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STS-108 Run 3

\*2945612 \*

12/05/01

# PROCESSING OPERATIONS CONTROL OMI PLANNING SHEET



Y57  
191  
DM

Wad Number S6444-J02-R03	SITE LCC	Elem CD V	End Item 105 FLT: 017	DATE: 12/05/2001 TIME: 07:51:53
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Title: SSV ICE AND DEBRIS ASSESSMENT	Sub Element/Zone 30
-----------------------------------------	------------------------

Project Work Order No.	Hazard: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	SFOC Safety N/A WC 150 USA DEC 5 01	<input type="checkbox"/> Local Copy <input checked="" type="checkbox"/> Firing Room Copy
------------------------	--------------------------------------------------------------------------------	-------------------------------------------	---------------------------------------------------------------------------------------------

Authorizing Document ORB517-459(ADD)	Material & Equipment: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	MICR Req'd <input type="checkbox"/> Yes <input type="checkbox"/> No	OMRS: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
-----------------------------------------	----------------------------------------------------------------------------------------------	------------------------------------------------------------------------	------------------------------------------------------------------------------

**PERFORM THE FOLLOWING:**

**Pre-Ops Setups**

Task	Operation Number	Seq	Steps	Task	Operation Number	Seq	Steps								
<table border="1"> <tr> <td>CVAS</td> <td>TIPS</td> <td>IAE</td> <td>TACETS</td> </tr> <tr> <td>USA VM 068</td> <td>N/A</td> <td>USA VM 068</td> <td>USA VM 068</td> </tr> </table>								CVAS	TIPS	IAE	TACETS	USA VM 068	N/A	USA VM 068	USA VM 068
CVAS	TIPS	IAE	TACETS												
USA VM 068	N/A	USA VM 068	USA VM 068												

**OPS Support**

Task	Operation Number	Seq	Steps	Task	Operation Number	Seq	Steps

**Operating Instructions**

Task	Seq	Steps	Task	Seq	Steps
	010			080	
	015			090	
	020			100	
	030			110	
	040			120	
	050			130	
	060			140	
	070			145	

**Post Ops**

Task	Operation Number	Seq	Steps	<b>Appendices</b>		
				Task	Seq	
				N/A		

**Subtask WAD's**

N/A
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Planner LISA RUTKOWSKI WC 150 USA DEC 5 01	Ext 0746	QC Closure	Date JAN 14 02	Page 1 OF 2
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USA  
VM  
068

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100

100

# PROCESSING OPERATIONS CONTROL OMI PLANNING SHEET



Wad Number S6444-J02-R03	SITE LCC	Elem CD V	End Item 105 FLT: 017	DATE: 12/05/2001 TIME: 07:51:53
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-----------------------------------------	----------------------------------------------------------------------------------------------	------------------------------------------------------------------------	------------------------------------------------------------------------------

### PERFORM THE FOLLOWING:

Pre-Ops Setups							
Task	Operation Number	Seq	Steps	Task	Operation Number	Seq	Steps

OPS Support							
Task	Operation Number	Seq	Steps	Task	Operation Number	Seq	Steps

Operating Instructions							
Task	Seq	Steps	Task	Seq	Steps	Task	Seq
	150						

Post Ops				Appendices			
Task	Operation Number	Seq	Steps	Task	Seq	Task	Seq
						N/A	

Subtask WAD's
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Planner LISA RUTKOWSKI	WC 150 USA DEC 5 '01	Ext 0746	QC Closure 	Date JAN 14 '02	Page 2 OF 2
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# OMI TASK CLOSEOUT CHECKLIST

OMI No. <i>56444 J-02</i>	Run No. <i>3</i>	Task Control No. (TCN) <i>2945612</i>
Start Date <i>12/4/01</i>	Completion Date <i>1/11/02</i>	Closure Date <i>1/11/02</i>  JAN 14 02

Item	QC/Eng.	Date
1. Deviation Index: Verify total number of deviations agree with index. Verify entry is correct into OMI.		<i>20/11/11</i>
2. Constraints List: Verify all constraints are accepted by QC or waived by Engineering. Verify that constraints list is complete and closed. <i>SUBTASKED TO 50007. R. Seal 1/11/02</i>	<i>N/A</i>	<i>N/A</i>
3. IPR's: Verify that all IPR's are closed or upgraded to problem reports or dispositioned as no constraint to OMI closure and incorporated in central IPR system and a copy of the central IPR sort attached.		<i>JAN 14 02</i>
4. Verify that material and equipment requirement list enclosed (if applicable).	<i>N/A</i>	<i>N/A</i>
5. OMI: Verify that all pages or verification sheets are completed, stamped, and dated in the lower left/right hand corners.		<i>20/11/11</i>
6. OMI: Verify that all miscellaneous documents/procedures have sequence number referenced and stamped; e.g., photos, sample results, etc.		<i>20/11/11</i>
7. Planned task/OMI satisfactorily completed. OPR: <i>R. Seal ETR 1/11/02</i> 		<i>20/11/11</i>
8. LSS review prior to closure for CIL OMI's. MMC <u>          <i>NA</i>          </u> Thiokol <u>          <i>NA</i>          </u>		

\*VOID, ENTER IN ERROR

 JAN 14 02

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## SSV ICE AND DEBRIS ASSESSMENT

Element/End Item: ALL  
Flow/Usage: ET-103 & SUBS  
Facility: LC 39  
Design Center Concurrence: MSFC/JSC  
Category: B  
OPR: ETM  
TTL ORG: SE

**This document contains  
HAZARDOUS operations.**

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## 1.0 INFORMATION

### 1.1 Objective

Provide necessary tasks that document, monitor and evaluate ice and debris conditions to eliminate or minimize debris concerns of the integrated SSV during ET tanking, FRF, launch, and associated detanking.

#### Description

1. This OMI is performed as subtask to S0007/S0014/S0037.
2. This OMI provides documentation of ice/debris activities:
  - A. Pre-launch icing briefing
  - B. Pre-launch debris inspection
  - C. Countdown - Based timeline evaluation monitoring of ET TPS surfaces using OTV
  - D. OTV monitoring of seal/flange areas for cryogenic leakage
  - E. SSV OTV monitoring for debris conditions during countdown
  - F. Cryogenic replenish inspection for evaluation of SSV and facility debris concerns or anomalies
  - G. Evaluation of concerns/anomalies in the event of ET detanking
  - H. Review of engineering film data for SSME ignition, launch, ascent, ET separation, and orbiter landing.
3. Orbiter landing debris information is contained in the NASA publication for Ice and Debris Assessment. That report is referenced in this OMI for continuity of debris data.

## 1.2 Special Instructions All Operations

1. This OMI is run as a subtask to OMI's S0007, S0014, and S0037. All PAD clearing and controlled access operations will be performed per those OMI's.
2. Constraints will be statused by controlling OMI's S0007/S0014/S0037.
3. The OTV camera numbering scheme for PAD A/B is 0XX/1XX.
4. Task Team Leader assignment: NASA PH-H is TTL for L-20 Hour Walkdown, Final Inspection, and Post Launch/Drain Walkdown. ETM is TTL for all other operations.
5. From time stable replenish mode starts until start of final SCAN, scanning with individual cameras should be performed approximately once per hour.
6. Cameras 061/161, 063/163, and 070/170 may be released to NASA select with CICE concurrence.
7. All personnel participating in final inspection and post drain walkdown shall be current in following training:
  - A. Emergency PAD egress
  - B. Fire fighting
  - C. ELSA
8. Milestones:
  - A. MLP portion of post launch walkdown commences at approximately T + 1 hours.
  - B. PAD acreage portion of the post launch walkdown commences at approximately T + 2 hours. (may be deferred until preferred daylight hours.)
  - C. Post drain walkdown commences at approximately T + 4 hours after drain initiated (typically 1 1/2 hours after LH<sub>2</sub>/LO<sub>2</sub> low level sensors dry).
9. Hands-on investigation required for all ET-TPS defects suspected of violating NSTS 08303 ice/debris inspection criteria.
10. From time launch scrub is declared until 1.5 hours past time LH<sub>2</sub>/LO<sub>2</sub> low level sensors read dry, OTV camera scanning shall be performed approximately once per hour.

11. OTV cameras 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171 shall be used to monitor LO<sub>2</sub>/LH<sub>2</sub> tank drain operations.
12. Excessive vapors are defined as being more severe than that described in NSTS 08303 - Ice/Debris Inspection Criteria or NSTS 16007 - Launch Commit Criteria - Hazardous Gas Subsystem.
13. Quality coverage is not required for performance of this OMI. Ref SFOC-GO0007, Ice and Debris Team Operations are exempt from quality coverage. The ROR (CTIF) performs the CMQC function for all non-hazardous operations.
14. Personnel using Sony DKC-ID1 camera shall verify lithium ion battery is securely locked in the bayonet fitting and the lithium button battery door is securely locked and taped in place.
15. Verify camera flash is deactivated.
16. Personnel using Kodak DC 50/120 camera shall verify alkaline batteries are properly installed.
17. Personnel using digital cameras shall not operate in H<sub>2</sub> leak or O<sub>2</sub> rich environment (23 percent or greater).
18. Personnel using the Sony MVC-FD91 camera shall verify the lithium ion battery is securely locked and the battery door is locked closed. Personnel shall verify that both battery doors (lithium ion and lithium button) are closed and taped shut.
19. Personnel shall verify that cameras and equipment are securely tethered when at the PAD while the SSV is present.

### 1.3 Operations List

Operation		Shop/ Cntl Rm Console	OPR	Haz (Y/N)	Duration (Hrs)
No.	Title				
10	Support Preparations	STM/ FR2	ETM	N	0.2
15	IR Camera Setup	PH-H/ NA	ETM	N	4.0
20	Ice Prediction Briefing	SE/ NA	ETM	N	0.5
30	Pre-launch Walkdown	SE/ NA	ETM	N	2.0
40	Ice Frost Debris Console Initial Configuration Setup	SE/ FR2	ETM	N	3.0
50	SSV Debris Assessment	SE/ FR2	ETM	N	18.0
60	Group 1 Monitoring LO2 Chill Down Thru T-0	SE/ FR2	ETM	N	15.0
70	Group 2 Monitoring - LH2 Chill Down Thru T-0	SE/ FR2	ETM	N	15.0
80	Final Inspection	SE/ FR2	ETM	Y	3.0
90	LO2/LH2 Drain Monitoring	SE/ FR2	ETM	N	4.0
100	Console Securing	SE/ FR2	ETM	N	0.5
110	Summary Tape	SE/ FR2	ETM	N	18.0
120	Post Drain Walkdown	SE/ NA	ETM	Y	2.0
130	Post Launch Walkdown	SE/ NA	ETM	Y	3.0
140	Film Review	SE/ NA	ETM	N	15.0
145	IR Camera Removal	PH-H/ NA	ETM	N	2.0
150	Final Report	SE/ NA	ETM	N	0.5

## 2.0 SAFETY INFORMATION

### 2.1 Hazards

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Operation

1. Working at unprotected heights.
2. Walkdown at PAD while SSV is in stable replenish mode.

### 2.2 Safety Requirements

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Operation

1. If lightning activity is forecast to be within 5 miles of launch PAD, CTC and SFOC safety shall implement provisions of adverse/severe weather and lightning policy contained in GSOP 5400 Ground Safety Operations Procedures.
2. There are no safing/shutdown or evacuation steps required in this OMI.
3. Hazardous operations within this subtask OMI will not be started until safety concurrence to proceed has been given per the integrated OMI controlling this subtask.

### 2.4 Reference Safety Documentation

Number	Rev	Title
KHB 1710.2	LI	KSC Safety Practices Handbook
GSOP 5400	LI	Ground Safety Operating Procedures

09-01-2001  
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### 3.0 STAGING REQUIREMENTS

#### 3.1 Referenced Engineering Documentation

##### 3.1.2 Documents

###### OPERATION 120

Document No.	Rev	Title
NSTS 08303	(LI)	NSTS PROGRAM ICE/DEBRIS INSPECTION CRITERIA

#### 3.2 Parts, Materials, Equipment, and Special Tools

##### 3.2.5 Shop Support Materials

###### OPERATION 15

Part No./Find No.	Nomenclature	Qty	Unit
8305-00-519-3144	Rymple cloth	2	roll
6810-00-543-7915	Isopropyl alcohol	8	ounces

###### OPERATION 145

Part No./Find No.	Nomenclature	Qty	Unit
8305-00-519-3144	Rymple cloth	2	roll
6810-00-543-7915	Isopropyl alcohol	8	ounces
6505-00-133-8025	Petroleum Jelly, Vaseline (or equivalent)	1	tube/jar

### 3.2.8 Personal Protective Equipment

<b>OPERATION 15</b>	<b>Nomenclature</b> N-Dex nitril gloves chemical splash goggles face shield
<b>OPERATION 30</b>	<b>Nomenclature</b> safety harness lanyard
<b>OPERATION 80</b>	<b>Nomenclature</b> safety harness lanyard Nomex coveralls with gloves and hoods ELSA
<b>OPERATION 120</b>	<b>Nomenclature</b> safety harness lanyard hardhats flame retardant coveralls
<b>OPERATION 130</b>	<b>Nomenclature</b> safety harness lanyard hardhats flame retardant coveralls
<b>OPERATION 145</b>	<b>Nomenclature</b> N-Dex nitril gloves chemical splash goggles face shield

## 4.0 PLANNING REQUIREMENTS

OIR Required Yes [ ], No [ X ]

### 4.3 LPS Requirements

#### 4.3.1 Computer Systems

PC GOAL  
CCMS Configuration  
CDS  
CMS

### 4.4 Support Services, Commodities, and Equipment

#### 4.4.2 Communications

(Per controlling OMI S0007, S0014 or S0037 unless specified otherwise)

#### 4.4.3 OTV

(Per controlling OMI S0007, S0014 or S0037 unless specified otherwise)

**OTV Cameras required:** 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171

**OTV Cameras to be recorded:** 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171

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#### 4.4.4 Countdown Display/Status

<u>Display Required</u>	<u>Bldg</u>	<u>Room</u>	<u>Operation Time</u>
Timing	LCC	FR2	Duration of Test
Countdown and GMT	LCC	FR2	Duration of Test

#### 4.4.8 Services

<u>Service/Special Requirements</u>	<u>Location</u>	<u>Purpose</u>
SFOC Safety	LC-39 A&B	Safety Support
ELSA'S (8)	LC-39 A&B	Inspection Team Use
Radio Net 105	LC-39 A&B	Inspection Team Use

#### 4.4.12 Propellants, Gases and Chemicals

<u>Commodity</u>	<u>Spec No.</u>	<u>Quantity</u>	<u>Rcvr</u>	<u>Location</u>	<u>Minimum Press</u>	<u>Delivery Time</u>
GN <sub>2</sub>	SES-0073 -6.3-5	Min 750 Cu ft	PH-H 861-3645	Pad 39B Camera Site 2	3000 PSI	1 week prior to T-0

## 5.0 CONFIGURATION ACCOUNTING AND VERIFICATION

### 5.1 Specific OMRS Requirements Satisfied by this TOP

OMRS NO.	NOMENCLATURE/ EFFECTIVITY	SEQ-STEP (CAP)
S00E00.021	ET TPS MON DURING DETANK TAF;C	90-005
S00E00.031	POST DETANK ET TPS INSPECT TAF;C	120-002
S00FA0.900	PRELAUNCH WEATHER BRIEFING (L-1 DAY) VAF1-90	20-001
S00FB0.005 (1 )	ET TPS SURFACE MONITORING T23,27-29,31-999	50-022
S00FB0.350 (1 )	MONITOR GC2 VENT HOOD VAF1-90	50-024
S00FB0.360 (1 )	MONITOR ET/ORB MPS FOR LEAKAGE VAF1-90	50-022
S00L00.150	HIGH WIND ET NOSE INSPECTION SAF;C	50-020
S00U00.010 (1 )	POST LAUNCH SHUTTLE/PAD AREA INSPECTION SAF1-999	130-002
S00U00.011 (1 )	ENGR REVIEW & ANALYSIS OF LAUNCH FILM SAF1-999	140-001
S00U00.020-A (1 )	AN ENGINEERING PAD INSPECTION TEAM SAF1-999	80-002
S00U00.020-C (1 )	INSPECT ORBITER AFT ENGINE SAF1-999	80-002
S00U00.020-D (1 )	INFRARED SURVEILLANCE SAF1-999	80-002
S00U00.030 (1 )	PRELAUNCH SHUTTLE/PAD AREA INSPECTION SAF1-999	30-001

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### **5.5 List of References**

#### **OPERATION 20**

<b>Reference No.</b>	<b>Rev</b>	<b>Title</b>
NSTS 16007	(LI)	NSTS Program Launch Commit Criteria - Hazardous Gas Subsystem and Appendix F

#### **OPERATION 30**

<b>Reference No.</b>	<b>Rev</b>	<b>Title</b>
80901019010	(LI)	ET Post Build Acceptance and In-Process Rework Requirements Manual - Offsite

#### **OPERATION 40**

<b>Reference No.</b>	<b>Rev</b>	<b>Title</b>
79K24576	(LI)	OTV System Installation, LC 39, Pad A
79K24522	(LI)	OTV System Installation, LC 39, Pad B

#### **OPERATION 50**

<b>Reference No.</b>	<b>Rev</b>	<b>Title</b>
SPI SP-519	(LI)	OMI and OM Implementation
SFOC GO0007	(LI)	Quality Planning Requirements Document (QPRD)

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### OPERATION 10 Support Preparations

Shop: STM  
Cntrl Rm Console: FR2  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 0.2

10-1 STM JYVO 138

Verify PAD OTV system is configured to support S6444 as scheduled.

Support: COMM

10-2 STM JSTC 111  
JSTC \*SCB 114

Verify eight 10-minute ELSA's available at complex J for use by Final Inspection Team (ref S0007/S0014/S0037).

Support: LS

10-3 STM TBC 136

Operation - Support Preparations complete.

\*\*\* End of Operation 10 \*\*\*

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## OPERATION 15 IR Camera Setup

Shop: **PH-H**  
Cntrl Rm Console: **NA**  
OPR: **ETM**  
Zone: **NA**  
Hazard (Y/N): **N**  
Duration (Hrs): **4.0**

### WARNING

Hard hats required on the Pad when SSV is not present.

### CAUTION

Exercise care to avoid dropping equipment, fasteners, etc from RSS Roof to prevent damage to equipment or injury to personnel. All tools must be tethered.

### NOTE

IR Camera installation at RSS Roof site may be not performed if IR Camera already installed or if technical concerns preclude such.

15-1      **Install** IR camera at RSS Roof Site as follows.

1.      **Rotate** camera housing back cover to open position by removing bolts with flat washers (20 pl). **Retain** bolts/washers for reinstallation.
2.      **Remove** camera housing front cover by removing fasteners (2 pl). **Reinstall** fasteners after cover removal. **Retain** cover for reinstallation after IR Camera Unit removal.
3.      **Install** IR Camera Unit into camera housing. **Secure** IR Camera Unit in housing by locking spring pin at lower, left.

**WARNING**

Power cable is live. Care should be exercised when connecting power cable to avoid electric shock.

**CAUTION**

Do NOT allow opened back cover to exert undue force on cables once cables have been connected.

4. **Connect:**
  - OTV coaxial cable
  - Pan & tilt cable
  - Controller cable
  - Power cable
  
5. **Rotate** camera housing back cover into closed position. **Secure** back cover by installing bolts/flat washers (20 pl). **Tighten** bolts wrench tight.

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**WARNING**

Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system. Ensure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear **N-Dex nitril gloves** and **chemical splash goggles**. When working at eye level or above wear a **face shield** over goggles.

WS002.a 05-22-01

6. **Clean** IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rymple cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl alcohol .
7. **Perform** functional checkout of IR Camera Unit using local controller if required at Task Team Leader (TTL) discretion.

Sub Step Not Performed: N/A

NASA PH-H N/A Date N/A

USA ETM N/A Date N/A

Not Performed: 

ET
01

  
12/5/01

**NOTE**

IR Camera installation at Camera Site 2 may be not performed if IR Camera already installed or if technical concerns preclude such.

15-2 **Install** IR camera at Camera Site 2 as follows.

1. **Rotate** camera housing back cover to open position by removing eight ea bolts using Phillips screwdriver. **Retain** bolts/washers for reinstallation.
2. **Remove** camera housing front cover by removing securing bolt(s). **Reinstall** bolt(s) after cover removal. **Retain** cover for reinstallation after IR Camera Unit removal.
3. **Install** IR Camera Unit into camera housing. **Secure** IR Camera Unit in housing by tightening set screw(s) wrench tight at lower left/right.

**WARNING**

Power cable is live. Care should be exercised when connecting power cable to avoid electric shock.

