

Declare RWL assembly operational
File: H_FCP_AOC_4R14.xls
Author: dsalt-hp



Procedure Summary

Objectives

The objective of this Herschel ACMS procedure is to prepare the reaction wheel assembly for normal operations in SCM.

The procedure involves the following activities:

- verify ACMS status and pointing
- verify LCL configuration
- switch-on of all 4 RWLs
- run-in RWLs, if necessary
 - modify RCS control parameters in OBDB
 - check updated OBDB value via dump
- run-in RWLs (calls H_FCP_AOC_4R34)
 - monitor wheel parameters during run-in
 - WAIT for initial run-in criteria to be met
 - STOP biasing
 - restore RCS control parameters in OBDB
 - check updated OBDB value via dump
- RWLs target momentum for SCM (calls H_FCP_AOC_4R34)
- check wheel parameters

It is intended for use during the early mission prior to the first entry in SCM.

The procedure consists of the following major actions:

1. Powering the wheels.
2. Run-in to achieve uniform distribution of lubricant on wheel bearings.

The procedure installs the nominal configuration of the RWS assembly with all four units simultaneously in use.

Summary of Constraints

ACMS must be pointing in OCM

Spacecraft Configuration

Start of Procedure

ACMS in OCM with all RWL's unpowered

End of Procedure

ACMS in OCM will RWL's powered and ready for use in SCM

Reference File(s)

Input Command Sequences

Output Command Sequences

HFA4R14A
HFA4R14B
HFA4R14C
HFA4R14D

Referenced Displays

ANDs GRDs SLDs

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ZAA01999 ZGZ07999 (None)
 WALC3584 (in SCM only)
 ZAA00999
 ZAA02999
 ZAZ61999
 ZAZ66999
 ZAA04999
 ZAA05999

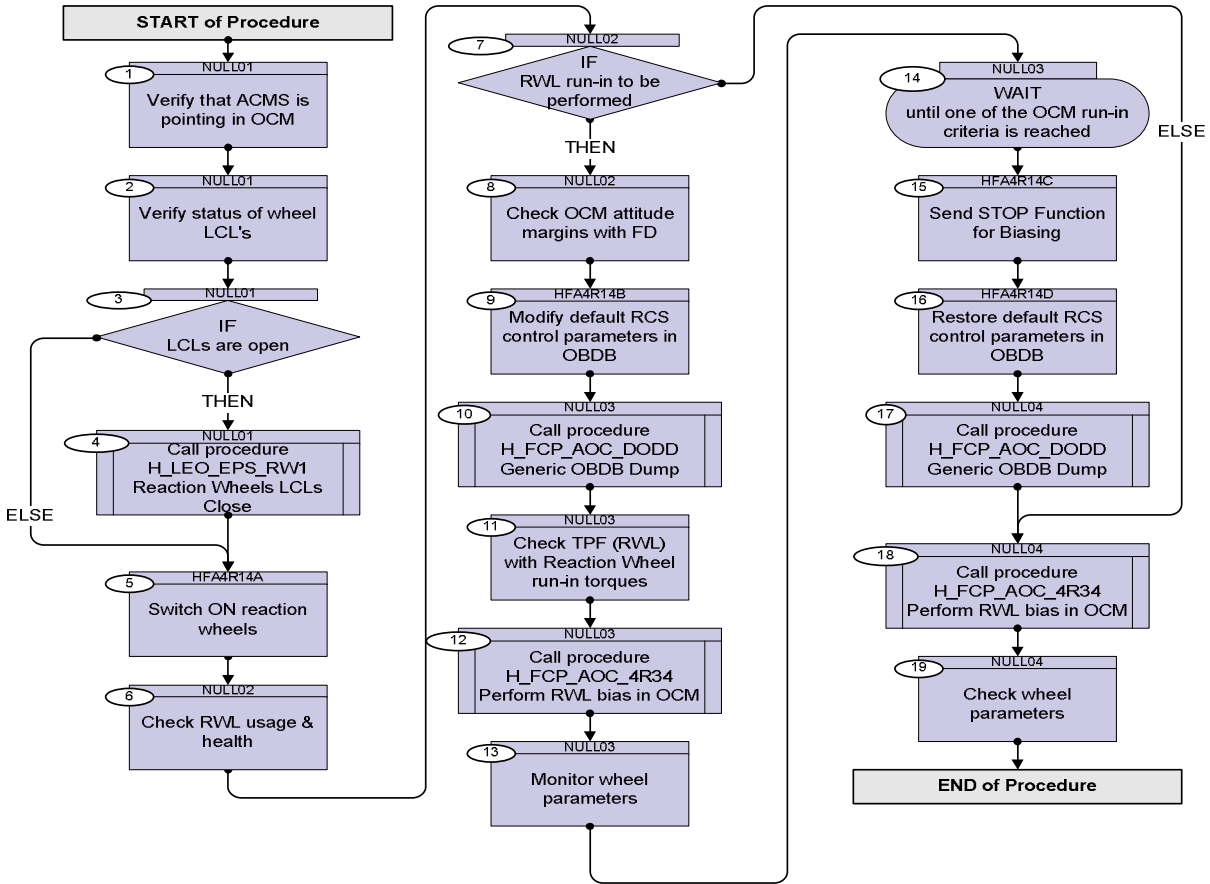
Configuration Control Information

DATE	FOP ISSUE	VERSION	MODIFICATION DESCRIPTION	AUTHOR	SPR REF
03/08/08	1	1	Created	dsalt-hp	
27/11/08	2	2	Sequece names and allocations rationalised and expanded.	dsalt-hp	
23/03/09		3	Updated for new run-in scenario, as per Section 3.3.16 of H-P-4-DS-MA-002 (Issue 2, Rev.5)	dsalt-hp	
23/03/09	2.2	4	Attitude check added at Step 8, as per constraints stated in Section 3.3.16 of H-P-4-DS-MA-002 (Issue 2, Rev.5)	dsalt-hp	

