OBSS NOMINAL

OBSS UNBERTH..... FS 1-2
BERTH..... FS 1-7
HANDOFF FROM SSRMS TO SRMS..... FS 1-11
SRMS TO SSRMS ..... FS 1-16

OBSS UNBERTH

WARNING
For UNDOCKED ops only

NOTE
Stbd MPMs assumed deployed

1. SETUP

MON 1	Elbow
MON 2	C/D

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

2. MNVR TO OBSS PREGRAPPLE

RHC
RATE – as desired (VERN within 10 ft)
BRAKES – OFF (tb-OFF)
MODE – ORB UNL, ENTER

If first RMS ops for the mission:
Perform manual PLB survey, en route to OBSS PREGRAPPLE position

Mnvr to OBSS PREGRAPPLE posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-680	+96	-513	270	350	1	0
SY	SP	EP	WP	WY	WR	
-90.0	+87.6	-129.5	-57.5	0.0	+110.4	

BRAKES – ON (tb-ON)

STBD RMS HTR (two) – OFF

CAUTION
SPEE power must be applied within TBD min to prevent sensor damage

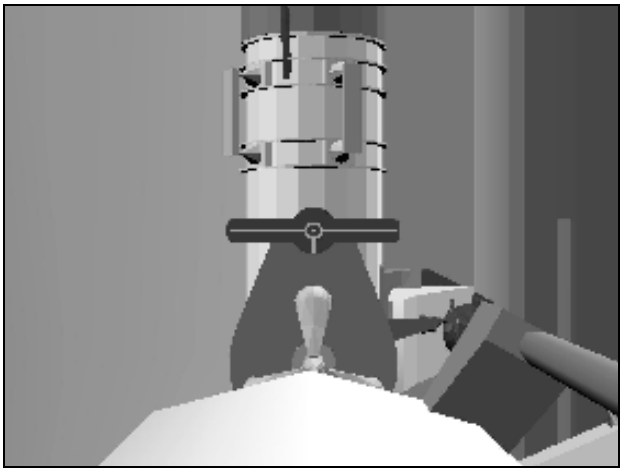
A6U
EVENT TIMER MODE – UP
CNTL – START

R12(OBSS) √SPEE PWR – OFF

3. OBSS GRAPPLE

MON 1	Wrist
MON 2	C/D

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



WRIST

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

A6U DAP: VERN(FREE)

Mnvr to grapple envelope

CAUTION
Monitor EE tb timing to prevent EE motor burnout

EE MODE – AUTO
CAPTURE – depress (mom)

	RIGID	CLOSE	CAPTURE
√			
	DERIGID	OPEN	EXTEND

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 PDRS CONTROL
PL ID – ITEM 3 +1 EXEC
INIT ID – ITEM 24 +1 EXEC

Record POSN/ATT and Joint Angles:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
							1
Expected	-680	+105	-436	0	0	341	1
	SY	SP	EP	WP	WY	WR	
Expected	-90.0	+76.5	-134.6	-40.9	0.0	+110.0	

Review GENERIC END EFFECTOR CUE CARD – SHUTTLE NOT DOCKED OPS

4. CONFIGURE POWER

MA73C:C cb MCA PWR AC2 3Φ MID 2 – cl
:D AC3 3Φ MID 4 – cl

R13L PL BAY MECH PWR SYS (two) – ON

5. STBD MRL RELEASE

SM 94 PDRS CONTROL

RMS STBD – ITEM 2 EXEC (*)
√STBD AFT,MID,FWD REL (six) = 0

* If any MSW shows '1', drive MRL *
* for single motor time (18 sec) *

STBD RMS RETEN LAT – REL (tb-REL) (18 sec max)
– OFF
If motor drive time > 8 sec, √MCC

SM 94 PDRS CONTROL

RMS PORT – ITEM 1 EXEC (*)

6. RECONFIGURE POWER

R13L PL BAY MECH PWR SYS (two) – OFF

MA73C:C cb MCA PWR AC2 3Φ MID 2 – op
:D AC3 3Φ MID 4 – op

Record joint angles:

SY	SP	EP	WP	WY	WR

7. MNVR TO OBSS HOVER

A7U CCTV – config for unberth

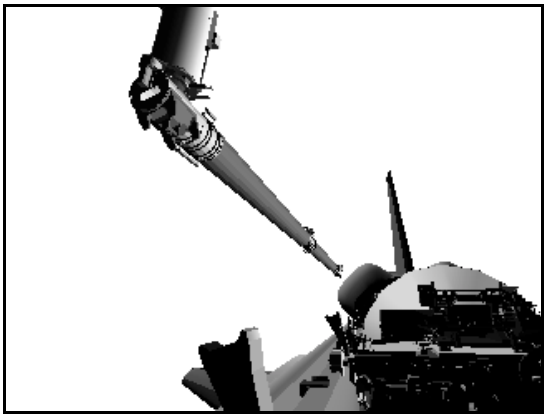
MON 1	Elbow
MON 2	D/C

RHC √RATE – VERN (RATE MIN tb-ON)
BRAKES – OFF (tb-OFF)
MODE – PL, ENTER

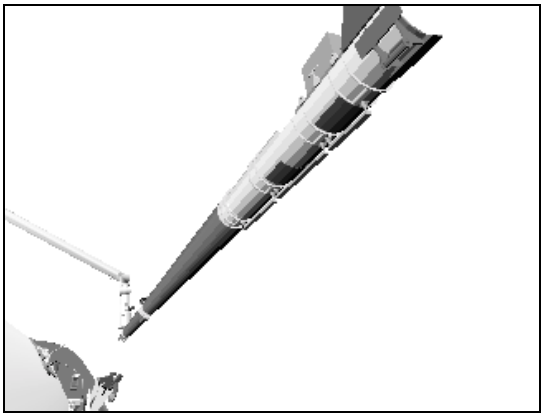
Mnvr OBSS up (-Z) to OBSS HOVER, Z: -496

X	Y	Z	PITCH	YAW	ROLL	PL ID
-680	+126	-496	0	0	341	1
SY	SP	EP	WP	WY	WR	
-90.0	+79.8	-123.1	-55.7	0.0	+110.0	

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



CCTV D (-15, 15)



CCTV C (25, 25)

A6U DAP: as reqd

Perform ACTIVATION (<u>LDRI/ITVC</u> Cue Card, PHOTO/TV)

Perform APCU ACTIVATION (ASSY OPS, <u>APCU</u>), APCU 2 only

8. <u>RESET PTU</u>

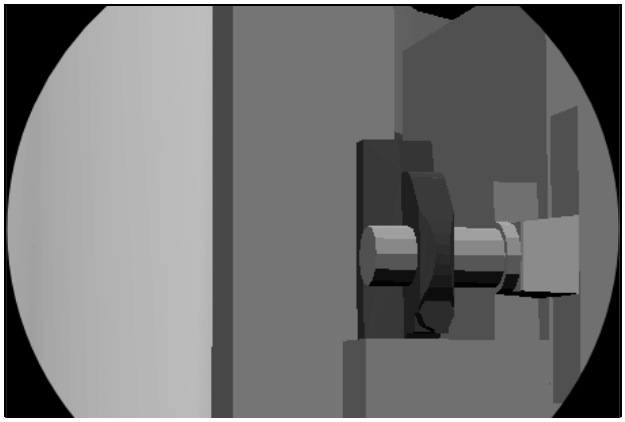
A7U VIDEO OUT MON2 pb – push
IN PL2(VPU) pb – push

CAMR CMD PAN/TILT – HI RATE (LO within 10°)
PAN – L (to hard stop)
TILT – UP (to hard stop)
PAN/TILT – RESET
PAN: +103 (right)
TILT: -260 (dn)

9. <u>LDRI 3-D CALIBRATION</u>

√VIDEO OUT MON2 pb – push
IN as desired (not PL2)
OUT MUX 1 L pb – push (MIDDECK lt on)
LDRI MODE 5 pb – push (flickering LDRI video)

BIRD'S EYE



LDRI (103, -260)

L10(VTR)	REC pb – push, hold PLAY pb – push, simo (red ●) Record for 2 min STOP pb – push (no red ●)
A7U	√VIDEO OUT MUX 1 L pb – push (MIDDECK lt on) LDRI MODE 6 pb – push (brighter flickering LDRI video)
L10(VTR)	REC pb – push, hold PLAY pb – push, simo (red ●) Record for 2 min STOP pb – push (no red ●)

