACED
	RV-3	MONOSCOPIC AFT CAMERA	
	RV-4	MONOSCOPIC AFT CAMERA THEN FWD CAMERA	
	1587	FILM PATH LEAK RATE TWICE NORMAL WHEN FWD CAMERA MONO OPS RESUMED	ADDITIONAL REPRESSURATION REQUIRED
	1929	ACS-1 HORIZON SCANNER FAILURE - SW TO ACS-2	NOT APPLICABLE TO CURRENT ANALYSIS
	1935	EXCESSIVE THRUSTER ACTIVITY - DEBOOST REV 1937	

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MSM#	REV	ANOMALIES (b)(1) (b)(3)	REMARKS
1212	24	INPUT RELAY (K-2) FROM SOLAR ARRAY TO BATTERY-3 FAILED OPEN: DOPPLER BEACON, MAPPING CAMERA AND [redacted] WERE INHIBITED - PAN CAMERAS WERE NOT	RELAY COULD HAVE BEEN REPLACED OR BYPASSED
	102	NORMAL OPS RESUMED	
	204 228	ESD AFT CAMERA - SCAN START - STOP LOGIC RELAY FAILURE SCC1 - TRANSFER TO SCC-2 NORMAL OPS	24 REV TO CORRECT 36 HOURS
	RV-1	FOCUS FWD CAMERA +4 MICRONS; AFT -6 MICRONS	EARLY FOCUS COULD ENHANCE RV-1 RESULTS
	1613	RCS-1 THRUSTER DEGRADATION TRANSFER TO RCS-2	
	1679	COMMAND DECODER 13 FAILED ON	CURTAIL [redacted] OPS
	2100	BATTERY 1 K-2 RELAY ANOMALOUSLY	CURTAIL [redacted] OPS

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MSM#	REV	ANOMALIES	REMARKS
1213		AFT CAMERA SHUTTER MALFUNCTION SWITCH TO SCC-2	16 REV TO CORRECT 24 HOURS
1214	DAY 76	FWD CAMERA PLATEN TACHOMETER CONTROL ASSEMBLY FAILED REMAINING MISSION IN MONOSCOPIC COVERAGE	STEREOSCOPIC COVERAGE COULD HAVE BEEN ACHIEVED BY REPLACING FAILED UNIT

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MSM#	REV	ANOMALIES	REMARKS
4342		NO MAJOR ANOMALIES	
4343		TAKE-UP TWO STALLED WHEN WRAPPING UP THE SPLICE FROM CUT AND SPLICE RV-1	5 REV TO CORRECT 7.5 HOURS
4343		NUMEROUS VIEW PORT DOOR FAILURE TO CLOSE	NO LOSS OF PAYLOAD
4343		LIGHT BAFFLE BROKEN IN FACTORY TEST CAUSED UNDEREXPOSURE STREAK 3/8 INCHES WIDE	IN FLIGHT REMOVAL MIGHT BE POSSIBLE
4343	251 253	PROGRAMMABLE MEMORY UNIT A (PMU-A) FAILED PMU-A TURNED ON BY RTC - THIS CREATED A 6077.6 SECOND OFFSET BETWEEN PMU-A & PMU-B. COMMANDS IN PMU-A & B WERE EXECUTED ON REV 253	LOST 3 REV OF P/L MANUAL INTERVENTION COULD HAVE SOLVED PROBLEM

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MSM#	REV	ANOMALIES	REMARKS
4344	1	PCM-1 FAILURE SW TO PCM-2	NO EFFECT ON MISSION
4344	111	POWER INTERRUPT OCCURRED ECS SIDE A PMU-A RESTRICTED TO REDUNDANT OFF	NO EFFECT ON MISSION
	130	ECS TELEMETRY INDICATE A SIDE POWER OFF	
		SRV-1 TAKE-UP MOTOR DREW STALL CURRENT AFTER SPLICE AND CUT OPERATIONS	NO EFFECT ON MISSION
4344	5-64	ELECTRICAL FAILURE IN THE VIEWPORT DOOR CONTROL CAUSE DOOR TO REMAIN OPEN	NO EFFECT ON MISSION
	64	DOOR SW TO BACKUP SYSTEM	
4345		FOCUS, LAUNCH 0.0 MIL - MOVED TO +0.5 MIL ON DAY 5 DUE TO FOCUS SENSOR ANALYSIS QUICK LOOK RV-1 INDICATED BPF +0.8 MIL	EARLY BPF WOULD HAVE ENHANCED RV-1 COVERAGE
4346	37 DAY	ISPS-1 DETERIORATED - PROBABLY DUE TO CLOGGING OF THE 25-MICRON OXIDIZER FILTER - SW TO ISPS-2 - INCREASED PERIGEE BY 4 NM	MINIMAL EFFECT ON MISSION
	51 DAY	ISPS-2 DETERIORATED - NO MORE ORBIT ADJUST - SAVE SPS FOR DEBOOST	NO MISSION EFFECT
	310	ADAPTIVE BIAS INADVERTENTLY TURNED OFF UNTIL REV 390	DECREASE IN AVERAGE NIIRS VALUE OF 0.1 MAN MIGHT HAVE SENSED DIFFERENT OPERATING MODE

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MSM#	REV	ANOMALIES	REMARKS
4347	0-4	BOOSTER SECOND STAGE DID NOT SHUT DOWN ON COMMAND. AGENA MAIN ENGINE IGNITED STILL IN THE BOOSTER ADAPTOR. AGENA AFT RACK THERMAL BLANKET WAS DESTROYED. HYDRAZINE IN THE EXPOSED PLUMBING FROZE BY REV 4 CAUSING LOSS OF STABILIZATION.	NOT APPLICABLE TO STS OPERATIONS
	6	CONTROL REGAINED AND MAINTAINED THROUGH THE USE OF SOLAR HEATING AND AGENA SUN ORIENTATION.SELECTIVE PAYLOAD COMBINED WITH SUN BATHING	NOT APPLICABLE
	20	TELEMETRY INDICATED FILM DRIVE SPEED (FDS) 29% FASTER THAN COMMANDED. FDS OSCILLATOR AT 1032 KHz INSTEAD OF NORMAL 800 KHz.	MANUAL INTERVENTION COULD HAVE PROBABLY SELECTED A HIGHER PERCENTAGE OF CORRECT FILM DRIVE SPEEDS PAYLOAD IN DEGRADED MODE FOR 145 REV. 217.5 HRS - 9 DAYS.
	20-165	TWO COMMAND LOADS GENERATED FOR EACH PAYLOAD PASS - NORMAL AND 29% LOW - BASE UPON REAL TIME DATA A SELECTION WAS MADE ON WHICH COMMAND MESSAGE SHOULD BE LOADED FDS OSCILLATOR SWITCHED MODED NINE TIMES A TOTAL OF 171 PAYLOAD FRAMES WERE AT IMPROPER (FDS).	
	165	STARTING WITH THIS REV, INVALID FDS WERE USED TO HEAT FDS OSCILLATOR WITH NO FILM, MOVEMENT, WHICH RESULTED IN A STABLE FDS OSCILLATOR FOR REMAINING MISSION.	