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Procedure Flowchart Overview



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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
Beginning of Procedure				
TC Seq. Name : NULL01 (Null Sequence 01)				
TimeTag Type: Sub Schedule ID: □				
1		Verify that ACMS is pointing in OCM		Next Step: 2
		Verify Telemetry AcmsMode AESMG002	= OCM	AND=ZAA01999
		Verify Telemetry AcmsSubstate AESMF002	= OCM Pointing	AND=ZAA01999
		Verify Telemetry AcmsMain AID AESM3002	= OCM pnt coarse	AND=ZAA01999
2		Verify status of wheel LCL's		Next Step: 3
		Verify Telemetry Status LCLs 55 WD055565	= ON	(None)
		Verify Telemetry Rwl_1_L55_1S WM22F565	= ON	AND=WALC3584
		Verify Telemetry Rwl_1_L55_2S WM22L565	= ON	AND=WALC3584
		Verify Telemetry Status LCLs 56 WD056565	= ON	(None)
		Verify Telemetry Rwl_2_L56_1S WM92F565	= ON	AND=WALC3584
		Verify Telemetry Rwl_2_L56_2S WM92L565	= ON	AND=WALC3584
		Verify Telemetry Status LCLs 57 WD057565	= ON	(None)
		Verify Telemetry Rwl_3_L57_1S WM12F565	= ON	AND=WALC3584
		Verify Telemetry Rwl_3_L57_2S WM12K565	= ON	AND=WALC3584
		Verify Telemetry Status LCLs 58 WD058565	= ON	(None)
		Verify Telemetry Rwl_4_L58_1S WMA2F565	= ON	AND=WALC3584
		Verify Telemetry Rwl_4_L58_2S WMA2K565	= ON	AND=WALC3584

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
3		IF LCLs are open		Next Step: THEN 4 ELSE 5
4		Call procedure H_LEO_EPS_RW1 Reaction Wheels LCLs Close		Next Step: 5
		Execute Procedure: H_LEO_EPS_RW1 Reaction Weels LCLs Close		
TC Seq. Name :HFA4R14A (Switch-on RWLs) TimeTag Type: Sub Schedule ID: <input type="checkbox"/>				
5		Switch ON reaction wheels		Next Step: 6
5.1		Switch on RWL1		<input type="checkbox"/>
		Execute Telecommand <div style="text-align: right;">RWL-1 ON</div> ACZ48109 Command Parameter(s) : UnitSw DF86 Cmd AH8F1001 Enable 86 UnitSw DD86 Cmd AH8F2001 Enable 86 TC Control Flags : <div style="text-align: right;">GBM IL DSE --Y -- --</div> Subsch. ID : 20 Det. descr. : TC(8,1) Switch ACMS unit on/off - RWL-1 ON		
		Execute Telecommand <div style="text-align: right;">FireSwitchACMSunitONOFF</div> ACZ1M109 Command Parameter(s) : FireFun DF86Cmd AH8F1001 Enable 86 FireFun DD86Cmd AH8F2001 Enable 86 TC Control Flags : <div style="text-align: right;">GBM IL DSE --Y -- --</div> Subsch. ID : 20 Det. descr. : TC(8,4) Fire Command - FireSwitchACMSunitONOFF		
		Wait 30 seconds to allow wheel power status to be reflected in essential TM		

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry RWL1 power AE4P3002	= ON	AND=ZAA00999
		Verify Telemetry Rwl_1_L55_I WM211565	> 0.1 < 0.2 A	AND=WALC3584
		LCL current should be consistent with steady state power consumption expected for the RWL's (between 0.1 and 0.2 A).		
5.2		Switch on RWL2		□
		Execute Telecommand RWL-2 ON Command Parameter(s) : UnitSw DF86 Cmd AH8P1001 Enable 86 UnitSw DD86 Cmd AH8P2001 Enable 86 TC Control Flags : GBM IL DSE --Y -- --- Subsch. ID : 20 Det. descr. : TC(8,1) Switch ACMS unit on/off - RWL-2 ON	ACZ50109	
		Execute Telecommand FireSwitchACMSunitONOFF Command Parameter(s) : FireFun DF86Cmd AH8F1001 Enable 86 FireFun DD86Cmd AH8F2001 Enable 86 TC Control Flags : GBM IL DSE --Y -- --- Subsch. ID : 30 Det. descr. : TC(8,4) Fire Command - FireSwitchACMSunitONOFF	ACZ1M109	
		Wait 30 seconds to allow wheel power status to be reflected in essential TM		
		Verify Telemetry RWL2 power AE4P4002	= ON	AND=ZAA01999
		Verify Telemetry Rwl_2_L56_I WM911565	> 0.1 < 0.2 A	AND=WALC3584
		LCL current should be consistent with steady state power consumption expected for the RWL's (between 0.1 and 0.2 A).		
5.3		Switch on RWL3		□

