RBSP EFW Axial Boom Deployment Procedure

RBSP_EFW_SOC_101
Revision A
12 August 2012

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2012.09.11
14:59:02 -07'00'

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Spacecraft (circle one) **A** **B**

Start Date: _____

End Date: _____

Record svn revision number _____

Record data location filename _____

Test Conductor: _____

Procedure Results Reviewed:

Systems Engineering: _____

Quality Assurance: _____

Revision	Author	Notes
A	Ludlam, Bonnell	Initial Flight Release, reflective of Project, GNC, and EFW discussions of 8 Aug 2012; 15 Aug 2012.

1. Scope

This procedure is used to deploy the Spin Plane Boom Sensors on orbit.

2. Precautions

This procedure is run with close collaboration of the Guidance and Control Team at APL.

3. Equipment Required

Record a list of non calibrated equipment used e.g. laptop computer

Equipment	Serial Number
GSE Laptop	
Good Luck Talisman of Choice	

4. Set Up – NOTE: perform this step each time a new deploy section is being run.

4.1. ☐ Start GSE Laptop computer

4.2. ☐ Start GSEOS.

4.3. ☐ Connect to the MOC.

4.4. ☐ Record activity in GSE log on GSE computer.

5. EFW Instrument Check – NOTE: perform this step each time a new deploy section is being run.

5.1. ☐ Record current from S/C Telemetry _____ (range 340-390mA)

5.2. ☐ Verify FSW running. Record version _____

5.3. ☐ Verify receipt of APID 267 and 263 HSK on GSE.

5.4. ☐ Verify all HSK is within ranges – no yellow or red limits.

5.5. ☐ Verify instrument is configured in operational mode 1

5.6. ☐ Verify receipt of APID 0x243 and 0x244 (ESVY and VSVY) science telemetry on GSE.

5.7. ☐ Verify APID 0x243 and 0x244 (ESVY and VSVY) science data are nominal for current AXB deploy configuration, illumination state, and environment using EFWPLOT from GSE command line.

5.8. ☐ Verify EMFISIS is a mode to monitor EFW science data.

6. AXB Sphere Cage Opening (Sphere and Whip Release)

6.1. ☐ Request S/C power on AXB Primary Deployment Service.

6.1.1. ☐ Record current on supply _____ (expected 0mA)

6.1.2. ☐ Record voltage on supply _____ (expected 22-34V)

6.2. **BOTTOM DECK (AXB-1, SCI –W, SC –Z) CAGE 5 OPENING**

6.2.1. ☐ Verify bottom deck caging mechanism temperature is within operational limits:

6.2.1.1. IEM.SEC_16.AXB_AFT_CAGING_MECH_TEMP: _____ (-25 C to +65 C).

6.2.2. ☐ From temperature of the bottom deck caging mechanism noted above, calculate the time to fire the sphere cage release frangibolt. Add 5 seconds and record time here _____ = T.

6.2.3. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

6.2.4. ☐ Obtain S/C approval to open AXB cage 5 (Bottom).

6.2.5. ☐ Record date and time _____

6.2.6. ☐ Start script to deploy AXB1 Cage : AXB_whip_deploy(boom=5, seconds=T) where T is the calculated number above.

6.2.7. ☐ When the script prompts, check the HSK for ACTSELECT reads AXB1_SPHERE and ACTTIME reads T seconds.

6.2.8. ☐ Fire actuator.

6.2.9. ☐ Record current on supply _____ (expected 900-1000mA)

6.2.10. ☐ Verify cage lights on the HSK 0x267 packet show AXB cage open (LED off)

6.2.11. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

6.2.12. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the whip and sphere deploy here:

_____

6.3. **TOP DECK (AXB-2, SCI +W, SC +Z) CAGE 6 OPENING**

6.3.1. ☐ verify that top deck AXB caging mechanism temperature is within operational limits:

6.3.1.1. IEM.SEC_16.AXB_FWD_CAGING_MECH_TEMP:

_____ (-25 C to +65 C).

6.3.2. ☐ From temperature of the top deck caging mechanism noted above, calculate the time to fire the frangibolt. Add 5 seconds and record time here

_____ = T.

6.3.3. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

6.3.4. ☐ Obtain S/C approval to open AXB cage 6 (Top).

6.3.5. ☐ Record date and time _____

6.3.6. ☐ Start script to deploy AXB2 Cage : AXB_whip_deploy(boom=6, seconds=T) where T is the calculated number above.