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MSM#	REV	ANOMALIES	REMARKS
4348	15	5-INCH FILM TENSION FLUCTUATING BECAUSE TAKE-UP RATCHET PAWLS WERE NOT ENGAGING	PAYLOAD IN DEGRADED MODE FOR 13 REVS 19.5 HOURS
	20	PAYLOAD ERASED FOR BOTH CAMERAS	
	33	5-INCH ERASED UNTIL REV 52	
	95	VEHICLE UNSTABLE AT POGO DUE PROBABLY TO BATTERY NO. 3 EXPLOSION OR HIGH PRESSURE VENTING SW TO REDUNDANT ACS	7 REV TO CORRECT 10.5 HOURS
	102	PAYLOAD RESUMED	
	596	5-INCH FILM HANDLING SYSTEM FAIL - INOPERABLE FOR REMAINDER OF MISSION ≈ REV 1100	PAYLOAD IN DEGRADED MODE FOR ≈ 500 REVS
	666	9-INCH FILM HANDLING SYSTEM ANOMALY PAYLOAD DELETED 666 THROUGH 668	3 REV TO CORRECT 4.5 HOURS
	880	COOK RTS PROBLEM PAYLOAD LOST	1 REV OF PAYLOAD NOT EXECUTED
	887	9-INCH FILM SUPPLY POTENTIOMETER FAILED NO PAYLOAD REV 887 THROUGH 910	23 REV TO CORRECT 34.5 HOURS
	912	9-INCH FILM DID NOT TAKE UP PROPERLY NO PAYLOAD REV 912 THROUGH 936	24 REV TO CORRECT 36 HOURS
	967	NO PAYLOAD REV 967 THROUGH 976 - FILM HANDLING PROBLEM	9 REV TO CORRECT 13.5 HOURS
	1062	PAYLOAD ERASED 1062 LOOPERS NOT EMPTY	1 REV 1.5 HOURS

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MSM#	REV	ANOMALIES	REMARKS
4349	593	VEHICLE ATTITUDE DEVIATIONS EXCEEDED PRESET THRESHOLDS; AUTOMATIC SW TO RACS	REV 595 PAYLOAD LOST 4 FRAMES WERE NOT TAKEN

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HISTORICAL PERSPECTIVE

- MOL REVIEW
- CRITICAL INCIDENT SURVEY
- INTERFACE DOCUMENTATION

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INTERFACE AREAS BEING EVALUATED

BIF-003 DOCUMENT NUMBER	ICD NUMBER	SUBJECT
2-067879-72	A1420208	TOP ICD
2-010108-73	A1420301	COMMAND/SIGNAL
2-010108-78	A1420301	COMMAND/SIGNAL IRN 8
2-010102-69A	1420302A	DATA
2-010109-73	B1420303	TELEMETRY
2-010109-77	B1420303	TM, IRN 10 AND 11
2-010073-71	1420503B	AGE

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LESSONS FROM SKYLAB

- FEASIBILITY OF EVA-RELATED FUNCTIONS
  - 10 EVAs: 82.5 HOURS
  - REPAIR AND MISSION FUNCTIONS
- MANNED CONTRIBUTION TO POINTING SYSTEMS
  - ~1 ARC SEC POINTING
  - BACKUP TO ATTITUDE TRACKER FAILURE
- DEMONSTRATED MAN AS AN OBSERVER AND IN-FLIGHT REPAIRMAN (SLL 1-1)
- IN-ORBIT REPAIR AND MAINTENANCE DEMONSTRATED (SLL 1-2)
  - SERVICING/RESERVICING
  - CLEARED STUCK DOORS/WEDGED MATERIALS
  - REPLACEMENT (EVA)
  - EVA REWIRING
- SYSTEM DESIGN/DEVELOPMENT GROUND RULES FOR MANNED OPERATIONS

SUBSTANTIATES >50% OF MANNED FUNCTIONS ANALYZED

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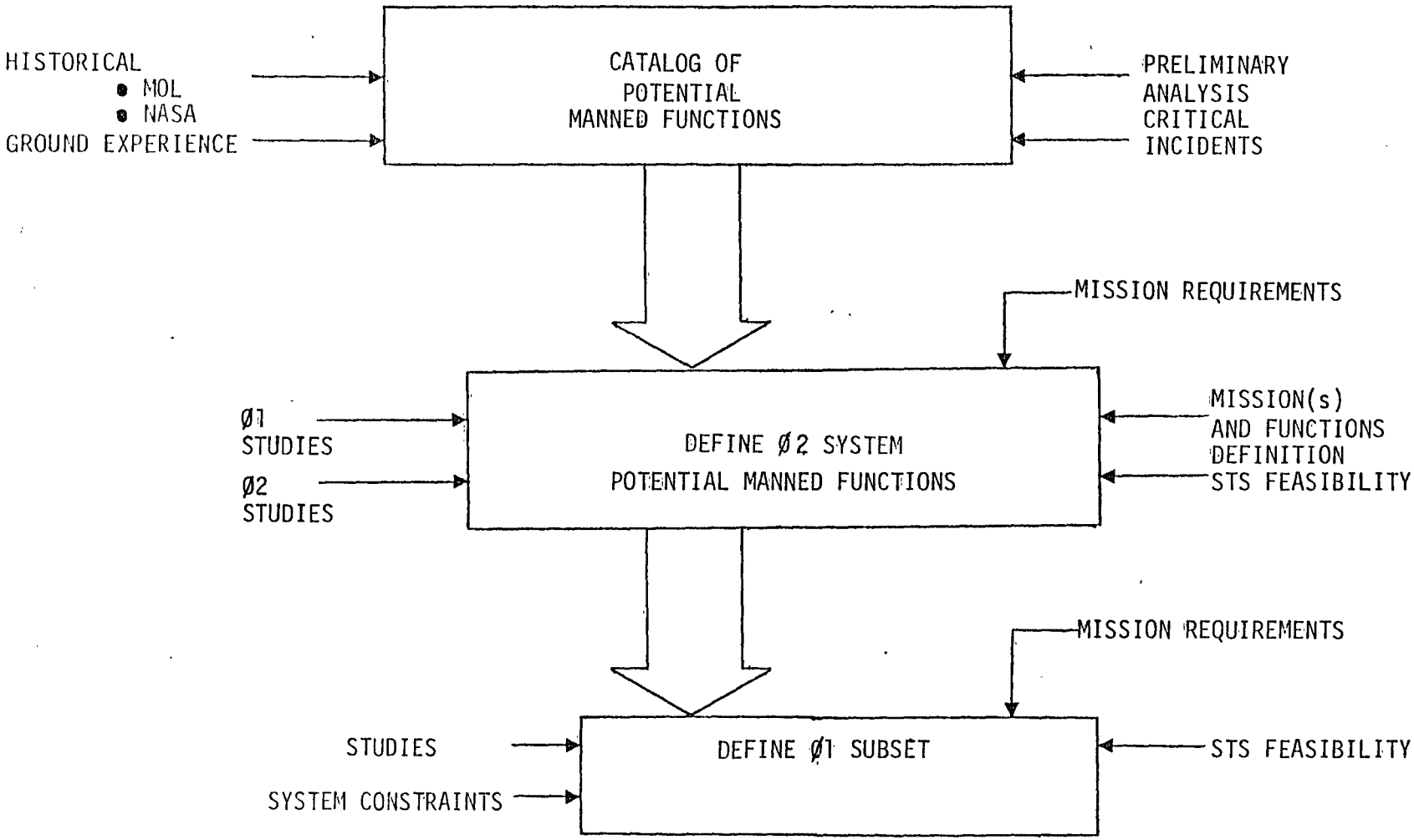
MANNED FUNCTIONS DEFINITION

- APPROACH -



Z-0035

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MANNED FUNCTIONS CATALOGUE (CATEGORIES)

1.0	LAUNCH AND ASCENT
2.0	INITIALIZATION/TEST
3.0	OPERATION PLANNING - SUPPORT TO PLANNING FOR NEXT PASS
4.0	REAL TIME OPERATIONS
5.0	EXPLOITATION
6.0	PERFORMANCE EVALUATION
7.0	SPECIAL
8.0	MAINTENANCE
9.0	CONTINGENCY
10.0	RECOVERY/DEBOOST
11.0	ENTRY AND LANDING

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Phase Number(s)	Phase Title(s)	Function No.(s)	Function Title	Rev.Date
2.0	INITIALIZATION/TEST	2.12	INITIALIZE AND VALIDATE MCC INTERFACES	

Description:
MANAGEMENT OF THE COMMUNICATIONS AND INTERFACE VALIDATION BETWEEN STS, MCC AND PAYLOAD

Subfunctions:
- ESTABLISH COMM. LINKS
- PERFORM TEST OPERATIONS
- VALIDATE AGAINST GROUND TRUTH (2.11)