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Execute Telecommand RWL-3 ON <i>Command Parameter(s) :</i> UnitSw DF86 Cmd AH8P1001 UnitSw DD86 Cmd AH8P2001 <i>TC Control Flags :</i> GBM IL DSE --Y -- --- <i>Subsch. ID : 20</i> Det. descr. : TC(8,1) Switch ACMS unit on/off - RWL-3 ON	ACZ52109 Enable 86 Enable 86	
		Execute Telecommand FireSwitchACMSunitONOFF <i>Command Parameter(s) :</i> FireFun DF86Cmd AH8F1001 FireFun DD86Cmd AH8F2001 <i>TC Control Flags :</i> GBM IL DSE --Y -- --- <i>Subsch. ID : 20</i> Det. descr. : TC(8,4) Fire Command - FireSwitchACMSunitONOFF	ACZ1M109 Enable 86 Enable 86	
		Wait 30 seconds to allow wheel power status to be reflected in essential TM		
		Verify Telemetry RWL3 power AE4P5002	= ON	AND=ZAA01999
		Verify Telemetry Rwl_3_L57_I WM111565	> 0.1 < 0.2 A	AND=WALC3584
		LCL current should be consistent with steady state power consumption expected for the RWL's (between 0.1 and 0.2 A).		
5.4		Switch on RWL4		□
		Execute Telecommand RWL-4 ON <i>Command Parameter(s) :</i> UnitSw DF86 Cmd AH8P1001 UnitSw DD86 Cmd AH8P2001 <i>TC Control Flags :</i> GBM IL DSE --Y -- --- <i>Subsch. ID : 20</i> Det. descr. : TC(8,1) Switch ACMS unit on/off - RWL-4 ON	ACZ54109 Enable 86 Enable 86	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Execute Telecommand FireSwitchACMSunitONOFF Command Parameter(s) : FireFun DF86Cmd AH8F1001 FireFun DD86Cmd AH8F2001 TC Control Flags : GBM IL DSE --Y -- --- Subsch. ID : 20 Det. descr. : TC(8,4) Fire Command - FireSwitchACMSunitONOFF	ACZ1M109 Enable 86 Enable 86	
		Wait 30 seconds to allow wheel power status to be reflected in essential TM		
		Verify Telemetry RWL4 power AE4P6002	= ON	AND=ZAA01999
		Verify Telemetry Rwl_4_L58_I WMA11565	> 0.1 < 0.2 A	AND=WALC3584
		LCL current should be consistent with steady state power consumption expected for the RWL's (between 0.1 and 0.2 A).		
TC Seq. Name :NULL02 (Null Sequence 02) TimeTag Type: Sub Schedule ID: <input type="checkbox"/>				
6		Check RWL usage & health		Next Step: 7
		The logic is the same as for the gyros, but for the wheels the power status has to be checked as well.		
		Verify Telemetry Curr RWLs use AES21002	= RWL 1-2-3 = RWL 1-2-3-4 = RWL 1-2-4 = RWL 1-3-4 = RWL 2-3-4	AND=ZAA01999
		Verify Telemetry RWL1 Health Sts AES45002	= Healthy	AND=ZAA02999
		Verify Telemetry RWL2 Health Sts AES46002	= Healthy	AND=ZAA02999
		Verify Telemetry RWL3 Health Sts AES47002	= Healthy	AND=ZAA02999
		Verify Telemetry RWL4 Health Sts AES48002	= Healthy	AND=ZAA02999

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
7		IF RWL run-in to be performed		Next Step: THEN 8 ELSE 18
8		Check OCM attitude margins with FD		Next Step: 9
		<p>***** WARNING *****</p> <p>Given that the new gains for OCM control used during the run-in increase the limit cycle to 1.5 degrees half-cone, the pointing selected must leave at least 3 deg margin with the edge of the Operational Zone</p>		
		<p>CHECK with Flight Dynamics that the attitude has sufficient margin to ensure safe pointing with the modified OCM control gains used in the next step.</p> <p>IF: Current attitude has insufficient margine</p> <p>THEN: Perform OCM pointing via procedure H_FCP_AOC_0OCM</p> <p>ELSE: Continue</p>		
<p>TC Seq. Name :HFA4R14B (ModifyRCSdefOBDB)</p> <p>TimeTag Type: N</p> <p>Sub Schedule ID:</p> <p><input type="checkbox"/></p>				
9		Modify default RCS control parameters in OBDB		Next Step: 10
9.1		Activate update		<input type="checkbox"/>

