

OMI TASK CLOSEOUT CHECKLIST

OMI No. <i>56444 J-04</i>	Run No. <i>1</i>	Task Control No. (TCN) <i>2987514</i>
Start Date <i>10-11-02</i>	Completion Date <i>10-31-02</i>	Closure Date <i>NOV 12 02</i> SPC 968
		QC/Eng. Date
1. Deviation Index: Verify total number of deviations agree with index. Verify entry is correct into OMI.		N/A N/A
2. Constraints: Verify all constraints are cleared.		N/A 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.		SPC 968 <i>NOV 12 02</i>
4. Verify that material and equipment requirement list enclosed (if applicable).		N/A N/A
5. OMI: Verify that all pages or verification sheets are completed, stamped, and dated in the lower left/right hand corners.		SPC 968 <i>NOV 12 02</i>
6. OMI: Verify that all miscellaneous documents/procedures have sequence number referenced and stamped; e.g., photos, sample results, etc.		SPC 968 SPC 968 NOV 02 02 <i>NOV 12 02</i>
7. Planned task/OMI satisfactorily completed. OPR: <u><i>R Brewer</i></u> <small>Brewer</small> <i>10-31-02</i>		SPC 968 <i>NOV 12 02</i>

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SSV ICE AND DEBRIS ASSESSMENT

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

**This document contains
HAZARDOUS operations.**

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1.0 INFORMATION

1.1 Objective

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

Description

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

1.2 Special Instructions All Operations

1. This OMI is run as a subtask to OMI's S0007, S0014, and S0037. All PAD clearing and controlled access operations will be performed per those OMI's.
2. Constraints will be statused by controlling OMI's S0007/S0014/S0037.
3. The OTV camera numbering scheme for PAD A/B is OXX/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.
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.

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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
15	IR Camera Setup	PH-H/ NA	ETM	N	4.0
20	Ice Prediction Briefing	SE/ NA	ETM	N	0.5
30	Pre-launch Walkdown	SE/ NA	ETM	N	2.0
40	Ice Frost Debris Console Initial Configuration Setup	SE/ FR2	ETM	N	3.0
50	SSV Debris Assessment	SE/ FR2	ETM	N	18.0
60	Group 1 Monitoring LO2 Chill Down Thru T-0	SE/ FR2	ETM	N	15.0
70	Group 2 Monitoring - LH2 Chill Down Thru T-0	SE/ FR2	ETM	N	15.0
80	Final Inspection	SE/ FR2	ETM	Y	3.0
90	LO2/LH2 Drain Monitoring	SE/ FR2	ETM	N	4.0
100	Console Securing	SE/ FR2	ETM	N	0.5
110	Summary Tape	SE/ FR2	ETM	N	18.0
120	Post Drain Walkdown	SE/ NA	ETM	Y	2.0
130	Post Launch Walkdown	SE/ NA	ETM	Y	3.0
140	Film Review	SE/ NA	ETM	N	15.0
145	IR Camera Removal	PH-H/ NA	ETM	N	2.0
150	Final Report	SE/ NA	ETM	N	0.5

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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 Procedures

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3.0 STAGING REQUIREMENTS

3.1 Referenced Engineering Documentation

3.1.2 Documents (Auto Build Section)

3.1 Referenced Engineering Documentation

3.1.2 Documents

OPERATION 120

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

3.2 Parts, Materials, Equipment, and Special Tools

3.2.5 Shop Support Materials

OPERATION 15

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

OPERATION 145

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

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3.2.8 Personal Protective Equipment

- OPERATION 15** **Nomenclature**
N-Dex nitril gloves
chemical splash goggles
face shield
- 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
- OPERATION 145** **Nomenclature**
N-Dex nitril gloves
chemical splash goggles
face shield

4.0 PLANNING REQUIREMENTS

OIR Required Yes [], No [X]

4.3 LPS Requirements

4.3.1 Computer Systems

PC GOAL
CCMS Configuration
CDS
CMS

4.4 Support Services, Commodities, and Equipment

4.4.2 Communications

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

4.4.3 OTV

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

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

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

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4.4.4 Countdown Display/Status

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

4.4.8 Services

<u>SGS Organization</u>	<u>Operation/Step</u>
LS	10-2

<u>COMM Organization</u>	<u>Operation/Step</u>
COMM	10-1
COMM	50-6
COMM	60-1
COMM	60-3
COMM	60-6
COMM	60-9
COMM	60-11
COMM	70-1
COMM	70-3
COMM	70-6
COMM	70-9
COMM	70-10
COMM	70-11
COMM	90-2
COMM	90-4
COMM	100-2

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	90-005
	L01 TAF;C	
S00E00.031	POST DETANK ET TPS INSPECT	120-002
	L01 TAF;C	
S00FA0.900	PRELAUNCH WEATHER BRIEFING (L-1 DAY)	20-001
	L01 VAF1-90	
S00FB0.005	ET TPS SURFACE MONITORING	50-024
(1)	L01 T23,27-29,31-999	
S00FB0.350	MONITOR GO2 VENT HOOD	50-026
(1)	L01 VAF1-90	
S00FB0.360	MONITOR ET/ORB MPS FOR LEAKAGE	50-024
(1)	L01 VAF1-90	
S00L00.150	HIGH WIND ET NOSE INSPECTION	50-022
	L01 SAF;C	
S00U00.010	POST LAUNCH SHUTTLE/PAD AREA INSPECTION	130-002
(1)	L01 SAF1-999	
S00U00.011	ENGR REVIEW & ANALYSIS OF LAUNCH FILM	140-001
(1)	L01 SAF1-999	
S00U00.020-A	ENGINEERING PAD INSPECTION	80-002
(1)	L01 SAF1-999	
S00U00.020-C	INSPECT ORBITER AFT ENGINE	80-002
(1)	L01 SAF1-999	
S00U00.020-D	INFRARED SURVEILLANCE	80-002
(1)	L01 SAF1-999	
S00U00.030	PRELAUNCH SHUTTLE/PAD AREA INSPECTION	30-001
(1)	L01 SAF1-999	

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5.5 List of References

OPERATION 20

Reference No. Rev
NSTS 16007 (LI)

Title
NSTS Program Launch Commit Criteria - Hazardous Gas
Subsystem and Appendix F

OPERATION 30

Reference No. Rev
80901019010 (LI)

Title
ET Post Build Acceptance and In-Process Rework
Requirements Manual - Offsite

OPERATION 40

Reference No. Rev
79K24576 (LI)
79K24522 (LI)

Title
OTV System Installation, LC 39, Pad A
OTV System Installation, LC 39, Pad B

OPERATION 50

Reference No. Rev
SPI SP-519 (LI)
SFOC GO0007 (LI)

Title
OMI and OM Implementation
Quality Planning Requirements Document (QPRD)

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OPERATION 10 Support Preparations

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

10-1 STM JYVO 138

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

Support: COMM

10-2 STM JSTC 111
JSTC *SCB 114

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

Support: LS

10-3 STM TBC 136

Operation - Support Preparations complete.

*** End of Operation 10 ***

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OPERATION 15 IR Camera Setup

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

WARNING

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

CAUTION

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

NOTE

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

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

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

WARNING

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

CAUTION

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

4. **Connect:**
 - OTV coaxial cable
 - Pan & tilt cable
 - Controller cable
 - Power cable

5. **Rotate** camera housing back cover into closed position. **Secure** back cover by installing bolts/flat washers (20 pl). **Tighten** bolts wrench tight.

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WARNING

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

WS002.a 05-22-01

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

Sub Step Not Performed: ET
05 9-26-02

NASA PH-H *[Signature]* Date 9/26/02
M. Payne

USA ETM *R Brewer* Date 09-26-02
BREWER

Not Performed: N/A

ET
05

NOTE

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

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

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

WARNING

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

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

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WARNING

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

WS002.a 05-22-01

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

Sub Step Not Performed: ET/05

ET/05

9-26-02

NASA PH-H M. Payne Date 9/26/02

M. Payne

USA ETM R Brewer Date 09-26-02

BREWER

Not Performed: N/A

*** End of Operation 15 ***

ET/05

15-1161



October 4, 2002
E686-CY02-026

ATK Thiokol Propulsion
P.O. Box 707
Brigham City, UT 84302-0707

Tel 435 863-3511
Fax 435 863-2234

George C. Marshall Space Flight Center
National Aeronautics & Space Administration
Marshall Space Flight Center, AL 35812

Attention Mr. Rick Burt, MP51

Gentlemen:

Subject: RSRM-87 (STS-112) Transmittal of L-3 Day PMBT Prediction

This letter officially transmits the L-3 day propellant mean bulk temperature (PMBT) predicted for STS-112, scheduled for launch on October 7, 2002. Based on measured temperatures at KSC and 33-year average temperature data, the PMBT is predicted to be 83°F at the time of the STS-112 launch. This prediction is also good for October 8, 2002. The PMBT prediction will be updated for L-24 hour.