Timeline Data	
- Duration	
- Frequency	A/R
- Special Geo.	✓
- Attitude	✓
- Other	

Inputs
- ORBIT POSITION DATA
- PLANNING DATA

Outputs/Controls
- COMM MODE CONTROL
- SENSOR COMMAND
- MCC COMMAND

Interfaces
- MCC
- ORBITER COMM
- STS MCC

STS Resources:	
- Orbiter Data	• STATE • NAV
- RMS	-
- Teleoperator	-
- Maneuvers	-
- Communication	✓
• Voice	✓
• COMSEC	✓
EVA	
- # Men	-
- Duration	-

Display Requirements
- GRAPHICS
- ALPHANUMERICS
- IMAGERY

Data Processing Requirements
- COMMAND GENERATION
- DATA CHECKING

Data Recording
- T/M
- VOICE

Automation Level

Security: BYE

References:

QQPRI:
- Number of Crew
- AFSC #
- Training Needs
- Special Needs

(b)(1)
(b)(3) 10 USC 424

Phase Number(s)	Phase Title(s)	Function No.(s)	Function Title	Rev.Date
3.0	OPERATION PLANNING	3.5	WEATHER ASSESSMENT	

Description:
ON-ORBIT DETERMINATION AND INPUTTING OF OBSERVED WEATHER FOR PLANNING PURPOSES

Subfunctions:
- OBSERVED WEATHER
- JUDGE SENSOR FEASIBILITY
- INPUT TO OPERATIONS PLANNING

Timeline Data	
- Duration	
- Frequency	A/R
- Special Geo.	-
- Attitude	-
- Other	

Inputs
- PREDICTED WEATHER
- OBSERVATIONS OF WEATHER STATE OVER AOIs

Outputs/Controls
- WEATHER COMMENTARY
- GEOGRAPHICAL/ WEATHER UPDATES
- PLANNING CONTROL

Interfaces
- MCC

STS Resources:	
- Orbiter Data	• STATE • NAV
- RMS	-
- Teleoperator	-
- Maneuvers	-
- Communication	✓
• Voice	✓
• COMSEC	✓
EVA	
- # Men	-
- Duration	-

Display Requirements
- WEATHER IMAGERY
- ALPHANUMERICS
- GRAPHICS

Data Processing Requirements
- CORRELATION OF OBSERVED WITH GEOGRAPHY

Data Recording
- T/M

Automation Level

Security:

References:

QQPRI:
- Number of Crew
- AFSC #
- Training Needs
- Special Needs

(b)(1)
(b)(3) 10 USC 424

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RATIONALE FOR THE SELECTION OF FUNCTIONS FOR FURTHER ANALYSIS

FIRST - STS RELATED:

1. FUNCTIONS REQUIRED BY STS RULES, OPERATIONS PHILOSOPHIES AND CONFIGURATION.
2. FUNCTIONS WHICH "COME FOR FREE" ON STS.

SECOND - SELECT CANDIDATE Ø 2 MANNED FUNCTIONS, WITHIN ZEUS MISSION CONCEPTS, WHERE PAYOFF:

3. HAS BEEN DEMONSTRATED (E.G., SKYLAB, APOLLO).
4. COULD HAVE OCCURRED IF IMPLEMENTED (CRITICAL INCIDENT SURVEY, MOL)
5. CAN BE SHOWN BY LOGIC, ANALYSIS.

THIRD - SELECT CANDIDATE Ø 1 MANNED FUNCTIONS FROM THE TOTAL Ø 2 SET EXCEPT WHERE:

6. HARDWARE IMPLEMENTATION PHILOSOPHY PROHIBITS IT.
7. COSTS/SCHEDULES ARE OBVIOUSLY PROHIBITIVE.

OTHERWISE;

8. CARRY THE FUNCTION AS A TRADEOFF (E.G., DIRECT OBSERVATION OF THE IMAGE/SCENE)

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POSSIBLE PAYOFFS FROM MANNED FUNCTIONS IN THE NRO PROCESS

1. COLLECTION PROCESS CONTRIBUTIONS		
1.1 NUMBER OF USEABLE FRAMES	-	INCREASE
1.2 SYSTEM UNAVAILABLE TIME	-	DECREASE
1.3 TIME TO RECTIFY ANOMALY	-	DECREASE
1.4 SYSTEM'S OPERATIONS TIME OVER AOI	-	INCREASE
1.5 INTERPRETATION SUITABILITY	-	INCREASE
2. PRODUCT CONTRIBUTIONS		
2.1 TIME TO INDICATIONS AND WARNING	-	DECREASE
2.2 RELEVANT MULTIPLE SENSOR DATA	-	INCREASE #
	-	DECREASE TIME UNTIL AVAILABLE
2.3 RESOLUTION	-	INCREASE
2.4 SYSTEM THROUGHPUT TIME TO USERS (INCLUDES COMMANDS)	-	DECREASE
3. SECURITY CONTRIBUTIONS		
3.1 PROCESS PROTECTION	-	MAINTAIN
3.2 DEFENSE AGAINST THREAT	-	ACHIEVE

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POSSIBLE PAYOFFS FROM MANNED FUNCTIONS IN THE NRO PROCESS (CONT'D.)

4.0 PROGRAMMATIC CONTRIBUTIONS

4.1	DEVELOPMENT COST	-	DECREASE
4.2	RECURRING COST	-	DECREASE
4.3	SCHEDULE	-	SHORTEN
4.4	SAFETY	-	INCREASE
4.5	RELIABILITY IMPLEMENTATION	-	DECREASE
4.6	SYSTEM RELIABILITY	-	INCREASE

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MANNED FUNCTION ANALYSIS AND SELECTION

MISSION PHASE 1.0 LAUNCH AND ASCENT

FUNCTION	PROGRAM PHASE		RATIONALE	PAYOFF
	01	02		
1.1 Monitoring of C&W	✓	✓	1. STS Need	(4.2) Rec. Cost (4.4) Safety

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MISSION PHASE 2.0 INITIALIZATION/TEST

FUNCTION	PROGRAM PHASE		PRECEDENT		RATIONALE	PAYOFF
	01	02	CIS	SKYLAB		
2.1 Checkout	✓	✓		✓	3. Demonstrated	
2.2* Deployment/Arm/Flight Safing/Pin Removal	✓	✓		✓	1. STS Need	
2.3 Test Conduct	✓	✓	✓	✓	5. Logic, Analysis	(1.2) System Time
2.4* Inspection of Payload (also 10.1)	✓	✓	✓	✓	2. STS Free	
2.5 Real Time Targeting Modification (also 4.8)	✓	✓			5. Logic Analysis	(1.1) + Frames (2.4) Throughput
2.6* Assembly of Space Structures	⊕	✓		✓	3. Demonstrated	
2.7 Test and Maintenance (Tools and Procedures) (also 10.12)	⊕	✓	✓	✓	3. Demonstrated	(4.1) Development Cost
2.8 Communication Management (priority) (also 3.3 & 4.6)	✓	✓			1. STS Need	
2.9* Removal of Shroud or Cover	✓	✓		✓	1. STS Need	
2.10 Calibration/Focus/Alignment (also 3.1, 4.3)	✓	✓	✓	✓	4. If Implemented	
2.11 Validation Using Ground Truth	✓	✓		✓	5. Logic/Analysis	(1.2) System Time (1.5) Suitability
2.12 Initialize & Validate MCC Interfaces	✓	✓		✓	1. STS Need	
2.13 STS/Payload/MCC Navigation Coordination	✓	✓		✓	1. STS Need	
2.14 Crypto Management	✓	✓			5. Logic/Analysis	(3.1) Security (4.2) Recur. Cost

*EVA

MANNED FUNCTION ANALYSIS AND SELECTION

MISSION PHASE 3.0 OPERATION PLANNING - SUPPORT TO PLANNING FOR NEXT PASS

FUNCTION	PROGRAM PHASE		PRECEDENT		RATIONALE	PAYOFF
	01	02	CIS	SKYLAB		
3.1 Calibration/Focus (2.10, 4.3)	✓	✓	✓	✓	4. If Implemented	(1.5) Suitability
3.2 Subsystem Management (also 4.4)	✓	✓	✓	✓	3. Demonstrated	
3.3 Communication Management (also 2.8 & 4.6)	✓	✓			1. STS Need	
3.4 Payload Expendable Management	✓	✓	✓	✓	3. Demonstrated	
3.5 Weather Assessment	✓	✓			4. If Implemented	(1.1) Number of Frames
3.6 Threat Assessment (also 7.1, 9.7)	⊕	✓			5. Logic/Analysis	(3.2) Defense
3.7 STS Timeline, Maneuver Coordination	✓	✓			1. STS Need	

