DAAY JOHNSON

SD77-SH-0001
VOLUME 2

SHUTTLE ORBITER OV-102 CDR

SAFETY ANALYSIS REPORT

VOLUME II

STRUCTURES SYSTEMS

27 APRIL 1977

CONTRACT NAS9-14000
IRD SA-045T2
WBS 1.2.5.1

F. J. Attaway, Manager
Program Safety
Space Shuttle Program

(NASA-CR-185618) SHUTTLE ORBITER OV-102 CDR SAFETY ANALYSIS REPORT. VOLUME 2: STRUCTURES SYSTEMS (Rockwell International Corp.) 79 p

N91-70254

Unclas
00/18 0141455

Rockwell International
Space Division

ABSTRACT

Hazard Analyses are presented for each subsystem of the Shuttle Orbiter OV-102 configuration, and include: subsystem descriptions, safety features and hazard analysis printout tabs. This report, "Shuttle Orbiter OV-102 CDR Safety Analysis Report," is prepared per IRD SA-045T in support of OV-102 CDR, updated to April 29, 1977, and consists of the following volumes:

SD77-SH-0001-001, Volume I Management Summary
SD77-SH-0001-002, Volume II Structural Systems
SD77-SH-0001-003, Volume III Mechanical Systems
SD77-SH-0001-004, Volume IV Propulsion Systems
SD77-SH-0001-005, Volume V Power Systems
SD77-SH-0001-006, Volume VI Avionics
SD77-SH-0001-007, Volume VII Environment Control & Life Support
SD77-SH-0001-008, Volume VIII Crew Station & Equipment

TABLE OF CONTENTS

	Page
INTRODUCTION	1
Hazard Analysis Process	1
Hazard Analysis Ground Rules	1
Organization of the Report	3
SUBSYSTEM DESCRIPTIONS	4
SAFETY FEATURES	8
STRUCTURES HAZARD SUMMARY	10
HAZARD ANALYSIS LISTING	16
Appendix A - Hazard Analysis Printout	17

INTRODUCTION

This Safety Analysis Report (SAR) supports the OV-102 CDR. Related SAR's in the Shuttle Orbiter program series include:

SD74-SH-0004	Shuttle Orbiter No. 1 HFT SAR
SD74-SH-0168	Shuttle Orbiter 101 Delta PDR SAR
SD74-SH-0323	Shuttle Orbiter 102 PDR SAR
SD75-SH-0064	Shuttle System PDR SAR
SD75-SH-0135	Shuttle Orbiter 101 CDR SAR
SD76-SH-0038	Shuttle Orbiter 102 Delta PDR SAR

HAZARD ANALYSIS PROCESS

The Hazard Analysis was performed per Rockwell International-Space Division, Reliability and Safety Desk Instruction 400-1. The hazard analysis process, shown in Figure 1, involves the evaluation of the Orbiter in its mission phases by subsystem identified by the System Definition Manual number for hazards in the major hazard groups described in the desk instruction and coded as listed below:

Illness/Injury/Loss of Personnel	AA
Collision/Impact/Erosion	BB
Fire/Explosion/Implosion	CC
Loss of/Unsafe Environment	DD
Crash Landing/Ditching	EE
Loss of Flight Control	FF
Other (Not Defined)	XX

The status classifications presented in the summary are defined in the desk instruction and listed below:

Open (In-Work)	Closed (Eliminated)
Open (Residual)	Closed (Controlled)
	Closed (Accepted)

HAZARD ANALYSIS GROUND RULES

Ground rules used for the hazard analysis are as follows:

1. Hazards are identified per the rationale stated in Desk Instruction 400-1 and NHB 5300.4 (1D-1).
2. Hazard analyses are conducted according to Desk Instruction 400-1 and NHB 5300.4 (1D-1).
3. Hazard levels are as stated in NHB 5300.4 (1D-1).
4. All Criticality 1 FMEA's are analyzed for hazards.
5. All other FMEA's are reviewed for identification of potential hazards.
6. Hazards requiring three or more failures will not be considered.
7. Unless stated in the hazard analysis, equipment is presumed to be operating per specification.

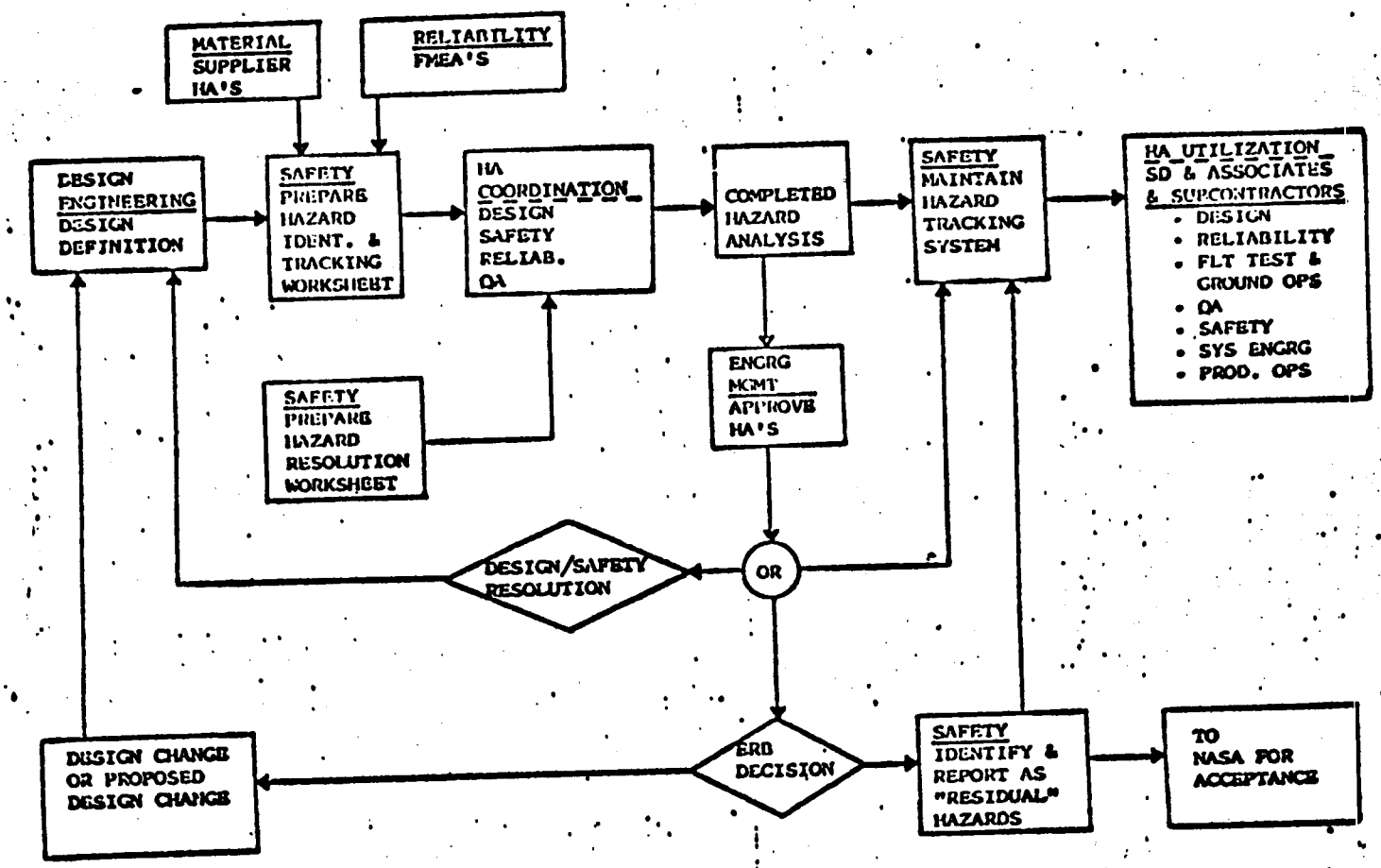

FIGURE 1 - HAZARD ANALYSIS PROCESS

ORGANIZATION OF THE REPORT

The first section of the report is a description of the individual subsystems. These are very brief descriptions and they are intended to provide sufficient technical information so that the subsequent safety data and discussions are understandable to the reader who may not be familiar with the particular system.

The second section discusses safety features which are in the particular system. A discussion of the safeguards in the system is necessary to indicate the rationale of why particular potential hazards were not documented in the hazard analysis section. An additional feature of this section is to provide some general information on the Generic Hazard Groups derived from NHB 5300.4 for the specific subsystems. This data should be useful in terms of providing additonal visibility and rationale involved in the hazard analysis selection process.

The third section is a summary of the individual hazard analyses. A discussion is given to the open, i.e., in-work or residual hazards which have not been closed out as of the date of this report. The current status and resolution plans for these open potential hazards is also briefly discussed. Three tables are also included in this summary section. Table I lists the number of HA's which have been generated for the individual hazard groups (Fire, Collision, etc.) for each of the subsystems. Table II is a tabulation of all the HA's in the particular volume. This list includes an identification number so that the reader can locate a particular potential hazard in the HA section of the document. This list also provides a descriptive title and current status for the individual potential hazards. It should be noted that a Catastrophic hazard is one in which no time exists to correct the problem, whereas in a Critical hazard situation time for corrective action is available. Table III is a Mission Phase Listing of the HA's.

The last section of the report contains the individual HA's which are arranged alpha-numerically by the identification numbers previously mentioned. This kind of listing results in the HA's being grouped by subsystem. Subsystem identifiers are also included on the top of the sheets to assist in locating specific items.

SUBSYSTEM DESCRIPTIONS

FUSELAGE STRUCTURE

The Fuselage Structure consists of the following basic fuselage assemblies:

- Forward Fuselage
- Mid-Fuselage
- Aft Fuselage
- Payload Bay Doors

Forward Fuselage Structure. The forward fuselage structure subsystem is divided into two major assemblies: (1) the upper forward fuselage, and (2) the lower forward fuselage. The lower forward fuselage supports the crew module and the nose landing gear. Penetrations are provided for windows and hatch openings which match those in the crew module.

Mid-Fuselage Structure. The mid-fuselage structure includes the wing carry-thru box and the forward portion of the wing glove.

Aft Fuselage Structure. The aft fuselage structure consists of all structure between and including the 1307 bulkhead web front face and the base heat shield and body flap of the Orbiter.

Payload Bay Doors Structure. The torsional payload bay doors are designed around the cargo payload requirements using an envelope 15 feet in diameter and 60 feet long. They are hinged to fittings mounted on the sill longerons of the mid-fuselage and are split along the upper centerline of the vehicle. The doors are also split into five (5) segments per side along circumferential expansion joints.

CREW MODULE

The crew module provides the habitable environment for the crew members. The module pressure is maintained at 14.7 PSIA to provide a shirt sleeve environment. The support structure provides for the equipment installations of the crew duty and rest stations, food preparation and hygiene facilities, the avionics equipment, the orbiter controls and displays equipment, the ECLSS subsystem and other subsystems as required. Crew vision is provided by the windows. The crew module consists of a completely welded pressure vessel with limited openings or penetrations for windows, hatches, hard lines, and wires. Normal ingress/egress is accomplished through the left side outward opening hatch. Emergency egress is through the side hatch as the primary escape route or through two ejectable panels above the pilot seats as a secondary escape route. These panels are also used in conjunction with the ejection seat system for in-flight escape.

