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CH/T STEP	PROCEDURE	PANEL	REMARKS
4.2 PRIME CREW PRELIMINE CHECKS			
4.2.1 INGRESS & STATUS CHECKS			
NOBF	DOO CREW PUMP - may be cycled from 0/1 to off (0/0) during crew ingress & checkout to maintain crew comfort.	2	Activation of secondary loop will warm suit circuit to 18-19°F. Secondary pump may be selected as on/off at option of flight crew for their comfort. Crew may be cold as vehicle is being pressurized by the coolant at this time.
4.2.1.1 CREW Ingress, LH Couch			
1/8	Ingress LH couch CREW COOL W/2 - open to P/A SHUT P/R - on (up) P/R - ARMED/LOCK	9	
NOBF	In SHUT FLOW via - OFF CREW 02 w/2 - open to P/R	0/1	Connect red to red and blue to blue. Suit hose interconnect removed from 04.
	In SHUT FLOW via - FULL FLOW CREW 02 w/2 - shut off & disconnect		P/A gas connector plugs installed. Ventilator removed from 04.
	Assist CREW in position; connections & adjustments completed		Restraints connected and tightened, and arm restraints and life vest adjusted. Helmet protector removed from 04.
	Verify we positions as follows: CREW P/R (Couch) - on (up) PUMP W/2 (3) - TEST P/R - central (locked) P/R ATT W/2 - P/RTS (0/0) P/R ATT P/RCS - ARMED (0/0)	2 8 1	Lever lock.

4.2.1.1

INGRESS & STATUS CHECKS

ORIG/T STEP	PROCEDURE	PANEL	REMARKS
118	<p>MSB ATT TPA - BATH CRB LCB TPA (2) - BATH CRB 2V 00 - LRA/CRB ALL ATTU - ALBU</p> <p>4.3.3.3 <u>IMP Ingress HI Check</u></p>	1	
119	<p>Ingress HI check IMP main tank - main to PMA SUIT PWR - as Capl PMA - AMPL/TORR</p>	4	
120B	<p>re: SUIT FLOW vls - 10V 10V AC vls - conn to 11A</p> <p>re: SUIT FLOW vls - FULL FLOW 10V AC vls - send ATT & disconnect</p>	4B	<p>Disconnect root to pot and plug to 11A. Suit main interconnect removed from CR.</p> <p>PMA gas connector plugs installed. Resistor removed from CR.</p>
	<p>Mount IMP in position; connections & adjustments completed</p> <p>Verify the following:</p>		<p>Resistor(s) energized and tightened, and amp curve, torque and life vent adjusted.</p>
121	<p>CPU DRIVING - ALL OLE PRESS - 2 ACS VEF ATT - CR LCP O2ID FLOW VLS 1000 - 1000</p>	4	
	<p>10A BOST - cr 10A BOST - cr CPU 4v VEF (book) - ALBU 2 40 AMP CRK A - cr 2 40 AMP CRK - CRB VEF 100 - 10V O2E PWR - 1000 SC 1 BOST - cr SC 2 BOST - cr</p>	1	

INPROG & SYSTEM CHECK

CALL/STEP	PROCEDURE	PAGE	REMARKS
<u>4.2.1.1 O2P Ingress Control Check</u>			
O2P	Ingress air check		
BCMP	O2P room amb - same to PIA SUIT PWR - on Capi PWR - AMB/TONE clr SUIT FLOW vlv - O2P O2P O2 amb - same to PIA	10 300	Connect red to red and blue to blue. Suit hose interconnect removed from OI.
	slr SUIT FLOW vlv - FULL FLOW O2P O2 vent - shut off & disconnect		PIA gas connector plugs installed. Ventilator removed from OI.
	Assist O2P in position; connections & adjustments completed		Repiratoris connected and tightened, and arm restra, torso and life vest adjusted. Injunt protector removed from OI.
	Perform full crew verification		Helmets, umbilicals, PIA diverter valves and wrist disseminets, foot restrainers, and life vests checked.
O2P	Verify the following PWRPT O2P - AUTO O/M O2P - BLOCK M2P O2P - START SUIT SCO ACCUM AUTO - 1 SUIT O2P2P AF 1st - 0.7-0.9 gald	2	
All	REF 84 VOL to 113 - as desired S 80 VOL to 113 - as desired	6,10,9	
OMP	SP TIM O2P - O2P	1	
O2P	SP TIM OI - BLOCK	2	
BCMP	PAD O2P - O2P	10	PAD O2P can be used after launch for intercom backup with PAD O2P VOL thumbwheel decreased.
	Retain OI		

