

SECTION II
 PLUM BROOK ROCKET SYSTEMS DIVISION
 TEST OPERATIONS REPORT
 FOR THE MONTH OF
 JANUARY 1973

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY</p> <p style="margin-left: 40px;"><u>CENTAUR STANDARD SHROUD TESTS</u> (YPO4239)</p> <p style="margin-left: 40px;"><u>CRYOGENIC UNLATCH TEST</u></p> <p style="margin-left: 40px;"><u>DISCUSSION</u></p> <p style="margin-left: 40px;"><u>OPERATIONS</u></p> <p>A series of tests were made in January to demonstrate the reliability of the new forward seal release mechanism and establish the effectiveness of the modified CSS insulation system.</p> <p style="text-align: center;">(Continued on Page 19)</p>

TCPO - S. V. SZABO;
 RSD - W. E. KLEIN

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="272 321 521 415">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="500 417 1052 449"><u>CRYOGENIC UNLATCH TEST (Continued)</u></p> <p data-bbox="500 485 1065 516">The major events of the month were:</p> <ol data-bbox="505 548 1312 999" style="list-style-type: none"> (1) Jan 3&5 - Shroud Leak Tests (2) Jan 8-11 - LN₂/LN₂ Tanking; Heat Transfer, Seal Release, and Rain Tests. (3) Jan 18 - Shroud Leak Test and Rain Test (4) Jan 22-24- LN₂/LH₂ Tanking; Heat Transfer, Seal Release and Rain Tests. (5) Jan 26 - CSS Bending Mode Test (6) Jan 29-31- Preparations for Cryogenic Unlatch Test #3 (scheduled for Feb 7). <p data-bbox="496 1037 1308 1415">Results of the tests showed that the new forward seal release mechanism functioned properly. The modified CSS insulation system reduced the heat transfer rate through the shroud by a factor of 2, to approximately 100,000 BTU/HOUR. This lower heat transfer rate is within the flight vehicle design limits. The need for better sealing of joints during the manufacturing process, became apparent during the simulated rain tests. Steps are being taken by LMSC to modify the shrouds during manufacture to eliminate water leaks due to rain.</p> <p data-bbox="493 1453 1308 1705">The CSS Bending Mode Test was conducted to determine the first cantilever bending mode and natural frequency of the shroud. A 2000 pound horizontal load was applied at the nose cone of the CSS. The load was released instantaneously and the shroud characteristics measured by accelerometers and deflectometers. The results of test are now being analyzed.</p> <p data-bbox="493 1743 1321 1803">Cryogenic Unlatch Test #3 is scheduled for February 7, 1973.</p> <p data-bbox="578 1871 928 1902">(Continued on Page 21)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="316 325 560 430">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="527 430 1071 462"><u>CRYOGENIC UNLATCH TEST</u> (Continued)</p> <p data-bbox="527 493 771 525"><u>INSTRUMENTATION</u></p> <p data-bbox="527 556 1356 724">All requested instrument and recording changes were accomplished on schedule. Instrumentation and data recording support was provided for the Tanking and Seal Separation Tests. No major problems or errors were evident.</p> <p data-bbox="527 745 1307 882">The major tasks required for Cryo-Unlatch #3 are complete. The remaining workload consists of a very thorough system check out and set up, plus probable changes in requirements.</p> <p data-bbox="527 913 657 945"><u>CONTROLS</u></p> <p data-bbox="519 976 1429 1081">LN₂/LN₂ and LH₂/LN₂ seal release tests were implemented and completed successfully. Abort and sequence requirements for Cryo-Unlatch Test #3 have been met.</p> <p data-bbox="519 1102 1396 1165">Vent system was modified to add payload purge and vent valves to the error monitoring system.</p> <p data-bbox="519 1197 771 1228"><u>STRUCTURAL TEST</u></p> <p data-bbox="909 1197 1266 1270">TCPO - J. C. HUMPHREY; RSD - L. C. GENTILE</p> <p data-bbox="795 1291 966 1323"><u>DISCUSSION</u></p> <p data-bbox="519 1354 690 1386"><u>OPERATIONS</u></p> <p data-bbox="519 1417 1364 1459">Preparations continued for the CSS Structural Tests.</p> <p data-bbox="519 1480 1364 1554">The shroud counter balance support system was assembled and proof loaded.</p> <p data-bbox="519 1575 1380 1617">The Centaur stretch system was assembled and checked.</p> <p data-bbox="519 1638 1299 1711">Pad eyes were welded on the test tower and proof loaded.</p> <p data-bbox="519 1732 1282 1806">The test requirements document was reviewed and approved.</p> <p data-bbox="519 1827 1331 1911">Visual display requirements have been clarified. Mutually agreeable techniques have been developed.</p> <p data-bbox="568 1921 925 1963">(Continued on Page 23)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="300 336 548 436">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="511 436 950 478"><u>STRUCTURAL TEST</u> (Continued)</p> <p data-bbox="511 500 1339 606">The Centaur LH₂ fill line drawing was completed. Off-Site fabrication of the components required for the fill and vent line modification is in progress.</p> <p data-bbox="511 627 755 670"><u>INSTRUMENTATION</u></p> <p data-bbox="511 691 1339 798">All connector wiring designation sheets for the additional 252 strain gauge channels have been completed.</p> <p data-bbox="511 819 1339 925">Approximately 20% of circuit modifications and 60% of cable additions for strain gauges have been completed.</p> <p data-bbox="511 946 1421 1159">All new deflectometer transducers have been received from the manufacturer. About 70% of the work on the calibration rig has been completed. The balance panel circuit has been revised to accommodate the new deflectometers. New deflectometer balance panel boards are presently being fabricated.</p> <p data-bbox="511 1181 1388 1223">Work has been initiated on the structural flow sheets.</p> <p data-bbox="511 1244 641 1287"><u>CONTROLS</u></p> <p data-bbox="511 1308 1404 1585">The control requirements for the B-3 Structural Tests have been reviewed. Work in various areas such as computer programming, TV, control and sequencing, control panel modification and alarm display has been started. There is still work to determine the final orifice size for the hydraulic failsafes pending outcome of D-Site Tests. All major purchase items have been received or a satisfactory promise date has been obtained.</p>

SECTION II

PLUM BROOK ROCKET SYSTEMS DIVISION

TEST OPERATIONS REPORT

FOR THE MONTH OF

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
------	--

B-3

ROCKET DYNAMICS
AND CONTROL
FACILITY

CENTAUR STANDARD
SHROUD TESTS
(YPO4239)

CRYOGENIC UNLATCH TEST

TCPO - S. V. SZABO;
RSD - W. E. KLEIN

DISCUSSION

OPERATIONS

"In a split second during the quiet evening hours last Wednesday, two latches unfastened, hinges rotated, and a 6500 pound aluminum cover on a rocket broke loose at Plum Brook Station".

(Continued on Page 23)

Lewis News 2-23-73

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.

CHANGES: (schedule changes since last report)

