

SECTION II

PLUM BROOK ROCKET SYSTEMS DIVISION

TEST OPERATIONS REPORT

FOR THE MONTH OF

JANUARY 1971

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS		
B-3	<p data-bbox="241 584 491 675">ROCKET DYNAMICS AND CONTROL FACILITY</p> <table data-bbox="423 675 1224 776"><tr><td data-bbox="423 675 861 776">CENTAUR STANDARD SHROUD TESTS (YPQ4239)</td><td data-bbox="884 675 1224 776">LVD - J. C. HUMPHREY; RSD - W. E. KLEIN</td></tr></table> <p data-bbox="642 806 1096 846"><u>CENTAUR TANK #55-7562 STATUS</u></p> <p data-bbox="415 876 1232 1139">The 7562 tank was removed from the shipping pallet and put into rings on January 13 and 14, 1971. The tank was then bubble leak checked in areas which were inaccessible while the tank was in the shipping pallet. No further leaks were found. On January 19, 1971, the tank was prepared for a pressure decay test to try to determine the overall leak rate.</p> <p data-bbox="415 1169 1232 1401">The blast shield was removed from the aft edge of the 412 ring on January 28, 1971. The aft edge of the 412 ring was then bubble leak checked. Several bubble leaks were found. This indicates that the gas is coming up under the 412 ring and finding the easiest paths out through both the forward and aft edges of the 412 ring.</p> <p data-bbox="415 1431 1232 1693">The tank is to be X-rayed the first week in February. Depending on the results of the X-ray, the tank will then be leak checked with a special vacuum shoe on the inside of the LOX tank. This fixture will be used in conjunction with a mass spectrometer to try to isolate the leak. This work should take place starting the third week in February.</p> <p data-bbox="415 1723 1232 1824">The pressure decay test is still in progress and the data are being examined. The results are inconclusive at this time.</p>	CENTAUR STANDARD SHROUD TESTS (YPQ4239)	LVD - J. C. HUMPHREY; RSD - W. E. KLEIN
CENTAUR STANDARD SHROUD TESTS (YPQ4239)	LVD - J. C. HUMPHREY; RSD - W. E. KLEIN		

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

CENTAUR STANDARD SHROUD TESTS B-3 YPQ4239

CONTRACT MODS AND FACILITY CHECK OUT COMPLETION	December 1971.
INSTALLATION AND SYSTEM CHECKOUT COMPLETION	July 1972.
CRYOGENIC TESTS SCHEDULED FOR	July thru October 1972.
STRUCTURE TEST SCHEDULED FOR.	November 1972.
Tank removed from shipping pallet.	
Bubble leak checked.	
Pressure decay test in progress.	
X-ray test scheduled for	Week of February 1, 71.
Leak check with spent vacuum shoe scheduled for . . .	Week of February 15.

CHANGES: None.

SECTION II

PLUM BROOK ROCKET SYSTEMS DIVISION

TEST OPERATIONS REPORT

FOR THE MONTH OF

FEBRUARY 1971

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
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B-3

ROCKET DYNAMICS
AND CONTROL
FACILITY

CENTAUR STANDARD
SHROUD TESTS
(YPQ4239)

LVD - J. C. HUMPHREY;
RSD - W. E. KLEIN

BACKGROUND

This is the first complete progress report for the Centaur Standard Shroud (CSS) qualification tests to be run in the B 3 Test Stand. The B-3 tests are part of a series of tests to flight qualify the CSS.

The CSS is a concept where one shroud can be used to launch a variety of payloads using a Titan-Centaur combination. The first scheduled use of the CSS will be for the Viking probe in early 1975. The shroud has two hinged petals that are 14 feet in diameter and 56 feet high. Lockheed Missiles and Space Company (LMSC) has been awarded a contract to build six shrouds. The first of these will be used for a test shroud. There is no spare test shroud in the event the first one should be damaged.

The first series of tests will consist of three cryogenic separation tests. Each shroud half will separate approximately 9 degrees before hitting the catchnets. The Centaur 7562 tank will be used inside the shroud. The hydrogen tank will be filled with liquid hydrogen and the LOX tank will be filled with liquid nitrogen. The hydrogen tank will probably be partially drained before initiating the separation.