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Execute Telecommand <p style="text-align: center;">Start database loading</p> Command Parameter(s) : ASW Function ID AHFUN001 DbLoad DF86 Cmd AH8D1001 DbLoad DD86 Cmd AH8D2001 DbLoad Nr Cmds AHFDL001 TC Control Flags : <p style="text-align: right;">GBM IL DSE --Y -- ---</p> Subsch. ID : 20 Det. descr. : TC_START_DATABASE_LOAD	ACDS1001 DB loading (Def) Enable 86 Enable 86 5 <dec>	
9.2		Load OCM control gain (KD2) in OBDB		□
		Execute Telecommand <p style="text-align: center;">Load databaseReal</p> Command Parameter(s) : DbLoad DF86 Cmd AH8D1001 DbLoad DD86 Cmd AH8D2001 DbLoad StartInd AHFDS001 DbLoad Nr Wrds AHFDN001 DbLoad Dwd Real AHFDZ001 DbLoad Dwd Real AHFDZ001 DbLoad Dwd Real AHFDZ001 TC Control Flags : <p style="text-align: right;">GBM IL DSE --Y -- ---</p> Subsch. ID : 20 Det. descr. : TC(8,4) - Load database Real	ACZTY109 Enable 86 Enable 86 403 <dec> 3 <dec> 0.5 <dec> 0.5 <dec> 0.5 <dec>	
9.3		Load OCM control gain (KI2) in OBDB		□
		Execute Telecommand <p style="text-align: center;">Load databaseReal</p> Command Parameter(s) : DbLoad DF86 Cmd AH8D1001 DbLoad DD86 Cmd AH8D2001 DbLoad StartInd AHFDS001 DbLoad Nr Wrds AHFDN001 DbLoad Dwd Real AHFDZ001 DbLoad Dwd Real AHFDZ001 DbLoad Dwd Real AHFDZ001 TC Control Flags : <p style="text-align: right;">GBM IL DSE --Y -- ---</p> Subsch. ID : 20 Det. descr. : TC(8,4) - Load database Real	ACZTY109 Enable 86 Enable 86 409 <dec> 3 <dec> 0.0008 <dec> 0.0008 <dec> 0.0008 <dec>	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Execute Telecommand <div style="text-align: right;">Load databaseReal</div> Command Parameter(s) : DbLoad DF86 Cmd AH8D1001 Enable 86 DbLoad DD86 Cmd AH8D2001 Enable 86 DbLoad StartInd AHFDS001 74 <dec> DbLoad Nr Wrds AHFDN001 1 <dec> (Def) DbLoad Dwd Real AHFDZ001 0.1 <dec> TC Control Flags : <div style="text-align: right;">GBM IL DSE --Y -- ---</div> Subsch. ID : 20 Det. descr. : TC(8,4) - Load database Real	ACZTY109	
9.7		Activate new values with the fire command		<input type="checkbox"/>
		Execute Telecommand <div style="text-align: right;">Fire critical command</div> Command Parameter(s) : FireFun DF86Cmd AH8F1001 Enable 86 FireFun DD86Cmd AH8F2001 Enable 86 FireFun CritFID AHFFH001 201 <dec> TC Control Flags : <div style="text-align: right;">GBM IL DSE --Y -- ---</div> Subsch. ID : 20 Det. descr. : TC_FIRE_COMMAND	ACFC1001	
TC Seq. Name : NULL03 (Null Sequence 03) TimeTag Type: N Sub Schedule ID: <input type="checkbox"/>				
10		Call procedure H_FCP_AOC_DODD Generic OBDB Dump		Next Step: 11
		NOTE: This procedure enables a direct dump of the OBDB from RAM or Safe-Guard Memory (SGM), as well as reading the OBDB via diagnostic telemetry (DTM) packets		

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		<p><u>Relevant details for use with H FCP AOC DODD</u></p> <p>Based upon the latest ASW ICD (H-P-4-TASW-IF-0002, Issue 3 G), this procedure loads the following parameters into specific OBDB offset locations in RAM:</p> <p>H_NOM_AUX_ASW_R_UNLOAD_TORQUE is at offset 77</p> <p>H_NOM_RCS_BIAS_THRESHOLD is at offset 74</p> <p>H_OCM_CTRL_ASW_GAIN_KD_2_*_1 is at offset 403-405</p> <p>H_OCM_CTRL_ASW_GAIN_KI_2_*_1 is at offset 409-411</p> <p>H_OCM_CTRL_ASW_GAIN_KP_2_*_1 is at offset 415-417</p> <p>These are located in Block 1 & 2 of the OBDB</p> <p>These parameters are not copied to SGM</p>		
10.1		Dump via DTM		<input type="checkbox"/>
		<p><u>Relevant details for use with H FCP AOC DODD</u></p> <p>The following parameters</p> <p>H_NOM_AUX_ASW_R_UNLOAD_TORQUE is at offset 77</p> <p>H_NOM_RCS_BIAS_THRESHOLD is at offset 74</p> <p>H_OCM_CTRL_ASW_GAIN_KD_2_*_1 is at offset 403-405</p> <p>H_OCM_CTRL_ASW_GAIN_KI_2_*_1 is at offset 409-411</p> <p>H_OCM_CTRL_ASW_GAIN_KP_2_*_1 is at offset 415-417</p> <p>These are located in Block 1 & 2 of the OBDB</p>		
		Use sequences HFADODDA & HFADODDB		
		<p>NOTE: The contents of diagnostic packet A3DH0BDB1109 {DTM with Herschel OBDB data} are spread over a group of 4 monitoring displays:</p> <p>ZAZ60999 DTMOBDB1_1 ZAZ61999 DTMOBDB1_2 <- values are in this display ZAZ62999 DTMOBDB1_3 ZAZ63999 DTMOBDB1_4</p>		

