

CRITICAL ITEMS LIST (CIL)

SYSTEM:	Pressure Vessels	FUNCTIONAL CRIT:	1
SUBSYSTEM:	L02 Tank (SLWT)	PHASE(S):	a, b
REV & DATE:	J, 12-19-97	HAZARD REF:	S.02, S.07,
DCN & DATE:	002, 2-28-99		S.08
ANALYSTS:	H. Claybrook/J. Robinson		

FAILURE MODE: Leakage

FAILURE EFFECT: a,b) Loss of mission and vehicle/crew due to fire/explosion.

TIME TO EFFECT: Seconds

FAILURE CAUSE(S):
 A: Structural Failure of Plates
 B: Structural Failure of Forgings
 C: Structural Failure of Extrusions
 D: Structural Failure of Welds

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: Contains the L02 Oxidizer for the SSME's.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
6.1.1.1	80902000000-500	L02 Tank Complete	1	LWT-89 thru 599

REMARKS: Retention rationale for FMEA Item Codes 6.1.1.1 and 6.1.1.2 is the same.

CRITICAL ITEMS LIST (CIL)

SYSTEM:	Pressure Vessels	FUNCTIONAL CRIT:	1
SUBSYSTEM:	LO2 Tank (SLWT)	PHASE(S):	a, b, c
REV & DATE:	J, 12-19-97	HAZARD REF:	S.02, S.08
DCN & DATE:	002, 2-28-99		
ANALYSTS:	H. Claybrook/J. Robinson		

FAILURE MODE: Burst

FAILURE EFFECT: a,b) Loss of mission and vehicle/crew due to structural failure or fire/explosion.
 c) Loss of mission and vehicle/crew due to Orbiter/ET collision.
 Loss of life due to ET impacting outside designated footprint.

TIME TO EFFECT: Seconds

FAILURE CAUSE(S): A: Structural Failure of Plates
 B: Structural Failure of Forgings
 C: Structural Failure of Extrusions
 D: Structural Failure of Welds

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: Contains the LO2 Oxidizer for the SSME's.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
6.1.1.2	80902000000-500	LO2 Tank Complete	1	LWT-89 thru 599

REMARKS: Retention rationale for FMEA Item Codes 6.1.1.1 and 6.1.1.2 is the same.

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Pressure Vessels
SUBSYSTEM: LO2 Tank (SLWT)
FMEA ITEM CODE(S): 6.1.1.1, 6.1.1.2

REV & DATE: J, 12-19-97
DCN & DATE:

RATIONALE FOR RETENTION

DESIGN:

The Liquid Oxygen (LO2) tank is a thin-wall fusion welded aluminum monocoque shell and is designed as a safe life structure. Structural integrity is assured by the fracture control plan (MMC-ET-SE13). Materials and processes are selected in accordance with MMC-ET-SE16, which assures repetitive conformance of composition and properties. Material specifications STM11A1 for Al2195 plate and STM31A1 for extrusions have been approved and added to SE16. Aluminum Lithium alloys offer several benefits to the SLWT design over the LWT alloys: higher strength, lower density and higher modulus. These improved material characteristics of Al2195 allowed the SLWT to be designed to meet weight reduction goals without sacrificing mission success. Aluminum Lithium material used on the LO2 tank must meet the requirements of Material Specifications STM11A1 (Al2195 Plate Products) and STM31A1 (Al2195 Extruded Products).

Other process specifications involving fabrication, testing and welding of Al2195 are contained in SE16. These specifications are STP1006 (frame chords), STP1008 (dome and ogive gores), STP1011 (LO2 barrel panels), STP5507 (fusion welding), STP5508 (VPPA welding) and STP5509 (SPAW welding).

The LO2 tank is designed to a required yield safety factor of 1.10 for all loads and ultimate safety factor of 1.25 for well-defined loads (i.e. thrust, inertia from thrust, dead weight, and ullage pressure) and 1.40 for other loads (i.e. thermal, aerodynamic, and dynamic transients). However, from External Tank (ET)/Orbiter separation through Main Engine Cut-Off (MECO) +225 seconds, the assembly is designed to a required ultimate safety factor of 1.00 for all loads. Overall tank strength analysis is based on minimum drawing thicknesses and minimum strength of a repaired weld. (Reference ET Stress Report 826-2188).