WING STRUCTURE

The wing subsystem is an aerodynamic lifting surface that provides conventional aerodynamic lift and control for the Orbiter vehicle. The wing consists of the following:

- Forward Wing Box (Wing Glove)
- Main Wing Box
- Elevons

Forward Wing Box. The forward wing box is an extension of the main wing that aerodynamically blends the wing leading edge into the fuselage.

Main Wing Box. The main wing box structure transfers the wing aerodynamic loads to the fuselage. In addition, the main wing box provides for the stowage of the main landing gear, and a main landing gear door.

Elevons. The elevons provide flight control and extend from the fuselage to the wing tip. The elevons are divided into two segments, each supported by three hinges. Attachments for the flight controls system are provided along the forward extremity of the elevon surfaces, and aft extremity of the main wing box.

VERTICAL TAIL STRUCTURE

The vertical tail structural subsystem consists of the vertical fin surface, the rudder/speed brake control surfaces, and the conical seal. This structural assembly is bolted to the aft fuselage and provides vehicle aerodynamic stability and control during re-entry, and landing. Within the structure are the rudder/speed brake actuation system, the thermal control system, hydraulic lines, and the electrical subsystem.

Vertical Fin. The vertical fin consists of machined skins with integral rib and stringer caps with rib webs and two spars making a torque box for primary loads. Doors are provided for rudder/speed brake power drive unit installation.

Rudder and Speed Brake. The rudder/speed brake control surface consists of honeycomb panels with ribs and spars for the primary load carrying members, and is attached through rotating hinge points to the structural fin. Access to the rotating actuation system is through the conical seal which is located between the rudder/speed brake and fin.

PURGE, VENT AND DRAIN (PV&D) SUBSYSTEM

The PV&D subsystem consists of the following five separate systems:

Purge - The purge system distributes ground-supplied conditioned air or nitrogen to all required Orbiter compartments for thermal, moisture, and hazards control, during pre-launch and postlanding mission phases.

Vent - The vent system maintains Orbiter compartment pressures at a level consistent with vehicle structural strength by providing adequately sized ports for ascent depressurization and descent repressurization. The ports also provide for on-orbit molecular venting which increases the efficiency of the thermal control insulation.

Drain - The drain system minimizes the accumulating of water within Orbiter compartments by either ducting the water directly overboard through open ports (passive drain system) or by utilizing an on-board duct network coupled to a GSE vacuum pump (active drain system).

Window Cavity Conditioning System (WCCS) - The WCCS maintains Orbiter windows free of fog, frost, volatile condensible material (VCM) and particulate contamination, by preventing the ingress of moisture, VCM, and particulates into the window cavities. The WCCS consists of a ground purge system for pre-launch environmental conditioning of the window cavities and a vent system which maintains window cavity pressures at a level consistent with the glass structural strength.

Hazardous Gas Detection System (HGDS) - The HGDS monitors the concentration of potentially hazardous gases in specific shuttle compartments by monitoring the purge effluent from those compartments during purge operations and by inserting portable sensors during non-purge operations.

THERMAL PROTECTION SUBSYSTEM (TPS)

The TPS is defined as materials applied externally to the primary structure of the Orbiter for the purpose of maintaining the airframe outer skin temperature within acceptable limits. The TPS consists of ceramic tiles, felt insulation, leading edge structural subsystem, thermal windows and thermal barriers.

Tiles. Two types of silica tiles are used which differ basically only in coating, color, size and operating temperature range.

High-Temperature Reusable Surface Insulation (HRSI). The basic tile is 6 X 6 inches, black in color and designed for areas in which maximum temperatures range between 1200F and 2300F.

Low-Temperature Reusable Surface Insulation (LRSI). The basic tile is 8 X 8 inches, diffused white color and designed for areas in which maximum temperatures range between 750F and 1200F.

Felt Reusable Surface Insulation (FRSI). The base material is nomex felt coated with a silicone material and is used in areas where surface temperatures do not exceed 750F.

Leading Edge Structural Subsystem (LESS). The LESS is that portion of the TPS operating at radiation equilibrium temperature in excess of 2300F. The leading edge structure provides the aerodynamic moldline for the Orbiter nose and wing leading edge, and is mechanically attached to the fuselage and the wing primary structures. It is composed of Reinforced Carbon-Carbon (RCC) which is an oxidation inhibited, reinforced pyrolyzed plastic. It serves to protect the structure from direct contact with the high temperatures in the leading edge areas. The RCC is not an insulator per se, and protection of the structure is provided by HRSI located behind the RCC.

Thermal Windows. The TPS includes only the thermal windows consisting of the outer window panes of the windshields, overhead windows and side hatch window. The inner/middle pane assemblies are considered part of the crew module structure. The thermal panes are made of fused silica, and their main function is to protect the inner pressure pane assemblies from re-entry heating, thereby insuring pressure integrity for a safe crew environment.

Thermal Seals. Three categories of seals are included in the definition of TPS: thermal barriers, environmental seals, and aerosurface seals.

Thermal Barriers. Thermal barriers inhibit the hot gas inflow and provide thermal protection for local structure and pressure seals for the gap excursions occurring during thermal/mechanical structural deflections (e.g., landing gear doors, payload bay doors, thermal windows, RCC/RSI interfaces, vertical tail and fuselage junctions).

Environmental Seals. Environmental seals are those seals which provide a pressure seal and deter contamination. Only the payload bay environmental seal is included in the TPS.

Aerosurface Seals. Aerosurface seals are those seals which maintain the primary structure, component structural envelope and actuation, and all equipment and hardware within the aerodynamic surface control areas, at operable temperature levels, and prevent high pressure/low pressure flow through the joint for aero/thermodynamic effectiveness.

THERMAL CONTROL SUBSYSTEM

The Thermal Control Subsystem (TCS) is used in conjunction with the Thermal Protection Subsystem (TPS) to maintain Orbiter components within their allowable temperature limits. The TCS is a passive system, using insulating materials, optical coatings, electrical heaters, heat sinks and thermal isolators to increase or decrease temperatures, as necessary, to meet the prescribed limits.

Insulating Blankets. Two basic type insulation blankets are used throughout the Orbiter: multilayer insulation (MLI) and fibrous bulk insulation (FBI). Thicknesses of the blankets are varied throughout the vehicle to meet localized requirements.

Multilayer Insulation. The MLI is a high temperature multilayered insulation system, consisting of 8 perforated reflectors made from 30-gage, double-goldized kapton, and separated by 9 layers of B4A dacron net. The multilayers are enclosed by a 50-gage outer layer of double-goldized reinforced kapton. It weighs approximately .09 psf.

Fiberous Bulk Insulation. The FBI consists of silicone-impregnated glass fiber batt, enclosed by a 50-gage outer layer of double-goldized reinforced kapton. The material density is 2 pcf.

SAFETY FEATURES

GENERAL

This section presents the results of the hazard analysis performed on the Structures System. The hazard groups identified in Desk Instruction 400-1 were complied with to arrange the material in this section of the Safety Analysis Report. Each paragraph identifies the hazard group and the sub-paragraph depict the potential hazard along with the corrective measures in which design or operation will eliminate or control the potential hazard.

FUSELAGE STRUCTURE

Loss of Flight Control

The hazard group relates primarily to basic structural failures. The elimination of this potential failure is predicated on compliance with specification design requirements and static testing.

Fire/Explosion

This hazard group identifies failure, during crash landings, of attach fittings of tanks containing flammable fluids resulting in fluid spillage and potential fire. This hazard is reduced by the application of the required VEI specification crash load factors in the design of these fittings.

CREW MODULE STRUCTURE

Impact/Collision

This hazard assumes failure of supporting structure to which an emergency egress device would be anchored. The sequences to this accident would be injury to egressing personnel from the ensuing fall. This hazard should be eliminated on the basis of VEI specification requirements for considering ultimate combined loadings in the design of all structures.

WING STRUCTURE

Loss of Flight Control

This hazard relates primarily to basic structural failure. The elimination of this potential failure is predicated on compliance with specification design requirements and static testing.

VERTICAL TAIL STRUCTURE

Loss of Flight Control

This hazard relates primarily to basic structural failure. The elimination of this potential failure is predicated on compliance with specification design requirements and static testing.

PURGE, VENT AND DRAIN

Unsafe Environment

Entrapped fluids within the vehicle structure can, in the course of time, result in structural degradation as a result of the corrosive effects of fluids which may be in continuous contact with the structure. During OV101 and OV102 flight tests, final verification will be made to determine the effectiveness of the design and of any detrimental effects that could be caused by any undrainable residual fluids.

Loss of Flight Control

Inadequate venting of structural compartments could cause primary structural failure with resultant loss of flight control. These failures would be caused by excessive delta pressures during flight ascents or descents. Present design has provided sufficient vent area to insure delta pressures will remain within normal limits.

THERMAL PROTECTION SUBSYSTEM

The TPS Development Testing Program is continuing and the results from this testing will be used to verify TPS design.

This volume of the Safety Analysis Report addresses the OV-102 Shuttle Orbiter, Vertical Flight Configuration, Structures System. Twenty-nine HA's have been identified in the structures area. The hazard analysis was performed in parallel with design definition and many of these hazards were identified from information in reports such as the Accident/Incident Data Bank and the JSC 00134 Space Flight Hazard Catalog that was available from previous programs. In most cases the initial design incorporated the safety features to eliminate or control these hazards, and the Safety Analysis Report listing was used as a method to check that the safety features were incorporated in the design. Table I is a summary of the number of hazards in each hazard category for each structures group. Table II lists each of the hazards identified, by structures subsystem, and their disposition. Table III is a mission phase breakdown of the HA's. Of the twenty-nine hazards identified, twenty-two of these are closed and seven are open, six of which are in an in-work status and one is a residual hazard.

OPEN HAZARDS

Residual

Hazard 1ZXX-0101-4A, "Crash Induced Egress Door Jamming", involves potential structural deformation due to a crash landing that can prevent opening of the side hatch and overhead ejection panels for emergency egress due to indeterminate structural effects. Although this hazard is residual, a study-part of MCR 960, Rev. 2, is being conducted for OV103 and subs with an OV101 and OV102 retrofit effectivity. Precautions associated with this potential hazard will be taken in that rescue personnel, fire fighting equipment and rescue equipment will be available at planned landing sites.

In-Work

1XXX-0101-06, "Star Tracker Door Fails to Close", was originally resolved by a design revision per MCR 1757 which provided for individual fail-safe door design. However, an additional requirement for re-entry capability with a door failed open was mutually agreed upon between JSC/EW and RI/SD (Reference: safety concern no. O-11). RI is to conduct additional thermal studies to determine how this objective can be met.

Hazard 1ZXX-0102-01, "Injury from Sharp Edges, Corners, and Protrusions", addresses contact injuries to personnel during the course of movement within the crew module. This potential hazard is significant to orbital missions under zero "G" conditions. The HA remains in-work to allow continuing inspection of the mock-up through the flight article, to ensure elimination of potential hazards from these sources.

Hazard 1VXX-0102-02, "Delta Pressure Loads on Flight Deck Floor Causing Structural Deflections and Misalignment of Ejection Seat Rails During Seat Ejection", is currently being investigated as part of a rapid decompression effects study per MCR 1964.

Hazards 1YXX-0106-1A, "Loss of Tile", 1YXX-0106-02, "Thermal Seal Failure", and 1YXX-0106-03, "Tile Incompatibility with Orbiter Fluids", are remaining open due to continuance of testing and development in this area.