OBSS BERTH

WARNING
For UNDOCKED ops only

NOTE
Stbd MPMs assumed deployed

1. SETUP

A7U CCTV – config for berth

MON 1	Elbow
MON 2	A(D)/B(C)

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

2. MNVR TO OBSS HOVER

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

Mnvr to OBSS HOVER posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-680	+126	-496	0	0	341	1
-998	+129	-507	0	0	10	2
SY	SP	EP	WP	WY	WR	
-90.0	+79.8	-123.1	-55.7	0.0	+110.0	

BRAKES – ON (tb-ON)
√STBD RMS HTR (two) – OFF

3. STOW PTU

A7U VIDEO OUT MON2 pb – push
IN PL2(VPU) pb – push

CAMR CMD PAN/TILT – HI RATE (LO within 10°)
PAN – L (to hard stop)
TILT – UP (to hard stop)
PAN/TILT – RESET
PAN: +108.2 (right)
TILT: -175 (dn)

Perform DEACTIVATION (LDRI/ITVC Cue Card, PHOTO/TV)

Perform APCU DEACTIVATION (ASSY OPS, APCU), APCU 2 only

4. OBSS BERTH

SM 94 PDRS CONTROL
PL ID – ITEM 3 +1 EXEC
INIT ID – ITEM 24 +1 EXEC
RMS STBD – ITEM 2 EXEC (*****)

A6U DAP: VERN (FREE)

BRAKES – OFF (tb-OFF)
MODE – PL, ENTER

NOTE

Refer to table in OBSS UNBERTH, step 3 for joint angles at GRAPPLE to fill in table below

Mnvr OBSS down (+Z) to OBSS BERTH:

	X	Y	Z	PITCH	YAW	ROLL	PL ID
							1
Expected	-680	+105	-436	0	0	341	1
	SY	SP	EP	WP	WY	WR	
Expected	-90.0	+76.5	-134.6	-40.9	0.0	+110.0	

A8L √STBD R-F-L tb (three) – gray

5. CONFIGURE POWER

MA73C:C cb MCA PWR AC2 3Φ MID 2 – cl
:D AC3 3Φ MID 4 – cl

R13L PL BAY MECH PWR SYS (two) – ON

6. STBD MRL LATCH

SM 94 PDRS CONTROL

√STBD AFT,MID,FWD LAT (six) = 0

* If any MSW shows '1', drive MRL *
* for single motor time (18 sec) *

A8L STBD RMS RETEN LAT – LAT (tb-LAT) (18 sec max)
– OFF

If motor drive time > 8 sec, √MCC

BRAKES – ON (tb-ON)

A6U DAP: as reqd

SM 94 PDRS CONTROL

RMS PORT – ITEM 1 EXEC (*****)

7. RECONFIGURE POWER

R13L PL BAY MECH PWR SYS (two) – OFF

MA73C:C cb MCA PWR AC2 3Φ MID 2 – op
:D AC3 3Φ MID 4 – op

8. OBSS UNGRAPPLE

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

MON 1	Wrist
MON 2	D/C

SM 94 PDRS CONTROL

PL ID – ITEM 3 +0 EXEC
INIT ID – ITEM 24 +0 EXEC

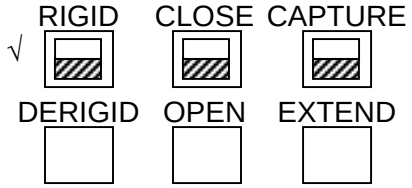
RHC √RATE – VERN (RATE MIN tb-ON)

BRAKES – OFF (tb-OFF)
MODE – END EFF, ENTER

CAUTION
Monitor EE tb timing to prevent EE motor burnout

EE MODE – AUTO
RELEASE sw – REL (mom)

When OPEN tb – gray, slowly mnvr arm clear of grapple pin



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

* 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 *

STBD RMS HTR (two) – AUTO

A6U EVENT TIMER CNTL – STOP

DAP: as reqd

Mnvr to OBSS PREGRAPPLE posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-680	+96	-513	270	350	1	0
SY	SP	EP	WP	WY	WR	
-90.0	+87.6	-129.5	-57.5	0.0	+110.4	

BRAKES – ON (tb-ON)

9. ARM PRE-CRADLE

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 0

√INIT ID, ITEM 24: 0

RATE – as desired (VERN within 10 ft)
BRAKES – OFF (tb-OFF)
MODE – SINGLE, ENTER

Mnvr to PRE-CRADLE posn:

	SY	SP	EP	WP	WY	WR	
OBSS Pre-Grapple	-90.0	+87.9	-129.8	-57.0	0.0	+110.0	
1: WP +				+5.0			
2: WR –						0.0	
3: EP +			-25.0				
4: SY +	0.0						
5: SP –		+25.0					
Pre-Cradle	0.0	+25.0	-25.0	+5.0	0.0	0.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1261	-146	-551	5	2	0	0

BRAKES – ON (tb-ON)
MODE – not DIRECT
PARAM – PORT TEMP
JOINT – CRIT TEMP

OBSS HANDOFF FROM SSRMS TO SRMS

1. SETUP

   SM 94 PDRS CONTROL

   √PL ID, ITEM 3: 0

   √INIT ID, ITEM 24: 0

A7U CCTV – config as reqd

MON 1	A
MON 2	B

2. PRE-GRAPPLE MNVR

   On SSRMS Operator GO for mnvr to OBSS PRE-GRAPPLE,

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

Mnvr to OBSS PRE-GRAPPLE posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1015	-362	-688	284	0	270	0
SY	SP	EP	WP	WY	WR	
+23.5	+63.5	-29.6	-102.9	+11.5	-98.6	

BRAKES – ON (tb-ON)

3. CONFIGURE POWER

   On SSRMS Operator GO to release STBD MRLs,

A8L STBD RMS HTR (two) – OFF

> CAUTION
> SPEE power must be applied within TBD min to prevent sensor damage

A6U EVENT TIMER MODE – UP
CNTL – START

MA73C:C cb MCA PWR AC2 3Φ MID 2 – cl
:D AC3 3Φ MID 4 – cl

R13L PL BAY MECH PWR SYS (two) – ON

4. STBD MRL RELEASE

   SM 94 PDRS CONTROL

   RMS STBD – ITEM 2 EXEC (*)

   √STBD AFT,MID,FWD REL (six) = 0

   * If any MSW shows '1', drive MRL *
   * for single motor time (18 sec) *

   STBD RMS RETEN LAT – REL (tb-REL) (18 sec max)
   – OFF

   If motor drive time > 8 sec, √MCC

SM 94 PDRS CONTROL
√STBD AFT,MID,FWD REL (six) = 1
RMS PORT – ITEM 1 EXEC (*****)

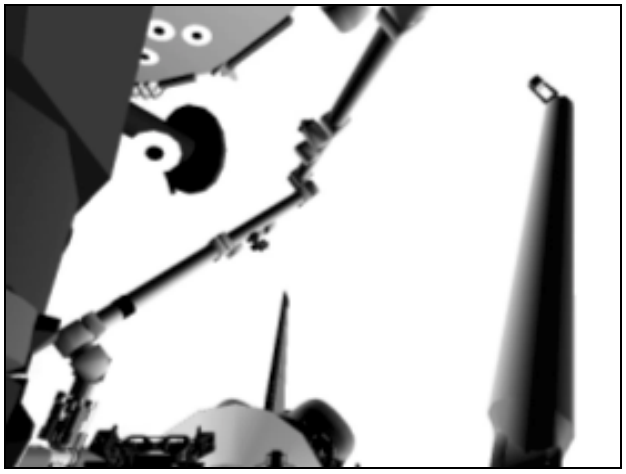
5. RECONFIGURE POWER

R13L PL BAY MECH PWR SYS (two) – OFF

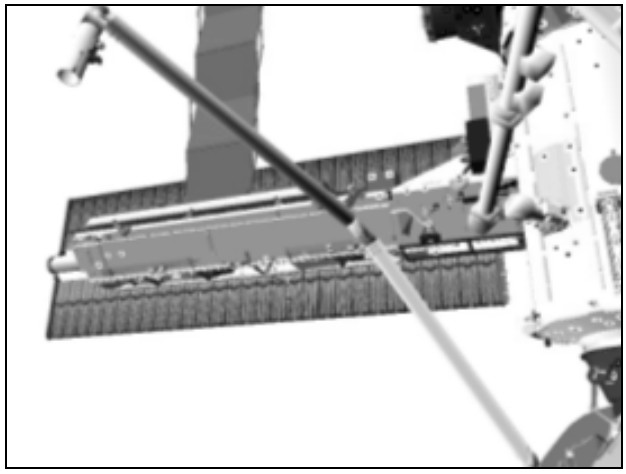
MA73C:C cb MCA PWR AC2 3Φ MID 2 – op
:D AC3 3Φ MID 4 – op