Very truly yours,

John Endicott
John Endicott, Manager
Motor Performance Requirements

Syd Henderson
Syd Henderson
Systems Performance/Flight Integration

JBE/mp

- cc: T. Boardman, L00
- J. Burn, LD0
- K. Eckhardt, 252
- S. Eden, E68
- J. Endicott, E68
- K. Foulger, E62
- S. Henderson, LF0
- M. Kahn, A10
- C. Ralston, E00
- R. Roth, Thiokol/MSFC
- D. Ruddell, E68

- D. Burton, K68
- K. Revay, USK-029
- M. Rudolphi, MP51
- T. Shaffner, Thiokol/KSC
- B. St. Aubin, Thiokol/KSC
- P. Teehan, KSC, SK
- D. Woods, MP51

Plus FAX List

FOR REVIEW ONLY NOT A BULK

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OR 04
OR 04

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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

James B. Olin PH-H 2 10/7/02
OLIN

OMRSD S00FA0.900

USA
VM
011

20-2 Operation - Ice Prediction Briefing complete.

*** End of Operation 20 ***

ET

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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 (L1) 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)

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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

USA
VM
011

SPC No. 511/2

Disc/Frame Nos: N/A

17-11-02

Page 1 of 1

STS-112 / ET-115

DMI-56444-RUN-2

Still Image		Seq/Step 30-1		TCN 2987514	
Documentation Log		Date Oct 6 2002	Vehicle / SSME No. OV 104		Flight No. 26
Sent From Location		Time 05:43 PM	STS No. STS-112		SPC No. 51112
IceTeam-2					
WAD / Rev S6444-RevJ 04			WAD Run 1	OMRS	
PHOTOGRAPHER					
Name Richards, W	Organization USA	Dept No. 5391	Phone No. 1-3350	Shift 2	Stamp MB20
Element Orbiter	Element Zone N/A		System Technology Code		
SRB Component Descriptor BI -	ET Component Descriptor ET -		Orbiter Component Descriptor 0		
Image Description					
SSV ICE AND DEBRIS ASSESSMENT					

Step 30-1 s/s 4
PAGE 30-2

FOR ET-115
10-10-02



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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. **Forward** description(s) of debris found to SFOC QC for entry into Processing Debris / FOD Database.

PH-H *[Signature]* Date 10-7-02
Speece

ETM *[Signature]* Date 10-6-02
RICHARDS

- 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)

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

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 ***

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

OPERATION 40 Ice Frost Debris Console Initial Configuration Setup

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

NOTE

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

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

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

03/15/02

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

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

Results DAZZLE AND COMPUTER FUNCTIONAL

ETM W. F. AT Richards

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: READY

CS 2: READY

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: ALL FUNCTIONAL

Tape recorders: ALL FUNCTIONAL

10-11-02

NOTE

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

Ref: 79K24576 (LI) OTV System Installation, LC 39, Pad A and

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

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

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

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

40-4 CVM1 JTV1 223

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

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

ETM W. L. D. Date 10-6-02

RICHARDS

Not Performed: N/A

03-15-2002

10/05

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

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 W. F. RICHARDS Date 10-6-02
Not Performed: N/A

12-11-02

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

S6444, J04

Table 40-1 ET Pre-Mapping Data		Tape # 481
OTV Camera	Start Time (GMT)	Stop Time (GMT)
004 / 104	00 40	00 46
009 / 109	00 16	00 22
013 / 113	01 19	01 23
033 / 133	01 06	01 09
042 / 142	01 11	01 16
054 / 154	00 07	00 16
055 / 155	23 53 23 30 ①	00 01 23 38 ①
056 / 156	23 44 ① 23 46	23 53
060 / 160	23 38 ① 01 23	23 44 ① 01 24
061 / 161	00 46	00 56
062 / 162	00 56	01 06
063 / 163	00 22	00 32
064 / 164	00 32	00 40
065 / 165	01 11 ① 01 16	01 19
066 / 166	01 09	01 11
067 / 167	00 01	00 07

Notes: most scans done AFTER DARK DUE TO RES
Roll

160 very DARK

ETI ① via FAX RICHMONS
10-6-02

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.
✓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.
✓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.
✓067 / 167	Set FOV with LH ₂ Aft Dome toward frame bottom and 2 nd black ring of SRB in view. <i>ON GUCP V/A/A/D</i>
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.

FOR ETDS
OR 04 10-11-02

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

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

ETM WPK Date 10-6-02
W. Richards

*** End of Operation 40 ***

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

SPCARS, 036

OPERATION 50 SSV Debris Assessment

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

NOTE

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

Entire Operation Not Performed: N/A

NOTE

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

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

NOTE

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

50-1

CTIF TBC
TBC CMQC 136

Notify TBC that CTIF will perform the CMQC function for STS 112, S6444 run 1. Request TBC notify CMQC that the ROR-as-CMQC option will be exercised for STS 112, S6444 run 1.

50-1

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

50-2

CTC	TBC	232
TBC	CTIF	136

Perform OTV and ice/frost monitoring area setups.

ETM _____

ET/05

Date 10-9-02

10-9-02

50-3

CTIF	TBC	136
TBC	CTC	
CTC	STM	232

Verify Operation 10- Support Preparations complete.

ETM _____

ET/05

Date 10-9-02

50-4

CTIF

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

ETM _____

ET/05

Date 10-9-02

ET/05

11-11-02

50-2

03-15-2002
APPROVED

OMI S6444 J04
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 _____

10/05

Date 10-7-02

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 _____

10/05

Date 10-7-02

Support: COMM

50-3

10/05

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

50-7

CTIF TBC 136
TBC CTC 232

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

ETM  Date 10-7-02

Not Performed: N/A

50-8

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 S00FB0.350-1

ETM  Date 10-9-02

Not Performed: N/A

10-11-02

03-15-2002
APPROVED

OMI S6444 J04
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 _____

ET/05

Date 10-9-02

Not Performed: N/A

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 _____

ET/05

Date 10-9-02

Not Performed: N/A

10-11-01
ET/05

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

NOTE

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

50-11

CTIF CVM1 222
CVM2

From start of 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 S00FB0.360-1

ETM _____

ET/05

Date 10-09-02

Not Performed: N/A

ET/05

10-11-02

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

SEAS, 928

50-12

CTIF CVM1 222
CVM2

Monitor and videotape 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 S00FB0.005-1

ETM Date 10-09-02

Not Performed: N/A

50-13

CTIF CVM1 222

Perform Operation 60 - Group 1 Monitoring.

ETM Date 10-09-02

Not Performed: N/A

SEAS, 928

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

50-14

CTIF CVM2 222

Perform Operation 70 - Group 2 Monitoring.

ETM _____

ET/05

Date 10-07-02

Not Performed: N/A

50-15

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 _____

ET/05

Date 10-07-02

Not Performed: N/A

~~ET/05
10-11-02~~

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

50-16

CTIF CICE 222

As count proceeds, for concerns/ observations identified:

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

ETM _____ Date 10-07-02

Not Performed: N/A

50-17

TBC CTIF 136
CTIF CICE 222

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

ETM _____ Date 10-07-02

Not Performed: N/A

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

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

50-18

CTIF CVM1 222
 CVM2

Perform final SSV scan.

ETM _____ Date 10-07-02

ET/05

Not Performed: N/A

50-19

CTIF CVM1 222
 CVM2

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

ETM _____ Date 10-07-02

ET/05

Not Performed: N/A

10-11-02
ET/05

50-10

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

50-20

CTIF

222

Start continuous recording per Table 50-1 at pick-up of T-9 Minute count including following events:

- T-7M30S OAA retraction on camera OTV 008/108 or 042/142.
- T-3M55S Orbiter elevon movement on OTV 009/109, 054/154, 063/163 064/164.
- T-2M30S GOX Vent Seal retraction, +Y / -Y GOX Vent Louvers, and GOX Vent Seal Footprints on OTV 013/113, 060/160, 061/161, 062/162, 068/168, and 069/169.
- T-1M00S through last view of vehicle during ascent on NASA Select (channel 179).

ETM _____

10/15

Date 10-07-02

Not Performed: N/A

50-11

10-11-02
10/15

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

NOTE

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

50-21

CICE CTIF 222

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

ETM

ET/03

Date 10-07-02

50-22

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

1. Monitor/videotape nose cone area during high winds.
2. Verify:
 - A. No ice formation on the +Y and -Y 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
011

ETM

ET/03

Date 10-07-02

Not Performed: N/A

50-12

ET/03
11-02

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

50-23

CTIF

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

Launch Scrub

Date 10/07/08 Time 19:38 GMT

Scrub at T- N/A

ETM R Brewer Date 10-07-02
BREWER

50-24

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
011

ETM R Brewer Date 10-07-02
BREWER

Not Performed: N/A

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.

