Subsystem: HPOTP B500 - 4750000-700	**Critical Item List**	Page: 114	
Functional Assy: Structional Section B50004	Prepared by: M.T. Spencer	Issue Date: December 23, 1993	
	Approved by: R.L. Pugh	Rev. Date: December 08, 1995	
	CIL Item: 040401		

CIL Item Code: 040401		Analyst: M.T. Spencer	
FMEA Item Code: 040401		Approved by: R.L. Pugh	
Function: Pump Piece Part Failure		Rev. No.:	
System/Subsystem: HPOTP B500 - 4750000-700		Rev. Date: December 08, 1995	
		Effectivity:	
		Hazard Ref.: See Listings Below	

Operating Phase	Failure Mode, Description and Effect	Criticality

Operating Phase:
a,m,c

Failure Mode:
Loss of structural integrity.

Failure Cause(s):
A. Internal structural failure of:
Preburn disch hsg f/n 232
Impeller f/n 017
Inducer f/n 018
Inducer f/n 019
Bolt f/n 134
Cover f/n 247
Plug f/n 148
Seal f/n 020
Counterweight f/n 021
Brg hsg f/n 039
Left inducer shroud f/n 024-03
Right inducer shroud f/n 023-03
Gasket f/n 025
Spacer f/n 228
Seal f/n 024-02
Seal f/n 023-02
Washer f/n 027
Washer f/n 057
Nut f/n 028
Preburner inner hsg. f/n 234
Tie rod f/n 035
Lock f/n 036
Counterweight f/n 288
Lock f/n 036
Bolt f/n 134
Bolt f/n 127
Bolt f/n 128
Ball brg. f/n 207
Seal f/n 230
Gasket f/n 276
Ring f/n 22-24
Seal f/n 22-05
Ring f/n 053

Criticality:
1

Hazard Ref:
A) C1S/A/M/C (AT) 2A1.2.1, 2A1.2.3.1.1, 2A1.2.3.1.2, 2A1.2.3.2, 2A1.2.3.3, 2A1.2.3.4, 2A1.2.3.5

Spacer f/n 054
Nut f/n 055
Converter f/n 061
Nut f/n 062
Spacer f/n 069
Key washer f/n 071
Deflector f/n 073
Cover f/n 153
Seal f/n 154
Sleeve f/n 156
Nut f/n 091
Washer f/n 092
Tube cooling f/n 093
Seal f/n 094
Preburner impeller f/n 029
Shaft f/n 090
Retainer f/n196
Bolt f/n 138
Seal f/n 197
Housing f/n 022
Washer f/n 136
Gasket f/n 125
Gasket f/n 147
Gasket f/n 233
Support P/B brg f/n 244-02
Support P/B brg f/n 244-03
Washer f/n 74
Nut f/n 235
Pin f/n 246
Washer f/n 238
Bolt f/n 245
Bolt f/n 287
Insert f/n 22-26-12
Stud f/n 22-26-18

Failure Effect:

A. Fire from LOX impact, or rubbing.

System:

Uncontained engine damage

Mission/Vehicle:

Loss of vehicle

Redundancy Screens:

Does not apply since it is a single point failure

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		Approved by:	R.L. Pugh	Rev. Date:	December 08, 1995
		CIL Item:	040401		

Part Name/No.	Design Considerations	Document Ref
I/n Listed LOX wetted parts	FAILURE CAUSE A. LOX compatibility Tests per NHB 8060.1B, Test 13 were conducted to substantiate the selection of materials for use in the Alternate Turbopump. This program is required to meet NHB 8060.1B requirements for the materials in LOX/GOX. Both metallic and non-metallic materials were evaluated for the HPOTP under the worst case pump operating conditions. Promoted combustion tests will provide basic information, and frictional heating tests will be performed to provide data for design substantiation. These tests are performed by NASA/MSFC Materials Lab. Promoted combustion tests will be performed with oxygen gas pressure raised from 1000 psig to 10,000 psig. In accordance with NHB 8060.1C for each successive test. Three tests will be performed at each pressure to establish repeatability and measure propagation rate on a 0.250-inch or 0.125-inch specimen. Frictional heating tests will be conducted in two phases. In Phase 1, metallic material will be tested in contact with itself at standard conditions. In Phase 2, various material combinations will be tested to evaluate their reaction at standard test condition as well as expected operating conditions. Details of this testing, and the results, can be found in the Materials Control Plan FR-19673-8. Use of materials which do not meet NHB 8060.1B requirements, are documented and approved by NASA with the Material Usage Agreement (MUA). LOX wetted surface area calculations can be found in design job 90WA283. These parts on this list which have been designated as being fracture critical will meet the requirements of the fracture control plan FR-19793-2 and safe life fracture mechanics requirements. These parts meet CEI requirements.	

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Inspection and Test

Possible Causes	Significant Characteristics	Inspection and Test	Document Ref
Failure Cause A Listed LOX wetted parts	Material Integrity	Review of the vendor supplied documentation of the required material properties and quality requirements specified in the purchase order, should provide the necessary information relative to the compliance with the test articles.	
		Those part on this list which have been identified as inseparable assemblies shall be cleaned per PWA-SP 36180-4 as identified on the applicable drawings.	PWA-SP 36180-4
		Those parts on this list which will have batch control for high pressure LOX compatability shall be identified per PWA-SP 82-72 BCX as identified on the applicable drawings.	PWA-SP 82-72-BCX
All Cause	General Quality Requirements:	Supplier Quality Assurance requirements are included in PW-QA-6076, and include such requirements as first piece layouts. This requires the documentation of dimensions on all characteristics represented on the delivered article.	
		Inspection Methods Sheets for use in the inspection of purchased parts and assemblies contain the necessary information to insure that the requirements of the CADs, engineering drawings, and referenced documents are satisfied. For shop fabricated parts, the sheets are audited by Inspection Methods.	
		The purchase orders for vendor supplied parts must comply with PWA-SP 300, 'Control of Materials Processes and Parts', which requires the vendor to provide material, process, and dimensional information to the Quality Department.	
	Waivers	This section would contain a description of any limiting features of CIL hardware	DAR Numbers
		Not applicable at this time	