4.2.1.1

INPROG & DENTUS CHECK

APOLLO CREW/MISSION HANDBOOK

98A-00-0000 15-0-101

NORMAL BACKUP

TEST STEP	PROCEDURE	PAGE	REMARKS
4.2.1.4 <u>ERG Checkout & Conditions Test</u>			Crew participation in ERG test is directed by ground personnel. Test requires ~50 minutes.
CRS	ch ERG (1) - check (verify)	8	
	ERG PAD - on (up)	7	
CRS	ERG AUTO - on (up)	2	
CRS	ABOVE in oper - verify	3	CRS will verify ABORT light operation as it is activated by ground.
CRS	UP THE CRG - OFF	3	
CRS	o ERG - OFF	9	CRS will participate in ERG test on PAD COMM.
	INTERCOM - OFF		
	VAR AN - OFF		
CRS	PAD COMM - OFF	6	
4.2.1.5 <u>Hatch Closed</u>			
-01:40:00			
CRS	Side hatch closing	Side hatch	
	Verify external tool stored on outside of hatch (tech)		
	Recess hatch seal protector (tech)		
	Verify safety pin has been removed from air handle sol. (tech)		
	Gear box sol - 8 (serv) (tech)		
	Air handle sol - 8 (serv) (tech)		
	ERG air handle - push (valve) (tech)		Squeeze handle to unlock.
	Verify piston chamber pressurized		

	If piston chamber is not pressurized		
	ERG charge No. 1 - CW (tech)		

ID#/Y STEP	PROCEDURE	PANEL	REMARKS
LMP	<p> Hatch open lock - rel (lock) Close hatch Push hatch in rear closed position (lock) Lock pin rel knob - BRLOCK (verify) Hold hatch closed Insert tool # (handle in P a'lock position) into external hatch activation socket, rot CW to stop & hold (lock) Press & hold LOCK PIS reset button Hold torque & remove tool # (lock) LOCK PIS reset button - rel LOCK PIS ind - red (red) (rel) (red) &/or white ind in opposite white red (rel & (k) (red)) ~~~~~ If lock pin is not engaged Insert tool # into external hatch activation socket & slowly rot CW until LMP verifies lock pin engagement (lock) ~~~~~ NOTE If RED lock pin is read =0.5 inch, lock pin has been sheared. GRN press ind - green (verify) </p>	<p>Close hatch</p>	<p> Obtain lock pin engagement. Mechanism should rotate ~1/4 rotation CW due to spring pressure. </p>

OBS/T STEP	PROCEDURE	PAGE	REMARKS
OBS	Configure hatch for rapid egress Gear box sol - U/LATCH Latch handle sol - U (unlatch) APC JETT knob - arrow on knob pointing to APC JETT decal	O/S-0 hatch	
-O/S-0/0	If rapid hatch opening req. refer to 5.1.1.1 Jett unlatch latched (O) - unseat & attach handle ends to HEC Gnd performs cab purge & hatch leak test Cab purge to 100 CO/100 O ₂ (launch atmosphere) Gnd performs hatch leak test <u>CAUTION</u> During this check, established SUITE/CAB AC should be maintained by DIRECT O/S via.	O/S verifies O/S/O ₂ ratio. Requires ~ 30 minutes.	
	4.2.1.6 <u>Change Launch Azimuth (if necessary)</u>		
	Key V188 FL V188 R24 X 00 launch azimuth X00.00 000 Key V215, load new azimuth 000 O/S FOR (both) - OFF	2	