A: There are five configurations for the eight forward ogive gore panels. The gores are stretch-formed from Al2195 per STP1008 to the required radius of 612.0 inches. Heat treatment to 2195-T8A7 condition is followed by chem-milling per STP5014 on both sides to the required thicknesses. One of the gore panels has locally thickened membrane pads for the attachment of exterior support brackets for the Gaseous Oxygen (GO2) pressurization line and electrical cable tray. The skin pads on the forward ogive gore also provide for attachment of interior supports for the sensor mast. Weld lands are configured to minimize discontinuity stresses. The ogive gores are edge trimmed during assembly.

There are seven configurations for the twelve Al2195 stretch formed and chem milled aft ogive gore panels. The gore panels are formed per STP1008 to the required curvatures and chem-milled per STP5014 on both sides to the correct pattern. One of the gore panels has locally thickened membrane pads where fillet welded clips for the attachment of the support brackets for the GO2 pressure line and electrical cable tray are installed. Weld lands are configured to minimize discontinuity stresses.

The forward ogive cover plate is made from Al2219 and serves as a removable bulkhead for the LO2 tank. The cover plate incorporates integrally machined stiffeners and provides a location for mounting propulsion/electrical system components. Threaded inserts and bolts are installed in the cover plate per STP2024 and STP2014 respectively.

The four Al2195-T8M4 barrel panels are chem-milled per STP5014 on both sides to the required thicknesses and formed per STP1011 to the required radius of 165.5 inches. One barrel panel has locally thickened skin pads for the attachment of exterior support brackets for the GO2 pressurization line and electrical cable tray. Weld land widths have been configured to minimize weld assembly "oil canning" concerns. The barrel panels are edge trimmed during assembly.

There is only one configuration for the twelve dome gores. They are stretch-formed per STP1008 to the required 0.75 height-to-radius ellipsoidal shape. Heat treatment to Al2195-T8A7 condition is followed by chem-milling per STP5014 on both sides to the required thicknesses. Weld lands are configured to minimize discontinuity stresses. The dome gores are edge trimmed during assembly.

The spherical dome cap is 140.0 inches in diameter and is spin-formed per STP1005. Heat treatment to 2219-T87 condition is followed by chem-milling per STP5014 on both sides to the required thicknesses. Cutouts are provided for the suction fitting, manhole fitting, and an electrical feedthru connector. Weld lands are configured to minimize discontinuity stresses. The dome cap is edge trimmed during assembly.

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Pressure Vessels
SUBSYSTEM: L02 Tank (SLWT)
FMEA ITEM CODE(S): 6.1.1.1, 6.1.1.2

REV & DATE: J, 12-19-97
DCN & DATE: 005, 6-30-00

RATIONALE FOR RETENTION

DESIGN: (cont)

The manhole fitting is 45.0 inches in diameter and is machined from 2219-T87 aluminum plate. The fitting provides a 36.0 inch diameter clear access to the tank interior. The manhole fitting is edge trimmed during assembly. Threaded inserts and bolts are installed in the manhole fitting per STP2024 and STP2014 respectively.

The manhole cover is machined from 2219-T87 aluminum plate. The manhole cover provides a closure for and a sealing surface with the manhole fitting. Both the manhole cover and the manhole fitting have two holes that are diametrically opposite each other. One hole in the manhole cover and the hole diametrically opposite in the manhole fitting each have roll pins installed. This precludes the possibility of interchanging the L02 and Liquid Hydrogen (LH2) manhole covers. Threaded inserts and bolts are installed in the manhole cover per STP2024 and STP2014 respectively.

- B: The forward ogive ring is a machined 2219-T87 aluminum forging. It provides the cover plate mating and sealing surface and the nose cone mounting surface. The forward ogive ring contains a penetration for an electrical feedthru connector. The forward ogive ring is edge trimmed during assembly. Threaded inserts and bolts are installed in the forward ogive ring per STP2024 and STP2014 respectively.

