

Perform Delta-V
File: H_FCP_AOC_3001.xls
Author: dsalt-hp



Procedure Summary

Objectives

The objective of this Herschel ACMS procedure is to execute a DV manoeuvre.

The procedure involves the following activities:

- check ACMS/RCS status & configuration
- switch ON appropriate RCS heaters and WAIT 40 minutes (calls H_FCP_AOC_5CBH)
- verify RCT preheat temperatures, LV and FCV status
- verify health of GYR and STRM & switch ON, if necessary
- slew to attitude in SCM, if necessary (calls H_FCP_AOC_4R20 & H_FCP_AOC_3S01)
- command OCM pointing, if necessary (calls H_FCP_AOC_00CM)
- IF prior mode=SCM, ensure wheel "bias & hold" is active, if necessary (calls H_FCP_AOC_4R34)
- dump EDR buffer to check for anomolous events (calls H_FCP_AOC_3011)
- command delta-V via TPF (DVH)
- verify thrusting and manoeuvre completion
- return to SCM, if necessary (calls H_FCP_AOC_0SCM)

NOTE: When preparing the execution of routine delta-Vs, consult the attached TPF CHECKLIST before uplinking the time-tagged TCS generated from the set of TPFs prepared by Flight Dynamics.

Summary of Constraints

1. Only one orbit control thruster is to be used at the same time;
2. Some pre-processing is required, namely:
 - # delta-V ON time;
 - # maximum allowed deviation from delta-V ON time;
 - # thrust level at start of delta-V;
 - # thrust level at end of delta-V;
 - # which RCS mode (Coarse/Fine) is aimed for after the delta-V;
 - # which orbit control thruster is to be used.

Spacecraft Configuration

Start of Procedure

ACMS mode is SAM/OCM/SCM

End of Procedure

ACM mode is OCM and correct orbit has been reached

Reference File(s)

Input Command Sequences

Output Command Sequences

AEDVH_00

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Referenced Displays

ANDs	GRDs	SLDs
ZAA01999	ZGZ07999	
WALC1584		
WALC2584		
ZAA02999		
ZAA06999		
ZAA07999		
ZAZ30999		
ZAZ31999		
ZAA21999		
ZAA31999		
ZAZ1B999		
ZAA00999		
ZAALF999		
ZAALH999		
ZAA04999		

Configuration Control Information

DATE	FOP ISSUE	VERSION	MODIFICATION DESCRIPTION	AUTHOR	SPR REF
03/08/08	1	1	Created	dsalt-hp	
15/10/08		2	Modified TM checks for LCL and catbed heaters (Step 3-11)	dsalt-hp	
26/11/08		3	Step 19 now includes TCs for RCS fine and OCM transition within same sequence (AEOFP_00) with time-tags to remove risk of a prolonged stay in OCM Fine pointing. <input type="checkbox"/> Optional step for STRM switch ON also added to cover case of starting procedure from SAM.	dsalt-hp	
27/11/08		4	Step 19 & 20 modified to ensure TCs for commanding OCM and RCS Fine are in separate sequences, as transition to OCM can also be commanded from SCM and TC for RCS Fine fails in SCM.	dsalt-hp	
27/11/08		5	Sequence HFA3O011 updated to be planable by all sources.	dsalt-hp	
02/12/08		6	Initial steps for RCS thruster catbed heater switching ON removed and replaced with call to procedure H_FCP_AOC_5CBH. <input type="checkbox"/> Additional checks added in Step 10 to ensure TC for OCM transition is in the time-tag queue before uplinking RCS Fine TC in STEP 11, where delta time-tag is now updated to 21 seconds before the OCM transition TC.	dsalt-hp	
02/12/08	2	7	Minor clean-up to remove old sequence names	dsalt-hp	
22/03/09		8	Updated to enable OCM pointing TC execution with RCS in Coarse (Step 10 & 15) as nominal, or Fine if necessary (Step 12 & 13), as per Section 2.1.1 of H-P-4-DS-MA-002 (Issue 2, Rev.5)	dsalt-hp	