HAZARD GROUP APPLICATION MATRIX

STRUCTURES

HAZARD GROUP	CODE	FUS	CREW MOD. STRUCT.	WING STRUCT.	VERT. TAIL STRUCT.	PV&D	TPS	TCS
LOSS OF PERSONNEL	AA	1	1	N/A	N/A	N/A	N/A	N/A
COLLISION/IMPACT	BB	1	2	N/A	N/A	N/A	N/A	N/A
FIRE/EXPLOSION	CC	4	N/A	N/A	N/A	1	2	1
LOSS OF/UNSAFE ENVIRONMENT	DD	N/A	N/A	N/A	N/A	3	N/A	N/A
LOSS OF FLIGHT CONTROL	FF	7	N/A	1	1	1	1	N/A
LOSS OF MISSION	XX	1	N/A	N/A	N/A	N/A	N/A	N/A

N/A - Not applicable

TABLE I

TABLE II
HAZARD ANALYSIS SUMMARY

MODEL	SHUTTLE ORBITER OV-102
SUBSYSTEM GROUP	STRUCTURES

HAZARD NUMBER	HAZARD GROUP	PROBLEM DESCRIPTION	STATUS: OPEN: IN-WORK	OPEN: RESIDUAL	CLOSED: ELIMINATED	CLOSED: CONTROLLED	CLOSED: ACCEPTED
FUSELAGE							
1ZXX-0101-01-1A	FF	Fwd Fus Structure Failure				X	
1ZXX-0101-01-2A	FF	Mid Fus Structure Failure				X	
1ZXX-0101-01-3A	FF	Aft Fus Structure Failure				X	
1YXX-0101-01-4A	FF	Payload Doors Fail to Close				X	
1ZXX-0101-2A	FF	Tail Cone Separation, Captive Flight				X	
1ZXX-0101-3A	FF	Tail Cone Fitting Failure				X	
1ZXX-0101-4A	AA	Crash Induced Egress Door Jamming		X			
1YXX-0101-05-01	CC	Fwd Fus Tanks Att. Fitting Fail.				X	
1ZXX-0101-05-2A	CC	Mid-Body P/L Att. Fitting Fail.				X	
1ZXX-0101-05-3A	CC	Aft Fus Tank Att. Fitting Fail				X	
1YXX-0101-06	CC	Star Tracker Door Fails to Close	X				
1YXX-0101-7A	XX	T-0 Umbilical Doors Fail to Close			X		
1YXX-0101-8A	FF	ET/Orb Umbilical Door Fail				X	
1ZXX-0101-09	BB	Crew Module Collapse During Ejection				X	
CREW MODULE STRUCTURE							
1ZXX-0102-01	AA	Sharp Edges, Corners, Protrusions	X				
1VXX-0102-02	BB	Floor Deflection During Ejection	X				
1ZXX-0102-3A	BB	Egress Device Instl. Failure				X	
1YXX-0102-04	FF	Debris Obstruction of Controls				X	
WING STRUCTURE							
1ZXX-0103-1A	FF	Structural Failure				X	
VERTICAL TAIL STRUCTURE							
1ZXX-0104-1A	FF	Structural Failure				X	
PURGE, VENT AND DRAIN SUBSYSTEM							
1ZXX-0105-1B	DD	Corrosion due to Inadequate Drainage				X	
1ZXX-0105-2B	FF	Struct. Failure From Delta Pressures				X	
1YXX-0105-3A	DD	Loss of Thermal Window Panes				X	
1YXX-0105-4A	DD	Loss of Cabin Pres Thru Vent Lines				X	
1YXX-0105-5A	CC	Active Vent Doors Fail to Close				X	
THERMAL PROTECTION SYSTEM							
1YXX-0106-1A	CC	Loss of Tile	X				
1YXX-0106-02	FF	Thermal Barrier Failure	X				
1YXX-0106-03	CC	Tile Incompatibility with Orbiter Fluids	X				
THERMAL CONTROL SYSTEM							
1YXX-0107-1A	CC	Entrapment of Combustible Fluids				X	

TABLE III

HAZARD ANALYSIS MISSION PHASE LISTING

SUBSYSTEM GROUP: STRUCTURES

HAZARD NUMBER	PROBLEM DESCRIPTION
PRELAUNCH	
1ZXX-0102-01	Sharp Edges, Corners Protrusions
1ZXX-0102-3A	Egress Device Instl Failure
1ZXX-0105-1B	Corrosion from Inadequate Drainage
1YXX-0106-03	Incompatibility with Orbiter Fluids
1YXX-0107-1A	Entrapment of Combustible Fluids
LIFT OFF THRU ORBIT	
1ZXX-0101-01-1A	Fwd Fus Structure Failure
1ZXX-0101-01-2A	Mid Fus Structure Failure
1ZXX-0101-01-3A	Aft Fus Structure Failure
1YXX-0101-05-01	Fwd Fus Tanks Att Ftg Failure
1ZXX-0101-05-2A	Mid Body P/L Att Ftg Failure
1ZXX-0101-05-3A	Aft Fus Tanks Att Ftg Failure
1YXX-0101-06	Star Tracker Door Fails Open
1YXX-0101-7A	T-0 Umbilical Door Fails Open
1YXX-0101-8A	ET/Orb Umbilical Door Failure
1ZXX-0101-09	Crew Mod. Collapse During Eject
1ZXX-0102-01	Sharp Edges, Corners, Protrusions
1VXX-0102-02	Floor Deflection During Ejection
1ZXX-0103-1A	Structural Failure
1ZXX-0104-1A	Structural Failure
1ZXX-0105-1B	Corrosion from Inadequate Drainage
1ZXX-0105-2B	Struct Fail from Delta Pressures
1YXX-0105-3A	Loss of Thermal Window Panes
1YXX-0105-4A	Cabin Pressure Loss Thru Vent Lines
1YXX-0106-03	Incompatibility with Orbiter Fluids
1YXX-0107-1A	Entrapment of Combustible Fluids
ON ORBIT	
1YXX-0101-06	Star Tracker Door Fails Open
1ZXX-0102-01	Sharp Edges, Corners, Protrusions
1ZXX-0105-1B	Corrosion from Inadequate Drainage
1YXX-0105-3A	Loss of Thermal Window Panes
1YXX-0105-4A	Cabin Pressure Loss Thru Vent Lines
1YXX-0105-5A	Active Vent Doors Fail Open

TABLE III

HAZARD ANALYSIS MISSION PHASE LISTING

SUBSYSTEM GROUP: STRUCTURES

HAZARD NUMBER	PROBLEM DESCRIPTION
DE-ORBIT THRU LANDING	
1ZXX-0101-01-1A	Fwd Fus Structure Failure
1ZXX-0101-01-2A	Mid Fus Structure Failure
1ZXX-0101-01-3A	Aft Fus Structure Failure
1YXX-0101-01-4A	P/L Doors Fail to Close
1ZXX-0101-4A	Crash Induced Egress Door Jamming
1YXX-0101-05-01	Fwd Fus Tanks Att Ftg Failure
1ZXX-0101-05-2A	Mid Body P/L Att Ftg Failure
1ZXX-0101-05-3A	Aft Fus Tanks Att Ftg Failure
1YXX-0101-06	Star Tracker Door Fails Open
1ZXX-0101-09	Crew Mod Collapse During Eject
1ZXX-0102-01	Sharp Edges, Corners, Protrusions
1VXX-0102-02	Floor Deflection During Ejection
1ZXX-0102-3A	Egress Device Instl Failure
1YXX-0102-04	Debris Obstruction of Controls
1ZXX-0103-1A	Structural Failure
1ZXX-0104-1A	Structural Failure
1ZXX-0105-1B	Corrosion from Inadequate Drainage
1ZXX-0105-2B	Struct Fail from Delta Pressure
1YXX-0105-4A	Cabin Pressure Loss thru Vent Lines
1YXX-0105-5A	Active Vent Doors Fail Open
1YXX-0106-1A	Loss of Tile
1YXX-0106-02	Thermal Barrier Failure
1YXX-0106-03	Incompatibility with Orbiter Fluids
1YXX-0107-1A	Entrapment of Combustible Fluids

HAZARD ANALYSIS LISTING

The tabular listing of hazard analyses are included. The initial and tracking level listings are as follows:

CA	Catastrophic: no time available to accommodate potential hazard.
CR	Critical: time available to react to potentially hazardous situation.
CA/CN	Catastrophic potential hazard having methodology identified to control hazard..
CR/CN	Critical potential hazard having methodology identified to control hazard.
CN/CN	Potential hazard that has been controlled or eliminated.

Note: CA or CR tracking status indicates an open hazard. CA/CN or CR/CN indicates a conditionally control hazard and CN/CN is a closed hazard.

APPENDIX A

Structures Hazard Analysis Printout

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
12AX-0101-01-1A	FORWARD FUSELAGE	CA	CN/CN	123	CONTROLLED	082974

HAZARD DESCRIPTION

LOSS OF FLIGHT CONTROL DUE TO FAILURE OF FUSELAGE STRUCT.

FLIGHT TEST X	GROUND TEST	FERRY FLIGHTS	ORBITAL MISSION X OTHER
PRELAUNCH	LIFT OFF THRU ORBIT X	ON ORBIT	DE-ORBIT THRU LANDING X

HAZARD GROUP FF LOSS OF FLIGHT CONTROL RESP.ENGR. I.J.ALONGI

RELATED FMEAS	FMEA REQD YES	NO
NONE		X

REFERENCES

VL70-001042 FWD FUS, SDP 15.1, RDD SD72-SH-0101-1

HAZARD CAUSES

01-FAILURE DUE TO DESIGN MARGIN
02-DETERIORATION DUE TO GALVANIC OR STRESS CORROSION
03-LIGHTNING DAMAGE
04-INTERFACE-EXCESS DELTA P POS IN ASCENT AND/OR NEG IN DESCENT
05-INTERFACE-CORROSION DUE TO ENTRAPMENT OF MOISTURE OR CORROSIVE FLUIDS
06-INTERFACE-FAILURE DUE TO OVERHEAT OF STRUCTURE DURING REENTRY
07-INTERFACE-EXCESS FLIGHT LOADS DUE TO FAULTY AVIONIC FLIGHT CONTROL
08-INTERFACE-COLLISION DAMAGE DURING SEPARATION BETWEEN ORBITER AND EXTERNAL TANK

HAZARD NUMBER 1ZXX-0101-01-1A

HAZARD EFFECTS

LOSS OF FLIGHT CONTROL WOULD RESULT IN LOSS OF VEHICLE AND PERSONNEL

RELATED HAZARD ANALYSES

04-1ZXX-0105-02; 05-1ZXX-0105-01; 06-0106-01; 07-1AXX-0507-03; 08-1ZXX-0203-01

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD W.H.BREHAUT SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN PER SAFETY FACTOR REQUIREMENTS OF CEI MJ070-0001 -1	391-100	
02-COMPLY WITH MATERIAL, PROCESS AND VERIFICATION REQUIREMENTS OF MC599-C096	391-100	
03-DESIGN SHALL MEET THE RQMNTS OF ELECT DES SPEC MF004-002	391-100	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN: SD74-SH-0281 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
S.KREIDEL	391-100	060475	F.J.ATTAWAY	060475

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1ZXX-0101-01-2A	MID-BODY AND P/L DRS	CA	CN/CN	123	CONTROLLED	082974

HAZARD DESCRIPTION

LOSS OF FLIGHT CONTROL DUE TO FAILURE OF PRIMARY FUSELAGE STRUCT

FLIGHT TEST X GROUND TEST FERRY FLIGHTS ORBITAL MISSION X OTHER
PRELAUNCH LIFT OFF THRU ORBIT X ON ORBIT , DE-ORBIT THRU LANDING X

