



**JOHN F. KENNEDY
SPACE CENTER**

TCP NO V-20030
REVISION 007
DATE JANUARY 17, 1969
EFFECTIVITY AS-503 & SUBS

**RELEASED
FOR AS 506**

SPACECRAFT/LAUNCH VEHICLE MATE & DEMATE

**THIS TCP CONTAINS
HAZARDOUS OPERATIONS**

PREPARED BY:
IBM CORPORATION
CAPE KENNEDY FACILITY

RELEASED
FOR AS 506

TCP NO. V-20030

REVISION 007

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EFFECTIVITY AS-503 & SUBS

INC. PCR'S

SPACECRAFT/LAUNCH VEHICLE MATE & DEMATE



THIS TCP CONTAINS
HAZARDOUS OPERATIONS

CONTRACTOR

NASA APPROVAL

F.W. Alint 1-13-69

PREPARED BY IBM

John R. Blum
KSC SAFETY OFFICE

JAN 15 1969

CONCURRENCE

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NR

**KSC OPERATIONS
APOLLO/SATURN TEST AND OPERATIONS CATALOG SHEET**

PAGE 1 OF 2

1. TEST TITLE

SPACECRAFT/LAUNCH VEHICLE MATE & DEMATE

2. KSC TEST NUMBER

V-20030

3. EFFECTIVITY

503 & SUBS

4. TEST OBJECTIVES

- A. TO MECHANICALLY MATE THE SPACECRAFT TO THE LAUNCH VEHICLE.
- B. TO MECHANICALLY DE-MATE THE SPACECRAFT FROM THE LAUNCH VEHICLE.

5. TEST DESCRIPTION/EQUIPMENT STATUS/CONFIGURATION

THIS TEST ☒ DOES ☐ DOES NOT CONTAIN HAZARDOUS OPERATIONS.

THIS OPERATION IS DIVIDED INTO TWO PARTS.

- A. THE INSTRUMENT UNIT FOWARD MATING SURFACE IS PREPARED FOR MATING THE SPACECRAFT. ALL PROTECTIVE DEVICES, EXCEPT CABLE TRAY COVERS, OVER THE INSTRUMENT UNIT ARE REMOVED. THE SPACECRAFT IS POSITIONED OVER THE IU, THEN LOWERED AND MATING HARDWARE IS INSTALLED AND TORQUED.

- B. THE HOISTING SLING IS ATTACHED TO THE SPACECRAFT. THE MATING HARDWARE IS REMOVED AND THE SPACECRAFT IS THEN REMOVED FROM THE LAUNCH VEHICLE.

CONFIGURATION: PART A. LAUNCH VEHICLE STACKED.
PART B. LAUNCH VEHICLE AND SPACECRAFT STACKED.

TEST REQUIREMENT

MSFC: N/A

| | | | | |
|------------------------|---------|--|---------------------|--------------------|
| C | 6/26/68 | MODIFY BLOCK 16 | <i>[Signature]</i> | <i>[Signature]</i> |
| B | 6/3/68 | MODIFY BLOCK 5 | S/ T.T.KOZMOSKI | S/ I.RIGELL |
| A | 4-23-68 | TO CORRECT SIGNATURE LEVELS AND CORRECT PHASES | S/T.T.KOZMOSKI | S/ I.RIGELL |
| 6. REV. | DATE | REASON | Contractor Approval | KSC Approval |
| 7. CONTRACTOR APPROVAL | | 8. ORGANIZATION | 9. DATE | |
| S/ W. B. HUNT | | IBM - 906 | 29 SEPTEMBER 1967 | |
| 10. NASA-KSC APPROVAL | | 11. ORGANIZATION | 12. APPROVAL DATE | |
| S/ PAUL W. SCHMID | | JD - 25 | 10/6/67 | |

1. TEST TITLE

SPACECRAFT/LAUNCH VEHICLE MATE AND DEMATE

2. KSC TEST NUMBER

V-20030

3. EFFECTIVITY

503 & SUBS

13. LOCATION

VAB

14. COMPUTER PROC. IDENTIFICATION

N/A

15. EST. TEST TIME

4 MEN / 8 HOURS

16. SUPPORT REQUIREMENTS

INTERSTAGE: NR
S IVB MECH.