The dome suction fitting is a machined 2219-T6 aluminum forging. It has a 64.0 inch overall diameter at the tank wall interface and a 17.0 inch inside diameter at the L02 feedline interface. The suction fitting provides the internal mounting surface for the vortex baffle and the screen. The suction fitting is edge trimmed during assembly. Threaded inserts and bolts are installed in the dome suction fitting per STP2024 and STP2014 respectively.

- C. The T-ring for LWT-89 thru 91 is made up of four AL2195 extrusions (2L2060) formed per STP1006 to the required radius of 165.5 inches. Heat treatment to 2195-T8A3 condition is followed by machining. The T-ring is located between the aft ogive and the barrel assemblies. It forms both a portion of the L02 tank wall and the outer chord for the Station 745 frame.

The T-ring for LWT-92 thru 599 is made up of four AL2219 extrusions (2L2008 for LWT-92 thru 95; 2L2092 for LWT-96 thru 599) formed per STP1002 to the required radius of 165.5 inches. Heat treatment to 2219-T8511 condition is followed by machining. The T-ring is located between the aft ogive and the barrel assemblies. It forms both a portion of the L02 tank wall and the outer chord for the Station 745 frame.

The dome ring for LWT-89 thru 98 is made up of four AL2195 extrusions (2L8012) formed per STP1006 to the required radius of 165.5 inches. Heat treatment to 2195-T8A3 condition is followed by machining. The dome ring is located between the barrel and the dome assemblies. It forms a portion of the L02 tank wall, the outer chord for the Station 851 frame, and the interface flange to mate the L02 tank/Intertank.

The dome ring for LWT-99 thru 599 is made up of four AL2219 extrusions (2L8013) formed per STP1002 to the required radius of 165.5 inches. Heat treatment to 2219-T8511 condition is followed by machining. The dome ring is located between the barrel and the dome assemblies. It forms a portion of the L02 tank wall, the outer chord for the Station 851 frame, and the interface flange to mate the L02 tank/Intertank.

- D: The L02 tank welds are designed to a safe life criterion. This assures that failure will not occur from flaw propagation in the expected operating environment during the required life of the vehicle. The welds are designed to three criteria: 1) leak-burst fracture stress, 2) allowable weld grades, and 3) allowable ultimate strength.

Various welding processes are used on the L02 tank: Fusion (TIG) Welding, Variable Polarity Plasma Arc (VPPA) Welding and Soft Plasma Arc Welding (SPAW). The requirements for these welds are controlled by STP5501/STP5507, STP5506/STP5508 and STP5509, respectively. STPs 5501 and 5506 are used exclusively for AL2219/AL2219 aluminum alloy. STPs 5507, 5508 and 5509 are used to weld AL2195/AL2195, AL2195/AL2219 aluminum combinations and AL2219/AL2219 segments when included as partial joint lengths in preceding weld combinations. After completion of welding, every weldment is visually and non-destructively inspected. Friction plug welding can be used to repair 2195/2195 and 2195/2219 aluminum weld combinations. This weld repair process is controlled by STP 5510. All repair/rework of AL2195 welds shall be reviewed for final acceptance by the Material Review Board with work performed and controlled by established weld repair procedures.

Radiographic inspection of initial AL2195 welds are conducted to established LWT ET practices. Heat repaired welds require "angle shots" taken at $\pm 35^\circ$ off the 90° angle in addition to the conventional 90° degree perspective. Angle shots are also taken of weld intersections and weld start/stop locations.

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CONTINUATION SHEET

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SUBSYSTEM: L02 Tank(SLWT)
FMEA ITEM CODE(S): 6.1.1.1, 6.1.1.2

REV & DATE: J, 12-19-97
DCN & DATE:

RATIONALE FOR RETENTION

TEST:

The L02 Tank Complete is certified for SLWT. Reference HCS MMC-ET-TM08-L-SS01.