The second series of tests will consist of a number of structural tests. The exact number, load value, and nature of the tests are still under discussion. However, these loads will be applied to the CSS and Centaur tank to simulate aerodynamic loads on the CSS, interstage adapter, stub adapter, truss adapter, and the Viking transition adapter. The CSS will be taken to 125% of flight design loads.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

CENTAUR STANDARD SHROUD TESTS B-3 YPQ4239

CONTRACT MODS AND FACILITY CHECK OUT COMPLETION . . .	December 1971.
INSTALLATION AND SYSTEM CHECK OUT COMPLETION.	July 1972.
CRYOGENIC TESTS SCHEDULED FOR	July thru October 1972.
STRUCTURE TEST SCHEDULED FOR.	November 1972.
Tank being X-rayed and checked.	
Design of test stand modifications underway.	
Design reviews are scheduled for	End of March 1971.
Concept drawings for catchnet system are scheduled to be completed	March 22, 1971.
Meeting with LMSC is scheduled for	Week of March 22, 1971.
Pre-concepts on cameras and lights are scheduled to be completed.	March 22, 1971.
Structures contract is scheduled to start.	June 1, 1971.
Equipment removal contract write-up is in progress.	

CHANGES: None.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="285 289 662 385">ROCKET DYNAMICS AND CONTROL FACILITY (Continued)</p> <p data-bbox="824 395 922 427" style="text-align: center;"><u>STATUS</u></p> <p data-bbox="483 459 1295 651">During the first week in February, X-rays were taken on the 7562 tank. These X-rays showed that approximately 375 spot welds had stress corrosion cracks. Approximately 1/3 of these were relatively bad. There were also five stress corrosion cracks which appeared in the two seam welds.</p> <p data-bbox="483 693 1295 949">During the last week of February, a structures engineer from General Dynamics/Convair was at Plum Brook to inspect the tank. Upon close internal inspection of the LOX tank, he found approximately 70 spot welds that showed signs of the stress corrosion inside the tank. Some of these had a corrosion product on the surface similar to that found on the terminal of a car battery.</p> <p data-bbox="483 991 1295 1108">Approximately 41 of the 70 were leak checked using a small vacuum shoe connected to a Veeco. Out of these, there were five probable leakers and five definite leakers.</p> <p data-bbox="483 1151 1295 1268">This information, along with the X-rays and the visual observations of the GD/C engineer, has been returned to GD/C for a decision on the status of the 7562 tank.</p> <p data-bbox="483 1310 1295 1502">The design of the test stand structure and floor modifications and the loading fixtures is being done by the LeRC-Cleveland design groups. Most of this design work is well underway, and final design reviews are scheduled for the end of March.</p> <p data-bbox="483 1544 1295 1864">The design of the catchnet system is being done by the Plum Brook Engineering Division. The intent is to use as much equipment as possible from the Skylab tests at SPF. Concept drawings and sketches are now being prepared. These are to be completed by March 22, 1971. Meetings with LMSC personnel have been scheduled at Plum Brook and at Cleveland during the week of March 22, 1971. The catching system concept drawings will be reviewed with LMSC at that time.</p> <p data-bbox="548 1906 906 1938" style="text-align: center;">(Continued on Page 37)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="280 289 607 348">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="480 353 651 385">(Continued)</p> <p data-bbox="475 421 1279 646">The design work for the high speed movie cameras and lighting is being done by the Plum Brook Engineering Division in conjunction with the Photo Lab at Cleveland. The preliminary concepts are in the process of being put on paper. Concept drawings will be available for review at the LMSC meetings.</p> <p data-bbox="475 683 1279 810">The gas and propellants system design is also being done by the Plum Brook Engineering Division. Concept design work has just started and conceptual drawings will be available for the LMSC meetings.</p> <p data-bbox="475 846 1279 1038">Work is in progress to put out a contract to remove the run tank, existing platforms, and miscellaneous valves and piping. This contract must be completed by the end of May 1971 to meet the schedule. The structures contract is scheduled to start June 1, 1971.</p> <p data-bbox="475 1074 1279 1332">There have been several delays in putting out a change order to the original Lockheed contract. This change order is needed to obtain design information on the catch system, movie cameras, and the Cleveland structural work. We have been able to get some information from Lockheed to start design concepts, but there is now a need for specific information.</p> <p data-bbox="475 1368 1279 1687">When Plum Brook management agreed to support the B-3 CSS tests in July 1970, the Hypersonic Tunnel Facility project was supposedly cancelled. Shortly after the CSS project information started coming in, the HTF project was re-activated. Consequently, the Plum Brook Mechanical Engineering Branch had to complete the HTF work before starting the B-3 work. This puts their design effort approximately one to two months behind where it should have been by this time.</p> <p data-bbox="475 1719 1279 1944">Our time schedule is fairly tight. Any further delays in getting information from Lockheed could impact the schedule and ultimately, the flight schedule. Any further delays on the design effort or the awarding of contracts could have the same effect. At this point we do not know the status of the 7562 tank or what impact it could have on the schedule.</p>