OFF-COMPLEX: N/A

ON-COMPLEX: IBM QA
SWING ARMS
PLATFORMS
750/75 TON CRANE
KSC SAFETY
SECURITY
FIREMAN
RD-40090

17. OTHER APPLICABLE REFERENCE DOCUMENTATION

NR / PROC. K-3117

13M50103

MIL-C-5541

K-V-053

10M14503

10M15003

18. ITEM CONTINUATION

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SATURN/APOLLO
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| REVISION HISTORY (11) | 007 |
| BAR CHART (2) | 001 |
| TEST OUTLINE (1) | 001 |
| TEXT 1 THRU 13 | 007 |

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| 001 | COMPLETE REVISION | <p>TO PROVIDE INITIAL RELEASE FOR AS-504. THIS TCP CONSISTS OF THE BASIC RELEASE FOR THE AS-503 PLUS INCORPORATION OF THE FOLLOWING:</p> <p>PCR'S - I-1-2, I-2-3 DCN - I-1, I-2, I-3 NR S/C REDLINED INPUTS</p> | | | | |
| 002 | ALL | INC. DCN I-3 | | | | |
| 003 | ALL | FOR AS-503 | | | | |
| 004 | ALL | INCORPORATE PCR I-6-3 TO BRING TCP INTO AGREEMENT WITH A HARDWARE CHANGE VIA EO. | | | | |
| 005 | COMPLETE REVISION | <p>TO PROVIDE INITIAL RELEASE FOR AS-505. THIS TCP CONSISTS OF THE BASIC RELEASE FOR AS-504 PLUS INCORPORATION OF THE FOLLOWING:</p> <p>DCN - I-1, I-3 GAEC INPUTS</p> | | | | |
| 006 | COMPLETE REVISION | INC PCR I-14-2 | | | | |
| 007 | COMPLETE REVISION | <p>TO PROVIDE INITIAL RELEASE FOR AS-506. THIS TCP CONSISTS OF THE BASIC RELEASE FOR AS-505 PLUS INCORPORATION OF THE FOLLOWING.</p> <p>DCN - I-1</p> | | | | |

-24 -7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

▲ SUPPORT ORGANIZATIONS NOTIFIED OF REQUIREMENTS

▲ LIGHTING PROVIDED FOR IU/SLA AREA

REMOVE PROTECTIVE COVER PER V-36049

REMOVE UPPER PROTECTIVE RING PER V-36048

▲ ALL REQUIRED EQUIPMENT AT IU LEVEL

REMOVE IU DOOR FRAME & COVER, INSTALL GUIDE PIN BRACKETS PER V-36048

PREP FOR B PLATFORM RETRACT PER V-30030

▲ IU AIR PURGE SYSTEM OPERATING

▲ PA ANNOUNCEMENT - START OPERATIONS

PREPARE MATING SURFACE (IU)

(IBM)

6 PEOPLE IN IU TO SUPPORT MATE

LOWER S/C TO ENGAGE GUIDE PINS

INSTALL MATING HARDWARE

LOWER S/C TO REST ON IU

CLOSE PLATFORMS A & B

SHIM INTERFACE

SNUG AND TORQUE MOUNTING HARDWARE

(BATC)

S/A #7 TIP EXTENDED WITH SLA UMB. ACCESS ▲ PLATFORM RETRACTED

(DAC)

▲ 402 ACCESS PLATFORMS INSTALLED

(NR)

HOIST S/C AND POSITION OVER IU

LOWER S/C TO 18" ABOVE IU

PREPARE S/C FOR MATE

REMOVE HOISTING SLING

(SUPPORT)

▲ SUPPORT ORGANIZATIONS ON STATION

▲ SECURITY ESTABLISH LIMITED ACCESS AREA

BENDIX RETRACT PLATFORMS A & B

CRANE COMMUNICATOR ON S/A #7 EXTENSION

BENDIX CLOSE PLATFORMS A & B

CRANE UNDER NR DIRECTION

CRANE UNDER IBM DIRECTION

LVO

SCO

DLO

W. S. Huffman Jr. 1/14/69

S/C MATE

S/C DEMATE

-24 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

▲ SUPPORT ORGANIZATIONS NOTIFIED OF REQUIREMENTS

▲ ALL REQUIRED EQUIPMENT AT IU LEVEL

▲ LIGHTING PROVIDED FOR IU/SLA AREA

REMOVE IU DOOR FRAME AND INSTALL GUIDE PIN BRACKETS PER V-36048

PREPS FOR B PLATFORM RETRACT PER V-30030

▲ PA ANNOUNCEMENT - START OPERATIONS

REMOVE MATING BOLTS

(IBM)

3 PEOPLE IN IU TO SUPPORT DEMATE

RAISE S/C TO 18" ABOVE IU

INSPECT MATING SURFACE

INSTALL UPPER PROTECTIVE RING & COVER

(DAC)

▲ 402 ACCESS PLATFORMS INSTALLED

(BATC)

▲ S/A #7 TIP EXTENDED WITH SLA ACCESS PLATFORM RETRACTED

(NR)

CONNECT HOISTING SLING

HOIST S/C FROM 18"

▲ SUPPORT ORGANIZATIONS ON STATION

▲ SECURITY ESTABLISHED LIMITED ACCESS AREA

BENDIX RETRACT PLATFORMS A & B

CRANE COMMUNICATOR ON S/A #7 EXTENSION

BENDIX CLOSE B PLATFORM

(SUPPORT)