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp

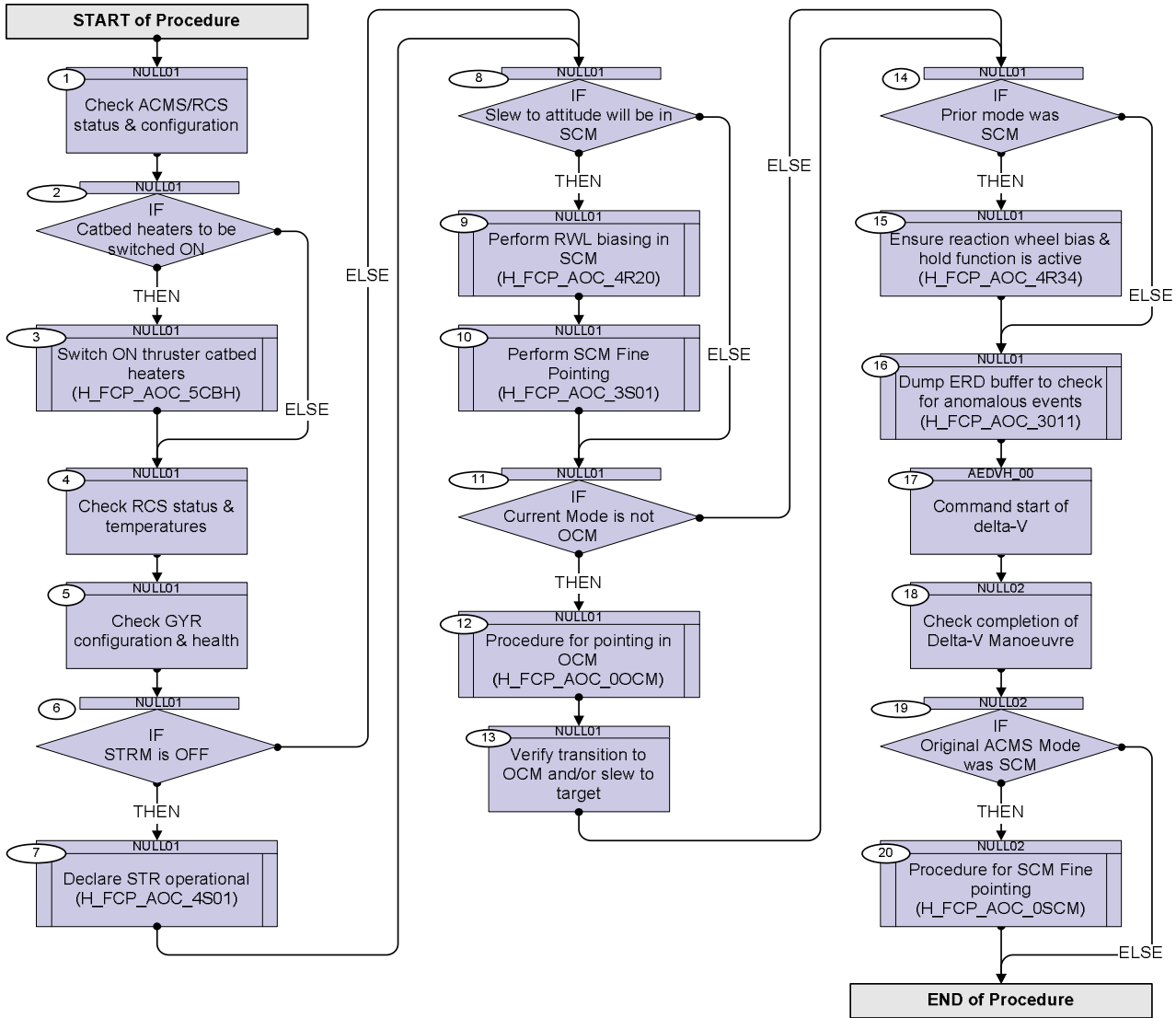


			Procedure rationalised by adding calls to separate procedures for: - declaring STR operational (calls H_FCP_AOC_4S01) at Step 7 - attitude change in OCM (calls H_FCP_AOC_0OCM) at Step 9 <input type="checkbox"/>		
24/03/09	2.2	9	NOTE: Attitude change procedure include all TCs to disable/enable the TC mode check	dsalt-hp	
21/07/09		10	Additional steps included to cover routine delta-Vs, plus attached worksheets with a TPF Checklist and an overview of the routine Delta-V Scenario	dsalt-hp	
23/07/09		11	Update to TPF Checklist relative timings	dsalt-hp	
23/07/09	2.5	12	Update of TPF Checklist & Delta-V Scenario to include possibility of TPF=RWO before first slew to delta-V attitude	dsalt-hp	

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Procedure Flowchart Overview



Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
Beginning of Procedure				
TC Seq. Name : NULL01 (Null sequence 01)				
TimeTag Type: Sub Schedule ID: <input type="checkbox"/>				
1		Check ACMS/RCS status & configuration		Next Step: 2
1.1		Check ACMS mode		<input type="checkbox"/>
		Verify Telemetry AcmsMode AESMG002	= OCM = SAM = SCM	AND=ZAA01999
		Verify Telemetry AcmsSubstate AESMF002	= OCM Pointing = SAM Sun Point = SCM Pointing	AND=ZAA01999
		Verify Telemetry AcmsMain AID AESM3002	= OCM pnt coarse = SAM pnt coarse = SCM Point Fine	AND=ZAA01999
1.2		Check LCL status for the RCS		<input type="checkbox"/>
		LCL's 17 - 18 power the catbed heaters of the two RCS branches.		
		Verify Telemetry CBH_N_L17_S WMA2H565	= ON	AND=WALC1584
		Verify Telemetry CBH_N_L17_I WMA13565	>= 0.0 A <= 0.069 A	AND=WALC1584
		Verify Telemetry CBH_R_L18_S WM12H565	= ON	AND=WALC1584
		Verify Telemetry CBH_R_L18_I WM113565	>= 0.0 A <= 0.069 A	AND=WALC1584
		LCL's 45 - 46 power the flow control valves of the two RCS branches.		
		Verify Telemetry RcsThrsA_L45_1S WM22D565	= ON	AND=WALC2584
		Verify Telemetry RcsThrsA_L45_2S WM22J565	= ON	AND=WALC2584

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry RcsThrsA_L45_I WM209565	>= 0.0 A <= 3.08 A	AND=WALC2584
		Verify Telemetry RcsThrsB_L46_1S WM92D565	= ON	AND=WALC2584
		Verify Telemetry RcsThrsB_L46_2S WM92J565	= ON	AND=WALC2584
		Verify Telemetry RcsThrsB_L46_I WM909565	>= 0.0 A <= 3.08 A	AND=WALC2584
		<i>LCL's 47 - 48 power the latch valves of the two RCS branches.</i>		
		Verify Telemetry RcsLvA_L47_1S WM12E565	= ON	AND=WALC2584
		Verify Telemetry AccLvA_L47_2S WM12J565	= ON	AND=WALC2584
		Verify Telemetry AccLvA_L47_I WM110565	>= 0.0 A <= 0.83 A	AND=WALC2584
		Verify Telemetry AccLvB_L48_1S WMA2E565	= ON	AND=WALC2584
		Verify Telemetry AccLvB_L48_2S WMA2J565	= ON	AND=WALC2584
		Verify Telemetry AccLvB_L48_I WMA10565	>= 0.0 A <= 0.83 A	AND=WALC2584
		NOTE: All of these LCL's must be closed throughout the mission. An explicit check is added before any operation involving the RCS to protect against inadvertent switching of these LCL's.		
1.3		<i>Check RCS nominal configuration (MAIN branch)</i>		
		Verify Telemetry Nom Conf RCS AESCF002	= RCS-A = RCS-B	AND=ZAA01999
2		<i>IF Catbed heaters to be switched ON</i>		Next Step: THEN 3 ELSE 4
3		<i>Switch ON thruster catbed heaters (H_FCP_AOC_5CBH)</i>		Next Step: 4

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Execute Procedure: H_FCP_AOC_5CBH Switch ON thruster catbed heaters		
4		Check RCS status & temperatures		Next Step: 5
4.1		Verify RCS control mode		<input type="checkbox"/>
		Verify Telemetry AcmsMain AID AESM3002	= OCM pnt coarse = SASM pnt coars	AND=ZAA01999
4.2		Verify nominal RCS branch		<input type="checkbox"/>
		Verify Telemetry Nom Conf RCS AESCF002	= RCS-A = RCS-B	AND=ZAA01999
4.2.1		Check RCS-A health, if flagged as nominal branch		<input type="checkbox"/>
		Verify Telemetry RCSA Health Sts AESK1002	= Healthy	AND=ZAA02999
4.2.2		Check RCS-B health, if flagged as nominal branch		<input type="checkbox"/>
		Verify Telemetry RCSB Health Sts AESK2002	= Healthy	AND=ZAA02999
4.3		Verify LV status for MAIN branch RCS		<input type="checkbox"/>
4.3.1		Verify LV status for RCS-A, if MAIN branch		<input type="checkbox"/>
		Verify Telemetry RCS-A LV closed AMTL2109	= FALSE	AND=ZAA06999
		Verify Telemetry RCS-A LV open AMTL1109	= TRUE	AND=ZAA06999
4.3.2		Verify LV status for RCS-B, if MAIN branch		<input type="checkbox"/>
		Verify Telemetry RCS-B LV open AMTL3109	= TRUE	AND=ZAA07999
		Verify Telemetry RCS-B LV closed AMTL4109	= FALSE	AND=ZAA07999