HAZARD GROUP FF LOSS OF FLIGHT CONTROL RESP.ENGR. I.J.ALONGI

RELATED FMEAS	FMEA REQD YES	NO
NONE		X

REFERENCES

VL70-004134 MID FUS, SDM 15.1, RDD SD72-SH-0101-1

HAZARD CAUSES

01-FAILURE DUE TO DESIGN MARGIN
02-DETERIORATION DUE TO GALVANIC OR STRESS CORROSION
03-LIGHTNING DAMAGE
04-INTERFACE-EXCESS DELTA P POS IN ASCENT AND/OR NEG IN DESCENT
05-INTERFACE-CORROSION DUE TO ENTRAPMENT OF MOISTURE OR CORROSIVE FLUIDS
06-INTERFACE-FAILURE DUE TO OVERHEAT OF STRUCTURE DURING REENTRY
07-INTERFACE-EXCESS FLIGHT LOADS DUE TO FAULTY AVIONIC FLIGHT CONTROL
08-INTERFACE-COLLISION DAMAGE DURING SEPARATION BETWEEN ORBITER AND EXTERNAL TANK

HAZARD NUMBER 1ZXX-0101-01-2A

HAZARD EFFECTS

LOSS OF FLIGHT CONTROL WOULD RESULT IN LOSS OF VEHICLE AND PERSONNEL

RELATED HAZARD ANALYSES

04-1ZXX-0105-02; 05-1ZXX-0105-01; 06-0106-01; 07-1AXX-0507-03; 08-1ZXX-0203-01

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD D.O.TOSTENSON SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN PER SAFETY FACTOR REQUIREMENTS OF CEI MJ070-0001 -1	391	
02-COMPLY WITH MATERIAL, PROCESS AND VERIFICATION REQUIREMENTS OF MC599-0096	391	
03-DESIGN SHALL MEET THE RQMNTS OF ELECT DES SPEC MF004-002 PROCUREMENT SPECIFICATION MC621-0006C	391	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN: SD74-SH-0281 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
D.O.TOSTENSON	391-602	060475	F.J.ATTAWAY	060475

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1ZXX-0101-01-3A	AFT FUSELAGE	CA	CN/CN	123	CONTROLLED	082974

HAZARD DESCRIPTION

LOSS OF FLIGHT CONTROL DUE TO FAILURE OF PRIMARY FUSELAGE STRUCT

FLIGHT TEST X GROUND TEST FERRY FLIGHTS ORBITAL MISSION X OTHER
PRELAUNCH LIFT OFF THRU ORBIT X ON ORBIT DE-ORBIT THRU LANDING X

HAZARD GROUP FF LOSS OF FLIGHT CONTROL RESP.ENGR. I.J.ALONGI

RELATED FMEAS	FMEA REQD YES	NO
NONE		X

REFERENCES

VL70-004134 MID FUS, SDM 15.1, RDD SD72-SH-0101-1

HAZARD CAUSES

01-FAILURE DUE TO DESIGN MARGIN
02-DETERIORATION DUE TO GALVANIC OR STRESS CORROSION
03-LIGHTNING DAMAGE
04-INTERFACE-EXCESS DELTA P POS IN ASCENT AND/OR NEG IN DESCENT
05-INTERFACE-CORROSION DUE TO ENTRAPMENT OF MOISTURE OR CORROSIVE FLUIDS
06-INTERFACE-FAILURE DUE TO OVERHEAT OF STRUCTURE DURING REENTRY
07-INTERFACE-EXCESS FLIGHT LOADS DUE TO FAULTY AVIONIC FLIGHT CONTROL
08-INTERFACE-COLLISION DAMAGE DURING SEPARATION BETWEEN ORBITER AND CARRIER AIRCRAFT OR EXTERNAL TANK

HAZARD NUMBER 1ZXX-0101-01-3A

HAZARD EFFECTS

LOSS OF FLIGHT CONTROL WOULD RESULT IN LOSS OF VEHICLE AND PERSONNEL

RELATED HAZARD ANALYSES

04-1ZXX-0105-02; 05-1ZXX-0105-01; 06-0106-01; 07-1AXX-0507-03; 08-1ZXX-0203-01

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD L.J.WALKOVER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN PER SAFETY FACTOR REQUIREMENTS OF CEI MJ070-0001 -1	391-400	
02-COMPLY WITH MATERIAL, PROCESS AND VERIFICATION REQUIREMENTS OF MC999-0096	391-400	
03-DESIGN SHALL MEET THE RQMNTS OF ELECT DES SPEC MF004-002	391-400	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN: SD74-SH-0281 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
L.J.WALKOVER	391-400	060475	F.J.ATTAWAY	060475

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YAA-0101-01-4A	MID-BODY AND P/L DRS	CA	CN/CN	123	CONTROLLED	110474

HAZARD DESCRIPTION

PAYLOAD DOORS FAIL TO CLOSE AND LATCH THEREBY PRECLUDING A SAFE REENTRY

FLIGHT TEST PRELAUNCH	GROUND TEST LIFT OFF THRU ORBIT	FERRY FLIGHTS ON ORBIT	ORBITAL MISSION DE-ORBIT THRU LANDING	OTHER
	X			X

HAZARD GROUP FF LOSS OF FLIGHT CONTROL RESP ENGR I.J. ALONGI

RELATED FMEAS

	FMEA REQD YES	NO
02-4B-003,004		X

REFERENCES

SDM 15.1, RDD SD72-SH-0101-1, MC621-0039, MCR 2739

HAZARD CAUSES

01-DOOR STRUCTURE DISTORTION FROM IN-ORBIT THERMAL EFFECTS
02-INTERFACE-DOOR ACTUATION AND LATCHING SYSTEM FAILURE

HAZARD EFFECTS

ORBITER PRIMARY STRUCTURE FAILURE WOULD OCCUR DURING REENTRY RESULTING IN LOSS OF FLIGHT CONTROL AND RESULTANT LOSS OF VEHICLE AND PERSONNEL. CONSEQUENTLY, AN IN-ORBIT RESCUE IS REQUIRED.

HAZARD NUMBER 1YXX-0101-C1-4A

RELATED HAZARD ANALYSES

J2-1YXX-0204-1A

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD R.B.TURNER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DOOR LATCHING MECHANISM SEQUENCE IS PROGRAMMED TO ACCOMMODATE EXPECTED WARPAGE UNDER NORMAL OPERATIONAL ENVIRONMENT. THIS WILL BE VERIFIED BY TEST.		MCR 2739,P/L BAY DOOR CENTERLINE & FWD BULKHEAD LATCH DEFLECTIONS AND LOADS

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON IMPLEMENTATION OF MCR 2739 REQUIREMENTS FOR REDESIGN OF LATCHING SYSTEM TO ACCOMMODATE LATEST ON-ORBIT THERMAL DEFLECTIONS AND BOOST/ENTRY LOADS

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1ZAX-0101-2A	FUSELAGE TAIL CONE	CA	CN/CN	123	CONTROLLED	043074

HAZARD DESCRIPTION

SEPARATION OF TAIL CONE DURING CAPTIVE FLIGHT COULD IMPACT VERTIC AL TAIL ASSY OF THE CARRIER CRAFT CAUSING LOSS OF FLIGHT CONTROL.

FLIGHT TEST X GROUND TEST FERRY FLIGHTS X ORBITAL MISSION OTHER
PRELAUNCH LIFT OFF THRU ORBIT ON ORBIT DE-ORBIT THRU LANDING

HAZARD GROUP FF LOSS OF FLIGHT CONTROL RESP.ENGR. I.J.ALONGI

RELATED FMEAS FMEA REQD YES NO

NONE X

REFERENCES

MC621-0060,MCR 1081

HAZARD CAUSES

01- FAILURE OF TAIL CONE ATTACH STRUCTURE OR FASTENERS.
02- INTERFACE- AFT FUSELAGE ATTACH STRUCTURE.

HAZARD EFFECTS

TAIL CONE DAMAGES CARRIER CRAFT VERTICAL TAIL CAUSING LOSS OF FLI GHT CONTROL AND LOSS OF CREW AND VEHICLES. TAIL CONE MAY ALSO CAUSE DAMAGE TO ORBITOR VERTICAL TAIL SECTION RESULTING IN LOSS OF ORBITOR FLIGHT CONTROL CAPABILITY

HAZARD NUMBER 1ZXX-0101-2A

RELATED HAZARD ANALYSES

02-1ZXX-0101-03

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD E.WALLENHORST SAFETY LEAD K.LOPP

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN TO STRUCT LOADS AND SAFETY FACTORS SPECIFIED IN MC621-0060 AND ORBITER CEI MJ 070-0001-1.	391-602	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN: SD74-SH-0281 AND IMPLEMENTATIC N OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
E.L.WALLENHORST		060475	F.J.ATTAWAY	060475

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1ZXX-0101-3A	AFT FUSELAGE STRUCT	CA	CN/CN	123	CONTROLLED	090474

HAZARD DESCRIPTION

FAILURE OF AFT FUSELAGE SUPPORT STRUCTURE FOR TAIL CONE ALLOWS TAIL CONE TO SEPARATE DURING PIGGYBACK PHASE AND IMPACT THE VERTICAL TAIL OF CARRIER AIRCRAFT

FLIGHT TEST X GROUND TEST FERRY FLIGHTS X ORBITAL MISSION X OTHER
PRELAUNCH LIFT OFF THRU ORBIT ON ORBIT DE-ORBIT THRU LANDING

HAZARD GROUP FF LOSS OF FLIGHT CONTROL RESP.ENGR. I.J.ALONGI

RELATED FMEAS

FMEA	REQD	YES	NO
			X

NONE

REFERENCES

MCR 0628,MCR 1081 ERB PRESENTATION,MC621-0060

HAZARD CAUSES

01-STRUCTURE FAILURE OF BODY ATTACH FITTINGS ON ORBITER VEHICLE
02-STRUCTURE FAILURE OF TAIL CONE ATTACH FITTINGS

HAZARD EFFECTS

LOSS OF VEHICLE & POSSIBLE LOSS OF CARRIER AIRCRAFT & ITS CREW

RELATED HAZARD ANALYSES

NONE

HAZARD NUMBER 1ZXX-0101-3A

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD L.J.WALKOVER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01 & 02 DESIGN OF TAIL CONE ATTACH FITTINGS AND AFT BODY INTERFACE STRUCTURE ATTACH FITTING SHALL BE IN ACCORDANCE WITH FACTORS OF SAFETY IDENTIFIED IN CEI SPEC MJ07C-0001-1	391-400	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN: S074-SH-0281 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
L.J.WALKOVER	391-XXX	060475	F.J.ATTAWAY	060475

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
12AX-0101-4A	FORWARD FUSELAGE	CA	CA	1	RESIDUAL	091874

HAZARD DESCRIPTION

STRUCTURAL DEFORMATION DUE TO A CRASH LANDING PREVENTS OPENING OF CREW SIDE HATCH, OVERHEAD EJECTION PANELS OR OTHER GROUND EGRESS PANELS, AND EXTERNAL FUS REMOVABLE ACCESS DOOR FOR EJECTION PANEL CONTROL

FLIGHT TEST	X	GROUND TEST	X	FERRY FLIGHTS	ORBITAL MISSION	X	OTHER
PRELAUNCH		LIFT OFF THRU ORBIT		ON ORBIT	DE-ORBIT THRU LANDING	X	

HAZARD GROUP AA INJURY/LOSS OF PERSONNEL RESP. ENGR I.J.ALONGI

RELATED FMEAS

	FMEA REQD YES	NO
NONE		X

REFERENCES

SDM 15.1, RDD SD72-SH-0101-01

HAZARD CAUSES

01-STRUCTURAL DEFORMATION
02-STRUCTURAL DEFLECTIONS

HAZARD EFFECTS

DELAYED EGRESS OR ENTRAPMENT OF CREWMAN FOLLOWING A CRASH CAN RESULT IN LOSS OF PERSONNEL THRU ENSUING FIRE, EXPLOSION, TOXIC ATMOSPHERE OR DELAYED MEDICAL AID TO INJURED CREWMAN

HAZARD NUMBER 1ZXX-0101-4A

RELATED HAZARD ANALYSES

1VXX-0721-08

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD W.H.BREHAUT SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
MCR 2624 AUTHORIZES DESIGN OF INWARD/OUTWARD HATCH IN AREA OF RIGHT-HAND OVERHEAD MISSION SPECIALIST WINDOW. EFFECTIVITY OV-103 & SUBS WITH OV-101,102 RETROFIT		

CLOSURE RATIONALE

THIS HAZARD STATUS IS RESIDUAL DUE TO INDETERMINATE EFFECTS ON STRUCTURE FROM CRASH LOADINGS AND DESIGN LIMITATIONS IMPOSED BY CEI SPEC MJ070-0001-1 REQUIREMENTS WHICH EXPRESSLY PROHIBIT DESIGN OF PRIMARY AND SECONDARY STRUCTURES TO ACCOMMODATE CRASH LOADS.