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STA/T STEP	PROCEDURE	PANEL	REMARKS
4.2.1.7 <u>ISS Test Complete</u>			
-01:05:00			
CDR	Get snack before test		
	IFCDROOM - T/R	6	
	VER AN - T/R		
	C IN - T/R		
LEP	ISS COMM - T/R	6	
CDR	ISS PWR - OFF	1	
OMP	ISS AUTO - OFF (verify)	2	
	2 SSC OFF sw - ALSO (verify)		
	LV BATT sw - ALSO (verify)		
CDR	o/Pc Ind - ____S	1	
-01:11:00			
OMP	UP TLR 10 - BLOCK	2	
4.2.2 <u>FINAL VERIFICATION & SYSTEMS CHECKS</u>			
4.2.2.1 <u>ISS Verification</u>			
1. Core Pwr By			
	C/W HSBM - NORM		
	ISSG TRIP In (lock) - out		
CDR	FDL/OPI PWR - OFF	7	If FDLs are powered when ISSGs come up to speed, rate needles will oscillate full scale.
	SEDC PWR - OFF/ACK		
	ISSG PWR (lock) - ON		
	FDL/OPI PWR - NORM		
OMP	C/W HSBM - ACK	2	
2. SSC Rlgs			
CDR	FDL SEL - 1	1	
	POST SOURCE - ATT OFF		

4.2.2.1

FINAL VERIFICATION & SYSTEMS CHECKS



SNA'S STEP	PROCEDURE	PANEL	REMARKS
CDB	ATT CRT to (1) - 0 100°, P 90°, Y 0° CSC ALIGN pb - push FINAL 1 - var null ATT CRT to (1) - 0 100°, P 0°, Y 90° FINAL 1 - full scale var (verify) 0 right, P up, Y right FINAL DEL - 0	1	These are nominal angles for a 12" search antenna and agree with preliminary TCP. Only roll is affected by a variable search antenna.
CDB	FINAL 2 - Ind same as FINAL 1 (verify)	2	
CDB	CSC ALIGN pb - push	1	
CDB	FINAL 2 - var null	2	
CDB	ATT CRT to (1) - 0 100°, P 90°, Y 0°	1	
CDB	FINAL 2 - full scale var (verify) 0 left, P down, Y left	2	
CDB	FINAL DEL - 1	1	
CDB	FINAL 1 - Ind same as FINAL 2 (verify)	2	
CDB	CSC ALIGN pb - push	1	
CDB	FINAL 1 - total ant (verify) 0 00°, P 90°, Y 0°	1	
CDB	<u>NOTES</u>		
CDB	Sequences in SDCS should be deactiviated to provide an inadvertent start.		
CDB	SDCS FTSO ADM (2) - SRPE (verify)	5	Lower lock.
CDB	SDCS LOGIC (2) - OFF (verify)	5	Lower lock.