6.3.7. ☐ When the script prompts, check the HSK for ACTSELECT reads AXB1_SPHERE and ACTTIME reads T seconds.

6.3.8. ☐ Fire actuator.

6.3.9. ☐ Record current on supply _____ (expected 900-1000mA)

6.3.10. ☐ Verify cage lights on the HSK 0x267 packet show AXB cage open (LED off)

6.3.11. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

6.3.12. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the whip and sphere deploy here:

_____

6.4. ☐ Request S/C power off AXB Primary Deployment Service.

6.4.1. ☐ Record current on supply _____ (expected 0mA)

6.4.2. ☐ Record voltage on supply _____ (expected 0V)

7. Stacer Release

7.1. ☐ Request S/C power on AXB Primary Deployment Service.

7.1.1. ☐ Record current on supply _____ (expected 0mA)

7.1.2. ☐ Record voltage on supply _____ (expected 22-34V)

7.2. **STACER RELEASE AXB 5 (BOTTOM DECK)**

7.2.1. ☐ From temperature of the AXB1 (EFW HSK TMON_AXB5) calculate the time to fire the frangibolt. Add 5 seconds and record time here _____ = T.

7.2.2. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

7.2.3. ☐ Obtain S/C approval to release AXB5 (Bottom) Stacer.

7.2.4. ☐ Record date and time _____

7.2.5. ☐ Start script to release AXB1 Stacer : AXB_stacer_fire(boom=5, seconds=T)

7.2.6. ☐ When the script prompts, check the HSK for ACTSELECT reads AXB1_STACER and ACTTIME reads T seconds.

7.2.7. ☐ Fire actuator.

7.2.8. ☐ Record current on supply _____ (expected 900-1000mA)

7.2.9. ☐ Verify stacer lights on the HSK 0x267 packet show AXB stacer is released (LED off). Note this may not happen as the stacer may not move enough until deployment occurs.

7.2.10. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

7.2.11. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the stacer release here:

_____

7.3. **STACER RELEASE AXB 6 (TOP DECK)**

7.3.1. ☐ From temperature of the AXB2 (EFW HSK TMON_AXB6) calculate the time to fire the frangibolt. Add 5 seconds and record time here

_____ = T.

7.3.2. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

7.3.3. ☐ Obtain S/C approval to release AXB6 (Top) Stacer.

7.3.4. ☐ Record date and time _____

7.3.5. ☐ Start script to release AX21 Stacer : AXB_stacer_fire(boom=6, seconds=T)

7.3.6. ☐ When the script prompts, check the HSK for ACTSELECT reads AXB2_STACER and ACTTIME reads T seconds.

7.3.7. ☐ Fire actuator.

7.3.8. ☐ Record current on supply _____ (expected 900-1000mA)

7.3.9. ☐ Verify stacer lights on the HSK 0x267 packet show AXB stacer is released (LED off). Note this may not happen as the stacer may not move enough until deployment occurs.

7.3.10. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

7.3.11. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the stacer release here:

_____

7.4. ☐ Request S/C power off AXB Primary Deployment Service.

7.4.1. ☐ Record current on supply _____ (expected 0mA)

7.4.2. ☐ Record voltage on supply _____ (expected 0V)

8. AXB Boom Deployment

8.1. ☐ Request S/C power on AXB Primary Deployment Service.

8.1.1. ☐ Record current on supply _____ (expected 0mA)

8.1.2. ☐ Record voltage on supply _____ (expected 22-34V)

8.2. **INITIAL BOTTOM AXB DEPLOY: AXB5 (Bottom) 3.997 m (5-m sphere to boom sym plane (BSP))**

8.2.1. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

8.2.2. ☐ Obtain S/C approval to release AXB-1 (EFW Boom 5) (Bottom) Stacer.

8.2.3. ☐ Record date and time _____

8.2.4. ☐ Start script to deploy AXB-1 boom 10 clicks :

AXB_stacer_DEPLOY(boom= 5, leng= 10)

8.2.5. ☐ When script prompts with the pop up window, check the command is to deploy the AXB1 10 clicks and start the deployment.

8.2.6. ☐ Record current on supply _____ (expected 125-175mA)

8.2.7. ☐ Verify in HSK APID 0x267 that DEPLIMIT =10, DLENA is counting up and stops at 10.

8.2.8. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

8.2.9. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the boom deploy here:

_____

8.2.10. ☐ Record date and time _____

8.2.11. ☐ Start script to deploy AXB 1 boom 627 clicks :

AXB_stacer_DEPLOY(boom= 5, leng= 627)

8.2.12. ☐ When script prompts with the pop up window, check the command is to deploy the AXB1 627 clicks and start the deployment.

