<table>
<thead>
<tr>
<th>NOMINAL MPLM INSTALL (CONTINGENCY)</th>
<th>FS 7-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>NODE 1 NADIR ACBM INSPECTION (CONTINGENCY)</td>
<td></td>
</tr>
<tr>
<td>MPLM GRAPPLE IN BAY (CONTINGENCY)</td>
<td></td>
</tr>
<tr>
<td>ROEU DEMATE (CONTINGENCY)</td>
<td></td>
</tr>
<tr>
<td>UNBERTH (CONTINGENCY)</td>
<td></td>
</tr>
<tr>
<td>INSTALL (CONTINGENCY)</td>
<td></td>
</tr>
<tr>
<td>UNGRAPPLE ON NODE NADIR (CONTINGENCY)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NODE 1 NADIR ACBM INSPECTION (CONTINGENCY)

1. SETUP
   A7U
   CCTV – RMS WRIST

<table>
<thead>
<tr>
<th>SM 94 PDRS CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>√ PL ID, ITEM 3: 0</td>
</tr>
<tr>
<td>√ INIT ID, ITEM 24: 0</td>
</tr>
</tbody>
</table>

2. MNVR TO ACBM INSPECTION POSN
   RATE – as reqd (VERN within 10 ft)
   BRAKES – OFF (tb-OFF)
   MODE – as desired

   NODE 1 NADIR ACBM posn:
<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>PITCH</th>
<th>YAW</th>
<th>ROLL</th>
<th>PL ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>-791</td>
<td>0</td>
<td>-875</td>
<td>145</td>
<td>0</td>
<td>180</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SY</th>
<th>SP</th>
<th>EP</th>
<th>WP</th>
<th>WY</th>
<th>WR</th>
</tr>
</thead>
<tbody>
<tr>
<td>-56.1</td>
<td>+86.1</td>
<td>-71.9</td>
<td>+104.7</td>
<td>-51.9</td>
<td>+168.3</td>
</tr>
</tbody>
</table>

3. ACBM INSPECTION
   Drive in END EFF as reqd to view entire interface

   BRAKES – ON (tb-ON)
MPLM GRAPPLE IN BAY (CONTINGENCY)

1. SETUP
   A7U
   CCTV – config for grapple
   – install PDRS TARGET OVERLAY FOR CTVM
   – RMS WRIST, zoom 34.0 HFOV
     focus 5 ft
   Maintain eyepoint approx 18 in when using grapple overlay

   SM 94 PDRS CONTROL
   √ PL ID, ITEM 3:  0
   √ INIT ID, ITEM 24:  0

   CAUTION
   Mid and Aft payload bay flood lights must be
   OFF until MPLM clear of V-guides

2. MNVR TO PRE-GRAPPLE
   MON 1  |  A(B)
   MON 2  |  Elbow(EE)
   RATE   – as reqd (VERN within 10 ft)
   BRAKES – OFF (tb-OFF)
   MODE   – ORB UNL, ENTER

   NOTE
   WR joint may be rotated 360 degrees to maintain consistency
   with documented joint angles through MPLM Install

   PRE-GRAPPLE posn:
<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>PITCH</th>
<th>YAW</th>
<th>ROLL</th>
<th>PL ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1059</td>
<td>-114</td>
<td>-497</td>
<td>271</td>
<td>310</td>
<td>151</td>
<td>0</td>
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<tr>
<td>SY</td>
<td>SP</td>
<td>EP</td>
<td>WP</td>
<td>WY</td>
<td>WR</td>
<td></td>
</tr>
<tr>
<td>+2.6</td>
<td>+62.3</td>
<td>-85.3</td>
<td>-68.4</td>
<td>-30.6</td>
<td>-193.1</td>
<td></td>
</tr>
</tbody>
</table>
3. **GRAPPLE**

<table>
<thead>
<tr>
<th>MON 1</th>
<th>EE (Elbow)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MON 2</td>
<td>A or Mux A/B(B)</td>
</tr>
</tbody>
</table>