LVO *[Signature]*

SCO *[Signature]*

DLO *[Signature]* 1/14/69

TEST OUTLINE

| | | | | |
|---|--------------------------|----------------|-------------------------------------|-------------------|
| 1. TCP TITLE SPACECRAFT/LV MATE AND DEMATE. | 2. TCP NUMBER V-20030 | 3. REV. 001 | 4. VEHICLE NUMBER SA-503 & SUBS. | 5. PAGE 1 OF 1 |
|---|--------------------------|----------------|-------------------------------------|-------------------|

6. CONTENT:

PART I IU SPACECRAFT MATE

THE SPACECRAFT IS POSITIONED IN THE VAB, LEVELED AND PREPARED FOR ERECTION, WHILE THE IU MATING SURFACE IS PREPARED TO RECEIVE THE SPACECRAFT. SWING ARMS NO. 7 AND NO. 9 ARE EXTENDED. THE EXTENSIBLE PLATFORMS A & B ARE OPENED AND THE SPACECRAFT IS RAISED AND POSITIONED OVER I. U. THE SPACECRAFT IS THEN CENTERED OVER THE IU AND LOWERED TO ENGAGEMENT. MATING HARDWARE IS INSTALLED; THE EXTENSIBLE PLATFORMS A & B ARE CLOSED; THE INTERFACE IS INSPECTED AND SHIMMED, IF REQUIRED. THE MATING HARDWARE IS THEN TIGHTENED AND THE HOISTING SLING IS REMOVED.

PART II IU SPACECRAFT DEMATE

THE SPACECRAFT IS PREPARED FOR DEMATING AND ALL INTERFACING CONNECTIONS ARE DISCONNECTED. THE HOISTING SLING IS INSTALLED AND MATING HARDWARE IS REMOVED. THE EXTENSIBLE PLATFORMS A & B ARE OPENED AND THE SPACECRAFT IS HOISTED TO CLEAR THE IU, TRAVERSED AND LOWERED TO ITS TRANSPORTER IN THE TRANSFER AISLE.

| | | | |
|------------------------------|--------------------|-----------------------------------|---------------------|
| 7. PREPARED BY J. TRICARD | 8. DATE 1-18-68 | 9. CHIEF ENGINEER M. J. Royell | 10. DATE 1-30-68 |
|------------------------------|--------------------|-----------------------------------|---------------------|

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SPACECRAFT/LAUNCH VEHICLE MATE AND DEMATE

THE OPERATIONS ENGINEER WILL ANNOUNCE THE REVISION LEVEL AND ALL OUT-
STANDING PROCEDURE CHANGE REQUESTS (PCR) OF THE PROCEDURE USED AS THE OFFICIAL
TEST COPY TO ALL PERSONNEL INVOLVED IN THE TEST.

IBM QV-----

A. EQUIPMENT REQUIREMENTS

1. TWO SETS OF MECHANIC'S GENERAL PURPOSE TOOLS. (CALIBRATED) IBM QV-----
2. TORQUE WRENCHES.
3. IU/SLA MATING HARDWARE. IBM QV-----
 - (A) NAS 625-8 BOLTS - 108 REQUIRED.
 - (B) 10M12286-1 NUTS - 108 REQUIRED.
 - (C) MS 20002-C5 WASHERS - 108 REQUIRED.
 - (D) MS 20002-5 WASHERS - 216 REQUIRED.
 - (E) 10M15103-1,3 SHIMS AS REQUIRED
 - (F) 10M12285-1 WASHERS - 108 REQUIRED.
4. TRICHLORETHYLENE, METHYL ETHYL KETONE OR ISOPROPYL ALCOHOL
(FOR DEGREASING).
5. CLEAN RAGS, KIM-WIPES.
6. SAFETY EQUIPMENT
 - (A) HARD HATS
 - (B) NEOPRENE GLOVES
 - (C) SAFETY GOGGLES OR FACESHIELD
 - (D) COTTON COVERALLS
7. SEALANT EC-1291 OR PR-1201-Q (IF REQUIRED) IBM QV-----
8. FEELER GAUGE
9. ALUMINUM LADDERS
10. CABLE TRAY COVERS IBM QV-----

30 EA, P/N JB-20023

B. SUBTASK PROCEDURES

1. V-30030-IBM PREPS FOR PLATFORM B RETRACTION.
2. V-36048-IU UPPER PROTECTIVE RING INSTALLATION & REMOVAL
3. V-36049-IU PROTECTIVE COVER INSTALLATION & REMOVAL.
4. KL10005-IMU/AMA THERMAL CONTROL.
5. K3117-S/C TRANSPORTATION TO VAB AND MATE.