Give SSRMS Operator GO for OBSS Unberth

Perform APCU DEACTIVATION (ASSY OPS, APCU), APCU 1 only



CCTV A (0, 28)



CCTV B (-20, 20)

6. SETUP FOR GRAPPLE

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

MON 1	B(Elbow)
MON 2	Wrist

R12(OBSS) √SPEE PWR – OFF

7. OBSS GRAPPLE AT HANDOFF POSITION

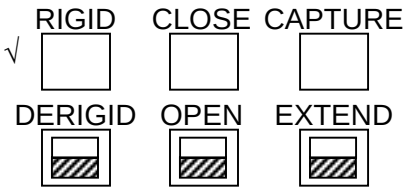
On SSRMS Operator GO for SRMS OBSS Grapple,

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

Mnvr to grapple envelope

CAUTION
Monitor EE tb timing to prevent EE motor burnout

EE MODE – AUTO
CAPTURE sw – depress (mom)



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
MODE – TEST, ENTER
Wait 5 sec

BRAKES – ON (tb-ON)

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

Expected GRAPPLE AT HANDOFF posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1032	-362	-618	284	0	270	0
-1032	-44	-610	*	270	*	2
SY	SP	EP	WP	WY	WR	
+25.8	+66.3	-49.0	-85.9	+10.7	-100.7	

*display singularity

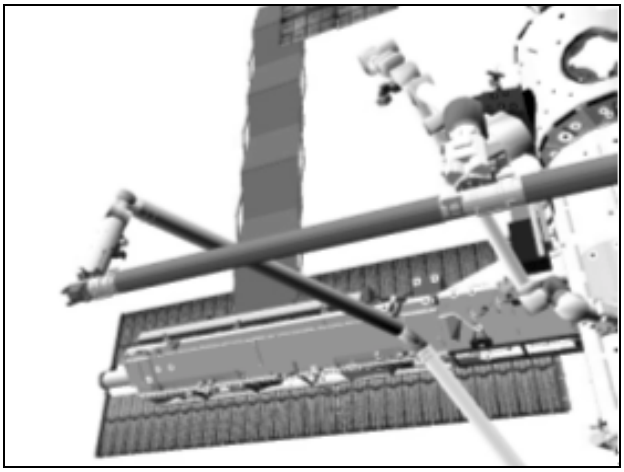
Perform ACTIVATION (LDRI/ITVC Cue Card, PHOTO/TV)

A6U EVENT TIMER CNTL – STOP

Verify APCU 1 Deact complete, then:
Perform APCU ACTIVATION (ASSY OPS, APCU), APCU 2 only

Give SSRMS Operator GO for OBSS Ungrapple

Review GENERIC END EFFECTOR CUE CARD – ISS/SHUTTLE DOCKED OPS



CCTV B (-25, 30)

ELBOW (-20, -20)

8. <u>MNVR TO MPLM VIEWING</u>
   On SSRMS Operator GO for mnvr to MPLM Viewing,

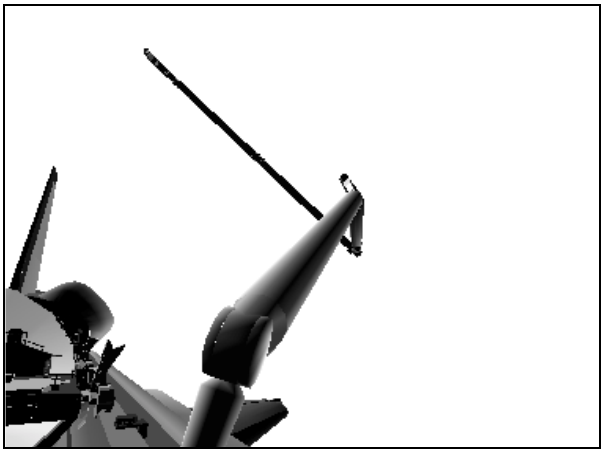
MON 1	S1LOOB(A)
MON 2	B(Elbow)