MANNED FUNCTION ANALYSIS AND SELECTION

MISSION PHASE 4.0 REAL TIME OPERATIONS

FUNCTION	PROGRAM PHASE		PRECEDENT		RATIONALE	PAYOFF
	01	02	CIS	SKYLAB		
4.1 System Pointing	⊕*	✓		✓	3. Demonstrated	
4.2 Quality Control	⊕*	✓	✓	✓	4,5 Payoff Indicated	(1.5) Suitability
4.3 Calibration (also 3.1)	✓	✓	✓	✓	4. If Implemented	
4.4 Subsystems Management (also 3.2)	✓	✓	✓	✓	3. Demonstrated	
4.6 Communication Management (also 3.3)	✓	✓			1. STS Need	
4.7 Manual Control of Payload Operation	✓	✓	✓	✓	3. Demonstrated	
4.8 Real Time Targeting Modification (also 2.5)	✓	✓	✓		5. Logic/Analysis	(1.1) No. of Frames (2.4) Throughput
4.9 Appending Commentary (also 5.2,6.2)	✓	✓		✓	3. Demonstrated	
4.10 Verify Sensor Readiness	✓	✓	✓	✓	3. Demonstrated	
4.11 Manage Attitude System	✓	✓	✓	✓	3. Demonstrated	
4.12 Verify Star Acquisition & Pointing Solution	✓	✓		✓	3. Demonstrated	
4.13 Visual Verification of Acquisition & Tracking (also 9.4)	⊕*	✓		✓	3. Demonstrated	
4.14 Adjust Tracking Conditions (IMC) (also 9.5)	⊕*	✓			3. Demonstrated	
4.15 In Pass Retargeting	✓	✓			5. Logic/Analysis	(1.1) No. of Frames (2.4) Throughput
4.16 (Deleted)						
4.17 Tip Off Alert (also 5.3)	✓	✓			3. Demonstrated 5. Logic/Analysis	
4.18 Data Recording & Monitoring (also 6.3)	✓	✓		✓	3. Demonstrated	

* Requires Access to Sensor Image

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MANNED FUNCTION ANALYSIS AND SELECTION

MISSION PHASE 4.0 REAL TIME OPERATIONS (Cont'd.)

FUNCTION	PROGRAM PHASE		PRECEDENT		RATIONALE	PAYOFF
	01	02	CIS	SKYLAB		
4.19 In Pass Retargeting Due to Weather Conditions	✓	✓			5. Logic/Analysis	(1.1) No. of Frames (2.4) Throughput
4.20 Emergency Shut Down Support	✓	✓	✓		4. If Implemented	
4.21 Multi-Sensor Tasking	⊕*	✓			4. If Implemented 5. Logic/Analysis	(2.2) Multiple Images/Data

* Requires Access to Sensor Image
Z-0046

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MANNED FUNCTION ANALYSIS AND SELECTION

MISSION PHASE 5.0 EXPLOITATION

FUNCTION	PROGRAM PHASE		PRECEDENT		RATIONALE	PAYOFF
	01	02	CIS	SKYLAB		
5.1 Image/Signal Interpretation	⊕*	✓	✓		4. If Demonstrated 5. Logic/Analysis	(2.1) I&W Time (2.4) Throughput
5.2 Interpret Product and Provide Comments (also 4.9, 6.2)	⊕*	✓		✓	3. Demonstrated	
5.3 Tip Off Alert (also 4.17)	✓	✓			3. Demonstrated 5. Logic/Analysis	
5.4 Selection and Transmission of Images/Signals (Wide Band)	⊕*	✓			5. Logic/Analysis	

* Requires Access to Sensor Data, Imagery and Product

Z-0047

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MISSION PHASE 6.0 PERFORMANCE EVALUATION

FUNCTION	PROGRAM PHASE		PRECEDENT		RATIONALE	PAYOFF
	01	02	CIS	SKYLAB		
6.1 Reconnaissance Assessment	✓	✓			5. Logic/Analysis	(1.1) No. of Frames (1.5) Suitability
6.2 Interpret Product - Provide Comments (also 5.2)	⊕*	✓	✓	✓	3. Demonstrated	
6.3 Data Recording & Monitoring (also 4.8)	✓	✓		✓	3. Demonstrated	

* Requires Access to Sensor Data, Imagery and Product

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MANNED FUNCTION ANALYSIS AND SELECTION

MISSION PHASE 7.0 SPECIAL

FUNCTION	PROGRAM PHASE		PRECEDENT		RATIONALE	PAYOFF
	01	02	CIS	SKYLAB		
7.1 Threat Assessment & Analysis (also 3.6, 9.7)	⊖	✓			5. Logic/Analysis	(3.2) Defense
7.2 Sensor-Aided Inspection	✓	✓			5. Logic/Analysis	(3.2) Defense
7.3 Indication and Warning Alerts	⊖*	✓			5. Logic/Analysis	(2.4) System Throughput
7.4 Unique Command and Control Capability	N/A	N/A				
7.5 Visual Inspection of Other Spacecraft	✓	✓		✓	5. Logic/Analysis	(3.2) Defense
7.6 Transmission to Unified & Specified Commands	⊖*	✓			5. Logic/Analysis	(2.4) System Throughput
7.7 Remote Manipulation with Teleoperator Type System	N/A	N/A				
7.8 Space-to-Space Communication Assessment and Verification (Multi-millimeter W-length)	N/A	N/A				
7.9 Selective Spectrum Analysis of Events	⊖	✓			5. Logic/Analysis	(2.2) Multiple Sensor
7.10 Transmission to Tactical Commanders	⊖*	✓			5. Logic/Analysis	(2.4) System Throughput
7.11 Situation Monitoring	⊖*	✓			5. Logic/Analysis	(2.4) System Throughput

* Requires Access to Sensor Data, Images and Products

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MISSION PHASE 8.0 MAINTENANCE

FUNCTION	PROGRAM PHASE		PRECEDENT		RATIONALE	PAYOFF
	01	02	CIS	SKYLAB		
8.1 Repair	⊕*	✓	✓	✓	3. Demonstrated	
8.2 Replenishment (also 10.4)	✓	✓	✓	✓	3. Demonstrated	
8.3 Fault Isolation	✓	✓	✓	✓	3. Demonstrated	
8.4 Service (also 10.5)	TBD	✓	✓	✓	3. Demonstrated 5. Logic/Analysis	(4.1) Dev. Cost
8.5 Correct Malfunctions (also 9.3)	✓	✓	✓	✓	3. Demonstrated	

* Depends on Inherent Repairability of Available Hardware

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MISSION PHASE 9.0 CONTINGENCY (as a result of C&W, Anomalies, Malfunction or Threat)

FUNCTION	PROGRAM PHASE		PRECEDENT		RATIONALE	PAYOFF
	Ø1	Ø2	CIS	SKYLAB		
9.1 Contingency Management	✓	✓		✓	3. Demonstrated	
9.2 Stabilize Payload	N/A	N/A			N/A	
9.3 Correct Malfunction (also 8.5)	✓	✓	✓	✓	3. Demonstrated	
9.4 Visual Verification of Acquisition of Tracking (also 4.13)	⊕*	✓		✓	3. Demonstrated	
9.5 Adjust Tracking Condition (also 4.14)	⊕*	✓		✓	3. Demonstrated	
9.6 (Deleted)						
9.7 Threat Assessment (also 3.6, 7.1)	⊕*	✓			5. Logic/Analysis	(3.2) Defense
9.8 Space Defense Operations	⊕	✓			5. Logic/Analysis	(3.2) Defense

* Requires Access to Sensor Data

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MANNED FUNCTION ANALYSIS AND SELECTION