4. **Connect:**
  - OTV coaxial cable
  - Pan & tilt cable
  - Controller cable (2 pl)
  - Power cable
5. **Rotate** camera housing back cover into closed position. **Secure** back cover by installing bolts (8 pl). **Tighten** bolts using Phillips screwdriver.

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12/5/01

**WARNING**

**Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system.** Ensure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear **N-Dex nitril gloves** and **chemical splash goggles**. When working at eye level or above wear a **face shield** over goggles.

WS002.a 05-22-01

- 6. **Clean** IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rymple cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl alcohol .
- 7. **Perform** functional checkout of IR Camera Unit using local controller if required at Task Team Leader (TTL) discretion.

Sub Step Not Performed: N/A

NASA PH-H N/A Date N/A

USA ETM N/A Date N/A

Not Performed: 

ET
01

  
12/5/01

\*\*\* End of Operation 15 \*\*\*

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12/5/01

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### OPERATION 20 Ice Prediction Briefing

Shop: SE  
Cntrl Rm Console: NA  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 0.5

**NOTE**

Ref: NSTS 16007 (LI) NSTS Program Launch Commit Criteria - Hazardous Gas Subsystem and Appendix F defines the ET No-Ice Zone.

**20-1 CICE**

**Conduct** L-1 day ice prediction briefing with launch director.

PH-H Signature

*[Handwritten Signature]*  
A. OLU 12/4/01

OMRSD S00FA0.900

*[Handwritten initials]*

**20-2** Operation - Ice Prediction Briefing complete.

\*\*\* End of Operation 20 \*\*\*

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### OPERATION 30 Pre-launch Walkdown

Shop: SE  
Cntrl Rm Console: NA  
OPR: ETM  
Zone: PAD  
Hazard (Y/N): N  
Duration (Hrs): 2.0

#### WARNING

Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

#### NOTE

This operation is performed at approximately L-20 hours. When this operation is performed in support of a 24 hour scrub turnaround, the preceding launch scrub post drain walkdown and this pre-launch walkdown may be performed concurrently.

Inspections may also be performed from the RSS, GO<sub>2</sub> Vent Arm (GVA), -Y OWP, or +Y OWP if still extended and accessible.

Ref: 80901019010 (LI) ET Post Build Acceptance and In-Process Rework Requirements Manual - Offsite

NASA ET Mechanical Engineer (PH-H) or designee shall function as team leader. Following personnel are optional walkdown participants.

NASA Engr	(4)
SFOC Engr	(2)
LMSSC - LSS	(1)
Boeing - LSS	(1)
SRB ELE	(1)
Thiokol - LSS	(1)

30-1 Debris inspection team **perform** walkdown of SSV and MLP per following:

1. Team leader **verify** S6444 pre-test briefing complete.
2. **Assemble** following essential personnel  
  
NASA PH-H Engineering - 1  
SFOC ETM Engineering - 1
3. **Inspect** following areas (as a minimum) from the MLP, RSS and FSS to identify/ resolve potential debris sources.

Areas to be inspected

- A. Launch vehicle external surfaces
  - Orbiter
  - SRB's
  - External Tank
- B. MLP surfaces
  - LH and RH SRB holddown posts
  - Deck including deck bolts, fixtures, and edge gutters
  - SSME LH and RH SRB exhaust openings, and sound suppression (SS) troughs
  - TSM's and camera housings
4. Ref Table 30-1, **document** and SIM Photograph SSV and Launch PAD Configuration.

Description: Pre launch walkdown.

OMRSD S00U00.030-1 9:29  
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OMI S6444 J02  
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- 30-2 Record all facility discrepancies in S0007. Submit copy to PAD leader and notify TBC/CTC. Verify no constraints to continue.

PH-H *[Signature]* Date 12-5-01  
*LEE LINERA*

ETM *[Signature]* Date 12-5-01  
*W.P. RICHARDS II*

- 30-3 Operation - Pre-launch Walkdown complete.

<b>Table 30-1 Photo Requirements for SSV and Launch Pad Configuration</b>			
<b>Photos from MLP</b>			
<b><u>Photo</u></b>	<b><u>Camera Orientation</u></b>	<b><u>Lens</u></b>	<b><u>Notes</u></b>
ET -Z	Vertical	28 mm	
Aft Dome	Horizontal	28 mm	
Aft Dome	Horizontal	35-70 mm	
LH SRB from North	Horizontal	35-70 mm	All water troughs in view
LH SRB from North	Vertical	35-70 mm	3-4 water troughs in view
LH SRB from East	Vertical	35-70 mm	
RH SRB from North	Horizontal	35-70 mm	All water troughs in view
RH SRB from North	Vertical	35-70 mm	3-4 water troughs in view
RH SRB from West	Vertical	35-70 mm	
SRB Heater Elec T-0	Horizontal	35-70 mm	Foam intrusion; May need flash
North HDP	Vertical	35-70 mm	Representative view
South HDP	Vertical	35-70 mm	Representative view
TSM T-0 LH <sub>2</sub>	Vertical	35-70 mm	Flash needed
TSM T-0 LO <sub>2</sub>	Vertical	35-70 mm	Flash needed
Orbiter Left & Right Wing	Vertical	35-70 mm	From below ET (1 Photo each wing)

ET  
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12/01

**135 Ft Level Photos**

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LO <sub>2</sub> UMB	Vertical	35-70 mm	From OWP usually during T5401
LH <sub>2</sub> UMB	Vertical	35-70 mm	From OWP usually during T5401

**215 Ft Level Photos**

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
ET surfaces from FSS	Vertical	35-70 mm	
LH SRB Frustrum and FWD skirt	Vertical	35-70 mm	
RH SRB Frustrum and FWD skirt	Vertical	35-70 mm	
Jack Pad C/O's	Horizontal	35-70 mm	Flash needed (1 each C/O)
LO <sub>2</sub> Ogive Cable Tray	Vertical	35-70 mm	From RSS roof

**255 Ft Level Photos**

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
ET surfaces with GO <sub>2</sub> vent ducts in view	Vertical	35-70 mm	
GO <sub>2</sub> vent ducts	Horizontal	250 mm	

\*\*\* End of Table 30-2 Photo Requirements for SSV and Launch Pad Configuration

\*\*\* End of Operation 30 \*\*\*

## OPERATION 40 Ice Frost Debris Console Initial Configuration Setup

Shop: SE  
Cntrl Rm Console: FR2  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 3.0

### NOTE

The next step sets up the photo processing laptop for use in the Firing Room. This is not a constraint to set up of the console or to final inspection team operations. Network or equipment failures on the photo processing machine shall be annotated below.

#### 40-1 Configure computer to perform image processing, analysis, and recording:

1. **Connect** following equipment at Ice/Frost console:
  - power cable to computer
  - "Dazzle" capture card to laptop parallel port
  - "Y" adapter to laptop PS2 port
  - keyboard to keyboard port on "Y" adapter
  - mouse to mouse port on "Y" adapter
  - monitor to laptop
2. **Insert** Xircon Network Card into Personal Computer PCMCIA port.
3. **Connect** ethernet (gray) cord to Xircon Network Card.
4. **Remove** terminator from video cable.
5. **Plug** BNC-to-RCA adapter into end of video cable.
6. **Plug** video cable into "Dazzle" DVC "video in".
7. **Power-up** Trouble Console VCR.

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

8. Log-on to KSC Ground Ops. Click-on Start/Programs/Dazzle.
9. Confirm above equipment as operational and record results.

Results OK

---

ETM R. Seab  
12-5-01

**NOTE**

The next step verifies the setup of the infrared scanners. This is not a constraint to set up of the ice console. IR scanner condition shall be annotated below.

- 40-2 Verify IR scanner operation condition, annotate below.

RSS: OK

CS 2: OK

**NOTE**

The next step verifies the operation of console monitors in the Firing Room. This is not a constraint to set up of the console or to final inspection team operations. Equipment condition shall be annotated below.

- 40-3 Verify console condition by powering on monitors and tape recorders.

Monitors: OK

Tape recorders: OK

ET  
01

12/5/01

**NOTE**

ET OTV pre-mapping/initial position of cameras may be performed in random order.

Ref: 79K24576 (LI) OTV System Installation, LC 39, Pad A and  
Ref: 79K24522 (LI) OTV System Installation, LC 39, Pad B define OTV camera locations.

FOV designates field-of view. RSS and -Y OWP must be retracted for completion of pre-mapping.

Pre-mapping steps/substeps in the remainder of this operation need not be performed if supporting a scrub turnaround and if performed during a previous run.

It is preferred to record all pre-mapping scanning on a single tape. However, multiple tapes may be used when lighting/ launch countdown constraints necessitate such.

40-4 CVM1 JTV1 223

**Perform** OTV pre-mapping of External Tank exterior surfaces using OTV Cameras 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, and 067/167 as follows:

- **Insert** designated pre-map tape into trouble console VCR.
- **Punch-up** camera number on trouble monitor.
- **Start** recording on pre-map tape. **Record** start time (GMT).
- **Scan** from top-to-bottom, left-to-right and right-to-left at approximately full zoom-in.
- **Stop** recording on pre-map tape. **Record** stop time (GMT).
- **Record** data in Table 40-1.
- **Repeat** with each OTV camera listed until each has been used to scan the External Tank.
- **Remove** pre-map tape from trouble console VCR.

ETM   N/A   Date   N/A  

Not Performed: 

ET
01

12/5/01



Table 40-1 ET Pre-Mapping Data		Tape #
OTV Camera	Start Time (GMT)	Stop Time (GMT)
004 / 104		
009 / 109		
013 / 113		
033 / 133		
042 / 142		
054 / 154		
055 / 155		
056 / 156		
060 / 160		
061 / 161	N/A	
062 / 162		
063 / 163		
064 / 164		
065 / 165		
066 / 166		
067 / 167		

Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

ET  
01  
12/5/01

<b>Table 40-2 OTV Camera Initial Positions</b>	
<b>OTV Camera</b>	<b>Initial Position</b>
004 / 104	FOV centered on GUCP
009 / 109	FOV on LH <sub>2</sub> Umbilical including ET/Orbiter interface. Vary close-up and wide angle views with 063/163 and 064/164.
013 / 113	Full zoom in. View SW GO <sub>2</sub> Vent Louver area.
033 / 133	FOV perpendicular to ET and with LO <sub>2</sub> -to-Intertank splice at frame top and LH <sub>2</sub> -to-Intertank splice at frame bottom. Then tilt down until XT2058 is in frame center.
042 / 142	FOV centered on Orbiter Access Arm-to-Orbiter interface.
054 / 154	FOV to encompass approximately 3 feet forward of XT2058 to 2 feet aft of XT2058. Orbiter wing and SRB should be in view at frame left.
055 / 155	Set FOV on north bridge LH <sub>2</sub> pipeline flange.
056 / 156	FOV with LH <sub>2</sub> Aft Dome in frame bottom and XT2058 in view at frame top.
060 / 160	Full zoom in. View SW GO <sub>2</sub> Vent Louver area.
061 / 161	Full zoom-in. Adjust FOV until ET LO <sub>2</sub> -to-Intertank splice is centered vertically and view is perpendicular to ET. Pan right until edge of the ET comes into view. Note: LO <sub>2</sub> Tank may pass out-of-view.
062 / 162	Full zoom in. View NW GO <sub>2</sub> Vent Louver area.
063 / 163	FOV on LH <sub>2</sub> Umbilical including ET/Orbiter interface. Vary close-up and wide angle views with 009/109 and 064/164.
064 / 164	FOV on LH <sub>2</sub> Umbilical including ET/Orbiter interface. Vary close-up and wide angle views with 009/109 and 063/163.
065 / 165	Full zoom out. Set FOV on aft part of ET with frame bottom approximately 2 feet below LH <sub>2</sub> Aft Dome.
066 / 166	FOV perpendicular to ET with LO <sub>2</sub> -to-Intertank splice at frame top. Then tilt down until Orbiter RH Wing/SRB intersection is in frame lower right.
067 / 167	Set FOV with LH <sub>2</sub> Aft Dome toward frame bottom and 2 <sup>nd</sup> black ring of SRB in view.
070 / 170	Select down wind camera of these two as wide angle view of the SSV.
071 / 171	Set up wind camera for close-up view of SSME's.

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OMI S6444 J02  
APPROVED

40-6 Operation - Ice Frost Debris Console Initial Configuration Setup complete.

ETM 

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 Date 12/5/01

\*\*\* End of Operation 40 \*\*\*

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### OPERATION 50 SSV Debris Assessment

Shop: SE  
Cntrl Rm Console: FR2  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 18.0

#### NOTE

Steps in this operation are contingent upon progression of launch countdown operations and may not be performed if countdown is terminated.

Entire Operation Not Performed: N/A

#### NOTE

Until otherwise indicated, all times are referenced to S0007, S0014 or S0037 timelines.

No operations/steps within this subtask OMI may be performed as a stand-alone procedure. This OMI may only be performed as a subtask to S0007/S0014/S0037.

#### NOTE

Ref: SPI SP-519 (LI) OMI and OM Implementation and Ref: SFOC GO0007 (LI) Quality Planning Requirements Document (QPRD), following step complies with requirements for ROR-as-CMQC function.

50-1

CTIF    TBC  
TBC    CMQC 136

Notify TBC that CTIF will perform the CMQC function for STS 108, S6444 run 3. Request TBC notify CMQC that the ROR-as-CMQC option will be exercised for STS 108, S6444 run 3.

50-1

ET  
01

12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

50-2

CTC	TBC	232
TBC	CTIF	136

Perform OTV and ice/frost monitoring area setups.

ETM R. Seale Date 12/5/01

50-3

CTIF	TBC	136
TBC	CTC	
CTC	STM	232

Verify Operation 10- Support Preparations complete.

ETM R. Seale Date 12/5/01

50-4

CTIF

Verify Operation 20 - Ice Prediction Briefing and Operation 30- Pre-launch Walkdown complete.

ETM R. Seale Date 12/5/01

ET  
01

12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

50-5

CTIF CVM1 222  
CVM1 222

Verify:

- All OTV cameras are on, tapes in recorder, and ready to commence OTV scanning, monitoring, and recording.
- Trouble tape recorder is ready.
- Ice Frost Debris Console Initial Configuration Setup complete.

ETM P. Seese Date 12/5/01

50-6

CTIF CICE 222  
CVM1  
CVM2  
CIPC  
CTIF JYVR 138  
CVM1 JTV1 223  
CVM2 JTV2 225

All personnel participating in OTV operations **report** test ready status.

ETM P. Seese Date 12/5/01

Support: COMM

ET  
01

12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

50-7

CTIF TBC 136  
TBC CTC 232

Ice Frost Console Area Setups for OTV scanning complete.  
Report readiness.

ETM R. Seale Date 12/5/01

Not Performed: N/A

50-8

CTIF CVM1 222

From start of LO<sub>2</sub> chilldown until seal deflation/GO<sub>2</sub> vent hood retraction, **monitor** the +Y/-Y GO<sub>2</sub> vent seal-to-ET interface for seal fretting and continuous GO<sub>2</sub> escape.

OMRS S00FB0.350-1

ETM R. Seale Date 12/5/01

Not Performed: N/A

ET  
01

12/5/01

50-4

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

NOTE

GO<sub>2</sub> vent seal fretting could induce damage to ET SOFI. Continuous GO<sub>2</sub> venting could result in formation of ice in the no ice zone (ref NSTS 16007). Ultimate decision to lift the vent hood rests with CMEC.

50-9

CTIF TBC 136  
CMEC

If +Y/-Y GO<sub>2</sub> vent seal fretting or continuous GO<sub>2</sub> escape detected from start of LO<sub>2</sub> chilldown until seal deflation, **notify** CMEC for GO<sub>2</sub> vent hood removal.

ETM N/A Date N/A

Not Performed:   
12/5/01

50-10

CTIF CIPC 222

**Monitor** wind speed and direction from start of LO<sub>2</sub>/LH<sub>2</sub> chill down through launch/scrub. CIPC **notify** CTIF if winds measured at 38 knots or greater from North +/-30 degrees as measured at 60 feet.

ETM P. Seaco Date 12/5/01

Not Performed: N/A

50-5

  
12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

**NOTE**

Excessive vapors are defined as being more severe than those described in NSTS 08303 (LI) NSTS Program Ice/Debris Inspection Criteria or NSTS 16007 (LI) NSTS Program Launch Commit Criteria - Hazardous Gas Subsystem.

50-11

CTIF CVM1 222  
CVM2

From start of LO<sub>2</sub>/LH<sub>2</sub> loading until Prepressurization  
(LO<sub>2</sub> at T-2M55s and LH<sub>2</sub> at T-1M57s):

1. **Monitor** following ET-Orbiter MPS areas for leakage:
  - LO<sub>2</sub> Feedline (portion external to the Intertank)
  - LH<sub>2</sub> Feedline
  - LH<sub>2</sub> Recirculation Line
  - LH<sub>2</sub> Aft Dome Manhole Cover(s)
  - ET-Orbiter LO<sub>2</sub>/LH<sub>2</sub> Umbilical Disconnects
  - LH<sub>2</sub> T-0 Umbilical
  - LO<sub>2</sub> T-0 Umbilical
  
2. **Verify** no visible cryogenic liquid or excessive vapors.

OMRS S00FB0.360-1

ETM P. Seale Date 12/5/01

Not Performed: N/A

ET  
01

12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

50-12

CTIF CVM1 222  
CVM2

**Monitor** and **videotape** following ET TPS surface areas and GO<sub>2</sub> Vent Area during LO<sub>2</sub>/LH<sub>2</sub> loading through Prepressurization (LO<sub>2</sub> at T-2M55s and LH<sub>2</sub> at T-1M57s):

- LH<sub>2</sub> Aft Dome
- LH<sub>2</sub> Barrel
- Intertank (external)
- LO<sub>2</sub> Tank
- GO<sub>2</sub> Vent Area
- Protuberances

OMRS S00FB0.005-1

ETM P. Seale Date 12/5/01

Not Performed: N/A

50-13

CTIF CVM1 222

**Perform** Operation 60 - Group 1 Monitoring.

ETM P. Seale Date 12/5/01

Not Performed: N/A

50-7

ET  
01

12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

50-14

CTIF CVM2 222

Perform Operation 70 - Group 2 Monitoring.

ETM R. Seave Date 12/5/01

Not Performed: N/A

50-15

CTIF CVM2 222

Once per hour minimum, after start of LO<sub>2</sub>/LH<sub>2</sub> (until LO<sub>2</sub>/LH<sub>2</sub> low level sensors read dry), scan LO<sub>2</sub> feed line brackets and flange closeouts per Table 50-1.

ETM R. Seave Date 12/5/01

Not Performed: N/A

ET  
01

12/5/01

09-01-2001  
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OMI S6444 J02  
APPROVED

50-16

CTIF CICE 222

As count proceeds, for concerns/ observations identified:

1. **Record** observation/concern on trouble tape per Table 50-1.
2. **Document** observed condition on Table 50-2, Observation Worksheet.

ETM R. Seena Date 12/5/01

Not Performed: N/A

50-17

TBC CTIF 136  
CTIF CICE 222

**Perform** Operation 80 - Final Inspection when called by  
S0007/S0014/S0037.

ETM R. Seena Date 12/5/01

Not Performed: N/A

09-01-2001  
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OMI S6444 J02  
APPROVED

**NOTE**  
Final SSV scan typically commences at L-2 hours.

50-18

CTIF CVM1 222  
CVM2

Perform final SSV scan.

ETM R. Seale Date 12/5/01

Not Performed: N/A

50-19

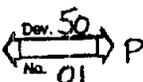
CTIF CVM1 222  
CVM2

At start of T-9 minute hold, **configure** OTV cameras for terminal count.

ETM R. Seale Date 12/5/01

Not Performed: N/A

WC  
150  
USA



WC  
150  
USA

DEC 5 '01

DEC 5 '01

**NOTE**  
Ref: NSTS 16007 (LI) NSTS Program Launch Commit Criteria - Hazardous Gas Subsystem Appendix F - Ice Launch Commit Criteria defines "No-Go Conditions".

50-19-1 CICE CTIF 222

Verify there are no Ice Launch Commit Criteria "No-Go Conditions" being violated.

ETM: R. Seale Date 12/5/01

50-10

ET  
01

12/5/01

50-20

If winds are from the north (+/-30 degrees) and are 38 knots (peak as measured at 60 feet above ground) or greater:

1. **Monitor/videotape** nose cone area during high winds.
2. **Verify:**
  - A. No ice formation on the +Y and -Y GO<sub>2</sub> vent seal footprint areas.
  - B. No damage to the ET TPS at the +Y and -Y GO<sub>2</sub> vent seal footprint areas.
  - C. No damage to the +Y and -Y GO<sub>2</sub> vent seals themselves.
  - D. No evidence of GO<sub>2</sub> leakage from +Y/-Y GO<sub>2</sub> vent seals to ET interface.

OMRSD S00L00.150

ETM N/A Date N/A

Not Performed:

12/5/01

50-21

CTIF

Verify launch or launch scrub (drain back). Record data.

