

STS-100

*2868407 * 4-2-01

USA
VM
047

PROCESSING OPERATIONS CONTROL OMI PLANNING SHEET



Wad Number S6444-J01-R01	SITE LCC	Elem CD V	End Item 105 FLT: 016	DATE: 04/03/2001 TIME: 13:01:43
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Title: SSV ICE AND DEBRIS ASSESSMENT	Sub Element/Zone 30
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Project Work Order No.	Hazard: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	SFOC Safety N/A TOTAL BOOK	WC 126 USA	<input type="checkbox"/> Local Copy <input checked="" type="checkbox"/> Firing Room Copy
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Authorizing Document ORB516-120(ADD)	Material & Equipment: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	MICR Req'd <input type="checkbox"/> Yes <input type="checkbox"/> No	APR 3 '01	OMRS: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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PERFORM THE FOLLOWING:

Pre-Ops Setups

Task	Operation Number	Seq	Steps	Task	Operation Number	Seq	Steps

CVAS	TIPS	ME	TACCS
USA VM 048	USA VM 048	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			090	
	020			100	
	030			110	
	040			120	
	050			130	
	060			140	
	070			150	
	080				

<p>Post Ops</p> <table border="1"> <thead> <tr> <th>Task</th> <th>Operation Number</th> <th>Seq</th> <th>Steps</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Task	Operation Number	Seq	Steps					<p>Appendices</p> <table border="1"> <thead> <tr> <th>Task</th> <th>Seq</th> </tr> </thead> <tbody> <tr> <td>N/A</td> <td></td> </tr> </tbody> </table>	Task	Seq	N/A	
Task	Operation Number	Seq	Steps										
Task	Seq												
N/A													

Subtask WAD's

N/A

Planner LISA RUTKOWSKI	WC 126 USA APR 3 '01	Ext 0746	QC Closure	Date MAY 17 '01	Page 1 OF 1
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2nd Review

SPC 780

MAY 17 '01

USA VM 047

USA VM 070

USA
VM
047

PROCESSING OPERATIONS CONTROL OMI PLANNING SHEET



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PERFORM THE FOLLOWING:

Pre-Ops Setups

Task	Operation Number	Seq	Steps	Task	Operation Number	Seq	Steps

CVAS	TIPS	ME	TACCS
USA VM 057	USA VM 046	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			090	
	020			100	
	030			110	
	040			120	
	050			130	
	060			140	
	070			150	
	080				

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

Subtask WAD's

N/A

Planner LISA RUTKOWSKI	WC 12G USA APR 3 '01	Ext 0746	QC Closure	Date MAY 17 '01	Page 1 OF 1
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2nd Review

SPC 790

MAY 17 '01

USA
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OMI TASK CLOSEOUT CHECKLIST

OMI No. <i>56444 J-1</i>	Run No. <i>1</i>	Task Control No. (TCN) <i>2868407-F/R</i>
Start Date <i>4/16/01</i>	Completion Date <i>5/11/01</i>	Closure Date MAY 17 '01 <i>5/14/01</i> (SFC 436)
		QC/Eng. Date
1. Deviation Index: Verify total number of deviations agree with index. Verify entry is correct into OMI.		<div style="border: 1px solid black; padding: 2px; display: inline-block;">ET 01</div> <i>5/14/01</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. Seale ETM 5/14/01</i>		N/A
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.		<div style="border: 1px solid black; border-radius: 50%; padding: 2px; display: inline-block;">SFC 436</div> <i>MAY 17 '01</i>
4. Verify that material and equipment requirement list enclosed (if applicable).		N/A
5. OMI: Verify that all pages or verification sheets are completed, stamped, and dated in the lower left/right hand corners.		<div style="border: 1px solid black; padding: 2px; display: inline-block;">ET 01</div> <div style="border: 1px solid black; border-radius: 50%; padding: 2px; display: inline-block; margin-top: 2px;">SFC 436</div> <i>5/14/01</i>
6. OMI: Verify that all miscellaneous documents/procedures have sequence number referenced and stamped; e.g., photos, sample results, etc.		<div style="border: 1px solid black; padding: 2px; display: inline-block;">ET 01</div> <i>5/14/01</i>
7. Planned task/OMI satisfactorily completed. OPR: <i>R. Seale ETM 5/14/01</i>		<div style="border: 1px solid black; padding: 2px; display: inline-block;">ET 01</div> <i>5/14/01</i>
8. LSS review prior to closure for CIL OMI's. MMC <u> <i>NA</i> </u> Thiokol <u> <i>NA</i> </u>		

SFC 436
 MAY 17 '01
 * Dated
 Remarked by

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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 stated 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 LH₂/LO₂ low level sensors dry).
9. Hands-on investigation required for all ET-TPS defects suspected of violating NSTS 08303 ice/debris inspection criteria.

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10. From time launch scrub is declared until 1.5 hours past time LH₂/LO₂ 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 LO₂/LH₂ 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 H₂ leak or O₂ 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
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
150	Final Report	SE/ NA	ETM	N	0.5

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2.0 SAFETY INFORMATION

2.1 Hazards

Operation

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

2.2 Safety Requirements

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 Procedure

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

3.2.8 Personal Protective Equipment

OPERATION 30	Nomenclature safety harness lanyard
OPERATION 80	Nomenclature safety harness lanyard Nomex coveralls with gloves and hoods ELSA
OPERATION 120	Nomenclature safety harness lanyard hardhats flame retardant coveralls
OPERATION 130	Nomenclature safety harness lanyard hardhats flame retardant coveralls

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4.0 PLANNING REQUIREMENTS

OIR Required Yes [], No [X]

4.3 LPS Requirements

4.3.1 Computer Systems

PC GOAL
CCMS Configuration
CDS
CMS

GSE Links/HIMs

Link	FEP	Location	HIM	Octal Addr	Function
------	-----	----------	-----	------------	----------

DPS Configuration

OPS Mode - ____
Dedicated DEU/DDU - ____

Vehicle Links and Formats

Link	FEP	Freq	Downlink	Downlist
------	-----	------	----------	----------

Control Room Consoles Required

SDC/RTIF Configuration

RPS Configuration

Link	Freq	Element	Downlink Format
------	------	---------	-----------------

ESA monitors/hot spares

CCS Configuration

Link	FEP	Location	HIM	Octal Addr	Function
------	-----	----------	-----	------------	----------

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CCS Consoles Required

4.4 Support Services, Commodities, and Equipment

4.4.2 Communications

(Per controlling OMI S0007, S0014 or S0037)

Voice Recording:

Radio nets:

Paging:

Area warning:

Portable radios (loan pool):

<u>Type</u>	<u>Qty</u>	<u>Net/Freq</u>	<u>Record</u>	<u>Duration/Purpose</u>
-------------	------------	-----------------	---------------	-------------------------

Portable OIS units:

Special communications:

4.4.3 OTV

(Per controlling OMI S0007, S0014 or S0037)

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

OTV Monitor:

Special OTV requirements:

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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 ₂	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	60-012 70-012
S00FB0.350 (1)	MONITOR GO2 VENT HOOD VAF1-90	50-021
S00FB0.360 (1)	MONITOR ET/ORB MPS FOR LEAKAGE VAF1-90	70-012
S00L00.150	HIGH WIND ET NOSE INSPECTION SAF;C	50-018 60-012
S00U00.010 (1)	POST LAUNCH SHUTTLE/PAD AREA INSPECTION SAF1-999	130-002
S00U00.011 (1)	ENGR REVIEW & ANALYSIS OF LAUNCH FILM SAF1-999	150-002
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

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

OPERATION 30

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

OPERATION 40

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

OPERATION 50

Reference No.	Rev	Title
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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MPR 18 01
See 10-3
Dev.
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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] PH-H Z
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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, GO₂ 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

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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

R. Brewer Date 04-18-01

ETM

R. Brewer Date 04-18-01

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

Table 30-1 Photo Requirements for SSV and Launch Pad Configuration			
Photos from MLP			
<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
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 ₂	Vertical	35-70 mm	Flash needed
TSM T-0 LO ₂	Vertical	35-70 mm	Flash needed
Orbiter Left & Right Wing	Vertical	35-70 mm	From below ET (1 Photo each wing)

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135 Ft Level Photos

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LO ₂ UMB	Vertical	35-70 mm	From OWP usually during T5401
LH ₂ 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 ₂ 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 ₂ vent ducts in view	Vertical	35-70 mm	
GO ₂ vent ducts	Horizontal	250 mm	

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

*** End of Operation 30 ***

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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 Connect to KSC ground ops network and **configure** laptop computer to perform photo processing/ analysis.

Notes Logitech TRACKBALL DRIVER NOT WORKING MUST USE TOUCH PAD.

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: FUNCTION NOMINALLY

CS 2: FUNCTION NOMINALLY

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

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

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.

ET
01

4/18/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

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 _____

ME
TG

Date

4-19-01

Not Performed: NA

40-5 CVM1 JTV1 223

Position 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, 070/170, and 071/171 to initial positions as defined in Table 40-2.

ETM _____

ME
TG

Date

4-19-01

Not Performed: NA

Table 40-1 ET Pre-Mapping Data		Tape #
OTV Camera	Start Time (GMT)	Stop Time (GMT)
004 / 104	22:39	22:45
009 / 109	22:46	22:50
013 / 113	22:51	22:52
033 / 133	22:54	22:55
042 / 142	22:56	22:59
054 / 154	22:59	23:01
055 / 155	23:02	23:04
056 / 156	23:04	23:07
060 / 160	23:08	23:10
061 / 161	22:30	22:38
062 / 162	23:11	23:12
063 / 163	23:12	23:18
064 / 164	23:18	23:21
065 / 165	23:22	23:23
066 / 166	23:24 00:01	00:04
067 / 167	08:35	08:37

ET
01

4/19/01

VOID -

Notes: 18:15 HRS: RSS STILL EXTENDED - CAMERA 004 - SUN SPOTS/SHADOWS -
 CAMERA 009 - SUN SPOTS - CAMERA 013 - VERY LIMITED RANGE, RSS IN VIEW -
 CAMERA 042, SUN SPOTS/SHADOWS - CAMERA 054, SPOTS/SHADOWS - CAMERA 056,
 SPOTS/SHADOWS - CAMERA 062, SPOTS/SHADOWS - CAMERA 063 - SPOTS/SHADOWS -

ET
01

4/19/01

Table 40-2 OTV Camera Initial Positions	
OTV Camera	Initial Position
004 / 104	FOV centered on GUCP
009 / 109	FOV on LH ₂ 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 ₂ Vent Louver area.
033 / 133	FOV perpendicular to ET and with LO ₂ -to-Intertank splice at frame top and LH ₂ -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 ₂ pipeline flange / LH ₂ AFT DOME.
056 / 156	FOV with LH ₂ Aft Dome in frame bottom and XT2058 in view at frame top.
060 / 160	Full zoom in. View SW GO ₂ Vent Louver area.
- 061 / 161	Full zoom-in. Adjust FOV until ET LO ₂ -to-Intertank splice is centered vertically and view is perpendicular to ET. Pan right until edge of the ET comes into view. Note: LO ₂ Tank may pass out-of-view. ALT: G V DUCTS
062 / 162	Full zoom in. View NW GO ₂ Vent Louver area.
063 / 163	FOV on LH ₂ Umbilical including ET/Orbiter interface. Vary close-up and wide angle views with 009/109 and 064/164.
064 / 164	FOV on LH ₂ 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 ₂ Aft Dome.
- 066 / 166	FOV perpendicular to ET with LO ₂ -to-Intertank splice at frame top. Then tilt down until Orbiter RH Wing/SRB intersection is in frame lower right. ALT: GVH VIEW
- 067 / 167	Set FOV with LH ₂ Aft Dome toward frame bottom and 2 nd black ring of SRB in view. ALT: GUCP 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.

ME
10

4/19/01

ME
10 4/19/01

ME
10 4/19/01

ME
10 4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

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

ETM

ME
10

 Date 4-19-01

*** End of Operation 40 ***

ET
01

4-19-01

01-15-2001
APPROVED

OMI S6444 J01
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: NA

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 100, S6444 run 1. Request TBC notify CMQC that the ROR-as-CMQC option will be exercised for STS 100, S6444 run 1.

50-1

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

50-2

CTC	TBC	232
TBC	CTIF	136

Perform OTV and ice/frost monitoring area setups.

ETM _____  Date 4-19-01

50-3

CTIF	TBC	136
TBC	CTC	
CTC	STM	232

Verify Operation 10- Support Preparations complete.

ETM _____  Date 4-19-01

50-4

CTIF

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

ETM _____  Date 4-19-01



4/19/01

50-2

01-15-2001
APPROVED

OMI S6444 J01
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 _____

ME
10

Date 4-19-01

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 _____

ME
10

Date 4-19-01

Support: COMM

50-3

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

50-7

CTIF TBC 136
TBC CTC 232

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

ETM _____

ME
10

 Date 4/19/01

Not Performed: NA

50-8

WC 013 USA
APR 9 01
Dev. 50
No. 01
WC 013 USA
APR 9 01

CTIF CVM1 222

From start of LO₂ chilldown until seal deflation/GO₂ vent hood retraction, **monitor** the +Y/-Y GO₂ vent seal-to-ET interface for seal fretting and continuous GO₂ escape.

OMRS S00FBO.350-1

ETM _____

ME
10

 Date 4-19-01

Not Performed: NA

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

NOTE

GO₂ vent seal fretting could induce damage to ET SOFI. Continuous GO₂ 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 GO₂ vent seal fretting or continuous GO₂ escape detected from start of LO₂ chilldown until seal deflation, **notify** CMEC for GO₂ vent hood removal.

ETM N/A Date N/A

Not Performed:

ET
01

4/19/01

50-10

CTIF CIPC 222

Monitor wind speed and direction from start of LO₂/LH₂ 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 ME Date 4-19-01

ME
10

Not Performed: NA

WC
013
USA
APR 9 01
Dev. 50
No. 01
See Dev.

ET
01

4/19/01

50-5

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

50-11

CTIF CVM1 222

Perform Operation 60 - Group 1 Monitoring.