RATE – VERN (RATE MIN tb-ON)  
BRAKES – OFF (tb-OFF)  
MODE – END EFF, ENTER

Mnvr to grapple envelope

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor EE tb timing to prevent EE motor burnout</td>
</tr>
</tbody>
</table>

EE MODE – AUTO  
CAPTURE sw – depress (mom)

<table>
<thead>
<tr>
<th>RIGID</th>
<th>CLOSE</th>
<th>CAPTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>√</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DERIGID</th>
<th>OPEN</th>
<th>EXTEND</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CRITICAL TIMES (28 sec total):
CAPTURE tb – gray, then
CLOSE tb – gray, 3 sec max, then
RIGID tb – gray, 25 sec max

EE MODE – OFF  
BRAKES – ON (tb-ON)

**SM 94 PDRA CONTROL**

PL ID – ITEM 3 +1(3) EXEC  
INIT ID – ITEM 24 +1(3) EXEC

![Image of grapple envelope](image_url)

Record POS/ATT and Joint Angles:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>PITCH</th>
<th>YAW</th>
<th>ROLL</th>
<th>PL ID</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>SY</td>
<td>SP</td>
<td>EP</td>
<td>WP</td>
<td>WY</td>
<td>WR</td>
<td></td>
</tr>
</tbody>
</table>

Expected:

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-2.0</td>
<td>+57.2</td>
<td>-89.4</td>
<td>-56.5</td>
<td>-30.6</td>
<td>-187.7</td>
<td></td>
</tr>
</tbody>
</table>

Review **GENERIC END EFFECCTOR CUE CARD**

Record POS/ATT and Joint Angles in MPLM BERTH (NOM MPLM BERTH (CONT)) and MPLM SJ BERTH (OFF-NOM MPLM BERTH (CONT))
MPLM ROEU DEMATE (CONTINGENCY)

1. DEADFACE ROEU
   SSP 1
   √MPLM CHAN 1,2 HTR PWR – OFF (tb-bp)
   √APCU 1,2 CONV – OFF (tb-bp)
   √2 OUTPUT RLY – OP (tb-bp)

2. SETUP

   ELBOW (-20,0)

   A6U Install ROEU A6U PANEL OVERLAY
   PL RETEN PL SEL – 2
   SM 97 PL RETENTION
   √REL 2,3 (four) – 0
   * If LATCH 2,3 REL msw shows ‘1,’ *
   * drive latch for single motor time *

   ELEC CONT
   RELAX DEMATE RELEASE
   √ REL MATE LAT LATCH

3. ACTIVATE ROEU
   PL RETEN LOGIC PWR SYS 1,2 (two) – ON

   R13L PL BAY MECH PWR SYS 1,2 (two) – ON
4. RELEASE LATCHES
Note single motor time (> 20 sec)
A6U RELEASE/LATCH – REL (tb-REL), 40 sec max
   – OFF

5. DEMATE ROEU
Note single motor time (> 18 sec)
DEMATE/MATE – DEMATE (tb-REL), 36 sec max
   – OFF

6. DEACTIVATE ROEU
PL RETEN LOGIC PWR SYS 1,2 (two) – OFF
R13L PL BAY MECH PWR SYS 1,2 (two) – OFF
MPLM UNBERTH (CONTINGENCY)

1. SETUP

√ MRLM ROEU DEMATE complete

A7U

CCTV – config for unberth
– Camr B,C,KEEL
– install MPLM BERTH OVERLAY and mark any offset between keel target and overlay

<table>
<thead>
<tr>
<th>MON 1</th>
<th>B/C Mux(D/A Mux)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Keel(Elbow)</td>
</tr>
</tbody>
</table>

Activate KEEL CCTV:

SSP 2

√ cb SW PWR 3 (CB2) – cl
MPLM KEEL CAM PWR – ON
HTR/ILLUM PWR – OFF, then ON for HI (repeat for MED,LO,OFF)

PCS

MCS: MCS Configuration: US GNC Inhibits
US GNC Inhibits

cmd Desat Request Inhibit (Verify – Inh)