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		NOTE: The contents of diagnostic packet A3DH0BDB2109 {DTM with Herschel OBDB data2} are spread over a group of 4 monitoring displays: ZAZ64999 DTMOBDB2_1 ZAZ65999 DTMOBDB2_2 ZAZ66999 DTMOBDB2_3 <- values are in this display ZAZ67999 DTMOBDB2_4		
		NOTE: This step enables diagnostic packets that contain data from specific blocks of the OBDB, where each block contains 250 onboard database parameters. The Herschel onboard database currently contains 2134 parameters and there are 8 diagnostic packets defined to cover the first 2000 entries. In HP-4-TASW-IF-0002 (ACC ASW_ICD) section 6.1 you can find a list of Herschel OBDB parameters ordered by offset.		
		Verify Telemetry HRwsUnloadTorq AED1W002	= -0.02 Nm	AND=ZAZ61999
		Verify Telemetry HRcsBiasThres AED1T002	= 0.1 Nms	AND=ZAZ61999
		Verify Telemetry HCtrlOcmKD2_11 AEDMT002	= 0.5 J/rs	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKD2_21 AEDMU002	= 0.5 J/rs	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKD2_31 AEDMV002	= 0.5 J/rs	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKI2_11 AEDN0002	= 0.0008 J/rs	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKI2_21 AEDN1002	= 0.0008 J/rs	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKI2_31 AEDN2002	= 0.0008 J/rs	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKP2_11 AEDN6002	= 0.032 J/rd	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKP2_21 AEDN7002	= 0.032 J/rd	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKP2_31 AEDN8002	= 0.032 J/rd	AND=ZAZ66999
10.2		Dump from RAM		□

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		<p><u>Relevant details for use with H FCP AOC DODD</u></p> <p>Based upon the latest ASW ICD (H-P-4-TASW-IF-0002, Issue 3 G), this procedure loads the following parameters into specific OBDB offset locations in RAM:</p> <p>H_NOM_AUX_ASW_R_UNLOAD_TORQUE is at offset 77 H_NOM_RCS_BIAS_THRESHOLD is at offset 74 H_OCM_CTRL_ASW_GAIN_KD_2_*_1 is at offset 403-405 H_OCM_CTRL_ASW_GAIN_KI_2_*_1 is at offset 409-411 H_OCM_CTRL_ASW_GAIN_KP_2_*_1 is at offset 415-417</p> <p>The <u>absolute address</u> of offset 74 is therefore: 020A = Memory ID</p> <p>D040 = Start Address</p> <p>The <u>absolute address</u> of offset 77 is therefore: 020A = Memory ID D04C = Start Address</p> <p>The <u>absolute address</u> of offset 403 is therefore: 020A = Memory ID D564 = Start Address</p> <p>The <u>absolute address</u> of offset 409 is therefore: 020A = Memory ID D57C = Start Address</p> <p>The <u>absolute address</u> of offset 415 is therefore:</p> <p>020A = Memory ID D594 = Start Address</p>		
		<p><u>Use sequence HFADODDL</u></p> <p>to dump <u>all</u> the OBDB in RAM, or edit: Start Address = D040 Length = 4</p>		
		<p><i>NOTE:</i></p> <p>The RAM memory address for a parameter with a given OBDB ID can be calculated as follows: RAM address = OBDB start address + parameter offset; OBDB start address = address of Asw_DatabaseManager_Obj + 12; parameter offset = OBDB ID * 4.</p> <p>Parameter ID's are listed in the ASW ICD (H-P-4-TASW-IF-002).</p> <p>Asw_Databasemanager_Obj is an ASW container structure used in the management of the OBDB and its address has to be obtained from the linker memory map valid for the software build currently used onboard.</p>		

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10.3		Dump from SGM		<input type="checkbox"/>
		This step can be ignored - parameter not copied to SGM		
		<p>NOTE: The address of a parameter with a given ID can be calculated as follows:</p> <p>SGMA Address = 0xBA0000 + (ParamID-1) * 4</p> <p>SGMB Address = 0xEA0000 + (ParamID-1) * 4</p> <p>Parameter ID's refer to the listing of SGM OBDB parameters in the ASW ICD (H-P-4-TASW-IF-0002) and are not the same as the ID's in the RAM OBDB.</p>		
11		Check TPF (RWL) with Reaction Wheel run-in torques		Next Step: 12
		TPF (RWL) is used in next step and will call sequence AERWL_00 and set Formal Parameter for all reaction wheels (Bias H_RWL*) to either 19.5 Nms or 23 Nms		
		<p>NOTE: The run-in should be carried out at the highest possible wheel speed. The subsystem user manual suggests an angular momentum target of 19.5 Nms for each wheel (close the maximum nominal momentum), but the unit supplier suggests even higher values (settings in excess of 28 Nms were used in wheel maintenance activities on ground). Higher rate improves the distribution of lubricant on wheel bearings and makes it easier to bring the wheels to nominal performance.</p>		
12		Call procedure H_FCP_AOC_4R34 Perform RWL bias in OCM		Next Step: 13
		Execute Procedure: H_FCP_AOC_4R34 Perform RWL bias in OCM		
13		Monitor wheel parameters		Next Step: 14
		The recommended duration of bias-and-hold at constant speed is 32 hours if the procedure is used for the first run-in of the wheels. In other cases the duration depends on specific operational needs.		