RHC
RATE – as desired (VERN within 10 ft)
BRAKES – OFF (tb-OFF)
MODE – SINGLE, ENTER

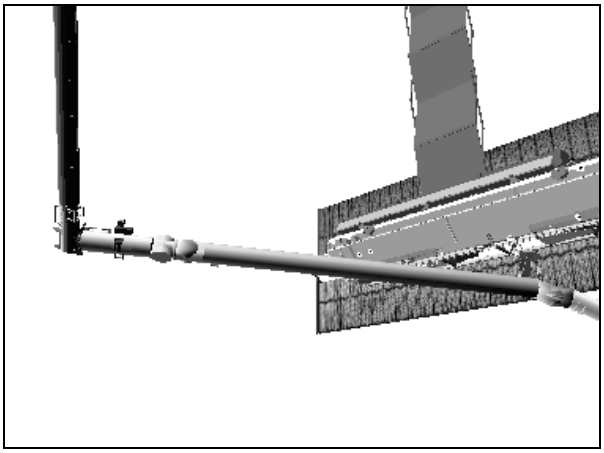
Mnvr to MPLM VIEWING posn:

	SY	SP	EP	WP	WY	WR	
Handoff posn	+25.8	+66.3	-49.0	-85.9	+10.7	-100.7	
1: SY +	+35.0						
2: EP +			-22.8				
3: WR +						-40.0	
4: WY –					-0.3		
5: SP –		+38.7					
6: WP +				-0.5			
MPLM View	+35.0	+38.7	-22.8	-0.5	-0.3	-40.0	
	X	Y	Z	PITCH	YAW	ROLL	PL ID
	-1248	-301	-810	62	324	312	2

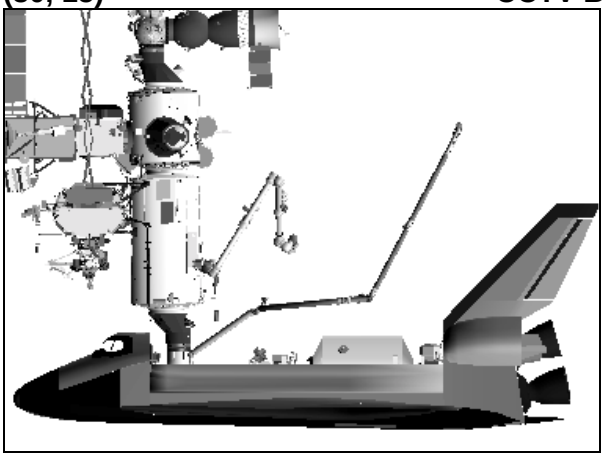
BRAKES – ON (tb-ON)
√MODE – not DIRECT
PARAM – PORT TEMP
JOINT – CRIT TEMP



CCTV A (30, 15)



CCTV B (-45, 20)



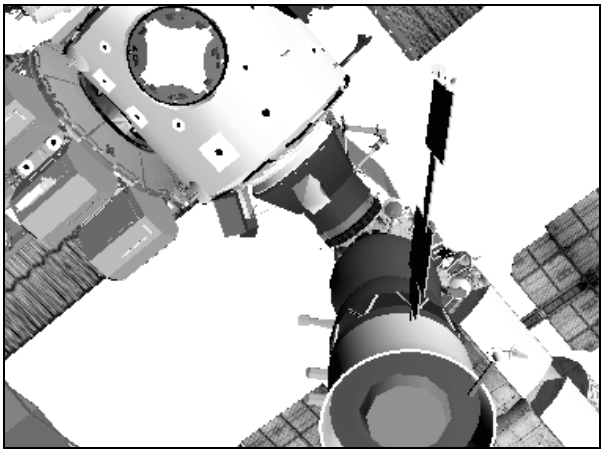
PORT

9. <u>RECONFIG PTU</u>

A7U VIDEO OUT MON2 pb – push
IN PL2(VPU) pb – push

CAMR CMD PAN/TILT – HI RATE (LO within 10˚)
PAN – L (to hard stop)
TILT – UP (to hard stop)
PAN/TILT – RESET
PAN: +50 (right)
TILT: -80 (dn)

VIDEO OUT MUX 1 L pb – push (MIDDECK lt on)
LDRI MODE 1 pb – push (ITVC video)



ITVC (50, -80)