MISSION PHASE 10.0 RECOVERY/DEBOOST*

FUNCTION	PROGRAM PHASE		PRECEDENT		RATIONALE	PAYOFF
	01	02	CIS	SKYLAB		
10.1 Inspect Payload (also 2.4)	✓	✓	✓	✓	2. STS Free	
10.2 Jettison Structures	✓*	✓*		✓	5. Logic/Analysis	(4.1) Dev. Cost (4.2) Recurring Cost
10.3 Safing/Shutdown	✓	✓			1. STS Need	
10.4 Retrieval	N/A	N/A				
10.5 Replenishment (also 8.2)	✓	✓	✓	✓	3. Demonstrated	
10.6 Service (also 8.4)	TBD	✓	✓	✓	3. Demonstrated	
10.7 Acquire with Manipulator	N/A	N/A				
10.8 Return to Payload Bay	N/A	N/A				
10.9 Secure Payload	N/A	N/A				
10.10 Deboost Payload	N/A	N/A				
10.11 Dump Propellant/Gases	✓	✓			1. STS Need	
10.12 Test and Maintenance (Tools and Procedures) (also 2.7)	⊖	✓	✓	✓	3. Demonstrated	
10.13 Maneuver to Acquire	N/A	N/A				
10.14 Installation of Shroud or Cover	✓	✓		✓	1. STS Need	
10.15 Acquire with Teleoperator Type System	N/A	N/A				
10.16 Terminate MCC Interfaces	✓	✓			1. STS Need	

* Tradeable

Z-0052

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MANNED FUNCTION ANALYSIS AND SELECTION

MISSION PHASE 11.0 ENTRY AND LANDING

FUNCTION	PROGRAM PHASE		RATIONALE	PAYOFF
	01	02		
11.1 C&W Monitoring (1.1)	✓	✓	1. STS Need	
11.2 On-Ground Payload Protection	✓	✓	1. STS Need	

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MANNED FUNCTION STATISTICS
-SUMMARY-

- 91 FUNCTIONS IN CATALOG
  - 71 UNIQUE
  - 13 NOT APPLICABLE TO ZEUS-TYPE MISSIONS
- 15 FUNCTIONS REQUIRED FOR STS
  - 12 UNIQUE
- 63 ADDITIONAL FUNCTIONS SELECTED FOR Ø2
  - 46 UNIQUE
- OF THE Ø2 FUNCTIONS, 26 ARE QUESTIONABLE FOR Ø1
  - 18 UNIQUE FUNCTIONS
    - : OF THESE, [15] REQUIRE FLIGHT CREW ACCESS TO IMAGERY/PRODUCT/SENSOR PATH
    - : OTHER QUESTIONABLES RELATE TO PHYSICAL NATURE OF PAYLOAD, MAINTENANCE AND SPACE DEFENSE

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FUNCTIONS REQUIRED BECAUSE OF STS

1.1 MONITOR OF C&W (ALL MISSION PHASES)
2.2 DEPLOYMENT/ARMING/FLIGHT SAFING/PIN REMOVAL
2.8 COMMUNICATION MANAGEMENT
2.9 REMOVAL OF SHROUD OR COVER
2.12 INITIALIZE & VALIDATE MCC INTERFACE
2.13 STS/PAYLOAD/MCC NAVIGATION COORDINATION
3.7 STS TIMELINE, MANEUVER COORDINATION
10.3 SAFING/SHUTDOWN
10.11 DUMP PROPELLANT/GASES
10.14 INSTALLATION OF SHROUD OR COVER
10.16 TERMINATE MCC INTERFACES
11.2 ON-GROUND PAYLOAD PROTECTION

FOR FREE

2.4, 10.1 INSPECTION OF PAYLOAD

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PRELIMINARY STS SUPPORT COMMENTS

- GENERALLY, FUNCTIONS SELECTED FOR FURTHER STUDY ARE FEASIBLE ON STS
  - MANY QUESTIONS REMAIN REGARDING PHYSICAL CHARACTERISTICS/ DESIGN OF SENSORS
  - SECURITY IS A CONSTANT CONCERN

- DEFINITION DRIVERS
  - CREW ACCESS TO IMAGES/PRODUCTS/SENSOR DATA
  - CREW ACCESS TO SUBSYSTEM PERFORMANCE DATA
  - DEGREE OF ON-BOARD PLANNING AND COMMAND GENERATION

- "MISSING PIECES" FOR DATA PROCESSING
  - WIDE BAND RECORDING/IMAGE ACCESS SYSTEM
  - SECURE DATA BASE

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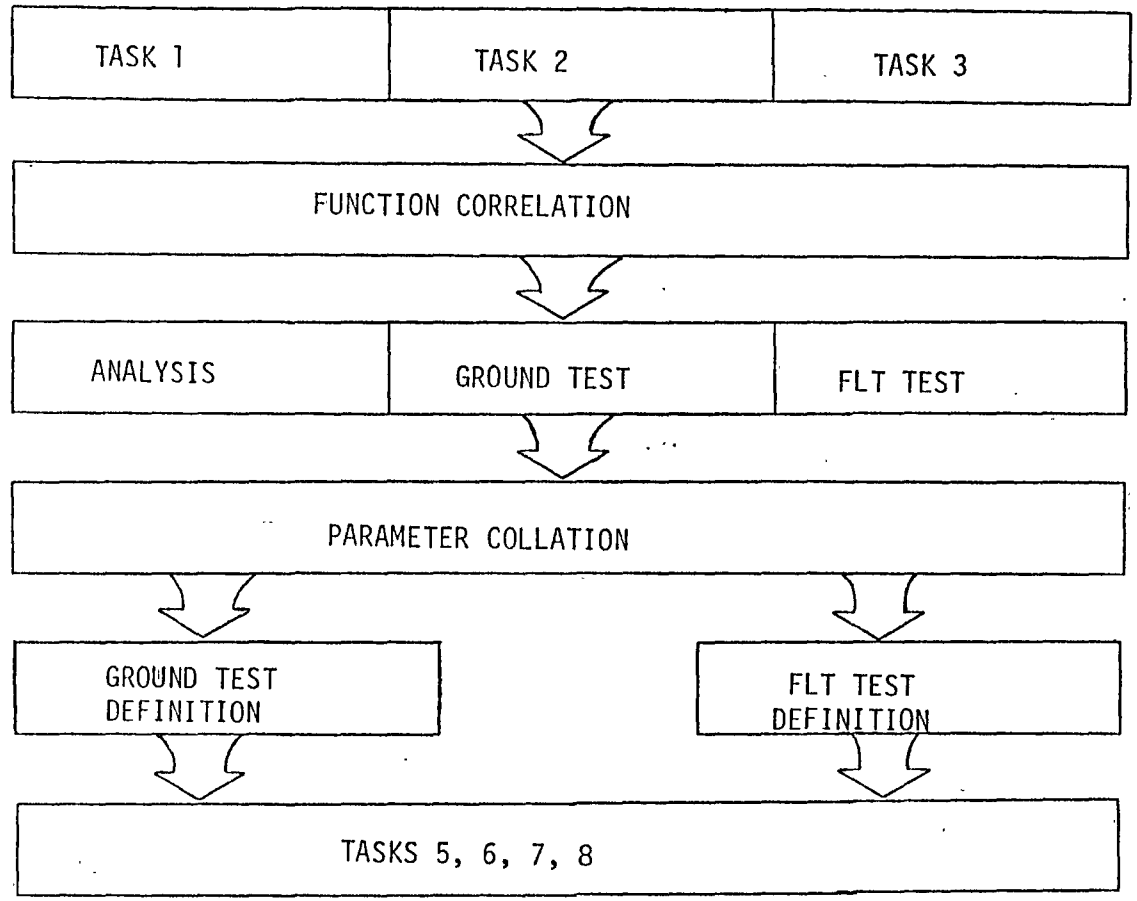
TASK 4 FLOW



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TEST PHASE DEFINITIONS

- GROUND TEST - GENERALLY CONNOTES THE USE OF GROUND-BASED DEMONSTRATION AND TEST EQUIPMENT INCLUDING SIMULATORS AND/OR EMULATORS. THE DESIGNATION SB SIGNIFIES THE USE OF THE JSC SHUTTLE MISSION SIMULATOR (SMS) WHILE SO INDICATES ALL OTHERS.