CENTAUR STANDARD SHROUD TESTS B-3 YP04239

STRUCTURAL TESTS SCHEDULED FOR	Apr - Jun 1973.
CRT STRESS-STRAIN READOUT TEST	Mar 21, 1973.
50% LOAD VALIDATION TEST	Apr 2, 1973.
STRUCTURAL TEST #3 (FIRST STR. TEST)	Apr 9, 1973.
ENGINEERING EVALUATION TEST	Feb 15 - Jun 30, 1974.
<u>ITEMS COMPLETED</u>	
Cryo-Unlatch Test #3 completed	Feb 7, 1973.
Shroud removed and sent to SPF	Feb 9 - Feb 12.
Shroud structural strengthen mods complete.	
Strain Gages installed	Feb 12 - Feb 26.
LN ₂ Fill Line installed	Feb 22.
Centaur tank loading cylinder installed	Feb 23.
New tank stretch system	Feb 23.
CSS Aft skirt section installed	Feb 27.
Decision to have a LN ₂ boil-off test following Test #7L.	
Preliminary flow and digital format sheets for tests 3, 4, & 7 completed.	
Alarm hardware C/O completed.	
<u>ITEMS IN PROGRESS</u>	
Strain gage check out	80% complete.
Deflectometer balance panel card work	80% complete.
Strain Gage facility cable work	60% complete.
Deflectometer facility cable work	40% complete.
Additions & Mods to thermocouples	70% complete.
Coding of program changes	50% complete.
TR48 interface design work	50% complete.
TR48 installation work	20% complete.
Testing Datametrics Unit.	
CSS structural test preparations continuing.	
Fabricating & Installing deflectometer brackets & other test hardware.	
Working on facility shutdown plans for Station Standby Status.	
Changes to sequence, abort and alarm system program are scheduled to be completed	Mar 21, 1973.
Modifying failsafe manifolds for axial cylinders.	
All purchases of major control items are scheduled to be delivered	Mar 5, 1973.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="289 325 535 420">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="483 424 1036 457"><u>CRYOGENIC UNLATCH TEST (Continued)</u></p> <p data-bbox="483 489 1347 619">Cryogenic Unlatch Test #3 was successfully performed on February 7, 1973 at 9:20 P.M. All data has been reviewed and no anomalies have been found. Therefore no further cryogenic unlatch tests are scheduled.</p> <p data-bbox="483 653 1344 745">The +Y half of the shroud was removed from B-3 on February 9, 1973 and sent to SPF for refurbishment. The -Y half of the shroud was removed on February 12.</p> <p data-bbox="483 779 1315 846">No further status reports will be prepared relative to cryogenic unlatch tests.</p> <p data-bbox="483 879 730 913"><u>INSTRUMENTATION</u></p> <p data-bbox="483 942 1377 1232">Instrumentation and data recording support was provided for Cryo-Unlatch Test #3. The only problems consisted of the Datametrics Pressure Transducer and the F.B.R. strain gages. The Datametrics unit is now being tested in the Standards Lab. A simulation of cryogenic conditions on the F.B.R. strain gage wiring showed that the zero drift problem was likely in the gage installation. Cleveland is planning further tests of the F.B.R. strain gages.</p> <p data-bbox="483 1266 730 1299"><u>STRUCTURAL TEST</u></p> <p data-bbox="950 1266 1307 1333">TCPO - J. C. HUMPHREY; RSD - L. C. GENTILE</p> <p data-bbox="787 1362 954 1396"><u>DISCUSSION</u></p> <p data-bbox="483 1430 646 1463"><u>OPERATIONS</u></p> <p data-bbox="483 1493 1388 1875">Preparations continued for the CSS Structural Test Program during this report period. Test stand work primarily involved the fabrication and installation of deflectometer mounting brackets and other test related hardware. A six man NASA team from Cleveland and a six man LMSC team installed strain gages on the shroud on a two shift, ten hour/day, six day/week basis. An LMSC manufacturing team made modifications to structurally strengthen the shroud for the upcoming tests. A total of six additional LMSC and nine additional GDC men have been at Plum Brook to assist in shroud preparations for the structural tests.</p> <p data-bbox="609 1904 966 1938">(Continued on Page 25)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="300 319 544 414">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="495 414 933 457"><u>STRUCTURAL TEST</u> (Continued)</p> <p data-bbox="495 478 1079 521">The major events of this month were:</p> <p data-bbox="495 542 1307 649">Feb. 12-26: Installed strain gages and made manufacturing modifications on the shroud at Space Power Facility.</p> <p data-bbox="495 670 1323 744">Feb. 22 : LN₂ fill line installed on Centaur LH₂ tank.</p> <p data-bbox="495 766 1339 840">Feb. 23 : Installed Centaur tank loading cylinder and new tank stretch system in B-3.</p> <p data-bbox="495 861 1388 936">Feb. 27 : Installed CSS aft skirt section on conical boattail at B-3 Facility.</p> <p data-bbox="495 968 1421 1298">TCPO decided to perform an LN₂ boiloff test following Structural Test #7L. This constitutes an additional test requirement. The formal paperwork (EWO) for the test arrived at Plum Brook on February 23, 1973. Some purge systems will have to be reinstalled for which plans had not previously been made. The primary problem posed by the new request involves the cable routing inside the shroud for the additional thermocouple recording requirements. It is hoped that the additional work can be accomplished without a schedule slip.</p> <p data-bbox="495 1330 836 1372">The test schedule is:</p> <p data-bbox="495 1393 1177 1436">Mar. 21: CRT Sress-Strain Readout Test</p> <p data-bbox="495 1457 1096 1500">Apr. 2: 50% Load Validation Test</p> <p data-bbox="495 1521 1339 1627">Week of Apr. 9: Structural Test #3 (first of the series of seven structural tests).</p> <p data-bbox="495 1649 1404 1755">Plans are being formulated for shutdown of the facility after completion of the final engineering evaluation test program.</p> <p data-bbox="495 1776 738 1819"><u>INSTRUMENTATION</u></p> <p data-bbox="495 1840 1339 1883">All strain gage installation work has been completed.</p> <p data-bbox="576 1904 917 1947">(Continued on Page 27)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="289 336 535 431">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="483 436 922 470"><u>STRUCTURAL TEST</u> (Continued)</p> <p data-bbox="483 502 1390 566">Eighty percent of strain gage check out by RSD personnel has been completed.</p> <p data-bbox="483 602 1360 666">Eighty percent of the deflectometer balance panel card work has been completed.</p> <p data-bbox="483 700 1341 763">About sixty percent of facility cable work for strain gages has been completed.</p> <p data-bbox="483 798 1390 861">About forty percent of facility cable work for deflectometers has been completed.</p> <p data-bbox="483 895 1370 959">Preliminary flow and digital format sheets for tests 3, 4 and 7 have been produced.</p> <p data-bbox="483 993 1305 1057">Seventy percent of work on thermocouple additions - modifications has been done.</p> <p data-bbox="483 1091 610 1125"><u>CONTROLS</u></p> <p data-bbox="477 1157 1370 1315">Sequence, abort and alarm system program changes are proceeding on schedule for a completion date of March 21. The coding of the program changes is 50% complete. There will be no CF-16 aborts, eliminating the requirements for changeable limits.</p> <p data-bbox="477 1349 1380 1449">The design of the TR-48 interface for the Structural Tests is 50% complete and the installation is 20% complete. The check out of the alarm hardware is complete.</p> <p data-bbox="477 1483 1383 1610">The failsafe manifolds for the axial cylinders are being modified with orifices so that the cylinder fails at a controlled rate. The last major purchase items required are due on March 5, 1973.</p>

SECTION II
 PLUM BROOK ROCKET SYSTEMS DIVISION
 TEST OPERATIONS REPORT
 FOR THE MONTH OF
 MARCH 1973

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
------	--

B-3	ROCKET DYNAMICS AND CONTROL FACILITY
-----	--

CENTAUR STANDARD
SHROUD (CSS) TESTS
 (YP04239)

STRUCTURAL TEST

TCPO - J. C. HUMPHREY;
 RSD - L. C. GENTILE

DISCUSSION

OPERATIONS

Preparations continued for the CSS Structural Test Program during this report period. Test stand work primarily involved the installation of the CSS and related facility hardware. Fabrication and installation of deflectometer mounting brackets continued through most of March.

(Continued on Page 29)