Launch  Scrub N/A

Date 12/5/01 Time 22:19 GMT

Scrub at T- N/A

ETM R. Seal Date 12/5/01

50-11

ET 01

12/5/01

09-01-2001  
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OMI S6444 J02  
APPROVED

50-22

CTIF

ET-Orbiter MPS monitoring for leakage and ET TPS Surface Areas and GO<sub>2</sub> Vent Area monitoring/recording for launch complete.

OMRSD S00FB0.005-1  
OMRSD S00FB0.360-1

ETM P. Sala Date 12/5/01

Not Performed: N/A

**NOTE**

When completely filled and drain is initiated, it takes approximately 1 hour until the LH<sub>2</sub> tank low level sensors read dry, and approximately 1.5 hours until the LO<sub>2</sub> tank low level sensors read dry.

50-23

CTIF CVM1 222  
CVM2

If launch scrubbed (or drain back declared) after start of LO<sub>2</sub>/LH<sub>2</sub> slow fill mode:

- **Perform** Operation 90 - LO<sub>2</sub>/LH<sub>2</sub> Drain Monitoring.
- **Record** observations/concerns on trouble tape per Table 50-1.
- **Document** all observations/concerns on Table 50-2 Observation Worksheet.

ETM N/A Date N/A

Not Performed: ET 01

12/5/01

ET 01  
12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

50-24 CTIF

GO<sub>2</sub> Vent seal to ET interface monitoring for seal fretting and continuous  
GO<sub>2</sub> escape complete.

OMRSD S00FB0.350-1 <sup>5/0</sup> <sub>1/0</sub> <sub>1/0</sub>

ETM P. Seale Date 12/5/01

Not Performed: N/A

50-25

CTIF CVM1 222  
CVM2

Terminate scanning operations.

ETM P. Seale Date 12/5/01

50-26

CTIF CVM1 222  
CVM2

Perform Operation 100 - Console Securing.

ETM P. Seale Date 12/5/01

50-27

CTIF

If LO<sub>2</sub>/LH<sub>2</sub> tanking started, perform Operation 110 - Summary  
Tape.

ETM P. Seale Date 12/5/01

Not Performed: N/A

50-13

ET  
01

12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

**NOTE**

Following step may be not performed at CTIF discretion.

50-28      CTIF      TBC      136  
             TBC      STM

If Post Drain Walkdown to occur at night, **request** PAD xenon lighting be maintained/activated for duration of walkdown.

Not Performed:

ET  
01

12/5/01

**NOTE**

Post drain walkdown typically commences approximately 1.5 hours after LH<sub>2</sub>/LO<sub>2</sub> low level sensors read dry.

50-29

**CTIF**

If launch scrubbed after start of LO<sub>2</sub>/LH<sub>2</sub> tanking, **perform** Operation 120 - Post-Drain Walkdown.

ETM N/A Date N/A

Not Performed:

ET  
01

12/5/01

50-30

**CTIF**

If launch occurred, **perform** Operation 130 - Post launch Walkdown.

ETM D. Seave Date 12/6/01

Not Performed: N/A

ET  
01

12/6/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

50-31

CTIF

If launch occurred, perform Operation 140 - Film Review.

ETM

D. Seale

Date

1/11/02

Not Performed: N/A

50-32

SSV Debris Assessment complete.

50-15

ET  
01

1/11/02

Table 50-1 Observation Documentation Procedure

1. CTIF CVM1 222 Locate anomaly/concern on pertinent OTV(s)  
CVM2
2. CTIF Punch-up pertinent OTV on trouble monitor.  
Update trouble tape log in table below.
3. CTIF Start the trouble tape.

**NOTE**

Trouble tape shall be allowed to run until sufficient OTV documentation of observation/concern has been made. OK to change OTV's while trouble tape is running.

4. CTIF After observation/concern has been documented on the trouble tape, stop the trouble tape. Update trouble tape log below.

**TROUBLE TAPE LOG**

Trouble Tape No.	Start Time (GMT)	Stop Time (GMT)	OTV	Description
#	13:23	13:25	154	LOZ F/L SCAN
	14:14	14:16	154	LOZ F/L SCAN
	14:18	14:19	163	FROST SPOT, -Y LONGERON/ THRUST STRUT
	15:11	15:13	154	LOZ F/L SCAN
	15:14	15:16	154	FROST SPOT, +Y THRUST STRUT KNUCKLE
	16:14	16:16	154	LOZ F/L SCAN
	16:51	17:00	104	VAPORS BELOW GUCD
	17:15	17:20	154	LOZ F/L SCAN AND +Y LONGERON FROST
	17:40	17:41	104	OXA SEAL STRAPS (N/SIDE)
↓	18:20	18:22	154	LOZ F/L SCAN AND +Y LONGERON

**TROUBLE TAPE LOG**

ET  
01  
12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

Table 50-1 Observation Documentation Procedure

Trouble Tape No.	Start Time (GMT)	Stop Time (GMT)	OTV	Description
# 1	19:15	19:19	154	LOZ F/L SCAN AND +Y LONGERON
	20:06	20:06	163	-Y VERT STRUT CRACK
	20:16	20:17	154	POST +Y THRUST STRUT CRACKS
	20:18	20:19	154	LOZ F/L SCAN
	21:16	21:18	154	LOZ F/L SCAN
	21:53	21:54	154	LOZ F/L SCAN
	22:15		164	ORB ELEVON MOVEMENT
	(CONTINUED)		170	GAME GIMBAL
			168/169	SOX SEAL DEFLATION
			170/187	LAUNCH VIEWS
			179	LAUNCH VIEWS
	22:28	22:31	103	SPARKS EMANATING FROM ELEV BOX, FSS 215' LVL

\*\*\* End of Table 50-1 Observation Documentation Procedure \*\*\*

ET  
01

12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. 1

Observed By: SEALE

Date 12/5/01 Time 1100 - 1517 GMT 1600 - 20:17

Camera No. (or Walkdown) 154

Description:

POST FORMATION ON FWD SIDE OF T/J THRUST  
SRJT - LONGERON KNUCKLE CLOSEOUT. APPROX  
1" DIA.

Acceptance Rationale (or IPR/PR No.):

ACCEPTABLE PER NRTS 08303, REF PHOTO  
7.2.8

CICE [Signature] Date 12/5/01  
CTIF [Signature] Date 12/5/01

D. Seale EIR 12/5/01

ET  
01  
12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. 2

Observed By: FINAL INSPECTION TEAM

Date 12/5/01 Time 1200 GMT 1700

Camera No. (or Walkdown) FET / 163

Description:

TWO SMALL PATCHES (APPROX 1/4" DIA EACH) OF  
FROST ON -1/ PIPED JACK PAD C/O (ABOUT  
CUTOUT #2). OBSERVED DURING FINAL INSPECTION.  
NO LONGER PRESENT AT 20:00 GMT

Acceptance Rationale (or IPR/PR No.):

(DOCUMENTATION ONLY)  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CICE [Signature] PH-HZ Date 12/5/01

CTIF [Signature] Date 12/5/01

ET  
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12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. \_\_\_\_\_

Observed By: \_\_\_\_\_

Date \_\_\_\_\_ Time \_\_\_\_\_ GMT \_\_\_\_\_

Camera No. (or Walkdown) \_\_\_\_\_

Description:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Acceptance Rationale (or IPR/PR No.):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CICE \_\_\_\_\_ Date \_\_\_\_\_

CTIF \_\_\_\_\_ Date \_\_\_\_\_

ET  
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12/5/01

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. \_\_\_\_\_

Observed By: \_\_\_\_\_

Date \_\_\_\_\_ Time \_\_\_\_\_ GMT \_\_\_\_\_

Camera No. (or Walkdown) \_\_\_\_\_

Description:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Acceptance Rationale (or IPR/PR No.):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CICE \_\_\_\_\_ Date \_\_\_\_\_

CTIF \_\_\_\_\_ Date \_\_\_\_\_

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. \_\_\_\_\_

Observed By: \_\_\_\_\_

Date \_\_\_\_\_ Time \_\_\_\_\_ GMT \_\_\_\_\_

Camera No. (or Walkdown) \_\_\_\_\_

Description:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Acceptance Rationale (or IPR/PR No.):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CICE \_\_\_\_\_ Date \_\_\_\_\_

CTIF \_\_\_\_\_ Date \_\_\_\_\_

ET  
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12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. \_\_\_\_\_

Observed By: \_\_\_\_\_

Date \_\_\_\_\_ Time \_\_\_\_\_ GMT \_\_\_\_\_

Camera No. (or Walkdown) \_\_\_\_\_

Description:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Acceptance Rationale (or IPR/PR No.):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CICE \_\_\_\_\_ Date \_\_\_\_\_

CTIF \_\_\_\_\_ Date \_\_\_\_\_

ET  
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12/31/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

**Table 50-2 Observation Worksheet**

**OBSERVATION DOCUMENTATION**

**Record following information for condition observed:**

Observation No. \_\_\_\_\_

Observed By: \_\_\_\_\_

Date \_\_\_\_\_ Time \_\_\_\_\_ GMT \_\_\_\_\_

Camera No. (or Walkdown) \_\_\_\_\_

Description:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Acceptance Rationale (or IPR/PR No.):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CICE \_\_\_\_\_ Date \_\_\_\_\_

CTIF \_\_\_\_\_ Date \_\_\_\_\_

ET  
01

12/5/01

**Table 50-2 Observation Worksheet**

**OBSERVATION DOCUMENTATION**

**Record following information for condition observed:**

Observation No. \_\_\_\_\_

Observed By: \_\_\_\_\_

Date \_\_\_\_\_ Time \_\_\_\_\_ GMT \_\_\_\_\_

Camera No. (or Walkdown) \_\_\_\_\_

Description:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Acceptance Rationale (or IPR/PR No.):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CICE \_\_\_\_\_ Date \_\_\_\_\_

CTIF \_\_\_\_\_ Date \_\_\_\_\_

**\*\*\* End of Table 50-2 Observation Worksheet \*\*\***

**\*\*\* End of Operation 50 \*\*\***

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### OPERATION 60 Group 1 Monitoring LO<sub>2</sub> Chill Down Thru T-0

Shop: SE  
Cntrl Rm Console: FR2  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 15.0

#### NOTE

Do not perform this operation if launch scrub declared before LO<sub>2</sub> Chill Down commences.

Operation Not Performed: N/A

#### NOTE

This operation monitors LO<sub>2</sub> Ogive and Barrel and associated components/ areas from start of Chill Down through T-0 via OTV cameras 013/113, 060/160, 061/161, 062/162, 063/163 and 064/164.

OTV cameras 013/113 and/or 062/162 will view -Y GO<sub>2</sub> Vent Hood Seal at all times. At no time will both cameras be positioned away from the -Y GO<sub>2</sub> Vent Hood Seal.

OTV cameras 068/168 and 069/169 view SW and NE GO<sub>2</sub> Vent Areas respectively. These are fixed FOV cameras and do not have pan, tilt, etc. capability.

Steps in this operation are contingent upon progression of launch countdown operations and may be not performed if countdown is terminated.

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### LO<sub>2</sub> Chill Down To L-2 Hour Mark

60-1 CVM1 JYVR 138

At start of vehicle LO<sub>2</sub> Chill Down, start recorders for cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169.

ETM P. Sule Date 12/5/01

Support: COMM

60-2 Record LO<sub>2</sub> MPS Chill Down start date and time (GMT).

LO<sub>2</sub> MPS Chill Down Date 12/5/01 GMT Time 12:46 GMT

ETM P. Sule Date 12/5/01

60-3 CVM1 JTV1 223

From start of LO<sub>2</sub> Chill Down until start of LO<sub>2</sub> Fast Fill on OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169 **monitor/videotape** ET-TPS surfaces. No cryogenic liquid or excessive vapors allowed.

ETM P. Sule Date 12/5/01

Support: COMM

Not Performed: N/A

ET  
01

12/5/01

60-2

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

60-4 Record LO<sub>2</sub> Slow Fill start date and time (GMT).

\* LO<sub>2</sub> HAD  
FW BENEFIT.  
2ND SLOW FILL  
AT 13:58.  
A. Seave ETM  
12/5/01

LO<sub>2</sub> Slow Fill Date 12/5/01 GMT Time 13:22 GMT \*

ETM R Seave Date 12/5/01

Not Performed: N/A

60-5 Record LO<sub>2</sub> Fast Fill start date and time (GMT).

LO<sub>2</sub> Fast Fill Date 12/5/01 GMT Time 14:11 GMT

ETM R Seave Date 12/5/01

Not Performed: N/A

60-6 CVM1 JTV1 223

From start of LO<sub>2</sub> Fast Fill until LO<sub>2</sub> stable replenish mode is established, **monitor/videotape** ET-TPS surfaces on OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169. **Scan** LO<sub>2</sub> Tank. **Alternate** cameras and **scan** from Intertank to LO<sub>2</sub> Barrel Splice to GO<sub>2</sub> Vent Hood. No cryogenic liquid or excessive vapors allowed.

ETM R Brewer Date 12/05/01

Support: COMM

Not Performed: N/A

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

60-7 Record LO<sub>2</sub> Topping date and time (GMT).

LO<sub>2</sub> Topping Date 12/05/01 GMT Time 16:10 GMT

ETM R Brewer Date 12/05/01

Not Performed: N/A

60-8 Record LO<sub>2</sub> Stable Replenish mode start date and time (GMT).

LO<sub>2</sub> Stable Replenish Date 12/05/01 GMT Time 16:15 GMT

ETM R Brewer Date 12/05/01

Not Performed: N/A

60-9 CVM1 JTV1 223

From time LO<sub>2</sub> Stable Replenish mode is established until time for final SSV scan (approximately L-2 hours), **monitor, scan and videotape** ET-TPS surfaces on OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169. No cryogenic liquid or excessive vapors allowed.

ETM R Brewer Date 12-05-01

Support: COMM

Not Performed: N/A

12-05-01  
ET  
05

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### Final SSV Inspection Scan

**NOTE**

Final SSV Inspection Scan should begin not later than 1.5 hours prior to start of T-9 minute hold (approximately L-2 hours) to allow ample time to finish. Final SSV Inspection Scan shall include the ET, SRB's and the Orbiter.

Final scan may be altered or partially performed in the event that time constraints will not permit a complete SSV scan prior to start of T-9 minute hold.

During Final SSV Inspection Scan the camera lights on OTV cameras 061/161 and 062/162 shall be turned "Off" when view passes over the Orbiter cockpit to preclude "distracting" the Flight Crew.

60-10 CVM1 JTV1 223

**Perform** Final SSV Inspection Scan with OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163 and 064/164. Scan passes shall view entire SSV with cameras at approximate full zoom in during final scan.

ETM *[Signature]* Date 12/5/01  
W. P. RICHMONDS II

Not Performed: N/A

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### Terminal Count Camera Positions

#### NOTE

This step performed for SSME ignition only and may be not performed if launch is scrubbed prior to pick-up of T-9 minute count. Cameras must be positioned for ignition no later than T-9 minutes. "Spot" scanning after pick-up of the T-9 minute count is acceptable with CICE concurrence.

Cameras may be positioned for SSME ignition in an arbitrary order.

Camera positions may be altered real-time with CICE concurrence. Alterations should be determined prior to pick-up of T-9 minute count to allow sufficient time for OTV operators to rehearse camera movements.

CVM1 camera positions for SSME ignition are defined in Table 60-1.

60-11 CVM1 JTV1 223

Ref Table 60-1, **position** cameras 004/104, 013/113, 042/142, 054/154, 060/160, 062/162 for terminal count.

Support: COMM

ETM R. Scale Date 12/5/01

Not Performed: N/A

60-12 Operation - Group 1 Monitoring - LO<sub>2</sub> Chill Down Thru T-0 complete.

ET  
01

12/5/01

**Table 60-1 CVM1 Camera Positions for Terminal Count**

**NOTE**

This Table defines CVM1 camera positions for terminal countdown. Cameras should be positioned for ignition no later than pick-up of T-9 minutes count. "Spot" scanning after pick-up of the T-9 minute count is acceptable with CICE concurrence.

Cameras may be positioned for SSME ignition non-sequentially.

Camera positions may be altered real-time with CICE concurrence. Alterations should be determined prior to pick-up of T-9 minute count to allow sufficient time for operators to rehearse camera movements with ice console.

The GO<sub>2</sub> Vent Arm (GVA) retracts at T-2m30s.

**CVM1 Camera Positions Are Defined As Follows:**

**004/104**

GUCP centered in frame so that GUCP will stay in view throughout SRB "twang".

**042/142**

At approximately T-1 hour, view and monitor Orbiter access arm while Orbiter hatch is being closed.

At **T-7m30s**, watch Orbiter access arm retract, then view bipod strut in center of frame, LO<sub>2</sub> feedline fairing in top of frame, and Orbiter hatch in right of frame.

**054/154**

At **T-3m50s**, view Orbiter right hand body flap movement, then zoom out with Orbiter/ET umbilicals at approximate frame center, Orbiter trailing edge at frame bottom, and edge of +Y (RH) SRB just in view at frame right.

**Table 60-1 CVM1 Camera Positions for Terminal Count**

**013/113**

At T-2m30s, watch lift of GO<sub>2</sub> vent arm for debris and nose cone/vent louvers for ice damage. Immediately following lift of GO<sub>2</sub> vent arm, center frame on GO<sub>2</sub> vent louver and then zoom-out so that entire ET movement is seen during SRB 'twang' at SSME ignition.

**060/160**

At approximately T-2m30s, after GO<sub>2</sub> vent arm retracts, go full zoom in for a close-up inspection of the GO<sub>2</sub> vent louver. After CICE concurrence, go full zoom out and position camera with SSV centered and ET nose cone at frame top.

**062/162**

At approximately T-2m30s, after GO<sub>2</sub> vent arm retracts, go full zoom in for a close-up inspection of the -Y GO<sub>2</sub> vent louver. After CICE concurrence, zoom out until ET nose spike is at top of frame with ET centered.

**061/161**

At approximately T-4m00s, verify camera lights are off. Then position camera to view astronaut closing visor at T-2 minutes 00 seconds.

**068/168 and 069/169**

Immediately after GO<sub>2</sub> vent hood lift, turn lights off to preclude distracting orbiter crew when the GVA rotates to its latchback position.

**\*\*\* End of Table 60-1 Camera Positions for Terminal Count \*\*\***

**\*\*\* End of Operation 60 \*\*\***

ET  
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12/5/81

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

**OPERATION 70 Group 2 Monitoring - LH<sub>2</sub> Chill Down Thru T-0**

Shop: SE  
Cntrl Rm Console: FR2  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 15.0

**NOTE**

Do not perform this operation if launch scrub declared before start of LH<sub>2</sub> Chill Down.

Operation Not Performed: N/A

**NOTE**

This operation monitors LH<sub>2</sub> Barrel and associated components/areas start of LH<sub>2</sub> Chill Down to pre-pressurization via OTV cameras 009/109, 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167.

Steps in this operation are contingent upon progression of launch countdown operations and may be not performed if countdown is terminated.



12/15/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### LH<sub>2</sub> Chill Down To L-2 Hour Mark

70-1 CVM2 JYVR 138

At start of LH<sub>2</sub> Chill Down, start recorders for cameras 009/109, 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167.

ETM R. Seale Date 12/5/01

Support: COMM

70-2 Record LH<sub>2</sub> Chill Down start date and time (GMT).

LH<sub>2</sub> Chill Down Date 12/5/01 Time 12:45 GMT

ETM R. Seale Date 12/5/01

70-3 CVM2 JTV2 225

From start of propellant loading until start of LH<sub>2</sub> Fast Fill on OTV cameras 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167, **monitor/videotape** ET-TPS surfaces. No cryogenic liquid or excessive vapors allowed.

ETM R. Seale Date 12/5/01

Support: COMM

Not Performed: N/A

MC  
120  
AZ

ET  
01  
12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

70-4 Record LH<sub>2</sub> Slow Fill start date and time (GMT).

LH<sub>2</sub> Slow Fill Date 12/5/01 Time 12:55  
~~12:38~~ GMT

ETM R. Seco Date 12/5/01

Not Performed: N/A

70-5 Record LH<sub>2</sub> Fast Fill start date and time (GMT).

LH<sub>2</sub> Fast Fill Date 12/5/01 Time 13:38 GMT

ETM R. Seco Date 12/5/01

Not Performed: N/A

70-6 CVM2 JTV2 225

From start of LH<sub>2</sub> Fast Fill until stable replenish mode is established, scan LH<sub>2</sub> Tank. Alternate OTV cameras 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167 and scan/videotape from LH<sub>2</sub> Aft Dome to Intertank.

ETM R. Brewer Date 12-05-01

Support: COMM

Not Performed: N/A

70-3

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

70-7

Record start date and time (GMT) for LH<sub>2</sub> Topping.