- PHASE 0 - PHASE ZERO DENOTES THE POTENTIAL UTILIZATION OF ORBITER FLIGHTS OTHER THAN THOSE SPECIFICALLY PLANNED FOR Ø1 AND Ø2, AS WELL AS THE POSSIBILITY OF AIRCRAFT TESTS FOR DEMONSTRATION AND TEST. SUCH DEMONSTRATIONS AND TEST COULD BE EITHER REAL OR SIMULATED. SOME FUNCTIONS WHICH ARE NOT DIRECTLY P/L RELATED OR EQUIPMENT PECULIAR, AND ARE CONCERNED PRIMARILY WITH PROCEDURAL ASPECTS COULD BE INCORPORATED INTO SEVERAL FLIGHTS (NOT NECESSARILY DOD) FOR CONCEPT DEVELOPMENT.

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TEST PHASE DEFINITIONS (CONT'D)

- PHASE 1 - PHASE 1 REFERS TO THE SPECIFIC FLIGHT WITH OPERATIONAL PAYLOAD HARDWARE WHICH CURRENTLY IS SCHEDULED FOR ORBITER FLIGHT [redacted] 15.

(b)(1)
(b)(3) 10 USC ⊥ 424

- PHASE 2 - PHASE 2 CONNOTES THE MISSION(S) DESIGNATED FOR AN ATTACHED WIDE AREA SEARCH PAYLOAD SPECIFICALLY DESIGNED TO TAKE ADVANTAGE OF THE SPECIAL QUALITIES OF THE SPACE TRANSPORTATION SYSTEM AND ITS CREW.

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TEST PHASE DEFINITIONS (CONT'D)

- OPERATIONAL - THE ACTIVITY OR FUNCTION CONCERNED WITH ACCOMPLISHING AN OPERATIONAL MISSION.

- REAL TEST - THE ACTIVITY OR FUNCTION PERFORMED USING ACTUAL EQUIPMENT, HW OR SW FOR THE PURPOSE OF TEST OR DEMONSTRATION.

- SIMULATED TEST - THE ACTIVITY OR FUNCTION PERFORMED USING SIMULATED EQUIPMENT, HW OR SW BUT UTILIZING AS CLOSE TO REAL PROCEDURES AS POSSIBLE TO DEMONSTRATE, TEST OR OTHERWISE SUPPORT DEVELOPMENTAL ACTIVITIES.

- PRIORITIES - PRIMARY(1) - Ø1 REQUIREMENTS
  - STS SUPPORT CAPABILITIES
  SECONDARY(2)- Ø2 REQUIREMENTS
  - GROUND TEST TOOLS
  TERTIARY(3) - MOST SUITABLE MAN-IN-LOOP ACTIVITIES
  - Ø0 TEST ACTIVITIES
  - OTHER MAN-IN-LOOP ACTIVITIES

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TEST PHASE DEFINITIONS (CONT'D)

- SUITABILITY CATEGORIES - INCLUDES COMPLEXITY, AVAILABILITY AND TO A LESSER DEGREE, FEASIBILITY.

  A - HIGH
  B - PROBABLE
  C - POSSIBLE
  D - SLIGHT

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TEST AND DEMONSTRATION ANALYSIS AND ASSIGNMENT

FUNCTION \ TESTING PHASE	GROUND		PHASE 0		PHASE I				PHASE II			
	REAL	SIM	REAL	SIM	P/L		NON-P/L		P/L		NON-P/L	
					REAL	SIM	REAL	SIM	REAL	SIM	REAL	SIM
1.0 LAUNCH AND ASCENT												
1.1 Monitoring of C&W	1-C	1-A		1-C	1-A				2-A			
2.0 INITIALIZATION/TEST												
2.1 Checkout	1-C	1-A		1-D	1-B	(2-A)			2-A			
2.2 Deployment/Arm/Flight Safing/Pin Removal		1-A		1-D	1-C	(2-A)			2-B			
2.3 Test Conduct	1-C	1-A		1-D	1-B	(2-A)			2-B			
2.4 Inspection of Payload (also 10.1)	1-C	1-A		1-C	1-A				2-A			
2.5 Real Time Targeting Modification (also 4.8)		1-A			1-C	(2-A)			2-A			
2.6 Assembly of Space Structures	1-C	1-C		1-B	1-B	2-B			2-B			
2.7 Test and Maintenance (Tools and Procedures) (also 10.12)		1-B		1-B	1-B	2-B			2-B			
2.8 Communication Management (Priority) (also 3.3 & 4.6)		1-A		1-A	1-A				2-A			
2.9 Removal of Shroud or Cover		1-B		1-B	1-B	(2-A)			2-A			
2.10 Calibration (also 3.1,4.3)		2-C			1-B	(2-B)			2-B			
2.11 Validation Using Ground Truth		2-C			1-B	(2-B)			2-B			
2.12 Initialize & Validate MCC Interfaces		1-A		1-A	1-A				2-A			
2.13 STS/Payload/MCC Navigation Coordination		1-A		1-B			1-A				2-A	
2.14 Crypto Management		1-A		1-A			1-A				2-A	
3.0 OPERATION PLANNING - SUPPORT TO PLANNING FOR NEXT PASS												
3.1 Calibration/Focus (also 2.10,4.3)		2-C			1-B	(2-B)			2-B			
3.2 Subsystem Mgmt. (also 4.4)	1-C	1-A			1-A				2-A			
3.3 Communication Mgmt. (also 2.8 & 4.6)		1-A		1-A	1-A				2-A			
3.4 Payload Expendable Mgmt.		1-A			1-A				2-A			
3.5 Weather Assessment			1-A				1-A				2-A	
3.6 Threat Assessment (also 7.1,9.7)				1-A			1-A				2-A	
3.7 STS Timeline, Maneuver Coordination		1-B			1-A				2-A			

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TEST AND DEMONSTRATION ANALYSIS AND ASSIGNMENT

FUNCTION \ TESTING PHASE	GROUND		PHASE 0		PHASE I				PHASE II			
	REAL	SIM	REAL	SIM	P/L		NON-P/L		P/L		NON-P/L	
					REAL	SIM	REAL	SIM	REAL	SIM	REAL	SIM
4.0 REAL TIME OPERATIONS												
4.1 System Pointing		1-C			1-B	(2-B)			2-A			
4.2 Quality Control					1-B	(2-C)			2-B			
4.3 Calibration (also 3.1)		2-C			1-B	(2-B)			2-B			
4.4 Subsystems Management (also 3.2)	1-C	(1-A)			1-A				2-A			
4.6 Communication Management (also 3.3)		1-A		1-A	1-A				2-A			
4.7 Manual Control of Payload Operation and Mode		1-A			1-A				2-A			
4.8 Real Time Targeting Modification (also 2.5)		1-A			1-C	(2-A)			2-A			
4.9 Appending Commentary	1-A	(1-A)		1-A			1-A	(2-B)			2-A	
4.10 Verify Sensor Readiness		1-B			1-A	(2-B)			2-A			
4.11 Manage Attitude System		1-B			1-A				2-A			
4.12 Verify Star Acquisition and Pointing Solution		1-B	1-B		1-A	(2-B)			2-A			
4.13 Visual Verification of Acquisition & Tracking (also 9.4)		1-B	1-B				1-A				2-A	
4.14 Adjust Tracking Conditions (IMC) (also 9.5)		1-B		1-C	1-B	(2-B)			2-A			
4.15 In Pass Retargeting		1-B			1-B	(2-B)			2-A			
4.16 ~~In-Pass-Weather-Deletion-of-Operation-~~ Deleted												
4.17 Tip Off Alert (also 5.3)	3-A	(3-A)					3-A				3-A	
4.18 Data Recording & Monitoring (also 6.3)	1-A	(1-A)		1-A			1-A				2-A	
4.19 In Pass Retargeting Due to Weather Conditions		1-A			1-B	(2-B)			2-A			
4.20 Emergency Shut Down Support	1-A	(1-A)			1-A	(2-A)			2-A			
4.21 Multi-Sensor Tasking		3-A			3-C	(3-B)			3-B	(3-A)		
5.0 EXPLOITATION												
5.1 Image/Signal Interpretation		1-C			1-C	(2-A)			2-A			
5.2 Interpret Product and Provide Comments (also 6.2)		1-C			1-C	(2-A)			2-A			
5.3 Tip Off Alert (also 4.17)	3-A	(3-A)					3-A				3-A	
5.4 Selection and Transmission of Images/Signals (Wide Band)		1-D			1-D	(2-C)			2-C			