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="285 325 526 421">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="480 421 911 455"><u>STRUCTURAL TEST</u> (Continued)</p> <p data-bbox="480 485 1052 519">The major events of this month were:</p> <p data-bbox="480 549 1373 583">Mar. 3 -Installed CSS -Y and +Y tank sections in B-3.</p> <p data-bbox="480 612 1344 676">Mar. 5 -Removed tank section AGE gear and installed Centaur load cylinder.</p> <p data-bbox="480 706 1133 740">Mar. 6 -Installed CSS payload section.</p> <p data-bbox="480 770 1040 804">Mar. 7 -Installed CSS nose cone.</p> <p data-bbox="480 834 1182 868">Mar. 10 -Installed shroud loading fixtures.</p> <p data-bbox="480 898 1317 961">Mar. 14 -Installed counterbalance beam below crane rails.</p> <p data-bbox="480 991 1344 1025">Mar. 13-23-Installed deflectometer brackets on shroud.</p> <p data-bbox="480 1055 1057 1089">Mar. 19-20-Installed deflectometers.</p> <p data-bbox="480 1119 1360 1183">Mar. 28 -Started final mechanical hookup of deflectometers to the shroud.</p> <p data-bbox="480 1212 1393 1459">Numerous problems developed during the installation of the deflectometers. Many had to be relocated due to interferences with building beams, hand rails, and Centaur vehicle attachments. Difficulties in equipment installation and check out plus the addition of another check out test at reduced loads will cause a one to two week delay in the schedule.</p> <p data-bbox="480 1489 943 1523">The current test schedule is:</p> <p data-bbox="480 1553 1365 1617">Week of April 9 - 25% check out and 50% load validation test.</p> <p data-bbox="480 1647 1089 1681">Week of April 16- Structural Test #3L.</p> <p data-bbox="480 1710 724 1744"><u>INSTRUMENTATION</u></p> <p data-bbox="480 1774 1390 1808">During the month of March the following was accomplished:</p> <p data-bbox="480 1838 1365 1902">All deflectometer wiring has been completed and checked through to the B-3 patchboard.</p> <p data-bbox="548 1932 894 1966">(Continued on Page 31)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="293 285 537 378">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="488 385 927 417"><u>INSTRUMENTATION</u> (Continued)</p> <p data-bbox="488 449 1365 544">All strain gages for the current run have been patched through the transfer box and checked through to the patchboard.</p> <p data-bbox="488 580 1365 644">All other instrumentation associated with Runs 3 and 4 has been checked out in a similar manner.</p> <p data-bbox="488 678 1409 774">Both site and control room patchboards have been patched. At present final check out through the SEL data system is being accomplished.</p> <p data-bbox="488 810 1393 874">Instrumentation should be ready for the first structural pre-test on week of April 9, 1973.</p> <p data-bbox="488 910 618 942"><u>CONTROLS</u></p> <p data-bbox="488 974 1409 1198">All controls hardware required for the initial structural tests has been installed and is currently being checked out. The necessary software programs for sequence, abort and alarm have been completed and are in the check out phase. The sequence, abort, and alarm data has been obtained from Lewis-Cleveland and is being implemented for the first series of structural tests.</p> <p data-bbox="488 1234 1393 1361">All purchased hardware required for the vent fin tests has been received and is being checked at D-Site. Plans are being made to proof test all parts involved in loading apparatus for all structural tests.</p> <p data-bbox="488 1398 1360 1461">Safety Committee and Readiness Review Committee recommendations are also currently being implemented.</p>

SECTION II
 PLUM BROOK ROCKET SYSTEMS DIVISION
 TEST OPERATIONS REPORT
 FOR THE MONTH OF
 APRIL 1973

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY</p> <p style="margin-left: 40px;"><u>CENTAUR STANDARD SHROUD (CSS) TESTS (Y004239)</u></p> <p style="margin-left: 40px;"><u>STRUCTURAL TEST</u> TCPO - J. C. HUMPHREY; RSD - L. C. GENTILE</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>Check out runs and the first structural test were accomplished in this reporting period. Except for minor problems in a few areas, all tests operations went well. Significant events of the month are noted below:</p> <p>April 1-7: Finish defeictometer hookups.</p> <p>April 9-10: Pre-run countdown operations.</p> <p>April 11: 25% Load Test and 27% Abort Test successfully accomplished.</p> <p>April 13: 50% Load Test successfully accomplished.</p> <p>April 16-20: Modifications to facility & research hardware resulting from 50% Load Test.</p> <p style="text-align: center;">(Continued on Page 19)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
--------	----------

CHANGES: (schedule changes since last report)

CENTAUR STANDARD SHROUD TESTS

B-3

Y0Q4239

<p>STRUCTURAL TESTS SCHEDULED FOR</p> <p>CHECK OUT RUNS AND FIRST STRUCTURAL TEST COMPLETED.</p> <p>STRUCTURAL TEST #4L SCHEDULED FOR</p> <p>STRUCTURAL TEST #5L SCHEDULED FOR</p> <p>ENGINEERING EVALUATION TESTS</p>	<p>Apr - Jun 1973.</p> <p>May 2, 1973.</p> <p>May 16, 1973.</p> <p>Feb 15 - Jun 30, 1974.</p>
<p><u>ITEMS COMPLETED</u></p> <p>Deflectometer hookups completed</p> <p>Pre-run countdown operations completed</p> <p>25% load test and 27% abort test completed</p> <p>50% load test completed.</p> <p>Facility and research hardware mods(after 50% load test).</p> <p>Pre-run countdown operations</p> <p>Structural Test #3L completed</p> <p>Set up instrumentation for 252 strain gages, 90 deflectometers, 5 temperatures, and 15 pressures.</p> <p>Recalibrated, corrected or repaired 30 strain gages and 8 deflectometers.</p> <p>Cleared instrument ground loops.</p> <p>Added fuses and comparator circuit to strain gage power supply.</p> <p>Capacitors added to strain gage power supplies.</p> <p>45 flow sheets and check sheets were made.</p> <p>Corrections and mods were made to control system.</p> <p>Facility control amplifier channel was changed.</p> <p>Modified data marker (generated during load ramps).</p>	<p>April 7.</p> <p>April 9 - 10.</p> <p>April 11.</p> <p>April 13.</p> <p>April 16 - 20.</p> <p>April 23 - 24.</p> <p>April 25.</p>
<p><u>ITEMS IN PROGRESS</u></p> <p>Preparing for Structural Test #4L scheduled for</p>	<p>May 2, 1973.</p>

CHANGES: Added next run schedule dates.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="305 321 548 417">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="480 421 919 453"><u>STRUCTURAL TEST</u> (Continued)</p> <p data-bbox="480 485 1175 517">April 23-24: Pre-run countdown operations.</p> <p data-bbox="480 549 1227 612">April 25: Structural Test #3L successfully accomplished.</p> <p data-bbox="480 644 1110 676">April 26-30: Preparation for Test #4L.</p> <p data-bbox="480 708 1422 1006">The combined CSS and facility hardware deflected about 50% more than anticipated under shear loading during the 25% and 50% Load Tests. Approximately 18% of this is attributed to the CSS and the remainder to the facility mounting hardware. Therefore, for Test #3L it was necessary to preload the CSS in shear to assure sufficient hydraulic cylinder actuator stroke to get the maximum shear load of 36,800 pounds. It may be necessary to preload the CSS for the remainder of the Structural Tests.</p> <p data-bbox="480 1038 1386 1134">Test #4L is scheduled for May 2 and Test #5L for May 16. An attempt will be made to accelerate the test schedule in order to deliver the CSS to SPF by July 1, 1973.</p> <p data-bbox="480 1166 724 1198"><u>INSTRUMENTATION</u></p> <p data-bbox="480 1229 1406 1325">During the month of April, B-3 instrumentation supported three successful test runs. These were 3L - 25%, 3L - 50% and 3L - 100%.</p> <p data-bbox="480 1357 1386 1421">In preparation for these tests the following instrumentation was set up.</p> <ul data-bbox="591 1453 883 1591" style="list-style-type: none"> 252 strain gages 90 deflectometers 5 temperatures 15 pressures <p data-bbox="480 1623 1354 1687">During the month, about 30 strain gages and 8 deflectometers were corrected, recalibrated, or repaired.</p> <p data-bbox="480 1719 1338 1751">The instrument ground loops at B-3 test were cleared.</p> <p data-bbox="480 1783 1370 1847">Fuses and a comparator circuit were added to the strain gage power supplies as a safety measure.</p> <p data-bbox="480 1879 1370 1942">Capacitors were added to the strain gage power supplies to eliminate noise.</p> <p data-bbox="558 1953 915 1985">(Continued on Page 21)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="292 315 544 409">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="470 409 722 451"><u>STRUCTURAL TEST</u></p> <p data-bbox="470 472 917 514"><u>INSTRUMENTATION</u> (Continued)</p> <p data-bbox="470 535 1274 609">Approximately 45 flowsheets and check sheets were produced.</p> <p data-bbox="470 640 609 672"><u>CONTROLS</u></p> <p data-bbox="470 703 1388 997">Some minor corrections and modifications were made to the control system during the 25% check out and 50% load validation tests. The faulty amplifier channel that caused two error aborts has been completely changed. A drift free set point at 100% load has been provided for the axial loads. The data marker that is generated during load ramps was modified to provide a 1 second pulse for each 2% of load change for use in data acquisition.</p> <p data-bbox="470 1029 1364 1249">During Structural Test #3L, all control systems basically performed satisfactorily. The one abort that occurred was caused by noise spikes on the "B" bridge of the North load cell. In ramping to 100% of shear load, the sum of "A" and the sum of "B" signals disagreed by 800 pounds. These problems are being investigated.</p>
HTF	<p data-bbox="292 1323 462 1417">HYPERSONIC TUNNEL FACILITY</p> <p data-bbox="462 1417 795 1480"><u>HRE (GARRETT ENGINE)</u> (YOD4891)</p> <p data-bbox="933 1417 1282 1480">P&CD - E. A. LEZBERG; RSD - T. W. BRINK</p> <p data-bbox="771 1512 941 1543"><u>DISCUSSION</u></p> <p data-bbox="462 1575 633 1606"><u>OPERATIONS</u></p> <p data-bbox="462 1638 1396 1900">Three test runs were performed in April. On April 27, a one minute, 20 second run was shut down manually because of a high chamber pressure. This indicated that the tunnel flow was not established through the shroud. A minor change was made for the April 30 tests, and both tests were fully started and run successfully. The first run was 51.8 seconds at 2000°R. The second run on April 30 was one minute, 42 seconds at 2500°R. It was shut</p> <p data-bbox="511 1911 876 1953">(Continued on Page 23)</p>