C. SPECIAL REQUIREMENTS

1. MATING/DEMATING OF THE SPACECRAFT TO THE LAUNCH VEHICLE IS ACCOMPLISHED AS A JOINT OPERATION BETWEEN NORTH AMERICAN ROCKWELL (NASA-SCO) AND IBM (NASA-LVO). THE OVERALL RESPONSIBILITY FOR THE OPERATIONS RESTS WITH THE TEST SUPERVISOR (DLO-HC).

(A) NR WILL PREPARE THE SPACECRAFT FOR MATING/DEMATING AND DIRECT THE HOISTING AND POSITIONING OF THE SPACECRAFT EXCEPT WHEN ITS LOWER SURFACE IS WITHIN APPROXIMATELY 18 INCHES OF THE IU UPPER SURFACE.

- (1) MATING WILL BE ACCOMPLISHED PER K-3117.
- (2) GAEC OPERATIONS WILL BE ACCOMPLISHED PER TCP-KL10005.
- (3) DEMATING WILL BE ACCOMPLISHED PER TPS.

(B) IBM WILL PREPARE THE IU FOR MATING/DEMATING, INSTALL OR REMOVE MATING HARDWARE AND DIRECT THE HOISTING AND POSITIONING OF THE SPACECRAFT WHEN ITS LOWER SURFACE IS WITHIN APPROXIMATELY 18 INCHES OF THE IU UPPER SURFACE.

2. THIS OPERATION WILL BE CONDUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF SOP VAB-SC-1 OF K-V-053.

(A) A CONTROLLED AREA WILL BE ESTABLISHED AND MAINTAINED DURING HOISTING OPERATIONS.

ACCESS BADGES, IF REQUIRED, WILL BE SECURED BY TEST OPERATIONS FROM THE COMPLEX SUPPORT CONTROLLER. TEST OPERATIONS SHALL CONTROL DISTRIBUTION OF ACCESS BADGES.

(B) SUPERVISION SHALL INSURE THAT ONLY TRAINED AND QUALIFIED PERSONNEL PARTICIPATE IN THE OPERATION.

(C) OTHER OPERATIONS IN THE AREA OF THE INSTRUMENT UNIT WHICH MIGHT INTERFERE WITH THE MATING/DEMATING OPERATION MUST BE DEFERRED UNTIL THE MATING/DEMATING OPERATION IS COMPLETED.

3. TOOLS, HARDWARE AND PERSONAL EFFECTS INVENTORY CONTROL MUST BE PLACED IN EFFECT WHEN PERSONNEL ARE INSIDE THE IU.
4. THE DAC 402 ACCESS PLATFORMS MUST BE INSTALLED TO PROVIDE ACCESS TO THE MATING RING. LIGHT STANCHIONS SHOULD NOT BE INSTALLED.
 - (A) LOOSE HARDWARE OR OBJECTS THAT COULD FALL ON THE FORWARD DOME OF THE SIVB FUEL TANK MUST BE TETHERED OR OTHERWISE RESTRAINED TO PREVENT SIVB TANK DAMAGE.

*****CAUTION*****
*
* ANY OBJECTS DROPPED OR SUSPECTED OF *
* BEING DROPPED IN THE SIVB FORWARD *
* INTERSTAGE SHOULD BE REPORTED TO LVO *
* IMMEDIATELY. *
*

5. PERSONNEL REQUIREMENTS:
 - (A) IBM TECHNICAL
 - (1) MECHANICAL SYSTEMS ENGINEER.
 - (2) SIX MECHANICAL SYSTEMS TECHNICIANS.
 - (3) TWO QUALITY INSPECTORS.

NOTE

THE ABOVE TECHNICAL REQUIREMENTS
MAY BE VARIED BY THE IBM SYSTEMS
ENGINEER.

- (B) NASA-LVO
 - (1) MECHANICAL SYSTEMS ENGINEER.
 - (2) QUALITY INSPECTOR.

- (C) NR AND NASA-SCO

REFER TO NR PROCEDURE K-3117 FOR PERSONNEL
REQUIREMENTS.

- (D) GAEC

REFER TO TCP KL 10005 FOR GAEC PERSONNEL REQUIREMENTS.

(E) OTHER

- (1) CRANE COORDINATOR.
- (2) CRANE OPERATOR.
- (3) PLATFORM A AND B OPERATORS.
- (4) SWING ARM NO. 7 AND NO. 9 OPERATORS.

(F) SAFETY

- (1) KSC SYSTEM SAFETY SUPERVISOR.
- (2) TWO SECURITY PATROLMEN.
- (3) SECURITY SERGEANT.
- (4) FIREMAN.

6. THE KSC SYSTEM SAFETY SUPERVISOR WILL VERIFY ALL SUPPORT ORGANIZATIONS ARE ON STATION PRIOR TO THE START OF OPERATIONS AND WILL MONITOR THE OPERATION TO INSURE THAT SAFETY PRECAUTIONS ARE FOLLOWED.