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TEST AND DEMONSTRATION ANALYSIS AND ASSIGNMENT

FUNCTION \ TESTING PHASE	GROUND		PHASE 0		PHASE I				PHASE II			
	REAL	SIM	REAL	SIM	P/L		NON-P/L		P/L		NON-P/L	
					REAL	SIM	REAL	SIM	REAL	SIM	REAL	SIM
6.0 PERFORMANCE EVALUATION												
6.1 Reconnaissance Assessment		1-A			1-A	(2-A)			2-A			
6.2 Interpret Product - Provide Comments (also 5.2)		1-C			1-C	(2-A)			2-A			
6.3 Data Recording & Monitoring (4.18)	1-A	(1-A)			1-A	(2-A)			2-A			
6.4 ~~Status Monitoring~~ Deleted												
7.0 SPECIAL												
7.1 Threat Assessment & Analysis	3-A	(3-A)	3-A	(3-A)	3-A				3-A			
7.2 Sensor Aided Inspection		1-A			1-A	(2-A)			2-A			
7.3 Indication and Warning Alerts		1-B	1-B	(1-B)	1-B	(2-A)			2-A			
7.4 Unique Command & Control Capability		3-B	3-B	(3-A)			3-B	(3-A)			3-B	
7.5 Visual Inspection of Other Spacecraft		3-B	3-B	(3-A)			3-B	(3-A)			3-A	
7.6 Transmission to Unified & Specified Commands		3-C	3-C	(3-B)			3-C				3-C	
7.7 Remote Manipulation with Teleoperator Type System		3-B					3-B	(3-A)			3-B	
7.8 Space-to-Space Communication Assessment and Verification (Multi-millimeter W-length)		3-C					3-C				3-C	
7.9 Selective Spectrum Analysis of Events		3-B			3-C				3-B			
7.10 Transmission to Tactical Commanders		1-C					1-C				2-C	
7.11 Situation Monitoring		1-C	3-A	(1-B)	1-B	(2-A)	3-A		2-A		3-A	
8.0 MAINTENANCE												
8.1 Repair	1,2-A			1-A	1-A	(2-A)			2-A			
8.2 Replenishment (also 10.4)	1,2-A			1-A	1-A	(2-A)			2-A			
8.3 Fault Isolation		1,2-A		1-A	1-A	(2-A)			2-A			
8.4 Service (also 10.5)	1,2-A	(1,2-A)		1,2-A	1-A	(2-A)			2-A			
8.5 Correct Malfunctions (also 9.3)		1-A			1-A	(2-A)			2-A			

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TEST AND DEMONSTRATION ANALYSIS AND ASSIGNMENT

FUNCTION \ TESTING PHASE	GROUND		PHASE 0		PHASE I				PHASE II			
					P/L		NON-P/L		P/L		NON-P/L	
	REAL	SIM	REAL	SIM	REAL	SIM	REAL	SIM	REAL	SIM	REAL	SIM
9.0 CONTINGENCY (AS A RESULT OF C&W, MALFUNCTION OR THREAT)												
9.1 Contingency Management		1-A			1-A	(2-A)			2-A			
9.2 Stabilize Payload		3-C				3-C				3-C		
9.3 Diagnose & Correct Malfunction (also 8.5)		1-A			1-A	(2-A)			2-A			
9.4 Visual Verification of Acquisition of Tracking (Space-to-Space) (also 4.13)		1-B	1-B				1-A	(2-A)			2-A	
9.5 Adjust Tracking Condition (Space-to-Space) (also 4.14)		1-B		1-C	1-B	(2-B)			2-A			
9.6 ~~Contingency OPS Mode~~ Deleted												
9.7 Threat Assessment	3-A	(3-A)	3-A	(3-A)			3-A				3-A	
9.8 Space Defense Operations	3-A	(3-A)	3-A	(3-A)			3-A				3-A	
10.0 RECOVERY/DEBOOST												
10.1 Inspect Payload (also 2.4)	1-C	1-A		1-C	1-A				2-A			
10.2 Jettison Structures		1-A		1-C	1-A				2-A			
10.3 Safing/Shutdown		1-A		1-C	1-A				2-A			
10.4 Retrieval		3-C				3-C				3-C		
10.5 Replenishment (also 8.2)	1,2-A			1-A	1-A	(2-A)			2-A			
10.6 Service (also 8.4)	1,2-A	(1,2-A)		1,2-A	1-A	(2-A)			2-A			
10.7 Acquire with Manipulator		3-C		3-C		3-C				3-C		
10.8 Return to Payload Bay		3-C		3-C		3-C				3-C		
10.9 Secure Payload		3-C		3-C		3-C				3-C		
10.10 Deboost Payload		3-C		3-C		3-C				3-C		
10.11 Dump Propellant		1-A		1-B	1-A				2-A			
10.12 Test & Maintenance (Tools and Procedures) (also 2.7)		1-B		1-B	1-B	2-B			2-B			
10.13 Maneuver to Acquire		3-C		3-C		3-C				3-C		
10.14 Installation of Shroud or Cover	1-A	(1-A)	1-A	(1-A)	1-A				2-B			
10.15 Acquire with Teleoperator Type System		3-C		3-C		3-C				3-C		
10.16 Terminate MCC Interfaces		1-A		1-A	1-A				2-A			
11.0 ENTRY AND LANDING												
11.1 C&W Monitoring (also 1.1)	1-C	1-A		1-C	1-A				2-A			
11.2 On-Ground Payload Protection	1-A	1-A		1-B	1-A				2-A			

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FUNCTION/TEST PHASE CORRELATION

FUNCTION \ TESTING PHASE		GROUND		PHASE 0		PHASE I				PHASE II			
		REAL	SIM	REAL	SIM	P/L		NON-P/L		P/L		NON-P/L	
						REAL	SIM	REAL	SIM	REAL	SIM	REAL	SIM
Primary	A	11	30	2	15	35		5	1				
	B		13	4	7	18							
	C	9	7		8	6		1					
	D		1		3	1							
	[A]		8		1								
	[B]				2								
	[C]												
	[D]												
Subtotal		20/0	51/8	6/0	33/3	60/0	0/0	6/0	1/0	0/0	0/0	0/0	0/0
Secondary	A	5	1		2					48		8	
	B						3			11			
	C		4							1		1	
	D												
	[A]		2				24						
	[B]						11		1				
	[C]						2						
	[D]												
Subtotal		5/0	5/2	0/0	2/0	0/0	3/37	0/0	0/1	60/0	0/0	9/0	0/0
Tertiary	A	3	1	4		1		5		1	1	6	
	B		4	2				3		2		2	
	C		9	1	6	2		2			8	2	
	D												
	[A]		5		5				3				
	[B]				1		1						
	[C]				8								
	[D]												
Subtotal		3/0	14/5	7/0	6/6	3/0	0/9	10/0	0/3	3/0	9/0	10/0	0/0
TOTALS		28/0	70/15	13/0	41/9	63/0	3/46	16/0	1/4	63/0	9/0	19/0	0/0