OBSS HANDOFF FROM SRMS TO SSRMS

1. SETUP

SM 94 PDRS CONTROL

√PL ID, ITEM 3: 2

√INIT ID, ITEM 24: 2

A7U CCTV – config as reqd

MON 1	A
MON 2	B(Elbow)

Review GENERIC END EFFECTOR CUE CARD – ISS/SHUTTLE DOCKED OPS

2. MANEUVER TO HANDOFF

On SSRMS Operator GO for mnvr to Handoff,

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

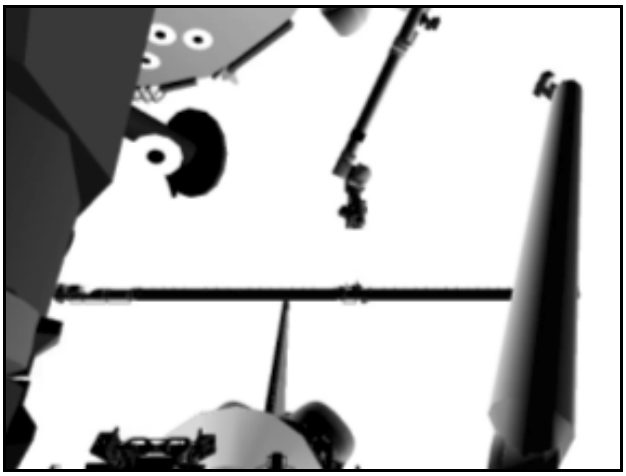
Mnvr to Handoff posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1032	-44	-610	*	270	*	2
SY	SP	EP	WP	WY	WR	
+25.8	+66.3	-49.0	-85.9	+10.7	-100.7	

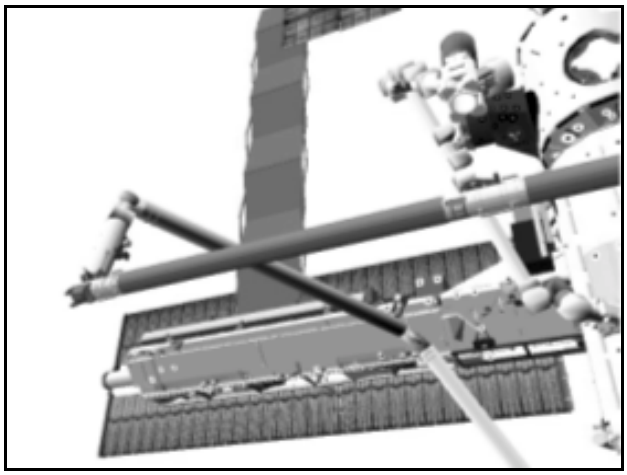
*display singularity

BRAKES – ON (tb-ON)

Give SSRMS Operator GO for OBSS Grapple



CCTV A (0, 30)



CCTV B (-25, 30)

ELBOW (-30, 0)

3. STOW PTU

A7U VIDEO OUT MON2 pb – push
IN PL2(VPU) pb – push

CAMR CMD PAN/TILT – HI RATE (LO within 10°)
PAN – L (to hard stop)
TILT – UP (to hard stop)
PAN/TILT – RESET
PAN: +108.2 (right)
TILT: -175 (dn)

Perform DEACTIVATION (LDRI/ITVC Cue Card, PHOTO/TV)

CAUTION
STBD HTR KA power must be applied within TBD min to prevent sensor damage

A6U EVENT TIMER MODE – UP
CNTL – START

Perform APCU DEACTIVATION (ASSY OPS, APCU), APCU 2 only

4. OBSS UNGRAPPLE

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

MON 1	B(Elbow)
MON 2	Wrist

NOTE
CONTR ERR lt and 'S96 PDRS CNTL' msg may occur due to Consistency/Envelope Check error

On SSRMS Operator GO for Ungrapple,
RHC RATE – COARSE (RATE MIN tb-OFF)

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

BRAKES – OFF (tb-OFF)

MODE – TEST, ENTER
Wait 5 sec
BRAKES – ON (tb-ON)