CLOSURE DOCUMENTATION

PENDING ACCEPTANCE OF RISK BY NASA

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
S.KREIDEL	391-100	061675	F.J.ATTAWAY	061675

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0101-05-01	FORWARD FUSELAGE	CA	CN/CN	123	CONTROLLED	110774

HAZARD DESCRIPTION

FAILURE OF ATTACH FITTINGSOF TANKS CONTAINING FLAMMABLE FLUIDS OR OXIDIZERS DURING CRASH LANDING CONDITIONS CAUSING FLUID SPILLAGE AND RESULTANT FIRE

FLIGHT TEST X	GROUND TEST	FERRY FLIGHTS	ORBITAL MISSION X OTHER
PRELAUNCH	LIFT OFF THRU ORBIT X	ON ORBIT	DE-ORBIT THRU LANDING X

HAZARD GROUP CC FIRE/EXPLOSION

RESP ENGR I.J. ALONGI

RELATED FMEAS

FMEA	REQD	YES	NO
			X

NONE

REFERENCES

SOM 15.1, RDD S072-SH-01C1-1

HAZARD CAUSES

01-TANK ATTACH FITTINGS FAILING UNDER CRASH LOADING WILL PERMIT TANK TO ACHIEVE UNRESTRAINED MOMENTUM CAUSING BROKEN FEED LINES OR EVEN IMPACT RUPTURE OF THE TANK ITSELF ALL OF WHICH WILL RESULT IN RELEASE OF TANK CONTENTS.

HAZARD EFFECTS

POST CRASH LANDING FIRE COULD ENTRAP CREW WITHIN THE CREW COMPT WITH FATAL RESULTS

HAZARD NUMBER 1YXX-0101-05-01

RELATED HAZARD ANALYSES

NONE

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD W.H.BREHAUT SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-FITTINGS TO BE DESIGNED PER CRASH LOAD FACTORS OF CEI SPEC MJ070-0001-1		

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN SD74-SH-0281 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
S.KREIDEL	391-100	060474	F.J.ATTAWAY	060675

HA-TRACK 01/27/77 PAGE 1

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
12XX-0101-05-2A	FUSELAGE, MID-BODY	CA	CN/CN	123	CONTROLLED	110674

HAZARD DESCRIPTION

FAILURE OF PAYLOAD ATTACH FITTINGS AND ATTACH FITTINGS OF TANKS CONTAINING FLAMMABLE FLUIDS OR OXIDIZERS DURING CRASH LANDING CONDITIONS CAUSING FLUID SPILLAGE AND RESULTANT FIRE/EXPLOSION

FLIGHT TEST X	GROUND TEST	FERRY FLIGHTS	ORBITAL MISSION X OTHER
PRELAUNCH	LIFT OFF THRU ORBIT X	ON ORBIT	DE-ORBIT THRU LANDING X

HAZARD GROUP CC FIRE/EXPLOSION RESP. ENGR I.J.ALONGI

RELATED FMEAS

	FMEA REQD	YES	NO
NONE			X

REFERENCES

SDM 15.1, RDD SD72-SH-0101-1

HAZARD CAUSES

01-TANK ATTACH FITTINGS FAILING UNDER CRASH LOADING WILL PERMIT TANK TO ACHIEVE UNRESTRAINED MOMENTUM CAUSING BROKEN FEED LINES OR EVEN IMPACT RUPTURE OF THE TANK ITSELF ALL OF WHICH WILL RESULT IN RELEASE OF TANK CONTENTS

02-INTERFACE-UNRESTRAINED PAYLOAD IMPACTS TANKS OR CREW MODULE

HAZARD EFFECTS

POST LANDING FIRE COULD ENTRAP CREW WITHIN THE CREW COMPARTMENT WITH FATAL RESULTS

HAZARD NUMBER 1ZXX-0101-C5-2A

RELATED HAZARD ANALYSES

02-1Z7X-0205-01

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD O.DEVICO SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-FITTINGS TO BE DESIGNED PER CRASH LOAD FACTORS OF TECH RQMNTS SPEC MC621-0006		

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN: SD74-SH-0281 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
D.O.TOSTENSON		060475	F.J.ATTAWAY	060475

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
12XX-0101-05-3A	AFT FUSELAGE	CA	CN/CN	123	CONTROLLED	110774

HAZARD DESCRIPTION

FAILURE OF ATTACH FITTINGS OF TANKS CONTAINING FLAMMABLE FLUIDS OR OXIDIZERS DURING CRASH LANDING CONDITIONS CAUSING FLUID SPILLAGE AND RESULTANT FIRE

FLIGHT TEST X	GROUND TEST	FERRY FLIGHTS	ORBITAL MISSION X OTHER
PRELAUNCH	LIFT OFF THRU ORBIT X	ON ORBIT	DE-ORBIT THRU LANDING X

HAZARD GROUP CC FIRE/EXPLOSION- RESP. ENGR I.J.ALONGI

RELATED FMEAS	FMEA REQD YES	NO
NONE		X

REFERENCES

SDM 15.1, RDD SD72-SH-0101-1

HAZARD CAUSES

01-TANK ATTACH FITTINGS FAILING UNDER CRASH LOADINGS WILL PERMIT TANK TO ACHIEVE UNRESTRAINED MOMENTUM CAUSING BROKEN FEED LINES OR EVEN IMPACT RUPTURE OF THE TANK ITSELF ALL OF WHICH WILL RESULT IN RELEASE OF TANK CONTENTS

HAZARD NUMBER 1ZXX-0101-05-3A

HAZARD EFFECTS

POST CRASH LANDING FIRE COULD ENTRAP CREW WITHIN THE CREW COMPARTMENT WITH FATAL RESULTS

RELATED HAZARD ANALYSES

NONE

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD L.J.WALKOVER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-FITTINGS TO BE DESIGNED PER CRASH LOAD FACTORS OF CEI SPEC MJC70-0001-1		

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN: SD74-SH-0281 AND IMPLEMENATION OF THE CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
L.J.WALKOVER		060475	F.J.ATTAWAY	060475

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0101-06	REMOTE OPERATED DOOR	CA	CA/CN	123	IN-WORK	030475

HAZARD DESCRIPTION

STAR TRACKER DOOR FAILS TO CLOSE PRIOR TO REENTRY

FLIGHT TEST PRELAUNCH	GROUND TEST LIFT OFF THRU ORBIT X	FERRY FLIGHTS ON ORBIT X	ORBITAL MISSION X DE-ORBIT THRU LANDING X	OTHER

HAZARD GROUP CC FIRE/EXPLOSION RESP.ENGR I.J.ALONGI

RELATED FMEAS	FMEA REQD YES	NO
02-4-031000,041000, 031001		X

REFERENCES

SDM 15.1, RDD SD72-SH-0101-1, MCR 1757

HAZARD CAUSES

01-DOOR STRUCTURE DEFORMATION FROM ON-ORBIT THERMAL EFFECTS
02-DOOR HINGE SEIZURE RESULTING FROM FLIGHT ENVIRONMENT AFFECTS
03-INTERFACE-DOOR ACTUATION MECHANISM FAILURE

HAZARD EFFECTS

HEAT FROM REENTRY WOULD CAUSE FIRE/EXPLOSION AND/OR STRUCTURAL DAMAGE DURING REENTRY RESULTING IN LOSS OF VEHICLE AND PERSONNEL

RELATED HAZARD ANALYSES

03-1YXX-0211-2A, 1YXX-0211-3A

HAZARD NUMBER 1YXX-0101-06

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD W.H.BREHAUT SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN OF DOORS SHALL MEET FLIGHT ENVIRONMENTS IDENTIFIED IN CEI SPEC MJ070-0001	391-100	
02-SAME AS ABOVE	391-100	

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0101-7A	REMOTE OPERATED DOOR	CR	CN/CN	002	ELIMINATED	030575

HAZARD DESCRIPTION

FAILURE OF LAUNCH UMBILICAL DOORS TO CLOSE FOLLOWING LIFT-OFF

FLIGHT TEST PRELAUNCH	GROUND TEST LIFT OFF THRU ORBIT	FERRY FLIGHTS X ON ORBIT	ORBITAL MISSION X OTHER DE-ORBIT THRU LANDING

HAZARD GROUP XX LOSS OF MISSION

RESP.ENGR I.J.ALONGI

RELATED FMEAS	FMEA REQD YES	NO
02-4-C61000		X

REFERENCES

SDM 15.1, RDD SD72-SH-0101-01, MCR 1755

HAZARD CAUSES

01-DOOR STRUCTURE DEFORMATION FROM LOW AMBIENT TEMPERATURES RESULTING FROM CRYOGENIC PROPELLANT LOADING
02-DOOR HINGE SEIZURE FROM LOW AMBIENT TEMPERATURES NOTED ABOVE
03-INTERFACE-DOOR ACTUATION MECHANISM FAILURE

HAZARD EFFECTS

AN RTLS ABORT WOULD BE REQUIRED RESULTING IN LOSS OF MISSION

RELATED HAZARD ANALYSES

03-1YXX-0211-5A

HAZARD NUMBER LYXX-0101-7A

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD L.J.WALKOVER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN OF DOORS SHALL MEET FLIGHT ENVIRONMENTS IDENTIFIED IN CEI SPEC MJ070-0001	391-801	MCR 1755, T-0 UMBILICAL DOOR RE-EVALUATION
02-SAME AS ABOVE	391-801	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON IMPLEMENTATION OF DESIGN CHANGE PER MCR 1755 WHICH HAS DELETED THE DOOR AND PROVIDED PASSIVE THERMAL PROTECTION IN THE UMBILICAL AREA.