50-25

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 _____

Not Performed: ET/OS

ET/OS
10-07-02

50-26

CTIF

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

USA
VM
011

OMRSD S00FB0.350-1

ETM N/A Date _____

Not Performed: ET/OS

ET/OS
16-07-02

ET/OS
10-07-02

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

50-27

CTIF CVM1 222
CVM2

Terminate scanning operations.

ETM _____  Date 10-07-02

50-28

CTIF CVM1 222
CVM2

Perform Operation 100 - Console Securing.

ETM _____  Date 10-07-02

50-29

CTIF

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

ETM _____ N/A Date _____

Not Performed: 
10-07-02


10-07-02

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

50-33

CTIF

If launch occurred, perform Operation 140 - Film Review.

ETM



Date 10-08-02

Not Performed: N/A

50-34

SSV Debris Assessment complete.

50-17

105
OR
03

TROUBLE TAPE RECORDING LOG

STS-112 S0007 LAUNCH

DATE: 10-07-02 19 45 GMT

TAPE NO.	CAM. NO.	START TIME (GMT)	STOP TIME (GMT)	DESCRIPTION OF ANOMALY/CONDITION
FT#1	154	10:39	10:42	LO2 FEEDLINE SCAN
	154	11:29	11:31	LO2 FEEDLINE SCAN
	154	12:16	12:18	LO2 FEEDLINE SCAN
	161	12:39	12:41	CHK - Y VOLT STUT AND FACE
	154	13:28	13:30	LO2 F/L SCAN
	154	13:31	13:31	Longeron (TY) FROST BALL
	154	14:31	14:34	LO2 F/L SCAN / Longeron Frost Ball
	154	15:16	15:19	LO2 F/L SCAN / Longeron Frost Ball
	154	16:22	16:24	LO2 F/L SCAN
	154	17:30	17:32	LO2 F/L SCAN
	154	18:14	18:16	LOX FEEDLINE SCAN
	154	19:08	19:10	LOX FEEDLINE SCAN

LAUNCH VIEWS (INCA PROHIBITED FOR STACS)

Notes: 2,170,168A, 19:41
187,170,2

- ET 115
- ORB 104
- SRB BH15
- MLP 3
- PAD B

FOR OF FOR STACS
ENGINEERING
FOR STACS
FOR STACS

PAGE NO. 1

FOR STACS

FOR STACS

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. 1

Observed By: Speece

Date 10-7-02 Time 1230 GMT 1630

Camera No. (or Walkdown) FIT WALK DOWN

Description:

CRACK ON VERTICAL STRUT 6 TO 8 INCHES
LONG NO OFFSET 1/8 TO 1/4 INCH WIDE

Acceptance Rationale (or IPR/PR No.):

within family REF NSTR 08303 2.2.24
NO ICE FROST & NO OFF SET.

FOR
FIT 05
10-7-02

FOR
PR

AMANDA OLIV

CICE

Amanda Oliv

Date 10/7/02

CTIF

Ken Leggett

Date 10-7-02

KEN LEGGETT

FOR
PR

FOR ETOS
10-11-02

10-11-02

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. 007 **IPR** FOR 6T05 10-11-02

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

Acceptance Rationale (or IPR/PR No.):
NA

CICE _____ Date _____

CTIF _____ Date _____

10-17
1/1/02

03-15-2002
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OMI S6444 J04
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:

Handwritten scribbles

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

Handwritten: Fix. OR 04, 04

03-15-2002
APPROVED

OMI S6444 J04
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:

NA

Acceptance Rationale (or IPR/PR No.):

NA

CICE _____ Date _____

CTIF _____ Date _____

FOR
E TO

03-15-2002
APPROVED

OMI S6444 J04
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:

W224
1274

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

10-11-02
OR
04

03-15-2002
APPROVED

OMI S6444 J04
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:

NA

NA

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

03-15-2002
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OMI S6444 J04
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:

Handwritten notes:
N/A
N/A

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

Handwritten: FOR EC05
OR
04

03-15-2002
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OMI S6444 J04
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:

WA

NA

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

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

*** End of Operation 50 ***

FOR ETDOS
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03-15-2002
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OMI S6444 J04
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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: N/A

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.

03-15-2002
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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

ET/05

Brewer

Date 10/07/02

Support: COMM

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

LO₂ MPS Chill Down Date 10/07/02 GMT Time 10:34 GMT

ETM

ET/05

Date 10/07/02

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

ET/05

Date 10/07/02

Support: COMM

Not Performed: N/A

ET/05

10-11-02

03-15-2002
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OMI S6444 J04
APPROVED

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

LO₂ Slow Fill Date 10/07/02 GMT Time 11:00 GMT

ETM  Date 10/07/02

Not Performed: N/A

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

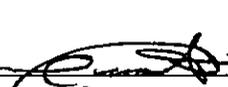
LO₂ Fast Fill Date 10/07/02 GMT Time 11:11 GMT

ETM  Date 10/07/02

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  Date 10/07/02
D. CHICATERRA

Support: COMM

Not Performed: N/A

10-16-02


03-15-2002
APPROVED

OMI S6444 J04
APPROVED

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

LO₂ Topping Date 10-07-02 GMT Time 13:08 GMT ^{ETM} MS
18 7 Oct 02

ETM ~~_____~~ Date 10-07-02
D. CHIATERRA
Not Performed: N/A

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

LO₂ Stable Replenish Date 10-07-02 GMT Time 13:15 GMT

ETM ~~_____~~ Date 10-07-02
D. CHIATERRA
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 ET/18 Date 10/7/02
Support: COMM
Not Performed: N/A

ET/18
10-07-02

03-15-2002
APPROVED

OMI S6444 J04
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
05

Date 10/7/02

Not Performed: N/A

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.

ETM  Date 10/7/02
Support: COMM

Not Performed: N/A

60-12 Operation - Group 1 Monitoring - LO₂ Chill Down Thru T-0 complete.


10-17-02

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.

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.

063/163

SRB AND ORBITER WING IN VIEW CENTERED OVER LH2 FIREDETECTION SYSTEM (BUTCHER PAPER)

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

*** End of Operation 60 ***

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SEP 18 '02

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03-15-2002
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OMI S6444 J04
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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: N/A

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.

FOR ETM
OR
04

03-15-2002
APPROVED

OMI S6444 J04
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 Tom Ford Date 10/7/02
TOM FORD

Support: COMM

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

LH₂ Chill Down Date 10/7/02 Time 10:20 GMT

ETM Tom Ford Date 10/7/02
TOM FORD

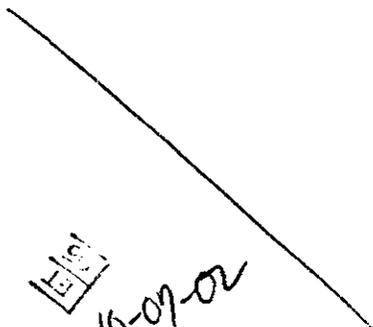
70-3 CVM2 JTV2 225

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 Tom Ford Date 10/7/02
TOM FORD

Support: COMM

Not Performed: N/A


15-07-02

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

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

LH₂ Slow Fill Date 10/7/02 Time 10:32 GMT

ETM Tom Ford Date 10/7/02
TOM FORD

Not Performed: N/A

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

LH₂ Fast Fill Date 10/7/02 Time 11:18 GMT
~~10:50~~ 10:50 Ful
ETOS

ETM Tom Ford Date 10/7/02
TOM FORD

Not Performed: N/A

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 Tom Ford Date 10/7/02
TOM FORD

Support: COMM

Not Performed: N/A

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

70-7 Record start date and time (GMT) for LH₂ Topping.

LH₂ Topping Date 10/7/02 Time 12:24 GMT

ETM Tom Ford Date 10/7/02
Tom Ford

Not Performed: N/A

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

LH₂ Stable Replenish Date 10/7/02 Time 13:04 GMT

ETM Tom Ford Date 10/7/02
Tom Ford

Not Performed: N/A

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 ME 10 Date 10/07/02

Support: COMM

Not Performed: N/A

ME 10 10-07-02

03-15-2002
APPROVED

OMI S6444 J04
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, 163, 142, 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 _____

ME
10

Date

10/7/02

Support: COMM

Not Performed: NA

03-15-2002
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OMI S6444 J04
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.

ETM

ME
10

Date 10/7/02

Support: COMM

Not Performed: NA

70-12 Operation - Group 2 Monitoring - LH₂ Chill Down Thru T-0 complete.

17/8

10-07-02

03-15-2002
APPROVED

OMI S6444 J04
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.