8.2.13. ☐ Record current on supply _____ (expected 125-175mA)

8.2.14. ☐ Verify in HSK APID 0x267 that DEPLIMIT =627, DLENA is counting up and stops at 627.

8.2.15. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

8.2.16. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the boom deploy here:

_____

8.3. **INITIAL TOP AXB DEPLOY: DEPLOY AXB6 (Bottom) TO 3.997 m (5-m sphere to BSP):**

8.3.1. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

8.3.2. ☐ Obtain S/C approval to deploy AXB6 (Top) Stacer.

8.3.3. ☐ Record date and time _____

8.3.4. ☐ Start script to deploy AXB 2 boom 10 clicks :

AXB_stacer_DEPLOY(boom= 6, leng= 10)

8.3.5. ☐ When script prompts with the pop up window, check the command is to deploy the AXB1 10 clicks and start the deployment.

8.3.6. ☐ Record current on supply _____ (expected 125-175mA)

8.3.7. ☐ Verify in HSK APID 0x267 that DEPLIMIT =10, DLENA is counting up and stops at 10.

8.3.8. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

8.3.9. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the boom deploy here:

_____

8.3.10. ☐ Record date and time _____

8.3.11. ☐ Start script to deploy AXB 2 boom 627 clicks :

AXB_stacer_DEPLOY(boom= 6, leng= 627)

8.3.12. ☐ When script prompts with the pop up window, check the command is to deploy the AXB1 627 clicks and start the deployment.

8.3.13. ☐ Record current on supply _____ (expected 125-175mA)

8.3.14. ☐ Verify in HSK APID 0x267 that DEPLIMIT =627, DLENA is counting up and stops at 627.

8.3.15. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

8.3.16. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the boom deploy here:

_____

8.4. Request S/C power off AXB Primary Deployment Service.

8.4.1. ☐ Record current on supply _____ (expected 0mA)

8.4.2. ☐ Record voltage on supply _____ (expected 0V)

9. AXB Boom Deployment Trim 1

9.1. ☐ Request S/C power on AXB Primary Deployment Service.

9.1.1. ☐ Record current on supply _____ (expected 0mA)

9.1.2. ☐ Record voltage on supply _____ (expected 22-34V)

9.2. **DEPLOY AXB5 (BOTTOM) TO TRIM LENGTH**

9.2.1. ☐ Calculate additional length required and convert to number of clicks required. Record number _____ = N

9.2.2. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

9.2.3. ☐ Obtain S/C approval to release AXB5 (Bottom) Stacer.

9.2.4. ☐ Record date and time _____

9.2.5. ☐ Start script to deploy AXB 1 boom N clicks :

AXB_stacer_DEPLOY(boom= 5, leng= N)

9.2.6. ☐ When script prompts with the pop up window, check the command is to deploy the AXB1 N clicks and start the deployment.

9.2.7. ☐ Record current on supply _____ (expected 125-175mA)

9.2.8. ☐ Verify in HSK APID 0x267 that DEPLIMIT =N, DLENA is counting up and stops at N.

9.2.9. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

9.2.10. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the boom deploy here:

_____

9.3. **DEPLOY AXB6 (TOP) TO TRIM LENGTH**

9.3.1. ☐ Calculate additional length required and convert to number of clicks required. Record number _____ = N

9.3.2. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

9.3.3. ☐ Obtain S/C approval to deploy AXB6 (Top) Stacer.

9.3.4. ☐ Record date and time _____

9.3.5. ☐ Start script to deploy AXB 2 boom N clicks :

AXB_stacer_DEPLOY(boom= 6, leng= N)

9.3.6. ☐ When script prompts with the pop up window, check the command is to deploy the AXB1 N clicks and start the deployment.

9.3.7. ☐ Record current on supply _____ (expected 125-175mA)

9.3.8. ☐ Verify in HSK APID 0x267 that DEPLIMIT =N, DLENA is counting up and stops at N.

9.3.9. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

9.3.10. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the boom deploy here:

_____

9.4. Request S/C power off AXB Primary Deployment Service.

9.4.1. ☐ Record current on supply _____ (expected 0mA)

9.4.2. ☐ Record voltage on supply _____ (expected 0V)

AXB Boom Deployment Trim 2

9.5. ☐ Request S/C power on AXB Primary Deployment Service.