SECTION 11
 PLUM BROOK ROCKET SYSTEMS DIVISION
 TEST OPERATIONS REPORT
 FOR THE MONTH OF
 MAY 1973

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
------	---

B-3

ROCKET DYNAMICS
 AND CONTROL
 FACILITY

CENTAUR STANDARD
 SHROUD (CSS) TESTS
 (Y004239)

STRUCTURAL TEST

TCPO - J. C. HUMPHREY
 RSD - L. C. GENTILE

DISCUSSION

OPERATIONS

All work this month was directed to the preparation for, and conducting of, structural test runs. Significant events of the month are noted below:

- May 2: Structural Test #4L successfully accomplished.
- May 3-10: Preparation for Test #2L-1: Moved shear strap, relocated deflectometer and activated a new set of stain gages.
- May 11: Structural tests #2L-1 & 2L-1A successfully accomplished.
- May 12-17: Preparations for Test #1L-1.
- May 18-19: Structural tests #1L-1 & 1L-2 & shroud leak test successfully accomplished.
- May 21-22: Preparations for Test #2L-2.
- May 23: Structural test #2L-2 (vent fin test) successfully accomplished.

(Continued on Page 21)

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
--------	----------

CHANGES: (schedule changes since last report)

CENTAUR STANDARD SHROUD TESTS

B-3

Y004239

<p>STRUCTURAL TESTS SCHEDULED FOR</p> <p>TEST 1L3 SCHEDULED FOR</p> <p>TESTS 7L-1 & 7L-2 SCHEDULED FOR</p> <p>TESTS 5L-1, 5L-2, 5L-3, & 5L-4 SCHEDULED FOR</p> <p>ENGINEERING EVALUATION TESTS</p>	<p>Apr - June 1973.</p> <p>June 4, 1973.</p> <p>Week of June 11, 1973.</p> <p>Week of June 26.</p> <p>Feb 15 - June 30, 1974.</p>
<p><u>ITEMS COMPLETED</u></p> <p>Structural Test #4L completed</p> <p>Structural Test #1L-1 & #1L-2 completed</p> <p>Shroud Leak Rate Test completed</p> <p>Structural Test #2L-2, Vent Fin Test, completed</p> <p>Operations preparations completed for special forward seal test #1L-3</p> <p>Operations preparations completed for Cryogenic Structural Test #7L-1 & 7L-2</p> <p>Two new tests added to program.</p> <p>Test #1L-3 instrumentation flowsheets and formats completed.</p>	<p>May 2, 1973.</p> <p>May 18 - 19, 1973.</p> <p>May 18 - 19, 1973.</p> <p>May 23, 1973.</p> <p>May 24 - 31, 1973.</p> <p>May 24 - 31, 1973.</p>
<p><u>ITEMS IN PROGRESS</u></p> <p>Work is progressing for Test Series 7 and 5.</p> <p>Control changes being made for 1L-3 structural test.</p>	

CHANGES: Run Schedules Added.

SITE SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS

B-3 ROCKET DYNAMICS
AND CONTROL
FACILITY

STRUCTURAL TEST (Continued)

May 24-31: Preparation for special forward seal test #1L-3 and cryogenic structural test #7L-1 and #7L-2.

The results of Test Nos. 3L, 4L, and 2L-1 and 2L-1A all verified that the CSS test hardware deflects approximately 50% greater than anticipated under shear load. This test result necessitated investigation of loads on the Centaur tanks, available motion of the vent fin disconnect, available clearance between the CSS and payload, design of the forward seal and design of the FBR struts. As a result of the investigations, the FBR struts were installed for Test #1L-1. The objective was to determine a combined stiffness factor for the shroud, FBR struts and Centaur tank. The information was needed for the redesign of the FBR strut spring mechanism and caused an additional special test to be added to the test program. The FBR struts were removed after Test #1L-1 and Test #1L-2 was run.

During Run #1L-2 the shroud was to be pressurized to approximately 3 psig to test the forward seal and its retention device. The seal "popped" off the retaining ring at about 2 psig. None of the seal equipment was damaged. The fact that the seal "popped" at a lower pressure than expected is of concern and another special test #1L-3 has been scheduled to further define the problem area.

Between Test #1L-1 and 1L-2 on May 18, a CSS leak test was performed to determine if the shroud tank section had additional leakage from that observed on April 6, 1973 before the structural tests began. Additional leaks could be caused because of flexing the shroud during the structural tests from April 6 to May 18. However, there was no significant change in shroud leakage.

The current schedule is as follows:

Test 1L-3: June 4

Test 7L-1 & 7L-2: Tentatively scheduled for week of June 11.

(Continued on Page 23)

SECTION II

PLUM BROOK ROCKET SYSTEMS DIVISION

TEST OPERATIONS REPORT

FOR THE MONTH OF

JUNE 1973

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-2	<p>SPACECRAFT PROPULSION RESEARCH FACILITY</p> <p><u>FACILITY</u> RSD - SECTION A/6111</p> <p>No work was accomplished on the pump repair or facility shutdown during this report period.</p> <p><u>AIR FORCE PROGRAM</u> RSD - R. A. DEZELICK (YGP3211)</p> <p>Word was received from Aerospace Corporation that they would not have the instrumentation ready by mid-July for Phase II testing.</p> <p>NASA has advised the SAMSO office that rescheduling to mid-August will not result in any manpower or funding problems.</p>
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY</p> <p><u>CENTAUR STANDARD</u> <u>SHROUD (CSS) TESTS</u> (Y0Q4239)</p> <p><u>STRUCTURAL TEST</u> TCPO - J. C. HUMPHREY; RSD - L. C. GENTILE</p> <p><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>All work this month was directed to the preparation for, and conducting of, structural test runs. Significant events of the month are noted below:</p> <p>(Continued on Page 17)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

AIR FORCE PROJECT (EXO-PEG TESTS) B-2 YGP3211

NEXT RUN SCHEDULED FOR	August 1973
Aerospace Corporation working on instrumentation for Phase II testing.	

CHANGES: Run schedule changed from July to August.

CENTAUR STANDARD SHROUD TESTS B-3 Y004239

SEAL TEST SCHEDULED FOR	Jul 2, 1973.
ENGINEERING EVALUATION TESTS SCHEDULED FOR	Apr 15 - Oct 15, 1974.
<u>ITEMS COMPLETED</u>	
Structural test #1L3 completed	June 4, 1973.
Prepared for 7L series of tests	June 5-13, 1973.
Completed Boiloff Test & 7L Series of tests	June 14-15, 1973.
Modified aft seal plate.	June 16-22, 1973.
Installed new forward seal	June 16-22, 1973.
Prepared for 5L & 6L test series	June 16-22, 1973.
Completed 6L series and 5L-2 tests	June 28, 1973.
Forward seal redesigned, fabricated & installed.	
<u>ITEMS IN PROGRESS</u>	
Preparing for July 2 test series.	
Control equipment being reviewed to determine necessary repairs.	