ETM

ME
10

 Date 4-19-01

Not Performed: NA

50-12

CTIF CVM2 222

Perform Operation 70- Group 2 Monitoring.

ETM

ME
10

 Date 4-19-01

Not Performed: NA

50-13

CTIF CVM2 222

Once per hour minimum, after start of LO₂/LH₂ (until LO₂/LH₂ low level sensors read dry), scan LO₂ feed line brackets and flange closeouts per Table 50-1.

ETM

ME
10

 Date 4-19-01

Not Performed: NA

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

50-14

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 _____

ME
10

Date

4-19-01

Not Performed: NA

50-15

TBC CTIF 136
CTIF CICE 222

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

ETM _____

ME
10

Date

4-19-01

Not Performed: NA

50-7

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

NOTE

Final SSV scan typically commences at L-2 hours.

50-16

CTIF CVM1 222
CVM2

Perform final SSV scan.

ETM R Bower Date 04-19-01

Not Performed: N/A

50-17

CTIF CVM1 222
CVM2

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

ETM R Bower Date 04-19-01

Not Performed: N/A

ET
01

4/19/01

50-8

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

50-18

WC 013 USA APR 9 01 Dev. 50 No. 01 WC 013 USA APR 9 01

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

1. Monitor/videotape nose cone area during high winds.
2. Verify:
 - A. No ice formation on the +Y and -Y GO₂ vent seal footprint areas.
 - B. No damage to the ET TPS at the +Y and -Y GO₂ vent seal footprint areas.
 - C. No damage to the +Y and -Y GO₂ vent seals themselves.
 - D. No evidence of GO₂ leakage from +Y/-Y GO₂ vent seals to ET interface.

OMRSD S00L00.150

USA VM 070

ETM R Brewer Date 04-19-01

Not Performed: N/A

WC 013 USA APR 9 01 Dev. 50 No. 01 See Dev. 50-19

ET 01

4/19/01

CTIF

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

Launch Scrub N/A

Date 04-19-01 GMT Time 18:40:42 GMT

Scrub at T- N/A

ETM R Brewer Date 04-19-01

50-9

ET 01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

NOTE

When completely filled and drain is initiated, it takes approximately 1 hour until the LH₂ tank low level sensors read dry, and approximately 1.5 hours until the LO₂ tank low level sensors read dry.

50-20

CTIF CVM1 222
CVM2

If launch scrubbed (or drain back declared) after start of LO₂/LH₂ slow fill mode:

- **Perform** Operation 90 - LO₂/LH₂ 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

4-19-01

50-21 CTIF

GO₂ Vent seal to ET interface monitoring for seal fretting and continuous GO₂ escape complete.

OMRSD S00FB0.350-1

USA
VINT
070

ETM

ET
01

 Date 04-19-01

Not Performed: N/A

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

50-22

CTIF CVM1 222
CVM2

Terminate scanning operations.

ETM A. Seale Date 4/19/01

50-23

CTIF CVM1 222
CVM2

Perform Operation 100 - Console Securing.

ETM A. Seale Date 4/19/01

50-24

CTIF

If LO₂/LH₂ tanking started, perform Operation 110 - Summary
Tape.

ETM A. Seale Date 4/19/01

Not Performed: N/A

50-11

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

NOTE

Following step may be not performed at CTIF discretion.

50-25 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

4/19/01

NOTE

Post drain walkdown typically commences approximately 1.5 hours after LH₂/LO₂ low level sensors read dry.

50-26

CTIF

If launch scrubbed after start of LO₂/LH₂ tanking, **perform** Operation 120 - Post-Drain Walkdown.

ETM N/A Date N/A

Not Performed:

ET
01

4/19/01

50-27

CTIF

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

ETM R. Seave Date 4/19/01

Not Performed: N/A

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

50-28

CTIF

If launch occurred, **perform** Operation 140 - Film Review.

ETM *D. Seala* Date 5/11/01

Not Performed: N/A

50-29

SSV Debris Assessment complete.

50-13

ET
01
5/11/01

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
(SEE "TROUBLE TAPE RELOADING				
LOG STS-100 50007				
DATE: 04-19-01")				
P. Sewell Bin 4/19/01				

ET
01
4/19/01

TROUBLE TAPE RECORDING LOG

STS-100 S0007

DATE: 04-19-01

TABLE 50-1

TAPE NO.	CAM. NO.	START TIME (GMT)	STOP TIME (GMT)	DESCRIPTION OF ANOMALY/CONDITION
TT#1	54	09:43	09:45	LO2 FEEDLINE SCAN
	54	10:39	10:41	LO2 FEEDLINE SCAN
	54	11:37	11:42	LO2 FEEDLINE SCAN
	54			LO2 FEEDLINE SCAN
	61	12:20	12:28	Fast LO2 O-give (-Y SIDE) ↳ CONTINUE SCANNING
	61	12:31	12:32	Fast MONITOR
	54	12:34	12:40	LO2 FEEDLINE SCAN
	54	12:52	13:01	MONITOR TROUBLE BASE OF STRET VERTICAL SRB CABLE TRAY
	61	13:16	13:17	MONITOR WAIL ON VERT RIM
	54 33	13:35	13:37	LO2 FEEDLINE SCAN
	54	13:44	13:49	FIT FOD CONTROL
	61	13:56	13:57	

COX VENT DUCTS - NORTH DUCT FREE OF
SMALL ICE/FROST PARTICLES THAT WERE
PRESENT ON PREVIOUS VIEWS (13:16 GMT)

Notes:

- ET 108
- ORB 105
- SRB B1107
- MLP 1
- PAD A



TROUBLE TAPE RECORDING LOG

STS-100 S0007

DATE: 04-19-01

TABLE 50-1

TAPE NO.	CAM. NO.	START TIME (GMT)	STOP TIME (GMT)	DESCRIPTION OF ANOMALY/CONDITION
TT#1	54	09:43	09:45	LO2 FEEDLINE SCAN
	54	10:39	10:41	LO2 FEEDLINE SCAN
	54	11:37	11:42	LO2 FEEDLINE SCAN
	54			LO2 FEEDLINE SCAN
	61	12:20	12:28	Fast LO2 Ogive (-Y SIDE) CONTINUE SCANNING
	61	12:31	12:32	Frost MONITOR
	54	12:34	12:40	LO2 FEEDLINE SCAN
	54	12:57	13:01	MONITOR FROST BALW BASE OF STRUCT VERTICAL STRUCT SRB CABLE T7A7
	61	13:16	13:17	MONITOR MAIL ON VENT RIM
	54 33	13:35	13:37	LO2 FEEDLINE SCAN
	54	13:44	13:47	FIT FOD CONTROL
	61	13:56	13:57	COX VENT DUCTS - NORTH OUTF FREE OF SMALL ICE/FROST PARTICLES THAT WERE PRESENT ON PREVIOUS VIEWS (13:16 GMT)

Notes:

- ET 108
- ORB 105
- SRB B1107
- MLP 1
- PAD A

PAGE NO. 1/2

4/19/01

ET
01

TROUBLE TAPE RECORDING LOG

STS-100 S0007

DATE: 04-19-01

TABLE 50-1

TAPE NO.	CAM. NO.	START TIME (GMT)	STOP TIME (GMT)	DESCRIPTION OF ANOMALY/CONDITION
TT#1	54	14:34	14:37	LO2 FEEDLINE SCAN
	54	15:32	15:34	" " "
	54	16:40	16:42	LO2 FEEDLINE SCAN
	61	17:03	17:05	CRACK @ -Y VERT. SLOT CLOSEOUT
	54	17:49	17:51	LO2 FEEDLINE SCAN
	68/69	18:37		SCALD DE FLATE
	60/62			FOOT PR
	187/179		18:44	MASK SELECT - CAMERA VIEW

Notes:

- ET 108
- ORB 105
- SRB B1107
- MLP 1
- PAD A

PAGE NO. 2/2

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____ (NO OBSERVATIONS)

Observed By: _____ (DOCUMENTED)

Date _____ Time _____ GMT R. Seab

Camera No. (or Walkdown) _____

ETM
5/11/01

Description:

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

ET
01

5/11/01

01-15-2001
APPROVED

OMI S6444 J01
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.):

N/A

CICE _____ Date _____

CTIF _____ Date _____

01-15-2001
APPROVED

OMI S6444 J01
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:

N/A

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

01-15-2001
APPROVED

OMI S6444 J01
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:

N/A

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

ET
01

3/11/01

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:

N/A

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

01-15-2001
APPROVED

OMI S6444 J01
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:

_____ N/A _____

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

ET
01
5/11/01

01-15-2001
APPROVED

OMI S6444 J01
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:

N/A

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

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



01-15-2001
APPROVED

OMI S6444 J01
APPROVED

OPERATION 60 Group 1 Monitoring LO2 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 LO₂ Chill Down commences.

Operation Not Performed: MA

NOTE

This operation monitors LO₂ 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 GO₂ Vent Hood Seal at all times. At no time will both cameras be positioned away from the -Y GO₂ Vent Hood Seal.

OTV cameras 068/168 and 069/169 view SW and NE GO₂ 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.

~~Noted requirements satisfied by completion of this operation.~~

~~OMRS S00FB0.005-1~~

~~OMRS S00L00.150-1~~

WC 013 USA APR 9 01
Dev 60
No. 01
WC 013 USA APR 9 01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

LO₂ Chill Down To L-2 Hour Mark

60-1 CVM1 JYVR 138

At start of vehicle LO₂ 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 Tom Ford Date 4.19.01

Support: COMM

60-2 Record LO₂ MPS Chill Down start date and time (GMT).

LO₂ MPS Chill Down Date * 4.19.01
09:16 GMT Time 09:16 GMT

ETM ⁰ Tom Ford Date 4.19.01

60-3 CVM1 JTV1 223

From start of LO₂ Chill Down until start of LO₂ 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 Tom Ford Date 4.19.01

Support: COMM

Not Performed: N/A

* See ETM 4/19/01

ET
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4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

60-4 Record LO₂ Slow Fill start date and time (GMT).

LO₂ Slow-Fill Date 4-19-01 GMT Time 09:52 GMT

ETM Tom Ford Date 4-19-01

Not Performed: N/A

60-5 Record LO₂ Fast Fill start date and time (GMT).

LO₂ Fast Fill Date 4-19-01 GMT Time 10:05 GMT

ETM Tom Ford Date 4-19-01

Not Performed: N/A

60-6 CVM1 JTV1 223

From start of LO₂ Fast Fill until LO₂ 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** LO₂ Tank. **Alternate** cameras and **scan** from Intertank to LO₂ Barrel Splice to GO₂ Vent Hood. No cryogenic liquid or excessive vapors allowed.

ETM

ME
08

 Date 4-19-01

Support: COMM

Not Performed: N/A

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

60-7 Record LO₂ Topping date and time (GMT).

LO₂ Topping Date 4-19-01 GMT Time 11:35 GMT

ETM

ME
OB

 Date 4-19-01

Not Performed: N/A

60-8 Record LO₂ Stable Replenish mode start date and time (GMT).

LO₂ Stable Replenish Date 4-19-01 GMT Time 12:06 GMT

ETM

ME
OB

 Date 4-19-01

Not Performed: N/A

60-9 CVM1 JTV1 223

From time LO₂ 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

ME
OB

 Date 4-19-01

Support: COMM

Not Performed: N/A

ET
01

4/19/01

56 55 54 62 04 06 03 01

01-15-2001
APPROVED

OMI S6444 J01
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

ET
01

 Date 4/19/01

Not Performed: N/A

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
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. Seale Date 4/19/01

Not Performed: N/A

WC 013 USA
Dev. 60
No. 01
APR 9 01

~~60-12 Completion of this operation satisfies noted OMRS requirements.~~

USA
VM
070

~~OMRSD-S00FB0.005-1~~

~~OMRSD-S00L00.150~~

ETM _____ Date _____

60-13 Operation - Group 1 Monitoring - LO₂ Chill Down Thru T-0 complete.

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

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 GO₂ 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, LO₂ 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.

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

Table 60-1 CVM1 Camera Positions for Terminal Count

013/113

At T-2m30s, watch lift of GO₂ vent arm for debris and nose cone/vent louvers for ice damage. Immediately following lift of GO₂ vent arm, center frame on GO₂ 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 GO₂ vent arm retracts, go full zoom in for a close-up inspection of the GO₂ 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 GO₂ vent arm retracts, go full zoom in for a close-up inspection of the -Y GO₂ 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 GO₂ 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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4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

OPERATION 70 Group 2 Monitoring - LH₂ 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 LH₂ Chill Down.

Operation Not Performed: NA

NOTE

This operation monitors LH₂ Barrel and associated components/areas start of LH₂ 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.

~~Noted requirements satisfied by completion of this operation.~~

~~OMRS S00FB0.005-1~~

~~OMRS S00FB0.360-1~~

WC 013 USA
APR 9 '01
70
WC 013 USA
APR 9 '01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

LH₂ Chill Down To L-2 Hour Mark

70-1 CVM2 JYVR 138

At start of LH₂ Chill Down, **start** recorders for cameras 009/109, 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167.

ETM _____

ME
10

 Date 4-19-01

Support: COMM

70-2 Record LH₂ Chill Down start date and time (GMT).

LH₂ Chill Down Date 4-19-01 Time 0919 GMT

ETM _____

ME
10

 Date 4-19-01

70-3 CVM2 JTV2 225

From start of propellant loading until start of LH₂ 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 _____

ME
10

 Date 4-19-01

Support: COMM

Not Performed: NA

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

70-4 Record LH₂ Slow Fill start date and time (GMT).

LH₂ Slow Fill Date 4/19/01 Time 10:05 GMT

ETM

ME
10

 Date 4/19/01

Not Performed: NA

70-5 Record LH₂ Fast Fill start date and time (GMT).

LH₂ Fast Fill Date 4-19-01 Time 10:05 GMT

ETM

ME
10

 Date 4-19-01

Not Performed: NA

70-6 CVM2 JTV2 225

From start of LH₂ Fast Fill until stable replenish mode is established, scan LH₂ Tank. Alternate OTV cameras 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167 and scan/videotape from LH₂ Aft Dome to Intertank.