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. (Sun)

✓ 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.

① 064/164

FULL ZOOM OUT, WITH LH₂ UMBILICAL AND LH ELEVON IN VIEW.
*** End of Table 70-1 - CVM2 Camera Positions for Terminal Count ***

OR 04 FOR ETOS 10/11/02

TRD - PER RAY
BROOKER
PER TOLSON

*** End of Operation 70 ***

① Pen+Ink
ME 10 10/7/02

03-15-2002
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OMI S6444 J04
APPROVED

OPERATION 80 Final Inspection

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

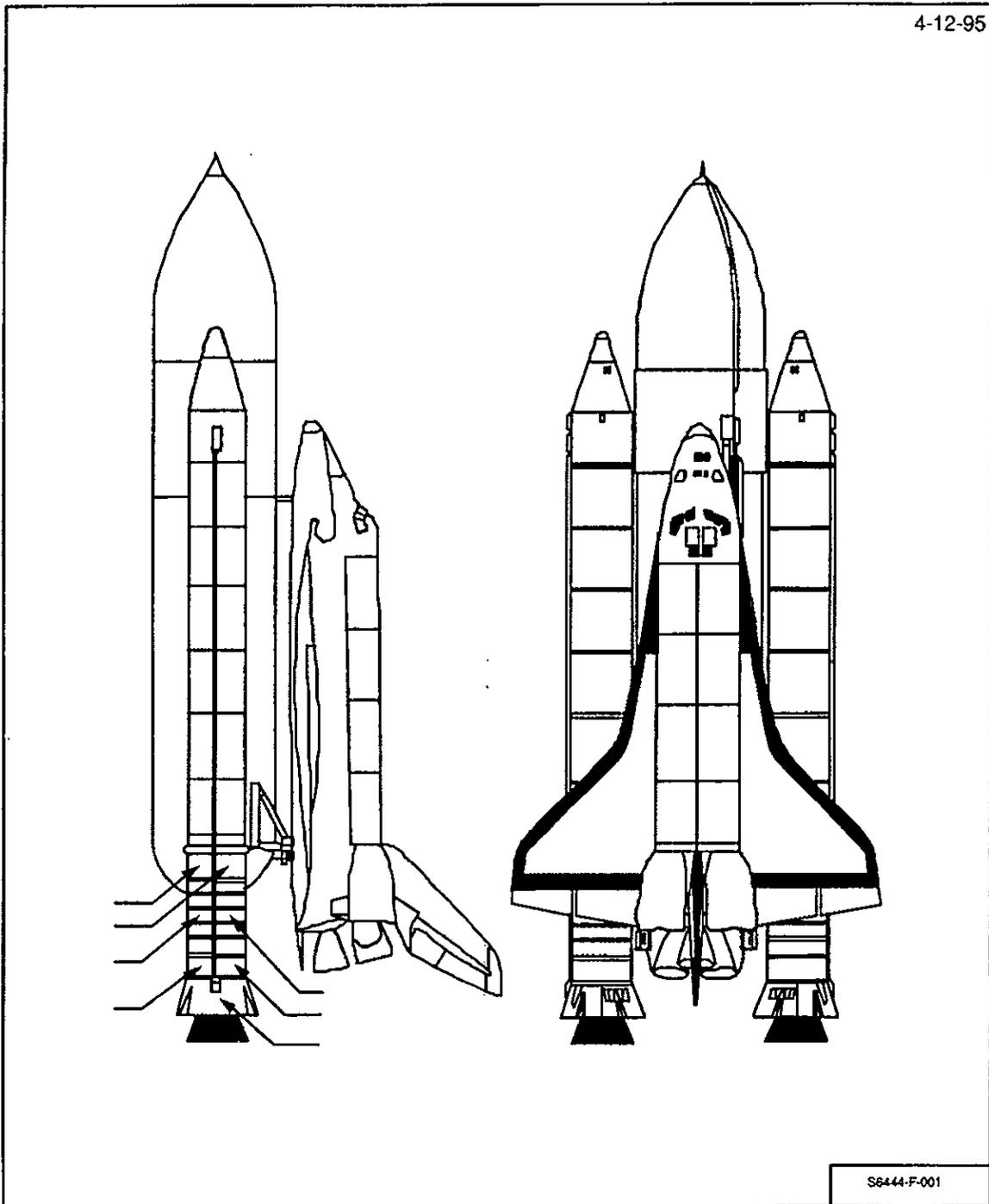
NOTE

Final Inspection may not need to be performed depending on 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

FOR DS
10-10-0



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

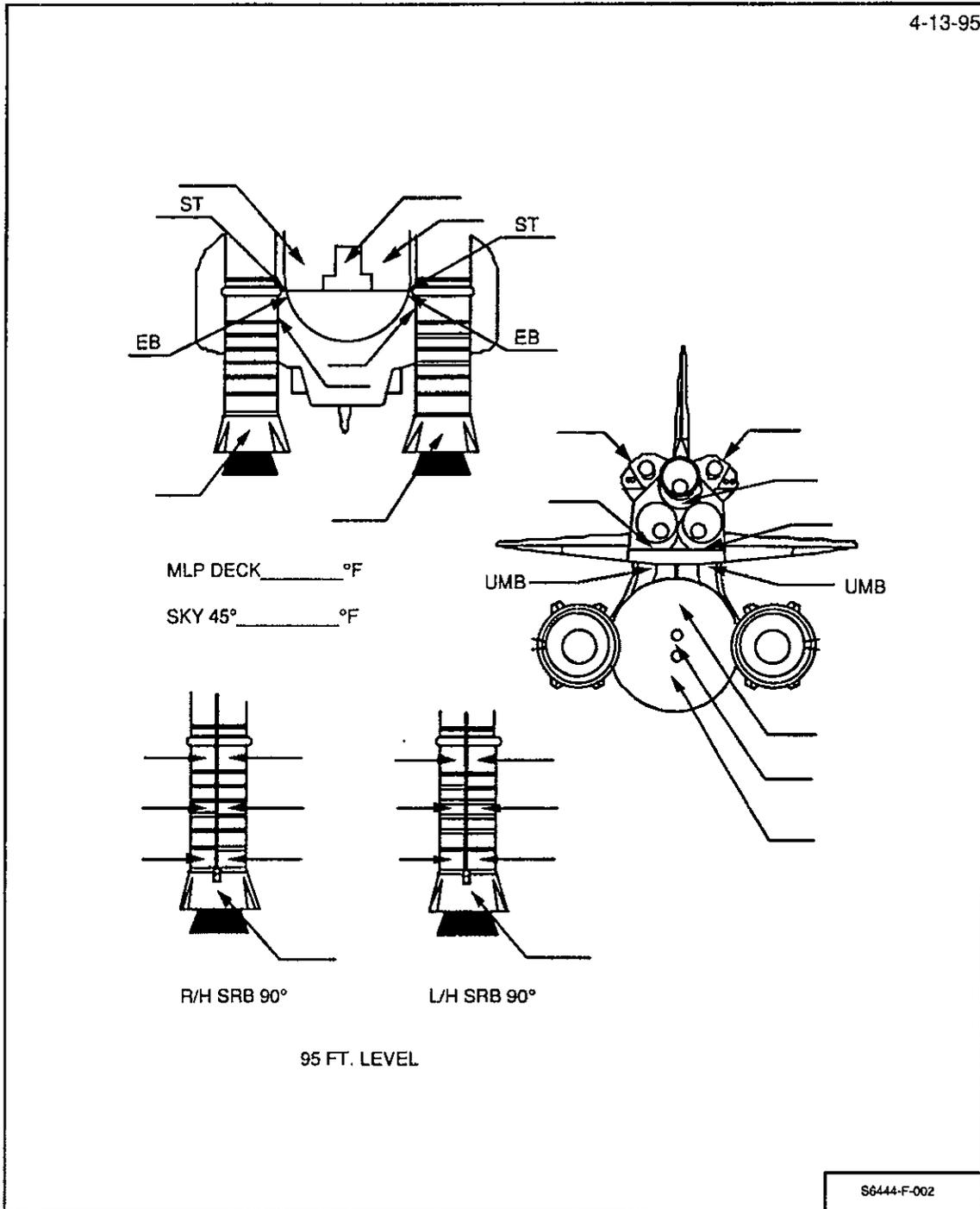
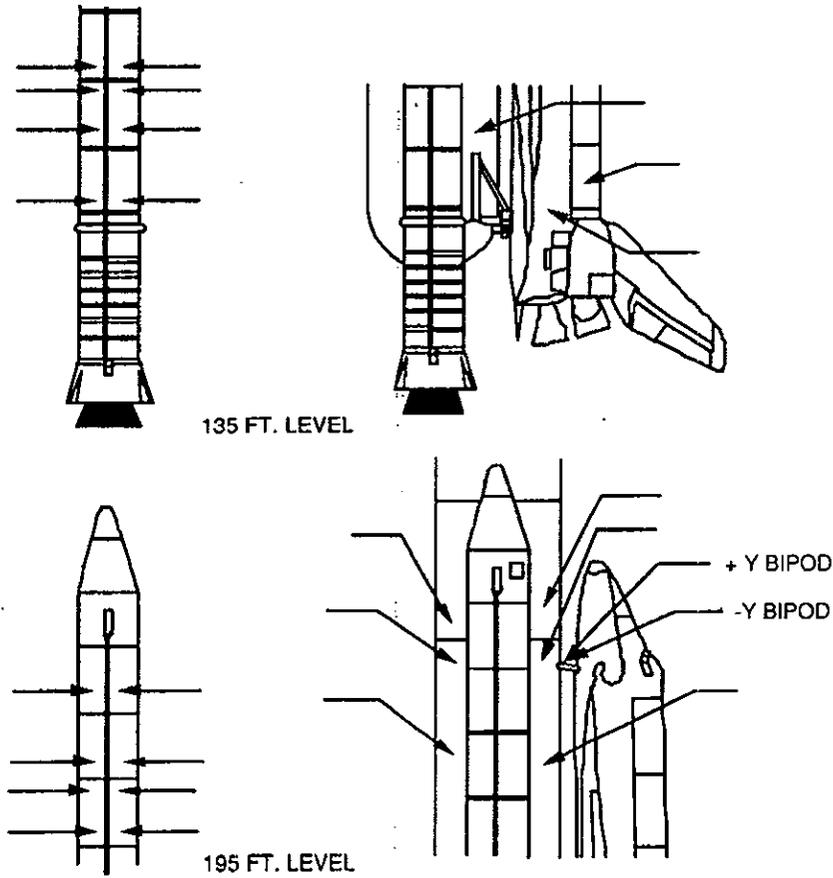