CHANGES: Engineering Evaluation Tests schedule.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="284 329 527 425">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="462 425 893 457"><u>STRUCTURAL TEST</u> (Continued)</p> <p data-bbox="462 489 1299 553">June 4: Test 1L-3 (forward seal pressure test) completed. Seal 'popped off' at 2.1 psig.</p> <p data-bbox="462 585 1185 627">June 5-13: Preparations for test series 7L.</p> <p data-bbox="462 649 1364 872">June 14-15: Successfully completed the following tests: #7L-1 - Launch transient loading #7L-2 - Limit load on FBR system #7L-3 - FMR separation #7L-4 - Payload Branch Spring Rate without FBRs. - Boiloff Test</p> <p data-bbox="462 883 1299 978">June 16-22: Modified aft seal plate. Installed new forward seal. Preparations for 5L & 6L test series.</p> <p data-bbox="462 1010 1364 1244">June 28: Successfully completed the following tests: #6L-1 - Limit loads on FBR and ISA Pressure and load test on forward seal. #6L-2 - FBR Separation #6L-3 - FSR Release #5L-2 - Limit Tension Load.</p> <p data-bbox="462 1266 1412 1436">The forward seal "popped off" the CSS retainer during Test 1L-3 on June 4. The seal is required to withstand 3.0 psig and it failed at 2.1 psig. This second failure (first failure was on May 18 during test 1L-2) necessitated a redesign of a portion of the forward seal by GDC.</p> <p data-bbox="462 1457 1380 1606">The boiloff test results on June 14 were nearly identical to those obtained earlier this year. This indicated that the insulation had not degraded due to handling and being exposed to atmospheric conditions for long time periods.</p> <p data-bbox="462 1627 1396 1947">It was decided to structurally modify the CSS aft seal plate to enable it to better withstand the 3 psig pressure it would be subjected to during the forward seal tests. This modification was made by LMSC personnel. During this same time period GDC personnel installed the redesigned forward seal. The larger retaining bead on the seal caused clearance problems on other CSS components. The FBR retract springs had to be relocated and structural gussets on the CSS forward seal plate had to be ground out to provide adequate clearance.</p> <p data-bbox="527 1957 876 1989">(Continued on Page 19)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="284 314 527 410">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="462 410 901 446"><u>STRUCTURAL TEST</u> (Continued)</p> <p data-bbox="462 478 1323 542">The redesigned seal withstood a 3 psig pressure check on June 28 and the test will be repeated on July 2.</p> <p data-bbox="462 574 1372 670">The July 2 series of tests will complete this portion of the B-3 test program. Shroud removal activities will start on July 5, and should be completed by July 20.</p> <p data-bbox="462 712 706 744"><u>INSTRUMENTATION</u></p> <p data-bbox="462 776 1356 840">During this month the instrument section prepared for and supported the following cryogenic structural tests:</p> <p data-bbox="625 861 1193 925"> 7L-1, 2, 3 6-14-73 - 6-15-73 6L-1, 2, 3, 5L-2 6-28-73 </p> <p data-bbox="462 936 1356 1000">On Test 7L approximately 400 channels of digital and 65 channels of analog information were recorded.</p> <p data-bbox="462 1032 1356 1095">On Test 6L and 5L approximately 200 channels of digital and 57 channels of analog information were recorded.</p> <p data-bbox="462 1138 1372 1202">All tests were covered by the real time data display and plotting system at B-Control.</p> <p data-bbox="462 1234 1421 1330">At present, instrumentation is planning the orderly removal of instrumentation from the test hardware prior to its shipment to SPF for the Heated Jettison Tests.</p> <p data-bbox="462 1372 592 1404"><u>CONTROLS</u></p> <p data-bbox="462 1436 1421 1564">The current structural test series in B-3 has been successfully completed. A review of all equipment used is being made to determine what repairs are necessary, and steps to facilitate the repairs will be taken.</p> <p data-bbox="462 1596 1388 1713">All structural test equipment will be inventoried, identified and stored. Equipment will be built up as far as possible to existing Engineering Evaluation Test configuration requirements.</p> <p data-bbox="462 1755 1323 1851">Design, purchase and testing of additional Engineering Evaluation Test items will be started within the next month.</p>

SECTION II

PLUM BROOK ROCKET SYSTEMS DIVISION

TEST OPERATIONS REPORT

FOR THE MONTH OF

JULY 1973

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-2	<p data-bbox="316 766 487 904">SPACECRAFT PROPULSION RESEARCH FACILITY</p> <p data-bbox="495 925 1347 968"><u>FACILITY</u> RSD - SECTION A/6111</p> <p data-bbox="495 1021 1347 1159">A purchase request and specifications have been prepared for the inspection of the pump shafts. The PR has been approved and a contract will be awarded to cover the work.</p> <p data-bbox="495 1223 1347 1287"><u>AIR FORCE PROGRAM</u> RSD - R. A. DEZELICK (YGP3211)</p> <p data-bbox="495 1351 1380 1489">Aerospace Corporation has advised NASA that procurement and modification of instrumentation for Phase II testing, will result in a delay of the EXO-PEG project at Plum Brook.</p> <p data-bbox="495 1542 1388 1649">Phase II testing will tentatively take place in January of 1974, therefore the monthly report will be discontinued until work on this project becomes active.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

AIR FORCE PROJECT (EXO-PEG TESTS) B-2 (NARRATIVE ON PAGE 5) YGP3211

<p>NEXT RUN SCHEDULED FOR</p> <p>Aerospace Corporation procuring and modifying instrumentation for Phase II.</p> <p><u>Facility</u></p> <p>Prepared PR and specs for pump shaft inspection.</p>	<p>January 1974.</p>
---	----------------------

CHANGES: Run Schedule

CENTAUR STANDARD SHROUD TESTS B-3 YOQ4239

<p>ENGINEERING EVALUATION TESTS SCHEDULED FOR</p> <p><u>ITEMS COMPLETED</u></p> <p>Structural test program completed</p> <p>CSS & related equipment was removed & sent to SPF</p> <p>Centaur removed and stored in shipping pallet in Bldg. No. 5131</p> <p>Cleaned up test site and inventoried equipment.</p> <p>Meetings held to review requirements for EET</p> <p>PR initiated for EET control items.</p> <p>Site personnel reassigned to HTF and K-Site</p> <p><u>ITEMS IN PROGRESS</u></p> <p>Repairing RT-20 analog computer power supply.</p> <p>Repairing digital run clock.</p> <p>Repairing vent system transducer power supply.</p>	<p>Apr 15 thru Oct 15.</p> <p>July 2, 1973.</p> <p>July 3 to 16, 1973.</p> <p>July 13, 1973.</p> <p>July 31, 1973.</p>
--	--

CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="337 363 586 459">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="521 463 813 559"><u>CENTAUR STANDARD SHROUD (CSS) TESTS</u> (YOQ4239)</p> <p data-bbox="521 591 764 623"><u>STRUCTURAL TEST</u></p> <p data-bbox="987 576 1344 634">TCPO - J. C. HUMPHREY; RSD - L. C. GENTILE</p> <p data-bbox="857 672 1024 704"><u>DISCUSSION</u></p> <p data-bbox="521 740 683 772"><u>OPERATIONS</u></p> <p data-bbox="521 804 1425 995">The CSS Structural Test program was completed on July 2. The CSS and related Centaur equipment was removed from the test stand and sent to Space Power Facility for the heated jettison test program. The Centaur tank was put in the shipping pallet and is in storage in Building No. 5131. Significant events of the month are noted below:</p> <p data-bbox="521 1034 1458 1193">July 2: Successfully completed the following tests: #5L-1 - Pressure and load test on forward seal at ambient conditions, #5L-3 - Forward seal release test at ambient conditions.</p> <p data-bbox="521 1229 1458 1325">July 3-7: Removed deflectometers, counterbalance beam, forward load application fixture and south door beams.</p> <p data-bbox="521 1364 1360 1421">July 9: Removed CSS nose cone, shroud, payload cylinder, and Centaur load cylinder.</p> <p data-bbox="521 1459 1458 1491">July 10-11: Removed truss adapter and CSS tank cylinder.</p> <p data-bbox="521 1527 1490 1585">July 12-13: Removed Centaur radiation shield stub adapter, fill lines, and CSS boattail skirt.</p> <p data-bbox="521 1623 1458 1681">July 13: Removed Centaur from B-3 and stored in shipping pallet.</p> <p data-bbox="521 1719 1425 1776">July 16: Removed Centaur ISA and CSS boattail. De-erection complete.</p> <p data-bbox="521 1815 1474 1910">The last half of the month was spent in cleaning up and inventorying equipment. Site personnel were reassigned to the Hypersonic Tunnel Facility to aid in the heater rebuild</p> <p data-bbox="630 1959 987 1991">(Continued on Page 9)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="321 342 570 438">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="505 442 894 506"><u>CENTAUR STANDARD SHROUD TESTS</u> (Continued)</p> <p data-bbox="505 538 1382 634">operation and to K-Site. A minimum crew will be maintained at B-3 to cover preliminary work for the CSS Engineering Evaluation Tests.</p> <p data-bbox="505 666 1382 793">A meeting was held with TCPO on July 31 to review requirements for the CSS Engineering Evaluation Tests. These tests will be conducted in B-3 when the heated jettison tests are completed at SPF.</p> <p data-bbox="505 836 748 868"><u>INSTRUMENTATION</u></p> <p data-bbox="505 900 1382 963">The final Cryo-Structural Tests were performed on July 1 and July 2.</p> <p data-bbox="505 995 1414 1091">Between July 3 and July 16 instruments supported the CSS and associated parts disassembly. This included the following:</p> <ol data-bbox="505 1123 1430 1485" style="list-style-type: none"> <li data-bbox="505 1123 1333 1187">(1) Removal of all thermocouples, pressure and RTS instrumentation from hardware. <li data-bbox="505 1219 1430 1347">(2) Removal of all internal and external cables from test hardware. In some cases cables were completely removed, in others, the cables were coiled back in Titan Skirt area. <li data-bbox="505 1378 1398 1485">(3) Depending upon future use requirements, all strain gage instrumentation was removed, cut back or tied down. <p data-bbox="505 1517 1341 1549">For the balance of the month the following was done:</p> <ol data-bbox="505 1581 1455 1910" style="list-style-type: none"> <li data-bbox="505 1581 1406 1644">(1) Removal of all deflectometers to calibration laboratory. <li data-bbox="505 1676 1373 1740">(2) Pull back and tie down all facility deflectometer cables. <li data-bbox="505 1772 1406 1836">(3) Documentation and repair of about 80% of instrument cables. <li data-bbox="505 1868 1455 1910">(4) Removal of about 50% of facility pressure transducers. <p data-bbox="662 1942 1016 1974">(Continued on Page 11)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY</p> <p><u>CENTAUR STANDARD SHROUD TESTS</u> (Continued)</p> <p><u>CONTROLS</u></p> <p>Purchase requests have been initiated for the long lead time hardware for the engineering evaluation test. Current structural test hardware has been removed and stored to the extent required to facilitate removal of the CSS.</p> <p>Repair work is in progress on the following control room equipment:</p> <ul style="list-style-type: none"> (1) RT-20 analog computer power supply, (2) Test conductor's digital run clock, and (3) Centaur vent system transducer power supply.
HTF	<p>HYPERSONIC TUNNEL FACILITY</p> <p><u>HRE (GARRETT ENGINE)</u> (Y0D4891)</p> <p>P&CD - E. A. LEZBERG RSD - T. W. BRINK</p> <p><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>The main work at the facility has been directed toward the reassembly of the heat exchanger and hot train. Repairs to the HRE have been completed and it is ready for resumption of the test program. Significant events of the month are noted below:</p> <ul style="list-style-type: none"> July 1-10: Felt insulation orders were placed and some received at Plum Brook. July 11-13: H2O cooled components of the heat exchanger were hydro-tested to determine if water leaks existed. None were apparent. July 12-17: Heater rebuild operations. <p>(Continued on Page 13)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK /
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

AIR FORCE PROJECT (EXO-PEG TESTS) B-2 (NARRATIVE ON PAGE 5) YGP3211

<p>NEXT RUN SCHEDULED FOR</p> <p>Aerospace Corporation procuring and modifying instrumentation for Phase II.</p> <p><u>Facility</u> Held site inspection for pump shaft inspection work.</p>	<p>January 1974.</p>
--	----------------------

CHANGES: None.

CENTAUR STANDARD SHROUD TESTS B-3 Y004239

<p>ENGINEERING EVALUATION TESTS SCHEDULED FOR</p> <p><u>ITEMS COMPLETED</u> Two meetings held with TCPO on test program. Preliminary tasks have been defined. Record copies of flow sheets and digital formats assigned and filed. Removed all pressure transducers and sent to Cal Lab. Work order written for load cell calibration. Initiated tasks to update all instrumentation blue-prints.</p> <p><u>ITEMS IN PROGRESS</u> Instrument cables being documented and repaired. Initiated design on test rig for deflectometers. Design and procurement of major contract items progressing</p>	<p>Apr thru May 31, 1974</p> <p>90% complete.</p>
--	---

CHANGES: Schedule Change.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="285 278 529 370">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="464 374 1110 404"><u>ENGINEERING EVALUATION TESTS</u> (Continued)</p> <p data-bbox="464 440 1354 602">Tentative test schedules have been prepared. To meet schedule dates, test requirements should be relatively firm by the 15 of October 1973. This will allow enough time to order or fabricate test equipment and purchase any additional instrumentation if required.</p> <p data-bbox="464 638 1370 729">A number of tasks preliminary to the EET have been defined and are being accomplished when manpower is available. They include:</p> <ol data-bbox="464 766 1338 1059" style="list-style-type: none"> (1) Raising the Titan Skirt and drilling additional mounting holes in the lower distribution chamber. (2) Cleaning and oiling the Centaur Tank Section. (3) Removing transducers, etc., for recalibration. (4) Removal and repair of facility hardware where required. <p data-bbox="464 1095 704 1125"><u>INSTRUMENTATION</u></p> <p data-bbox="464 1161 1256 1191">The following tasks were completed during August:</p> <ol data-bbox="464 1227 1386 1810" style="list-style-type: none"> (1) All record copies of flow sheets and digital formats have been assembled and filed. (2) All facility pressure transducers have been removed and sent to the calibration laboratory. (3) Work orders have been written and all load cells are presently being shipped to Lewis-Cleveland for calibration. (4) The task of updating all facility instrumentation blueprints has been initiated. (5) Work on the documentation and repair of instrument cables is continuing. (6) Per EET test requirements, work was initiated on the design of a test rig for deflectometers. <p data-bbox="561 1910 899 1940">(Continued on Page 9)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY</p> <p style="text-align: center;"><u>CONTROLS</u></p> <p>As a result of a test review committee meeting, several EET tests have been eliminated or modified. Design and procurement of all major control items needed as of the present test configuration is 90% complete. The build up and testing of any new equipment should start within a month.</p>
HTF	<p>HYPERSONIC TUNNEL FACILITY</p> <p style="text-align: center;"><u>HRE (GARRETT ENGINE)</u> AED - E. A. LEZBERG (Y0D4891) RSD - T. W. BRINK</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p style="text-align: center;"><u>OPERATIONS</u></p> <p>During the GN₂ pressure check of the heater exit piping on August 3 a leak from the inside of the hot tee into the water jacket which cools the liner support pads was discovered. Inspection showed a half inch long crack. Attempts were made to repair the crack during the first two weeks in August. However, fine hair line cracks were found throughout the welds and the cracks would open up when welding was attempted. The closure plate was removed during the third week of August and a new one fabricated. Inspection of the parent metal was made by dye penetrant check, X-ray and ultrasonic tests to insure good basic metal. The X-rays showed fine hair line cracks in the major weld which joins the horizontal to the vertical pipe. Dye penetrant tests showed no surface cracks and the ultrasonic tests showed the cracks to be traverse. A meeting was held with the designers and it was decided to proceed with machining to accept the new closure plate. The machining will expose a portion of the major weld and a dye penetrant test will be made. The machining will be completed September 6, 1973. It is expected that the hot tee will be ready for installation during the week of September 17, 1973. Heat up will start during the week of September 24 and tests will resume during the first or second week of October.</p> <p style="text-align: center;">(Continued on Page 11)</p>

SECTION II
 PLUM BROOK ROCKET SYSTEMS DIVISION
 TEST OPERATIONS REPORT
 FOR THE MONTH OF
 SEPTEMBER 1973

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-2	<p data-bbox="266 693 428 821">SPACECRAFT PROPULSION RESEARCH FACILITY</p> <p data-bbox="456 825 1317 857"><u>FACILITY</u> RSD - OPERATION SECTION/6111</p> <p data-bbox="453 889 1365 1772">Purchase Request #506538 is now being processed to purchase about \$25,000 worth of replacement parts for water pump #P701. This is the pump which was dismantled earlier to ascertain the extent of the damage. Contract No. NAS3-17970-PB was issued to the William Ferrell Company to accomplish the internal inspection and replacement of the drive shaft coupling bolts in the other three spray chamber pumps. The delay in the startup of this contract is caused by the delivery time needed for replacement bolts. This contract should start about the end of October. The contract price is \$12,480 and was the lowest of 4 bids, the highest being over \$17,000. The completion time will be 30 days after notice to proceed is given by NASA.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

AIR FORCE PROJECT (EXO-PEG TESTS) B-2 (NARRATIVE ON PAGE 3) YGP3211

NEXT RUN SCHEDULED FOR	January 1974.
<u>Facility</u> Processing purchase requests for water pump parts. Contract awarded to inspect and replace drive shaft coupling bolts for three pumps.	

