

Update Control Parameters - inertia related
File: H_FCP_AOC_3M02.xls
Author: dsalt-hp



Procedure Summary

Objectives

The objective of this Herschel ACMS procedure is to update the Inertia Tensor.

The procedure involves the following activities:

- determine updates to inertia tensor values derived by FD
- uplink specific TPF (SCI) defined by FD containing these OBDB updates
- confirm OBDB updates via dumps or DTM, as necessary

The controller design for SCM is based on a requested acceleration vector, which is converted into a requested torque vector, using the stored values of the inertia vector. As the mission progresses, the actual inertia will evolve, in case the on-board ACMS values are not updated the difference between these and the actual ones will eventually exceed the maximum allowable deviation. Therefore, periodic update of the inertia tensor data is required. Optimum performances require inertia tensor accurate to within 5%.

Note for flexibility reasons it is also possible to update all controller and estimator gains for the SCM control algorithm, including the filter coefficients for STR-only operations. H

Summary of Constraints

It is assumed that these inertias are derived from a ground based model.

It is advised to update the controller gains for the SAM when the inertia changes. In OCM the controller gains themselves do not need to be updated, as normalized inertia gains are used by the control scheme.

Spacecraft Configuration

Start of Procedure

Spacecraft initial conditions:
- S/C in a nominal mode

End of Procedure

Spacecraft final conditions:
- Updated inertia related control parameters

Reference File(s)

Input Command Sequences

Output Command Sequences

AESCI_00

Referenced Displays

ANDs GRDs SLDs

Status : Version 1 - Unchanged
Last Checkin: 02/08/08

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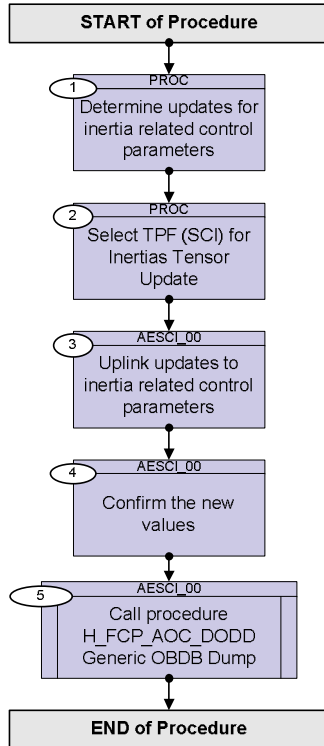
Configuration Control Information

DATE	FOP ISSUE	VERSION	MODIFICATION DESCRIPTION	AUTHOR	SPR REF
02/08/08	1	1	Created	dsalt-hp	

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Procedure Flowchart Overview

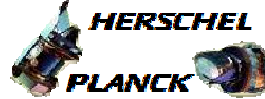


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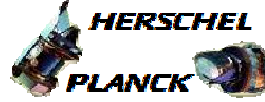
Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
Beginning of Procedure				
PROC Procedure Properties				
SSID :				
1		Determine updates for inertia related control parameters		Next Step: 2
		Following parameters can be updated: ALL CTL SAT_INERTIA_i_j (6 matrix variables) M_DECOUPLING_i_j (6 matrix variables) SAM K_D_SLEW K_P1 & K_P2 K_D1 & K_D2 K_I2		
2		Select TPF (SCI) for Inertias Tensor Update		Next Step: 3
		Check with Flight Dynamics the exact name of the TPF instance to be uplinked		
AESCI_00 Update SCI				
Sequence Parameter(s) :				
INERTIA_1_1 SCI_11 kgm2				
INERTIA_1_2 SCI_12 kgm2				
INERTIA_1_3 SCI_13 kgm2				
INERTIA_2_1 SCI_21 kgm2				
INERTIA_2_2 SCI_22 kgm2				
INERTIA_2_3 SCI_23 kgm2				
INERTIA_3_1 SCI_31 kgm2				
INERTIA_3_2 SCI_32 kgm2				
INERTIA_3_3 SCI_33 kgm2				
INERT_INV_1_1 SCI_11_I 2mgk				
INERT_INV_1_2 SCI_12_I 2mgk				
INERT_INV_1_3 SCI_13_I 2mgk				
INERT_INV_2_1 SCI_21_I 2mgk				
INERT_INV_2_2 SCI_22_I 2mgk				
INERT_INV_2_3 SCI_23_I 2mgk				
INERT_INV_3_1 SCI_31_I 2mgk				
INERT_INV_3_2 SCI_32_I 2mgk				
INERT_INV_3_3 SCI_33_I 2mgk				
SSID :				
3		Uplink updates to inertia related control parameters		Next Step: 4
		Uplink onboard the parameters determined in the previous step		