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
4.4		Verify FCV temps for MAIN branch RCS		<input type="checkbox"/>
4.4.1		Verify FCV temps for RCS-A, if MAIN branch		<input type="checkbox"/>
		<p>NOTE: The temperatures used in the verification criteria above are those the CDMU ASW derives by averaging data from three individual thermistors mounted on the same thermal node.</p> <p>The positions of the nodes are as follows: #22 - FCV A1A #42 - FCV A2A #41 - FCV C1A #23 - FCV C2A #44 - FCV C3A #51 - FCV C4A</p>		
		Verify Telemetry ThermAvgTemp022 DEA8D170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp042 DEAA1170	< 65.0 deg C > 10.0 deg C	AND=ZAZ31999
		Verify Telemetry ThermAvgTemp041 DEAA0170	< 65.0 deg C > 10.0 deg C	AND=ZAZ31999
		Verify Telemetry ThermAvgTemp023 DEA8E170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp044 DEAA3170	< 65.0 deg C > 10.0 deg C	AND=ZAZ31999
		Verify Telemetry ThermAvgTemp051 DEAAA170	< 65.0 deg C > 10.0 deg C	AND=ZAZ31999
4.4.2		Verify FCV temps for RCS-B, if MAIN branch		<input type="checkbox"/>

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		<p>NOTE: The temperatures used in the verification criteria above are those the CDMU ASW derives by averaging data from three individual thermistors mounted on the same thermal node.</p> <p>The positions of the nodes are as follows: #03 - FCV A1B #09 - FCV A2B #08 - FCV C1B #04 - FCV C2B #28 - FCV C3B #10 - FCV C4B</p>		
		Verify Telemetry ThermAvgTemp003 DEA7A170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp009 DEA80170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp008 DEA7F170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp004 DEA7B170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp028 DEA93170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp010 DEA81170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
5		Check GYR configuration & health		Next Step: 6
		<p>The checks must be conditional to cover all valid configurations of the GYR assembly. In particular, normal operations are possible with one GYR channel excluded from the hardware configuration and checks must be executed only for the GYR channels included in the current configuration in use.</p>		
5.1		Check GYR configuration		□
		Verify Telemetry Curr GYRs use AES19002	= GYR 1-2-3 = GYR 1-2-3-4 = GYR 1-2-4 = GYR 1-3-4 = GYR 2-3-4	AND=ZAA01999

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry Curr GYRE use AES20002	= GYRE 1 = GYRE 2	AND=ZAA01999
5.2		Check GYR health		<input type="checkbox"/>
		NOTE: GYR 2-3-4 excludes GYR1 GYR 1-3-4 excludes GYR2 GYR 1-2-4 excludes GYR3 GYR 1-2-3 excludes GYR4		
		Verify Telemetry GYR1 Health Sts AES41002	= Healthy	AND=ZAA02999
		Verify Telemetry GYR2 Health Sts AES42002	= Healthy	AND=ZAA02999
		Verify Telemetry GYR3 Health Sts AES43002	= Healthy	AND=ZAA02999
		Verify Telemetry GYR4 Health Sts AES44002	= Healthy	AND=ZAA02999
5.3		Check GYR-E health		<input type="checkbox"/>
		Verify Telemetry GYRE1 Hlth Sts AESK3002	= Healthy	AND=ZAA02999
		Verify Telemetry GYRE2 Hlth Sts AESK4002	= Healthy	AND=ZAA02999
5.4		Check GYR rates		<input type="checkbox"/>
		Verify Telemetry GYR A cal rate AEGRA002		AND=ZAA21999
		Verify Telemetry GYR B cal rate AEGRB002		AND=ZAA21999
		Verify Telemetry GYR D cal rate AEGRD002		AND=ZAA31999
		Verify Telemetry GYR C cal rate AEGRC002		AND=ZAA21999