NOTE

THE KSC SYSTEMS SAFETY SUPERVISOR MAY STOP THE OPERATION IF AN APPARENT HAZARD TO PERSONNEL OR PROPERTY DEVELOPS AND WILL CO-ORDINATE CORRECTIVE ACTION WITH THE TEST SUPERVISOR

7. SUPPORT ORGANIZATIONS MUST BE NOTIFIED AT LEAST 24 HOURS PRIOR TO THE START OF OPERATIONS.
8. RUBBER GLOVES, EYE PROTECTION AND COTTON COVERALLS MUST BE WORN WHEN HANDLING DEGREASING SOLUTION. IF ANY OF THE CHEMICALS COME IN CONTACT WITH THE SKIN, WASH IMMEDIATELY WITH SOAP AND WATER. IF ANY OF THE CHEMICALS COME IN CONTACT WITH THE EYES, FLUSH WITH COPIOUS AMOUNTS OF WATER AND SEEK MEDICAL ASSISTANCE IMMEDIATELY. METHYL ETHYL KETONE IS FLAMMABLE AND SHOULD BE USED ONLY IN A WELL VENTILATED AREA AWAY FROM SPARKS OR OPEN FLAME. BOTH METHYL ETHYL KETONE AND TRICHLORETHYLENE FUMES ARE TOXIC. AVOID BREATHING THE FUMES AND USE IN A WELL VENTILATED AREA.

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D. INITIAL TEST CONDITIONS

1. VERIFY ALL EQUIPMENT LISTED UNDER A IS AVAILABLE IN THE IU AREA. IBM QV-----
2. SWING ARM NO. 7 MUST BE EXTENDED TO THE IU DOOR, WITH THE SLA UMBILICAL ACCESS PLATFORM RETRACTED.
3. PREPARATIONS FOR PLATFORM RETRACTIONS MUST BE COMPLETED. PER V-30030
4. SECURITY GUARDS MUST BE STATIONED TO ESTABLISH AND MAINTAIN A LIMITED ACCESS AREA.
5. SUPPORT PERSONNEL MUST BE ON STATION AND READY TO BEGIN THE OPERATION.
6. THE IU UPPER PROTECTIVE RING AND PROTECTIVE COVER MUST BE REMOVED FOR MATING AND AVAILABLE FOR INSTALLATION FOR DEMATING. PER V-36048 & V-36049. IBM QV-----
7. VERIFY FIT CHECK OF BOLTS AND WASHERS AND VISUALLY INSPECT FOR BURRS, CORROSION, NICKS AND FREE OF LUBRICANT. (MATE ONLY)
8. HARDWARE SPECIFIED IN PARAGRAPH A.4 MUST BE WEIGHED AND WEIGHT RECORDED _____ LBS. (MATE ONLY) IBM QV-----
9. IU AIR PURGE SYSTEM MUST BE OPERATING.
10. REMOVE IU DOOR FRAME AND PROTECTIVE COVER AND INSTALL GUIDE PIN BRACKETS PER PROCEDURE V-36048. VERIFY SPACECRAFT GUIDEPIN BRACKETS INSTALLED (AS REQUIRED).
11. SAFETY SUPERVISOR MUST CONCUR WITH READINESS TO BEGIN AND A PUBLIC ADDRESS ANNOUNCEMENT MUST BE MADE:

"LIGHTS PROVIDED FOR I.U./SLA AREA.

"ALL NON-ESSENTIAL PERSONNEL CLEAR EXTENSIBLE PLATFORMS A AND B FOR SPACECRAFT MATING (DEMATING) OPERATION."

E. MATING OPERATION

1. IBM PREPARE THE IU UPPER MATING SURFACE TO RECEIVE THE SPACECRAFT.

*****CAUTION*****
*
* PERSONNEL MUST WEAR SAFETY *
* GOGGLES OR FACESHIELDS, *
* COTTON COVERALLS AND NEO- *
* PRENE GLOVES WHEN HANDLING *
* DEGREASING SOLUTIONS. *
*

- (A) WIPE THE MATING SURFACE USING A RAG SATURATED WITH METHYL ETHYL KETONE OR TRICHLORETHYLENE. IBM QV-----
- (B) INSPECT THE IU MATING SURFACE TO VERIFY THE ABSENCE OF NICKS, BURRS OR CORROSION. REPAIR DEFECTS AS REQUIRED.
- (C) INSPECT THE IU MATING SURFACE TO VERIFY IT HAS BEEN ALODINED. IBM QV-----
2. NR BEGIN PREPARATION OF THE SPACECRAFT FOR MATING PER K-3117.