STA/T STEP	PROCEEDS	PAGE	REMARKS										
4.2.2.2	Gibal Drive & Trim Check		<p>Verifies trim control and manual (MYTC) control capability of primary and secondary gibal control system. DFO gibal angle settings based on CRB e.g. and vary with propeller loading.</p> <p>PITCH and TRIM CRIB, caution/warning lights (panel 2) indicate overcurrent to gibal motors. Otherwise, no indication to crew, except for switch selection, that a gibal motor not operating or auto switchover (TRD-CV) has taken place.</p> <p>CRIB POC indicator response opposite to RBC commands as follows:</p> <table border="0" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><u>CRB</u></td> <td style="text-align: center;"><u>TRB</u></td> </tr> <tr> <td style="text-align: center;">= Pitch</td> <td style="text-align: center;">= Pitch</td> </tr> <tr> <td style="text-align: center;">= Pitch</td> <td style="text-align: center;">+ Pitch</td> </tr> <tr> <td style="text-align: center;">= Trim</td> <td style="text-align: center;">= Trim</td> </tr> <tr> <td style="text-align: center;">= Trim</td> <td style="text-align: center;">+ Trim</td> </tr> </table>	<u>CRB</u>	<u>TRB</u>	= Pitch	= Pitch	= Pitch	+ Pitch	= Trim	= Trim	= Trim	+ Trim
<u>CRB</u>	<u>TRB</u>												
= Pitch	= Pitch												
= Pitch	+ Pitch												
= Trim	= Trim												
= Trim	+ Trim												
1	Initialization PC on as listed (verify)												
LUP	PC HMA 1 & 2 - ON, 3 - OFF PC HMA 1 & 2 tk - gray, 3 tk - bp	5	Fuel cells are placed on main buses by crew prior to primary TRD check per ground crew instructions.										
	PC HMA 1 & 2 - OFF, 3 - ON PC HMA 1 & 2 tk - bp, 3 tk - gray		Gray indicates fuel cells 1 and 2 connected to main bus A; barber pole indicates fuel cell 3 disconnected from main bus A.										
	MR BUS T18 (2) - on (up)	5	Barber pole indicates fuel cells 1 and 2 disconnected from main bus B; gray indicates fuel cell 3 connected to main bus B.										
CRB	CRB TRC (2) - MAIN CRB (verify)	1											



STATE STEP	PROCEDURE	PANEL	REMARKS
LANDING			
More than 1 hr of coast is on-time for TWC SERVO PMS 1 or 2 or may be detrimental to CPU gmbd activities.			
1 CM	TWC SERVO PMS 1 - ACTION TWC SERVO PMS 2 - HOLD/NO LP IN/OFC to - GFI (entry) SSC 2 - INNO	2 1	
2	Trim TWC Check GNL ROT F1, F2 - ORBIT Confirm trim cost on indicator CPU GNL to (2) - 4 - SSC 2 - perform MWC check		ORBIT position is momentary. Check CPU gimbal motion sequentially at 1-second intervals to avoid power surge. For ground checks, CPU MFC F1/F2 or TWC are the equivalent of flight trim GNL ROT F or Y. Gimbal drive in response to CPU pitch and yaw thumb- wheel movement. Verify primary gimbal trim control. Gimbal drive in response to SSC movement, and return to set-in motion when SSC is neutral. Verify primary MWC loops.
3	Sec TWC Check sec TWC (2) - AUTO GNL ROT F2, F2 - ORBIT SSC - CM Confirm trim cost on indicator CPU GNL to (2) - 4 - SSC 2 - perform MWC check		Verify secondary gimbal trim control. Verify secondary MWC loops.

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DETAILED STEP	PROCEDURE	PAGES	REMARKS
CDR Verify no RTVC TIC = read DPS DBL to (2) - P ____°, I ____° DBL NOT FL, EI - OFF RSC PWR NORM 2 - AC/DC RSC 2 - LOCKED	k Radio Switchover Check DBL NOT IN, IS - OFF DBL NOT FL, EI - OFF RSC PWR NORM 2 - AC/DC RSC 2 - LOCKED	1 3 1 1	Shut off gimbal motors sequentially to avoid a power surge. Gimbals are trimmed to thrusting values. These values are derived from Operational Trajectory, Table VIIIa, and include gimbal offset of ____ in pitch and ____ in yaw from spacecraft axis.
LMP CDR	NO SLS TIC (2) - OFF, then ALEX TWO SERVO PWR (both) - OFF BY 120/DPS as - 221/SERVO	3 1	
	4.2.2.3 <u>FDI Verification</u> FDI Ind - 1/0 FDI SOURCE - DAC FDI 1 - total alt R 0°, P 30°, I 0°		FDI 2 is drifting as a function of earth rate.
	4.2.2.4 <u>RSI Test & Setup</u> RSI ROLL - on [up] CSC ALIGN pb = push & hold RPT SEP YAW to - adj thru 45° angle, observe RSI tracks = 45°, then adj until RSI points up CSC ALIGN pb = rel RSI ROLL - OFF		For ground checks, RSI RAI is the equivalent of flight term RSI. Avoid FDI gimbal lock region.