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Calculate/plot $ GYR_A_cal_rate - GYR_B_cal_rate + GYR_C_cal_rate - GYR_D_cal_rate $ and check this against a fixed limit (for the moment, set it to 0.01 rad/s). Anything above that means that a GYR is not behaving as it should. (N.B. a subsequent check against the STR can identify the culprit, but is difficult to implement)		
		Verify Telemetry <div style="display: flex; justify-content: space-around;"> GYR_sum XD008990 </div>	< +0.01 rd/s > -0.01 rd/s	AND=ZAZ1B999
6		IF STRM is OFF		Next Step: THEN 7 ELSE 8
7		Declare STR operational (H_FCP_AOC_4S01) Execute Procedure: H_FCP_AOC_4S01 Declare STR operational		Next Step: 8
8		IF Slew to attitude will be in SCM		Next Step: THEN 9 ELSE 11
9		Perform RWL biasing in SCM (H_FCP_AOC_4R20) Execute Procedure: H_FCP_AOC_4R20 Perform RWL biasing in SCM		Next Step: 10
10		Perform SCM Fine Pointing (H_FCP_AOC_3S01) Execute Procedure: H_FCP_AOC_3S01 Perform SCM Fine Pointing		Next Step: 11
11		IF Current Mode is not OCM		Next Step: THEN 12 ELSE 14

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
12		<i>Procedure for pointing in OCM (H_FCP_AOC_00CM)</i>		Next Step: 13
		Execute Procedure: H_FCP_AOC_00CM Procedure for pointing in OCM		
13		<i>Verify transition to OCM and/or slew to target</i>		Next Step: 14
13.1		<i>Check the control state is reached within the specified period T_slew (AHHD1002)</i>		<input type="checkbox"/>
		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
13.2		<i>Check attitude quaternion is close to commanded target</i>		<input type="checkbox"/>
		Verify Telemetry Est Attitude Q1 AESA6001	as commanded	AND=ZAA0999
		Verify Telemetry Est Attitude Q2 AESA7001	as commanded	AND=ZAA0999
		Verify Telemetry Est Attitude Q3 AESA8001	as commanded	AND=ZAA0999
		Verify Telemetry Est Attitude Q4 AESA9001	as commanded	AND=ZAA0999
13.3		<i>Check attitude errors</i>		<input type="checkbox"/>
		Verify Telemetry Attitude err X AESBX002	= +/- 0.50 deg	AND=ZAA0999
		Verify Telemetry Attitude err Y AESBY002	= +/- 0.25 deg	AND=ZAA0999
		Verify Telemetry Attitude err Z AESBZ002	= +/- 0.25 deg	AND=ZAA0999

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
14		IF Prior mode was SCM		Next Step: THEN 15 ELSE 16
15		Ensure reaction wheel bias & hold function is active (H_FCP_AOC_4R34)		Next Step: 16
15.1		Check if Bias & Hold function is active		<input type="checkbox"/>
		Verify Telemetry CurrentBiasAid AESM9002	= BiasHold	AND=ZAA01999
		IF Bias & Hold function is not active THEN Execute procedure H_SVT_AOC_4R34 ELSE go to next main step		
15.2		Perform RWL bias in OCM (H_FCP_AOC_4R34)		<input type="checkbox"/>
		Execute Procedure: H_FCP_AOC_4R34 Perform RWL bias in OCM		
15.3		Verify wheel biasing status		<input type="checkbox"/>
		Verify Telemetry CurrentBiasAid AESM9002	= BiasHold	AND=ZAA01999
		NOTE: If reaction wheels are not commanded to maintain a fixed angular momentum while in OCM, friction will slow them down and result in speeds that may be incompatible with any later transition back to SCM.		
		Verify Telemetry RWL1 wheel spd AEWS1002		GRD=ZGZ07999
		Verify Telemetry RWL2 wheel spd AEWS2002		GRD=ZGZ07999
		Verify Telemetry RWL3 wheel spd AEWS3002		GRD=ZGZ07999

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry RWL4 wheel spd AEWS4002		GRD=ZGZ07999
16		Dump ERD buffer to check for anomalous events (H_FCP_AOC_3011)		Next Step: 17
		Execute Procedure: H_FCP_AOC_3011 ERD buffer dump		
<p>TC Seq. Name : AEDVH_00 (command DVH)</p> <p>TimeTag Type: B Sub Schedule ID: 20 Formal Parameter List :</p> <p>AcmsH Cmd TQ1r Q_FIN_X= <dec> AcmsH Cmd TQ2r Q_FIN_Y= <dec> AcmsH Cmd TQ3r Q_FIN_Z= <dec> AcmsH Cmd TQ4r Q_FIN_S= <dec> AcmsH DVOnTime T_DELTAV= s AcmsH DVMaxDev T_DEVIAT= s AcmsH Fstart F_START= N AcmsH Fend F_END= N AcmsH RCS Mode RCS_MODE=</p> <p>AcmsH OCMThrstr OCM_THRS=</p>				
17		Command start of delta-V		Next Step: 18
17.1		Select TPF (DVH) to Perform Delta-V		<input type="checkbox"/>
		Check with Flight Dynamics the exact name of the <u>TPF instance</u> to be uplinked		
	ET=+00.00.00 UT=+	Execute Telecommand Command Parameter(s) : ASW Function ID AHFUN002 AcmsH AID Cmd AHHF0002 AcmsH DF86 Cmd AH8G1002 AcmsH DD86 Cmd AH8G2002 AcmsH Cmd TQ1r AHHC6002 AcmsH Cmd TQ2r AHHC7002 AcmsH Cmd TQ3r AHHC8002 AcmsH Cmd TQ4r AHHC9002 AcmsH DVOnTime AHHDV002 AcmsH DVMaxDev AHHDD002 AcmsH Fstart AHHFS002	Start delta-V ACAV1002	ACMSMain (Def) OCM prep thrst (Def) Enable 86 Enable 86 Q_FIN_X Q_FIN_Y Q_FIN_Z Q_FIN_S T_DELTAV T_DEVIAT F_START