Figure 80-2: Deck (0) and 95 Ft Levels
(For Reference Only)

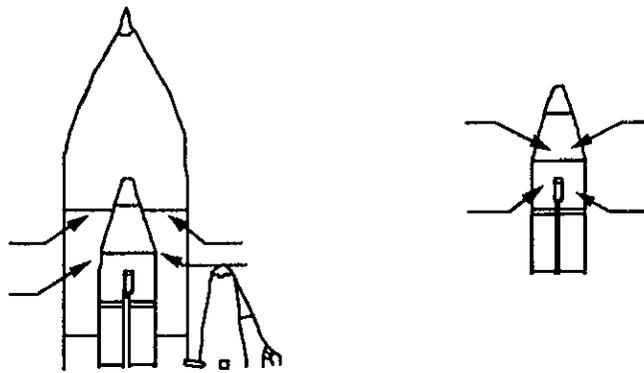
4-12-95



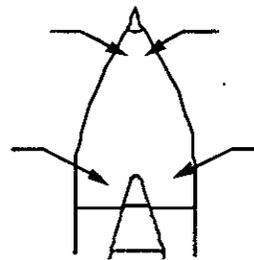
S6444-F-003

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

4-12-95



215 FT. LEVEL



255 FT. LEVEL

S6444-F-004

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)

OMI- \$6444- STEP 80-2.2

Still Image	TCN	2987514	Seq/Step	80-2
Documentation Log	Date	Oct 7 2002	Vehicle / SSME No.	OV 104
	Flight No.	26		
Sent From Location	Time	02:28 PM	STS No.	STS-112
	SPC No.	54256		
WAD / Rev	S6444-RevJ 04	WAD Run	1	OMRS
PHOTOGRAPHER				
Name	Organization	Dept No.	Phone No.	Shift
Richards, W	USA	5391	1-3350	2
Stamp	ME20			
Element	Element Zone	System Technology Code		
Orbiter	N/A			
SRB Component Descriptor	ET Component Descriptor	Orbiter Component Descriptor		
BI -	ET -	0		
Image Description				
SSV ICE AND DEBRIS ASSESSMENT				

For STOR
OR
10-11-

80-1 Assemble following final inspection team members:

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

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

NOTE

Following substep may be not performed with TTL concurrence.

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

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

Roll No. N/A

Negative No. N/A

Work order No. N/A

Sub Step Not Performed:

ME
10

 10/7/02

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

Description: Final Inspection Team

SPC No. 54256

Disc/Frame Nos: 1-85

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

OMI S6444 J04

OMRSD S00U00.020-D-1

80-3 Final Inspection complete. Verify no constraints to continue. Forward description(s) of debris found to SFOC QC for entry into Processing Debris / FOD Database.

TTL (PH-H) A. Quinn Date 10/7/02

SFOC-ETM ✓  Date 10/7/02

80-4 Operation - Final Inspection complete.

ETM ✓  Date 10/7/02

80-8

10-11-02
[Signature]

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

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

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

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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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	

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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

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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

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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	

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-0; 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	
Overall SSME Cluster	Horizontal	50 mm	+Y Side

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Table 80-2 Final Inspection Team - Telephotos

WIDE ANGLE PHOTOS - MLP (continued)

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
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 ***

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Table 80-3 Reduced Final Inspection Team Photos

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 255 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
GO 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	

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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Table 80-3 Reduced Final Inspection Team Photos

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - MLP DECK (continued)

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 ***

03-15-2002
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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:

ME
10

10/7/02

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 _____ Time _____ GMT

LO₂ Drain Start Date _____ Time _____ GMT

ETM _____ Date _____

90-1 REMOVED Pgs 90-3
and REV 90/01 N/p

FOR

03-15-2002
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OMI S6444 J04
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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 _____

SR
ETD
N/P
OR
04

03-15-2002
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OMI S6444 J04
APPROVED

1996 05/11

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

WC
150
USA

Dev. 90
No. 01

SEP 18 '02

SEE DEV

90-5 Completion of this operation satisfies noted requirements.

OMRSD S00E00.021

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

*** End of Operation 90 ***

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10-1

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APPROVED
03-15-2002

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.

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NOTE

Perform next step only after a successful launch.

100-4

CTIF

Remove photo processing laptop computer from Firing Room.

Not Performed:

ET
05

10-07-02

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 Brewer
BREWER

Date

10/07/02

*** End of Operation 100 ***

10-11-02
ET
05

03-15-2002
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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 R Brewer Date 10-07-02
BREWER

*** End of Operation 110 ***

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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:

ME
10

10/7/02

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.

MP

ETM

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

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12-29-02

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NOTE

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

120-2 Perform post drain walkdown as follows:

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

OMRSD S00E00.031

3. Photograph any vehicle / facility concerns observed.

SPC No. _____

Disc/Frame Nos: _____

120-3 Walkdown complete. All discrepancies identified. No constraints to continue. Forward description(s) of debris found to SFOC QC for entry into Processing Debris / FOD Database.

PH-H _____ Date _____

ETM _____ Date _____

120-4 Operation Post Drain Walkdown complete.

*** End of Operation 120 ***

120-3

105

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03-15-2002
03-15-2002

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: NA

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)
Pad Mgmt Rep	(1)

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

Essential Personnel		
NASA	PH-H	1
SFOC	ETM	1

NOTE

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

- 130-2 Perform Post Launch Walkdown as follows:

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

Description: Post Launch Walkdown

OMRSD S00U00.010-1 ^{USA} _{SW 011}

SPC No. 51360

Disc/Frame Nos: 148

- 130-3 Walkdown complete. Debris sources and lost flight hardware identified. No constraints to continue. **Forward** description(s) of debris found to SFOC QC for entry into Processing Debris / FOD Database.

PH-H M. Payne Date 10/7/02

ETM Wm. [unclear] Date 10-7-02 OR
04 Farrell

10-7-02

- 130-4 Operation - Post Launch Walkdown complete.

ET 05

03-15-2002
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Table 130-1 Post Launch Walkdown Inspection Areas

Record mission info, PAD, date, and time:

STS 112 PAD 'B'
Date 10-08-02 Time 16:00

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:

NORMAL MINOR / DAMAGE Debris

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)

10/20/02

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Table 130-1 Post Launch Walkdown Inspection Areas

215 Ft Level - GH2 Vent Line/GUCP

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

255 Ft Level - GO₂ Vent Arm, Ducts, Hood

Seals
Hood windows, doors, latches

Fixed Service Structure (FSS)

Cable tray covers
Signs
Hydraulic leaks
Slidewire baskets

PAD Apron/Acreage

Vehicle hardware and/or flight TPS materials
Facility debris

Table K-1 PAD Apron/Acreage Items

<u>Description</u>	<u>Location</u>
<i>Minor Debris</i>	<i>in GRASS AREAS</i>

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

ET 05

11-7-9-02

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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 *****

Handwritten signature and initials at the bottom right corner.