SM 94 PDRS CONTROL
√ PL ID, ITEM 3: 1
√ INIT ID, ITEM 24: 1

2. ACTIVATE LATCHES

A6U

√ PL RETEN LAT (five) – OFF
PL SEL – 1
LOGIC PWR SYS 1,2 (two) – ON

R13L

PL BAY MECH PWR SYS 1,2 (two) – ON

SM 97 PL RETENTION
√ RDY-FOR-LAT 1,2,3,4,5 (ten): 1
√ LAT 1,2,3,4,5 (ten): 1

* If any REL msw shows ‘1’, expect *
* single motor time (60 sec) *
3. **AKA RELEASE**

A6U

\[\sqrt{\text{PL RETEN LAT 5 \ tb - LAT}}\]

\[\sqrt{\text{RDY 5 \ tb - gray}}\]

Note single motor time (> 30 sec)

PL RETEN LAT 5 – REL (tb-REL), 60 sec max

– OFF

4. **PRLA RELEASE**

\[\sqrt{\text{PL RETEN LAT 1,2,3,4 \ tb \ (four) - LAT}}\]

\[\sqrt{\text{RDY 1,2,3,4 \ tb \ (four) - gray}}\]

Note single motor time (> 30 sec)

PL RETEN LAT 1,2 (two) – REL (tb-REL), 60 sec max

– OFF

3,4 (two) – REL (tb-REL), 60 sec max

– OFF

5. **DEACTIVATE LATCHES**

PL RETEN LOGIC PWR SYS 1,2 (two) – OFF

R13L

PL BAY MECH PWR SYS 1,2 (two) – OFF

Record POS/ATT and Joint Angles:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>PITCH</th>
<th>YAW</th>
<th>ROLL</th>
<th>PL ID</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>SY</td>
<td>SP</td>
<td>EP</td>
<td>WP</td>
<td>WY</td>
<td>WR</td>
<td></td>
</tr>
</tbody>
</table>

6. **MNVR TO MPLM LOW HOVER**

RATE – as reqd (VERN within 10 ft)

BRAKES – OFF (tb-OFF)

MODE – ORB LD, ENTER

**NOTE**

Monitor clearance between MPLM STBD trunnions and the OBSS. Clearance can be monitored with Cameras C and D.

Minimum clearance is 3 in

Mnvr MPLM up until unconstrained

A6U

\[\sqrt{\text{PL RETEN RDY 1,2,3,4 \ tb \ (four) – bp}}\]

<table>
<thead>
<tr>
<th>MON 1</th>
<th>Keel(Elbow)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MON 2</td>
<td>A(D)</td>
</tr>
</tbody>
</table>
Mnvr MPLM to Low Hover

MPLM LOW HOVER posn:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>PITCH</th>
<th>YAW</th>
<th>ROLL</th>
<th>PL ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1106</td>
<td>0</td>
<td>-650</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>-992</td>
<td>0</td>
<td>-636</td>
<td>0</td>
<td>0</td>
<td>270</td>
<td>2</td>
</tr>
</tbody>
</table>

SY SP EP WP WY WR

-13.6  +63.4  -51.0  -94.3  -29.6  -174.3

Deactivate KEEL CCTV:

SSP 2
MPLM KEEL CAM HTR/ILLUM PWR – toggle until illuminator off
(leave sw in ON posn)
PWR – OFF

BRAKES – ON (tb-ON)

7. MNVR TO MPLM HIGH HOVER

SM 94 PDRS CONTROL
PL ID – ITEM 3 +2 EXEC
INIT ID – ITEM 24 +2 EXEC

<table>
<thead>
<tr>
<th>MON 1</th>
<th>Elbow(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MON 2</td>
<td>A → B(CBCS)</td>
</tr>
</tbody>
</table>

RATE – as reqd (VERN within 10 ft)
√BRAKES – OFF (tb-OFF)
MODE – ORB LD, ENTER
Mnvr MPLM to High Hover