LH<sub>2</sub> Topping Date 12-05-01 Time 14:50 GMT

ETM R Brewer Date 12-05-01

Not Performed: N/A

70-8 Record LH<sub>2</sub> Stable Replenish mode start date and time (GMT).

LH<sub>2</sub> Stable Replenish Date 12-05-01 Time 15:34 GMT

ETM R Brewer Date 12-05-01

Not Performed: N/A

70-9 CVM2 JTV2 225

During LH<sub>2</sub> Stable Replenish mode and until time for final scan (approximately L-1.5 hours), on OTV cameras 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167, **monitor/videotape** ET TPS surfaces including LO<sub>2</sub> Feed Line, LH<sub>2</sub> Feed Line, LH<sub>2</sub> Recirculation Line, LH<sub>2</sub> Aft Dome and manhole covers, LH<sub>2</sub>/LO<sub>2</sub> Umbilicals, and TSM LH<sub>2</sub>/LO<sub>2</sub> Umbilicals. No cryogenic liquid or excessive vapors allowed.

ETM D. Seub Date 12/5/01

Support: COMM

Not Performed: N/A

ET  
01

12/5/01

70-4

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### Final SSV Inspection Scan

#### NOTE

Final SSV Inspection Scan should begin not later than 1.5 hours prior to start of T-9 minute hold (approximately L-2 hours) to allow ample time to finish. Final SSV Inspection Scan shall include the ET, SRB's and the Orbiter.

Final SSV Inspection Scan may be altered or partially performed in the event that time constraints will not permit a complete SSV scan prior to start of T-9 minute hold.

70-10 CVM2 JTV2 225

**Perform** Final SSV Inspection Scan with OTV cameras 009/109, 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 064/164. Scan passes shall view entire SSV with cameras at full zoom in during final scan.

ETM Tom Ford Date 12/5/01

Support: COMM

Not Performed: N/A

ET  
01

12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### T-9 Minute Terminal Count

**NOTE**

Next step performed for terminal count only and may be not performed if launch is scrubbed prior to pick-up of T-9 minute terminal count. Cameras must be positioned for SSME ignition no later than T-9 minutes. 'Spot' scanning after pick-up of the T-9 minute terminal count is acceptable with CICE concurrence.

Cameras may be positioned for SSME ignition in an arbitrary order.

Camera positions may be altered real-time with CICE concurrence. Alterations should be determined prior to pick-up of T-9 minute count to allow sufficient time for OTV operators to rehearse camera movements.

CVM2 camera positions for terminal count are defined in Table 70-1.

70-11 CVM2 JTV2 225

Ref Table 70-1, **position** cameras 009/109, 033/133, 056/156, 065/165, 066/166 061/161, 070/170, 071/171 and 067/167 for terminal count.

Support: COMM

ETM R. Seave Date 12/5/01

Not Performed: N/A

70-12 Operation - Group 2 Monitoring - LH<sub>2</sub> Chill Down Thru T-0 complete.

ET  
01  
12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

**Table 70-1 - CVM2 Camera Positions for Terminal Count**

**NOTE**

This Table defines CVM2 camera positions for terminal countdown. Cameras should be positioned for ignition no later than pick-up of T-9 minutes count. "Spot" scanning after pick-up of the T-9 minute count is acceptable with CICE concurrence.

The Orbiter access arm (OAA) retracts at T-7M30S. Orbiter body flap movement occurs at T-3m50s.

Cameras may be positioned for SSME ignition non-sequentially

Camera positions may be altered real-time with CICE concurrence. Alterations should be determined prior to pick-up of T-9 minute count to allow sufficient time for operators to rehearse camera movements with ice console.

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

**Group 2 Camera Positions Are Defined As Follows:**

**033/133**

Full zoom out. LO<sub>2</sub> feed line in frame center and MLP deck at bottom.

**055/155**

View ET aft dome with MLP deck just out of view at bottom, ET XT-2058 ring frame at frame top and both SRB's just in view at sides.

**056/156**

View ET aft dome with MLP deck just out of view at bottom. ET XT-2058 ring frame at frame top and both SRB's just in view at sides.

**065/165**

Full zoom out. SSV centered. MLP deck edge just in view at bottom.

**066/166**

ET centered. Intertank to LO<sub>2</sub> Barrel splice at frame top with the majority of Orbiter wing in view.

**067/167**

Center on GUCP for optimum view.

**070/170 and 071/171**

At **T-9m00s**, zoom in on space shuttle main engine with camera providing best view. Zoom out on SSME for wide angle view with other camera.

**009/109**

At approximately **T-3m50s**, position to view Orbiter body flap and elevons movement. Afterwards, center on LH<sub>2</sub> umbilical with -Y vertical strut at frame top.

**061/161**

At approximately **T-1m30s**, tilt-up to GO<sub>2</sub> Vent Footprint. Zoom in. Pause. If footprint is acceptable, zoom out and tilt down to view Orbiter nose/cockpit through liftoff.

**\*\*\* End of Table 70-1 - CVM2 Camera Positions for Terminal Count \*\*\***

\*\*\* End of Operation 70 \*\*\*

ET  
01  
12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### OPERATION 80 Final Inspection

Shop: SE  
Cntrl Rm Console: FR2  
OPR: ETM  
Zone: PAD A/B  
Hazard (Y/N): Y  
Duration (Hrs): 3.0

#### NOTE

Final Inspection may not need to be performed depending on LO<sub>2</sub>/LH<sub>2</sub> tanking and launch countdown, as determined by CTC/TTL.

Final Inspection Team stay time guidelines for each level are given in Table 80-1. These guidelines are for reference only and may be deviated from at PICE discretion.

Operation Not Performed: N/A

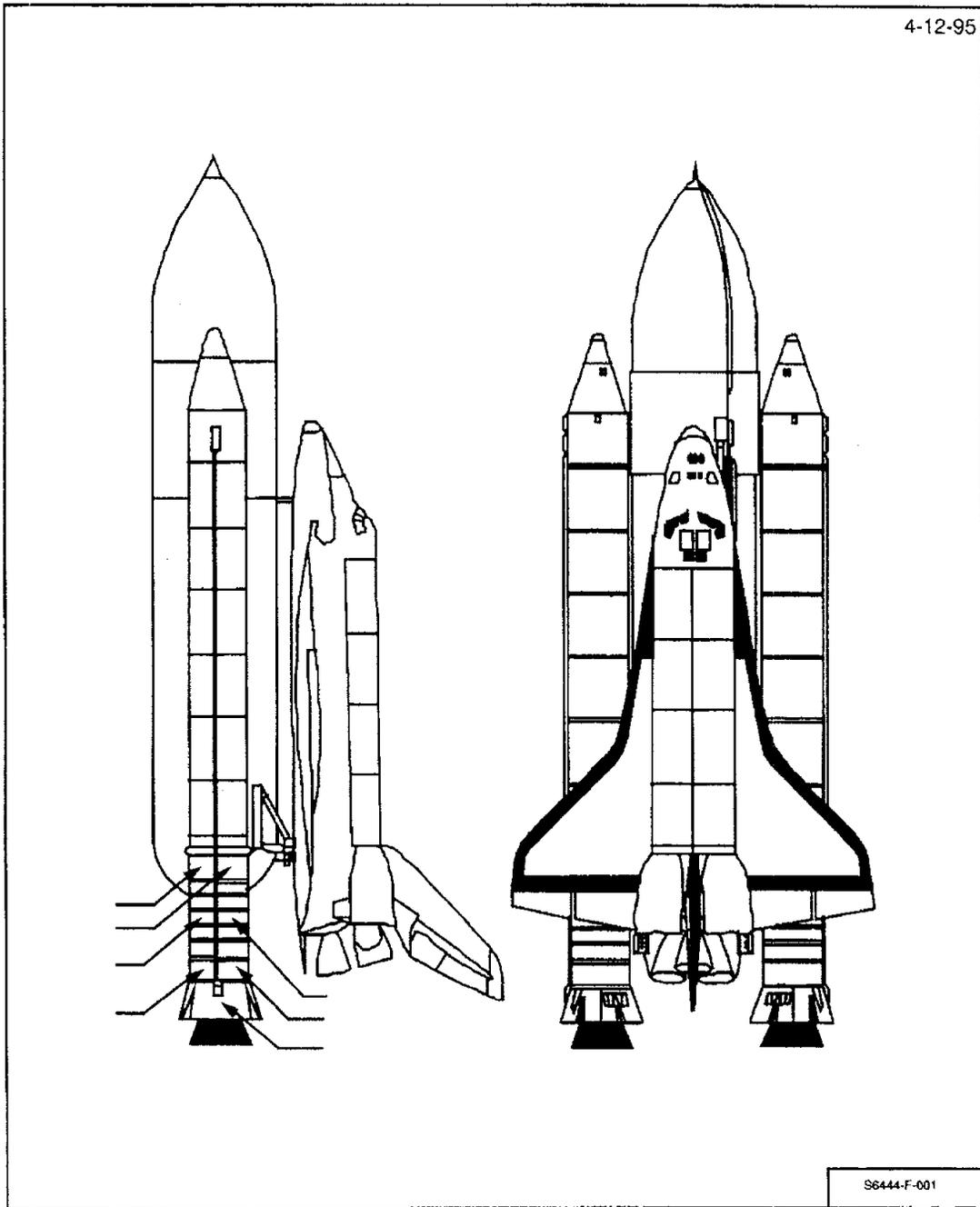


Figure 80-1: Deck (0) Level  
(For Reference Only)

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12/5/9

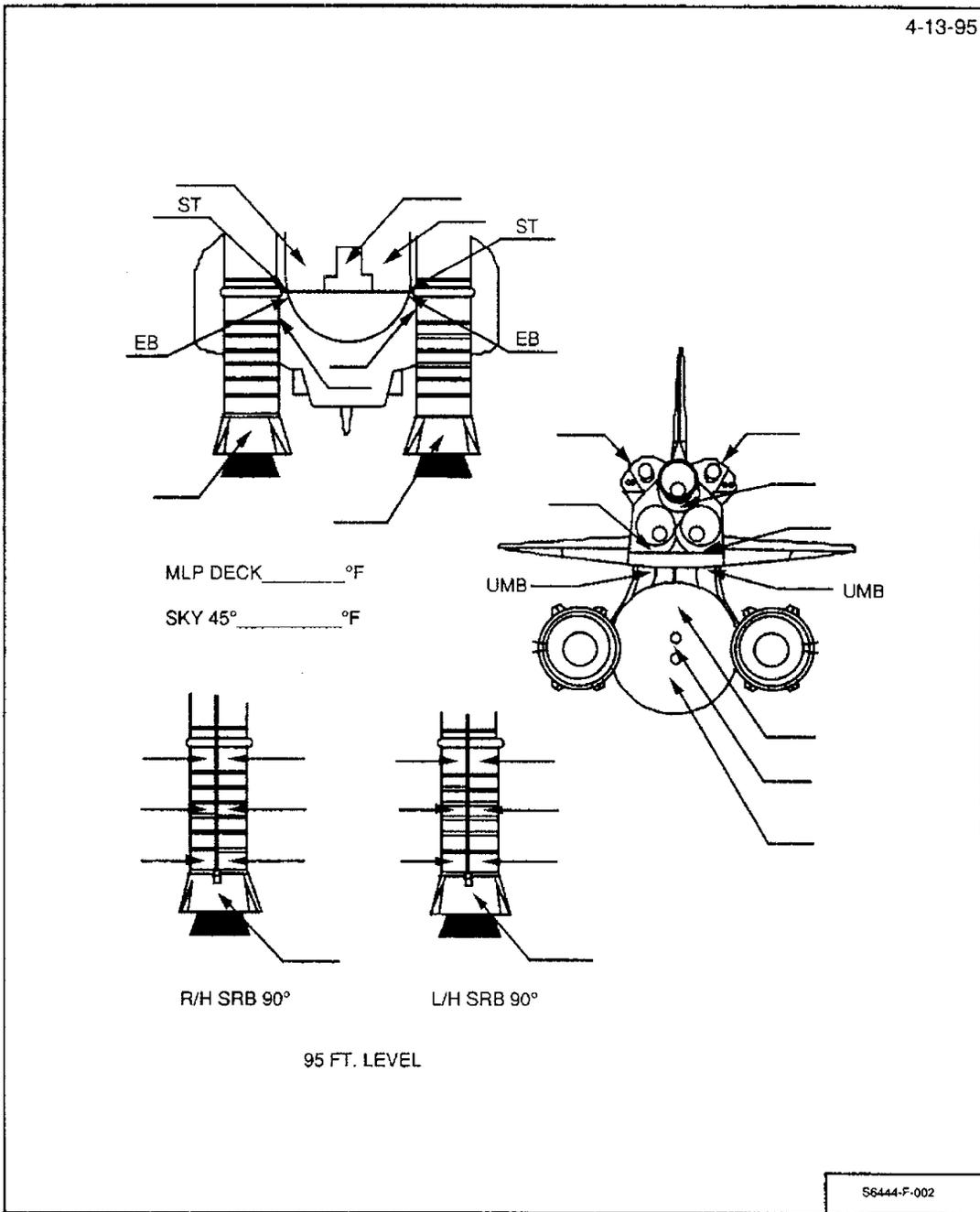
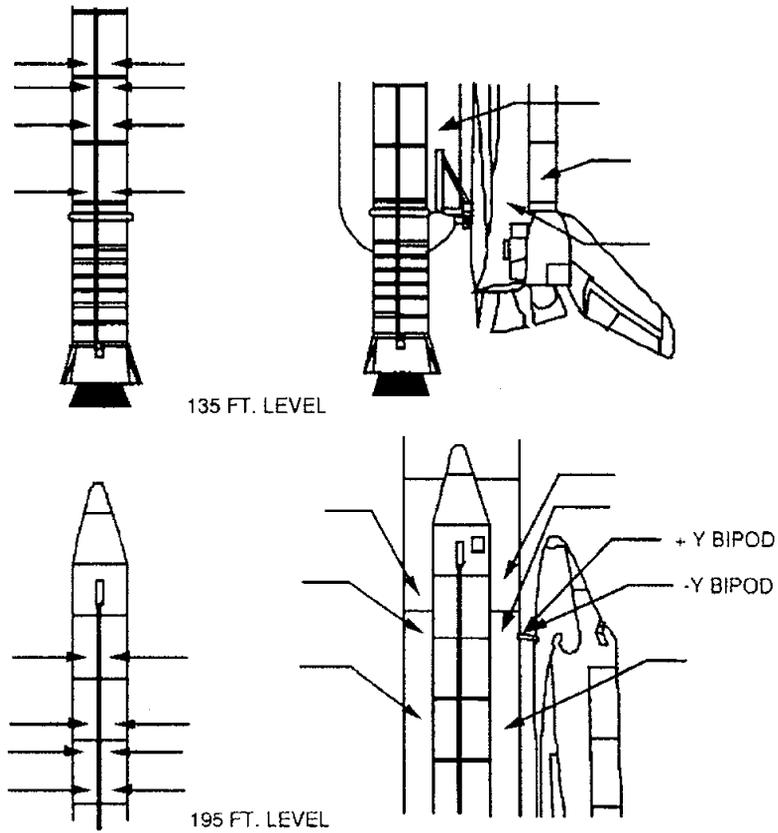


Figure 80-2: Deck (0) and 95 Ft Levels  
(For Reference Only)

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12/3/01

4-12-95



S6444-F-003

Figure 80-3: 135 and 195 Ft Levels  
(For Reference Only)

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12/5/01

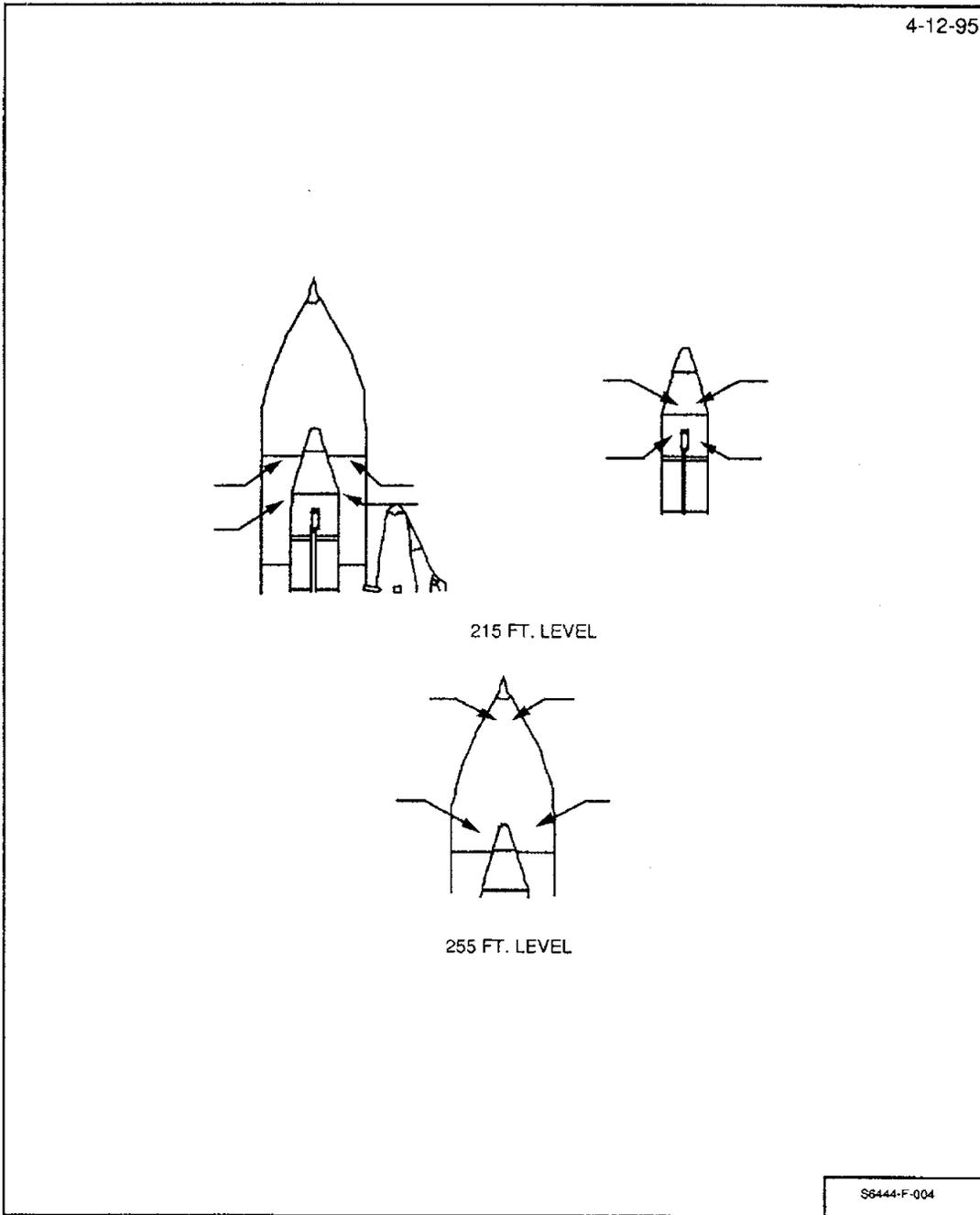


Figure 80-4: 215 and 255 Ft Levels  
(For Reference Only)

12/5/01

**WARNING**

Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

**WARNING**

Personnel performing final inspection shall be attired in **Nomex coveralls with gloves and hoods**. Personnel shall have available gloves, hoods, and ELSA at all times during walkdown.

Personnel using Sony DKC-ID1 camera shall verify lithium ion battery is securely locked in bayonet connector and the lithium button battery door is locked and taped in place. Personnel shall ensure the flash is not activated on the camera.

Personnel using Kodak DC-50/120 shall verify alkaline batteries are properly installed and the flash is not active on the camera.

Personnel using digital cameras (Sony DKC ID1, Kodak DC-50/120 shall not use these cameras in the presence of a hydrogen leak or an oxygen enriched atmosphere (readings greater than 23 percent O<sub>2</sub>).

**NOTE**

Task Team Leader (TTL) for final inspection is PH-H. Additional personnel (listed below) may be added to the final inspection team with CTC, Launch Director, and Safety concurrence.

JSC Level II	(1)
PH-H	(2)
SFOC ETM	(1)

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80-1 Assemble following final inspection team members:

TTL - PH-H	(1)
PH-H	(1)
SFOC ETM	(2)
LMSSC LSS	(1)
SFOC Safety	(1)

80-2 Final inspection team **perform** walkdown of SSV and associated facilities as follows:

**NOTE**

Following substep may be not performed with TTL concurrence.

Tables 80-2 and 80-3 are reference only items. Images are to be taken of targets of opportunity. Images must be taken with 35 mm and digital cameras. Digital images shall be inputted into SIMS.