4.2.2.4

FDI VERIFICATION & SYSTEM CHECKS

DELT/STEP	PROCEDURE	PANEL	REMARKS
CSB	Align CDC to IM		Ensures that CDC is aligned to actual IM angles, rather than calculated values. Attitude reference comparison (in orbit) will be more accurate.
	FDWI SEL - 1 FDWI SOURCE - ATT DCT	1	Constraint: If LSC is on, an overload in IMI sensitive circuitry may cause an SCW oscillation and trigger IMI warning light. (Reference SCM 8001-01379-206.) FDWI must be used as a fail meter in this mode of operation. If not, large errors will result because of impedance mismatch.
	ATT DCT - IMI ATT DCT to (3) - wait FDWI 1 err ATT DCT - CDC CDC ALARM ps - push FDWI SOURCE - CDC FDWI SEL - 1/1		
	<u>4.2.2.5 IMI Prog.</u>		
	Set IMI IF IMI MODE - ATD (warning) IMI FUNC - AV DCT Set IM Ind - 4999.9 Tps IMI FUNC - AV		
-33.00			
CSB	C/A 8004 - 8007	2	Inhibits master alarm light on panel 1.
1.87	Cont head av - DCT, hold until advised to rel		
	UP TLR CSB - 8008	3	

TIME/T STEP	PROCEDURE	PANEL	REMARKS
	4.2.2.6 <u>End Abort Routine</u>		
	<u>WARNING</u>		
	After pad abort enbl, oper of THE - OTW will suit an abort.		
04:00			
0400	SEC PYRO - on (cap)	7	
0400	Clear box sel - LAFCS	SIDE SWITCH	
	Actr handle sel - U (unlock)		
	(verify)		
0400	Shoulder harness - locked		
0400	ON RCS LOGIC - on (cap)	1	
	ch RCS ARM (2) - close	8	
	ch RCS LOGIC (2) - close		
	RCS LOGIC (both) - on (cap)		Lever lock.
	Report Logic arm		
	After GO from STC		
	SEC PYRO ARM (2) - on (cap)		Both lever lock pyro arm switches must be operated, LSC pad abort capability enabled, RCS LOGIC and PYRO buses are armed.
04:00			
0400	IS FANS (both) - off (ctr)	2	
	OS FANS (both) - off (ctr)		
	4.2.2.7 <u>ON RCS Isolation</u>		
04:00	ON RCS Is 1 (4) - OPEN		OPEN position is necessary.
	ON RCS Is 1 (4) - GRAY		Gray indicates primary He isolation valves open.
	ON RCS Is 2 (4) - OPEN		OPEN position is necessary.
	ON RCS Is 2 (4) - GRAY		Gray indicates secondary He isolation valves open.

STA/T STEP	PROCEDURE	PANEL	REMARKS
00P	000 100 sel - ON A, B, C, D 00 000 000 FUEL PRESS Ind - 100-200 psia	3	Check pressure with 000 100 selector positioned at ON A, B, C, and D in turn.
	00 000 000 FUEL PRESS (A) - close		CLOSE position is mandatory. No backlocks. ACK and confirm valves closed.
	00 000 000 FUEL (A) - OPEN		OPEN position is mandatory. Open IC isolation valves.
	00 000 000 FUEL (B) (A) - OPEN		Open indicates primary fuel and oxidizer isolation valves open.
	00 000 000 FUEL (B) (B) - OPEN		Open indicates secondary fuel and oxidizer isolation valves open.
	4.2.2.8 00 000 00000 Check		
	000 100 sel - ON A, B, C, D 00 000 000 TWT Ind - sel		00 000 buttons are not operated on pad or firing assist to reduce effects of heat loading on package temperature. Ambient temperature <10° or >20°° will cause 00 100 status lights to come on.
	00 000 00 FUEL PRESS Ind - 4000-4500 psia		Monitor to load 4150 psia at TWP. Pressure and temperature excursions are due to ambient conditions.
	00 000 000 FUEL PRESS Ind - 150-200 psia		Primary fuel pressure initially shown for each quad until secondary 0000 position or 00 000 A (B, C, D) 000 FUEL PRESS switch selected.
	00 000 100 sw - No TX TWP 00 000 00 TX TWP Ind - 60°-80°° 00 000 100 sw - FUEL QTY 00 000 000 FUEL QTY Ind - 1000 000 100 sel - ON 3		