ETM

ME
10

 Date 4-19-01

Support: COMM.

Not Performed: NA

70-3

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4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

70-7

Record start date and time (GMT) for LH₂ Topping.

LH₂ Topping Date 4-19-01 Time 11:18 GMT

ETM _____  Date 4-19-01

Not Performed: NA

70-8 Record LH₂ Stable Replenish mode start date and time (GMT).

 4-19-01 NOT RECORDED PER S0007.
LH₂ Stable Replenish Date _____ Time _____ GMT

ETM _____  Date 4-19-01

Not Performed: NA

70-9 CVM2 JTV2 225

During LH₂ 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 LO₂ Feed Line, LH₂ Feed Line, LH₂ Recirculation Line, LH₂ Aft Dome and manhole covers, LH₂/LO₂ Umbilicals, and TSM LH₂/LO₂ Umbilicals. No cryogenic liquid or excessive vapors allowed.

ETM _____  Date 4-19-01

Support: COMM

Not Performed: NA



4/19/01

01-15-2001
APPROVED

OMI S6444 J01
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 R Brewer Date 04-19-01

Support: COMM

Not Performed: N/A

01-15-2001
APPROVED

OMI S6444 J01
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 Brewer Date 04-19-01

Not Performed: _____

VC 313
USA
APR 9 01
Dev. 70
WC 013
USA
APR 9 01

70-12 Completion of this operation satisfies noted OMRS requirements.

~~OMRSD-S00FB0.005-1~~

~~OMRSD-S00FB0.360-1~~

070
VM
USA

ETM _____ Date _____

70-13 Operation - Group 2 Monitoring - LH₂ Chill Down Thru T-0 complete.

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4/14/01

01-15-2001
APPROVED

OMI S6444 J01
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.

01-15-2001
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OMI S6444 J01
APPROVED

Group 2 Camera Positions Are Defined As Follows:

033/133

Full zoom out. LO₂ 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 LO₂ 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 LH₂ umbilical with -Y vertical strut at frame top.

061/161

At approximately **T-1m30s**, tilt-up to GO₂ 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 ***

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OMI S6444 J01
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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 LO₂/LH₂ 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: NA

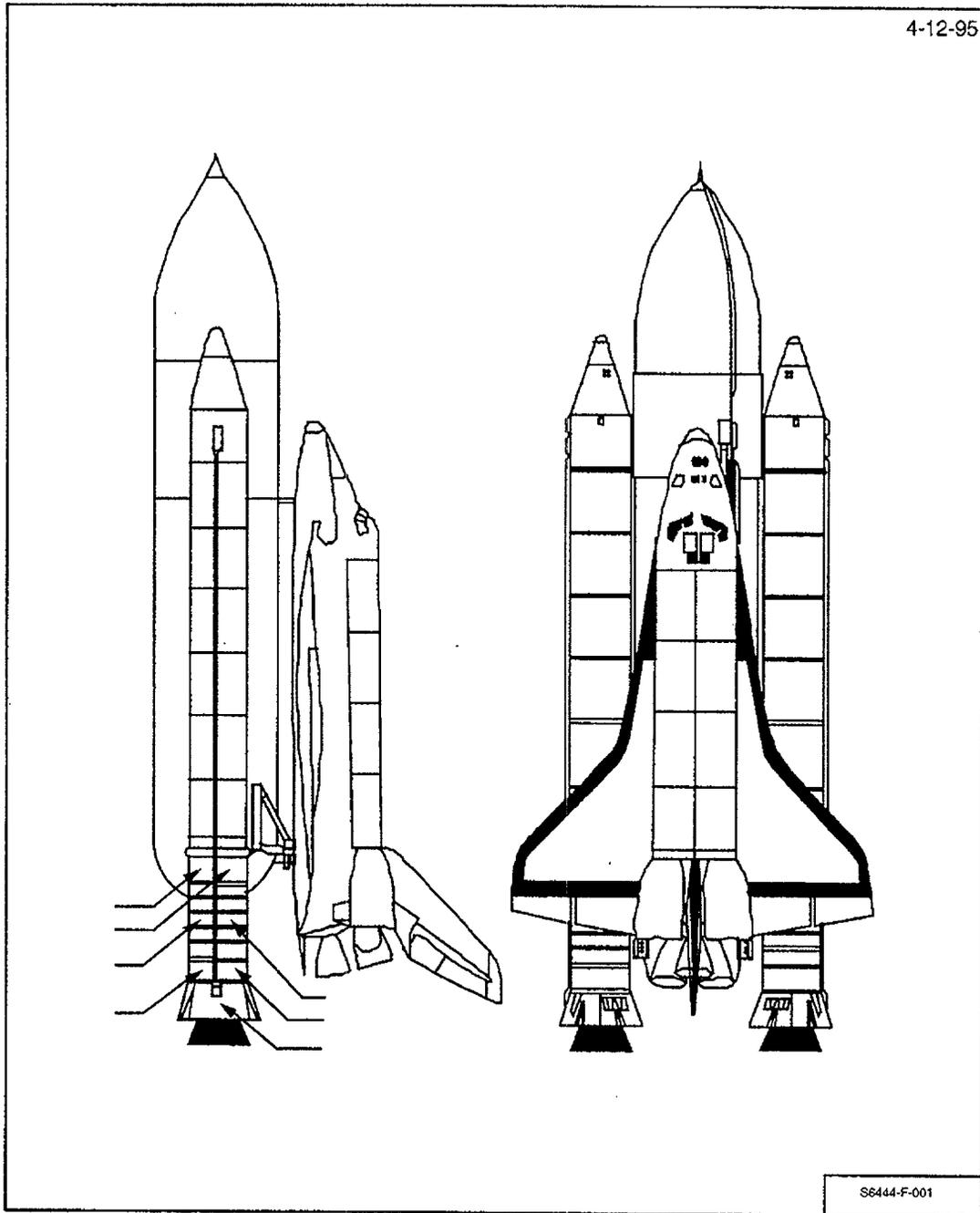


Figure 80-1: Deck (0) Level
(For Reference Only)

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4/19/01

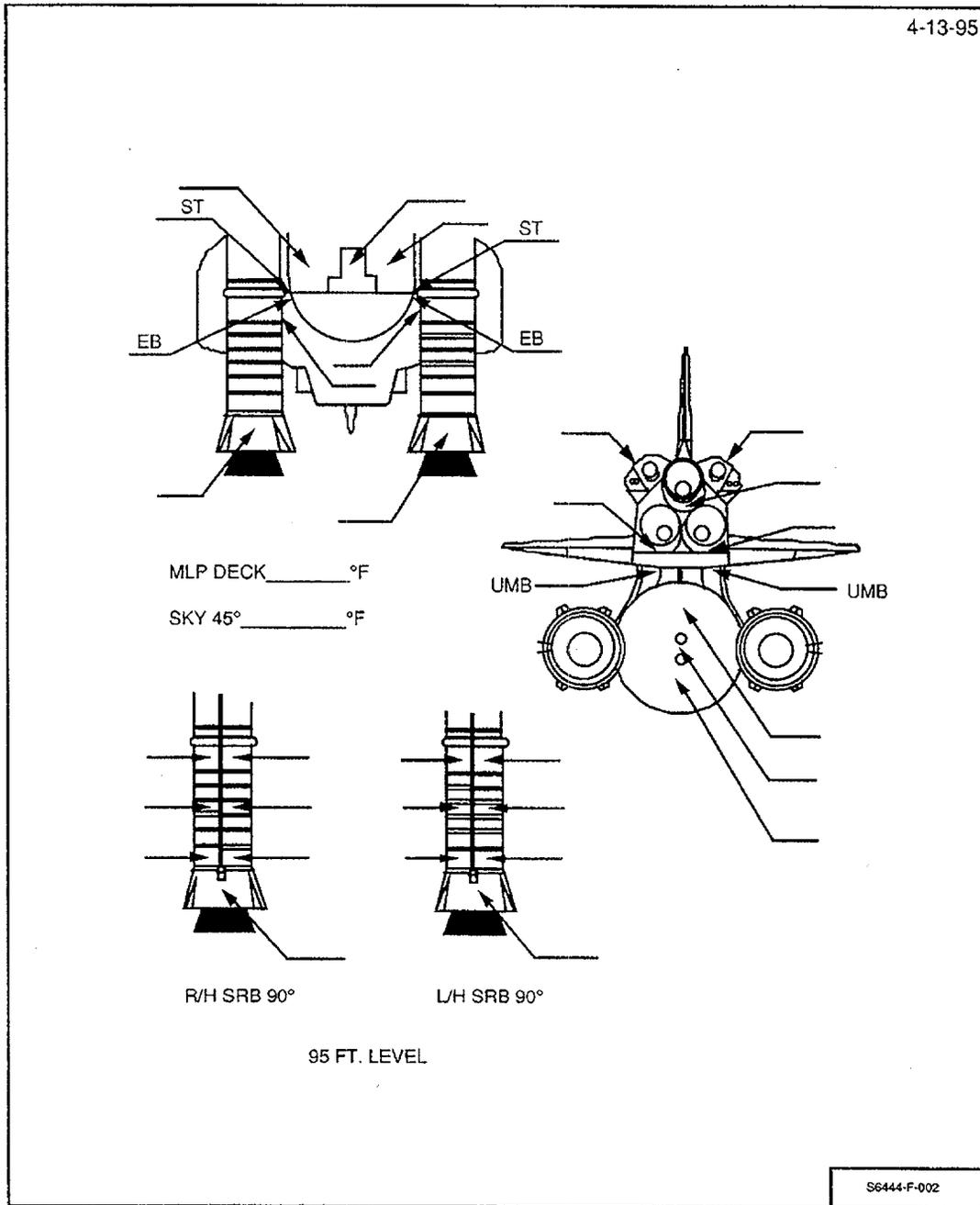


Figure 80-2: Deck (0) and 95 Ft Levels
(For Reference Only)

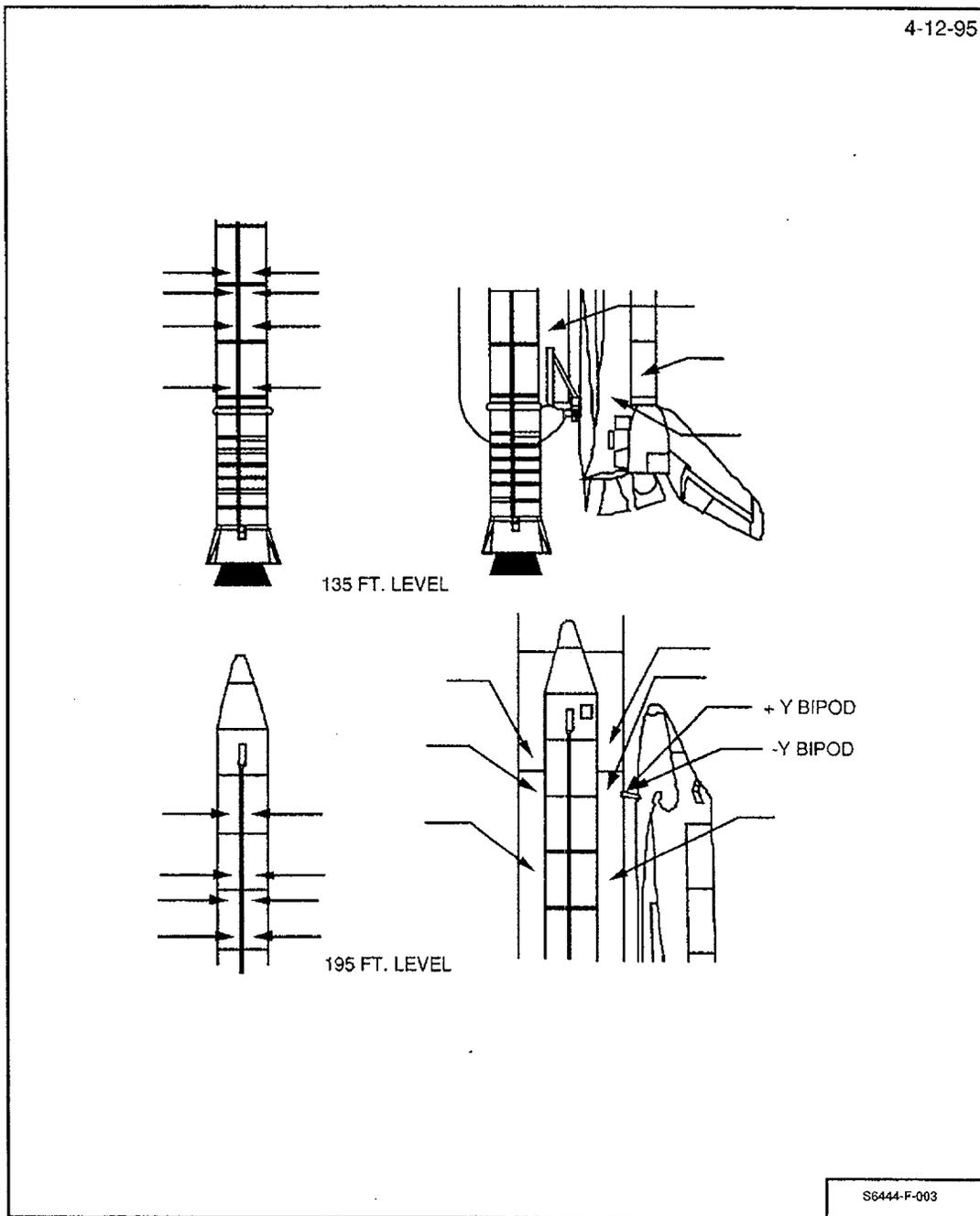


Figure 80-3: 135 and 195 Ft Levels
(For Reference Only)