Verification:

SLWT L02 tank structural verification was tied to either a test or LWT flight history. This test based ground rule was deviated from in the L02 tank aft ogive and barrel areas which are critical for unpressurized prelaunch stability. However, additional requirements were imposed in these areas. An analytical factor of safety equal to 2 vs the required design of 1.25 - 1.4 was maintained in this area and an independent analysis was performed by Langley Research Center. Test and flight data from the Standard Weight Tank (SWT) and current LWT program influenced the SLWT design in areas where testing was impractical. SLWT thicknesses remained the same as LWT in these areas and existing ringframe stiffness was maintained to protect applicability of SWT stability testing. Verification tests on the L02 tank included the Aluminum Lithium Test Article (ALTA), component, material/weld coupon and proof. The analytical methods that were used for verification were validated by correlation to SWT, LWT and SLWT test programs. In addition to the above activities, all aspects of SLWT ground operations are planned to be tested by a special tanking test on LWT-89 (SLWT Tanking Test).

A-D: An independent stability analysis on the L02 tank was performed by Langley research. This analysis helped to confirm the ability of ET analytical methods to predict failure.

A-D: SLWT Tanking Test (LWT-89 only)

This test will demonstrate (1) overall thermal and structural response to cryogenic loading and (2) L02 tank forward ogive, aft ogive, barrel, and aft dome stability for ambient and cryogenic prelaunch limit load conditions.

A-D: ALTA Proof and Stability Test (Report MMC-ET-SE63-01)

ALTA contained a SLWT L02 aft dome. Test data from ALTA validated analytical methods used to design the SLWT and demonstrated adequate stability capability of the L02 Tank dome.

Component Tests:

A-D: L02 Frame Beaded Weld Test (Report MMC-ET-SE63-5)

Web thickness of Frame Xt 745 was reduced in 24 of 32 segments for SLWT. Shear tests based on the maximum design loading condition demonstrated the structural integrity and shear capability of the beaded webs.

D: Fillet Weld Test (Report MMC-ET-SE63-7)

Cable trays and pressline supports are fillet welded to the L02 tank. This test demonstrated fillet welding on Al2195 base metal and the interaction of parent metal with clip stresses at these welds.

A,C: Biaxial Failure Theory Test (Report MMC-ET-SE63-8)

Biaxial failure effects tests verified the failure theory methodology used for the strength analysis.

A-D: Stress Concentration/Insert Pull Tests(Reports B26-2483 and MMC-ET-SE63-10)

Stress concentration tests were performed to address Al2195 elongation results on design. Three main regions (thin plate, thick plate, and inserts) were tested. No issues were identified by these tests.

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Pressure Vessels
SUBSYSTEM: LO2 Tank (SLWT)
FMEA ITEM CODE(S): 6.1.1.1, 6.1.1.2

REV & DATE: J, 12-19-97
DCN & DATE:

RATIONALE FOR RETENTION

TEST: (cont)

Material/Weld Coupon

A,C: Aluminum-Lithium Lot Acceptance Test Methods and Requirements (MMC-ET-SE59)

Lot Acceptance Test (LAT) and Characterization programs for Al2195 Plate and Extrusions are conducted concurrently. The material procurement specifications (STM11A1 and STM31A1) specifies comprehensive lot acceptance test programs which verify that each Al2195 plate and extrusion meet minimum material property requirements. These test programs, documented in MMC-ET-SE59, have been approved by NASA. These LAT processes ensure that all Al2195 material meets the minimum design strength and fracture toughness. Only material that meets the SE59 requirements are used on SLWT and ALTA.

D. SLWT LO2 tank welding was verified by the development of welding allowables for each weld joint configuration and the inspection of each flight weld. Each new weld process is controlled by a STP identified in MMC-ET-SE16. This weld development work assures that these STPs (5507, 5508 and 5509) meet the EIS requirement. All welded flight hardware drawings must reference these STPs and are approved by materials engineering.