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OPERATION 140 Film Review

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

NOTE

This operation may be not performed after launch scrub.

Operation 140 Not Performed: N/A

NOTE

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

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

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

OMRSD S00U00.011-1

USA
OMI
011

ETM

R Brewer
BREWER

Date 10/17/02

140-2 Operation - Film Review complete.

ETM

R Brewer
BREWER

Date 10/14/02

*** End of Operation 140 ***

03-15-2002
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OPERATION 145 IR Camera Removal

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

WARNING

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

CAUTION

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

NOTE

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

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

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

03-15-2002 12:38

145-1

WARNING

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

CAUTION

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

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

E 05

18 29-02

WARNING

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

WS002.a 05-22-01

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

NASA PH-H *[Signature]* Date 10-29-02

M. PRYNE

USA ETM *[Signature]* Date 10-29-02

BREWER

Not Performed: N/A

NOTE

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

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

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

WARNING

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

CAUTION

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

3. **Loosen** screws (8 pl) securing camera housing back cover using Phillips screwdriver. **Rotate** camera housing back cover to open position. **Retain** bolts/washers for reinstallation.
4. **Disconnect:**
 - Power cable
 - Pan & tilt cable
 - Controller cable (2 pl)
 - OTV coaxial cable
5. **Unscrew** set screw(s) at lower, left/right to release IR camera Unit in camera housing. **Remove** IR camera Unit from camera housing by carefully sliding it out the back opening of the camera housing. **Support** IR camera Unit during removal.
6. **Coat** camera housing back cover O-ring with a single coat of (1) tube/jar 6505-00-133-8025 Petroleum Jelly, Vaseline (or equivalent) .
7. **Rotate** camera housing back cover into closed position. Do not pinch cables. **Secure** back cover by installing screws (8 pl). **Tighten** screws wrench tight using Phillips screwdriver.

EL/05
10-29-02

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

WARNING

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

WS002.a 05-22-01

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

NASA PH-H *[Signature]* Date 10-29-02

M. Payne

USA ETM *[Signature]* Date 10-29-02

BREWER

Not Performed: **N/A**

*** End of Operation 145 ***

10-29-02
ET
05

03-15-2002
APPROVED

OMI S6444 J04
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.

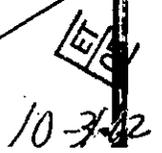
Post Launch PAD Assessment
SRB Assessment
Launch Film Review
Launch Day Video Review
Orbiter Landing Assessment
ET Separation Review

150-2 Final report assembly complete.

ETM R Brewer Date 10/31/02
BREWER

150-3 Operation - Final Report complete.

*** End of Operation 150 ***


10-31-02

STS 112

OMI-56444-STEP 150-1

Brewer, Raymond J

From: Oliu-1, Armando [Armando.Oliu-1@ksc.nasa.gov]
 Sent: Monday, October 21, 2002 2:59 PM
 To: Abner, Charlie; 'Adams, Randall'; 'Ayotte, William'; Blue, John B; 'Brown Kenneth'; 'Buckingham, Bruce'; Bulloch-1, Steve; Bursian, Henry; 'Byrne, Greg'; Chitko, Pete J.; 'cookjh@thiokol.com'; 'Derry Steve'; 'Disler, Jon'; 'Disler, Jon (2)'; 'Eastwood Martin'; Estrada 1, Carlos; 'Fricke, Robert'; Gaetjens, William; Glenn-1, Malcolm; 'Gomez Reynaldo'; 'GRP DOC Mission Support Room'; Guidi-1, John; Hawkins, Tyrell; Herman, Robert S; Herst, Terry; Holloway, Darrell L; 'Holmes Steve'; Huff, Joy N.; 'Jay.Sambamurthi@msfc.nasa.gov'; Jones 1, Frank; Kelley-1, David; 'Khodadoust, Abdollah'; Kienitz, Fred; 'Kinder Gerald'; 'Koenig Lisa'; 'Kopfing, Philip A'; Lafleur, Tom C; Leggett, Kenneth D; Leinbach-1, Mike; 'Linda Ham'; 'Mango, Ed'; 'McClymonds, Jack'; 'MCCORMACK, DONALD L. (DON) (JSC-MV)'; Mosteller, Ted; Mulligan-1, Melanie; Nguyen-1, Bao; 'O'Farrell Mike'; 'Ortiz Carlos'; 'Otte Neil'; 'Otto, Scott'; 'Page, Robert'; Payne-1, Michael; 'Ramirez, Juan'; Revay, Kenneth P; 'Rieckhoff, Tom - PC'; 'Rieckhoff, Tom - UNIX'; 'Roe Ralph'; 'Schomburg Calvin'; 'Schricker, B.'; 'snichols@hq.nasa.gov'; Sofge, Al (NASA HQ); 'Speece, Robert'; Stevenson-1, Charlie; 'Stone, Jeff'; Tenbusch-1, Ken; Wells-1, Joel; Wilson, Thomas F.; Rivera, Jorge; Greenwell, Shawn; Crisafulli, Anthony; Brewer, Raymond J; Marren, Tom; Thompson-1, Becky J.; Key, John; Lorick, Vicky K; Champagne, Lorraine C; Kent, William T. "Tim"; Spaulding-1, Jeff; Altemus-1, Steve; Mullins, Michael B; Atkinson, Bill C.; Powell, Doug; 'Carlos Ortiz (Boeing) (E-mail)'; 'Lang, J Robert

Subject: STS-112 Orbiter Post-Landing Inspection - Final

**STS-112 ORBITER POST LANDING INSPECTION
 DEBRIS ASSESSMENT
 21 October 2002**

After the 11:44 pm local/eastern time landing on 18 October 2002, a post landing inspection of OV-104 Atlantis was conducted at the Kennedy Space Center on SLF runway 33 and in Orbiter Processing Facility bay 1. This inspection was performed to identify debris impact damage and, if possible, debris sources.

The Orbiter TPS sustained a total of 107 hits of which 25 had a major dimension of 1-inch or larger. This total does not include the numerous hits on the base heat shields attributed to SSME vibration/acoustics and exhaust plume recirculation.

The following table lists the STS-112 Orbiter damage hits by area:

	<u>HITS > 1-inch</u>	<u>TOTAL HITS</u>
Lower Surface	22	81
Upper Surface	0	0
Window Area	3	22
Right Side	0	1
Left Side	0	0
Right OMS Pod	0	0
Left OMS Pod	0	3
TOTALS	25	107

The Orbiter lower surface sustained 81 total hits, of which 22 had a major dimension of 1-inch or larger, both numbers are well within family. The majority of the hits were in the area from the nose landing gear to the main landing gear wheel wells. This area sustained 46 hits with 15 greater than 1-inch. Most of the hits in this area are shallow, indicative of damage from External Tank foam.

Handwritten notes:
 OK
 10-31
 10-31

The largest lower surface tile damage site, located just right of centerline in between main landing gear wheel wells, measured 4-1/2 inches long by 1/2-inches wide by 1/4-inches deep. The cause of this damage was most likely ice/frost from the ET LO2 feedline bellows or support brackets.

There was an Ames Gap Filler material protruding from in between two tiles just forward of the RH MLG door.

The landing gear tires were in good condition.

ET/Orbiter separation devices EO-1, EO-2, and EO-3 functioned normally. No ordnance fragments were found on the runway beneath the umbilicals. The EO-2 and EO-3 fitting retainer springs appeared to be in nominal configuration. The EO-2/3 pyro debris shutters were fully closed. No other debris was found beneath the umbilicals.

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

There were a total of 22 hits, with 3 having one dimension greater than 1-inch, on the window perimeter tiles. Hazing and streaking of forward-facing Orbiter windows appears to be lighter greater than normal.

The post-landing walkdown of Runway 33 was performed immediately after landing. All components of the drag chute were recovered and appeared to have functioned normally.

In summary, the total number of Orbiter TPS debris hits and the number of hits 1-inch or larger were within established family. However, the number of hits between the nose landing gear and main landing gear wheel wells is slightly higher than normal. The potential identification of debris damage sources for mission STS-112 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-112 Debris/Ice/TPS Assessment and Integrated Photographic Analysis report.

Armando Oliu
NASA - KSC

Robert Speece
NASA - KSC



STS-112 Orbiter Debris
Mapping...

FOR ET 05
10-1-02
OR
02

OMI-56444, STEP 150-1

FOR ETOS
10-31-02
OR

STS-112 POST LAUNCH PAD DEBRIS INSPECTION REPORT
KSC Debris Team
07 October 2002

The post launch inspection of the MLP-3, Pad B FSS, north flame trench, and Pad B apron was conducted on 07 October 2002 from Launch + 1.50 to 6.25 hours (1745 to 2200 EST).

