MASTER

SEMI-ANNUAL STATUS REVIEW

NOVEMBER 1971

NOZZLE, EXTENSION, PRESSURE VESSEL

L. A. SHURLEY

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SEMI-ANNUAL STATUS REVIEW

NOVEMBER 1971

PRESSURE VESSEL AND CLOSURE

L. A. SHURLEY
PRESSURE VESSEL
SIGNIFICANT EVENTS
E/CDSR TO NOVEMBER 1971

- COMPLETED AND PUBLISHED PRESSURE VESSEL MID-CYLINDER THERMAL DESIGN STUDY REPORT
- COMPLETED STEADY-STATE EOL THERMAL ANALYSIS OF PV CYLINDER WITH FLOW PERTURBATORS
- COMPLETED STEADY-STATE EOL THERMAL ANALYSIS OF FORWARD CLOSURE JOINT WITH 7075-T73 CLOSURE
- COMPLETED STEADY-STATE EOL THERMAL ANALYSIS OF 7075-T73 CLOSURE
- COMPLETED 7075-T73 CLOSURE LAYOUT AND DETERMINED WEIGHT SAVINGS RESULTING FROM MATERIAL CHANGE
- UPDATED PVC DESIGN LAYOUT REFLECTING CLOSURE MATERIAL CHANGE
- COMPLETED REVIEW AND APPROVAL OF TWO ISSUES OF PVC C-002 SPECIFICATION
- UPDATED PVC FAILURE-MODE ANALYSIS
PRESSURE VESSEL
PLANNED ACTIVITY
NOVEMBER 1971 TO MAY 1972

- Update PVC design layout reflecting changes required from analyses and interface definition
- Conduct stress analysis of forward joint
- Conduct stress analysis of 7075-T73 closure
- Perform probabilistic reliability analysis of selected critical failure mechanisms
- Issue draft of PVC design report
- Continue coordination with WANL to resolve forward reactor interface definition
PRESSURE VESSEL

MID-CYLINDER DESIGN STUDY
STEADY-STATE EOL THERMAL ANALYSIS
- CYLINDER WITH FLOW PERTURBATORS
- FWD CLOSURE JOINT (7075-T73)
- 7075-T73 CLOSURE SHELL

STEADY-STATE EOL STRESS ANALYSIS
- FWD JOINT (7075-T73)
- 7075-T73 CLOSURE SHELL

PREPARE DRAFT OF PVC DESIGN REPORT

RELIABILITY
- UPDATE PVC FMA
- CALCULATE PRELIMINARY RELIABILITY OF SELECTED CRITICAL FAILURE MECHANISMS

7075-T73 LAYOUT AND WEIGHT SAVINGS
UPDATE PVC DESIGN LAYOUT
SUPPORT FOR C-002 SPEC. PREPARATION
PVC/NSS INTERFACE COORDINATION WITH WANL
PRESSURE VESSEL
SELECTED TECHNICAL TOPICS

- CLOSURE MATERIAL CHANGE 6061 TO 7075 AA
- FWD IMPEDANCE RING LOCATION AND BOLT COOLANT
- MID-CYLINDER OVERHEATING RESOLUTION
NON-WELDED INSTRUMENTATION PORT ADAPTER CONCEPT

INSTRUMENTATION PORT ADAPTER

CONOSEAL

BOLTED FLANGE

CLOSURE

AEROGNET NUCLEAR SYSTEMS COMPANY
PRESSURE VESSEL CYLINDER MID-WALL TEMPERATURE PROFILE
STEADY-STATE EOL CONDITIONS

MID-WALL TEMPERATURE, °F

DISTANCE FORWARD OF PV-NOZZLE FLANGE INTERFACE, INCHES

ENHANCEMENT FACTOR = 1.0
ENHANCEMENT FACTOR = 1.3
ENHANCEMENT FACTOR = 2.98
CLOSURE BOLT COOLANT CONCEPT
PRESSURE VESSEL RELIABILITY

<table>
<thead>
<tr>
<th>PVC FAILS TO CONTAIN PROPELLANT</th>
<th>MAY 71 VALUES</th>
<th>NOV 71 VALUES</th>
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<tbody>
<tr>
<td>ALLOCATED</td>
<td>ASSESSED</td>
<td>ALLOCATED</td>
</tr>
<tr>
<td>LEAKAGE AT NOZZLE TO PV JOINT</td>
<td>.96</td>
<td>TBD</td>
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<tr>
<td>LEAKAGE AT PV CLOSURE JOINT</td>
<td>.9686</td>
<td>TBD</td>
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<tr>
<td>PVC FAILS TO TRANSMIT ENGINE LOADS AND PROVIDE STRUCTURAL SUPPORT FOR INTERFACING COMPONENTS</td>
<td>.9664</td>
<td>.938</td>
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<td>STRUCTURAL FAILURE OF PV WALL</td>
<td>.9588</td>
<td>TBD</td>
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<tr>
<td>FAILURE OF PV TO CLOSURE JOINT</td>
<td>.9664</td>
<td>.975**</td>
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<tr>
<td>SHEAR LIP FAILURE OF PV CLOSURE</td>
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<td>.938</td>
</tr>
<tr>
<td>FAILURE OF PV CLOSURE BETWEEN BOLT HOLES</td>
<td>.974</td>
<td>&gt;.910</td>
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</table>

* An enhancement factor on heat transfer coefficient of 1.60 is required to produce this value

** This value was based on temperatures that subsequent analysis proved inaccurate
PRESSURE VESSEL
SUMMARY AND CONCLUSIONS

TECHNICAL RESULTS

• WEIGHT SAVINGS OF 95 LBS RESULTED FROM CLOSURE MATERIAL CHANGE

• WITH A COOLING ENHANCEMENT FACTOR OF 1.6 THE CYLINDER TEMPERATURE AT MID-CORE IS 10°F, WHICH PROVIDES A M.S. OF +.11 AND A RELIABILITY OF .915.

• MAXIMUM CLOSURE FLANGE TEMPERATURE IS -142°F

• MAXIMUM CLOSURE BOLT (UNCOOLED) TEMPERATURE IS -99°F

PROJECT STATUS

• ALL WORK STATEMENTS ON SCHEDULE