9.5.1. ☐ Record current on supply _____ (expected 0mA)

9.5.2. ☐ Record voltage on supply _____ (expected 22-34V)

9.6. **DEPLOY AXB5 (Bottom) TO TRIM LENGTH**

9.6.1. ☐ Calculate additional length required and convert to number of clicks required. Record number _____ = N

9.6.2. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

9.6.3. ☐ Obtain S/C approval to release AXB5 (Top) Stacer.

9.6.4. ☐ Record date and time _____

9.6.5. ☐ Start script to deploy AXB 1 boom N clicks :

AXB_stacer_DEPLOY(boom= 5, leng= N)

9.6.6. ☐ When script prompts with the pop up window, check the command is to deploy the AXB1 N clicks and start the deployment.

9.6.7. ☐ Record current on supply _____ (expected 125-175mA)

9.6.8. ☐ Verify in HSK APID 0x267 that DEPLIMIT =N, DLENA is counting up and stops at N.

9.6.9. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

9.6.10. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the boom deploy here:

_____

9.7. **DEPLOY AXB6 (Top) TO TRIM LENGTH**

9.7.1. ☐ Calculate additional length required and convert to number of clicks required. Record number _____ = N

9.7.2. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

9.7.3. ☐ Obtain S/C approval to deploy AXB6 (Top) Stacer.

9.7.4. ☐ Record date and time _____

9.7.5. ☐ Start script to deploy AXB 2 boom N clicks :

AXB_stacer_DEPLOY(boom= 6, leng= N)

9.7.6. ☐ When script prompts with the pop up window, check the command is to deploy the AXB1 N clicks and start the deployment.

9.7.7. ☐ Record current on supply _____ (expected 125-175mA)

9.7.8. ☐ Verify in HSK APID 0x267 that DEPLIMIT =N, DLENA is counting up and stops at N.

9.7.9. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

9.7.10. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the boom deploy here:

_____

9.8. Request S/C power off AXB Primary Deployment Service.

9.8.1. ☐ Record current on supply _____ (expected 0mA)

9.8.2. ☐ Record voltage on supply _____ (expected 0V)

10. AXB Boom Deployment Trim 3

10.1. ☐ Request S/C power on AXB Primary Deployment Service.

10.1.1. ☐ Record current on supply _____ (expected 0mA)

10.1.2. ☐ Record voltage on supply _____ (expected 22-34V)

10.2. **DEPLOY AXB5 (Bottom) TO TRIM LENGTH**

10.2.1. ☐ Calculate additional length required and convert to number of clicks required. Record number _____ = N

10.2.2. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

10.2.3. ☐ Obtain S/C approval to release AXB5 (Top) Stacer.

10.2.4. ☐ Record date and time _____

10.2.5. ☐ Start script to deploy AXB 1 boom N clicks :

AXB_stacer_DEPLOY(boom= 5, leng= N)

10.2.6. ☐ When script prompts with the pop up window, check the command is to deploy the AXB1 N clicks and start the deployment.

10.2.7. ☐ Record current on supply _____ (expected 125-175mA)

10.2.8. ☐ Verify in HSK APID 0x267 that DEPLIMIT =N, DLENA is counting up and stops at N.

10.2.9. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

10.2.10. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the boom deploy here:

_____

10.3. **DEPLOY AXB6 (Top) TO TRIM LENGTH**

10.3.1. ☐ Calculate additional length required and convert to number of clicks required. Record number _____ = N

10.3.2. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

10.3.3. ☐ Obtain S/C approval to deploy AXB6 (Top) Stacer.

10.3.4. ☐ Record date and time _____

10.3.5. ☐ Start script to deploy AXB 2 boom N clicks :

AXB_stacer_DEPLOY(boom= 6, leng= N)

10.3.6. ☐ When script prompts with the pop up window, check the command is to deploy the AXB1 N clicks and start the deployment.

10.3.7. ☐ Record current on supply _____ (expected 125-175mA)

10.3.8. ☐ Verify in HSK APID 0x267 that DEPLIMIT =N, DLENA is counting up and stops at N.

10.3.9. ☐ Record S/C spin rate _____ (expected 5.5 RPM)

10.3.10. ☐ Note any changes to APID 0x243 and 0x244 science data coincident to the boom deploy here:

_____

10.4. Request S/C power off AXB Primary Deployment Service.

10.4.1. ☐ Record current on supply _____ (expected 0mA)

10.4.2. ☐ Record voltage on supply _____ (expected 0V)

Congratulations – you have successfully completed the RBSP-EFW AXB deploy sequence.