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3.1		Activate update		<input type="checkbox"/>
		Execute Telecommand <p style="text-align: center;">Start database loading</p> Command Parameter(s) : ASW Function ID AHFUN001 DB loading (Def) DbLoad DF86 Cmd AH8D1001 Enable 86 DbLoad DD86 Cmd AH8D2001 Enable 86 DbLoad Nr Cmds AHFDL001 2 <dec> TC Control Flags : GBM IL DSE --Y -- --- SSID : 20	ACDS1001	
		Following the Start_database_loading command the following commands must each be sent within C_ALL_OPS_ASW_CRIT_CMD_TIMEOUT (=180 seconds default) of the previous command to avoid the started status of the function timing-out.		
3.2		Load new values		<input type="checkbox"/>
		Execute Telecommand <p style="text-align: center;">OBDB_SAT_INERTIA</p> Command Parameter(s) : DbLoad DF86 Cmd XH191990 Enable 86 (Def) DbLoad DD86 Cmd XH192990 Enable 86 (Def) INERTIA_1_1 XH069990 SCI_11 INERTIA_1_2 XH070990 SCI_12 INERTIA_1_3 XH071990 SCI_13 INERTIA_2_1 XH072990 SCI_21 INERTIA_2_2 XH073990 SCI_22 INERTIA_2_3 XH074990 SCI_23 INERTIA_3_1 XH075990 SCI_31 INERTIA_3_2 XH076990 SCI_32 INERTIA_3_3 XH077990 SCI_33 TC Control Flags : GBM IL DSE --Y -- --- SSID : 0	XC017990	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Execute Telecommand OBDB_SAT_INERTIA_INV Command Parameter(s) : DbLoad DF86 Cmd XH191990 Enable 86 (Def) DbLoad DD86 Cmd XH192990 Enable 86 (Def) INERT_INV_1_1 XH078990 SCI_11_I INERT_INV_1_2 XH079990 SCI_12_I INERT_INV_1_3 XH080990 SCI_13_I INERT_INV_2_1 XH081990 SCI_21_I INERT_INV_2_2 XH082990 SCI_22_I INERT_INV_2_3 XH083990 SCI_23_I INERT_INV_3_1 XH084990 SCI_31_I INERT_INV_3_2 XH085990 SCI_32_I INERT_INV_3_3 XH086990 SCI_33_I TC Control Flags : GBM IL DSE --Y -- --- SSID : 0	XC018990	
3.3		Activate the changes using the fire command		<input type="checkbox"/>
		Execute Telecommand Fire critical command 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 -- --- SSID : 20	ACFC1001	
4		Confirm the new values		Next Step: 5
		Confirm CEV completion of load commands		
5		Call procedure H_FCP_AOC_DODD Generic OBDB Dump		Next Step: END
		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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		<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 F), the current procedure loads the following parameters into specific OBDB offset locations in RAM:</p> <p>V_ALL_CTRL_SAT_INERTIA_*_* at offsets 889-897</p> <p>V_NOM_CTRL_SAT_INERTIA_INV_*_* at offsets 950-958</p> <p>These are located in Block 4 of the OBDB</p> <p>None of these parameters are copied to SGM</p>		
5.1		Dump via DTM		□
		<p><u>Relevant details for use with H FCP AOC DODD</u></p> <p>The following parameters</p> <p>V_ALL_CTRL_SAT_INERTIA_*_* V_NOM_CTRL_SAT_INERTIA_INV_*_*</p> <p>are located in Block 4 of the OBDB</p>		
		Use sequence HFADODDD		
		<p>NOTE:</p> <p>The contents of diagnostic packet A3DH0BDB4109 {DTM with Herschel OBDB data4} are spread over a group of 4 monitoring displays:</p> <p>ZAZ6C999 DTMOBDB4_1 ZAZ6D999 DTMOBDB4_2 ZAZ6E999 DTMOBDB4_3 <- values are in this display ZAZ6F999 DTMOBDB4_4 <- values are in this display</p>		
		<p>NOTE:</p> <p><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>		
5.2		Dump from RAM		□

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		<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 F), this procedure loads the following parameters into specific OBDB offset locations in RAM:</p> <p>V_ALL_CTRL_SAT_INERTIA_*_* at offsets 889-897</p> <p>V_NOM_CTRL_SAT_INERTIA_INV_*_* at offsets 950-958</p> <p>The <u>absolute address</u> of offset 889 is therefore: 020A = Memory ID DCFC = Start Address</p> <p>The <u>absolute address</u> of offset 950 is therefore: 020A = Memory ID DDF0 = Start Address</p>		
		<p><u>Use sequence HFADODDL</u></p> <p>to dump <u>all</u> the OBDB in RAM, or edit: Start Address = DCFC Length = 36</p> <p>THEN create a 2nd TC instance with Start Address = DDF0 Length = 36</p>		
		<p><i>NOTE:</i> 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> <p>Details from "image.syms": 020bcb64 l 0 .bss 000065d4 Asw_DatabaseManagerObj</p> <p>020b = Memory ID cb64 = Start Address (=52068 <dec>)</p>		
5.3		Dump from SGM		<input type="checkbox"/>
		<p><u>Relevant details for use with H FCP AOC DODD</u></p> <p>This step can be ignored - parameter not copied to SGM</p>		

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		<p><i>NOTE:</i> The address of a parameter with a given ID can be calculated as follows:</p> <p><i>SGMA</i> Address = 0xBA0000 + (ParamID-1) * 4</p> <p><i>SGMB</i> 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>		
End of Procedure				