MPLM to HIGH HOVER posn:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>PITCH</th>
<th>YAW</th>
<th>ROLL</th>
<th>PL ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>-796</td>
<td>0</td>
<td>-980</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>SY</td>
<td>SP</td>
<td>EP</td>
<td>WP</td>
<td>WY</td>
<td>WR</td>
<td></td>
</tr>
<tr>
<td>-40.0</td>
<td>+94.9</td>
<td>-67.7</td>
<td>+15.6</td>
<td>-41.7</td>
<td>-69.2</td>
<td></td>
</tr>
</tbody>
</table>

CCTV B (5,40)

ELBOW (0,35)

CBCS

BRAKES – ON (tb-ON)

MODE – not DIRECT
MPLM INSTALL (CONTINGENCY)

1. MNVR TO MPLM PRE-INSTALL POSN
   Install MPLM CBCS CCTV OVERLAY
   √CBCS setup complete

   SM 94 PDRS CONTROL
   √PL ID, ITEM 3: 2
   √INIT ID, ITEM 24: 2

   | MON 1  | CBCS(B or C) |
   | MON 2  | Elbow/Dig Mux(A) |

   RATE – as reqd (VERN within 10 ft)
   BRAKES – OFF (tb-OFF)
   MODE – ORB LD, ENTER

   MPLM PRE-INSTALL posn:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>PITCH</th>
<th>YAW</th>
<th>ROLL</th>
<th>PL ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>-744</td>
<td>0</td>
<td>-980</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>SY</td>
<td>SP</td>
<td>EP</td>
<td>WP</td>
<td>WY</td>
<td>WR</td>
<td></td>
</tr>
<tr>
<td>-49.5</td>
<td>+103.0</td>
<td>-74.3</td>
<td>+9.5</td>
<td>-34.6</td>
<td>-77.0</td>
<td></td>
</tr>
</tbody>
</table>

   BRAKES – ON (tb-ON)
   √MODE – not DIRECT

2. SETUP FOR INSTALLATION
   A7U
   CCTV – config for install
   – RMS ELBOW, CBCS

   √1.505 NODE 1 CBM VERIFY PRE-MATE STATUS (SODF: S&M: NOMINAL: CBM) complete
3. UPDATE RMS COMMAND FRAME

<table>
<thead>
<tr>
<th>SM 169 POS/ATT (PL ID 2)</th>
<th>SM 94 ITEM ENTRIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>18</td>
</tr>
<tr>
<td>Y</td>
<td>19</td>
</tr>
<tr>
<td>Z</td>
<td>20</td>
</tr>
<tr>
<td>PITCH</td>
<td>21</td>
</tr>
<tr>
<td>YAW</td>
<td>22</td>
</tr>
<tr>
<td>ROLL</td>
<td>23</td>
</tr>
</tbody>
</table>

Load POR REF with calculated POR data from the table below (SM 94, Items 18-23, 25, 30)
4. MNVR TO MPLM READY-TO-LATCH POSN

PCS

MCS: MCS Configuration: US GNC Inhibits

US GNC Inhibits

√Desat Request – Inh

<table>
<thead>
<tr>
<th>MON 1</th>
<th>CBCS(B or C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MON 2</td>
<td>Elbow(A)</td>
</tr>
</tbody>
</table>

RATE – VERN (RATE MIN tb-ON)
BRAKES – OFF (tb-OFF)
MODE – ORB LD, ENTER

SM 94 PDRS CONTROL
FLY-PL – ITEM 33 EXEC (*)

Mnvr MPLM until Y, Z, PITCH, YAW, ROLL errors ≤ 0.1

Mnvr MPLM until RTLs achieved (expected X: -4.8)

NOTE

√CBCS misalignment at X: -14 and correct if necessary

Expected MPLM READY-TO-LATCH posn:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>PITCH</th>
<th>YAW</th>
<th>ROLL</th>
<th>PL ID 2</th>
<th>CMD FRAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>-713</td>
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<td>-980</td>
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<td></td>
</tr>
<tr>
<td>-4.8</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SY</th>
<th>SP</th>
<th>EP</th>
<th>WP</th>
<th>WY</th>
<th>WR</th>
</tr>
</thead>
<tbody>
<tr>
<td>-56.9</td>
<td>106.8</td>
<td>-77.1</td>
<td>5.7</td>
<td>-28.6</td>
<td>-82.2</td>
</tr>
</tbody>
</table>