NOTE

IBM MECHANICAL SYSTEMS ENGINEER AND QUALITY INSPECTOR WILL VERIFY THE SPACECRAFT MATING SURFACE IS LEVEL WITHIN TWO INCHES AND THE LOWEST POINT IS NOT AT THE SPACECRAFT +Y AXIS (IU ACCESS DOOR). INSPECTOR WILL INSPECT MATING SURFACE FOR NICKS, BURRS, CORROSION AND ALODINED.

IBM QV-----

3. HAVE CRANE COMMUNICATOR STATIONED ON THE EXTENSION OF SWING ARM NO. 7 AND AT LEAST THREE IBM MECHANICAL SYSTEMS TECHNICIANS STATIONED IN THE IU. THE IBM SYSTEMS ENGINEER WILL BE STATIONED IN THE IU TO DIRECT THE CRANE COMMUNICATOR.
4. HAVE EXTENSIBLE PLATFORMS A AND B SUFFICIENTLY RETRACTED BY BENDIX.
5. NR WILL DIRECT THE HOISTING OF THE SPACECRAFT ABOVE THE 16TH FLOOR CROSSWALK.

NOTE

REQUEST DAC OPERATIONS TO REMOVE ANY POSSIBLE INTERFERING GSE, HAND-RAILS, DOME COVERS, ETC. VERIFY THAT ALL LEM HARDWARE IS FREE OF INTERFERENCE WHILE BEING LOWERED TO THE IU MATING SURFACE.

6. NR DIRECT CRANE OPERATOR/COMMUNICATOR TO POSITION THE SPACECRAFT OVER THE IU AND LOWER UNTIL THE SLA MATING SURFACE IS WITHIN APPROXIMATELY 18 INCHES OF THE IU MATING SURFACE.

NOTE

AT THIS POINT RESPONSIBILITY
FOR DIRECTING CRANE OPERATOR/
COMMUNICATOR IS TRANSFERRED
TO IBM (NASA-LVO).

7. VISUALLY ALIGN THE IU POSITION MARKINGS I, II, III, AND IV WITH SPACECRAFT POSITION MARKINGS I, II, III, AND IV. IBM QV-----
8. IBM SYSTEMS ENGINEER DIRECT CRANE OPERATOR/COMMUNICATOR TO LOWER THE SPACECRAFT UNTIL THE LOWEST POINT IS WITHIN APPROXIMATELY 3/16" OF THE IU MATING SURFACE, AND THE GUIDE PINS ARE ENGAGED.

*****CAUTION*****
*
* PERSONNEL INSIDE THE IU *
* MUST GUIDE THE SLA DURING *
* ITS DESCENT TO AVOID *
* STRIKING THE IU CABLE *
* TRAY. *
*

9. INSTALL MATING HARDWARE IBM QV-----

NOTE

NON FLIGHT MATING HARDWARE MAY BE
USED FOR NON FLIGHT SPACECRAFT MATING.

- (A) AT THE LOW POINT OF THE SPACECRAFT, INSERT A NAS 625-8 BOLT THROUGH A MS20002-C5 WASHER (COUNTERSUNK FACE UP) INTO THE HOLE IN THE SPACECRAFT FLANGE AND CORRESPONDING HOLE IN THE IU FLANGE.
- (B) SIMILARLY INSTALL BOLTS IN THE HOLES ADJACENT TO THE LOW POINT WHILE HAVING THE SPACECRAFT INCREMENTALLY LOWERED TO PERMIT INSTALLATION OF ALL (108) BOLTS LOWER THE SPACECRAFT UNTIL ITS ENTIRE WEIGHT RESTS ON THE IU. INITIAL CONTACT SHALL NOT BE IN THE ACCESS DOOR QUADRANT OR AT B OR C SPLICES.
- (C) INSTALL A 10M12286-1 NUT & A MS20002-5 WASHER ON EACH BOLT. DO NOT TIGHTEN THE NUTS.
 - (1) VERIFY THAT EACH NUT THREAD IS CLEAN AND DRY, AND FREE OF ANY LUBRICANT.

- (2) CHECK THE THREAD EXTENSION ON EACH BOLT BY OBSERVING IT IN THE GAP BETWEEN THE SPACECRAFT AND THE IU MATING RINGS. SHIM AS REQUIRED UNDER THE NUT TO AVOID ENGAGEMENT OF IMPERFECT THREADS ON THE BOLT USING A MAXIMUM OF TWO MS20002-5 OR 10M12285-1 WASHERS UNDER EACH NUT. MAINTAIN A MINIMUM BOLT-THRU-NUT PROTRUSION OF TWO THREADS.
- (3) DO NOT REMOVE SLINGS OR DISMISS CRANE OPERATOR UNTIL ALL BOLTS ARE POSITIONED AND NUTS HAVE BEEN INITIALLY ENGAGED.