1. Ref Tables 80-2 and 80-3, photograph SSV points of opportunity during final inspection using 35 mm. **Record** data.

Roll No. 1

Negative No. 1-10

Work order No. E107

Sub Step Not Performed: N/A

2. Reference Tables 80-2 and 80-3, **take** digital image of SSV points of opportunity using digital camera.

Description: Final Inspection Team

3. See Figures 80-1 through 80-4, **measure and record** (deg F) SSV external surface temperatures using IR gun(s)/scanners.

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**NOTE**

The following substep references inspection areas. However, inspection shall not be limited to these areas. Inspection shall be of entire SSV and specific areas of concern as defined by the TTL, CTC, or Launch Director.

**4. Visually inspect:**

- Orbiter aft engine compartment external surfaces for condensation and ice formations.
- ET TPS surfaces which cannot be observed by the OTV system.
- Specific areas of concern as determined by the TTL, CTC, or Launch Director.

OMRSD S00U00.020-A-1

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312

OMRSD S00U00.020-C-1

OMRSD S00U00.020-D-1

**80-3** Final Inspection complete. **Verify** no constraints to continue.

TTL (PH-H) *[Signature]* Date 12/5/01

SFOC-ETM *[Signature]* Date 12/5/01

**80-4** Operation - Final Inspection complete.

ETM *[Signature]* Date 12/5/01

12/5/01

**Table 80-1 Final Inspection Team Walkdown Stay Times**

**255 Ft Level - 5 Minutes**

- LO<sub>2</sub> Ogive and Barrel acreage
- GO<sub>2</sub> Pressurization Line
- LO<sub>2</sub> Tank Cable Tray
- Visible LH SRB surfaces
- GO<sub>2</sub> Vent Ducts

**215 Ft Level - 20 Minutes**

- ET GH<sub>2</sub> 7 inch Vent Assembly
- ET acreage (between -Z and -Y axis)
- GO<sub>2</sub> vent area
- Orbiter tiles
- Visible SRB surfaces
- Inter tank-to-LO<sub>2</sub> Barrel splice

**195 Ft Level - 10 Minutes**

- LO<sub>2</sub> Feed Line
- ET/Orbiter Bipods (side and bottom view)
- -Y ET/SRB forward attachment (bottom view)
- -Y ET/SRB aft attachments (top view)
- Inter tank splice areas (LO<sub>2</sub> and LH<sub>2</sub>)
- ET acreage (between -Y and +Z axis)
- Orbiter tiles
- Visible LH SRB surfaces

**135 Ft Level - 10 Minutes**

- LH<sub>2</sub> ET/Orbiter Umbilical
- -Y ET/SRB C/T
- -Y Vertical Strut
- LO<sub>2</sub> Feed Line
- ET acreage between -Y axis and +Z axis
- ET/Orbiter attachments (top view)
- Visible LH SRB surfaces
- Orbiter aft fuselage

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**APPROVED**

**Table 80-1 Final Inspection Team Walkdown Stay Times**  
**0 Level - 30 Minutes**

- LH<sub>2</sub> Aft Dome
- ET acreage around +Z axis
- ET acreage around -Z axis
- LO<sub>2</sub> Feed Line
- LH<sub>2</sub> Feed Line
- ET/Orbiter attachments - Bottom view
- ET/Orbiter LH<sub>2</sub> and LO<sub>2</sub> Umbilicals
- T-0 LH<sub>2</sub> and LO<sub>2</sub> Umbilicals
- Space Shuttle Main Engines (SSME)
- Orbiter tiles
- ET/SRB aft attachments
- Visible SRB surfaces
- SRB ignition overpressure sound suppression water troughs

\*\*\* End of Table 80-1- Final Inspection Team Walkdown Stay Times \*\*\*

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Table 80-2 Final Inspection Team - Telephotos

TELEPHOTOS - 255 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Notes</u>
GO <sub>2</sub> Vent Ducts	Horizontal	
LO <sub>2</sub> Acreage	Vertical	

TELEPHOTOS - 215 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Notes</u>
-Y Bipod Ramp	Horizontal	From RSS
LO <sub>2</sub> P/L Ice Frost Ramps	Vertical	From RSS; Requires 3-4 shots
GO <sub>2</sub> Seal/Hood	Horizontal	From haunch & RSS
GUCP	Vertical	

TELEPHOTOS - 195 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Notes</u>
-Y Bipod Ramp & Jack PAD C/O	Horizontal	

TELEPHOTOS - 135 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Notes</u>
LH <sub>2</sub> UMB	Horizontal	
-Y Longeron	Vertical	If needed
Jack Pad Closeouts	Horizontal	
LH <sub>2</sub> Acreage	Vertical	

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Table 80-2 Final Inspection Team - Telephotos

TELEPHOTOS - MLP

<u>Photo</u>	<u>Camera Orientation</u>	<u>Notes</u>
LH <sub>2</sub> UMB	Horizontal	From West
LH <sub>2</sub> UMB	Horizontal	From NW
EB-7	Horizontal	
EB-8	Horizontal	
LH <sub>2</sub> Aft Dome	Horizontal	
Third Hard Point C/O	Vertical	
LH <sub>2</sub> Barrel	Horizontal	From North
SSV Overall	Horizontal	From North
SSV Overall	Horizontal	From East
LO <sub>2</sub> F/L Bracket & Bellows	Vertical	XT-1973
LO <sub>2</sub> F/L Bracket	Vertical	XT-1871
LO <sub>2</sub> F/L Bracket	Vertical	XT-1623
LO <sub>2</sub> F/L Bracket	Vertical	ST-1377 & XT-1129
LO <sub>2</sub> F/L Bracket & Bellows	Vertical	XT-1129 & XT-1106 from SE
LO <sub>2</sub> P/L & C/T	Vertical	From SE

600 MM PHOTOS - 255 FT LVL

<u>Photo</u>	<u>Shutter Speed</u>	<u>Notes</u>
GO <sub>2</sub> Vent Ducts	1/30	Contingency

600 MM PHOTOS - 215 FT LVL

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**Table 80-2 Final Inspection Team - Telephotos**

<u>Photo</u>	<u>Shutter Speed</u>	<u>Notes</u>
-Y GO <sub>2</sub> Seal	1/30	
-Y Bipod Ramp	1/30	Contingency
Jack Pad C/O's	1/4	Difficult if windy
LO <sub>2</sub> F/L	1/15	
-Y Vertical Strut (Crack)	1/30	

**600 MM PHOTOS - 195 FT LVL**

<u>Photo</u>	<u>Shutter Speed</u>	<u>Notes</u>
-Y Bipod Ramp	1/30	Contingency

**600 MM PHOTOS - 135 FT LVL**

<u>Photo</u>	<u>Shutter Speed</u>	<u>Notes</u>
LH <sub>2</sub> UMB	1/30	
-Y Vertical Strut (Crack)	1/60	
LO <sub>2</sub> F/L Bellows	1/15	Contingency

**600 MM PHOTOS - MLP**

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**Table 80-2 Final Inspection Team - Telephotos**

<u>Photo</u>	<u>Shutter Speed</u>	<u>Notes</u>
LH <sub>2</sub> UMB	1/30	From West
LH <sub>2</sub> UMB	1/30	From NW
LH <sub>2</sub> UMB	1/30	From East
LH <sub>2</sub> UMB Actuator C/O	1/15 or 1/30	From North standing next to water pipe
LO <sub>2</sub> UMB	1/5	Lower Inboard
LO <sub>2</sub> UMB	1/8	Inboard
LO <sub>2</sub> F/L Bracket & Bellows	1/15	One photo to include XT-1978 & XT-1973
LO <sub>2</sub> F/L Bracket	1/15	XT-1871
LO <sub>2</sub> F/L Bracket	1/15	XT-1623
LO <sub>2</sub> F/L Bracket	1/15	XT-1377
LO <sub>2</sub> F/L Bracket	1/30	One photo to include XT-1129 & XT-1106
LO <sub>2</sub> F/L Bracket	1/30	From SE corner; One photo to include XT- 1129 & XT-1106
Jack Pad C/O's	1/15	From SE corner
Ice Frost Ramps or Pal Ramps	1/15 or 1/30	Contingency
LH <sub>2</sub> UMB Inboard	1/15	From East
+Y Longeron	1/15 or 1/30	Contingency
-Y Longeron	1/15	Contingency

**WIDE ANGLE PHOTOS - 255 FT LVL**

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**Table 80-2 Final Inspection Team - Telephotos**

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LO <sub>2</sub> Tank	Vertical	35-70 mm	
GO <sub>2</sub> Vent Ducts	Horizontal	35-70 mm	

**WIDE ANGLE PHOTOS - 215 FT LVL**

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
Overall GH <sub>2</sub> Vent Line	Horizontal	35-70 mm	
Orbiter Nose, ET -Y Side	Horizontal	35-70 mm	
Orbiter Nose, ET -Y, +Z Side	Horizontal	35-70 mm	From RSS
Forward Half of Vehicle	Vertical	28 mm	From RSS
Entire Orbiter	Vertical	28 mm	From RSS

**WIDE ANGLE PHOTOS - 195 FT LVL**

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
Aft Part of SSV, LH Wing	Vertical	35-70 mm	
Orbiter Fwd Section, Upper LH <sub>2</sub> Tank	Vertical	35-70 mm	
Bipod, -Y, +Z Intertank Area	Horizontal	35-70 mm	

**WIDE ANGLE PHOTOS - 135 FT LVL**

<u>Photo</u>	<u>Camera</u>	<u>Lens</u>	<u>Notes</u>
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Table 80-2 Final Inspection Team - Telephotos  
Orientation

Orbiter Aft Section	Vertical	35-70 mm
Lower LH <sub>2</sub> Tank & LH SRB	Vertical	35-70 mm

WIDE ANGLE PHOTOS - MLP

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
Overall Orbiter Left Side	Vertical	28 mm	
ET -Y, +Z Quadrant	Vertical	28 mm	
ET -Z Side	Vertical	28 mm	
ET +Y, +Z Quadrant	Vertical	28 mm	
Overall Orbiter Right Side	Vertical	28 mm	
ET Aft Dome	Horizontal	35-70 mm	
-Z Side of LO <sub>2</sub> T-0; RCS Stinger	Horizontal	35-70 mm	
+Z Side of LO <sub>2</sub> T-); RCS Stinger OMS Nozzle	Horizontal	35-70 mm	
-Z Side of LH <sub>2</sub> T-0; RCS Stinger	Horizontal	35-70 mm	
+Z Side of LH <sub>2</sub> T-0; RCS Stinger OMS Nozzle	Horizontal	35-70 mm	
Overall SSME Cluster	Horizontal	50 mm	-Y Side
SSME No. 2	Horizontal	50 mm	
SSME No. 1, -Z Side	Horizontal	50 mm	
SSME No. 3	Horizontal	50 mm	
Overall SSME Cluster	Horizontal	50 mm	+Y Side
LO <sub>2</sub> UMB Area	Horizontal	35-70 mm	
LH <sub>2</sub> UMB Area	Horizontal	35-70 mm	
ET/ORB UMB & ORB	Horizontal	28 mm	From under ET

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**Table 80-2 Final Inspection Team - Telephotos  
Lower Surface**

**\*\*\* End of Table 80-2 Final Inspection Team - Telephotos \*\*\***

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Table 80-3 Reduced Final Inspection Team Photos

**WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 255 FT LVL**

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
GO <sub>2</sub> Vent Ducts	TELE	Horizontal	

**WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 215 FT LVL**

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
-Y Bipod Ramp	Horizontal	TELE	From RSS
LO <sub>2</sub> P/L Ice/Frost Ramps	Vertical	TELE	From RSS; 2 photos required
GO <sub>2</sub> Seal/Hood	Horizontal	TELE	From RSS
GUCP	Vertical	TELE	
Fwd Half of SSV	Vertical	28 mm	From RSS
Entire Orbiter	Vertical	28 mm	From RSS

**WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 195 FT LVL**

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
-Y Bipod Ramp & Jack Pad C/O's	Horizontal	TELE	

**WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 135 FT LVL**

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OMI S6444 J02  
APPROVED

Table 80-3 Reduced Final Inspection Team Photos

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LH <sub>2</sub> UMB	Horizontal	TELE	
Orbiter Aft Section	Vertical	35-70 mm	

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - MLP DECK

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LH <sub>2</sub> UMB	Horizontal	TELE	From West
ET Aft Dome	Horizontal	TELE	
Aft Hard Point Closeout	Vertical	TELE	
LH <sub>2</sub> Tank	Horizontal	TELE	From North
LO <sub>2</sub> Tank	Horizontal	TELE	From North
LO <sub>2</sub> Tank	Horizontal	TELE	From East
LO <sub>2</sub> F/L Bracket Bellows	Horizontal	TELE	XT - 1978 & XT - 1973
LO <sub>2</sub> F/L Bracket	Horizontal	TELE	XT - 1871
LO <sub>2</sub> F/L Bracket	Horizontal	TELE	XT - 1623
LO <sub>2</sub> F/L Brackets	Horizontal	TELE	XT - 1377 & XT - 1129
LO <sub>2</sub> F/L Brackets & Bellows	Horizontal	TELE	XT - 1129 & XT - 1108; from SE
LO <sub>2</sub> P/L & C/T	Horizontal	TELE	From SE
Overall Orbiter Left Side	Vertical	28 mm	
ET -Z Side	Vertical	28 mm	
Overall Orbiter Right Side	Vertical	28 mm	
Overall SSME Cluster -Y Side	Horizontal	28 mm	
Overall SSME Cluster +Y Side	Horizontal	28 mm	

09-01-2001  
APPROVED

OMI S6444 J02  
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**Table 80-3 Reduced Final Inspection Team Photos**

ET/Orb UMB & Orbiter Lower Surface	Horizontal	28 mm	From under ET
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\*\*\* End of Table 80-3 - Reduced Final Inspection Team Photos \*\*\*

\*\*\* End of Operation **80** \*\*\*

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09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### OPERATION 90 LO<sub>2</sub>/LH<sub>2</sub> Drain Monitoring

Shop: SE  
Cntrl Rm Console: FR2  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 4.0

#### NOTE

This operation is contingent upon progression of launch countdown and is performed after start of cryo (LO<sub>2</sub>/LH<sub>2</sub>) loading and subsequent launch scrub, FRF, or WCDDT.

Operation Not Performed:

ET  
01  
12/5/01

#### NOTE

This operation monitors the External Tank external surfaces during LO<sub>2</sub>/LH<sub>2</sub> drain operations from time of detanking until 1.5 hours after LO<sub>2</sub>/LH<sub>2</sub> low level sensors read dry via OTV 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171.

Noted requirements satisfied by this operation: OMRS S00E00.021

90-1 Record start date/time (GMT) of LH<sub>2</sub> and LO<sub>2</sub> Tank Drain.

LH<sub>2</sub> Drain Start Date N/A Time N/A GMT

LO<sub>2</sub> Drain Start Date N/A Time N/A GMT

ETM N/A Date N/A

ET  
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12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

90-2 CVM1 JTV1 223

From start of LO<sub>2</sub> Tank Drain and LH<sub>2</sub> Tank Drain until respective LO<sub>2</sub>/LH<sub>2</sub> low level sensors read dry, **monitor** ET external surfaces including LO<sub>2</sub> Feed Line, LH<sub>2</sub> Feed Line, LH<sub>2</sub> Recirculation Line, LH<sub>2</sub> Aft Dome and manhole covers, LH<sub>2</sub>/LO<sub>2</sub> Umbilicals, TSM LH<sub>2</sub>/LO<sub>2</sub> Umbilicals via OTV cameras. No cryogenic liquid or excessive vapors allowed.

ETM \_\_\_\_\_ Date \_\_\_\_\_

Support: COMM

90-3 Record date/time (GMT) when LO<sub>2</sub>/LH<sub>2</sub> low level sensors read dry.

LH<sub>2</sub> Sensors Dry Date \_\_\_\_\_ Time \_\_\_\_\_ GMT

LO<sub>2</sub> Sensors Dry Date \_\_\_\_\_ Time \_\_\_\_\_ GMT

ETM \_\_\_\_\_ Date \_\_\_\_\_

ET  
01

12/3/01

90-2

90-4 CVM1 JTV1 223

Monitor ET external surfaces including LO<sub>2</sub> Feed Line, LH<sub>2</sub> Feed Line, LH<sub>2</sub> Recirculation Line, LH<sub>2</sub> Aft Dome and manhole covers, LH<sub>2</sub>/LO<sub>2</sub> Umbilicals, TSM LH<sub>2</sub>/LO<sub>2</sub> Umbilicals via OTV cameras for 1.5 hours after LO<sub>2</sub>/LH<sub>2</sub> low level sensors have read dry. No cryogenic liquid or excessive vapors allowed. Record date/time (GMT) when monitoring complete.

LH<sub>2</sub> Complete Date \_\_\_\_\_ Time \_\_\_\_\_ GMT

LO<sub>2</sub> Complete Date \_\_\_\_\_ Time \_\_\_\_\_ GMT

ETM \_\_\_\_\_ Date \_\_\_\_\_

Support: COMM

90-5 Completion of this operation satisfies noted requirements.

OMRSD S00E00.021

90-6 Operation - LO<sub>2</sub>/LH<sub>2</sub> Drain Monitoring complete.

\*\*\* End of Operation 90 \*\*\*

90-3

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12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### OPERATION 100 Console Securing

Shop: SE  
Cntrl Rm Console: FR2  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 0.5

100-1

CTIF TBC 136  
TBC CTC 232

OTV support for ET thermal protection system evaluation no longer required.

100-2

CTIF JYVR 138

Perform the following:

1. Turn off video recorders.
2. Remove tape cartridges.
3. OTV support no longer required.

Support: COMM

100-3

CTIF CVM1 222  
CVM2

Secure consoles by setting all monitors to "Off" position.  
Report completion.

100-1

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G1  
12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
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**NOTE**

Perform next step only after a successful launch.

100-4

**CTIF**

**Remove** photo processing laptop computer from Firing Room.

Not Performed: N/A

12/6/01

100-5

<b>CTIF</b>	<b>TBC</b>	<b>136</b>
<b>TBC</b>	<b>CTC</b>	<b>232</b>

Firing Room 2, ice frost monitoring area securing complete.

100-6

Operation 100 - Console Securing complete.

ETM P. Seave Date 12/6/01

\*\*\* End of Operation 100 \*\*\*

100-2

12/6/01

① P. Seave ETM 12/6/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### OPERATION 110 Summary Tape

Shop: SE  
Cntrl Rm Console: FR2  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 18.0

**NOTE**

Observations/concerns observed during count are typically recorded on the summary tape real-time (trouble tape).

**110-1 CICE**

After launch or launch scrub, prepare a summary tape to include observations/concerns noted during count.

**110-2** Operation Summary Tape complete.

ETM D. Seave Date 12/5/01

\*\*\* End of Operation 110 \*\*\*

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01

110-1

12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

## OPERATION 120 Post Drain Walkdown

Shop: SE  
Cntrl Rm Console: NA  
OPR: ETM  
Zone: PAD A/B  
Hazard (Y/N): Y  
Duration (Hrs): 2.0

### NOTE

Post drain walkdown performed only after start of cryo (LH<sub>2</sub>/LO<sub>2</sub>) loading and subsequent launch scrub.

Operation Not Performed:

ET  
01

12/5/01

### WARNING

Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

Personnel shall wear **hardhats** and **flame retardant coveralls** while performing post drain walkdown.

### NOTE

Post drain walkdown typically commences approximately 1.5 hours after LH<sub>2</sub>/LO<sub>2</sub> low level sensors read dry.

Post drain walkdown performed in support of a 24 hour scrub turnaround is typically coincident with the L-20 hour pre-launch walkdown for the ensuing launch attempt.

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12/5/01

**NOTE**

NASA ET Mechanical Engineer (PH-H) or designee shall function as team leader. Following personnel are walkdown optional participants:

NASA Engr	(4)
SFOC Engr	(2)
LMSSC-LSS	(1)
Boeing LSS	(1)
SFOC Safety	(1)

- 120-1** NASA Lead ET Mechanical Systems Engineer (PH-H) verify essential personnel on station, properly attired, and ready to proceed with post drain walkdown.

**Essential Personnel**

NASA Engineering (PH-H)	1
SFOC Engineering (ETM)	1

**NOTE**

"Hands-on Investigation" is applicable only to those areas which are not understood or fully defined and which cannot be adequately evaluated otherwise.

- 120-2** **Perform** post drain walkdown as follows:

- 1. Visually inspect** ET TPS exterior surfaces **after** detanking and warm-up (approximately T + 4 hours after drain is initiated) from the MLP, FSS, and RSS as access permits.
- 2. Perform** hands-on investigation of all areas suspected of violating Doc: NSTS 08303 (LI) NSTS PROGRAM ICE/DEBRIS INSPECTION CRITERIA (LI)

OMRSD S00E00.031

10/15/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

120-3 Walkdown complete. All discrepancies identified. No constraints to continue.