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		AcmsH Fend AHHFE002 AcmsH RCS Mode AHHRM002 AcmsH OCMThrstr AHHDT002 TC Control Flags : Subsch. ID : 20 Det. descr. : TC_START_H_DELTAV GBM IL DSE --Y -- ---	F_END RCS_MODE OCM_THRS	
17.2		Verify start of thrusting		<input type="checkbox"/>
		Verify Packet Reception AccAsw TM_5_1_16427 - New mode_state Packet Details: APID: 512 Type: 5 Subtype: 1 PI1: 16427 PI2: 0	A51CSTATE109	
		Verify Packet Telemetry (Pkt = A51CSTATE109)		
		New_Substate AE5CC001	= OCM Thrusting	AND=ZAALF999
TC Seq. Name : NULL02 (Null sequence 02) TimeTag Type: Sub Schedule ID: <input type="checkbox"/>				
18		Check completion of Delta-V Manoeuvre		Next Step: 19
		Delta_V should NOT stop before T_DELTAV - T_DEVIAT The Manoeuvre should be completed at the latest T_DELTAV + T_DEVIAT after start of thrusting.		
		Verify Packet Reception AccAsw TM_5_1_16429 - Mode Deltav Accomplished Packet Details: APID: 512 Type: 5 Subtype: 1 PI1: 16429 PI2: 0	A51DVACPL109	
		Verify Packet Telemetry (Pkt = A51DVACPL109)		
		ASW Event Time AE5TM001		AND=ZAALH999
		Verify Packet Telemetry (Pkt = A51DVACPL109)		
		Substate Event AE5ST109		AND=ZAALH999
		Verify Packet Telemetry (Pkt = A51DVACPL109)		
		Resid in DV_X AE5CV001		AND=ZAALH999

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Packet Telemetry (Pkt = A51DVACPL109) Resid in DV_Y AE5CW001		AND=ZAALH999
		Verify Packet Telemetry (Pkt = A51DVACPL109) Resid in DV_Z AE5CX001		AND=ZAALH999
18.1		Check thruster temps and on-times		<input type="checkbox"/>
18.1.1		Verify catbed temps of Acceleration thruster		<input type="checkbox"/>
		Check the following if OCM will use A1		
		Verify Telemetry A1D1 Ttemp act AE5TA001	> 453.23 K	AND=ZAA04999
		Check the following if OCM will use A2		
		Verify Telemetry A2D2 Ttemp act AETTB001	> 453.23 K	AND=ZAA04999
18.1.2		Verify catbed temps of Control thrusters		<input type="checkbox"/>
		Verify Telemetry C1F1 Ttemp act AETTC001	> 453.23 K	AND=ZAA04999
		Verify Telemetry C2F2 Ttemp act AETTD001	> 453.23 K	AND=ZAA04999
		Verify Telemetry C3U1 Ttemp act AETTE001	> 453.23 K	AND=ZAA04999
		Verify Telemetry C4U2 Ttemp act AETTF001	> 453.23 K	AND=ZAA04999
		NOTE: Unused branch should be around S/C ambient, but check values are above hydrazine's freezing point ~2 degC (to ensure they so could support ACMS survival mode triggering without risk of damage).		
		Verify Telemetry C1F1 Ttmp unuse AETUC001		AND=ZAA04999
		Verify Telemetry C2F2 Ttmp unuse AETUD001		AND=ZAA04999
		Verify Telemetry C3U1 Ttmp unuse AETUE001		AND=ZAA04999
		Verify Telemetry C4U2 Ttmp unuse AETUF001		AND=ZAA04999