ET
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4/19/01

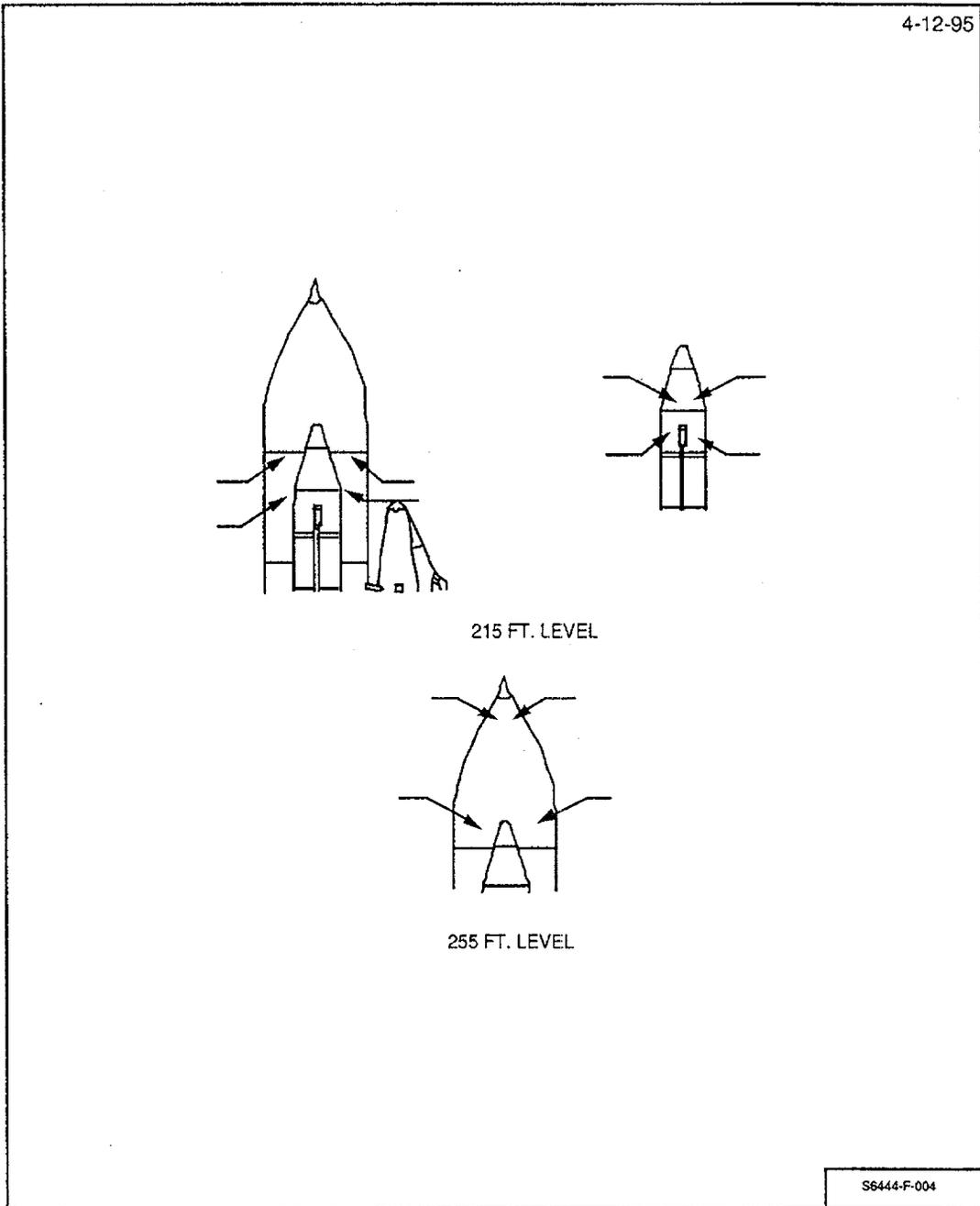


Figure 80-4: 215 and 255 Ft Levels
(For Reference Only)

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 O₂).

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

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-N

Work order No. E107

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.

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

OMRSD S00U00.020-C-1

OMRSD S00U00.020-D-1

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

TTL (PH-H) *James Ali* Date 4/19/01

SFOC-ETM Tom Ford Date 4/19/01

80-4 Operation - Final Inspection complete.

ETM *D. Seale* Date 4/19/01

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01-15-2001
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Table 80-1 Final Inspection Team Walkdown Stay Times

255 Ft Level - 5 Minutes

- LO₂ Ogive and Barrel acreage
- GO₂ Pressurization Line
- LO₂ Tank Cable Tray
- Visible LH SRB surfaces
- GO₂ Vent Ducts

215 Ft Level - 20 Minutes

- ET GH₂ 7 inch Vent Assembly
- ET acreage (between -Z and -Y axis)
- GO₂ vent area
- Orbiter tiles
- Visible SRB surfaces
- Inter tank-to-LO₂ Barrel splice

195 Ft Level - 10 Minutes

- LO₂ 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 (LO₂ and LH₂)
- ET acreage (between -Y and +Z axis)
- Orbiter tiles
- Visible LH SRB surfaces

135 Ft Level - 10 Minutes

- LH₂ ET/Orbiter Umbilical
- -Y ET/SRB C/T
- -Y Vertical Strut
- LO₂ Feed Line
- ET acreage between -Y axis and +Z axis
- ET/Orbiter attachments (top view)
- Visible LH SRB surfaces
- Orbiter aft fuselage

01-15-2001
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OMI S6444 J01
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Table 80-1 Final Inspection Team Walkdown Stay Times

0 Level - 30 Minutes

- LH₂ Aft Dome
- ET acreage around +Z axis
- ET acreage around -Z axis
- LO₂ Feed Line
- LH₂ Feed Line
- ET/Orbiter attachments - Bottom view
- ET/Orbiter LH₂ and LO₂ Umbilicals
- T-0 LH₂ and LO₂ 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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4/19/01

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APPROVED

OMI S6444 J01
APPROVED

Table 80-2 Final Inspection Team - Telephotos

TELEPHOTOS - 255 FT LVL

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

TELEPHOTOS - 215 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Notes</u>
-Y Bipod Ramp	Horizontal	From RSS
LO ₂ P/L Ice Frost Ramps	Vertical	From RSS; Requires 3-4 shots
GO ₂ 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 ₂ UMB	Horizontal	
-Y Longeron	Vertical	If needed
Jack Pad Closeouts	Horizontal	
LH ₂ Acreage	Vertical	

01-15-2001
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OMI S6444 J01
APPROVED

Table 80-2 Final Inspection Team - Telephotos

TELEPHOTOS - MLP

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

600 MM PHOTOS - 255 FT LVL

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

ET
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4/19/01

01-15-2001
APPROVED

OMI S6444 J01
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Table 80-2 Final Inspection Team - Telephotos

600 MM PHOTOS - 215 FT LVL

<u>Photo</u>	<u>Shutter Speed</u>	<u>Notes</u>
-Y GO ₂ -Seal	1/30	
-Y Bipod Ramp	1/30	Contingency
Jack Pad C/O's	1/4	Difficult if windy
LO ₂ 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 ₂ UMB	1/30	
-Y Vertical Strut (Crack)	1/60	
LO ₂ F/L Bellows	1/15	Contingency

01-15-2001
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OMI S6444 J01
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Table 80-2 Final Inspection Team - Telephotos

600 MM PHOTOS - MLP

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

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Table 80-2 Final Inspection Team - Telephotos

WIDE ANGLE PHOTOS - 255 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LO ₂ Tank	Vertical	35-70 mm	
GO ₂ 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 ₂ 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 ₂ Tank	Vertical	35-70 mm	
Bipod, -Y, +Z Intertank Area	Horizontal	35-70 mm	

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Table 80-2 Final Inspection Team - Telephotos

WIDE ANGLE PHOTOS - 135 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
Orbiter Aft Section	Vertical	35-70 mm	
Lower LH ₂ 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 ₂ T-0; RCS Stinger	Horizontal	35-70 mm	
+Z Side of LO ₂ T-); RCS Stinger OMS Nozzle	Horizontal	35-70 mm	
-Z Side of LH ₂ T-0; RCS Stinger	Horizontal	35-70 mm	
+Z Side of LH ₂ 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	

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Table 80-2 Final Inspection Team - Telephotos

Overall SSME Cluster	Horizontal	50 mm	+Y Side
LO ₂ UMB Area	Horizontal	35-70 mm	
LH ₂ UMB Area	Horizontal	35-70 mm	
ET/ORB UMB & ORB Lower Surface	Horizontal	28 mm	From under ET

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

01-15-2001
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APPROVED

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 ₂ 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 ₂ P/L Ice/Frost Ramps	Vertical	TELE	From RSS; 2 photos required
GO ₂ 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	

ET
01
4/19/03

Table 80-3 Reduced Final Inspection Team Photos

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 135 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LH ₂ 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 ₂ UMB	Horizontal	TELE	From West
ET Aft Dome	Horizontal	TELE	
Aft Hard Point Closeout	Vertical	TELE	
LH ₂ Tank	Horizontal	TELE	From North
LO ₂ Tank	Horizontal	TELE	From North
LO ₂ Tank	Horizontal	TELE	From East
LO ₂ F/L Bracket Bellows	Horizontal	TELE	XT - 1978 & XT - 1973
LO ₂ F/L Bracket	Horizontal	TELE	XT - 1871
LO ₂ F/L Bracket	Horizontal	TELE	XT - 1623
LO ₂ F/L Brackets	Horizontal	TELE	XT - 1377 & XT - 1129
LO ₂ F/L Brackets & Bellows	Horizontal	TELE	XT - 1129 & XT - 1108; from SE
LO ₂ 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	

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APPROVED

Table 80-3 Reduced Final Inspection Team Photos

Overall SSME Cluster +Y Side	Horizontal	28 mm	
ET/Orb UMB & Orbiter Lower Surface	Horizontal	28 mm	From under ET

*** End of Table 80-3 - Reduced Final Inspection Team Photos ***

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

ET
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4/19/01

01-15-2001
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OMI S6444 J01
APPROVED

OPERATION 90 LO₂/LH₂ 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 (LO₂/LH₂) loading and subsequent launch scrub, FRF, or WCDDT.

Operation Not Performed:

ET
01

4/19/01

NOTE

This operation monitors the External Tank external surfaces during LO₂/LH₂ drain operations from time of detanking until 1.5 hours after LO₂/LH₂ 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 LH₂ and LO₂ Tank Drain.

LH₂ Drain Start Date N/A Time N/A GMT

LO₂ Drain Start Date N/A Time N/A GMT

ETM N/A Date N/A

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

90-2 CVM1 JTV1 223

From start of LO₂ Tank Drain and LH₂ Tank Drain until respective LO₂/LH₂ low level sensors read dry, **monitor** ET external surfaces including LO₂ Feed Line, LH₂ Feed Line, LH₂ Recirculation Line, LH₂ Aft Dome and manhole covers, LH₂/LO₂ Umbilicals, TSM LH₂/LO₂ Umbilicals via OTV cameras. No cryogenic liquid or excessive vapors allowed.

ETM _____ Date _____

Support: COMM

90-3 Record date/time (GMT) when LO₂/LH₂ low level sensors read dry.

LH₂ Sensors Dry Date _____ Time _____ GMT

LO₂ Sensors Dry ~~Date~~ _____ Time _____ GMT

ETM _____ Date _____

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

90-4 CVM1 JTV1 223

Monitor ET external surfaces including LO₂ Feed Line, LH₂ Feed Line, LH₂ Recirculation Line, LH₂ Aft Dome and manhole covers, LH₂/LO₂ Umbilicals, TSM LH₂/LO₂ Umbilicals via OTV cameras for 1.5 hours after LO₂/LH₂ low level sensors have read dry. No cryogenic liquid or excessive vapors allowed. Record date/time (GMT) when monitoring complete.

LH₂ Complete Date _____ Time _____ GMT

LO₂ Complete Date _____ Time _____ GMT

ETM _____ Date _____

Support: COMM

N/A

90-5 Completion of this operation satisfies noted requirements.

OMRSD S00E00.021 USA
0/0 VM

90-6 Operation - LO₂/LH₂ Drain Monitoring complete.

*** End of Operation 90 ***

90-3

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
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

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

NOTE

Perform next step only after a successful launch.

100-4

CTIF

Remove photo processing laptop computer from Firing Room.

Not Performed: N/A

100-5

CTIF	TBC	136
TBC	CTC	232

Firing Room 2, ice frost monitoring area securing complete.

100-6

Operation 100 - Console Securing complete.

ETM R. Seale Date 4/20/01

*** End of Operation 100 ***

ET
01

4/20/01

100-2

01-15-2001
APPROVED

OMI S6444 J01
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 A. Seale Date 4/19/01

*** End of Operation 110 ***

01-15-2001
APPROVED

OMI S6444 J01
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 (LH₂/LO₂) loading and subsequent launch scrub.

Operation Not Performed:

ET
01

4/19/01

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 LH₂/LO₂ 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.

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)

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120-2

4/19/01

01-15-2001
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OMI S6444 J01
APPROVED

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

PH-H _____ Date _____
N/A
ETM _____ Date _____

120-4 Operation Post Drain Walkdown complete.

*** End of Operation 120 ***

120-3

ET
01

4/19/01

01-15-2001
APPROVED

OMI S6444 J01
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)

01-15-2001
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OMI S6444 J01
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

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MPR 8 01
Dev 130
No. 01
See 4/19/01
Dev.
130-2
ET
01
4/19/01

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

USA
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070

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

PH-H *[Signature]* Date 4/19/01

ETM *[Signature]* Date 4/19/01

130-4 Operation - Post Launch Walkdown complete.

ET
01
4/19/01

01-15-2001
APPROVED

OMI S6444 J01
APPROVED

Table 130-1 Post Launch Walkdown Inspection Areas

Record mission info, PAD, date, and time:

STS 100

PAD A

Date 4/19/01

Time 1630-1915 HRS

SRB Hold-down posts (HDP)

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

(SEE "STS-100 POST LAUNCH PAD
DEBRIS INSPECTION REPORT"
INSERTED FOR STEP 50-1).