PH-H N/A Date N/A

ETM N/A Date N/A

120-4 Operation Post Drain Walkdown complete.

\*\*\* End of Operation 120 \*\*\*

120-3

01

12/5/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### OPERATION 130 Post Launch Walkdown

Shop: SE  
Cntrl Rm Console: NA  
OPR: ETM  
Zone: PAD A/B  
Hazard (Y/N): Y  
Duration (Hrs): 3.0

#### NOTE

Do not perform this operation after launch scrub.

Operation Not Performed: N | A

#### WARNING

Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

Personnel participating in walkdown shall wear **hardhats** and **flame retardant coveralls**.

#### NOTE

NASA ET Mechanical Engineer (PH-H) or designee shall function as team leader. Following personnel are walkdown optional participants:

NASA Engr	(3)
SFOC Engr	(2)
LMSSC-LSS	(1)
Boeing LSS	(2)
SRB ELE	(1)
Thiokol-LSS	(1)
SFOC Safety	(1)

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

- 130-1 NASA (PH-H) **verify** following personnel on station, properly attired, and ready to proceed with post launch walkdown.

Essential Personnel		
NASA	PH-H	1
SFOC	ETM	1

**NOTE**

Post Launch Walkdown must be performed prior to washdown and Pad being opened for normal work.

- 130-2 **Perform** Post Launch Walkdown as follows:

1. Ref Table 130-1, **visually inspect** post launch pad/area to identify any lost flight or ground systems hardware and debris sources.
2. Ref Table 130-2, **document/SIMS photograph** launch PAD area configuration.

Description: Post Launch Walkdown

OMRSD S00U00.010-1

- 130-3 Walkdown complete. Debris sources and lost flight hardware identified. No constraints to continue.

PH-H *[Signature]* Date 12/6/01

ETM *[Signature]* Date 12/6/01

- 130-4 Operation - Post Launch Walkdown complete.

ET  
01

12/6/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

**Table 130-1 Post Launch Walkdown Inspection Areas**

Record mission info, PAD, date, and time:

STS 108

PAD B

Date 12/5/01

Time 20:22:30

SEE "SIS-108 POST  
LAUNCH PAD DEBRIS  
INSPECTION REPORT"  
INSERT AT STEP  
150-1.

**SRB Hold-down posts (HDP)**

R. S. E. ETM  
12/5/01

Inspect for damage, stud hang-up Epon shim material, ordnance fragments, doghouse blast covers, erosion, missing hardware, debris. Record Results:

~~\_\_\_\_\_~~  
~~\_\_\_\_\_~~  
~~\_\_\_\_\_~~  
~~\_\_\_\_\_~~  
~~\_\_\_\_\_~~  
~~\_\_\_\_\_~~  
~~\_\_\_\_\_~~  
~~\_\_\_\_\_~~

**MLP Deck**

- SRB aft skirt purge lines
- SRB T-0 umbilicals
- Tail service masts (TSM's)
- MLP deck

**195 Ft Level**

- Orbiter access arm (OAA)

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

**Table 130-1 Post Launch Walkdown Inspection Areas**

**215 Ft Level - GH2 Vent Line/GUCP**

Latch position  
Loose cables  
Damage from SRB plume  
Damage to the QD

**255 Ft Level - GO<sub>2</sub> Vent Arm, Ducts, Hood**

Seals  
Hood windows, doors, latches

**Fixed Service Structure (FSS)**

Cable tray covers  
Signs  
Hydraulic leaks  
Slidewire baskets

**PAD Apron/Acreage**

Vehicle hardware and/or flight TPS materials  
Facility debris

**Table K-1 PAD Apron/Acreage Items**

<u>Description</u>	<u>Location</u>

\*\*\* End of Table 130-1 - Post Launch Walkdown Inspection Areas \*\*\*

ET  
01  
12/6/01

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

**Table 130-2 Post Launch Photos (MLP, FSS, PAD, Apron, Pad Acreage)**

**MLP 0-level**

1 Ea HDP No. 1, 2, 5 & 6 (HDP shoe and Epon shim)  
1 Ea HDP No. 3, 4, 7 & 8 (blast cover down to HDP base)  
1 Ea SRB T-O umbilical  
1 Ea overall view SRB exhaust cutouts\

Any unusual or debris-related damage to the facility; sound suppression water pipes,  
TSM's cracks in MLP deck, witness panels, handrails, etc.

Any flight hardware debris (tiles, SRB ordnance fragments)  
Any facility debris (nuts, bolts, cable tray covers, etc.)

**FSS**

Close-ups of GUCP and latching mechanism  
Overall views of GO<sub>2</sub> vent hood/ducts, if damaged  
Any flight hardware or facility debris  
Any unusual or debris-related damage to the facility

**PAD Apron/PAD Acreage**

Any flight hardware or unusual facility debris objects

Any unusual or debris-related damage to the PAD (such as missing brick in the flame  
trench), perimeter fence, etc.

**\*\*\* End of Table 130-2 - Post Launch Photos (MLP, FSS, PAD, Apron, Pad  
Acreage) \*\*\***

**\*\*\* End of Operation 130 \*\*\***

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

### OPERATION 140 Film Review

Shop: SE  
Cntrl Rm Console: NA  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 15.0

**NOTE**

This operation may be not performed after launch scrub.

Operation 140 Not Performed: N/A

**NOTE**

Analysis of Pad Debris Inspection Results determines priority for film review. All critical film (as determined by the Debris Team) must be reviewed as soon as possible after launch and no later than 36 hours prior to entry (of the Orbiter into the earth's atmosphere).

**140-1** Review and analyze all engineering launch (and flight) film to:

- Identify any debris damage to the SSV
- Identify flight vehicle or ground system damage that could affect Orbiter flight operations of future SSV launches.

OMRSD S00U00.011-1

ETM P. Seale Date 1/10/02

**140-2** Operation - Film Review complete.

ETM P. Seale Date 1/10/02

\*\*\* End of Operation 140 \*\*\*

140-1

ET  
01

1/10/02

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

## OPERATION 145 IR Camera Removal

Shop: PH-H  
Cntrl Rm Console: NA  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 2.0

### WARNING

Hard hats required on the Pad when SSV is not present.

### CAUTION

Exercise care to avoid dropping equipment, fasteners, etc from RSS roof to prevent damage to equipment or injury to personnel. All tools must be tethered.

### NOTE

IR Camera removal from RSS Roof site may be not performed in launch scrub turnaround scenarios.

145-1 Remove IR camera at RSS Roof Site as follows.

1. **Remove** fasteners (2 pl) from camera housing front. **Retain** fasteners for reinstallation when front cover is installed.
2. **Install** camera housing front cover using previously removed fasteners (2 pl). **Tighten** fasteners (2 pl) wrench tight.

**WARNING**

Power cable is live. Care should be exercised when connecting power cable to avoid electric shock.

**CAUTION**

Do NOT allow back cover to exert undue force on cables when opening/rotating back cover.

3. **Rotate** camera housing back cover into open position by removing bolts with flat washers (20 pl). **Retain** bolts/washers for reinstallation.
4. **Disconnect:**
  - Power cable
  - Pan & tilt cable
  - Controller cable
  - OTV coaxial cable
5. **Unlock** spring pin at lower, left to release IR camera Unit in camera housing. **Remove** IR Camera Unit from camera housing by carefully sliding it out the back opening of the camera housing. **Support** IR Camera Unit during removal.
6. **Rotate** camera housing back cover into closed position. Do not pinch cables. **Secure** back cover by reinstalling bolts/flat washers (20 pl). **Tighten** bolts wrench tight.

ET  
01

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**WARNING**

**Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system. Ensure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear N-Dex nitril gloves and chemical splash goggles. When working at eye level or above wear a face shield over goggles.**

WS002.a 05-22-01

7. **Clean** IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rymple cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl alcohol .
8. **Route** IR Camera Unit to VAB 3K1 for refurb/checkout.

NASA PH-H

*[Signature]*

Date 12/12/01

USA ETM

*[Signature]*

Date 12/13/01

Not Performed: N/A

**NOTE**

IR Camera removal from Camera Site 2 may be not performed in launch scrub turnaround scenarios.

145-2 Remove IR camera from Camera Site 2 as follows.

1. **Remove** bolt(s) from camera housing front. **Retain** bolt(s) for reinstallation when front cover is installed.
2. **Install** camera housing front cover using previously removed bolt(s). **Tighten** bolt(s) wrench tight.

**WARNING**

Power cable is live. Care should be exercised when connecting power cable to avoid electric shock.

**CAUTION**

Do NOT allow back cover to exert undue force on cables when opening/rotating back cover.

3. **Loosen** screws (8 pl) securing camera housing back cover using Phillips screwdriver. **Rotate** camera housing back cover to open position. **Retain** bolts/washers for reinstallation.
4. **Disconnect:**
  - Power cable
  - Pan & tilt cable
  - Controller cable (2 pl)
  - OTV coaxial cable
5. **Unscrew** set screw(s) at lower, left/right to release IR camera Unit in camera housing. **Remove** IR camera Unit from camera housing by carefully sliding it out the back opening of the camera housing. **Support** IR camera Unit during removal.
6. **Coat** camera housing back cover O-ring with a single coat of (1) tube/jar 6505-00-133-8025 Petroleum Jelly, Vaseline (or equivalent) .

ET  
01

12/13/01

7. **Rotate** camera housing back cover into closed position. Do not pinch cables. **Secure** back cover by installing screws (8 pl). **Tighten** screws wrench tight using Phillips screwdriver.

**WARNING**

**Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system.** Ensure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear **N-Dex nitril gloves** and **chemical splash goggles**. When working at eye level or above wear a **face shield** over goggles.

WS002.a 05-22-01

8. **Clean** IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rymple cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl alcohol .
9. **Route** IR Camera Unit to VAB 3K1 for refurb/checkout.

NASA PH-H *[Signature]* Date 12/13/01

USA ETM *[Signature]* Date 12/13/01

Not Performed: N/A

\*\*\* End of Operation 145 \*\*\*

09-01-2001  
APPROVED

OMI S6444 J02  
APPROVED

## OPERATION 150 Final Report

Shop: SE  
Cntrl Rm Console: NA  
OPR: ETM  
Zone: NA  
Hazard (Y/N): N  
Duration (Hrs): 0.5

### NOTE

This operation may be not performed after launch scrub.

Operation 150 Not Performed: N/A

- 150-1 Assemble final report by attaching following reports to this OMI.  
Reference each to this step.

Post Launch PAD Assessment  
SRB Assessment  
Launch Film Review  
Launch Day Video Review  
Orbiter Landing Assessment  
ET Separation Review

NOTE: INITIAL L-20 HB  
WALKDOWN REPORT ON  
11/24/01 AND POST DRAIN/MLP  
INSIP REPORT ON 12/4/01  
ALSO INCLUDED. A. Seale ETM  
12/10/01

- 150-2 Final report assembly complete.

ETM A. Seale Date 1/11/02

- 150-3 Operation - Final Report complete.

\*\*\* End of Operation 150 \*\*\*



1/11/02

STEP 150-1

**STS-108 PRE-LAUNCH PAD DEBRIS INSPECTION REPORT**

KSC Debris Team  
28 November 2001

The pre-launch inspection of the MLP-1, Pad B FSS and RSS was conducted on 28 November 2001 from 1500 to 1730 hrs EDT. No flight hardware issues/anomalies were detected.

No facility items were documented in Appendix K of S0007VL4. Minor clean-up items were in-work.

Additional Pad work, including SSME ESP lowering, was in-work at the conclusion of the Debris Inspection.

Armando Oliu  
NASA

Robert Speece  
NASA

STEP 150-1

## STS-108 POST DRAIN SSV/MLP INSPECTION

KSC Debris Team

December 4, 2001

The post drain inspection of STS-108, MLP-1, and Pad B FSS was conducted on December 4, 2001 from 2300 to 0015 hours under dark conditions. Nevertheless, visibility was adequate for the inspection.

No MLP deck or facility anomalies were detected.

Likewise, no anomalies were observed on the SRB's.

Orbiter tiles, RCC panels, and SSME's were in nominal configuration. RCS thruster paper covers were intact.

The GOX vent arm was in the retracted position. OTV monitoring from LCC Firing Room 2 was performed prior to and during GVA retraction and had verified no anomalies with the vent system or the ET nose cone and forward LO2 tank TPS. The post detank Pad inspection also verified no anomalies in this area. No topcoat was missing from the nose cone area under the GOX vent seal footprint.

The External Tank was in excellent condition. Bipod jack pad standoff closeouts were in nominal condition. All PDL repairs were intact with none protruding. No crushed foam or debris was detected in the LO2 feedline support brackets. The stress relief crack in the -Y vertical strut forward facing TPS was not visible.

The only ice remaining was located in the LO2/LH2 feedline bellows, the lower EB fittings, and on the ET/ORB umbilical purge vents.

The three ET burst discs were monitored from the LCC Firing Room 2 via OTV and inspected from the MLP Zero Level and no anomaly was observed.

In summary, no IPR conditions and no flight hardware concerns were detected during the post drain inspection. There are no constraints for the next cryoload.

Jorge Rivera  
NASA-KSC

Mike Payne  
NASA-KSC

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ET  
01  
12/10/01

TABLE No-1 / STEP 150-1

## STS-108 POST LAUNCH PAD DEBRIS INSPECTION REPORT

KSC Debris Team

5 December 2001

The post launch inspection of the MLP-1, Pad B FSS and RSS was conducted on 5 December 2001 from Launch + 2.75 to 4.5 hours(2000 to 2230 EST).

No flight hardware was found.

Orbiter liftoff lateral acceleration data to predict stud hang-ups received from Boeing-Huntington Beach indicated that no SRB holddown stud hang-up had occurred, the reported value was 0.09G. Evaluation of the MLP 0-level was performed and the south holddown studs were visually assessed as having no indication of hang-up. Erosion was typical for the north posts with some evidence of missing RTV at the HDP haunch interface. North holddown post blast covers and T-0 umbilical exhibited minimal exhaust plume damage. Both SRB aft skirt GN2 purge lines were intact, protective tape layering was partially eroded on the RH side and the metal braid was partially eroded the LH purge line.

The LO2 and LH2 Tail Service Masts (TSM) appeared undamaged and the LO2 bonnet was observed to have closed properly. The MLP deck was in generally good shape. All MLP deck communication connector caps were found intact and secured.

The GH2 vent line did not latch on the FSS latching mechanism. It appears the vent line impacted the south side of the FSS structure preventing the latch back and cause substantial damage to the saddle structure. The south side bridle cable sheared from the southern tang on the yoke. Pieces of debris (bolts and clevis leg) were found on/in the grating and vent line structure. GUCP and 7-inch QD exhibited no damage, the poppet was observed to be intact. The deceleration cable was in nominal configuration, and the vent line blanket was sooted and torn. Film review should provide further data on the cause of the anomaly.

The OAA appeared to be intact with no evidence of plume impingement.

All slidewire baskets were secured with no evidence of damage.

The GOX vent arm, ducts and structure appeared to be in good shape with no indications of plume damage. The access door window on the north side of the hood was broken

# STEP 150-1

with loss of material. A major hydraulic leak was observed on the GOX vent arm/FSS structure hinge (255' Level).

## Debris findings included:

- FSS 235' level loose cable tray cover latch.
- RSS 215' level broken light fixture.
- FSS 215' level electrical box shorted out burning through the box.
- FSS 175' level pressure gauge cover was found near gauge on grating.
- FSS 155' level pressure gauge cover was noted in cable tray (source not determined).
- MLP deck a piece of steel cable with swedge (kellum grip) was found on the east side.
- Pad surface a 7/8" facility nut was found near the MLP north west pedestal.
- Pad surface numerous pieces of fragmented metal were found (1/16" aluminum)



# STEP 150-1

Overall damage to the pad appeared to be slightly greater than nominal. Walk down of pad apron and north flame trench was not completed due to lighting conditions, will be completed 12/6/01.

Jorge Rivera, NASA-KSC  
Mike Payne, NASA-KSC

STEP 150-1

## STS-108 SRB POST FLIGHT/RETRIEVAL ASSESSMENT

KSC Debris Team

8 December 2001

The BI-110 Solid Rocket Boosters were inspected for debris damage and debris sources at CCAFS Hangar AF on 8 December 2001. Generally, both boosters were in excellent condition.

**Anomalies** - None

**Funnies** - None

### **Observations**

The TPS on both frustums exhibited no debonds/unbonds. There was minor localized blistering of the Hypalon paint.

All eight BSM aero heat shield covers had fully opened and locked, but one H and two LH cover attach rings had been bent at the hinge by parachute riser entanglement.

The forward skirts exhibited no debonds or missing TPS. RSS antennae covers/phenolic base plates were intact, though one layer of the LH and RH SRB +Z antenna phenolic base plate had delamination at the edge.

The Field Joint Protection System (FJPS) and the System Tunnel Covers closeouts were generally in good condition with no unbonds observed.

Separation of the aft ET/SRB struts appeared normal.

Aft skirt external surface TPS was in good condition. Typical blistering of Hypalon paint had occurred on the BTA insulation close-outs and GEI cork runs.

The holddown post Debris Containment Systems (DCS) appeared to have functioned normally except on HDP No. 1 which was fully obstructed by the frangible nut halves. This condition most likely happened at water impact.

No indication of stud hang up was observed.

Armando Oliu  
NASA - KSC

12/8/01

STEP 150-1

## STS-108 POST LAUNCH FILM REVIEW

KSC Photo/Video Analysis Team

6 December 2001

### Significant Anomalies

Gaseous Hydrogen vent line did not latch-back after retraction (E-52). Vent line rebounded, but did not contact vehicle. Launch Accessories Engineering is processing an IPR to document and investigate this anomaly.

### Minor Anomalies - None

### Funnies - None

### Observations

1. SRB separation appeared normal. (E-207, E-212, E-223 )
2. SSME Mach diamond formation sequence was 3-2-1 (E-76, -77)
3. Free-burning GH2 blown toward vertical stabilizer by wind. (E-52, E-76, E-77, E-222)
4. Particles of SRB aft-skirt instafoam fell along side the SRB plume. (E-207, E-212)
5. Body flap and elevon movement during ascent were typical. (E-207, E-212, E-213, E-220, E-223)
6. Ice particles fell from ET/ORB umbilicals after lift-off. No impact to orbiter lower surface was noted. (E-34, E-36, E-52, E-63)
7. Charring on the ET aft dome was typical. (E-207, E-220, E-223, E-224)
8. Umbilical purge barrier baggie material fell during roll maneuver. (E-52, E-207, E-212, E-220, E-222)
9. Forward RCS paper covers were observed falling aft during early ascent. (E-52, E-54, E-207, E-212, E-213, E-220, E-222, E-223, E-224)
10. Pieces of facility debris entered field of view well after vehicle cleared tower. (E-36, E-40).
11. Ice from forward LO2 feedline bellows seen falling between ET and Orbiter. No contact with orbiter noted. (E-34, E-40)
12. OMS assist firing visible shortly after SRB separation. (E-212)

### Notes

Review of launch pad high-speed films will continue on Friday, December 7, 2001.

### Post-Launch Debris Inspections

1. Walk down of pad apron and north flame trench was performed today, completing the Post Launch Pad Debris Inspection. No flight hardware was found.
2. A yellow herculite Remove Before Flight cover was found near the pad gate on the west side of the crawler way.
3. Numerous pieces of metal and hardware (bolts, nuts, washers) were found on the north flame trench.

Armando Oliu  
NASA - KSC

Robert Speece  
NASA - KSC

Doug Powell  
Lockheed Martin - KSC

STEP 150-1

## STS-108 POST LAUNCH FILM REVIEW

KSC Photo/Video Analysis Team

7 December 2001

### Significant Anomalies

Gaseous Hydrogen vent line contacted south side of support structure at two locations; the saddle plate and the bridle cable connection. Contact caused debris, which fell toward SRB exhaust. Vent line did not latch-back and rebounded approximately 3-feet. No contact with flight hardware was observed. (E-41, E-42, E-60)

Launch Accessories Engineering is processing IPR PADB-2539 to document and investigate this anomaly.

**Minor Anomalies - None.**

**Funnies - None.**

### Observations

1. GUCP separation from ET nominal. (E-33)
2. No stud hang up, or ordnance fragments, were observed on any of the SRB hold-down posts.
3. After T-0 object seen moving across field of view toward camera E-1 and away from flight hardware. No contact with flight hardware noted. (E-1)
4. No OMS pod flexing observed. (E-17, E-18)
5. Debris particle observed emanating from near DCS of HDP #1, moves away from the SRB and aft of orbiter. No contact with flight hardware. (E-9)
6. Piece of debris noted between HDP 3 and shoe. (E-10)
7. RTV from base of HDP ejected out of SRB hole and contacted top of HDP #3 blast cover momentarily before being expelled. No contact with flight hardware. (E-10, E-15)
8. Free-burning GH2 blown toward vertical stabilizer.
9. Several ice particles fell from ET/ORB umbilicals during SSME ignition.
10. Vapors on ET aft dome and SRB stiffener rings were observed after T-0.
11. Ice particles fell from LH2 / LO2 TSM T-0 disconnects.
12. Tile surface coating material was lost from aft face of LH OMS RCS stinger. This is a common occurrence due to SSME ignition acoustics. (E-20)
13. SRB throat plug material ejected from exhaust hole. No contact with vehicle.
14. Deluge water pipe leaking adjacent to HDP 8, water dripping on MLP deck. (E-14)

### Notes

Remaining film items will be reviewed Monday, December 10.