SECTION 11

PLUM BROOK ROCKET SYSTEMS DIVISION

TEST OPERATIONS REPORT

FOR THE MONTH OF

MARCH 1971

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

B-3 ROCKET DYNAMICS
AND CONTROL
FACILITYCENTAUR STANDARD
SHROUD TESTS
(YPQ4239)LVD - J. C. HUMPHREY;
RSD - W. E. KLEINSUMMARY

The work on the CSS project is progressing satisfactorily. With the exception of the leaky Centaur tank all problem areas are being resolved as they arise. Drawings for a major contract to strengthen the B-3 structure are in final review with contract award scheduled for June 1, 1971.

DISCUSSIONOPERATIONS

A decision has not been reached on what should be done with the leaky 7562 Centaur tank. It does appear at this time, however, that if the 7562 tank is to be used, it will be necessary to put it back into F site for at least one more cold shock test.

The site showing for the equipment removal contract is scheduled for April 5, 1971. This contract will remove the existing run tank and platforms from the stand. The bid opening should take place approximately April 20. The contractor will have 45 days to complete his work.

The Cleveland Facility Engineering Division design work on the test stand structure and floor modifications and on some new work platforms is now almost complete. Work is now progressing on the specifications. An Ad Hoc Committee was formed to review the proposed structural changes. The first Ad Hoc Meeting was held on March 29, 1971. The problems associated with handling shroud related equipment with the present limited travel crane dictated the need for an additional crane in B-3. Therefore, it was decided to add a 5-ton auxiliary crane under the bridge of the 65-ton crane to give the desired additional coverage. The crane installation is being added to the structural contract. This contract is scheduled to be awarded by June 1, 1971.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="276 319 633 425">ROCKET DYNAMICS AND CONTROL FACILITY (Continued)</p> <p data-bbox="454 446 1266 1074">The Plum Brook Engineering Division has continued work on the mechanical design of the shroud catchnet system and the three movable work platforms and the electrical design for the movie cameras and lighting. Some problems have been encountered in finding lamps with sufficient power and the desired filament temperature that will still be usable in an explosion-proof fixture. Equipment has been ordered to run some checkout tests to verify the proper operating characteristics of the lamps under consideration. Design work has also started on the gas and propellant feed systems. Lines are being sized and valve lists prepared. It appears that some of the equipment can be reused with only minor modifications required. Design concept drawings on all of the above systems were presented for comments at a joint NASA-Lockheed meeting during the week of March 29, 1971.</p> <p data-bbox="454 1106 706 1138"><u>INSTRUMENTATION</u></p> <p data-bbox="454 1170 1266 1244">A series of tests has been initiated to evaluate the proposed strain gage signal conditioning networks.</p> <p data-bbox="454 1266 1266 1404">Tests planned will include noise rejection, lead-wire effects, thermal compensation, stability and system compatibility. Results thus far appear highly promising.</p> <p data-bbox="454 1436 592 1468"><u>CONTROLS</u></p> <p data-bbox="454 1500 1266 1564">Purchase requests for the hydraulic loading cylinders and controllers have been submitted.</p> <p data-bbox="454 1596 1266 1659">Preliminary hydraulic flow and abort system schematics have been generated.</p> <p data-bbox="454 1691 1266 1787">Design of the bulkhead and propellant tanks protection system is 75% complete. Transducers for the vent control systems have been ordered.</p>

SECTION II

PLUM BROOK ROCKET SYSTEMS DIVISION

TEST OPERATIONS REPORT

FOR THE MONTH OF

APRIL 1971

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

B-3

ROCKET DYNAMICS
AND CONTROL
FACILITY

CENTAUR STANDARD
SHROUD TESTS
(YPQ4239)

LVD - J. C. HUMPHREY;
RSD - W. E. KLEIN

SUMMARY

The work on the CSS project is progressing reasonably well. A few tasks are slightly behind schedule (mostly due to late arrival of preliminary information to start design). However, this should not create any significant problems provided there are no further delays.