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0101-8A	REMOTE OPERATED DOOR	CA	CN/CN	123	CONTROLLED	030575

HAZARD DESCRIPTION

FAILURE OF ET/ORBITER UMBILICAL DOOR CLOSURE FOLLOWING ET SEPARATION

FLIGHT TEST PRELAUNCH	GROUND TEST LIFT OFF THRU ORBIT	FERRY FLIGHTS X ON ORBIT	ORBITAL MISSION DE-ORBIT THRU LANDING	X OTHER

HAZARD GROUP FF LOSS OF FLIGHT CONTROL RESP.ENGR I.J.ALONGI

RELATED FMEAS	FMEA REQD YES	NO
02-4-011000		X

REFERENCES

SDM 15.1, RDD SD72-SH-0101-01

HAZARD CAUSES

01-DOOR STRUCTURE DEFORMATION AND MISALIGNMENT CAUSED BY THE COMBINED EFFECTS OF ASCENT HEATING AND AERODYNAMIC LOADING
02-DOOR HINGE SEIZURE FROM THE EFFECTS NOTED ABOVE
03-INTERFACE-DOOR ACTUATION MECHANISM FAILURE

HAZARD EFFECTS

FAILURE OF DOOR CLOSURE FOLLOWING NORMAL ET SEPARATION PLACES ORBITER IN AN AOA, ATO OR ABORT FROM ORBIT SITUATION FROM WHICH A SAFE REENTRY CANNOT BE ACCOMPLISHED WITHOUT LOSS OF VEHICLE AND PERSONNEL

HAZARD NUMBER 1YXX-0101-8A

RELATED HAZARD ANALYSES

03-1YXX-0211-1A

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD L.J.WALKOVER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN OF DOORS SHALL MEET FLIGHT ENVIRONMENTS IDENTIFIED IN CEI SPEC MJ070-0001	391-801	
02-SAME AS ABOVEJ070-0001	391-801	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN SD74-SH-0033 AND IMPLEMENTATION OF THE CORRECTIVE ACTION NOTED ABOVE

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1ZXX-0101-09	FUSELAGE STRUCTURE	CA	CN/CN	12	CONTROLLED	100275

HAZARD DESCRIPTION

COLLAPSE OF FORWARD FUSELAGE AND CREW MODULE COULD INTERFERE WITH CREW EJECTION ABOVE 20,000 FEET

FLIGHT TEST	X	GROUND TEST	FERRY FLIGHTS	ORBITAL MISSION	X	OTHER
PRELAUNCH		LIFT OFF THRU ORBIT	X	ON ORBIT		DE-ORBIT THRU LANDING	X

HAZARD GROUP BB IMPACT/COLLISION RESP.ENGR. I.J.ALONGI

RELATED FMEAS

	FMEA REQD	YES	NO
NONE			X

REFERENCES

RECP R01063, MCR 1229

HAZARD CAUSES

01-FLOW OF CABIN ATMOSPHERE THROUGH OVERHEAD EJECTION PANEL OPENINGS CAN CAUSE NEGATIVE DIFFERENTIAL PRESSURE SUFFICIENT TO COLLAPSE STRUCTURE

HAZARD EFFECTS

INJURY OR LOSS OF CREW BY CONTACT WITH STRUCTURE DURING EJECTION

RELATED HAZARD ANALYSIS

1VXX-0102-02

HAZARD NUMBER 1ZXX-0101-C9

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD W.H.BREHAUT SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-INSTALL VENT BARRIER BETWEEN CREW MODULE AND FORWARD FUSELAGE TO RETARD AIRFLOW PER MCR 1229	391-100	V070-310723 BAFFLE INSTL-EJECT SEAT AIR FLOW CONTROL

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
12XX-0102-01	CREW MODULE STRUCT	CA	CA/CN	1	IN WORK	040974

HAZARD DESCRIPTION

PERSONNEL INJURY OR LOSS DUE TO CONTACT WITH OR DAMAGE TO PERSONAL EQUIPMENT (EVA/IVA, O2 UMBILICALS, ETC)

FLIGHT TEST X GROUND TEST FERRY FLIGHTS ORBITAL MISSION X OTHER
PRELAUNCH X LIFT OFF THRU ORBIT X ON ORBIT X DE-ORBIT THRU LANDING X

HAZARD GROUP AA ILLNESS-INJURY-LOSS OF LIFE RESP.ENGR I.J.ALCNGI

RELATED FMEAS — FMEA REQD YES NO

NONE — X

REFERENCES

VL70-003240, SDM 15.2, RDD SD 72-SH-0101-2

HAZARD CAUSES

01- STRUCT PROTRUSIONS AND SHARP CORNERS OR EDGES IN THE CREW MODULE AND AIRLOCK AREAS.

HAZARD EFFECTS

CREW INJURY COULD RESULT IN NECESSITY TO ABORT MISSION. DAMAGE TO PERSONAL EQUIPMENT DURING EVA OPERATIONS COULD RESULT IN LOSS OF LIFE- WORST CASE

RELATED HAZARD ANALYSES

NONE

HAZARD NUMBER 1ZXX-0102-01

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD W.H.BREHAUT SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-ELIMINATE SHARP EDGES OR PROTRUSIONS. REFERENCED IN CEI SPEC MJ070-0001-1	391-102	

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1VXX-0102-02	CREW MODULE STRUCT	CA	CA/CN	1	IN WORK	042474

HAZARD DESCRIPTION

POSSIBLE LOSS OF PERS. OR INJURY DURING EMERGENCY ESCAPE DUE TO MISALIGNMENT OF EJECTION SEAT RAILS CAUSED BY FLOOR STRUCTURE DEFORMATION

FLIGHT TEST X GROUND TEST FERRY FLIGHTS ORBITAL MISSION X OTHER
PRELAUNCH LIFT OFF THRU ORBIT X ON ORBIT DE-ORBIT THRU LANDING X

HAZARD GROUP 88 IMPACT/COLLISION , RESP.ENGR. I.J.ALONGI

RELATED FMEAS

FMEA	REQD	YES	NO
			X

NONE

REFERENCES

VL70-003240, SDM 15.2, ROD SD 72-0101-2

HAZARD CAUSES

01-HIGH DELTA PRESS LOAD ON FLOOR STRUCTURE WHEN EJECTION PANELS ARE JETTISONED

HAZARD EFFECTS

INJURY OR LOSS OF PERSONNEL RESULTING FROM STRIKING ADJACENT STRUCTURE DUE TO MISALIGNMENT OF RAILS

RELATED HAZARD ANALYSES

NONE

HAZARD NUMBER 1VXX 0102-02

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD W.H.BREHAUT SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-PROVIDE FLOOR DESIGN WITH ADEQUATE DELTA P VENT AREA AND STRUCTURAL STRENGTH TO ENSURE RIGIDITY OF EJECTION RAILS	391-102	

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
12XX-0102-3A	CREW MODULE STRUCT	CA	CN/CN	1	CONTROLLED	091174

HAZARD DESCRIPTION

FAILURE OF EMERGENCY EGRESS DEVICE INSTALLATION DUE TO SUPPORTING STRUCTURE FAILURE WHILE DEVICE UNDER USAGE LOAD

FLIGHT TEST X GROUND TEST X FERRY FLIGHTS ORBITAL MISSION X OTHER
PRELAUNCH X LIFT OFF THRU ORBIT ON ORBIT DE-ORBIT THRU LANDING X

HAZARD GROUP BB COLLISION/IMPACT RESP.ENGR. I.J.ALONGI

RELATED FMEAS

NONE

FMEA REQD	YES	NO
		X

REFERENCES

SD4 15.2, RDD SD 72-SH-0101-02

HAZARD CAUSES

01-STRUCT NOT STRONG ENOUGH TO ACCOMMODATE APPLIED USAGE LOAD TO EMERG EGRESS DEVICE INSTALLATION

HAZARD EFFECTS

INJURY OR LOSS OF PERSONNEL DUE TO FALL INCURRED DURING EGRESS DEVICE DETACHMENT AND LOSS OF ESCAPE CAPABILITY FOR FOLLOWING PERSONNEL WHERE DEVICE OR ATT POINT IS COMMONLY USED BY ALL PERSONNEL

RELATED HAZARD ANALYSES

NONE

HAZARD NUMBER |ZXX-0102-3A

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD W.H.BREHAUT SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN FOR ULTIMATE COMBINED LOADS PER CEI MJ070-0001-1 REQUIREMENTS	391-102	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN: SD74-SH-0281 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
W.H.BREHAUT	391-102	060375	F.J.ATTAWAY	060375

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0102-04	CREW MODULE STRUCT	CA	CN/CN	123	CONTROLLED	051276

HAZARD DESCRIPTION

POTENTIAL JAMMING OF YAW AND BRAKE CONTROL PEDAL LINKAGE BY FOREIGN OBJECTS

FLIGHT TEST X	GROUND TEST X	FERRY FLIGHTS	ORBITAL MISSION X OTHER
PRELAUNCH	LIFT OFF THRU ORBIT	ON ORBIT	DE-ORBIT THRU LANDING X

HAZARD GROUP FF LOSS OF FLIGHT CONTROL RESP.ENRG. I.J.ALONGI

RELATED FMEAS

	FMEA REQD YES	NO
NONE		X

REFERENCES

RID 06.04.56, 101 CDR, MCR 2853

HAZARD CAUSES

01-DEBRIS ENTRY INTO YAW AND BRAKE CONTROL LINKAGE AREA FROM PEDAL OPENINGS IN FLIGHT DECK FLOOR
02-INTERFACE-FAILURE OF YAW AND BRAKE PEDAL SUBSYSTEM

HAZARD EFFECTS

LOSS OF FLIGHT AND GROUND CONTROL CAN RESULT IN LOSS OF VEHICLE AND CREW

HAZARD NUMBER 1YXX-0102-04

RELATED HAZARD ANALYSES

02-1YXX-0209-06

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD R.L.GUTIERREZ SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-PROVIDE CLOSEOUT OR DEBRIS TRAPS TO PREVENT ENTRY OF FOREIGN OBJECTS INTO LINKAGE AREA	391-107	MCR 2853, PROVIDE METHOD TO PREVENT JAMMING OF FLT YAW AND BRAKE CONT PEDAL

CLOSURE RATIONALE

THIS HAZARD IS CLOSED BASED ON MCR 2853 REQUIREMENTS TO PROVIDE DEBRIS CLOSE-OUTS AROUND THE YAW AND BRAKE CONTROL LINKAGE AREA OF BOTH COMMANDER AND PILOT INSTALLATIONS

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1ZXX-0103-1A	WING STRUCTURE	CA	CN/CN	123	CONTROLLED	083074

HAZARD DESCRIPTION

LOSS OF FLIGHT CONTROL DUE TO STRUCT FAILURE OF WING OR ELEVON

FLIGHT TEST X	GROUND TEST	FERRY FLIGHTS	ORBITAL MISSION X OTHER
PRELAUNCH	LIFT OFF THRU ORBIT X	ON ORBIT	DE-ORBIT THRU LANDING X

HAZARD GROUP FF LOSS OF FLIGHT CONTROL

RESP.ENGR. I.J.ALONGI

RELATED FMEAS	FMEA REQD YES	NO
NONE		X

REFERENCES

VL70-006094A, GRUMMAN HA NO. 1ZXX-01-03-02 & 1ZXX-01-03-05, SDM 15.3, RDD SD72-SH-0101-3

HAZARD CAUSES

01-FAILURE DUE TO DESIGN MARGIN
02-DETERIORATION DUE TO GALVANIC OR STRESS CORROSION
03-LIGHTNING DAMAGE
04-INTERFACE-CORROSION DUE TO ENTRAPMENT OF MOISTURE OR CORROSIVE FLUIDS
05-INTERFACE-EXCESS DELTA P POS IN ASCENT AND/OR NEG IN DESCENT
06-INTERFACE-FAILURE DUE TO OVERHEAT OF STRUCTURE DURING REENTRY
07-INTERFACE-EXCESS FLIGHT LOADS DUE TO FAULTY AVIONIC FLIGHT CONTROL
08-INTERFACE-COLLISION DAMAGE DURING SEPARATION BETWEEN ORBITER AND EXTERNAL TANK