Armando Oliu  
NASA - KSC

Robert Speece  
NASA - KSC

Scott Otto  
Lockheed Martin - KSC

STEP 150-1

## STS-108 LAUNCH DAY VIDEO REVIEW

KSC Photo/Video Analysis Team

05 December 2001

**Significant Anomalies** - None

**Minor Anomalies** - None.

**Funnies** - None.

### Observations

1. Free burning hydrogen was visible near the vertical stabilizer (OTV 170, 141, TV-7B).
2. Numerous pieces of ice from the ET/ORB umbilical shook loose and contacted umbilical sill tiles, but no damage was detected (OTV 109, 163).
3. LH2 and LO2 T-0 umbilical disconnect was normal (OTV 149, 150).
4. Debris particle (probably ice from LO2 feedline support brackets or bellows) was seen falling between ET and Orbiter. Particle glances off orbiter lower surface. No damage noticed (OTV 161).
5. Frost was visible around -Y and +Y ET GOX vent louver (OTV 160, 161).
6. Pieces of aft skirt instafoam fell out of the SRB plume during flight (TV-4B, TV-13).

### Notes

A total of 17 videos were made available for review.

Review of long range tracking films is scheduled to begin Thursday, December 6, 2001.

Armando Oliu  
NASA - KSC

Robert Speece  
NASA - KSC

STEP 150-1

**STS-108 ORBITER POST LANDING INSPECTION**  
**PRELIMINARY DEBRIS ASSESSMENT**  
17 December 2001

A runway walkdown and preliminary post landing inspection of OV-105 Endeavour was conducted at the Kennedy Space Center on SLC runway 15.

The Orbiter lower surface sustained 57 total hits, of which 14 had a major dimension of 1-inch or larger, both numbers are well within family. The majority of the hits (29 total with 4 greater than 1-inch) were located in the area from the nose landing gear to the main landing gear wheel wells on both left and right chines. Approximately 11 of the total lower surface hits were around the LH2 umbilical area. Most of these damage sites around the ET/ORB umbilical were most likely caused by pieces of the umbilical purge barrier flailing in the airstream and contacting tiles before pulling loose and falling aft.

The largest lower surface tile damage site, located inboard of the RH MLG door, measured 8½ inches long by 1½ inches wide by 3/8-inches deep. The damage spans three separate tiles. The cause of this damage has not been determined yet.

The landing gear tires were reported to be in good condition.

ET/Orbiter separation devices EO-1, EO-2, and EO-3 functioned normally. No ordnance fragments were found on the runway beneath the umbilicals. The EO-2 and EO-3 fitting retainer springs appeared to be in nominal configuration, though one of the "salad bowl" clips was missing from EO-2 and 2 were missing from EO-3. The EO-2/3 pyro debris shutters were fully closed. A small piece of white RTV (1/2 inch long by 1/8 inch diameter) used for umbilical test-port closeout process was found under the LH2 umbilical. No other debris was found beneath the umbilicals.

Typical amount of tile damage occurred on the base heat shield. All SSME Dome Heat Shield closeout blankets were in good condition.

There were a total of 8 hits, with 4 having one dimension greater than 1-inch, on the window perimeter tiles. Hazing and streaking of forward-facing Orbiter windows appears to be less than normal. A 1½ inch diameter by ¼ inch deep tile damage was noted on the +Z side of the body flap, underneath SSME #3. A more detailed inspection of the upper surface will be performed in the OPF.

STEP 150-1

The post-landing walkdown of Runway 15 was performed immediately after landing. All components of the drag chute were recovered and appeared to have functioned normally.

In summary, the Orbiter TPS sustained a total of 66 hits, of which 19 had a major dimension of 1-inch or larger. This total does not include the numerous hits on the base heat shield attributed to SSME vibration/acoustics and exhaust plume recirculation.

The Orbiter post landing assessment will continue in OPF Bay 1 on Tuesday 12/18/01.

Armando Oliu, NASA - KSC  
Robert Speece, NASA - KSC  
Mike Payne, NASA - KSC

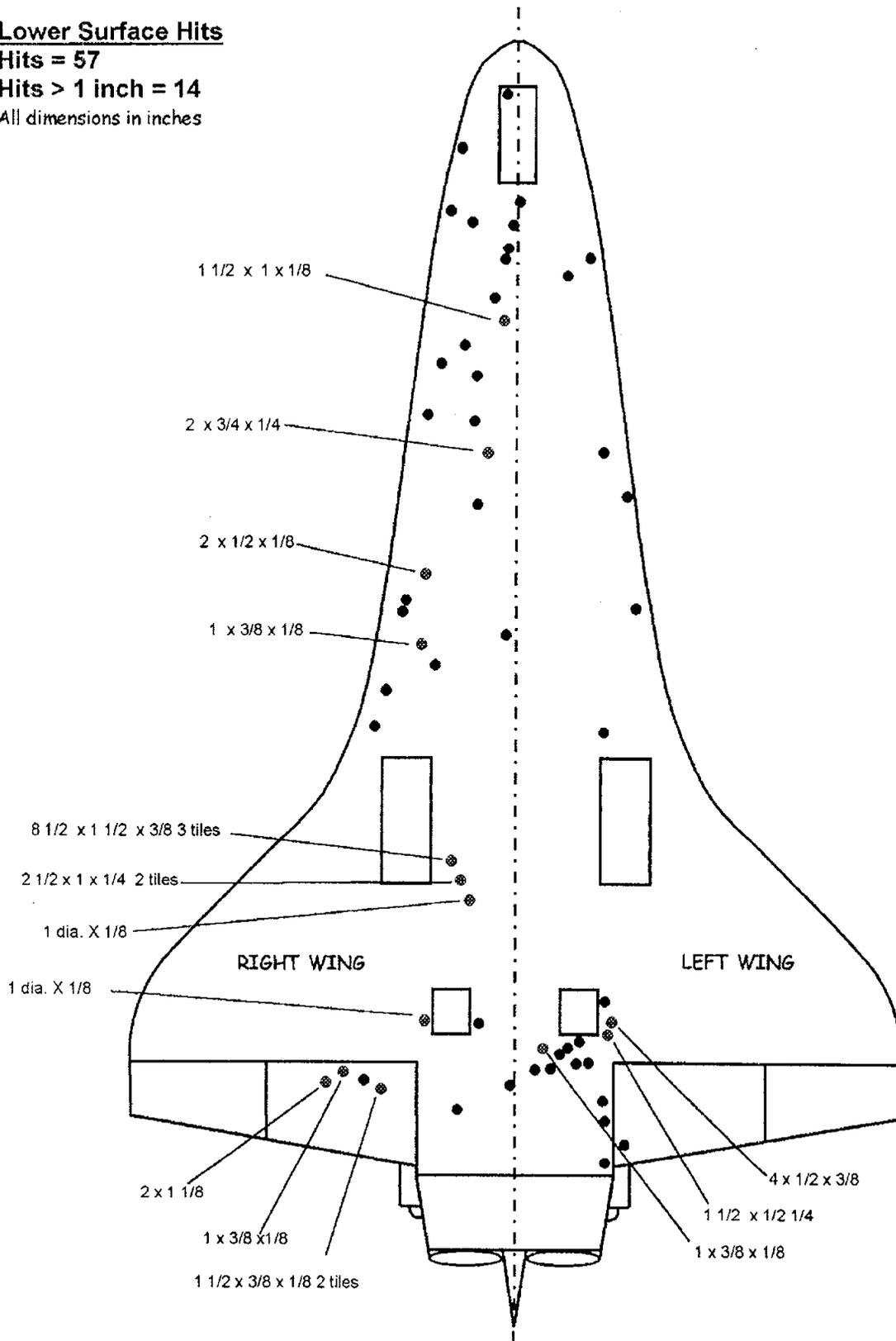
STEP 150-1  
**STS-108 Preliminary  
 Debris Damage Locations**

**Lower Surface Hits**

Hits = 57

Hits > 1 inch = 14

All dimensions in inches



ET  
01

12/17/01

STEP 150-1

STS - 108

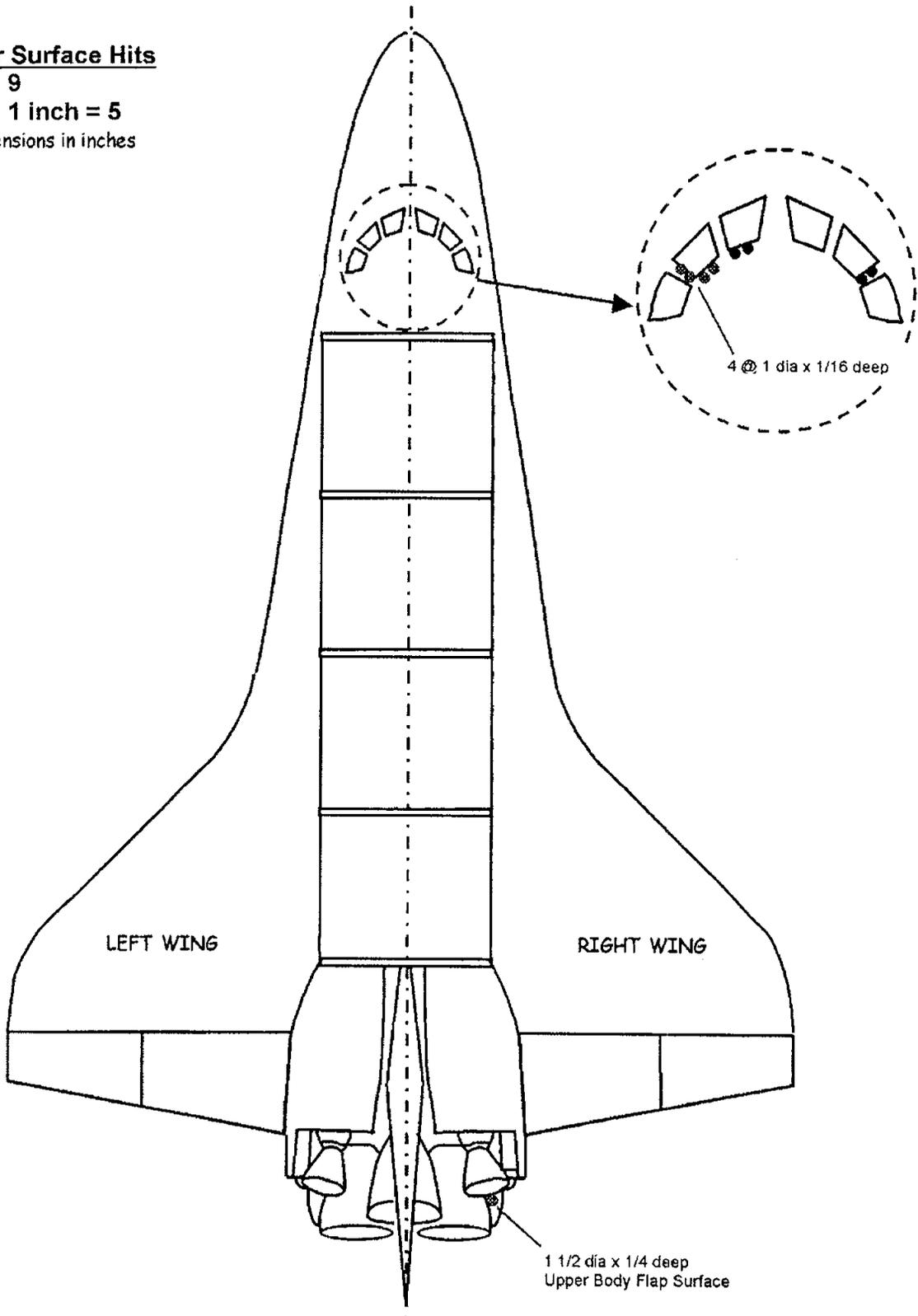
# DEBRIS DAMAGE LOCATIONS

## Upper Surface Hits

Hits = 9

Hits > 1 inch = 5

All dimensions in inches



ET  
01

12/17/01

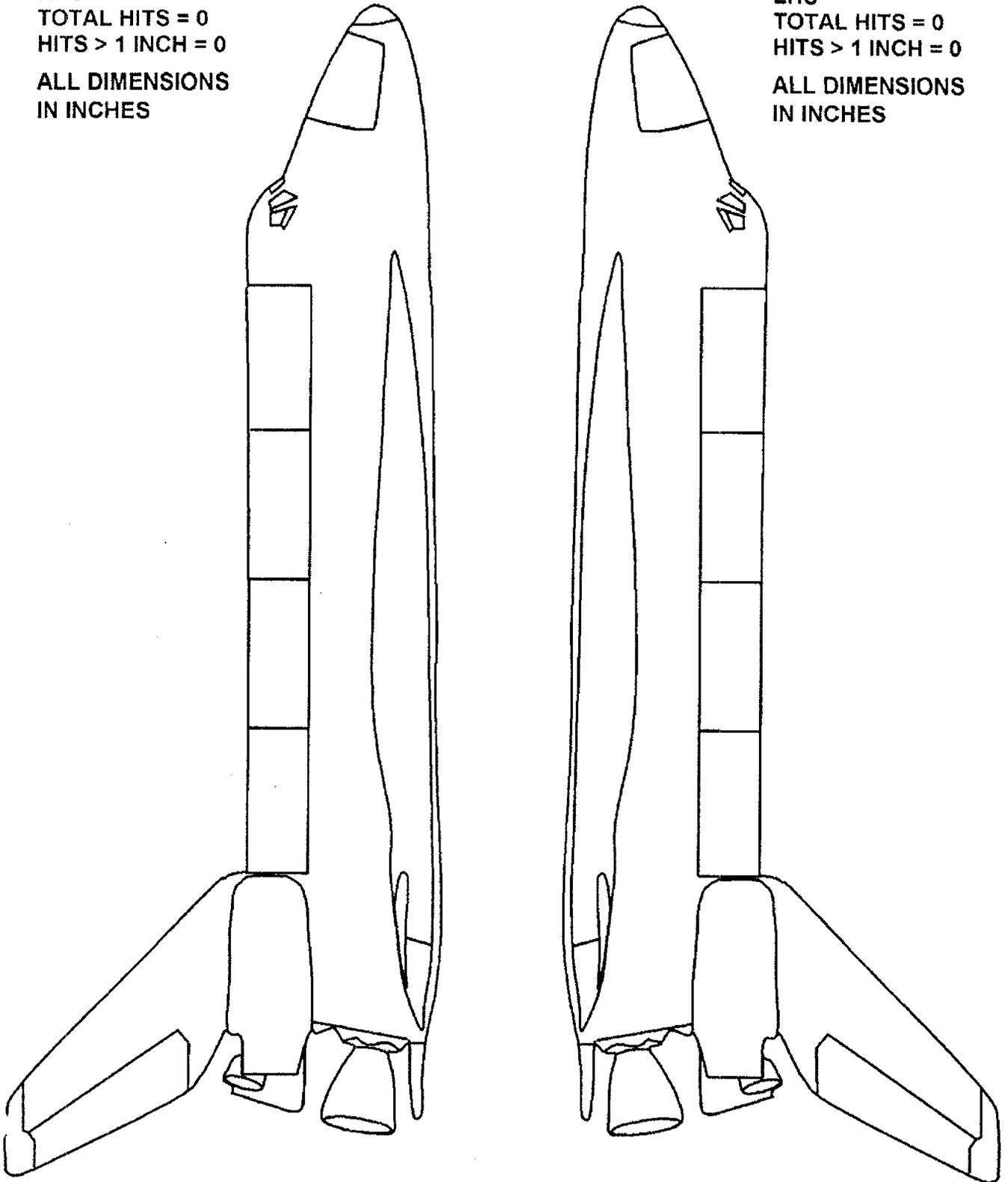
STEP 150-1

STS - 108

# DEBRIS DAMAGE LOCATIONS

RHS  
TOTAL HITS = 0  
HITS > 1 INCH = 0  
ALL DIMENSIONS  
IN INCHES

LHS  
TOTAL HITS = 0  
HITS > 1 INCH = 0  
ALL DIMENSIONS  
IN INCHES



STEP 150-1

**STS-108 ORBITER POST LANDING INSPECTION**  
DEBRIS ASSESSMENT  
18 December 2001

After the 12:56 p.m. local/eastern time landing on 17 December 2001, a post landing inspection of OV-105 Endeavour was conducted at the Kennedy Space Center on SLF runway 15 and in Orbiter Processing Facility bay 1. This inspection was performed to identify debris impact damage and, if possible, debris sources.

The Orbiter TPS sustained a total of 95 hits of which 22 had a major dimension of 1-inch or larger. This total does not include the numerous hits on the base heat shields attributed to SSME vibration/acoustics and exhaust plume recirculation.

The following table lists the STS-108 Orbiter damage hits by area:

	<u>HITS &gt; 1-inch</u>	<u>TOTAL HITS</u>
Lower Surface	17	81
Upper Surface	1	1
Window Area	4	13
Right Side	0	0
Left Side	0	0
Right OMS Pod	0	0
Left OMS Pod	0	0
<b>TOTALS</b>	<b>22</b>	<b>95</b>

The Orbiter lower surface sustained 81 total hits, of which 17 had a major dimension of 1-inch or larger, both numbers are well within family. The majority of the hits (49 total with 12 greater than 1-inch) were located in the area aft of the main landing gear wheel wells. Approximately 11 of the total lower surface hits were around the LH2 umbilical area and 24 around the LO2 umbilical area. Most of these damage sites around the ET/ORB umbilical were most likely caused by pieces of the umbilical purge barrier flailing in the airstream and contacting tiles before pulling loose and falling aft.

The largest lower surface tile damage site, located inboard of the RH MLG door, measured 8-1/2 inches long by 1-1/2-inches wide by 3/8-inches deep. The damage spans three separate tiles. The cause of this damage has not been determined yet.

The landing gear tires were in good condition.

ET/Orbiter separation devices EO-1, EO-2, and EO-3 functioned normally. No ordnance fragments were found on the runway beneath the umbilicals. The EO-2 and EO-3 fitting retainer springs appeared to be in nominal configuration, though one of the "salad bowl" clips was missing from EO-2 and 6 were missing from EO-3. The EO-2/3 pyro debris

## STEP 150-1

shutters were fully closed. A small piece of white RTV (1/2 inch long by 1/8 inch diameter) used for umbilical test-port closeout process was found under the LH2 umbilical. No other debris was found beneath the umbilicals.

Typical amount of tile damage occurred on the base heat shield. All SSME Dome Heat Shield closeout blankets were in good condition.

There were a total of 13 hits, with 4 having one dimension greater than 1-inch, on the window perimeter tiles. Hazing and streaking of forward-facing Orbiter windows appears to be less than normal.

A 1-1/2 inch diameter by 1/4 inch deep tile damage was noted on the +Z side of the body flap, underneath SSME #3.

The post-landing walkdown of Runway 15 was performed immediately after landing. All components of the drag chute were recovered and appeared to have functioned normally.

In summary, the total number of Orbiter TPS debris hits and the number of hits 1-inch or larger were within established family. The potential identification of debris damage sources for mission STS-108 will be based on the laboratory analysis of Orbiter post landing microchemical samples, inspection of the recovered SRB components, film analysis, and aerodynamic debris particle trajectory analysis. The results of these analyses will be documented in the STS-108 Debris/Ice/TPS Assessment and Integrated Photographic Analysis report.