NOTE: [ ] - Backup simulation or test

Total functions in all phases to be tested or simulated: 324/74

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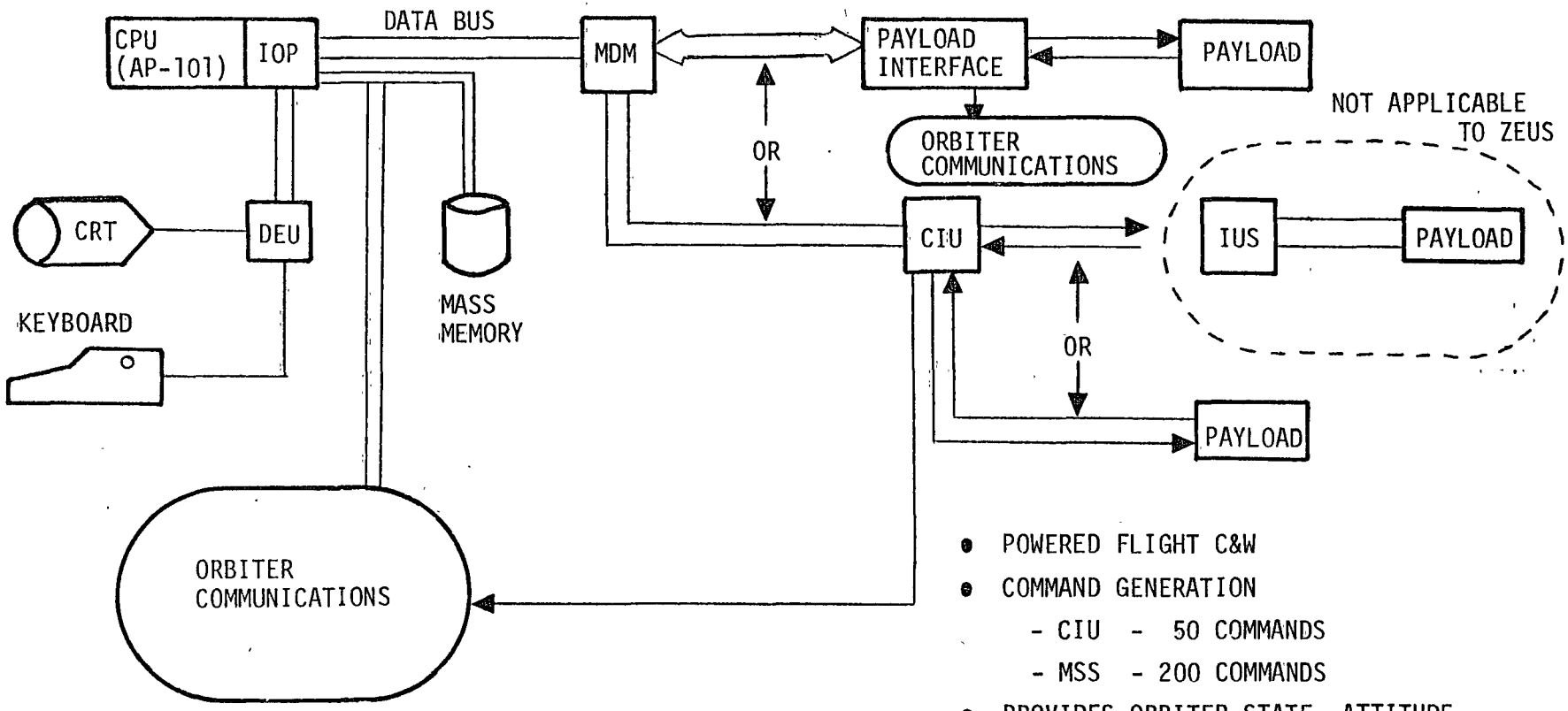
STS ONBOARD CONFIGURATIONS - BASIC MISSION SPECIALIST SUPPORT

MISSION SPECIALIST STATION AND/OR FRONT FLIGHT DECK



- POWERED FLIGHT C&W
- COMMAND GENERATION
  - CIU - 50 COMMANDS
  - MSS - 200 COMMANDS
- PROVIDES ORBITER STATE, ATTITUDE TO PAYLOAD

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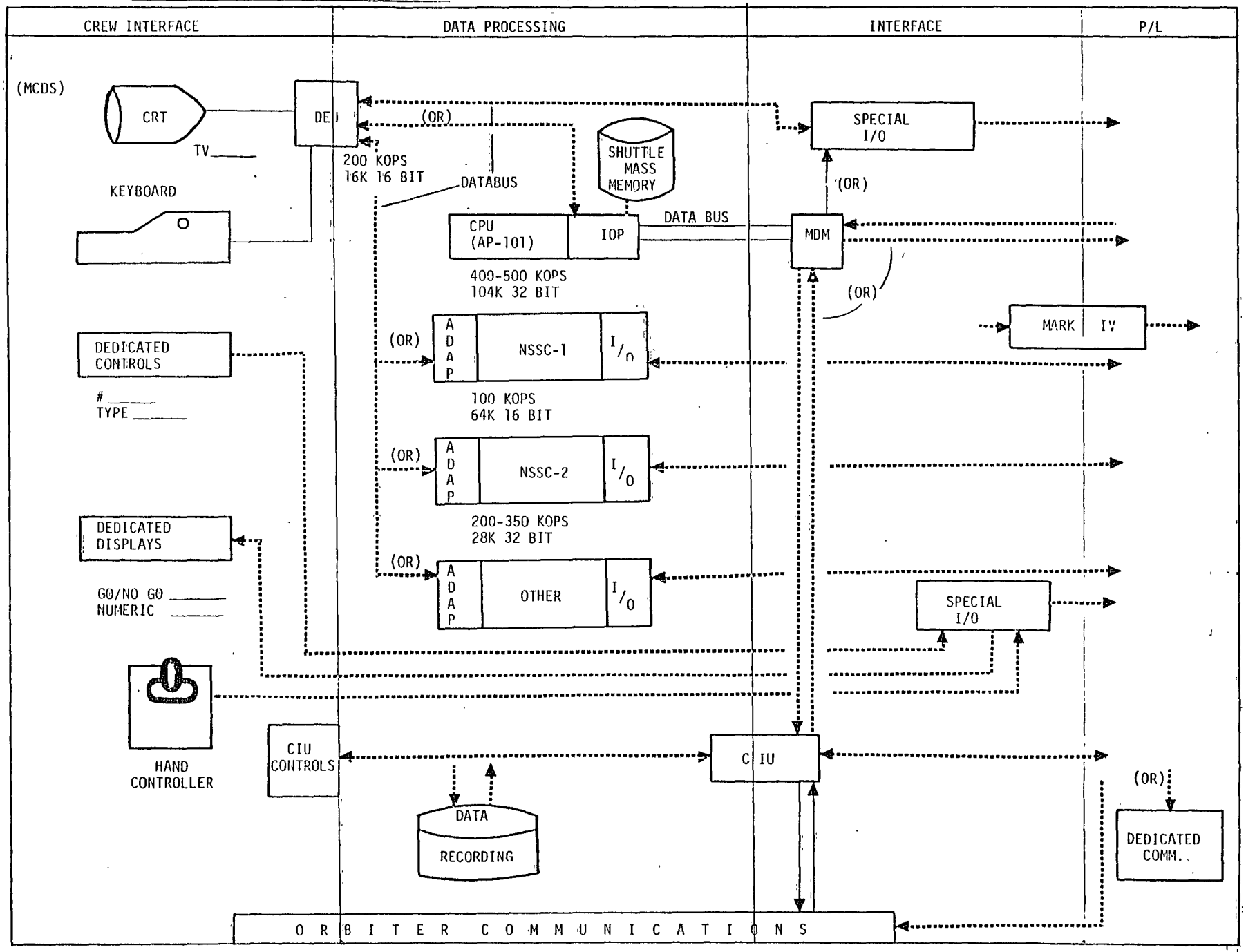
FUNCTION # _____
FUNCTION TITLE _____

- DEDICATED SUPPORT -



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APRIL MEETING OUTLINE

TASK 1 - DOCUMENT REVIEW AND ANALYSIS
- QUESTIONNAIRE RESULTS

TASK 4 - DEFINITION OF TEST AND DEMONSTRATION
- SUMMARY

TASK 5 - MANNED FUNCTION REQUIREMENTS
- PROGRESS

TASK 6 - STS USAGE
- PROGRESS

DISCUSSION AREAS

MANNED FUNCTIONS

- RATIONALE
- SELECTION

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