BLANKET V070-361995 (LH & RH) MAY INTERFERE WITH PVD PURGE VENT ON XO 378

Element/End Item: **OV-103**
Flow/Usage: **116/FLIGHT 33**
Facility: **OPF-3**
Design Center Concurrence: **KSC**
Category:
OPR: **TCS**
TTL ORG: **TO**

This document does not contain hazardous operations.

Approval Record

BLANKET V070-361995 (LH & RH) MAY INTERFERE WITH PVD PURGE VENT ON XO 378

Technical Contact: M. Falero **Phone:** 1-6782

Category II TOP Only

This Approval Record is for all Operation No(s) listed below:

Initial Released Operations:

Added Operations: **12**

Deleted Operations:

Replaced Operations:

Change Index Added _____

Comments: **Summary/Conclusion in Operation 12.**

_____

_____

Organization	Name (Printed)	Name (Signature)	Date
USA TCS SE	M. Falero		07/06/10
USA 2nd Checker	T. Miller		07/06/10
Boeing LSS	A. Chambers		07/06/10
NASA TCS	J. Huff/L. Huddleston/ S. Cox		07/06/10

Table of Contents:

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List of Illustrations

1.0 INFORMATION

1.1 Objective

To restrain blankets V070-361995-024 & -025 from billowing into PVD purge vents on Xo 378.

1.3 Operations List

Operation		Shop/ Cntl Rm Console	OPR	Haz (Y/N)	Duration (Hrs)
No.	Title				
10	Pg 1, Item 1, Block 21 (Continued): TTL Disposition	FWD/ N/A	TCS	N	8.0
11	Pg 1, Item 1, Block 21 (Continued): TTL Disposition	FWD/ N/A	TCS	N	8.0
12	Summary/Conclusion	FWD/ N/A	TCS	N	1.0

2.0 SAFETY INFORMATION

2.2 Safety Requirements

	Operation
Safety requirements pertinent to this TOP are contained in the Operations Instructions.	All

2.4 Reference Safety Documentation

Number	Rev	Title
KNPR 8715.3	LI	KSC Safety Practices Procedural Requirements
FSOP 6100	LI	USA Florida Safety Operating Plan

3.0 STAGING REQUIREMENTS

4.0 PLANNING REQUIREMENTS

OIR Required Yes [ ], No [x]

Predecessors: None

Successors: None.

Configuration Required: None

4.4 Support Services, Commodities, and Equipment

4.4.5 Photograph

Step Number	Photo Type
10-3	Problem Resolution-Discrepant Condition
11-7	Problem Resolution-Discrepant Condition

5.0 CONFIGURATION ACCOUNTING AND VERIFICATION

OPERATION 10 Pg 1, Item 1, Block 21 (Continued): TTL Disposition

Shop: **FWD**
Cntrl Rm Console: **N/A**
OPR: **TCS**
Zone: **560**
Hazard (Y/N): **N**
Duration (Hrs): **8.0**

NOTE

The following steps may be worked out of sequence. Boroscope video to be worked in conjunction with blanket work.

NOTE

Recording of large areas is to be with sequential overlapping images to capture the entire area.

10-1 **Perform** a boroscope observation of work being performed in steps 10-4 thru 10-7.

Qw: _____

10-2 **Obtain** digital still images of the following hardware or area:

Hardware Description: LH/RH Vent Ports and adjacent hardware including loose and/or dislodged TCS Blankets.

Review digital still images on camera for accuracy and clarity.

Qw: _____

NOTE

The following step is not a constraint to continuing this WAD.

10-3 **Delete** any images that are duplicates or provide no useful information (out of focus, etc.).

Enter digital images into SIMS database using the following information:

- TCN number from this WAD
- Operation/Step that obtained images
- Element: Orbiter
- Element Zone: 560
- Image Classification: Problem Resolution-Discrepant Condition
- Image Description: FRC3-33-1113: TCS Blankets configuration

SPC Number: _____

Number of Images Archived: _____

Qw: _____

10-4 **IF** blanket can be tucked under (fwd side of) drain line (per print condition),

THEN Perform the following:

Tuck blanket V070-361995-024 (LH side) under drain line.