HAZARD NUMBER 1ZXX-0103-1A

HAZARD EFFECTS

LOSS OF FLIGHT CONTROL WOULD RESULT IN LOSS OF VEHICLE AND PERSONNEL

RELATED HAZARD ANALYSES

04-1ZXX-0105-01; 05-1ZXX-0105-02; 06-1ZXX-0106-01;
07-1ZXX-0507-03; 08-1ZXX-0203-01

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD D.F.SWEARINGEN SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN PER SAFETY FACTOR REQUIREMENTS OF CEI MJ070-0001 -1	391-104	
02-COMPLY WITH MATERIAL, PROCESS AND VERIFICATION REQUIREMENTS OF MC999-0096	391-104	
03-DESIGN PER WING TECH RQMNTS SPEC MC621-0005	391-104	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN: SD74-SH-0281 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
C.A.BUTLER	391-104	060475	F.J.ATTAWAY	060475

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1ZXX-0104-1A	VERTICAL TAIL STRUCT	CA	CN/CN	123	CONTROLLED	083074

HAZARD DESCRIPTION

LOSS OF FLIGHT CONTROL DUE TO STRUCT FAILURE OF VERTICAL TAIL

FLIGHT TEST X GROUND TEST FERRY FLIGHTS ORBITAL MISSION X OTHER
PRELAUNCH LIFT OFF THRU ORBIT X ON ORBIT DE-ORBIT THRU LANDING X

HAZARD GROUP FF LOSS OF FLIGHT CONTROL RESP.ENGR. I.J.ALONGI

RELATED FMEAS	FMEA REQD YES	NO
NONE		X

REFERENCES

VL70-067017,SOM 15.4, RDD SD72-SH-0101-04

HAZARD CAUSES

01-FAILURE DUE TO DESIGN MARGIN
02-DETERIORATION DUE TO GALVANIC OR STRESS CORROSION
03-LIGHTNING DAMAGE
04-INTERFACE-CORROSION DUE TO ENTRAPMENT OF MOISTURE OR CORROSIVE FLUIDS
05-INTERFACE-EXCESS DELTA P POS IN ASCENT AND/OR NEG IN DESCENT
06-INTERFACE-FAILURE DUE TO OVERHEAT OF STRUCTURE DURING REENTRY
07-INTERFACE-EXCESS FLIGHT LOADS DUE TO FAULTY AVIONIC FLIGHT CONTROL
08-INTERFACE-COLLISION DAMAGE DURING SEPARATION BETWEEN ORBITER AND EXTERNAL TANK

HAZARD NUMBER 1ZXX-0104-1A

HAZARD EFFECTS

LOSS OF FLIGHT CONTROL WOULD RESULT IN LOSS OF VEHICLE AND PERSONNEL

RELATED HAZARD ANALYSES

04-1ZXX-0105-01; 05-1ZXX-0105-02; 06-1ZXX-0106-01;
07-1ZXX-0507-03; 08-1ZXX-0203-01

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD B.M.YOUNG SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN PER SAFETY FACTOR REQUIREMENTS OF CEI MJ070-0001 -1	391-104	
02-COMPLY WITH MATERIAL, PROCESS AND VERIFICATION REQUIREMENTS OF MC999-0096	391-104	
03-DESIGN PER VERT TAIL TECH RQMNTS SPEC MC621-0004	391-104	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN: SD74-SH-0281 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
C.A.BUTLER	391-104	060475	F.J.ATTAWAY	060475

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
12XX-0105-18	PURGE, VENT AND DRAIN	CR	CN/CN	2	CONTROLLED	050774

HAZARD DESCRIPTION

FLUIDS ENTRAPPED IN VEHICLE WHICH CAN CAUSE CORROSICN AND DETERIORATION OF VEHICLE STRUCTURE

FLIGHT TEST X GROUND TEST X FERRY FLIGHTS X ORBITAL MISSION X OTHER
PRELAUNCH X LIFT OFF THRU ORBIT X ON ORBIT X DE-ORBIT THRU LANDING X

HAZARD GROUP DD UNSAFE ENVIRONMENT RESP.ENGR. I.J.ALONGI

RELATED FMEAS

01-5

FMEA REQD YES NO
X

REFERENCES

VL70-000247, SDM 15.5, RDD SD72-SH-0101-5

HAZARD CAUSES

01-WATER VAPOR CONDENSATION DUE TO AMBIENT TEMPERATURE EXCURSIONS DURING CONDITIONS OF HIGH HUMIDITY

HAZARD EFFECTS

CORRJSION THAT IS PERMITTED TO GO UNCHECKED CAN LEAD TO SERIOUS STRUCTURAL DEGRADATICN WHICH COULD ULTIMATELY RESULT IN VEHICLE STRUCTURAL FAILURE.

RELATED HAZARD ANALYSES

NONE

HAZARD NUMBER 1ZXX-0105-1B

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD R. GLAYSHER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
PROVIDE ADEQUATE DRAINAGE FOR ALL STRUCTURAL CAVITIES TO PRECLUDE THE ENTRAPMENT OF LIQUIDS IN COMPLIANCE WITH RQMNTS IN CEI MJ 070-0001-1, PAR.3.3.1.7.8.	391-105	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN SD74-SH-0020 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE. VC070-000008 ORBITER DRAIN SYSTEM PROVIDES DRAIN OPERATIONS FOR ELEVONS, RUDDER/SPEEDBRAKE, BODY FLAP, NOSE SPHERE, WING LEADING EDGE AND VERTICAL STABILIZER

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
S.KREIDEL	391-104		F.J.ATTAWAY	

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
12AX-0105-2B	PURGE, VENT, DRAIN	CA	CN/CN	123	CONTROLLED	050774

HAZARD DESCRIPTION

FAILURE OF PRIMARY STRUCT DUE TO EXCESS DELTA P POSITIVE OR NEGA TIVE CAUSED BY PRESSURE LAG DURING FLIGHT ASCENT AND DECENT PHASES

FLIGHT TEST X GROUND TEST FERRY FLIGHTS X ORBITAL MISSION X OTHER
PRELAUNCH LIFT OFF THRU ORBIT X ON ORBIT DE-ORBIT THRU LANDING X

HAZARD GROUP FF LOSS OF FLIGHT CONTROL RESP.ENGR. I.J.ALONGI

RELATED FMEAS	FMEA REQD YES	NO
01-5		X

REFERENCES

VL70-000247, SDM 15.5, RCD SD 72-SH-0101-5

HAZARD CAUSES

01-INADEQUATE VENTING OF FUSELAGE COMPARTMENTS
02-INTERFACE-FAILURE OF CAUTION AND WARNING TO ALERT CREW
03-INADEQUATE VENTING OF WINGS OR OMS PCD

HAZARD EFFECTS

INADEQUATE VENTING OF COMPARTMENTS COULD RESULT IN STRUCTURE FAIL URE DUE TO EXCESSIVE DELTA P AND RESULT IN LOSS OF FLIGHT CONTROL ABILITY AND LOSS OF VEHICLE

HAZARD NUMBER 1ZXX-0105-28

RELATED HAZARD ANALYSES

02-1AXX-0503-C6

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD R. GLAYSHER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-PROVIDE SUFFICIENT VENTS IN COMPARTMENT STRUCTURE TO MAINTAIN DELTA P WITHIN SAFE LIMITS PER RQMNTS IN CEI MJ-C70-0001-1,PAR 3.3.1.7.8.	391-105	01-VC70-000007, NON-PRESSURIZED COMPT'S ORBITER VENT SYSTEM REQUIREMENTS
03-LEVEL III CCB APPROVED R31664 IMPLEMENTING A RELIEF VALVE IN THE WING VENT AND A CROSSOVER DESIGN CONNECTING THE OMS PODS, ELIMINATING THE CRIT I SINGLE FAILURE POINT		

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN SD74-SH-0020 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD NUMBER 1ZXX-0105-2B

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
S.KREIDEL	391-104		F.J.ATTAWAY	

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0105-3A	PURGE,VENT AND DRAIN	CA	CN/CN	123	CONTROLLED	102974

HAZARD DESCRIPTION

LOSS OF THERMAL WINDOW PANES, PRIOR TO REENTRY, DUE TO EXCESSIVE DELTA PRESSURE IN OUTER WINDOW CAVITIES

FLIGHT TEST X GROUND TEST FERRY FLIGHTS ORBITAL MISSION X OTHER
PRELAUNCH LIFT OFF THRU ORBIT X ON ORBIT X DE-ORBIT THRU LANDING

HAZARD GROUP DD LOSS OF/UNSAFE ENVIRONMENT RESP ENGR I.J. ALONGI

RELATED FMEAS	FMEA REQD YES	NO
NONE		X

REFERENCES

VS70-381071, SDM 15.5, RDD SD72-SH-0101-5

HAZARD CAUSES

01-OUTER CAVITY VENT LINE FILTER CLOGGED
02-INNER CAVITY PRESSURE ATTAINS A ONE ATMOSPHERE PRESSURE DIFFERENTIAL WITH RESPECT TO OUTER CAVITY DUE TO A DAMAGED INNER PRESSURE PANE OR A CLOGGED INNER CAVITY VENT LINE FILTER

HAZARD EFFECTS

LOSS OF WINDSHIELD THERMAL PANE PRIOR TO REENTRY MAY RESULT IN SUBSEQUENT LOSS OF INNER PANES DURING REENTRY WITH RESULTANT LOSS OF VEHICLE AND PERSONNEL.