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
18.1.3		Check thruster on-times		<input type="checkbox"/>
		NOTE: Thruster total ON times are running counters that get re-set only when thruster Main branch is re-set		
		Monitor total ON time for acceleration (A) thrusters		
		Verify Telemetry A1D1 accu ToT AETAA001		AND=ZAA04999
		Verify Telemetry A2D2 accu ToT AETAB001		AND=ZAA04999
		Monitor total ON time for control (C) thrusters		
		Verify Telemetry C1F1 accu ToT AETAC001		AND=ZAA04999
		Verify Telemetry C2F2 accu ToT AETAD001		AND=ZAA04999
		Verify Telemetry C3U1 accu ToT AETAE001		AND=ZAA04999
		Verify Telemetry C4U2 accu ToT AETAF001		AND=ZAA04999
18.2		Check S/C & orbit status after Delta-V		<input type="checkbox"/>
18.2.1		Check the control ACMS mode after delta-V is complete		<input type="checkbox"/>
		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
18.2.2		Check correct orbit reached		<input type="checkbox"/>
		Ground procedure/computation		
19		IF Original ACMS Mode was SCM		Next Step: ELSE END THEN 20

Perform Delta-V
 File: H_FCP_AOC_3001.xls
 Author: dsalt-hp



Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
20		<i>Procedure for SCM Fine pointing (H_FCP_AOC_OSCM)</i>		Next Step: END
		Execute Procedure: H_FCP_AOC_OSCM Procedure for SCM Fine Pointing		
End of Procedure				

TPFs & associated TCs for routine Delta-Vs

Routine delta-Vs will be executed outside of a pass but will be timed to complete just before the start of a DTCP. The associated set of TCs will therefore be uplinked manually to the MTL during the previous DTCP.

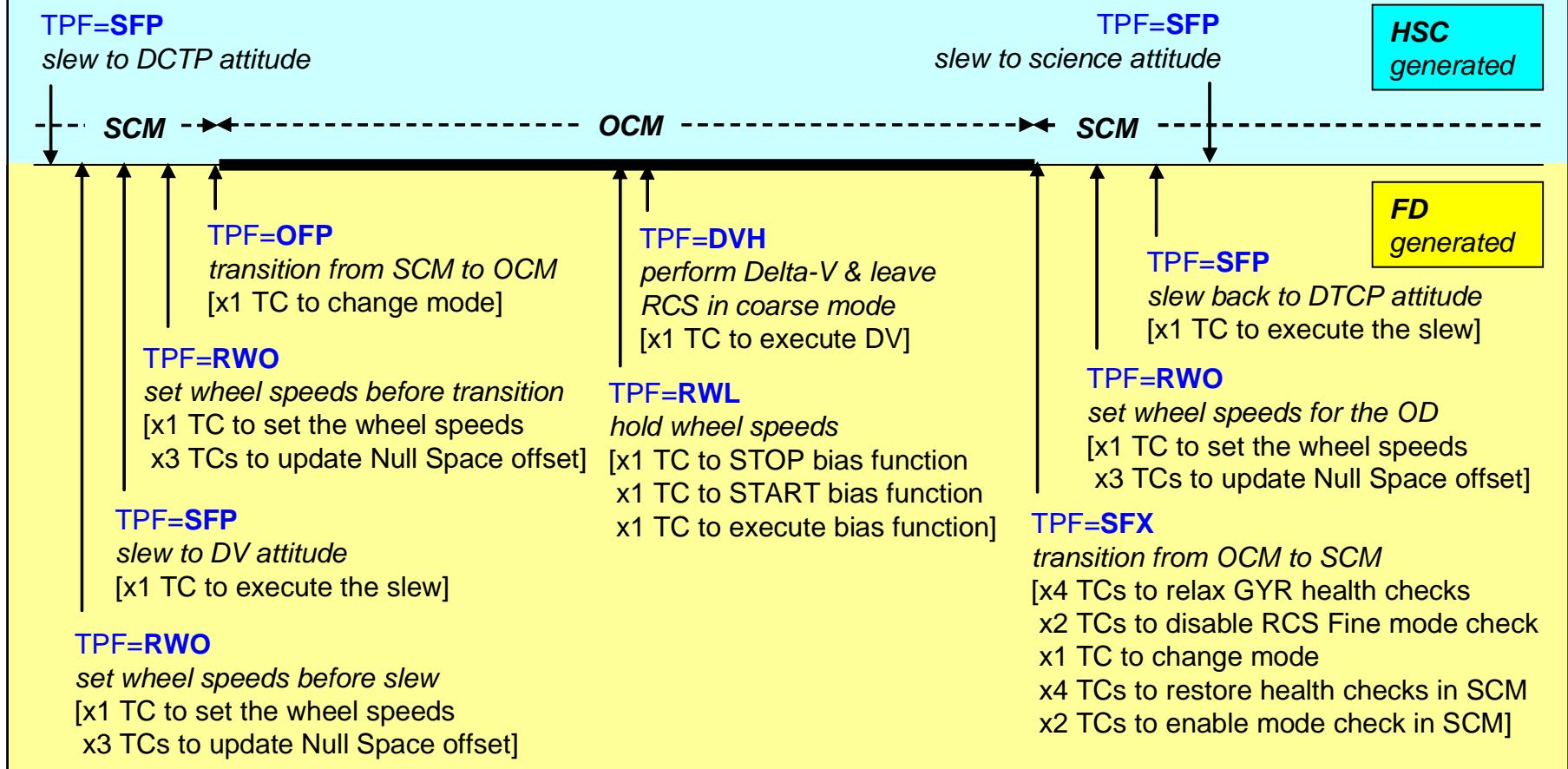
Each delta-V will be defined via a set of TPFs, as indicated in this table, which will be delivered by Flight Dynamics (FD) prior to the DTCP start. When loaded onto the Manual Stack, the TPFs will instantiate a set of time-tagged commands, with the times of the key TCs being defined by FD and those of the other TCs being defined by relative time off-sets within the associated sequences.