Secure to thruster box blanket buttons using lacing cord and (2 ea) MD128-0008-0002 buttons. Note: Loop tie cord through thruster box blanket button knots, then through MLI blanket, then through button.

Not Performed: _____

T: _____ Qv: _____

10-5 **IF** blanket could not be tucked under (fwd side of) drain line (TTL condition),

THEN Secure blanket V070-361995-024 (LH side) as follows:

Using lacing cord, **loop** cord around lower drain line support through blanket cutout. Anchor, if possible, to lower support.

Extend cord upward over MLI blanket to upper drain line support through blanket cutout and tie off at upper support.

Tape inboard seam of MLI blanket to adjacent thrust box blanket using MB0135-050 type V tape.

Comments:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

USA TCS SE: _____ date: _____

Not Performed: _____

T: _____ Qv: _____

10-6 **IF** blanket can be tucked under (fwd side of) drain line (per print condition),

THEN Perform the following:

Tuck blanket V070-361995-025 (RH side) under drain line.

Secure to thruster box blanket buttons using lacing cord and (2 ea) MD128-0008-0002 buttons. Note: Loop tie cord through thruster box blanket button knots, then through MLI blanket, then through button.

Not Performed: _____

T: _____ Qv: _____

10-7 **IF** blanket could not be tucked under (fwd side of) drain line (TTL condition),

THEN Secure blanket V070-361995-025 (RH side) as follows:

Using lacing cord, **loop** cord around lower drain line support through blanket cutout. Anchor, if possible, to lower support.

Extend cord upward over MLI blanket to upper drain line support through blanket cutout and tie off at upper support.

Tape inboard seam of MLI blanket to adjacent thrust box blanket using MB0135-050 type V tape.

Comments:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

USA TCS SE: _____ date: _____

Not Performed: _____

T: _____ Qv: _____

NOTE
Further disposition to follow.

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

OPERATION 11 Pg 1, Item 1, Block 21 (Continued): TTL Disposition

Shop: **FWD**
Cntrl Rm Console: **N/A**
OPR: **TCS**
Zone: **560**
Hazard (Y/N): **N**
Duration (Hrs): **8.0**

Figure 11-1 V5008.003 Run 1 (STS-121) LH Closeout Photo

Note: MLI blanket is over (aft side of) drain lines and not secured to adjacent blanket on thruster housing. No closeout photos of RH side.

Figure 11-2 Boroscope view of LH Xo 378 purge vent (IPR 116V-0015)

Note: Flow path obstructed by blanket.