CHANGES: None.

CENTAUR STANDARD SHROUD TESTS B-3 Y0Q4239

ENGINEERING EVALUATION TESTS SCHEDULED FOR	Apr thru May 31, 1974
<u>ITEMS COMPLETED</u> Design of Twang Tests loading systems completed. Method of shroud shear loading was modified. All LVDTs were delivered. O-Rings for the hydraulic failsafe were delivered.	
<u>ITEMS IN PROGRESS</u> Planning sessions on EETs. Proceeding with procurement of hardware. Working on request to have an absolute reference system to check shroud alignment between tests. Refurbishing the ladder instrument cabling. Updating instrumentation blueprints. Proceeding on tests to check deflectometers. Calibrating load cells and pressure transducers.	

CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="256 297 503 393">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="454 393 751 500"><u>CENTAUR STANDARD SHROUD (CSS) TESTS</u> (YOQ4239)</p> <p data-bbox="454 521 1296 585"><u>ENGINEERING EVALUATION TESTS</u> TCPO - J. G. MCARDLE; RSD - L. C. GENTILE</p> <p data-bbox="809 617 933 659"><u>SUMMARY</u></p> <p data-bbox="454 680 1329 819">Planning sessions for the Engineering Evaluation Tests are continuing. Hardware is being bought as test requirements are firmed up. No problem areas have been uncovered at this time.</p> <p data-bbox="759 840 933 883"><u>DISCUSSION</u></p> <p data-bbox="454 915 619 946"><u>OPERATIONS</u></p> <p data-bbox="454 968 1329 1138">The weekly meetings with TCPO are continuing. The basic test plan as outlined in the previous report appears to be relatively firm. A number of items have been discussed in detail and clarified. Some of the major items are:</p> <ol data-bbox="454 1159 1362 1659" style="list-style-type: none"> <li data-bbox="454 1159 1272 1298">(1) A loading system for the twang tests has been designed. Pyrotechnic cable cutters will be used to release the shroud after it has been pulled over and parts are being ordered. <li data-bbox="454 1319 1338 1500">(2) The shroud shear loading has been modified to permit required deflections without a pre-load. Longer stroke cylinders will be used and attached to the shroud, through a cable system. The bell crank was eliminated. <li data-bbox="454 1521 1362 1659">(3) An absolute reference system has been requested to check shroud alignment between tests. If feasible, deflectometers will be used to obtain the measurements. <p data-bbox="454 1681 1288 1755">There has been little activity at the site over the past month.</p> <p data-bbox="454 1776 1288 1851">The support contract with Lockheed to cover the EET program was reviewed.</p> <p data-bbox="586 1904 933 1947">(Continued on Page 7)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS	
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY</p> <p><u>CENTAUR STANDARD SHROUD</u> (Continued)</p> <p><u>INSTRUMENTATION</u></p> <p>Work involving the refurbishment of ladder instrument cabling is continuing.</p> <p>Facility blueprint update work is continuing.</p> <p>A test involving the repeatability of deflectometer measurements was initiated.</p> <p>Work on the calibration of both load cells and pressure transducers is continuing.</p> <p><u>CONTROLS</u></p> <p>Procurement of items for the EET tests is 95% complete. All LVDTs, including those for the 20 inch stroke cylinders, have been delivered. The O-rings for the hydraulic failsafes have also been received.</p>	
HTF	<p>HYPERSONIC TUNNEL FACILITY</p> <p><u>HRE (GARRETT ENGINE)</u> (YOD4891) AED - E. A. LEZBERG RSD - T. W. BRINK</p> <p><u>SUMMARY</u></p> <p>The GN₂ heat exchanger and hot train rebuild was completed this month. Engine flow calibrations have been started and the first HRE test is scheduled for October 4, 1973.</p> <p><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>The Hot Tee was delivered to Plum Brook September 6 ready for welding and test. The tee was completed on September 12 ready for replating of the inner nickel coating.</p> <p>(Continued on Page 9)</p>	

SECTION II
 PLUM BROOK ROCKET SYSTEMS DIVISION
 TEST OPERATIONS REPORT
 FOR THE MONTH OF
 OCTOBER 1973

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-2	<p data-bbox="267 691 430 819">SPACECRAFT PROPULSION RESEARCH FACILITY</p> <p data-bbox="438 829 576 861"><u>FACILITY</u></p> <p data-bbox="893 829 1234 861">RSD - J. W. VANDENBOS</p> <p data-bbox="438 893 1266 1478">During this month, the contractor performed the internal inspection of pumps 702, 705, and 706. The major internal problem seemed to be one of loose bolts on the drive shaft couplings as expected. These bolts were replaced with bolts which had been drilled for safety wiring and then after they were torqued, they were safety wired. Pumps 705 and 706 may have sustained damage to the pump bowl assembly due to the rubbing of the impeller against the lower suction manifold. The bowl assemblies will be removed from the spray chamber and disassembled to ascertain the extent of the damage. A purchase request is in process by Procurement to purchase the repair parts for Pump 701. The projected delivery date is about 20 weeks. It is expected that another contract will be issued to reassemble 701 after the new parts are received.</p> <p data-bbox="438 1510 771 1542"><u>PAPER DRYING PROJECT</u></p> <p data-bbox="893 1510 1185 1542">RSD - J. E. SHOLES</p> <p data-bbox="438 1574 1299 1840">An agreement has been reached with General Services Administration, Federal Personnel Records Center to dry records in B-2 facility. This will involve placing pallets of wet records in B-2 chamber and then cyclic heating and vacuum drying of the records. Heat will be supplied by introducing steam in the cryowalls. Vacuum will be obtained by operating the existing auxiliary ejector system.</p> <p data-bbox="519 1862 860 1904">(Continued on Page 5)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-2	<p data-bbox="277 300 444 425">SPACECRAFT PROPULSION RESEARCH FACILITY</p> <p data-bbox="440 427 959 457"><u>PAPER DRYING PROJECT</u> (Continued)</p> <p data-bbox="440 495 1386 719">System modification design is in process with completion expected the first week in November. Drying of the first partial chamber load should start the first week in December. The target completion date is about February 1. However, both the actual drying time per load and the total amount of records to be dried are substantially unknown.</p> <p data-bbox="440 757 719 819"><u>AIR FORCE PROJECT</u> (YGP3211)</p> <p data-bbox="956 757 1284 787">RSD - R. A. DEZELICK</p> <p data-bbox="440 857 1300 951">D. D. T. Testing - The test item is to be delivered to Plum Brook on February 11, 1974, ready for installation in the vacuum chamber.</p> <p data-bbox="440 989 1317 1051">The support structure for the test is currently in the design phase.</p> <p data-bbox="440 1089 1300 1183">EXO-PEG Testing - The EXO-PEG testing will follow the completion of the D. D. T. Tests. Changes required from Phase I tests are currently in the design phase.</p>
B-3	<p data-bbox="277 1268 521 1357">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="440 1364 732 1457"><u>CENTAUR STANDARD SHROUD (CSS) TESTS</u> (Y0Q4239)</p> <p data-bbox="956 1461 1292 1523">TCPO - L. G. MCARDLE; RSD - L. C. GENTILE</p> <p data-bbox="440 1491 907 1521"><u>ENGINEERING EVALUATIONS TESTS</u></p> <p data-bbox="776 1559 938 1589"><u>DISCUSSION</u></p> <p data-bbox="440 1627 597 1657"><u>OPERATIONS</u></p> <p data-bbox="440 1696 1312 1757">Weekly meetings with Titan Centaur Project Office were continued.</p> <p data-bbox="440 1796 1312 1942">The main body of the "Test Requirements Document" for the Engineering Evaluation Tests" was reviewed. A number of discrepancies were noted and correction will be made. The Instrumentation Section of the TRD is now being compiled.</p> <p data-bbox="760 1938 1094 1968">(Continued on Page 7)</p>

SITE SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS

B-3 ROCKET DYNAMICS
AND CONTROL
FACILITY

ENGINEERING EVALUATION TESTS (Continued)

A firm order has been placed for the cable cutting devices, required for the Twang Tests. In general, most equipment for the EET Program is on order or at Plum Brook.