A,C,D: Al-Li Materials Data Base (Service Order 89818)

This service order documents the test data used to develop the design values (allowables) for Al2195. Test data from the following six areas is included:

1. Plate allowables including
 - Alternate Fracture Toughness Ratio Determination
 - Simulated Service Testing
 - Fatigue Crack Propagation Rate Determination
2. Extrusion Allowables
3. Weld Allowables including
 - Initial Weld Tensile Allowables
 - Initial Weld Fracture Allowables
 - Repair Weld Fracture Testing
 - Effect of Peaking and Mismatch
 - Wide Panel Test Results
4. First Article Cut-Up Testing
5. Processing Development at Vendors
6. Physical Property Determination

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Pressure Vessels
SUBSYSTEM: LO2 Tank (SLWT)
FMEA ITEM CODE(S): 6.1.1.1, 6.1.1.2

REV & DATE: J, 12-19-97
DCN & DATE:

RATIONALE FOR RETENTION

TEST: (cont)

Acceptance:

MAF:

- A-D: Perform LO2 tank proof test to verify structural integrity and ultimate cycle life (MMC-ET-TM04k).
The SLWT proof test applies the same philosophy as SWT and LWT. The test is fracture based and proves that any undetected flaw will not grow enough to cause a failure within four mission lifes of the tank. Post proof Non-Destructive Evaluation (NDE) is performed on all inadequately proofed welds.
The required proof stress is equal to the flight limit stress multiplied by the proof factor at the proof test temperature. This proof factor is equal to the fracture toughness of the material at the proof test temperature divided by the fracture toughness of the material at the use temperature times the proof factor at the use temperature.
Test covers are substituted for both the flight forward ogive cover plate and manhole cover for the proof test. The test covers have the same elastic properties and the same equivalent stiffness as the flight covers. The flight covers are proof tested separately to facilitate manufacturing.
- D: NDE (radiographic evaluation per STP2503) is performed on inadequately proofed welds. These welds are identified in drawing 8090000069.
- A: LO2 tank parts made from Al2195 undergo penetrant inspection per STP2507. This inspection requires two certified personnel to independently inspect and document penetrant inspection results.
- D: Perform the LO2 Leak Test to verify structural integrity (MMC-ET-TM04k).
A laminated tape system is applied to the fusion butt welds to detect leaks during the hydrostatic proof test. The system is controlled by STP3502. The laminated system is composed of three layers consisting of a water soluble paper, aluminum foil, and tape. Any leaks would dissolve the water soluble paper, complete an electrical circuit, and produce a voltage indication on the electrical leak detection system.
All detection circuits are continuously monitored during fill, proof, and drain operations. No leaks are permitted.

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Pressure Vessels
SUBSYSTEM: LO2 Tank (SLWT)
FMEA ITEM CODE(S): 6.1.1.1, 6.1.1.2

REV & DATE: J, 12-19-97
DCN & DATE: 002, 2-28-99

RATIONALE FOR RETENTION

INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

- A: Verify material selection and verification controls (MMC-ET-SE16, QQ-A-250/30 and STM1701 for AL2219 parts; MMC-ET-SE16 and STM11A1 for AL2195 parts).
- B: Verify material selection and verification controls (MMC-ET-SE16, STM-Q-250 and STM5163).
- C: Verify material selection and verification controls (MMC-ET-SE16 and STM31A1).
- A: Verify heat treatment of the following part to 2219-T87 (MIL-H-6088).
Dome Cap
80912650001
- A: Verify mechanical properties test of the following parts (Engineering drawing and STP1008).
Aft Ogive Gores
80912200001
80912200002
80912200003
Forward Ogive Gores
80912100003
80912100004
80912100005
80912100006
Dome Gore
80912660001
- A: Verify mechanical properties test of the following parts (Engineering drawing and STP1011).
Barrel Panels
80912400001
80912400002
- C: Verify mechanical properties test of the following parts (Engineering drawing and STP1006).
I-Ring Segment
80912300001 (LWT 89 thru 91)
Dome Ring Segment
80912640001 (LWT 89 thru 98)
- A: Inspect part number applied to the following parts (Engineering drawing).
Forward Ogive Gores
80912100003
80912100004
80912100005
80912100006
Aft Ogive Gores
80912200001
80912200002
80912200003
Barrel Panels
80912400001
80912400002
- A-C: Inspect penetrant examination of the following parts (STP2501 for AL2219; STP2507 for AL2195).
Aft Ogive Gores
80912200001
80912200002
80912200003
Forward Ogive Gores
80912100003
80912100004
80912100005
80912100006
Barrel Panels
80912400001
80912400002
Dome Ring Segment
80912640001
Dome Gore
80912660001
I-Ring Segment
80912300001
- A-C: Inspect dimensions of the following parts (Engineering drawing).
Forward Ogive Gores
80912100003
80912100004
80912100005
80912100006
Aft Ogive Gores
80912200001
80912200002
80912200003
Barrel Panels
80912400001
80912400002
Suction Fitting
80912630001
Manhole Fitting
80912650002
Feedthru Plate
80934003726
I-Ring Segment
80912300001
Dome Gore
80912660001
Dome Cap
80912650001
Dome Ring Segment
80912640001