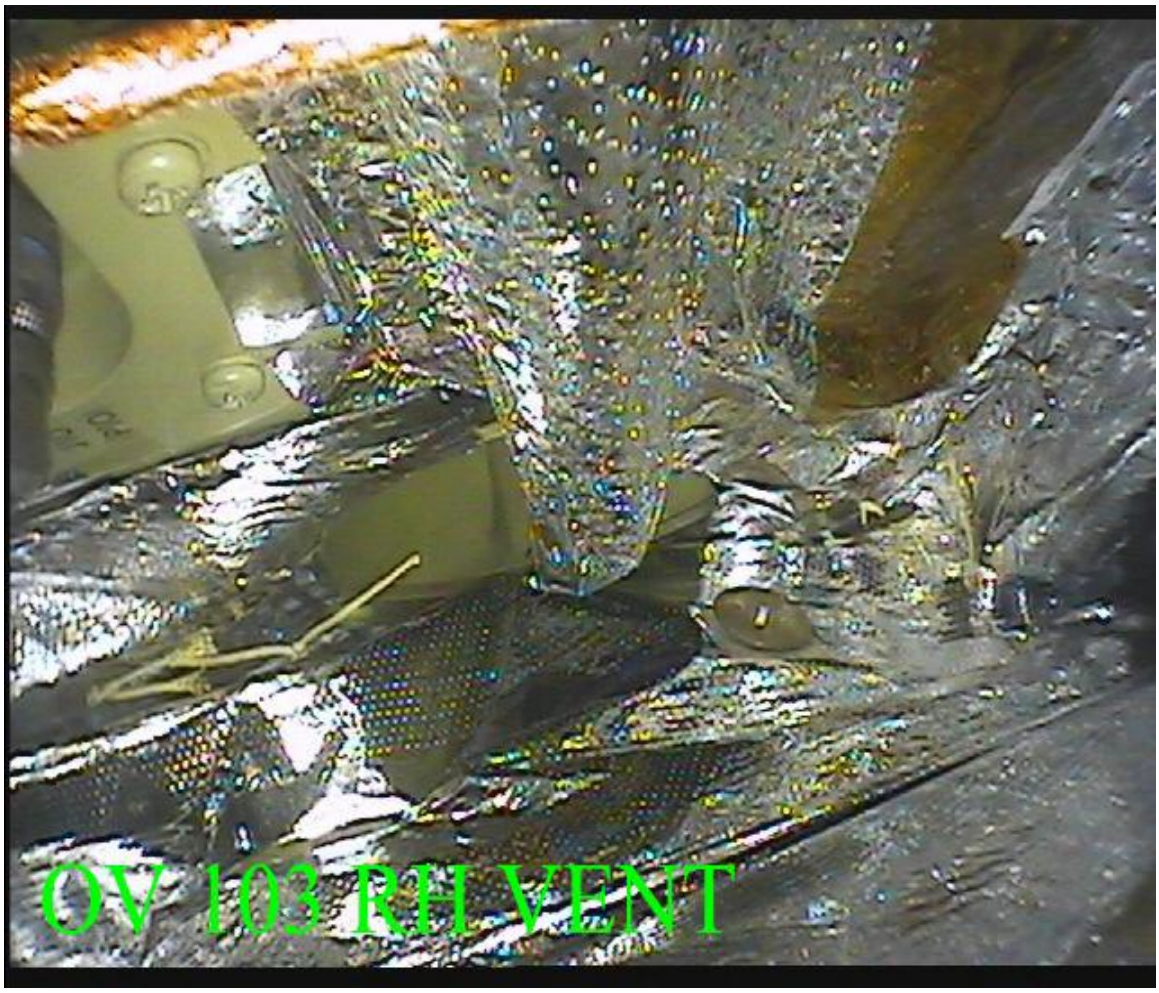

Figure 11-3 Boroscope view of RH Xo 378 purge vent (IPR 116V-0015)

Note: Flow path obstructed by blanket.

Figure 11-4 Boroscope view of LH Xo 378 purge vent after repositioning of blanket (SPC # 90790)

Note: MLI Blanket under drain line and secure to adjacent blanket. Flow path no longer obstructed by blanket.

Figure 11-5 Boroscope view of RH Xo 378 purge vent after repositioning of blanket (SPC # 90790)

Note: MLI Blanket under drain line and secure to adjacent blanket. Flow path no longer obstructed by blanket.

Restricted Installation Disposition

Item(s): 1

Part/Program Name: Insulation Installation - RCS Module, TCS

Part/Program Number: V070-361900-017

Serial/Rev No.: J60568

Location of Item(s): Xo 374 to Xo 378 on FRC3 (LH & RH outboard sides)

Photos: Figure(s) 11-1 thru 11-3 or Photos not performed [ ]

Drawings/Sketches:
See Page(s) Attachment or Drawings/Sketches not performed [x]

Problem Description: Suspect Condition: Blanket V070-361995 (LH & RH) may interfere with PVD purge vent on Xo 378.

Part Criticality: 3 .

Functional Criticality of the non-conformance: 3

MR Criticality: 3

Risk Assessment: Yes [ ] No [x]

Probable Cause Statement: Installation drawing does not show details for the instln of blankets V070-361995-024 & -025.

OMRSD Waiver/Exception Required: Yes [ ] No [x]

OMRSD Waiver/Exception Number: N/A **See Attachment:** N/A

OMRSD N/A **satisfied by this MR: Yes [ ] No [X]**

Reason for Restricted Life: To inspect condition of reworked/repositioned TCS blankets in FRC3 post flight, as part of STS-121 purge event anomaly resolution follow-up activity.