SM 94 PDRS CONTROL
AUTO BRAKE ENA – ITEM 9 EXEC (*****)
PL ID – ITEM 3 +0 EXEC
INIT ID – ITEM 24 +0 EXEC

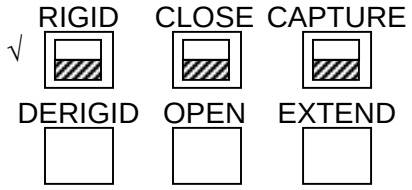
RHC

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

CAUTION
Monitor EE tb timing to prevent EE motor burnout

EE MODE – AUTO
RELEASE sw – depress (mom)

When OPEN tb – gray, slowly mnvr arm clear



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

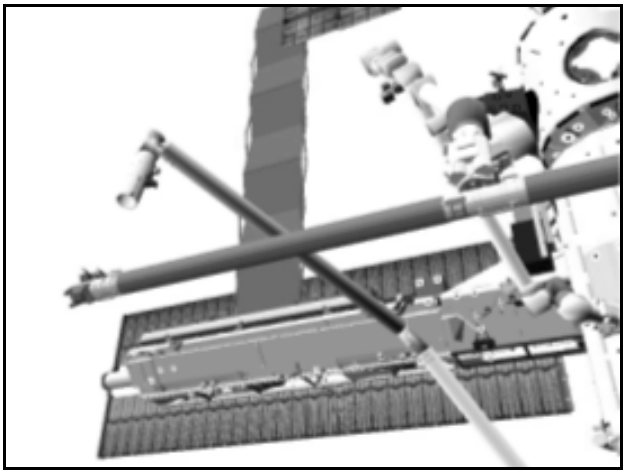
EE MODE – OFF

* 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 (tb-ON) *

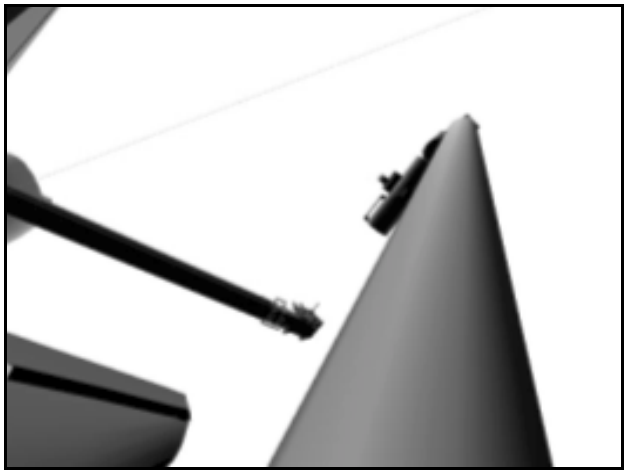
5. MNVR TO OBSS PRE-GRAPPLE
RATE – as desired (VERN within 10 ft)
MODE – as desired

Mnvr to OBSS PRE-GRAPPLE posn:

X	Y	Z	PITCH	YAW	ROLL	PL ID
-1015	-362	-688	284	0	270	0
SY	SP	EP	WP	WY	WR	
+23.5	+63.5	-29.6	-102.9	+11.5	-98.6	



CCTV B (-25, 30)



ELBOW (-20, -20)

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

Give SSRMS Operator GO to Berth OBSS

6. <u>CONFIGURE POWER</u>
On SSRMS Operator GO to latch STBD MRLs,

A8L √STBD R-F-L tb (three) – gray

MA73C:C cb MCA PWR AC2 3Φ MID 2 – cl
:D AC3 3Φ MID 4 – cl

R13L PL BAY MECH PWR SYS (two) – ON

7. <u>STBD MRL LATCH</u>
SM 94 PDRS CONTROL
√STBD AFT,MID,FWD LAT (six) = 0

* If any MSW shows '1', drive MRL *
* for single motor time (18 sec) *

A8L STBD RMS RETEN LAT – LAT (tb-LAT) (18 sec max)
– OFF

If motor drive time > 8 sec, √MCC

SM 94 PDRS CONTROL
√STBD AFT,MID,FWD LAT (six) = 1
RMS PORT – ITEM 1 EXEC (*****)

8. <u>RECONFIGURE POWER</u>

R13L PL BAY MECH PWR SYS (two) – OFF

MA73C:C cb MCA PWR AC2 3Φ MID 2 – op
:D AC3 3Φ MID 4 – op

A8L STBD RMS HTR – AUTO A(B)

A6U EVENT TIMER CNTL – STOP

Give SSRMS Operator GO to ungrapple OBSS and mnvr clear

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