No flight hardware was found.

Orbiter liftoff lateral acceleration data to predict stud hang-ups received from Boeing-Huntington Beach and reported as 0.15 g. Inspection was performed and the south holddown studs were visually assessed as having no indication of hang-up. Erosion was typical for both the north and south posts. Epon shim on HDP 1 is cracked with some delamination, no evidence of missing material. North holddown post blast covers and T-0 umbilical exhibited nominal exhaust plume damage. Both SRB aft skirt GN2 purge lines were intact and erect, protective tape layering was partially eroded and exhibited frayed braiding on the RH side.

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

The GH2 vent line latched on the fifth tooth on the latching mechanism. The vent line was located in a 'centered' position in the latching mechanism. The GUCP 7-inch quick disconnect probe was accessible for inspection and appeared to be undamaged with sealing surface in good shape. The deceleration cable was in nominal configuration, and the vent line blanket was sooted.

The OAA appeared to be intact with no evidence of plume impingement. All slidewire baskets were secured with no evidence of damage.

The GOX vent arm, ducts and structure appeared to be in nominal condition. The GOX vent seals were inspected and found to be in good shape with no indication of ET paint residue present. Mastic was chipped/missing from two locations on the upper surface of the GOX vent hood.

Debris findings included:

- FSS 115' an "Evacuation Route" sign was found laying on the OWP (Orbiter Weather Protection) structure, it was determined that the sign was from the 125' level.
- FSS 95' "Evacuation Route" was loose and wrapped around banister.
- South Flametrench Apron, SRB Plug material was found.
- North Flametrench Deflector, Significant erosion from left and right boosters; fence is damaged with debris at base.
- Bolts were found loose in the attach points for the Sound Suppression Pipes (SW corner).

Overall damage to the pad appeared to be normal. Photos will be available on SIMS.

FOR ETOS
10-31-02
OR

OMI-6444, Step 150-1

FOR ETDS
10-31-02

**STS-112 ORBITER POST LANDING INSPECTION
DEBRIS ASSESSMENT
21 October 2002**

After the 11:44 am local/eastern time landing on 18 October 2002, a post landing inspection of OV-104 Atlantis was conducted at the Kennedy Space Center on SLF runway 33 and in Orbiter Processing Facility bay 1. This inspection was performed to identify debris impact damage and, if possible, debris sources.

The Orbiter TPS sustained a total of 104 hits of which 25 had a major dimension of 1-inch or larger. This total does not include the numerous hits on the base heat shields attributed to SSME vibration/acoustics and exhaust plume recirculation.

The following table lists the STS-110 Orbiter damage hits by area:

	<u>HITS > 1-inch</u>	<u>TOTAL HITS</u>
Lower Surface	22	81
Upper Surface	0	0
Window Area	3	22
Right Side	0	1
Left Side	0	0
Right OMS Pod	0	0
Left OMS Pod	3	3
TOTALS	25	107

The Orbiter lower surface sustained 81 total hits, of which 22 had a major dimension of 1-inch or larger, both numbers are well within family. The majority of the hits were in the area from the nose landing gear to the main landing gear wheel wells. This area sustained 46 hits with 15 greater than 1-inch. Most of the hits in this area are shallow, indicative of damage from External Tank foam.

The largest lower surface tile damage site, located just right of centerline in between main landing gear wheel wells, measured 4-1/2 inches long by 1/2-inches wide by 1/4-inches deep. The cause of this damage was most likely ice/frost from the ET LO2 feedline bellows or support brackets.

There was an Ames Gap Filler material protruding from in between two tiles just forward of the RH MLG door.

The landing gear tires were in good condition.

ET/Orbiter separation devices EO-1, EO-2, and EO-3 functioned normally. No ordnance fragments were found on the runway beneath the umbilicals. The EO-2 and EO-3 fitting retainer springs appeared to be in nominal configuration. The EO-2/3 pyro debris shutters were fully closed. No other debris was found beneath the umbilicals.

ETDS

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

There were a total of 22 hits, with 3 having one dimension greater than 1-inch, on the window perimeter tiles. Hazing and streaking of forward-facing Orbiter windows appears to be lighter than normal.

The post-landing walkdown of Runway 33 was performed immediately after landing. All components of the drag chute were recovered and appeared to have functioned normally.

In summary, the total number of Orbiter TPS debris hits and the number of hits 1-inch or larger were within established family. However, the number of hits between the nose landing gear and main landing gear wheel wells is slightly higher than normal. The potential identification of debris damage sources for mission STS-112 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-112 Debris/Ice/TPS Assessment and Integrated Photographic Analysis report.

Armando Oliu
NASA - KSC

Robert Speece
NASA - KSC

FOR ETDS
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-312

OML \$6444, Step 150-1

Far ETOS
OR 04
10-31-02

STS-112 SRB POST FLIGHT/RETRIEVAL ASSESSMENT
KSC Debris Team
10 October 2002

RELEASE: 073

The BI-115 Solid Rocket Boosters were inspected for debris damage and debris sources at CCAFS Hangar AF on 10 October 2002. Overall, both boosters were in excellent condition.

ANOMALIES

There was evidence of a debris impact on the ETA ring of the LH SRB near the IEA box. This location coincides with the event seen, and reported, in the high-speed tracking films. The impact site is approximately 4 inches in diameter and 3 inches in depth. Exact measurements will be taken of the impact site as the area is removed and samples are taken for laboratory analysis.

FUNNIES

None

OBSERVATIONS

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

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

The forward skirts exhibited no debonds or missing TPS. RSS antennae covers/phenolic base plates were intact. All primary frustum severance ring pins and retainer clips 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 insulation close-outs and GEI cork runs.

In support of IPR 114V-004 System A HDP Fire 1 Command Circuit Failure, all eight of the holddown post Debris Containment Systems (DCS) had already been removed. The report from the investigation team is that the DCS appeared to have functioned normally on all HDP's. All eight of the HDP had one un-fired NSI detonator cartridge.

As expected, broaching occurred in the holddown stud bore of post #3 consistent with stud hang-up seen in the post launch film review. Minor thread marks from the holddown studs could be seen on all of the remaining stud bores.

Armando Oliu
NASA - KSC

OR 04
10-31-02

OMI-6444, Step 150-1

OR
04

FOR ETDS

STS-112 LAUNCH DAY VIDEO REVIEW
KSC Photo/Video Analysis Team
7 October 2002

Significant Anomalies

None

Minor Anomalies

None.

Funnies

None.

Observations

- ET CAMERA** - Free burning hydrogen blown south during SSME start-up.
- At approx T-3 seconds 2 particles seen to the +Y side of the cable tray. Probably ice from the forward LO2 feedline bellows. No contact with vehicle observed.
 - Small particles enter field of view from upper right and pass to lower left between approx. T+3 and T+4 seconds. No contact with vehicle observed.
 - Forward RCS butcher paper fell during roll maneuver.
 - Localized flow condensation visible on various points on the vehicle.
 - Erosion of forward portion of cable tray PAL ramp was visible.
 - Instafoam from RH SRB aft skirt ejected out of plume at approx. T+72 seconds. This compares to observation in TV-4.
 - Evidence of forward RCS thruster firing was visible at approx. T+120 seconds.
 - View degrades at approx. T+121 seconds (SRB sep).
 - OMS-assist firing was visible shortly after SRB separation (approx. T+132 seconds).

Numerous pieces of ice from the ET/ORB umbilical shook loose, but no damage was detected. (OTV 109, 154, 163).

Free burning hydrogen blown past the vertical stabilizer. (OTV 170, 171, TV-4, TV-7B).

LH2 and LO2 T-0 umbilical disconnect was normal. (OTV 149, 150).

Frost was visible around -Y ET GOX vent louver. (OTV 161).

Several pieces of aft skirt instafoam ejected out of the SRB plume during ascent (TV 4).

Localized flow condensation at various points on the vehicle (TV 4, TV 13).

GH2 vent line retraction and latch appeared nominal (OTV 160).

ET aft dome charring was visible. (TV 13)

FOR ETDS
OR
04

Notes

A total of 19 videos were made available for review.

Review of long range tracking films is scheduled to begin Tuesday, October 8, 2002.

Armando Oliu
NASA-KSC

Robert Speece
NASA_KSC

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OR 10-3-02

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ET 05

OMI- $\frac{1}{2}$ 6444, Step 150-1
STS-112 POST LAUNCH FILM REVIEW
KSC Photo/Video Analysis Team
8 October 2002

Anomaly

At 19:46:24.610 UTC (approx. T+33 seconds) a particle was observed traveling along side the ET LH2 tank and impacts the forward face of LH SRB IEA generating a shower of particles aft of IEA. No impact with the orbiter was observed. (E-212, E-220, E-222)

Observations

Free burning hydrogen blown past vertical stabilizer. (E-52, E-63, E-77)

GUCP separation and retraction appeared normal (E-33).