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Pressure Vessels
SUBSYSTEM: LO2 Tank (SLWT)
FMEA ITEM CODE(S): 6.1.1.1, 6.1.1.2

REV & DATE: J, 12-19-97
DCN & DATE: 001, 6-15-98

RATIONALE FOR RETENTION

INSPECTION: (cont)

B,C: Verify ultrasonic examination of the following parts (STM31A1, or STP2505, Class B).

<u>T-Ring Segment</u>	<u>Suction Fitting</u>
80912300001 (LWT 89 thru 95)	82612210010

A: Verify epoxy primer applied to the following part (STP3003, Type 1 and Engineering drawing).

Feedthru Plate
80934003726

A: Verify chemical film applied to the following part (STP3001, Class 1A and Engineering drawing).

Feedthru Plate
80934003726

B: Inspect hole dimensions for inserts on the following part (STP2024 and Engineering drawing).

Suction Fitting
80912630001

Lockheed Martin Procurement Quality Representative:

A: Witness proof test of the following part (Engineering drawing).

Feedthru Plate
80934003726

A: Inspect axis orientation markings and/or direction orientation markings applied to the following assemblies (Engineering drawing).

Barrel Panel
80912400002

MAF Quality Inspection:

A: Verify material selection and verification controls for the following parts (MMC-ET-SE16, QQ-A-250/30 and STM1701 for AL2219 part; MMC-ET-SE16 and STM11A1 for AL2195 part).

<u>Forward Ogive Cover Plate</u>	<u>Manhole Cover</u>
80911001207	80911001205

A: Inspect axis orientation markings and/or direction orientation markings applied to the following assemblies (Engineering drawing).

<u>Forward Ogive Assy</u>	<u>Aft Ogive Assy</u>	<u>T-Ring Assy</u>
80912100000	80912200001	80912300000

Dome Assy
80912651100

A: Inspect orientation of welded parts in the following assemblies (Engineering drawing).

<u>Forward Ogive Assy</u>	<u>Aft Ogive Assy</u>	<u>Barrel Assy</u>
80912001100	80912200000	80912400000
80912100000		

<u>Ogive and Barrel Assy</u>	<u>LO2 Tank Assy</u>
80912090000	80912000100

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REV & DATE: J, 12-19-97
DCN & DATE: 001, 6-15-98

RATIONALE FOR RETENTION

INSPECTION: (cont)

A: Verify cleaning of the following parts (STP5008 and Engineering drawing).

<u>Forward Ogive Cover Plate</u> 80911001207	<u>Manhole Cover</u> 80911001205	<u>Feedthru Plate</u> 80934003709
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A: Verify epoxy primer applied to the following parts (STP3003, Type 1 and Engineering drawing).

<u>Forward Ogive Cover Plate</u> 80911001207	<u>Manhole Cover</u> 80911001205
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A, B: Inspect dimensions of the following parts (Engineering drawing).