Engineering Interim Summary: During STS-121 ascent, the Xo 378 bulkhead delta-pressure transducer showed higher than normal pressure differential across the bulkhead. This was documented as an IFA (ref IPR 116V-0015). The actual pressure differential encountered was 1.2 psi. The structure is certified to .95 psid. Blockage of the Xo 378 purge vents from the FRCS side was considered the most likely cause.

TCS Engineering post flight inspection revealed the following:
Borescope inspections on FRC3 showed that TCS blankets in the FRCS module were very close to the vents, and were not installed under PVD drain lines. Design intent is to install the V070-361995-024 (LH) and V070-361995-025 (RH) MLI blankets under PVD drain lines in the FRCS. The blankets contain existing cutouts and cutlines, allowing installation under these lines. When properly installed, the blankets are restrained and cannot billow into the Xo 378 vent areas. When installed improperly, the blankets could billow into the vent area. Improper installation of the TCS blankets was determined to be the likely cause of the vent anomaly. CAR 121RF08 was written for corrective action.

FRC4 and FRC5 were evaluated for the same condition. Blankets were observed installed over (aft side of) the drain lines (FRC3 for STS 121, & FRC5) and under (fwd side of) the drain lines (FRC4 for STS-115). Related PR's FRC4-27-1044 and FRC5-20-0638 were written to document this problem.

Installation drawing V070-361900, F/D shows V070-361995-024 & -025 at zone 55A but does not specify installation details. Specific installation details for these blankets are needed to prevent blanket migration over the PVD purge vents on Xo 378. Engineering recommends the following installation drawing clarifications to ensure no venting obstructions with blankets:

- install under drain lines
- tie to thruster box blankets using lacing cord and buttons
- tape to thruster box blankets along inboard seams

The TCS installation drawing V070-361900 will be changed to include detailed requirements for this area (to be incorporated by EOTF on FRC5 and by mod on FRC3 and FRC4).

Rework of FRC3 Blankets (interim without FRC removal):
On FRC3 the blankets were reworked and repositioned as recommended above. Blankets were installed under drain lines, fastened to thruster box blankets with buttons and tie

cord, and taped to thruster box blankets along inboard seams. Post rework borescope photos show no obstruction to purge vent operations for STS-116.

Restricted Life: Use As Is [ ] Use As Repaired [X]

Restricted to:
[X] one flight
[ ] future flight
[ ] future flight based on flight to flight inspection/evaluation

MR Part marking required: Yes [ ] No [X]

Retest required: Yes [ ] No[X]

Retest WAD: .N/A

Photos of Repair: Operation-Step number(s) 10-3 (SPC # 90790) and Figures 11-4 & 11-5 or Photos not performed [ ]

Rationale: During STS-121 ascent, the Xo 378 bulkhead delta-pressure transducer showed higher than normal pressure differential across the bulkhead. This was documented as an IFA (ref IPR 116V-0015), and subsequent CAR 121FR08. The actual pressure differential encountered was 1.2 psi. The structure is certified to .95 psid. Blockage of the Xo 378 purge vents from the FRCS side was determined to be caused by improperly installed TCS blankets.

FRC3 blankets were reworked and repositioned to eliminate the interference with the Xo 378 vents and prevent any possibility of billowing. Blankets were installed under drain lines as per design intent, fastened to thruster box blankets with buttons and tie cord per drawing, and taped to thruster box blankets along inboard seams with approved TCS tape. Post rework borescope photos show no obstruction to purge vent operations for STS-116. The blanket rework was evaluated and approved by Boeing, USA and NASA TCS, PVD and STR engineering groups, at both KSC and JSC.

Blankets will be inspected with borescope post flight as part of STS-121 purge event anomaly resolution follow-up activity. In addition, post flight pressure differential data will be used to determine if blankets remained outside of the Xo 378 vent area.

This MR action does [ ] does not [X] affect the intended function of the component/system and **will [ ] will not [X]** create additional risks to flight safety or mission success.

Design Signature _____ Date_____

This MR action does [ ] does not [X] impact the basis for certification.