10. HAVE EXTENSIBLE PLATFORMS A AND B CLOSED.
11. MEASURE THE GAP AT THE IU/SLA INTERFACE ALONG THE OUTBOARD EDGE USING A FEELER GAUGE. THE MAXIMUM GAP SHALL NOT EXCEED .020 INCHES NOR SHALL THE GAP DIFFERENTIAL OVER ANY 10 INCHES EXCEED .010 INCHES. RECORD ANY OUT OF TOLERANCE GAPS ON TSS. INCLUDE GAP, LOCATION, AND SHIMMING REQUIRED. SHIM AS REQUIRED USING 10M15103-1, 3 SHIMS TO ACHIEVE THESE LIMITS. IBM QV-----
12. SNUG, MATING HARDWARE AT THE INTERFACE. EITHER BOLT OR NUT MAY BE TIGHTENED.

NOTE

SHIMMING OF GAPS ABOVE THE IU ACCESS DOOR WILL BE DECIDED ON A REAL TIME BASIS BY IBM ENGINEER AND LVO ENGINEER.

NOTE

AFTER 25% OF THE MATING HARDWARE HAS BEEN TIGHTENED, NOTIFY NR THEY MAY BEGIN POST MATE OPERATIONS, PER K-3117: NOTIFY GAEC THEY MAY BEGIN POST MATE OPERATIONS PER KL10005.

13. TORQUE THE MATING HARDWARE PER 10M15016 (AS-506) OR APPLICABLE STAGE TO STAGE TORQUE SEQUENCE. NON-FLIGHT SPACECRAFT MATING HARDWARE SHOULD BE TORQUED TO 115±10 INCH-POUNDS. IBM QV-----

*****CAUTION*****
*
* THE TORQUE VALUES GIVEN ARE FOR NON- *
* LUBRICATED SURFACES. PRESENCE OF LUBRI- *
* CANT COULD RESULT IN OVERSTRESS. *
* *

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- (A) TIGHTEN ALL OF THE BOLTS EQUALLY IN THE SPECIFIED SEQUENCE TO 115 \pm 10 INCH POUNDS.
- (B) TIGHTEN ALL OF THE BOLTS EQUALLY IN THE SPECIFIED SEQUENCE TO 170 \pm 10 INCH POUNDS.
- (C) TIGHTEN ALL OF THE BOLTS EQUALLY IN THE SPECIFIED SEQUENCE TO 230 \pm 10 INCH POUNDS.
14. IF THIS IS THE FINAL INSTALLATION, HAVE QAI TORQUE SEAL MATING HARDWARE. IBM QV-----
15. IF THIS IS THE FINAL INSTALLATION APPLY EC-1291 OR PR-1201-Q SEALANT AT THE INTERFACE PER 10M15006 (AS-506) OR APPLICABLE VEHICLE ASSEMBLY. IBM QV-----

NOTE

SEALANT APPLICATION MAY BE COMPLETED AT A LATER DATE ON A NON-INTERFERENCE BASIS PER CAP.

16. VERIFY HOISTING SLING HAS BEEN REMOVED. IBM QV-----
17. NOTIFY TEST CONDUCTOR MATING OPERATION IS COMPLETE AND MAKE PUBLIC ADDRESS ANNOUNCEMENT "SPACECRAFT MATING OPERATION HAS BEEN COMPLETED. THE AREA IS NOW OPEN FOR NORMAL WORK."
18. WEIGH HARDWARE NOT INSTALLED. SUBTRACT TOTAL FROM WEIGHT IN PARAGRAPH C.7 AND RECORD WEIGHT OF HARDWARE INSTALLED IN THE IU WEIGHT AND BALANCE LOGBOOK. TOTAL WEIGHT _____ HARDWARE NOT INSTALLED WEIGHT _____ WEIGHT OF HARDWARE INSTALLED _____. IBM QV-----
19. IF THIS IS NOT THE FINAL INSTALLATION REMOVE GUIDE PIN BRACKET AT IU DOOR AND REINSTALL THE DOOR FRAME AND PROTECTIVE COVER.
20. IF THIS IS THE FINAL INSTALLATION, REMOVE THE THREE GUIDE PIN BRACKETS AND INSTALL FLIGHT HARDWARE PER PROCEDURE V-36048 AND REINSTALL DOOR FRAME & PROTECTIVE COVER.

F. DEMATING OPERATION

NOTE

APPROXIMATELY 85% OF THE MATING BOLTS MAY BE REMOVED PRIOR TO STEP 1. THE REMAINING BOLTS SHALL BE EVENLY DISTRIBUTED.