The deflectometer frequency response check out rig is being assembled.

The test to determine the feasibility of using deflectometers to check shroud alignment between tests has been completed. The method appears to be satisfactory.

Some of the test fixtures required for the EET have been repainted and a protective coating has been applied over the flanges. The Centaur standby pressurization system has been modified and reworked.

INSTRUMENTATION

Work continued on the calibration of pressure transducers and load cells.

The deflectometer stability tests were completed at B-3 Test Stand.

CONTROLS

The 20-inch hydraulic actuators required for the EET Tests are currently being assembled. All major control hardware has been received. Testing of the completed hydraulic actuator will be done at "D" Site. Proof testing of all structural hardware will then be done in B-3.

SECTION II
PLUM BROOK ROCKET SYSTEMS DIVISION
TEST OPERATIONS REPORT
FOR THE MONTH OF
NOVEMBER 1973

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY</p> <p><u>CENTAUR STANDARD SHROUD (CSS) TESTS (Y0Q4239)</u></p> <p><u>ENGINEERING EVALUATIONS TESTS</u></p> <p style="text-align: right;">TCPO - L. G. MCARDLE; RSD - L. C. GENTILE</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>Weekly meetings with Titan Centaur Project Office were continued.</p> <p>The instrumentation section of the "Test Requirements Document" was reviewed. A final instrumentation list will be issued after firm deflectometer requirements are established and deflectometer frequency response characteristics have been determined.</p> <p>Accomplishment responsibility for various items on the test scheduled was also reviewed.</p> <p>There has been minimum activity at the site and on existing work orders.</p> <p style="text-align: center;">(Continued on Page 7)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

CENTAUR STANDARD SHROUD TESTS B-3 Y004239

ENGINEERING EVALUATION TESTS SCHEDULED FOR	Apr thru May 31, 1974.
<u>ITEMS COMPLETED</u> Titan-Centaur Project Office weekly meetings. Reviewed Instr. Section of "Test Requirements Doc." Reviewed various items accomplishment responsibility. Calibrated load cells in the 20K# and 60K# range. Set up deflectometer frequency response rig.	
<u>ITEMS IN PROGRESS</u> Deflectometer and strain gage layout engineering work. Assembling 20" hydraulic actuators	60% complete.

CHANGES: None

SITE SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS

3-3 ROCKET DYNAMICS
AND CONTROL
FACILITY

ENGINEERING EVALUATION TESTS (Continued)

INSTRUMENTATION

All load cells in the 20K# and 60K# range have been calibrated and returned from LeRC-Cleveland.

Engineering work with TCPO was begun on deflectometer and strain gage layout for EET.

The deflectometer frequency response rig has been set up at H-Building. Tests are to begin shortly.

CONTROLS

The 20 inch hydraulic actuators required for the EET Tests are approximately 60% assembled in the valve shop. Testing of the completed hydraulic actuators will be accomplished at D-Site. Proof tests on all new structural hardware will then be done in B-3.

F HYDRAULICS LAB

LOX FLOW TESTS
(YOV6114)

PSD - R. C. HENDRICKS
RSD - W. E. KLEIN

DISCUSSION

OPERATIONS

Very little manpower was expended on F-Site this month. We were waiting on the delivery of gaskets and cleaning materials for the run tank.

The tank support stand was completed and the tank is now located in the stand. The gaskets and cleaning materials were delivered late in the month. Work on mellographing and cleaning the run tank will start the first week in December. The tank will then be moved to F-Site and the flow system fabricated.

The bids for supplying and applying the tank insulation were opened November 20, 1973. The job will be awarded to Standard Asbestos Manufacturing Company of Cleveland, Ohio as soon as the system is ready.

(Continued on Page 9)

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

LOX FLOW TESTS

YOV6114

LOX FLOW TEST RUN SCHEDULE	Feb 1974.
<p><u>ITEMS COMPLETED</u> Support stand completed. Tank installed in stand. Received tank gaskets and cleaning materials. Opened bids for tank insulation. Calibrated pressure transducers. Checked out control wiring for "H" to "F" Site.</p> <p><u>ITEMS IN PROGRESS</u> Modifying H-Bldg. digital subsystem logic. Servicing control valves at valve shop</p>	<p>80% completed.</p>

CHANGES: Run schedule changed.

SECTION I
 PLUM BROOK ROCKET SYSTEMS DIVISION
 TEST OPERATIONS REPORT
 FOR THE MONTH OF
 DECEMBER 1973

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS						
B-2	<p>SPACECRAFT PROPULSION RESEARCH FACILITY</p> <p style="text-align: center;"><u>FACILITY</u> RSD - J. W. VANDENBOS</p> <p>Prices were received on the replacement parts for the water pump rebuilding. Delivery time on some parts is 200 days. This obviously would be too late to have them installed before the scheduled June 30, 1974 shut-down of Plum Brook. A quicker delivery schedule is being discussed with the manufacturer.</p> <p style="text-align: center;"><u>PAPER DRYING PROJECT</u> RSD - J. E. SHOLES</p> <p>On December 1, drying of the first partial load of paper at B-2 was completed. This load weighed 44,000 pounds before being dried. Approximately 7,900 pounds of water was removed during the drying process.</p> <p>Drying of the second load of 132,000 pounds of wet paper was accomplished between December 6 and December 13, 1973. Approximately 44,000 pounds of water was removed by the drying process.</p> <p>Drying of the third load, 184,000 pounds of wet paper, was started on December 17, 1973. Drying of this load was suspended December 21 for the holidays. Drying will be completed the first week in January.</p> <p>A fourth load of paper is in transit to Plum Brook. This load will complete the paper drying program.</p> <p>Fuel consumption for the steam boilers has been:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding-right: 20px;">November 1973</td> <td style="text-align: right;">- 9,200 gallons</td> </tr> <tr> <td>December 1973</td> <td style="text-align: right;">- <u>24,500</u> gallons</td> </tr> <tr> <td style="padding-left: 40px;">Total</td> <td style="text-align: right;">33,700 gallons</td> </tr> </table>	November 1973	- 9,200 gallons	December 1973	- <u>24,500</u> gallons	Total	33,700 gallons
November 1973	- 9,200 gallons						
December 1973	- <u>24,500</u> gallons						
Total	33,700 gallons						

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-2	<p>SPACECRAFT PROPULSION RESEARCH FACILITY (Continued)</p> <p><u>AIR FORCE PROJECT</u> RSD - R. A. DEZELICK (YGP3211)</p> <p>Exo-Peg Testing - No significant items occurred during this report period. Testing is still scheduled for March 1974.</p>
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY</p> <p><u>CENTAUR STANDARD SHROUD (CSS) TESTS</u> (YQQ4239)</p> <p><u>ENGINEERING EVALUATION TESTS</u> TCPO - R. W. HEATH; RSD - L. C. GENTILE</p> <p><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>Because of the absence of many personnel during the holiday season the regular weekly meetings with the Titan-Centaur Project Office were not held. There was also minimum activity at the site and on existing work orders.</p> <p>Tests were run to determine the affect of five feet of cable on the frequency response of a three inch deflectometer with a stroke of $\pm 1/4$ inch. With two intermediate-point restraints, frequency response and zero shift were within two percent of that of the deflectometer alone. Further testing will be done on the specific deflectometers that will be used for the "Twang" tests on the Centaur Shroud. Accelerometers are also being calibrated for use in the "Twang" tests.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK #
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

LOX FLOW TESTS F YOV6114

LOX FLOW TEST RUN SCHEDULE	Feb 1974.
<u>ITEMS COMPLETED</u> Received gaskets and cleaning materials. 2250 psig hydrostatic pressure test of tank. Fabricated anti-vortex baffle assembly. Fabricated and pressure tested mixing chamber. Awarded contract for tank insulation. Fabricated and calibrated flow measuring system.	

CHANGES: None.