HAZARD NUMBER 1YXX-0105-3A

RELATED HAZARD ANALYSES

NONE

HAZARD IDENTIFICATION CONCURRENCE
FUNCTIONAL LEAD R.M.GLAYSHER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-FILTER BY-PASS RELIEF VALVES SHALL BE PROVIDED FOR BOTH ASCENT AND DESCENT PROTECTION	391-105	01602-VS70-381071-A, WINDOW CAVITIES CONDITIONING SYS. SCHEMATIC DIAGRAM
02-INNER AND OUTER CAVITY VENT AND PURGE SYSTEMS SHALL BE ISOLATED FROM EACH OTHER IN A MANNER THAT WILL PREVENT ANY INTERACTION OF PRESSURE ANOMALIES.	391-404	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON IMPLEMENTATION OF ABOVE NOTED CORRECTIVE ACTION

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
S.KREIDEL	391-104		F.J.ATTAWAY	

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0105-4A	PURGE,VENT AND DRAIN	CA	CN/CN	123	CONTROLLED	102974

HAZARD DESCRIPTION

LOSS OF CABIN PRESSURE THRU INNER CAVITY VENT LINES

FLIGHT TEST X GROUND TEST FERRY FLIGHTS X ORBITAL MISSION OTHER
PRELAUNCH LIFT OFF THRU ORBIT X ON ORBIT X DE-ORBIT THRU LANDING X

HAZARD GROUP DD LOSS OF/UNSAFE ENVIRONMENT I.J.ALONGI

RELATED FMEAS

	FMEA REQD	YES	NO
NONE			X

REFERENCES

MCR 0212, VS70-381071, SDM 15.5, RDD SD72-SH-0101-5

HAZARD CAUSES

01-INNER WINDOW PRESSURE PANE DAMAGED DURING IVA

HAZARD EFFECTS

CABIN ATMOSPHERE WILL VENT TO SPACE THRU INNER CAVITY VENT LINES THEREBY CAUSING FATAL CABIN DEPRESSURIZATION

RELATED HAZARD ANALYSES

NONE

HAZARD NUMBER 1YXX-0105-4A

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD R.M.GLAYSHER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN SHALL PROVIDE FLOW RESTRICTION IN ALL INNER CAVITY PURGE AND VENT LINES CONNECTED TO THESE CAVITIES TO RESTRICT POSSIBLE AIR LOSSES TO ACCEPTABLE LIMITS AS DEFINED IN MSC-07700, VOL X OF SHUTTLE SYS SPEC.	391-105	01-VS70-381071-A, WINDOW CAVITIES CONDITIONING SYSTEM SCHEMATIC DIAGRAM

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
S.KREIDEL	391-104		F.J.ATTAWAY	

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0105-5A	PURGE,VENT AND DRAIN	CA	CN/CN	123	CONTROLLED	030475

HAZARD DESCRIPTION

ACTIVE VENT SYSTEM DOORS FAIL TO CLOSE PRIOR TO REENTRY

FLIGHT TEST PRELAUNCH	GROUND TEST LIFT OFF THRU ORBIT	FERRY FLIGHTS ON ORBIT	ORBITAL MISSION X OTHER DE-ORBIT THRU LANDING X

HAZARD GROUP CC FIRE/EXPLOSION RESP.ENGR. I.J.ALONGI

RELATED FMEAS	FMEA REQD YES	NO
01-5-380101, -380109, -380117, -380125		X

REFERENCES

SUM 15.1, RDD SD72-SH-0101-1

HAZARD CAUSES

01-DOOR STRUCTURE DEFORMATION FROM ON-ORBIT THERMAL EFFECTS
02-DOOR HINGE SEIZURE RESULTING FROM FLIGHT ENVIRONMENT AFFECTS
03-INTERFACE-DOOR ACTUATION MECHANISM FAILURE

HAZARD EFFECTS

HEAT FROM REENTRY WOULD CAUSE FIRE/EXPLOSION AND/OR STRUCTURAL DAMAGE DURING REENTRY RESULTING IN LOSS OF VEHICLE AND PERSONNEL

RELATED HAZARD ANALYSES

03-1YXX-0211-7A

HAZARD NUMBER 1YXX-0105-5A

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD R.GLAYSHER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-DESIGN OF DOORS SHALL MEET FLIGHT ENVIRONMENTS IDENTIFIED IN CEI SPEC MJC70-0001 AND SDM 72-SH-0101-5	391-105	
02-SAME AS ABOVE	391-404	

CLOSURE RATIONALE

HAZARD IS CLOSED BASED ON REQUIREMENTS CONTAINED IN CERTIFICATION PLAN SD74-SH-0074 AND IMPLEMENTATION OF CORRECTIVE ACTION NOTED ABOVE

HAZARD DISPOSITION CONCURRENCE

FUNCTIONAL SUPERVISION	DEP-GRP	DATE	SAFETY SUPERVISION	DATE
S.KREIDEL	391-104		F.J.ATTAWAY	

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0106-1A	THERMAL PROTECT SYS	CA	CA	123	IN-WORK	082974

HAZARD DESCRIPTION

LOSS OF TPS TILES PRIOR TO OR DURING REENTRY

FLIGHT TEST	X	GROUND TEST	FERRY FLIGHTS	ORBITAL MISSION	X	OTHER	X
PRELAUNCH		LIFT OFF THRU ORBIT	ON ORBIT	DE-ORBIT THRU LANDING	X		

HAZARD GROUP CC FIRE/EXPLOSION/IMPLOSION RESP ENGR I.J. ALONGI

RELATED FMEAS	FMEA REQD YES	NO
NONE		X

REFERENCES

SDM 15.6, RDD SD72-SH-0101-6, MCR 0741

HAZARD CAUSES

01-IMPROPER INSTALLATION OF TILES
02-UNDETECTABLE DAMAGE TO TPS TILE, FILLER, OR BONDING
03-TILES LOOSENED FROM VIBRATION EFFECTS ENCOUNTERED DURING MISSION LAUNCH PHASE

HAZARD EFFECTS

BURN-THROUGH OF SKIN CAN CAUSE DAMAGE TO PRIMARY STRUCTURE AND FLIGHT CRITICAL SYSTEMS, AND ALSO PROVIDE AN IGNITION SOURCE FOR FIRE AND EXPLOSION. LOSS OF VEHICLE AND PERSONNEL COULD RESULT.

HAZARD NUMBER 1YXX-0106-1A

RELATED HAZARD ANALYSES

NONE

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD D.H.CADE SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-INSTALLATION TO BE CONTROLLED BY ML0301-0010, RSI TPS INSTL.	391-301	
02-NONE-NO PRESENT MEANS TO DETECT		
03-VIBRO-ACOUSTIC TEST WILL BE CONDUCTED TO EVALUATE ATTENUATION PROPERTIES OF THE TPS AND SUBSTRUCTURE.		

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0106-02	THERMAL PROTECT SYS	CA	CA	12	IN-WORK	090374

HAZARD DESCRIPTION

THERMAL BARRIER FAILURE PRIOR TO OR DURING REENTRY

FLIGHT TEST X	GROUND TEST	FERRY FLIGHTS	ORBITAL MISSION X OTHER
PRELAUNCH	LIFT OFF THRU ORBIT	ON ORBIT	DE-ORBIT THRU LANDING X

HAZARD GROUP FF LOSS OF FLIGHT CONTROL RESP ENGR I.J. ALONGI

RELATED FMEAS	FMEA REQD YES	NO
NONE		X

REFERENCES

SDM 15.6, RDD S072-SH-0101-6

HAZARD CAUSES

01-THERMAL DAMAGE DUE TO OVER-TEMP
02-DETACHMENT RESULTING FROM VIBRO/ACOUSTIC EFFECTS AND AERO SHEAR
03-COLD SOAK EFFECTS ON SEAL PERFORMANCE
04-THERMAL EFFECTS ON SEAL PERFORMANCE

HAZARD EFFECTS

LOSS OF BARRIER COULD CAUSE HEAT DAMAGE TO STRUCTURE, EQUIPMENT AND HARDWARE WITHIN CONTROL SURFACE AREAS RESULTING IN LOSS OF VEHICLE AND PERSONNEL

HAZARD NUMBER 1YXX-0106-02

RELATED HAZARD ANALYSES

NONE

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD J.O.KANE SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01 THRU 04-SEALING TECHNIQUES, MATERIALS, AND FORMS ARE TBD AND VERIFIED BY TEST.	391-301	

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0106-03	THERMAL PROTECT SYS	CA	CA	123	IN-WORK	110774

HAZARD DESCRIPTION

POTENTIAL FIRE DUE TO INCOMPATIBILITY OF PROPELLANT FLUIDS IN CONTACT WITH TPS TILES

FLIGHT TEST X GROUND TEST X FERRY FLIGHTS ORBITAL MISSION X OTHER
PRELAUNCH X LIFT OFF THRU ORBIT X ON ORBIT DE-ORBIT THRU LANDING X

HAZARD GROUP CC FIRE/EXPLOSION RESP ENGR I.J. ALONGI

RELATED FMEAS	FMEA REQD YES	NO
NONE		X

REFERENCES

SOM 15.6, ROD SD72-SH-0101-6, MCR 0719

HAZARD CAUSES

01-SPILLAGE CAUSED BY CRASH LANDING DAMAGE
02-RELIEF VALVE VENTING DUE TO OVERTEMP CONDITION OR RELIEF VALVE LEAKAGE OR FAILURE
03-TANK OR LINE LEAKAGE DRAIN THROUGH PV/D DRAIN HOLES DURING PRELAUNCH OR POST LANDING

HAZARD EFFECTS

CONTACT OF INCOMPATIBLE FLUIDS WITH TPS TILES CAN RESULT IN SPONTANEOUS IGNITION WITH RESULTING FIRE ENDANGERING VEHICLE AND PERSONNEL.

HAZARD NUMBER 1YXX-0106-03

RELATED HAZARD ANALYSES

NONE

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD D.H.CADE SAFETY LEAD R.E.RABY

DISPOSITION

01THRU 03-COMPATIBILITY OF FLUIDS AND MATERIALS SHALL MEET THE FIRE/TOXICITY SAFETY REQUIREMENTS OF SD74-SH-0223 AND FURTHER VERIFIED BY OTHER TESTS AS REQUIRED.

RESP GRP ACTION DOCUMENTATION

HAZARD ANALYSIS NUMBER	SUBSYSTEM/EQUIPMENT OR OPERATION	LEVEL INIT	LEVEL TRACK	HZD CAT	HAZARD STATUS	ENTRY DATE
1YXX-0107-1A	THERMAL CONTROL-TCS	CA	CN/CN	123	CONTROLLED	090674

HAZARD DESCRIPTION

POTENTIAL FIRE DUE TO ENTRAPMENT OF COMBUSTIBLE FLUID LEAKAGE BY THE TCS MATERIAL

FLIGHT TEST X GROUND TEST FERRY FLIGHTS ORBITAL MISSION X OTHER
PRELAUNCH X LIFT OFF THRU ORBIT X ON ORBIT DE-ORBIT THRU LANDING X

HAZARD GROUP CC FIRE/EXPLOSION/IMPLOSION RESP ENGR I.J. ALONGI

RELATED FMEAS

	FMEA REQD YES	NO
NONE		X

REFERENCES

SDM 15.7, RDD SD72-SH-0101-7, MCR 0719, MCR 0998

HAZARD CAUSES

01-ABSORPTION OF FLUIDS BY INSULATION IN AREAS OF POTENTIAL LEAKAGE
02-INTERFACE-IGNITION SOURCE FROM REMOTE OPERATED DOORS

HAZARD EFFECTS

FIRE RESULTING IN LOSS OF VEHICLE AND PERSONNEL

RELATED HAZARD ANALYSES

1YXX-0211-08

HAZARD NUMBER 1YXX-0107-1A

HAZARD IDENTIFICATION CONCURRENCE

FUNCTIONAL LEAD H.H.BAKER SAFETY LEAD R.E.RABY

DISPOSITION	RESP GRP	ACTION DOCUMENTATION
01-IN COMPLIANCE WITH CEI SPEC NJ070-001-01 RQMTS, THE TCS INSULATION WILL BE DESIGNED TO PROTECT AGAINST ABSORPTION OF LIQUIDS IN AREAS OF POTENTIAL LEAKAGE	391-301	SHUTTLE SYSTEM SAR SD75-SH-0064, HA #GEN-001 & #GEN-002

CLOSURE RATIONALE

THIS HAZARD IS CLOSED BASED ON THE ESTABLISHMENT OF REQUIREMENTS FOR FIRE PROTECTION (MCR 719) AND THE INCORPORATION OF THE HAZARDOUS GAS DETECTION SYSTEM (MCR 998) WHICH WILL CONTROL THE HAZARD BY DETECTING LEAKAGES AND INSTIGATING THE APPROPRIATE CONTINGENCY ACTION NECESSARY TO ELIMINATE THE POTENTIAL FIRE HAZARD