NOTE1: Relative time values presented here indicate typical time separations between key TCs, while those in parentheses are the time offsets of the supporting TCs relative to the key TCs.

NOTE2: The first instance of TPF=RWO may not be provided if wheel speeds analysis shows current speeds have sufficient margin to support the slew to the delta-V attitude.

TPF	Offset	Associated TC(s) - with key TC in BOLD
RWO	+00:00:00 (+00:00:01) (+00:00:02) (+00:00:03)	ACWP1002 (Bias total RWS pointing – prior to slew) ACDS1001 (Start database loading) ACZTY109 (Load OBDB value for new Null Space offset) ACZ5L109 (Fire Start DB loading)
SFP	+00:20:00	ACAF1002 (SCM Fine Pointing – slew to the Delta-V attitude)
RWO	+00:20:00 (+00:00:01) (+00:00:02) (+00:00:03)	ACWP1002 (Bias total RWS pointing – prior to OCM transition) ACDS1001 (Start database loading) ACZTY109 (Load OBDB value for new Null Space offset) ACZ5L109 (Fire Start DB loading)
OFP	+00:20:00 (-00:00:10) (-00:00:05)	ACAD1002 (Perform OCM pointing – null-slew transition to OCM) AC082109 (Stop Function) AC081109 (Start Function)
RWL	+00:00:30	ACWH1002 (Bias and hold RWLs – fixes wheel speeds in OCM)
DVH	+00:00:05	ACAV1002 (Start delta-V)
SFX	(-00:00:20) (-00:00:18) (-00:00:16) (-00:00:14) (-00:00:12) (-00:00:10) +00:02:00 (+00:10:02) (+00:10:04) (+00:10:06) (+00:10:08) (+00:10:10)	ACY8P109 (Disable TC check on Fine mode) ACZ7M109 (Fire Disable Check) ACDS1001 (Start database loading) ACZTY109 (Load OBDB value 1 to <u>relax</u> GYR health check) ACZTY109 (Load OBDB value 2 to <u>relax</u> GYR health check) ACFC1001 (Fire critical command) ACAF1002 (SCM Fine Pointing – null-slew transition back to SCM) ACDS1001 (Start database loading) ACZTY109 (Load OBDB value 1 to <u>restore</u> GYR health check) ACZTY109 (Load OBDB value 2 to <u>restore</u> GYR health check) ACFC1001 (Fire critical command) ACZDL109 (Enable TC check on Fine mode)
RWO	+00:10:00 (+00:00:01) (+00:00:02) (+00:00:03)	ACWP1002 (Bias total RWS pointing – prior to DTCP attitude slew) ACDS1001 (Start database loading) ACZTY109 (Load OBDB value for new Null Space offset) ACZ5L109 (Fire Start DB loading)
SFP	+00:20:00	ACAF1002 (SCM Fine Pointing – slew to the DTCP attitude)

TPF/Sequences for the Routine Delta-V Scenario



Doc No. : PT-HMOC-OPS-FOP-6001-OPS-OAH
Fop Issue : 3.0
Issue Date: 13/04/10



Status : Version 12 - Unchanged
Last Checkin: 23/07/09