Ice particles from the GH2 disconnect fell at T-0. (E-33, E-34)

Umbilical purge barrier baggie material fell during ascent. (E-52, E-207, E-222)

SRB separation appeared normal. (E-207, E-212, E-222)

Particles of SRB aft-skirt instafoam fell along side the SRB plume during ascent. (E-212, E-220, E-223)

OMS-assist firing was visible shortly after SRB separation. (E-207)

Localized flow condensation at various points on the vehicle appeared very pronounced during ascent. (E-212, E-222)

SSME Mach diamond formation sequence was 3-2-1. (E-76)

Body flap movement during ascent was typical. (E-207, E-212, E-220)

Ice particles fell from ET/ORB umbilicals after lift-off. No impact to orbiter lower surface was noted. (E-31, E-52, E-63)

Charring on the ET aft dome was typical. (E-207)

Forward RCS paper covers were observed falling aft during early ascent. (E-52, E-222)

Numerous pieces of facility debris entered field of view after vehicle cleared tower. (E-31, E-36).

Debris ejected from SRB exhaust hole at T-0. (E-52, E-63)

Notes

Review of high-speed films will continue on Wednesday, October 9, 2002.

Armando Oliu	Robert Speece
NASA - KSC	NASA - KSC

FOR ET 05
OR 10-31-02

OMI 56444, step 150-1

FOR ETOS
OR 04
10-31-02

STS-112 POST LAUNCH FILM REVIEW
KSC Photo/Video Analysis Team
9 October 2002

ANOMALIES

None.

OBSERVATIONS

A stud hang-up occurred on HDP #3. The stud was held fully extended until the aft skirt foot was clear. Then the stud twanged briefly before falling into the holddown post. A piece of debris, possibly shaved aluminum from the bore fell with the stud, so broaching may be visible during the SRB Post Flight Assessment (scheduled for 10 October). (E-10)

The firing cable/line on HDP #6 did not break off at the SRB after T-0. Approximately three feet of the cable pulled out and flew with the SRB. (E-13)

SRB holddown post shoe rocked slightly on HDP's #2 and #6. (E-8, E-13)

GH2 vent line retraction appeared normal. (E-41, E-42, E-60, E-61)

No OMS pod flexing observed. (E-17, E-18)

Several tile surface chips were noted from base heat shield. This is a common occurrence due to SSME ignition acoustics.

Free-burning GH2 visible near vertical stabilizer during SSME ignition.

Several ice particles fell from ET/ORB umbilicals during SSME ignition.

Vapors on ET aft dome and SRB stiffener rings were observed after T-0.

Ice particles fell from LH2 / LO2 TSM T-0 disconnects.

Slight rebound of LH2 and LO2 TSM doors was observed. (E-2, E-3, E-19, E-20)

T-0 umbilical access platform on the inboard side of the LO2 and LH2 TSM moves slightly during SSME ignition. (E-17, E-18)

Small pieces of deck debris were blown across MLP deck during SSME and SRB ignition.

SRB throat plug, aft skirt instafoam pieces, and water trough material ejected from exhaust hole. No contact with vehicle.

FOR ETOS
10-31-02
OR 04

NOTES

All high speed film items have been reviewed.

No anomalies were observed in the films and videos that would be a concern for re-entry and landing.

Armando Oliu
NASA - KSC

NO. 10000

FOR ETOS 0-31-

OR
104

OMI-¹6444, Step 150-1

FOR ET05
OR
04

STS-112 LANDING and ON-ORBIT FILM SUMMARY
KSC Photo/Video Analysis Team
22 October 2002

The last film/video data, 16mm and 35mm landing films, 35mm still images from the LO2 ET/ORB umbilical camera, 16mm motion picture with 5mm and 10mm lens from the LH2 ET/ORB umbilical cameras, and Crew Hand-Held Still Images of the External Tank after separation from the Orbiter were received and reviewed at KSC on 22 October 2002.

ANOMALIES

A large portion of the -Y bipod ramp is missing. The bipod spindle housing is exposed. The missing foam is most likely the item seen (E-222) striking the LH ETA ring during ascent.

FUNNIES

None.

Observations:

Small "popcorn" divots were observed on the -Y thrust panel aft of the ET/SRB attach point in the non-vented area.

All landing events appeared nominal.

SRB separation from the External Tank appeared nominal.

ET separation from the Orbiter was normal.

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.

One TPS divot was observed on the intertank-to-LH2 tank flange closeout near the -Y jack-pad closeout. The divot is approximately 3-inches in diameter and has exposed substrate.

Two shallow divots were noted at the intertank-to-LH2 tank flange closeout. One, approximately 6-inches long and 2-inches wide, was located in between the jack-pad closeouts. The other, approximately 2.5-inches long by 1.5-inches wide, was just forward of the +Y jack pad closeout.

FOR ET05
OR
04
10-31-02

One shallow TPS divot was observed on the LH2 tank near the ice/frost ramp at station Xt-1857. The area is shallow and approximately 5-inches long by 3-inches wide.

No anomalies were detected in the LO2 tank acreage. The BSM burn scars were typical. The Ogive exhibited no foam loss.

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

Armando Oliu
NASA - KSC

FOR ETOS
10-31-02





United Space Alliance

TOP/WAD Deviation

Dev No. 90/01 DILS No. 98/24 (9) Page 1 of 1

TOP/WAD No. S6444	REV/CHG/VER J04	<input type="checkbox"/> In Family <input type="checkbox"/> Out of Family <input checked="" type="checkbox"/> NMA	Cause Code Requesting or Causing Org (B,D,E,G,H,L,N,O,P,Q,S,T,V) E	Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 20
First Use <input type="checkbox"/> SRB BI- Effectivity: <input type="checkbox"/> ORB /FLT	<input checked="" type="checkbox"/> ET 093	<input type="checkbox"/> GSE <input type="checkbox"/> FRCS/POD /FLT	<input type="checkbox"/> STS- <input type="checkbox"/> SSME /FLT	
Affected: <input type="checkbox"/> OMRS/ACOMC/OMP	<input type="checkbox"/> Design Req'ts	<input type="checkbox"/> Haz Step(s)	<input type="checkbox"/> PPE	<input checked="" type="checkbox"/> Internal Review Req.
Contractor OPR <i>R Brewer 06-04-02</i>	Contractor Test Conductor <i>Other SE Check</i>	Gov't OPR <i>14-12</i>	Gov't Project Engineer <i>06-04-02</i>	
Contractor Test Project Engineer	Other <i>06-04-02</i>	Gov't Test Director or Contractor Chief TC		

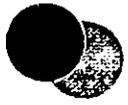
Page Number: 90-3 Step Number: 90-4

Add the following new step:

90-4.1 Monitor the ET GOX Vent Land area after GOX Vent Hood retraction using cameras no. 013/113, 060/160, 062/162, 068/168 and 069/169 for potential Topcoat Paint/TPS damage. Record results below.

Results N/A
ETM _____ Date _____

Originator (print) R. Brewer	SPDMS ID ZQ6345	Phone 1-4429	Organization ETM	Date 06/04/2002	<input checked="" type="checkbox"/> Perm <input type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle
--	---------------------------	------------------------	----------------------------	---------------------------	---



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*****
* PROGRAM PRA120 SELECTION CRITERIA
* -----
* RPT TYPE: IPR
* PR GROUP:
* WORK AREA CD:
* PR ELEM CD:
* STS NO:
* Starting RPT DT: 10/11/02
* Ending RPT DT: 10/31/02
* LRU or Non-LRU: B
* PRACA EFF CD:
* EICN:
* RPT STATUS: OP
* DETECTED DURING: S6444
* -----
* Sorted by DETECTED DURING, PR ELEM CD, and EICN
* *****

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

*
* END OF REPORT *
*

USA 10/11/02

10/12/02

/REVISION		56444 / 504		EFFECTIVITY		BI-113, ET-113	
Tracking Number		Page		Seq/Op - Step		Eng Approval	
02-FR3-070902		60-8		Table 60-1		[Signature]	
Add Camera 063/163 Specifications OR 5-30-02							
SRB AND ORBITER WING IN VIEW CENTERED 5/3/02							
RDR LH2 FIRE DETECTION SYSTEM (BUTCHER PAPER)							

Tracking Number	Page	Seq/Op - Step	Eng Approval
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Tracking Number	Page	Seq/Op - Step	Eng Approval
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United Space Alliance

Pen and Ink Change Record

11-06-02

REVISION	56444	JOY	RO1	EFFECTIVITY	026 / 112	027 / H46	SPC 968
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