<u>Forward Ogive Cover Plate</u> 80911001207	<u>Manhole Fitting</u> 80912610000	<u>Manhole Cover</u> 80911001205
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Forward Ogive Fitting
80912100001

A, B: Inspect hole dimensions for inserts on the following parts (STP2024 and Engineering drawing).

<u>Manhole Cover</u> 80911001205	<u>Manhole Fitting</u> 80912610000	<u>Forward Ogive Fitting</u> 80912100001
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Forward Ogive Cover Plate
80911001207

A, B: Inspect installation of bolts in the following parts (STP2014 and Engineering drawing).

<u>Forward Ogive Cover Plate</u> 80911001207	<u>Forward Ogive Fitting</u> 80911001200	<u>Manhole Fitting</u> 80911001204
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80921021009	80911001206
80921021039	80911001220
80921021045	80911041230
80921061009	80921021009
80931003729 (LWT-89)	80921061009
80931003800 (LWT-90 & up)	80931003719

Suction Fitting
80912651100
80922011900

A-C: Inspect penetrant examination of the following parts (STP2501 for A12219 parts; STP2507 for A12195 parts).

<u>Forward Ogive Cover Plate</u> 80911001207	<u>Forward Ogive Fitting</u> 80912100001	<u>Manhole Cover</u> 80911001205
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Dome Ring
80912641100

A: Inspect weld land widths of the following assemblies (Engineering drawing).

<u>Forward Ogive Assy</u> 80912100000 80912101000	<u>Aft Ogive Assy</u> 80912200000 80912201000	<u>Dome Assy</u> 80912600000 80912620000 80912630000 80912640000 80912650000 80912660000 80912670000
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Barrel Assy
80912400000

CRITICAL ITEMS LIST (CIL)
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REV & DATE: J, 12-19-97
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RATIONALE FOR RETENTION

INSPECTION: (cont)

- A-D: Witness Proof Test and Leak Test (MMC-ET-TM04k).
A-D: Verify cleaning and chemical film applied to the following assemblies (STP5009 and Engineering drawing).

LO2 Tank Complete
80912005000
80912015000

- A-D: Verify chemical film applied to the following parts (STP3001, Class 1A and Engineering drawing).

Forward Ogive Cover Plate Forward Ogive Fitting
80911001207 80912100001

Manhole Fitting Manhole Cover
80912610000 80911001205

- A-D: Verify epoxy primer applied to the following assembly (STP3004 and Engineering drawing).

LO2 Tank Complete
80912005000

- D: Inspect the 2319 Aluminum Weld Wire/Rod (MMS-Y-469) for conformance to material specification and packaging (MMC-ET-SE16 and STM-Y-469).

- D: Inspect the 4043 Aluminum Weld Wire/Rod (MMS-Y-469B) for conformance to material specification and packaging (MMC-ET-SE16 and STM-Y-469B).

- D: Inspect the dimensions and conformance to weld grade of the following assemblies (Engineering drawing).

Reference the following STPs for welding and acceptance requirements: STP5501(AL2219)/STP5507(AL2195) for TIG weld, STP5506(AL2219)/STP5508(AL2195) for VPPA weld and STP5509(AL2195) for SPAW weld.

<u>Forward Ogive Assy</u>	<u>Aft Ogive Assy</u>	<u>Dome Assy</u>
80912100000	80912200000	80912600000
80912101000	80912001100	80912620000
80912001100		80912630000
		80912640000
<u>I-Ring Assy</u>	<u>Barrel Assy</u>	80912650000
80912300000	80912400000	80912660000
	80912001100	80912670000
<u>LO2 Tank Assy</u>		
80912090000		
80912000100		

- D: Inspect post proof inspection (Engineering drawing).

LO2 Post Proof Inspection
80912004000

- D: Inspect post proof ultrasonic and penetrant inspections of friction plug weld repairs (80912004000 and STP 5510 for LWT-105 thru 599).

FAILURE HISTORY:

Current data on test failures, unexplained anomalies and other failures experienced during ground processing activity can be found in the PRACA data base.