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		<p>The following set of wheel parameters should be monitored throughout this period:</p> <ol style="list-style-type: none"> 1. AEWS1002 - AEWS4002 (wheel speed). 2. AEWTA002 - AEWTD002 (bearing temperatures) 3. AEWT1002 - AEWT4002 (commanded wheel torque). When the bias-and-hold loop runs in steady state maintaining the wheels at constant speed, the average absolute value of the commanded torque is equal to friction (TM only available in SCM & DTM). 4. WM211565, WM911565, WM11156, WMA11565 - LCL currents 		
		<p>NOTE: <i>Wheel speeds and torques are encoded in the TM parameters listed above in a format which requires post-processing to be converted to a signed floating point value. It is assumed that this processing will be achieved by providing derived parameters in the version of the mission database used in ground operations.</i></p>		
13.1		Monitor RWL1		<input type="checkbox"/>
		Verify Telemetry RWL1 wheel spd AEWS1002		GRD=ZGZ07999
		Verify Telemetry RWL1 wheel spd AEWS1002		AND=ZAA04999
		Verify Telemetry RWL1 bear temp AEWTA002		AND=ZAA05999
		Verify Telemetry RWL1 torque req AEWT1002		(in SCM only)
		Verify Telemetry Rwl_1_L55_I WM211565		AND=WALC3584
13.2		Monitor RWL2		<input type="checkbox"/>
		Verify Telemetry RWL2 wheel spd AEWS2002		GRD=ZGZ07999
		Verify Telemetry RWL2 wheel spd AEWS2002		AND=ZAA04999
		Verify Telemetry RWL2 bear temp AEWTB002		AND=ZAA05999
		Verify Telemetry RWL2 torque req AEWT2002		(in SCM only)
		Verify Telemetry Rwl_2_L56_I WM911565		AND=WALC3584

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
13.3		Monitor RWL3		<input type="checkbox"/>
		Verify Telemetry RWL3 wheel spd AEWS3002		GRD=ZGZ07999
		Verify Telemetry RWL3 wheel spd AEWS3002		AND=ZAA05999
		Verify Telemetry RWL2 bear temp AEWTB002		AND=ZAA05999
		Verify Telemetry RWL3 torque req AEWT3002		(in SCM only)
		Verify Telemetry Rwl_3_L57_I WM111565		AND=WALC3584
13.4		Monitor RWL4		<input type="checkbox"/>
		Verify Telemetry RWL4 wheel spd AEWS4002		GRD=ZGZ07999
		Verify Telemetry RWL4 wheel spd AEWS4002		AND=ZAA05999
		Verify Telemetry RWL4 bear temp AEWTD002		AND=ZAA05999
		Verify Telemetry RWL4 torque req AEWT4002		(in SCM only)
		Verify Telemetry Rwl_4_L58_I WMA11565		AND=WALC3584
14		WAIT until one of the OCM run-in criteria is reached		Next Step: 15
		WAIT until one of the following has expired, whichever is first: - 1 kg of fuel has been spent - 4 hours have expired - Friction of all RWLs < 0.018 Nms and gradient < 0.0005 Nm/min		
TC Seq. Name :HFA4R14C (SendSTOPbiasing)				
TimeTag Type: Sub Schedule ID: <input type="checkbox"/>				

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
15		Send STOP Function for Biasing		Next Step: 16
		Execute Telecommand <p style="text-align: right;">Stop Function</p> Command Parameter(s) : Any Function ID AHFUN109 TC Control Flags : GBM IL DSE --Y -- --- Subsch. ID : 20 Det. descr. : TC(8,2) Stop Function	AC082109 Biasing	
		Verify Telemetry <p style="text-align: center;">CurrentBiasAid AESM9002</p>	= Standby = Stopped	AND=ZAA01999
TC Seq. Name :HFA4R14D (RestoreRCSdefOBDB) TimeTag Type: Sub Schedule ID: <input type="checkbox"/>				
16		Restore default RCS control parameters in OBDB		Next Step: 17
16.1		Activate update		<input type="checkbox"/>
		Execute Telecommand <p style="text-align: right;">Start database loading</p> Command Parameter(s) : ASW Function ID AHFUN001 DbLoad DF86 Cmd AH8D1001 DbLoad DD86 Cmd AH8D2001 DbLoad Nr Cmds AHFDL001 TC Control Flags : GBM IL DSE --Y -- --- Subsch. ID : 20 Det. descr. : TC_START_DATABASE_LOAD	ACDS1001 DB loading (Def) Enable 86 Enable 86 5 <dec>	
16.2		Load default OCM control gain (KD2) in OBDB		<input type="checkbox"/>

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Subsch. ID : 20 Det. descr. : TC(8,4) - Load database Real		
16.5		Load default for Unload Torque Value in OBDB		<input type="checkbox"/>
		Execute Telecommand Load databaseReal Command Parameter(s) : DbLoad DF86 Cmd AH8D1001 Enable 86 DbLoad DD86 Cmd AH8D2001 Enable 86 DbLoad StartInd AHFDS001 77 <dec> DbLoad Nr Wrds AHFDN001 1 <dec> (Def) DbLoad Dwd Real AHFDZ001 -0.02 <dec> TC Control Flags : GBM IL DSE --Y -- --- Subsch. ID : 20 Det. descr. : TC(8,4) - Load database Real	ACZTY109	
16.6		Load default for Momentum Bias Threshold in OBDB		<input type="checkbox"/>
		The wheel run-in procedure modifies the wheel bias threshold to a value normally used during bias-and-hold operations in OCM. The default value must be restored, since the same OBDB variable (H_NOM_RCS_BIAS_THRESHOLD) is used also for unloading and biasing in SCM, which is not compatible with the lower threshold used for the bias-and-hold loop.		
		Load parameter H_NOM_RCS_BIAS_THRESHOLD setting the value to 0.5 (Nms)		
		Execute Telecommand Load databaseReal Command Parameter(s) : DbLoad DF86 Cmd AH8D1001 Enable 86 DbLoad DD86 Cmd AH8D2001 Enable 86 DbLoad StartInd AHFDS001 74 <dec> DbLoad Nr Wrds AHFDN001 1 <dec> (Def) DbLoad Dwd Real AHFDZ001 0.5 <dec> TC Control Flags : GBM IL DSE --Y -- --- Subsch. ID : 20 Det. descr. : TC(8,4) - Load database Real	ACZTY109	
16.7		Activate new values with the fire command		<input type="checkbox"/>