A. Sauer ETM #1 4/19/01

A. Sauer ETM
4/19/01

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)

01-15-2001
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OMI S6444 J01
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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 GO₂ 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 *****

01-15-2001
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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

140-1 ^{FOD} Review engineering films for FOD issues, launch anomalies, or other
^{ET} discrepancies.

140-2 Operation - Film Review complete.

ETM R. Seale Date 5/11/01

*** End of Operation 140 ***

01-15-2001
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OMI S6444 J01
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

WC 013 USA APR 9 01
Dev. 150
WC 013 USA APR 9 01

150-2 Final report assembly complete.

ETM A. Seale Date 5/11/01

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~~OMRSD S00U00.011-1~~

150-3 Operation - Final Report complete.

*** End of Operation 150 ***

*Pal WC 013 USA APR 9 01

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5/11/01

STEP 150-1 / 20-1

STS-100 PRE-LAUNCH PAD DEBRIS INSPECTION REPORT
KSC Debris Team
18 April 2001

The pre-launch inspection of the MLP-1, Pad A FSS and RSS was conducted on 18 April 2001 from 1515 to 1715 EST). No flight hardware issues / anomalies were detected.

Four facility items were documented in Appendix K of S0007VL4:

- Retainer pin on East egress flip platform on MLP 0-level missing a securing cotter pin.
- Both securing pins on the Southwest egress platform on MLP 0-level were missing the retainer feature.
- Three loose caps found on feed-through pipes adjacent to SSME and SRB exhaust holes at the MLP 0-level.
- Metal debris/slag found in web of horizontal beam FSS 255-foot level at Southeast corner.

All above items were in work by Pad crew at the conclusion of debris inspection.

Armando Oliu, NASA-KSC
Robert Speece, NASA-KSC
Abdi Khodadoust, Boeing-Huntington Beach

STEP 150-1 / TABLE 130-1

STS-100 POST LAUNCH PAD DEBRIS INSPECTION REPORT
KSC Debris Team
19 April 2001

The post launch inspection of the MLP-1, Pad A FSS and RSS was conducted on 19 April 2001 from Launch + 2 to 5 hours (1630 to 1915 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. Erosion was typical for the north posts. North holddown post blast covers and T-0 umbilicals exhibited typical exhaust plume damage. Both SRB aft skirt GN2 purge lines were intact, protective tape layering was partially eroded, but braids were not exposed.

The LO2 and LH2 Tail Service Masts (TSM) appeared undamaged and the LO2/LH2 bonnets were observed to have closed properly. The MLP deck was in generally good shape.

The GH2 vent line latched in the eighth of eight teeth of the latching mechanism. The deceleration cable failed to catch the spool weldment, no damage was noted. The GUCP 7-inch QD sealing surface exhibited no damage. A detached ID ("dog tag") metal was found around the GUCP purge QD's.

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

All slidewire baskets were secured in place. Basket # 3 had a missing caution sign that was found nearby on the 195 ft. level. Baskets # 5, 6 and 7 had damaged/missing guard rail bumpers.

The GOX vent arm, hood, ducts and structure appeared to be in good shape with no indications of plume damage.

Debris findings included:

- 4' x 1' section of deck grating lifted out of position on FSS 115 ft-level, east side.
- A piece (12 inches long) of rusted unistrut was found on FSS 155 ft-level.
- A broken 1/2 inch diameter bolt (1 inch long) was found at the pad surface near the elevator landing area.

The three grass fire areas east of the pad were inspected and no flight/facility debris was found.

Overall, damage to the pad appeared to be minimal. Minimal debris was noted on pad apron and FSS.

Jorge Rivera
Randall Seale

NASA-KSC
USA

STEP 150-1

STS-100 LAUNCH DAY VIDEO REVIEW
KSC Photo/Video Analysis Team
19 April 2001

Significant Anomalies

None

Minor Anomalies

None

Funnies

None

Observations

- Free burning hydrogen was visible near the orbiter base heat shield and base of vertical stabilizer. (OTV 070, 071, TV 7, 21).
- Numerous pieces of ice from the ET/ORB umbilical shook loose and contacted umbilical sill tiles, but no damage was detected (OTV 009, 063, 054).
- Nominal elevon movement was observed at SSME ignition.
- LH2 and LO2 T-0 umbilical disconnect was normal (OTV 049, 050).
- Small pieces of ice dislodged from ice/frost ball on aft side of the ET +Y vertical strut closeout (OTV 054).
- Several ice/frost particles observed falling aft from forward LOX feedline bellows. No evidence of contact with Orbiter lower surface (OTV 061).
- Four particles observed falling aft under the left hand wing. No evidence of contact with the Orbiter lower surface (OTV 009).

Notes

A total of 19 videos were made available for review. Review of long range tracking films is scheduled to begin Friday afternoon, April 20th, 2001.

Armando Oliu, NASA - KSC
Robert Speece, NASA - KSC
Abdi Khodadoust, Boeing - Huntington Beach
Thomas Wilson, Boeing - KSC

STEP 150-1

STS-100 POST LAUNCH FILM REVIEW
KSC Photo/Video Analysis Team
20 April 2001

Significant Anomalies
None

Minor Anomalies
None

Funnies
None

Observations

- Streaks/ashes were observed in the SSME plume (E-207, E-220, E-222).
- Small amount of free-burning GH2 was observed rising towards base of the vertical tail.
- Numerous pieces of SRB throat plug material and water trough baggie material ejected from the SRB exhaust hole; none were observed to contact the Orbiter lower surface (E-54, E-76, E-77).
- Body flap and elevon movement during ascent were typical (E-207, E-212, E-220).
- Base heat shield movement during SSME ignition was typical (E-76, E-77).
- Ice particles fell from ET/ORB umbilicals after lift-off. No impact to orbiter lower surface was noted (E-76, E-77).
- SRB separation appeared normal (E-207, E-212).
- Charring on the ET aft dome was typical.
- Forward RCS paper covers were observed falling aft over left hand and right hand wing upper surface during early ascent.

Notes

Review of launch pad high-speed films will continue on Saturday, April 21st 2001.

Armando Oliu, NASA - KSC
Robert Speece, NASA - KSC
Abdi Khodadoust, Boeing - Huntington Beach

STEP 150-1

STS-100 SRB POST FLIGHT/RETRIEVAL ASSESSMENT
KSC Debris Team
23 April 2001

The BI-107 Solid Rocket Boosters were inspected for debris damage and debris sources at CCAFS Hangar AF on 23 April 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.
- The forward skirts exhibited no debonds or missing TPS. RSS antennae were intact.
- 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. No indication of stud hang up was observed.

Armando Oliu
NASA - KSC

STEP 150-1

STS-100 POST LAUNCH FILM REVIEW
KSC Photo/Video Analysis Team
21 April 2001

SIGNIFICANT ANOMALIES

None.

MINOR ANOMALIES

None.

FUNNIES

None.

OBSERVATIONS

- No stud hang up, or ordnance fragments, were observed on any of the SRB hold-down posts.
- Particles observed falling from +Z side of the body flap during SSME startup(UTC 18:40:38.663). This is possibly tile surface coating material from body flap upper surface. (E-5, E-20)
- Three ice particles from forward LO2 feedline bellows were observed falling aft. Due to the easterly winds, the particles moved across the vehicle and fell outboard of the -Y ET thrust strut. No contact with the Orbiter lower surface was noted. (E-40, E-57)
- Loose tie-wrap was observed inside LH2 TSM after T-0 while door was closing. (E-22)
- Small amount of free-burning GH2 was observed rising towards base of the vertical tail. (E-18, E-57, E-62)
- Several ice particles fell from ET/ORB umbilical during SSME ignition, none of the particles contacted the vehicle. (E-1, E-4, E-5, E-9, E-12, E-16, E-31, E-36, E-60, E-62)
- Vapors on ET aft dome and SRB stiffener rings were observed after T-0.(E-1, E-2, E-3, E-4, E-5, E-40, E-57, E-59, E-62)
- Ice particles fell from LH2 / LO2 TSM T-0 disconnects. (E-19, E-20, E-21, E-22)
- Tile surface coating material was lost from several tiles on the Orbiter base heat shield. This is a common occurrence due to SSME ignition acoustics. (E-17, E-18, E-19)
- Numerous pieces of SRB throat plug and water trough baggie material ejected from the SRB exhaust holes. (E-4, E-7, E-8, E-10)

NOTES

All delivered launch films have been reviewed.

Armando Oliu, NASA - KSC
Jorge Rivera, NASA - KSC
Tom Wilson, Boeing-KSC
Abdi Khodadoust, Boeing-Huntington Beach

STEP 150-1

STS-100 POST LAUNCH FILM REVIEW
KSC Photo/Video Analysis Team
27 April 2001

Due to the flexing of the TPS on the LH OMS Pod (LP04) on STS-100 we have gone back and reviewed films E-17 and E-18 on the previous 20 launches to determine if any movement was present in those launches. The 20 previous launches gave a wide variety of launch times and lighting conditions. The results are as follows:

Of the 40 launch films reviewed (2 cameras per launch), 7 of them gave no data:

- Both sides on STS-89 due to under exposure.
- LH side (E-18) on STS-90 due to moisture on lens.
- LH side (E-18) on STS-90 due to under exposure.
- Both sides on STS-99 due to sunshine glare on lenses.
- RH side (E-17) on STS-97 due to excessive camera shake.

Movement was noted on two previous launches:

1. Slight movement noticed on both the LH (LP05) and RH (RH05) OMS pod on STS-94.
2. Slight movement noticed on the LH (LP03) OMS pod on STS-98.

Movement was also seen on the RH OMS Pod (RP01) on STS-100.

The movements noticed on STS-94, STS-98, and the RH OMS Pod on STS-100 were of significantly less magnitude than that of the LH OMS Pod on STS-100.

Armando Oliu
NASA - KSC

STEP 150-1

STS-100 ORBITER POST LANDING INSPECTION
Debris Assessment
1 May 2001

A preliminary post landing inspection of OV-105 Endeavour was conducted at the Edwards Air Force Base Runway 22.

The Orbiter lower surface sustained 42 total hits, of which 4 had a major dimension of one inch or larger. The majority of the lower surface damage sites occurred on the right-hand wing glove. Impacts in this area are most likely from LO2 feedline ice/frost or foam debris.

Although the number of hits on the left-hand side were less than the right-hand side, the largest lower surface tile damage site was located on the left-hand wing glove forward of the main gear door. This shallow damage site measured 2.5-inches long by 1-inch wide by 0.125-inch deep, and is probably the result of impact by low density foam material.

The OMS pods and vertical tail tiles appeared from ground level to have a typical amount of damage. No unusual tile damage or evidence of tile movement, as seen in lift-off films E-17 and -18, was observed on the OMS pods. However, a 4-inch long segment of gap filler material was protruding from the left-hand OMS pod side-wall tiles by approximately 0.5-inch.

A segment of Ames gap filler, located just aft of the nose gear wheel well, was protruding 0.5-inches. There was no indication of entry heating or tile damage. A second Ames gap filler from an unknown source and showing signs of entry heating was found on the runway, to the left of the Orbiter approximately 10 feet outboard from the Orbiter wing glove.

This is the third flight using the forward up-firing RCS jet plumes to help protect the windows from BSM particulate impingement during SRB separation. Hazing on windows 3 and 4 appeared to be greater than observed for the first two flights with the windows protection system. Quantitative evaluation of the window hazing will be provided through optical testing at KSC.

An AFRSI blanket was slightly de-bonded and protruding from the area immediately aft of the forward-firing jets in the forward RCS group.

In addition to hazing on windows 3 and 4, streaks on the forward windows were observed and are the result of impacts from the RTV adhesive used on the forward RCS paper covers. Damage to the perimeter tiles on the forward facing windows was typical and is also attributed to impacts by the RTV adhesive.

The main landing gear tires were reported to be in typical condition for landing on a concrete runway. Ply under-cutting was observed on the outboard edges of both left-hand main gear tires.

ET/Orbiter separation devices EO-1, EO-2, and EO-3 were reported to have functioned normally. The EO-2 and EO-3 fitting retainer springs appeared to be in nominal configuration. No debris was found beneath the umbilicals.

STEP 150-J

There was less than usual tile damage on the Orbiter base heat shield. The SSME Dome Heat Shield closeout blankets were in good condition. Slight fraying was observed on SSME #3 from the 10 to 12 o'clock position. Two possible damage sites on the body flap upper surface tiles adjacent to the body flap stub, measuring approximately 3-inches by 3-inches, may have been failed repairs.

A post landing walk-down of the runway was performed by the rollout measurement team and no flight hardware was found. All components of the drag chute were recovered and appeared to have functioned normally. Both reefing and line cutter pyrotechnic devices were expended.

The Orbiter post landing assessment will continue in the MDD after towing and safing operations have been completed.