* Repeat step 4, correcting for misalignments until at least 3 of 4 RTLs indicated

NODE 1 NADIR CBM RTL CONFIG FOR MPLM

NOTE: VIEW SHOWN IS FROM NODE 1 NADIR WINDOW
5. **FIRST STAGE CAPTURE**
   √1.506 NODE 1 CBM CAPTURE/ABOLT, step 2 (SODF: S&M: NOMINAL: CBM) complete

   **NOTE**
   CNTL ERR lt and S96 PDRS CNTL msg may occur when Auto Brakes inhibited and during CBM Second Stage Capture

   **SM 94 PDRS CONTROL**
   AUTO BRAKE INH – ITEM 10 EXEC (*)

   MODE – TEST, ENTER (CNTL ERR lt and S96 PDRS CNTL msg may occur)
   RATE – COARSE (RATE MIN tb-OFF)

6. **SECOND STAGE CAPTURE**
   √1.506 NODE 1 CBM CAPTURE/ABOLT, step 3 (SODF: S&M: NOMINAL: CBM) complete
   √1.506 NODE 1 CBM CAPTURE/ABOLT, step 2 (SODF: S&M: NOMINAL: CBM) complete

   AUTO BRAKE ENA – ITEM 9 EXEC (*)
   BRAKES – ON (tb-ON)
   RATE – VERN (RATE MIN tb-ON)

   After MPLM fully installed, record POS/ATT and Joint Angles:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>PITCH</th>
<th>YAW</th>
<th>ROLL</th>
<th>PL ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY</td>
<td>SP</td>
<td>EP</td>
<td>WP</td>
<td>WY</td>
<td>WR</td>
<td>2</td>
</tr>
</tbody>
</table>
   
   **Actual Expected**

   -58.2 +107.3 -77.3 +5.0 -27.5 -83.0
MPLM UNGRAPPLE ON NODE NADIR (CONTINGENCY)

1. SETUP
\[ \sqrt{1.506} \] NODE 1 CBM CAPTURE/ABOLT, step 4 (SODF: S&M: NOMINAL: CBM)
complete

PCS
MCS: MCS Configuration: US GNC Inhibits
US GNC Inhibits
cmd Desat Request Enable (Verify – Ena)

A7U
CCTV – config for ungrapple
– RMS WRIST, zoom 34.0 HFOV
focus 5 ft

SM 94 PDRS CONTROL
PL ID – ITEM 3 +0 EXEC
INIT ID – ITEM 24 +0 EXEC

2. MPLM UNGRAPPLE

<table>
<thead>
<tr>
<th>MON 1</th>
<th>EE (Elbow)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MON 2</td>
<td>B (C)</td>
</tr>
</tbody>
</table>

RATE – VERN (RATE MIN tb-ON) within 10 ft
BRAKES – OFF (tb-OFF)
MODE – END EFF, ENTER

CAUTION
Monitor EE tb timing to prevent EE motor burnout

When OPEN tb – gray,
mnvr arm clear of GF and MPLM

EE MODE – AUTO
RELEASE sw – depress (mom)

\[
\begin{array}{ccc}
\checkmark & \text{CLOSE} & \text{CAPTURE} \\
\text{DERIGID} & \text{OPEN} & \text{EXTEND}
\end{array}
\]

CRITICAL TIMES (28 sec total):
DERIGID tb – gray, 5 sec max, then
OPEN tb – gray, 3 sec max, then
EXTEND tb – gray, 20 sec max

EE MODE – OFF
BRAKES – ON (tb-ON)
\[ \sqrt{\text{MODE}} \] – not DIRECT
JOINT – CRIT TEMP

* If manual release reqd:
* EE MODE – MAN
* MAN CONTR – DERIGID (hold until DERIGID tb-gray, 5 sec max)
* RELEASE sw – depress (hold until OPEN tb-gray, 3 sec max)
* Mnvr arm clear, then
* EE MAN CONTR – DERIGID (hold until EXTEND tb-gray, 20 sec max)
* MODE – OFF
* BRAKES – ON