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Execute Telecommand <p style="text-align: center;">Fire critical command</p> Command Parameter(s) : FireFun DF86Cmd AH8F1001 Enable 86 FireFun DD86Cmd AH8F2001 Enable 86 FireFun CritFID AHFFH001 201 <dec> TC Control Flags : GBM IL DSE --Y -- --- Subsch. ID : 20 Det. descr. : TC_FIRE_COMMAND	ACFC1001	
TC Seq. Name : NULL04 (Null Sequence 04) TimeTag Type: Sub Schedule ID: <input type="checkbox"/>				
17		Call procedure H_FCP_AOC_DODD Generic OBDB Dump		Next Step: 18
		NOTE: This procedure enables a direct dump of the OBDB from RAM or Safe-Guard Memory (SGM), as well as reading the OBDB via diagnostic telemetry (DTM) packets		
		<u>Relevant details for use with H FCP AOC DODD</u> Based upon the latest ASW ICD (H-P-4-TASW-IF-0002, Issue 3 G), this procedure loads the following parameters into specific OBDB offset locations in RAM: H_NOM_AUX_ASW_R_UNLOAD_TORQUE is at offset 77 H_NOM_RCS_BIAS_THRESHOLD is at offset 74 H_OCM_CTRL_ASW_GAIN_KD_2_*_1 is at offset 403-405 H_OCM_CTRL_ASW_GAIN_KI_2_*_1 is at offset 409-411 H_OCM_CTRL_ASW_GAIN_KP_2_*_1 is at offset 415-417 These are located in Block 1 & 2 of the OBDB These parameters are not copied to SGM		
17.1		Dump via DTM		<input type="checkbox"/>

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		<p>Relevant details for use with H FCP AOC DODD</p> <p>The following parameters</p> <p>H_NOM_AUX_ASW_R_UNLOAD_TORQUE is at offset 77</p> <p>H_NOM_RCS_BIAS_THRESHOLD is at offset 74</p> <p>H_OCM_CTRL_ASW_GAIN_KD_2_*_1 is at offset 403-405</p> <p>H_OCM_CTRL_ASW_GAIN_KI_2_*_1 is at offset 409-411</p> <p>H_OCM_CTRL_ASW_GAIN_KP_2_*_1 is at offset 415-417</p> <p>These are located in Block 1 & 2 of the OBDB</p>		
		<p>Use sequences HFADODDA & HFADODDE</p>		
		<p>NOTE: The contents of diagnostic packet A3DH0BDB1109 {DTM with Herschel OBDB data1} are spread over a group of 4 monitoring displays:</p> <p>ZAZ60999 DTMOBDB1_1 ZAZ61999 DTMOBDB1_2 <- values are in this display ZAZ62999 DTMOBDB1_3 ZAZ63999 DTMOBDB1_4</p>		
		<p>NOTE: The contents of diagnostic packet A3DH0BDB2109 {DTM with Herschel OBDB data2} are spread over a group of 4 monitoring displays:</p> <p>ZAZ64999 DTMOBDB2_1 ZAZ65999 DTMOBDB2_2 ZAZ66999 DTMOBDB2_3 <- values are in this display ZAZ67999 DTMOBDB2_4</p>		
		<p>NOTE: <i>This step enables diagnostic packets that contain data from specific blocks of the OBDB, where each block contains 250 onboard database parameters.</i></p> <p><i>The Herschel onboard database currently contains 2134 parameters and there are 8 diagnostic packets defined to cover the first 2000 entries. In HP-4-TASW-IF-0002 (ACC ASW_ICD) section 6.1 you can find a list of Herschel OBDB parameters ordered by offset.</i></p>		
		<p>Verify Telemetry</p> <p style="text-align: center;">HRwsUnloadTorq AED1W002</p>	= -0.02 Nm	AND=ZAZ61999
		<p>Verify Telemetry</p> <p style="text-align: center;">HRcsBiasThres AED1T002</p>	= 0.1 Nms	AND=ZAZ61999
		<p>Verify Telemetry</p> <p style="text-align: center;">HCtrlOcmKD2_11 AEDMT002</p>	= 0.7 J/rs	AND=ZAZ66999
		<p>Verify Telemetry</p> <p style="text-align: center;">HCtrlOcmKD2_21 AEDMU002</p>	= 0.7 J/rs	AND=ZAZ66999