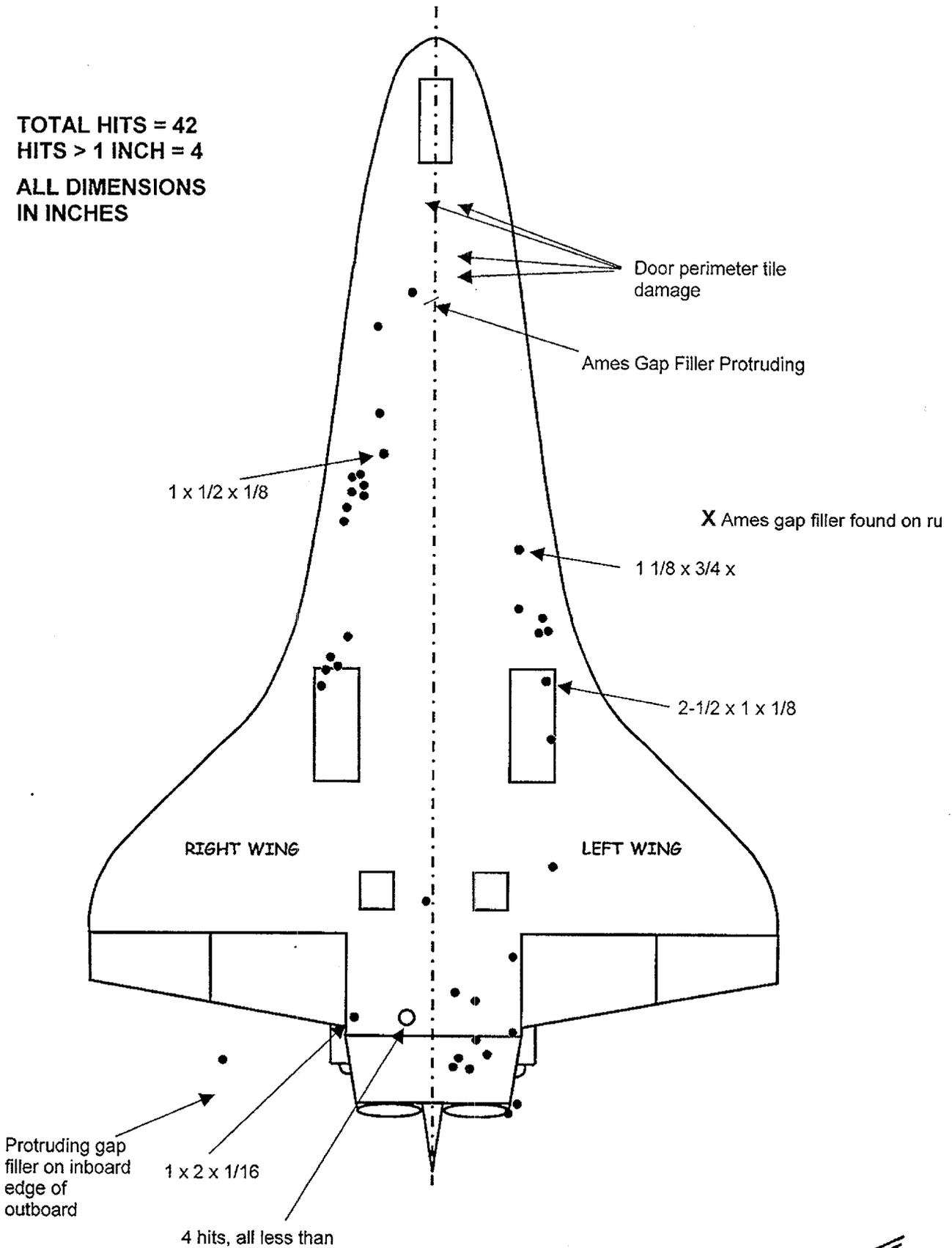
Jeff Stone
Boeing/Huntington Beach

Jack McClymonds
Boeing/Huntington Beach

Abdi Khodadoust
Boeing/Huntington Beach

STEP 150-J

TOTAL HITS = 42
HITS > 1 INCH = 4
ALL DIMENSIONS
IN INCHES



ET
01
5/2/01

STEP 150-1

STS-100 ORBITER POST LANDING INSPECTION
Debris Assessment
2 May 2001

After the 9:11 a.m. local/pacific time landing on 1 May 2001, a post landing inspection of OV-105 Endeavour was conducted at the at Edwards Air Force Base on runway 22 and in the Mate-Demate Facility (MDD). This inspection was performed to identify debris impact damage and, if possible, debris sources.

The Orbiter TPS sustained a total of 92 hits of which 13 had a major dimension of one-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-100 Orbiter damage hits by area:

	<u>HITS > 1-inch</u>	<u>TOTAL HITS</u>
Lower Surface	4	42
Upper Surface	0	0
Window Area	8	48
Right Side	0	0
Left Side	0	0
Right OMS Pod	1	2
Left OMS Pod	0	0
TOTALS	13	92

The Orbiter lower surface sustained 42 total hits, of which 4 had a major dimension of one inch or larger. The majority of the lower surface damage sites occurred on the right-hand wing glove. Impacts in this area are most likely from LO2 feedline ice/frost or foam debris.

Although the number of hits on the left-hand lower surface were less than the right-hand lower surface, the largest lower surface tile damage site was located on the left-hand wing glove forward of the main gear door. This shallow damage site measured 2.5-inches long by 1-inch wide by 0.125-inch deep, and is probably the result of impact by low density foam material.

The OMS pods tiles had a typical amount of damage. No unusual tile damage or evidence of tile movement, as seen in lift-off films E-17 and -18, was observed on the OMS pods. However, a four-inch long segment of gap filler material was protruding from the left-hand OMS pod tiles by approximately 0.5-inch.

A segment of Ames gap filler, located just aft of the nose gear wheel well, was protruding 0.5-inches. There was no indication of entry heating or tile damage. A second Ames gap filler from the nose gear door was found on the runway after wheel stop, to the left of the Orbiter approximately 10 feet outboard from the Orbiter wing glove. The gap filler showed signs of entry heating.

This is the third flight using the forward up-firing RCS jet plumes to help protect the windows from BSM particulate impingement during SRB separation. Hazing on windows 3 and 4 appeared to be greater than observed for the first

STEP 150-1

two flights with the windows protection system. Quantitative evaluation of the window hazing will be provided through optical testing at KSC.

An AFRSI blanket was slightly de-bonded and protruding from the area immediately aft of the forward-firing jets in the forward RCS group.

Moderate hazing was noted on the upper portion of windows 2, 3, 4 and 5. In addition to hazing, streaks were observed on windows 3 and 4. The streaks are the result of impacts by RTV adhesive used on the forward RCS paper covers.

Damage sites on the window perimeter tiles were more than usual in quantity. There were a total of 48 hits on the window perimeter tiles with eight having dimensions greater than one inch. Damage to the window perimeter tiles on the forward facing windows is attributed to impact by RTV adhesive used on the forward RCS paper covers.

The main landing gear tires were reported to be in typical condition for landing on a concrete runway. Ply under-cutting was observed on the outboard edges of both left-hand main gear tires.

ET/Orbiter separation devices EO-1, EO-2, and EO-3 were reported to have functioned normally. The EO-2 and EO-3 fitting retainer springs appeared to be in nominal configuration. No debris was found beneath the umbilicals.

There was less than usual tile damage on the Orbiter base heat shield. The SSME Dome Heat Shield closeout blankets were in good condition. Slight fraying was observed on the SSME #3 blanket from the 10 to 12 o'clock position. Two large damage sites (approximately 3-inches by 3-inches) on the body flap upper surface tiles adjacent to the body flap stub, appear to be failed repairs.

A post landing walk-down of the runway was performed by the rollout measurement team and no flight hardware was found. All components of the drag chute were recovered and appeared to have functioned normally. Both reefing and line cutter pyrotechnic devices were expended.

In summary, both the total number of Orbiter TPS debris hits and the number of hits one-inch or larger were well within established family. The potential identification of debris damage sources for mission STS-100 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-100 Debris/Ice/TPS Assessment and Integrated Photographic Analysis report.