Armando Oliu  
NASA - KSC

STEP 150-1

STS - 108

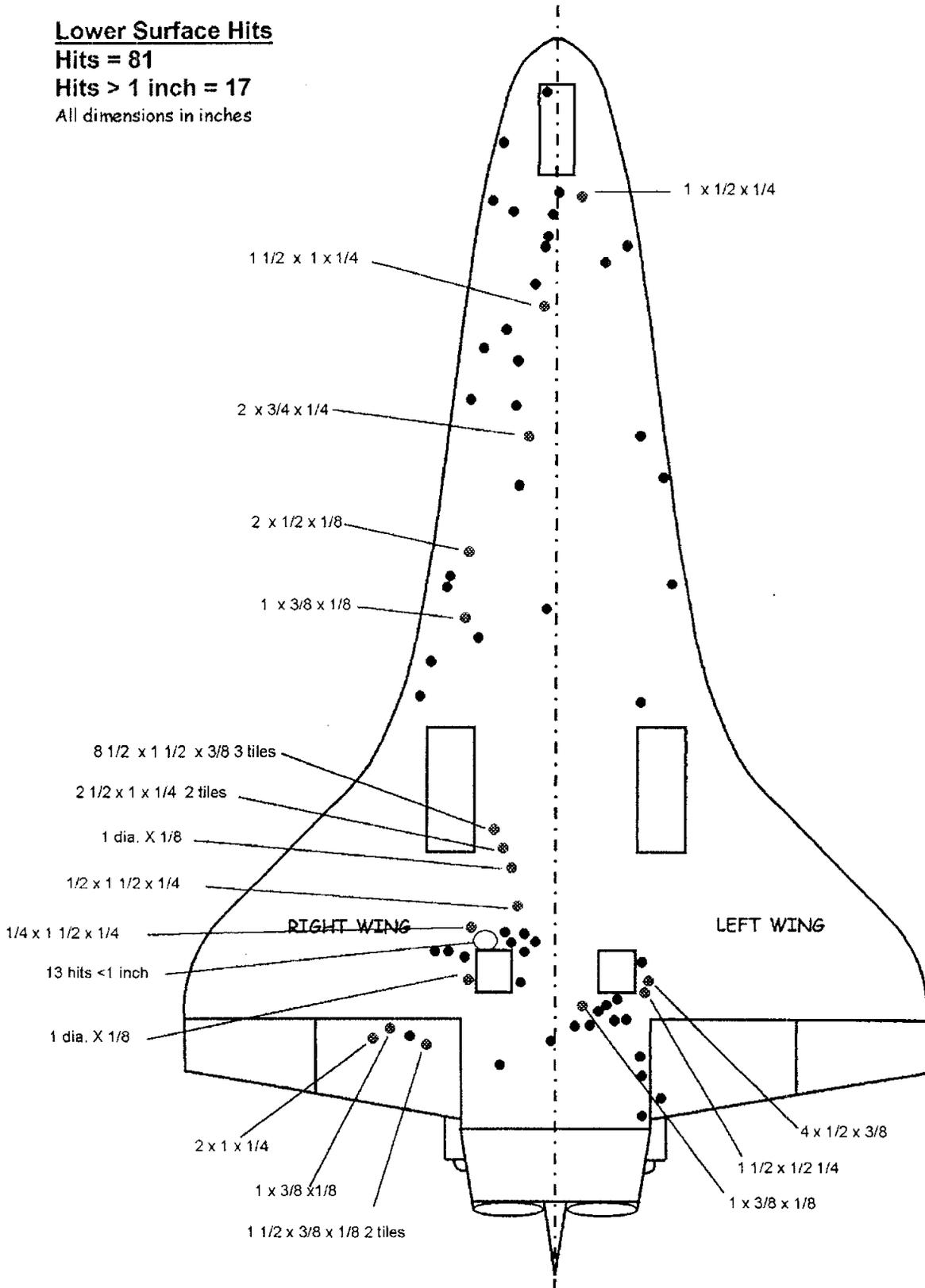
# DEBRIS DAMAGE LOCATIONS

## Lower Surface Hits

Hits = 81

Hits > 1 inch = 17

All dimensions in inches



ET  
01

12/18/01

STEP 150-1

STS - 108

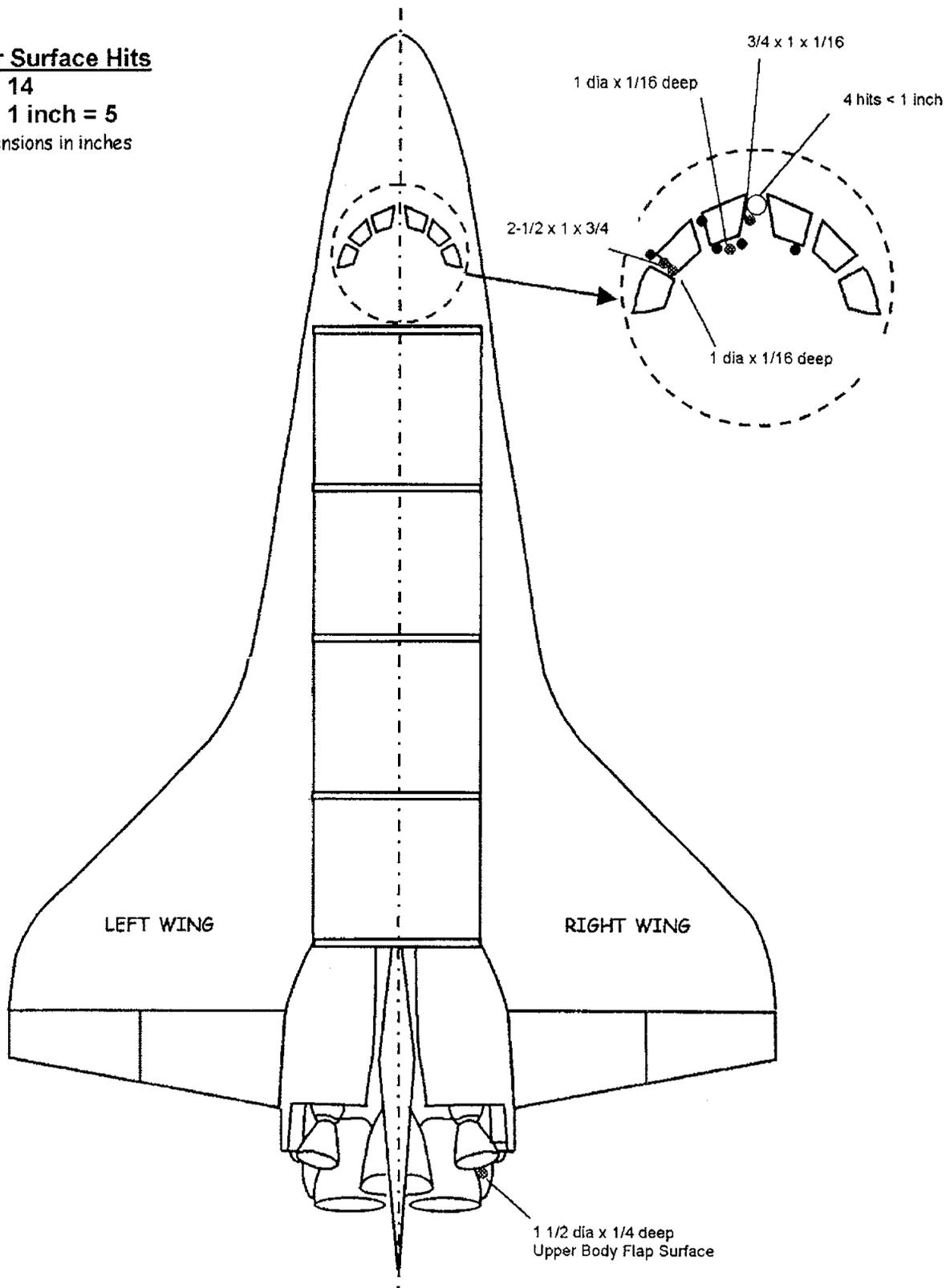
# DEBRIS DAMAGE LOCATIONS

## Upper Surface Hits

Hits = 14

Hits > 1 inch = 5

All dimensions in inches



ET

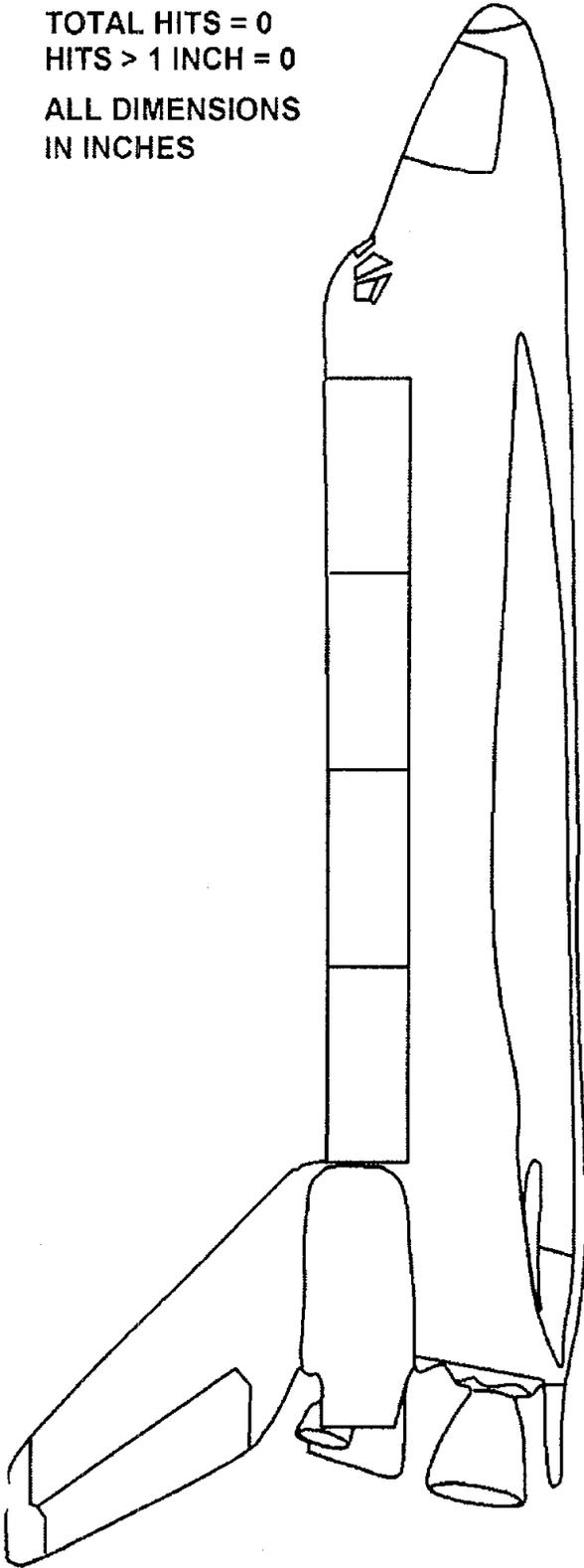
12/13/01

STEP 150-1

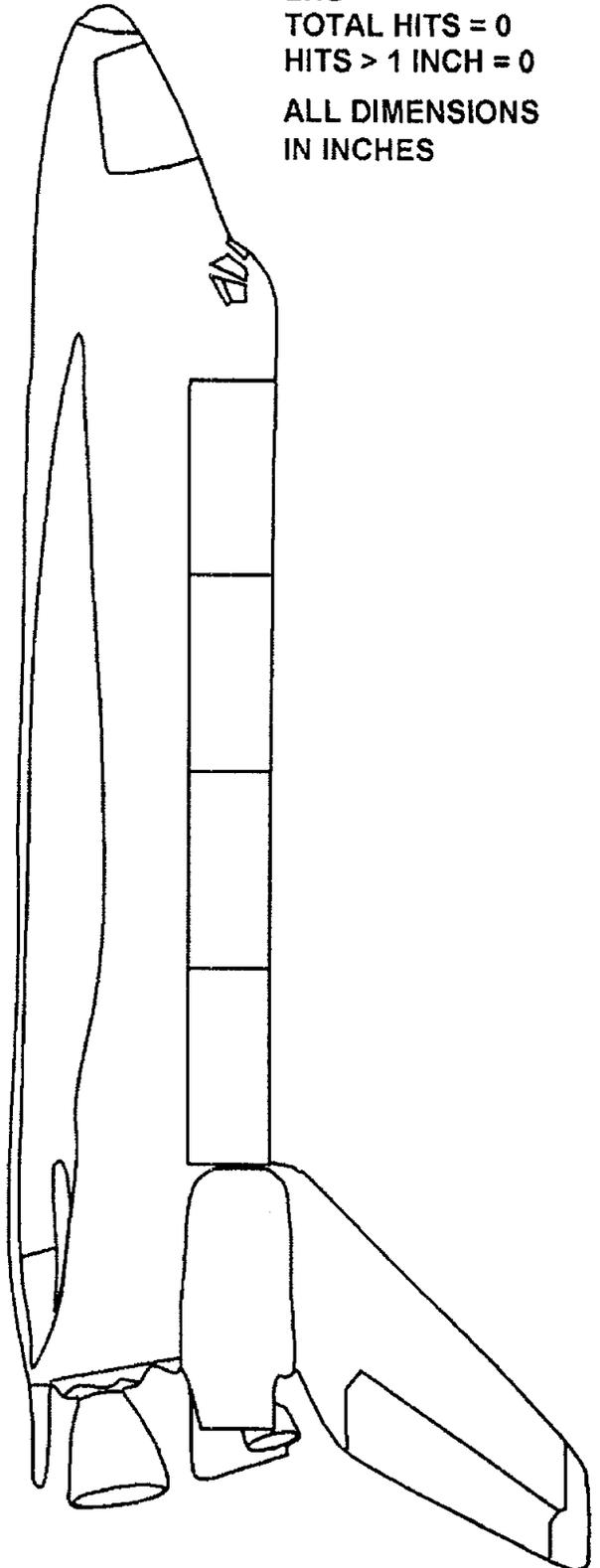
STS - 108

# DEBRIS DAMAGE LOCATIONS

RHS  
TOTAL HITS = 0  
HITS > 1 INCH = 0  
ALL DIMENSIONS  
IN INCHES



LHS  
TOTAL HITS = 0  
HITS > 1 INCH = 0  
ALL DIMENSIONS  
IN INCHES



STEP 150-1

## STS-108 EXTERNAL TANK (ET-111) FILM SCREENING REPORT

### Handheld External Tank (ET) Photo Products

The 35mm handheld film and the Camcorder video of the ET were not acquired on STS-108 because of darkness.

### 16mm Umbilical Well Camera Films

The LSRB separation appeared normal on the two 16mm umbilical well camera films. Similar to previous missions, numerous light-colored pieces of debris (insulation) and dark debris (charred insulation) were seen throughout the SRB separation film sequence. Typical ablation and charring of the ET/Orbiter LH2 umbilical electric cable tray and the aft surface of the -Y upper strut fairing were seen prior to SRB separation. Numerous irregularly shaped pieces of debris (charred insulation) were noted near the base of the LSRB electric cable tray prior to SRB separation. Pieces of TPS were seen detaching from the aft surface of the horizontal section of the -Y ET vertical strut. The amount of ablation of the TPS on the aft dome was typical of previous flights. The left SRB nose cap was visible during SRB separation.

The ET separation from the Orbiter was too dark for analysis on the 16 mm umbilical well camera films due to the nighttime conditions. However, for short periods, some portions of the aft end of the ET could be seen from the light coming from the RCS thruster firings. No anomalous conditions were noted.

The film quality of both of the 16 mm umbilical well camera films was good during the SRB separation sequence. Timing data was present on the 16mm umbilical well camera films.

### 35mm Umbilical Well Camera Film

The ET separation from the Orbiter was not imaged on the 35 mm umbilical well camera films due to darkness.

Jon Disler  
JSC Image Science and Analysis Group  
Human Exploration Science Office/ SX3-LM

```

*****
* PROGRAM PRA120 SELECTION CRITERIA *
* ----- *
* RPT TYPE: IPR *
* PR GROUP: *
* WORK AREA CD: *
* PR ELEM CD: *
* STS NO: *
* Starting RPT DT: 12/04/01 *
* Ending RPT DT: 01/11/02 *
* LRU or Non-LRU: B *
* PRACA EFF CD: *
* EICN: *
* RPT STATUS: OP *
* DETECTED DURING: S6444 *
* ----- *
* Sorted by DETECTED DURING, PR ELEM CD, and EICN *
*****

```

DATE: 01/14/02 12:49  
REPORT CODE: PRA1200A

PROBLEM REPORTING AND CORRECTIVE ACTION SYSTEM  
PROBLEMS BY DETECTED DURING

PAGE: 1

DETECTED DURING: S6444 FILM REVIEW-STS105  
WORK AREA CD: PAD-A  
WORK AREA LOC:  
WORK AREA ZONE:  
PART PROG NO:  
PART PROG NM:  
FUNCT CRIT:  
HM CRIT:  
SERIAL REV NO:  
REPL SER NO:  
TECH ACPT DT:  
TECH STAMP:  
GOVT STAMP:  
GOVT CD:  
CONTR STAMP:  
CONTR CD:  
VALIDATOR ID/NM:  
VALIDATOR DT:

RPT NO: IV-6-381703  
CONSTRAINTS: YES  
CONSTRAINTS TO: S0007V12  
HAZARD OP CD:  
HAZARD OP:  
QTY/UNITS: 0  
RPTED BY ID/NM: T08011 SEALE, RANDALL D  
RPT BY ORG/DEPT: USA 53910  
RPTED BY PH: 1321)861-3348  
RPT DT/TM: 12/10/01 09.01  
DATA CODE:  
FSCN NO/NM:  
NHA PN TDID:  
RSPRL ORG:  
RC ACTION REQ: ETM  
RC CONSTRAINT TO:  
RC CONSTRAINT DT:  
RC CONSTR ID/NM:  
RC CLOSURE ID/NM:  
RC CLOSURE DT:  
RC CLOSURE ID/NM:  
RC CLOSURE DT:

EICN: PADA-2209  
STS EFF:  
WORK UNIT CD:  
ENG CHNG REQ:  
HR REQ:  
HEIGHT REQ:  
RETEST REQ:  
TIME CYCLE:  
CRIT SKILLS:  
FRACTURE CRIT:  
SOFTWARE PROB DT/TM:  
SYS RESTD DT:  
SYS REST ID/NM:  
TPD CAUSE:

000 G GSE

RELATED RPTS:  
DESCRIPTION: ITEM PAGE

1 1  
POST LAUNCH FILM ANALYSIS OF FILM E-18 SHOWS A CYLINDRICAL SHAPED OBJECT  
COMING INTO VIEW AT 21:10:15.643 GMT BEST ESTIMATE OF OBJECT IS THAT IT  
IS A 3" L X .75" DIA FACILITY BOLT

\*\*\*\*\*  
\* TOTAL ELEMENTS DETECTED DURING: S6444 FILM REVIEW-STS105 = 1 \*  
\* TOTAL DETECTED DURING FOR THIS REPORT = 1 \*  
\*\*\*\*\*

\*\*\*\*\*  
\* \*  
\* END OF REPORT \*  
\* \*  
\*\*\*\*\*

QC NOTE,  
PADA-2209 WAS FOR STS-105. OV-105  
STS-108 LAUNCH OFF OF PAD B. (206)







**TOP/WAD Deviation**

Dev No. 50-01 DILS No. 92714<sup>9</sup> Page 1 of 1

TOP/WAD No. <b>S6444</b>	REV/CHG/VER <b>J02</b>	<input type="checkbox"/> In Family <input type="checkbox"/> Out of Family <input checked="" type="checkbox"/> NMA	Cause Code Org (B,D,E,G,H,I,N,O,P,Q,S,T,V) <b>E</b>	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite <b>20</b>
First Use <input type="checkbox"/> SRB BI- <input type="checkbox"/> ET <input type="checkbox"/> GSE <input checked="" type="checkbox"/> STS-108	Effectivity: <input type="checkbox"/> ORB /FLT <input type="checkbox"/> FRCS/POD /FLT <input type="checkbox"/> SSME /FLT			
Affected: <input type="checkbox"/> OMRS/ACOMC/OMP <input type="checkbox"/> Design Req'ts <input type="checkbox"/> Haz Step(s) <input type="checkbox"/> PPE			<input checked="" type="checkbox"/> Internal Review Req.	
Contractor OPR <i>R. Seale 11/15/01</i>	Contractor Test Conductor <i>John K. Anderson 11/15/01</i>	Gov't OPR <i>PH-42 11-15-01</i>		
Contractor Test Project Engineer <i>Z.W. Anderson 11-16-01</i>	Other <i>SF check 11/15/01</i>	Gov't Project Engineer <i>11/16/01</i>		
Contractor Safety	Other <i>11/15/01</i>	Gov't Test Director or Contractor Chief TC <i>11/16/01</i>		

Page Number: 50-10 Step Number: 50-19

Add Note and Step 50-19-1:

**NOTE**

Ref: NSTS 16007 (LI) NSTS Program Launch Commit Criteria - Hazardous Gas Subsystem Appendix F - Ice Launch Commit Criteria defines "No-Go Conditions".

50-19-1 CICE CTIF 222

Verify there are no Ice Launch Commit Criteria "No-Go Conditions" being violated.

ETM: \_\_\_\_\_ Date \_\_\_\_\_

Reason: Provide positive verification that LCC have not been violated.

Originator (print) R. Seale	SPDMS ID T08011	Phone 1-3348	Organization ETM	Date 11/14/01	<input checked="" type="checkbox"/> Perm <input type="checkbox"/> Term <input type="checkbox"/> Temp-Recycle
--------------------------------	--------------------	-----------------	---------------------	------------------	-----------------------------------------------------------------------------------------------------------------