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry HCtrlOcmKD2_31 AEDMV002	= 0.7 J/rs	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKI2_11 AEDN0002	= 0.004 J/rs	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKI2_21 AEDN1002	= 0.004 J/rs	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKI2_31 AEDN2002	= 0.004 J/rs	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKP2_11 AEDN6002	= 0.160 J/rd	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKP2_21 AEDN7002	= 0.160 J/rd	AND=ZAZ66999
		Verify Telemetry HCtrlOcmKP2_31 AEDN8002	= 0.160 J/rd	AND=ZAZ66999
17.2		Dump from RAM		□
		<p><u>Relevant details for use with H FCP AOC DODD</u></p> <p>Based upon the latest ASW ICD (H-P-4-TASW-IF-0002, Issue 3 G), this procedure loads the following parameters into specific OBDB offset locations in RAM:</p> <p>H_NOM_AUX_ASW_R_UNLOAD_TORQUE is at offset 77 H_NOM_RCS_BIAS_THRESHOLD is at offset 74 H_OCM_CTRL_ASW_GAIN_KD_2_*_1 is at offset 403-405 H_OCM_CTRL_ASW_GAIN_KI_2_*_1 is at offset 409-411 H_OCM_CTRL_ASW_GAIN_KP_2_*_1 is at offset 415-417</p> <p>The <u>absolute address</u> of offset 74 is therefore: 020A = Memory ID</p> <p>D040 = Start Address</p> <p>The <u>absolute address</u> of offset 77 is therefore: 020A = Memory ID D04C = Start Address</p> <p>The <u>absolute address</u> of offset 403 is therefore: 020A = Memory ID D564 = Start Address</p> <p>The <u>absolute address</u> of offset 409 is therefore: 020A = Memory ID D57C = Start Address</p> <p>The <u>absolute address</u> of offset 415 is therefore:</p> <p>020A = Memory ID D594 = Start Address</p>		

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		<p>Use sequence HFADODDL to dump <u>all</u> the OBDB in RAM, or edit: Start Address = D040 Length = 4</p>		
		<p>NOTE: The RAM memory address for a parameter with a given OBDB ID can be calculated as follows: RAM address = OBDB start address + parameter offset; OBDB start address = address of Asw_DatabaseManager_Obj + 12; parameter offset = OBDB ID * 4.</p> <p>Parameter ID's are listed in the ASW ICD (H-P-4-TASW-IF-002).</p> <p>Asw_Databasemanager_Obj is an ASW container structure used in the management of the OBDB and its address has to be obtained from the linker memory map valid for the software build currently used onboard.</p>		
17.3		Dump from SGM		□
		This step can be ignored - parameter not copied to SGM		
		<p>NOTE: The address of a parameter with a given ID can be calculated as follows:</p> <p>SGMA Address = 0xBA0000 + (ParamID-1) * 4</p> <p>SGMB Address = 0xEA0000 + (ParamID-1) * 4</p> <p>Parameter ID's refer to the listing of SGM OBDB parameters in the ASW ICD (H-P-4-TASW-IF-0002) and are not the same as the ID's in the RAM OBDB.</p>		
18		Call procedure H_FCP_AOC_4R34 Perform RWL bias in OCM		Next Step: 19
		Execute Procedure: H_FCP_AOC_4R34 Perform RWL bias in OCM		
19		Check wheel parameters		Next Step: END

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		<p>The following set of wheel parameters should be checked before declaring RWL assembly operational:</p> <ol style="list-style-type: none"> AEWS1002 - AEWS4002 (wheel speed). AEWTA002 - AEWTD002 (bearing temperatures) AEWT1002 - AEWT4002 (commanded wheel torque). When the bias-and-hold loop runs in steady state maintaining the wheels at constant speed, the average absolute value of the commanded torque is equal to friction (TM only available in SCM & DTM). WM211565, WM911565, WM11156, WMA11565 - LCL currents 		
		<p>NOTE: Wheel speeds and torques are encoded in the TM parameters listed above in a format which requires post-processing to be converted to a signed floating point value. It is assumed that this processing will be achieved by providing derived parameters in the version of the mission database used in ground operations.</p>		
19.1		Monitor RWL1		<input type="checkbox"/>
		Verify Telemetry RWL1 wheel spd AEWS1002		GRD=ZGZ07999
		Verify Telemetry RWL1 wheel spd AEWS1002		AND=ZAA04999
		Verify Telemetry RWL1 bear temp AEWTA002		AND=ZAA05999
		Verify Telemetry RWL1 torque req AEWT1002		(in SCM only)
		Verify Telemetry Rwl_1_L55_I WM211565		AND=WALC3584
19.2		Monitor RWL2		<input type="checkbox"/>
		Verify Telemetry RWL2 wheel spd AEWS2002		GRD=ZGZ07999
		Verify Telemetry RWL2 wheel spd AEWS2002		AND=ZAA04999
		Verify Telemetry RWL2 bear temp AEWTB002		AND=ZAA05999
		Verify Telemetry RWL2 torque req AEWT2002		(in SCM only)
		Verify Telemetry Rwl_2_L56_I WM911565		AND=WALC3584

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
19.3		Monitor RWL3		<input type="checkbox"/>
		Verify Telemetry RWL3 wheel spd AEWS3002		GRD=ZGZ07999
		Verify Telemetry RWL3 wheel spd AEWS3002		AND=ZAA05999
		Verify Telemetry RWL2 bear temp AEWTB002		AND=ZAA05999
		Verify Telemetry RWL3 torque req AEWT3002		(in SCM only)
		Verify Telemetry Rwl_3_L57_I WM111565		AND=WALC3584
19.4		Monitor RWL4		<input type="checkbox"/>
		Verify Telemetry RWL4 wheel spd AEWS4002		GRD=ZGZ07999
		Verify Telemetry RWL4 wheel spd AEWS4002		AND=ZAA05999
		Verify Telemetry RWL4 bear temp AEWTD002		AND=ZAA05999
		Verify Telemetry RWL4 torque req AEWT4002		(in SCM only)
		Verify Telemetry Rwl_4_L58_I WMA11565		AND=WALC3584
End of Procedure				