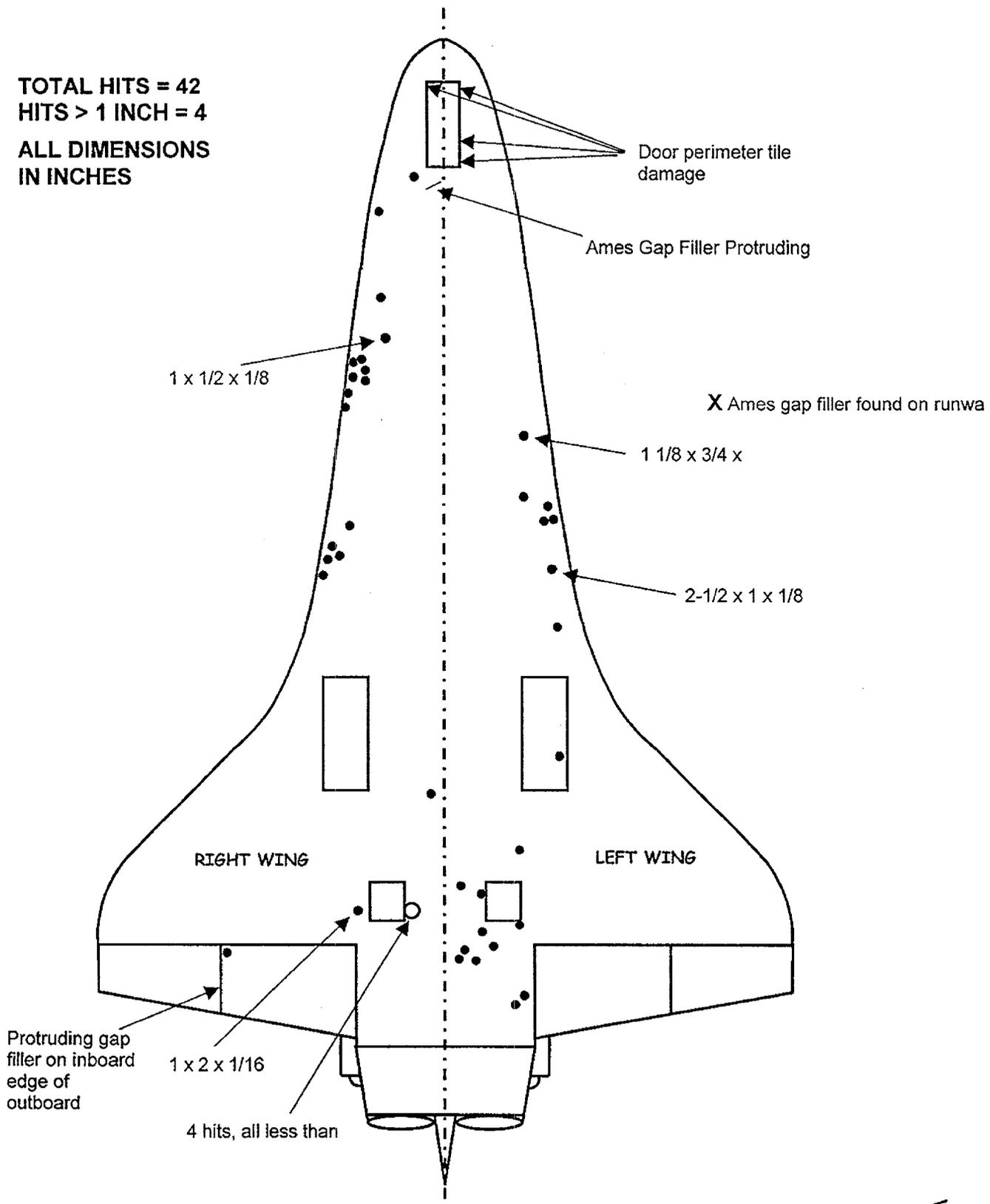
Jeff Stone
Boeing/Huntington Beach

Jack McClymonds
Boeing/Huntington Beach

Abdi Khodadoust
Boeing/Huntington Beach

STEP 150-1

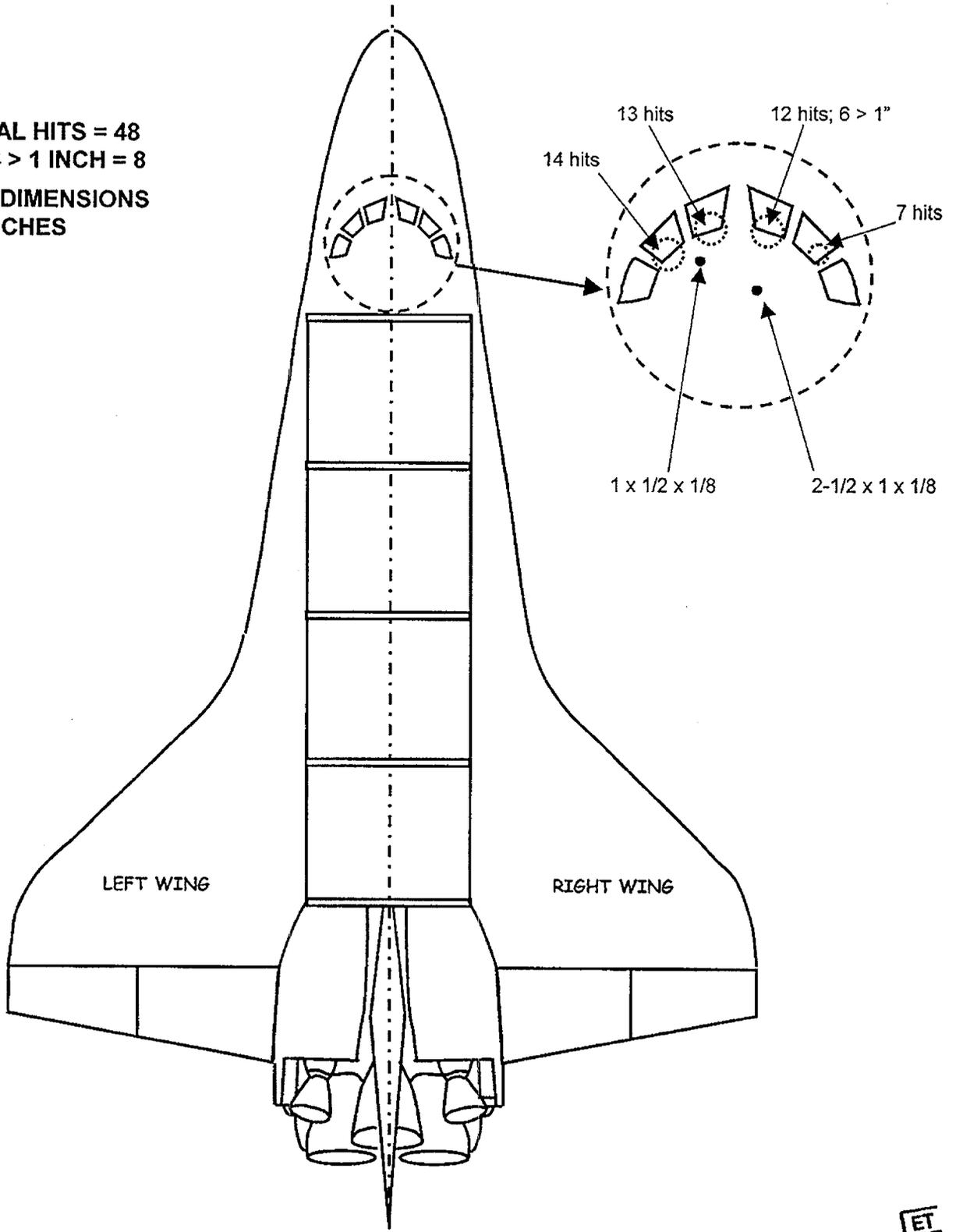
TOTAL HITS = 42
HITS > 1 INCH = 4
ALL DIMENSIONS
IN INCHES



ET
01
5/3/04

STEP 150-1

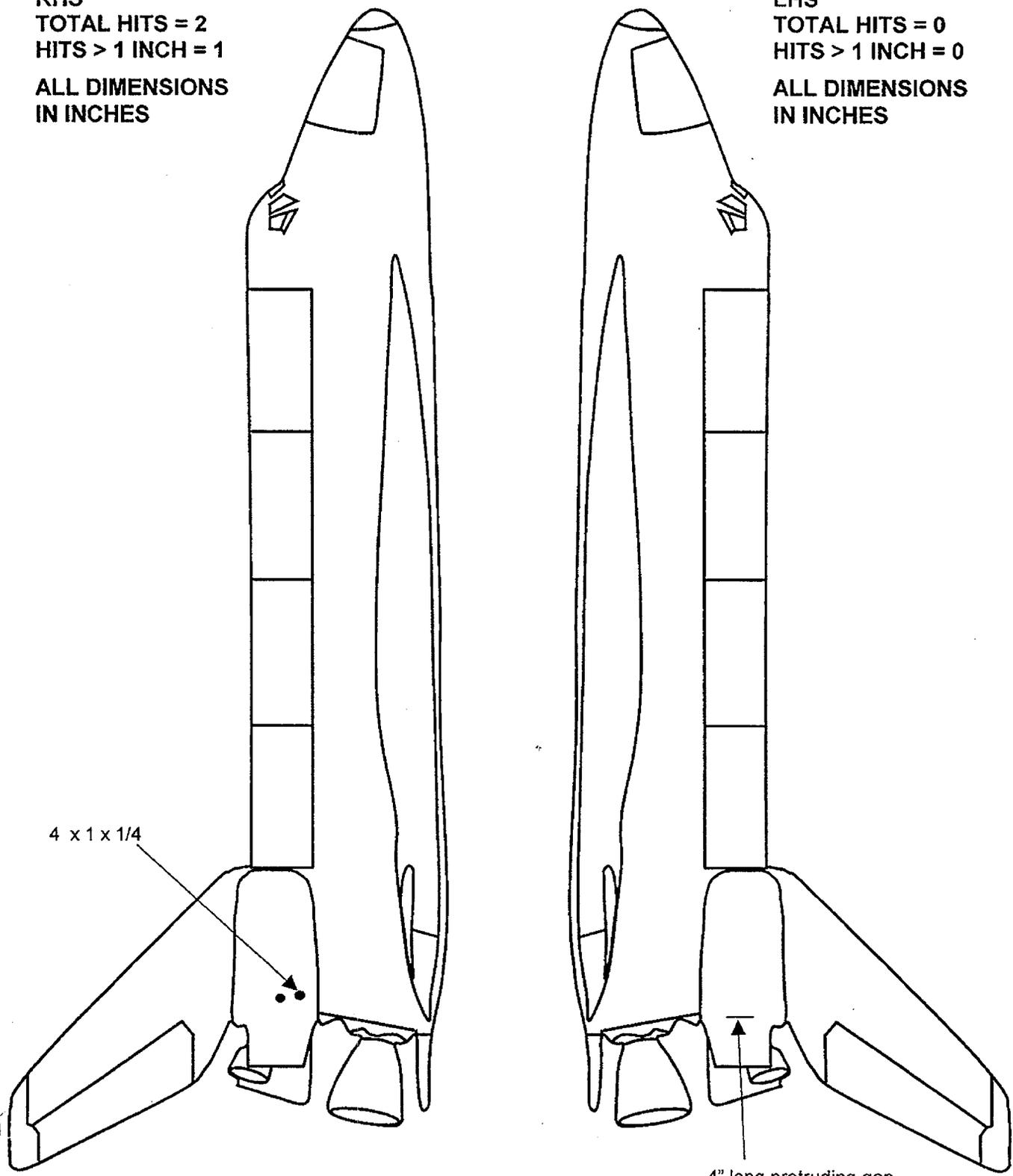
TOTAL HITS = 48
HITS > 1 INCH = 8
ALL DIMENSIONS
IN INCHES



STEP 150-1

RHS
TOTAL HITS = 2
HITS > 1 INCH = 1
ALL DIMENSIONS
IN INCHES

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



ET
01
5/3/01

STEP 150-1

STS-100 ON-ORBIT FILM SUMMARY
KSC Photo/Video Analysis Team
11 May 2001

The last film data, two 16 mm umbilical well high-speed motion film, 35mm still images from the LO2 ET/ORB umbilical camera and Crew Hand-Held Still Images, of the External Tank after separation from the Orbiter were received and reviewed at KSC on 11 May 2001. All images were in clear focus, field of view and the lighting was excellent. The 16 mm film FL-101 ran out prior to full view of the ET after separation.

No anomalies or significant missing TPS was detected and the ET appeared in good condition.

SRB separation from the External Tank appeared nominal. Illumination from the SRB exhaust plumes showed typical erosion/flaking of thin layers of TPS from the aft surfaces of the -Y upper strut fairing, -Y vertical strut, and LH2 ET/ORB cable tray. TPS charring and "popcorn" divoting of the aft dome was less than typical.

The wide angle LH2 ET/ORB umbilical camera provided a view of the left SRB falling away from the ET. No anomalies were detected on LH SRB including the nose cap, which is not recovered for post flight inspection.

Overall, the intertank TPS acreage was in good condition. The visible portion of the +Y thrust panels exhibited no divots or anomalies. Heating from the shock waves off both EB fittings left black marks on the intertank acreage in a diagonal line to the bipod spindle housing.

The EO-3 (LO2 side) separation bolt protrusion was noted. Protrusion appeared to be similar to EO-3 bolt protrusion observed on STS-106 film. Shuttle Program investigation determined no anomaly for STS-106 bolt extension.

The jack pad standoff closeouts were intact. Two TPS divots, one 10 inches in diameter and a second one 4 inches diameter, were visible between the bipods near centerline in the LH2 tank-to-intertank flange closeout. Also, another divot, 4-6 inches in diameter, was present in the flange closeout -Y+Z quadrant. These type of flange divots have been seen before in previous missions.

A shallow divot, 4 inches in diameter, was noted on the LH2 tank foam acreage just aft of the +Y bipod spindle housing closeout.

A divot, 6 x 4 inches was seen on the +Y longeron TPS closeout, near the thrust strut joint to the longeron.

No damage was detected on the LO2 ET/ORB umbilical disconnect, sealing surfaces, or closeout TPS. Typical ablation and divoting was noted on the vertical portion of the umbilical cable tray.

Some small, irregular, white or light-colored objects floating in field of view is believed to be pieces of frozen oxygen or hydrogen.

STEP 150-1

No anomalies were detected in the LO2 tank acreage. The BSM burn scars were typical. TPS erosion was noted on several GO2 pressline ice frost ramps.

Normal amounts of TPS erosion and topcoat charring occurred on the forward ogive near the nose cone, but no divots or grooves in the TPS were observed. The composite nose cone was in good condition.

The ablation/erosion of LO2 feedline flange closeouts was typical.

Jorge Rivera, NASA - KSC
Robert Speece, NASA - KSC

```
*****  
* PROGRAM PRA120 SELECTION CRITERIA  
*-----  
* RPT TYPE: IPR  
* PR GROUP:  
* WORK AREA CD:  
* PR ELEM CD:  
* STS NO:  
* Starting RPT DT: 04/16/01  
* Ending RPT DT: 05/17/01  
* LRU or Non-LRU: B  
* PRACA EFF CD:  
* EICN:  
* RPT STATUS: OP  
* DETECTED DURING: S6444  
*-----  
* Sorted by DETECTED DURING, PR ELEM CD, and EICN  
*-----  
*****
```



10, 4 AM

*
* NO DATA FOUND ON THE DATABASE FOR THE SELECTED PARAMETERS *
*

*
* END OF REPORT *
*





INSPECTION COPY

TOP/WAD Deviation

Dev No. <u>50-01</u>		DILS No. <u>87031</u> (s)		Page 1 of 4	
TOP/WAD No. S6444		REV/CHG/VER J01		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V) E	
First Use <input type="checkbox"/> SRB BI- <input type="checkbox"/> ET <input type="checkbox"/> GSE <input checked="" type="checkbox"/> STS-100		<input type="checkbox"/> In Family <input checked="" type="checkbox"/> Out of Family		Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 30	
Effectivity: <input type="checkbox"/> ORB /FLT <input type="checkbox"/> FRCS/POD /FLT <input type="checkbox"/> SSME /FLT		Affected: <input checked="" 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 ETM 4/5/01</i>		Contractor Test Conductor <i>Jim Taylor 4-9-01</i>		Gov't OPR <i>Robert F. Speer 4-6-01</i>	
Contractor Test Project Engineer <i>Mark Wollan 4/9/01</i>		Other <i>Mark Wollan 4/5/01</i>		Gov't Project Engineer <i>Mark Wollan 4/9/01</i>	
Contractor Safety		Other		Gov't Test Director or Contractor Chief TC <i>Mark Wollan 4/9/01</i>	

Page Number: 50-4 Step Number: 50-8

Add following (one line below end of step text):

OMRS S00FB0.350-1

INSPECTION COPY

Originator (print) R. Seale	SPDMS ID T08011	Phone 1-3348	Organization ETM	Date 4/5/01	<input checked="" type="checkbox"/> Perm <input type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle
--------------------------------	--------------------	-----------------	---------------------	----------------	---

ET
01

5/14/01

TOP/WAD No. S6444		REV/CHG/VER J01	<input type="checkbox"/> In Family <input checked="" type="checkbox"/> Out of Family	Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V) E	Page 2 of 4
Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 30		First Use <input type="checkbox"/> SRB Bl- <input type="checkbox"/> ET <input type="checkbox"/> GSE <input checked="" type="checkbox"/> STS-100		Effectivity: <input type="checkbox"/> ORB /FLT <input type="checkbox"/> FRCS/POD /FLT <input type="checkbox"/> SSME /FLT	
Affected: <input checked="" 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 ETM 4/5/01</i>		Contractor Test Conductor <i>Jim Taylor 4-9-01</i>		Gov't OPR <i>PH-HZ</i>	
Contractor Test Project Engineer <i>Paul Kelly Connolly 4/9/01</i>		Other <i>Mark Wollam 4/5/01</i>		Gov't Project Engineer <i>V. F. ... 4-6-01</i>	
Contractor Safety		Other		Gov't Test Director or Contractor Chief TC <i>Mark Taylor 4/9/01</i>	

Page Number: 50-5 Step Number: 50-10

Add steps 50-10.1 with preceding Note and 50-10.2 as follows:

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 .

50-10.1 CTIF CVM1 222 CVM2

From start of LO₂ / LH₂ loading until Prepressurization (LO₂ at T-2M55s and LH₂ at T-1M57s):

1. Monitor following ET-Orbiter MPS areas for leakage:
 - LO₂ Feedline (portion external to the Intertank)
 - LH₂ Feedline
 - LH₂ Recirculation Line
 - LH₂ Aft Dome Manhole Cover(s)
 - ET-Orbiter LO₂ / LH₂ Umbilical Disconnects
 - LH₂ T-0 Umbilical
 - LO₂ T-0 Umbilical
2. Verify no visible cryogenic liquid of excessive vapors.

OMRS (general) S00FB0.360-1

ME
10

ETM _____ Date 4-19-01

INSPECTION COPY

Not Performed: NA

Originator (print) R. Seale	SPDMS ID T08011	Phone 1-3348	Organization ETM	Date 4/5/01	<input checked="" type="checkbox"/> Perm <input type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle
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ET
01

4/19/01

USA INSPECTION COPY

TOP/WAD Deviation

United Space Alliance

TOP/WAD No. S6444		Dev No. <u>50-01</u>	DILS No. <u>87031 (5)</u>	Page 3 of 4
REV/CHG/VER J01		<input type="checkbox"/> In Family <input checked="" type="checkbox"/> Out of Family	Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V) E	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 30
First Use <input type="checkbox"/> SRB BI- <input type="checkbox"/> ET <input type="checkbox"/> GSE <input checked="" type="checkbox"/> STS-100				
Effectivity: <input type="checkbox"/> ORB /FLT <input type="checkbox"/> FRCS/POD /FLT <input type="checkbox"/> SSME /FLT				
Affected: <input checked="" 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 QPR <i>R. Seale ETM 4/5/01</i>		Contractor Test Conductor <i>Jim Jahn 4-9-01</i>	Gov't QPR <i>Robert F. Speer 4-6-01</i>	PH-112
Contractor Test Project Engineer <i>Paul C. ... 4/4/01</i>		Other <i>Mark ... 4/5/01</i>	Gov't Project Engineer	
Contractor Safety		Other	Gov't Test Director or Contractor Chief TC <i>Stephen ... 4/9/01</i>	

50-10.2 CTIF CVM1 222
CVM2

Monitor and videotape record following ET TPS surface areas and GO₂ Vent Area during LO₂ / LH₂ loading through Prepressurization (LO₂ at T-2M55s and LH₂ at T-1M57s):

- LH₂ Aft Dome
- LH₂ Barrel
- Intertank (external)
- LO₂ Tank
- GO₂ Vent Area
- Protuberances

OMRS (general) S00FB0.005-1

ETM ME
TG Date 4-19-01

Not Performed: NA

INSPECTION COPY

Originator (print) R. Seale	SPDMS ID T08011	Phone 1-3348	Organization ETM	Date 4/5/01	<input checked="" type="checkbox"/> Perm <input type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle
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4/19/01

ET
01

TOP/WAD No. S6444		Dev No. 50-01	DILS No. 87031 (S)	Page 4 of 4
REV/CHG/VER J01	<input type="checkbox"/> In Family <input checked="" type="checkbox"/> Out of Family	Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V) E	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 30	
First Use <input type="checkbox"/> SRB BI- <input type="checkbox"/> ET <input type="checkbox"/> GSE <input checked="" type="checkbox"/> STS-100	Effectivity: <input type="checkbox"/> ORB /FLT <input type="checkbox"/> FRCS/POD /FLT <input type="checkbox"/> SSME /FLT	Affected: <input checked="" 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 ETM 4/5/01</i>	Contractor Test Conductor <i>Jim Taylor 4-9-01</i>	Gov't OPR <i>Robert F. Speare PH-H2 4-6-01</i>		
Contractor Test Project Engineer <i>Bill Kelly 4/5/01</i>	Other <i>Mark Nollen 4/5/01</i>	Gov't Project Engineer		
Contractor Safety	Other	Gov't Test Director or Contractor Chief TC <i>Stephen Wayne 4/19/01</i>		

Page Number: 50-9 Step Number: 50-18

Change step 50-18 as follows:

was: "... are 38 knots or ..."

is: "... are 38 knots (peak as measured at 60 feet above ground) or ..."