FINAL VERIFICATION & SERVICE CHECK

STATION STEP	PROCEDURE	PANEL	REMARKS
	4.2.3 LAUNCH PREPARATION		
1-29-00 OMP	Change launch azimuth (if necessary) Key VTRF PL 900 000 X 04 launch azimuth 000.00 DEG Key VTRF, load core azimuth PRO align OMC to IMU, 4.2.3	2	
1CB	PDRI SEL - 1 PDRI SOURCE - ATT OMT ATT OMT - IMU ATT OMT SW (X) = null PDRI 1 err ATT OMT - OMC OMC ALIGN ph = pass PDRI SOURCE - OMC PDRI SEL = 1/2 AUTO RCS A/E HOLD (A) - OFF (verify) AUTO RCS B/D HOLD B1 & B2 - HOLD AUTO RCS B/D HOLD B3 & B4 - HOLD AUTO RCS PITCH A3 & A4 - HOLD AUTO RCS PITCH C3 & A4 - HOLD AUTO RCS YAW B3 & B4 - HOLD AUTO RCS YAW B1 & B4 - HOLD	1	Ensures that OMC is aligned to actual IMU angles, rather than calculated values. Attitude reference comparison (in orbit) will be more accurate. CONSTRAINT: If OMC is on, an overload in IMU resolver circuitry may cause an EODS oscillation and trigger ISS warning light. (Reference OCM 0000-0130-016.1) PDRI must be used as a null meter in this mode of operation. If not, large errors will result because of impedance mismatch.
		8	

4.2.3

LAUNCH PREPARATION

SEA/T STEP	PROCEDURE	PANEL	REMARKS
LAP	NAV C voltage = _____ Volts	3	
DC	DC 1RD sel - 000		
CRB	PMAI 1 - Initial sel. $R = \frac{a}{b}, P = \frac{c}{d}, T = \frac{e}{f}$ MAGN INDEX: $ \phi = \text{MAGN } 1$	1	PMAI 2 is drifting as function of earth rate. This position provides most reliable configuration in event a roll gyro fails during launch.
	PMAI 200LE - 1/5		Roll attitude error is scaled in PFI assuming PMAI 1 is in 50/15/50/10 position. Until this position is selected at 101:50, roll full scale deflection will be 20°, not 15° as position indicates.
	RATE - 01 RSC (Lock) - 0000 RSC PWR DIS (Lock) - 000/000 CSC 0000 - 0000 TSC 000 - on (up)		
LAP	C 40 - OFF	6	
CRB	YAP 00 - OFF	9	
ALL	Perform air-to-ground valve check with 0001		
LAP	Z 00 - 7/8	6	
CRB	YAP 00 - 1/8	9	
	SPD THRUST - 0000 AT THRUST (2) - OFF a/Ro 1RD 00 - 0	1	lever lock, latched.
CRB	CSC AUTO - on (up) LA 0000 00 - AUTO C 000 OUT 00 - AUTO CSC 000 - OFF	3	OFF position is momentary.
CRB	THE DEVO PMAI 1 - AC1/000 THE DEVO PMAI 2 - AC1/000	7	
-10:00			
LAP	FC 0000 VL00 - LATCH	1	

LAUNCH PREPARATION

STEP/STEP	PROCEDURE	PAGE	REMARKS
110-10			
110-11	GET SLICK ps - 1000, 1004	10	
110-12	PMB 2 total all - no motion	10	
110-13	GET SLICK ps - 101	10	
	<p style="text-align: center;">TABLE OF CONTENTS</p> <p style="text-align: center;">Refer to Appendix B for crew positions positions at job listoff.</p>		