1. VERIFY NR HAS CONNECTED THE HOISTING SLING PER TPS AND IS PREPARED TO START DEMATING.
2. REMOVE IU DOOR FRAME AND PROTECTIVE COVER.
3. VERIFY THE GUIDE PIN BRACKETS ARE INSTALLED PER PROCEDURE V-36048 AND ENGAGED WITH SPACECRAFT GUIDE PINS. IBM QV-----
4. VERIFY THE IU UPPER PROTECTIVE RING AND PROTECTIVE COVER ARE AVAILABLE FOR INSTALLATION. IBM QV-----
5. VERIFY ALL ITEMS WHICH MIGHT PREVENT IU/SLA SEPARATION ARE REMOVED. IBM QV-----
6. REMOVE MATING BOLTS (108 TOTAL) FROM THE IU/SLA INTERFACE. IBM QV-----
7. HAVE CRANE COMMUNICATOR STATIONED ON THE EXTENSION OF SWING ARM NO. 7 AND AT LEAST THREE IBM MECHANICAL SYSTEMS TECHNICIANS STATIONED IN THE IU. THE IBM SYSTEMS ENGINEER WILL BE STATIONED IN THE IU TO DIRECT THE CRANE COMMUNICATOR.

NOTE

MATING BOLTS AND NUTS MAY NOT BE
REUSED FOR FLIGHT INSTALLATION.

NOTE

IBM ENGINEER SHALL BE ON STATION
PRIOR TO STEP E.7.

8. TAKE A GRADUAL STRAIN ON THE HOISTING SLING. STOP THE CRANE WHEN THE FIRST SEPARATION OF THE IU/SLA OCCURS. LOCATION OF FIRST SEPARATION SHOULD BE AT ACCESS DOOR BY RESTRAINT ON OPPOSITE SIDE OF IU. WEIGHTS SHOULD NOT REMAIN ON SPLICES DURING SEPARATION.
9. HAVE BENDIX RETRACT EXTENSIBLE PLATFORMS A AND B.
10. IF THE INITIAL SEPARATION OCCURS AT A LOCATION OTHER THAN BETWEEN IU PANELS 16 AND 24, SLOWLY HOIST THE SPACECRAFT UNTIL IT IS APPROXIMATELY TWO FEET ABOVE THE IU. REMOVE ANY SHIMS INSTALLED AT THE INTERFACE AND RETAIN FOR WEIGHING. IBM QV-----

*****CAUTION*****
*
* PERSONNEL IN THE IU WILL *
* GUIDE THE SPACECRAFT TO *
* INSURE IT DOES NOT CONTACT *
* THE IU CABLE TRAY. *
*

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11. NR WILL DIRECT CRANE OPERATOR/COMMUNICATOR TO COMPLETE THE DEMATING OPERATING IN ACCORDANCE WITH THE TPS.
12. WHEN THE SPACECRAFT IS CLEAR OF THE PLATFORMS, HAVE BENDIX CLOSE THE EXTENSIBLE PLATFORM B.
13. INSPECT AND RECORD ANY DAMAGE TO IU MATING SURFACE.
14. INSTALL THE IU UPPER PROTECTIVE RING PER PROCEDURE V-36048, AND IF THE IU IS TO REMAIN MATED, INSTALL THE PROTECTIVE COVER PER PROCEDURE V-36049 AND UPPER PROTECTIVE RING NEED NOT BE INSTALLED.

NOTE

IF A SPACECRAFT IS TO BE INSTALLED WITHIN 24 HOURS, PLATFORM B COVER MAY BE USED IN PLACE OF IU/S-IVB PROTECTIVE COVER.

IF SPACECRAFT MATE IS NOT GOING TO BE PERFORMED WITHIN 24 HOURS AFTER DEMATE REMOVE GUIDE PIN BRACKET BY THE IU ACCESS DOOR AND INSTALL THE IU DOOR FRAME AND PROTECTIVE COVER.

IBM QV-----

15. RECORD WEIGHT OF REMOVED HARDWARE IN THE IU WEIGHT AND BALANCE LOGBOOK. WEIGHT _____
16. NOTIFY TEST CONDUCTOR OF COMPLETION OF DEMATING AND MAKE PUBLIC ADDRESS "SPACECRAFT DEMATING OPERATION HAS BEEN COMPLETED. THE AREA IS NOW OPEN FOR NORMAL WORK."

IBM QV-----

G. EMERGENCY PROCEDURE

1. STOP ALL OPERATIONS.
2. CLEAR THE AREA OF ALL PERSONNEL.

*****WARNING*****
*
* IN THE EVENT OF SLING OR *
* CABLE FAILURE, PERSONNEL *
* WILL IMMEDIATELY MOVE TO *
* A SAFE LOCATION, MAKING *
* NO ATTEMPT TO PROTECT *
* EQUIPMENT. *
*

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3. ENGINEER IN CHARGE INVESTIGATE MALFUNCTION TO DETERMINE IF OR WHEN OPERATIONS WILL CONTINUE AND INITIATE SECURING STEPS IF OPERATIONS ARE TO BE DISCONTINUED.

END OF TEST PROCEDURE V-20030.

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OPERATING PERSONNEL

TECHNICIAN(S)-----

QUALITY INSPECTOR(S)

PAD ENGINEER(S)