Page Number: 50-9 Step Number: 50-19

Add step 50-19.1 as follows:

50-19.1 CTIF

ET-Orbiter MPS monitoring for leakage and ET TPS Surface Areas and GO₂ Vent Area monitoring/recording for launch complete.

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

USA
VM
070

ETM *R. Seale* Date *4/19/01*

Not Performed: *N/A*

INSPECTION COPY

Reason: Ensure text of operational instructions complies with the OMRS.

Originator (print) R. Seale	SPDMS ID T08011	Phone 1-3348	Organization ETM	Date 4/5/01	<input checked="" type="checkbox"/> Perm <input type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle
---------------------------------------	---------------------------	------------------------	----------------------------	-----------------------	---



INSPECTION COPY

TOP/WAD Deviation

Dev No. <u>60-01</u>		DILS No. <u>87032 (S)</u>		Page 1 of 1	
TOP/WAD No. S6444		REV/CHG/VER J01		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V) E	
First Use <input type="checkbox"/> SRB BI- <input type="checkbox"/> ET <input type="checkbox"/> GSE <input checked="" type="checkbox"/> STS-100		Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 30			
Effectivity: <input type="checkbox"/> ORB /FLT <input type="checkbox"/> FRCS/POD /FLT <input type="checkbox"/> SSME /FLT		Affected: <input checked="" 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 ESM 4/5/01</i>		Contractor Test Conductor <i>ME TO Jim Taylor 4-9-01</i>		Gov't OPR <i>Robert F. ... 4-6-01</i>	
Contractor Test Project Engineer <i>Paul Celery Conway 4/8/01</i>		Other <i>Mark Wollam 4/5/01</i>		Gov't Project Engineer	
Contractor Safety		Other		Gov't Test Director or Contractor Chief TC <i>Stephen ... 4/9/01</i>	

Page Number: 60-1 Step Number: 60-1

Delete OMRS S00FB0.005-1 and S00L00.150-1 from Note preceding step 60-1: "Noted ... operation."
⓪

Page Number: 60-6 Step Number: 60-12

Delete OMRSD S00FB0.005-1 and OMRSD S00L00.150 ^{and} ~~from~~ step 60-12.
⓪

Reason: These OMRSD's have been moved to Operation 50.

INSPECTION COPY

Originator (print) R. Seale	SPDMS ID T08011	Phone 1-3348	Organization ETM	Date 4/5/01	<input checked="" type="checkbox"/> Perm <input type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle	ET 01
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INSPECTION COPY

TOP/WAD Deviation

Dev No. <u>70-01</u>		DILS No. <u>87033 (S)</u>		Page 1 of 1	
TOP/WAD No. S6444		REV/CHG/VER J01		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V) E	
First Use <input type="checkbox"/> SRB BI- <input type="checkbox"/> ET <input type="checkbox"/> GSE <input checked="" type="checkbox"/> STS-100		Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 30			
Effectivity: <input type="checkbox"/> ORB /FLT <input type="checkbox"/> FRCS/POD /FLT <input type="checkbox"/> SSME /FLT		<input type="checkbox"/> In Family <input checked="" type="checkbox"/> Out of Family			
Affected: <input checked="" 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 QPR <i>R. Seale ETM 4/5/01</i>		Contractor Test Conductor <i>Jim Taylor 4-9-01</i>		Gov't OPR <i>PH-AZ</i>	
Contractor Test Project Engineer <i>Carl Cherry Connors 4/9/01</i>		Other <i>Mark Wollam 4/5/01</i>		Gov't Project/Engineer <i>4-6-01</i>	
Contractor Safety		Other		Gov't Test Director or Contractor Chief TC <i>Stephen Payne 4/9/01</i>	

Page Number: 70-1 Step Number: 70-1

Delete OMRS S00FB0.005-1 and S00FB0.360-1 from Note preceding step 70-1: "Noted ... operation."
⓪

Page Number: 70-6 Step Number: 70-12

Delete OMRSD S00FB0.005-1 and OMRSD S00FB0.360-1 ^{and} ~~from~~ step 70-12.
⓪

Reason: These OMRSD's are satisfied via Operation 50.

INSPECTION COPY

Originator (print) R. Seale	SPDMS ID T08011	Phone 1-3348	Organization ETM	Date 4/5/01	<input checked="" type="checkbox"/> Perm <input type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle
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TOP/WAD Deviation

United Space Alliance

Dev No. 130-01

DILS No. 87034 (S)

Page 1 of 1

TOP/WAD No.

S6444

REV/CHG/VER

J01

In Family

Out of Family

Cause Code Org
(B,D,E,G,H,L,N,O,P,Q,S,T,V)

E

Cause Code Reason
10-Tech Chg 20-Proc Chg
30-Auth Error 40-Rewrite

30

First Use SRB BI- ET GSE STS-100

Effectivity: ORB /FLT FRCS/POD /FLT SSME /FLT

Affected: OMRS/ACOMC/OMP Design Req'ts Haz Step(s) PPE Internal Review Req.

Contractor OPR

R. Seale 4/5/01

Contractor Test Conductor

Jim Taylor 4-9-01

Gov't OPR

PA #12
Bob Ffrench 4-6-01

Contractor Test Project Engineer

Paul Wiley 4/19/01

Other

Mark Wollen 4/15/01

Gov't Project Engineer

Contractor Safety

Other

Gov't Test Director or Contractor Chief TC

Stephen Payne 4/19/01

Page Number: 130-2 Step Number: 130-2

Add following Note prior to step 130-2:

NOTE

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

Reason: Ensure text of operational instructions complies with OMRS S00U00.010-1.

INSPECTION COPY

Originator (print)
R. Seale

SPDMS ID
T08011

Phone
1-3348

Organization
ETM

Date
4/5/01

Perm Temp
 Temp-Recycle

4/19/01



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TOP/WAD Deviation

United Space Alliance

Dev No. <u>140-01</u>	DILS No. <u>87035</u> (5)	Page 1 of 1
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TOP/WAD No. S6444	REV/CHG/VER J01	<input type="checkbox"/> In Family <input checked="" type="checkbox"/> Out of Family	Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V) E	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 30
First Use <input type="checkbox"/> SRB BI- <input type="checkbox"/> ET <input type="checkbox"/> GSE <input checked="" type="checkbox"/> STS-100				
Effectivity: <input type="checkbox"/> ORB /FLT <input type="checkbox"/> FRCS/POD /FLT <input type="checkbox"/> SSME /FLT				
Affected: <input checked="" 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 ORR <i>R. Seale ETM 4/5/01</i>	Contractor Test Conductor <i>Jim Sfor 4-9-01</i>	Gov't ORR <i>[Signature] 4-6-01</i>		
Contractor Test Project Engineer <i>[Signature] 4/9/01</i>	Other <i>Mark Wollan 4/5/01</i>	Gov't Project Engineer <i>[Signature] 4/9/01</i>		
Contractor Safety	Other	Gov't Test Director or Contractor Chief TC <i>[Signature] 4/9/01</i>		

Page Number: 140-1 Step Number: 140-1

Add following Note and change step 140-1 to read as follows:

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 or future SSV launches.

OMRSD S00U00.011-1

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ETM: *R. Seale* Date *5/11/01*

Reason: Ensure text of operational instructions complies with the OMRSD S00U00.011-1.

INSPECTION COPY

Originator (print) R. Seale	SPDMS ID T08011	Phone 1-3348	Organization ETM	Date 4/5/01	<input checked="" type="checkbox"/> Perm <input type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle
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United Space Alliance

TOP/WAD Deviation

Dev No. <u>150-01</u>		DILS No. <u>87036^(S)</u>		Page 1 of 1	
TOP/WAD No. S6444		REV/CHG/VER J01	<input type="checkbox"/> In Family <input checked="" type="checkbox"/> Out of Family	Cause Code Org (B, D, E, G, H, L, N, O, P, Q, S, T, V) E	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 30
First Use <input type="checkbox"/> SRB BI- <input type="checkbox"/> ET <input type="checkbox"/> GSE <input checked="" type="checkbox"/> STS-100					
Effectivity: <input type="checkbox"/> ORB /FLT <input type="checkbox"/> FRCS/POD /FLT <input type="checkbox"/> SSME /FLT					
Affected: <input checked="" 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"/> Intergal Review Req.	
Contractor OPR <i>R. Seale</i> <i>Firm</i> <i>4/5/01</i>		Contractor Test Conductor <i>Jim Doyle</i> <i>4/9/01</i>		Gov't OPR <i>PH-12</i> <i>4-6-01</i>	
Contractor Test Project Engineer <i>Gally Kelly Connolly</i> <i>4/9/01</i>		Other <i>Mark Wollan</i> <i>4/5/01</i>		Gov't Project Engineer	
Contractor Safety		Other		Gov't Test Director or Contractor Chief TC <i>Stephen Payne</i> <i>4/9/01</i>	

Page Number: 140-1 (s/b 150-1) Step Number: 150-2

Delete following from step 150-2:

"OMRSD S00U00.011-1"

Reason: OMRS S00U00.011-1 pertains to Film Review (Operation 140).

INSPECTION COPY

Originator (print) R. Seale	SPDMS ID T08011	Phone 1-3348	Organization ETM	Date 4/5/01	<input checked="" type="checkbox"/> Perm <input type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle
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TCN: 2868A01B⁷

TOP/WAD Deviation

Dev No. <u>10-01</u>		DILS No. <u>87216 (5)</u>		Page 1 of 2	
TOP/WAD No. S6444		REV/CHG/VER J 01		Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V) E	
First Use <input type="checkbox"/> SRB BI- <input type="checkbox"/> ET <input type="checkbox"/> GSE <input checked="" type="checkbox"/> STS-100		<input type="checkbox"/> In Family <input checked="" type="checkbox"/> Out of Family		Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 20	
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 <u>R. Seale</u> <u>ETM 4/16/01</u>		Contractor Test Conductor <u>Jim Raitt</u> <u>4-16-01</u>		Gov't OPR <u>Robert F. Seale</u> <u>4-16-01</u>	
Contractor Test Project Engineer		Gov't Test Director or Contractor Chief TC		Gov't Project Engineer <u>PH-HZ</u>	
Contractor Safety		Other		Gov't Test Director or Contractor Chief TC	

Page Number: 10-1 Step Number: 10-3

Add Operation 11 as follows:

OPERATION 11 - IR Camera Setup

CAUTION
Exercise care to avoid dropping equipment on RSS Roof. All tools must be tethered.

11-1 RSS Roof:

1. **Install** IR Camera Unit into housing.
2. **Connect:**
 - Power cable
 - OTV Coaxial cable
 - Pan & Tilt cable
 - Controller cable
3. **Wipe** camera/housing lens clean using rymple cloth.
4. **Verify** camera functional using local controller.

NASA PH-H: Robert F. Seale Date: 4-16-01

USA ETM: Jim Raitt Date: 4-16-01

*Check FROM FR-2 @
Op NOT ADEQA FOR AVE POWER*

Originator (print) R. Seale	SPDMS ID T08011	Phone 1-3348	Organization ETM	Date 4/16/01	<input type="checkbox"/> Perm <input checked="" type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle
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ET
01

4/16/01

100
100
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100
100
100



TOP/WAD Deviation

TOP/WAD No. S6444		REV/CHG/VER J 01	<input type="checkbox"/> In Family <input checked="" type="checkbox"/> Out of Family	Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V) E	Page 2 of 2
First Use <input type="checkbox"/> SRB BI- <input type="checkbox"/> ET <input type="checkbox"/> GSE <input checked="" type="checkbox"/> STS-100		Effectivity: <input type="checkbox"/> ORB /FLT <input type="checkbox"/> FRCS/POD /FLT <input type="checkbox"/> SSME /FLT		Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 20	
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 ETM 4/16/01</i>		Contractor Test Conductor <i>William M. Lauffer 4/16/01</i>		Gov't OPR <i>[Signature] PH-H 2</i>	
Contractor Test Project Engineer		Other <i>[Signature] 4-16-01</i>		Gov't Project Engineer <i>[Signature] 4-16-01</i>	
Contractor Safety		Gov't Test Director or Contractor Chief TC			

11-2 Camera Site 2:

1. **Install** IR Camera Unit into housing.
2. **Connect:**
 - Power cable
 - OTV Coaxial cable
 - Pan & Tilt cable
 - Controller cable
3. **Wipe** camera/housing lens clean using rymple cloth.
4. **Verify** camera functional using local controller.

NASA PH-H: *[Signature]* Date: 4-16-01
 USA ETM: *[Signature]* Date: 4-16-01

Reason: Establish operational controls for installation of the IR Camera units on the RSS Roof and at Camera Site 2.

Originator (print) R. Seale	SPDMS ID T08011	Phone 1-3348	Organization ETM	Date 4/16/01	<input type="checkbox"/> Perm <input checked="" type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle	ET 01
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4/16/01



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