Design Signature _____ Date_____

This MR action does [ ] does not [X] impact the CIL retention rationale or hazard controls.

Design Signature _____ Date_____

This MR action does [ ] does not [X] impact the Thermal profile of the closed out area.

Design Signature _____ Date_____

PMRB Required: Yes: [X] No: [ ]

11-1 **Route** This WAD to PMRB.

QE:_____

11-2 **Update** CRR with next use constraint of V80-92127 & V80-92128 (Flight 34).

Engineering Signature:_____

11-3 **Update** constraint information in applicable database.

WC: _____

11-4 **Transfer** this WAD to OV-103 flight 34 TAIR.

WC: _____

Post Flight Work steps or Statement of Intent:

11-5 Verify access thru FRCS Electrical Access Panels 21-27 & 21-28 has been obtained.

T: _____

NOTE
The following steps may be worked out of sequence.

NOTE
Recording of large areas is to be with sequential overlapping images to capture the entire area.

11-6 **Obtain** digital still images of the following hardware or area using a boroscope:

Hardware Description: LH/RH Vent Ports and adjacent hardware including TCS Blankets.

Review digital still images on camera for accuracy and clarity.

Qw: _____

NOTE
The following step is not a constraint to continuing this WAD.

11-7 **Delete** any images that are duplicates or provide no useful information (out of focus, etc.).

Enter digital images into SIMS database using the following information:

- TCN number from this WAD
- Operation/Step that obtained images
- Element: Orbiter
- Element Zone: 560
- Image Classification: Problem Resolution-Discrepant Condition
- Image Description: FRC3-33-1113: TCS Blankets configuration post flight 33

LH side:

SPC Number: _____

Number of Images Archived: _____

RH side:

SPC Number: _____

Number of Images Archived: _____

Qw: _____

NOTE
Further disposition to follow.

*** End of Operation **11** ***

OPERATION 12 Summary/Conclusion

Shop: **FWD**
Cntrl Rm Console: **N/A**
OPR: **TCS**
Zone: **560**
Hazard (Y/N): **N**
Duration (Hrs): **1.0**

12-1 (TAIR) **Delete** steps 11-5 (page 11-11) thru 11-7 (page 11-12).

WC: _____

Summary/Conclusion

Item 1:
During STS-121 ascent, the Xo 378 bulkhead delta-pressure transducer showed higher than normal pressure differential across the bulkhead. This was documented as an IFA (ref IPR 116V-0015). TCS Engineering post flight inspection revealed the following: Borescope inspections on FRC3 showed that TCS blankets in the FRCS module were very close to the vents, and were not installed under PVD drain lines. Design intent was to install the V070-361995-024 (LH) and V070-361995-025 (RH) MLI blankets under PVD drain lines in the FRCS. The blankets contained existing cutouts and cutlines, allowing installation under these lines. When properly installed, the blankets are restrained and cannot billow into the Xo 378 vent areas. When installed improperly, the blankets could billow into the vent area. Improper installation of the TCS blankets was determined to be the likely cause of the vent anomaly. CAR 121RF08 was written for corrective action.

The TCS installation drawing V070-361900 was changed to include detailed requirements for this area on an EOTF. On FRC3 the blankets were reworked and repositioned as recommended in EOTF. Blankets were installed under drain lines, fastened to thruster box blankets with buttons and tie cord, and taped to thruster box blankets along inboard seams. Post rework borescope photos showed no obstruction to purge vent operations for STS-116.

Summary/Conclusion (continues on next page)

Summary/Conclusion (continued)

PR was deferred one flight to assess the reworked condition.

Review of STS-116 ascent flight data for the Xo 378 bulkhead delta-pressure transducer, showed normal pressure differential across the bulkhead.

Based on this data, the TCS PRT and PVD PRT decided that no post flight TCS inspection was required.

Probable Cause: Design deficiency

No further action is required on this PR.

This condition does affect other serial numbers. Suspect PRs were addressed on OV-104 & OV-105.

12-2 **Close** this PR.

Qw: _____

*** End of Operation **12** ***