The problem of the corroded and leaking spotwelds on the 7562 Centaur tank is nearing resolution. The contractor will start removal of excess equipment from the test stand early in May. Design of the test stand structural modifications is nearing completion and has been reviewed by the Ad Hoc review committee. The catchnet system design is progressing and procurement of the structural test loading fixtures is in progress.

(Continued on Page 35)

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="477 385 647 414">(Continued)</p> <p data-bbox="797 453 959 483" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="469 517 1300 740">There still has been no decision on what to do with the 7562 Centaur tank. The latest word is that the tank will be used as it is without any further testing. If this is done, the test pressures will be lowered slightly and the portion of the structural tests which would significantly load the lower portions of the Centaur tank will be eliminated.</p> <p data-bbox="469 776 1300 902">The equipment removal contract was awarded April 23, 1971, to Mack Iron of Sandusky. The contractor has 10 days to start and 45 days to complete his work.</p> <p data-bbox="469 938 1300 1229">The Cleveland Facility Engineering Division design work on the test stand structural and floor modifications is virtually complete. The drawings have been completed and the specifications are in Procurement typing. The Ad Hoc Committee formed to review the design made some relatively minor recommendations which were incorporated into the design. The contract is still scheduled to be awarded June 1, 1971.</p> <p data-bbox="469 1266 1300 1459">The Plum Brook Engineering Division has continued work on the mechanical design of the shroud catchnet system, the three movable work platforms and on the electrical design for the movie cameras and lighting. Full time effort must be given to these three tasks if the schedule is to be met.</p> <p data-bbox="469 1495 1300 1719">Design effort on the catching system is now being coordinated with T. Porada of the Systems Analysis Office in the Launch Vehicles Division. Mr. Porada is developing an analog model of the shroud and catchnet system. This should aid the design effort considerably and give increased confidence in the final design.</p> <p data-bbox="469 1755 1300 1881">The explosion-proof lighting fixture proposed for the camera lighting has arrived. We are still waiting for the desired lamp to run some time-temperature tests.</p> <p data-bbox="583 1917 935 1947" style="text-align: center;">(Continued on Page 37)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="284 287 568 351">ROCKET DYNAMICS & CONTROL FACILITY</p> <p data-bbox="462 351 641 383">(Continued)</p> <p data-bbox="462 393 1282 563">A new camera location list and some new camera mounting concepts were submitted by Lockheed at the NASA-Lockheed meetings which ended April 2, 1971. Work is now proceeding on locating the cameras based on this new information.</p> <p data-bbox="462 585 1282 808">Design work on the gas and propellant feed systems has continued. The flow schematic and a valve list are now complete and have been given to the Plum Brook Engineering Division. They have now started preliminary design effort on the propellant feed systems and on all of the electrical control circuits.</p> <p data-bbox="462 829 706 861"><u>INSTRUMENTATION</u></p> <p data-bbox="462 883 1282 1117">Preliminary tests were completed on the proposed strain gage signal conditioning networks. These tests look very good and the results appear to give a strain gage error of less than ± 10 in./in. strain. For the majority of the strain measurements this is equivalent to less than 1% error. Further testing with another specimen is planned.</p> <p data-bbox="462 1138 1282 1330">The LH₂ level probes were pulled out of the boiler plate Centaur tank in B-1. We are planning to use the flight LH₂ probe in the 7562 tank. A shorter, more accurate probe will be used to cover the top portion of the LH₂ tank for the boil-off tests.</p> <p data-bbox="462 1351 592 1383"><u>CONTROLS</u></p> <p data-bbox="462 1404 1282 1542">A supply contract for the loading cylinder controllers has been awarded. A purchase request was initiated and the controllers should be ordered approximately the first of May.</p> <p data-bbox="462 1564 1282 1659">An RFP for the loading cylinders has been prepared. This should leave Procurement approximately the first of May.</p> <p data-bbox="462 1681 1282 1883">Design work on the vent systems and on the bulkhead and tank protection circuits has been completed. The tank pressure transducers and most of the other components in the ΔP circuits have been ordered. The specifications for the ΔP transducers are being written.</p> <p data-bbox="544 1904 901 1936">(Continued on Page 39)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p>ROCKET DYNAMICS & CONTROL FACILITY</p> <p>(Continued)</p> <p>A prototype hydraulic actuator, load cell, and simulated load has been set up and operated successfully with feedback control at the D Site controls lab.</p>
HTF	<p>HYPERSONIC TUNNEL FACILITY</p> <p>HRE (GARRETT ENGINE) P&CD - E. A. LEZBERG; (YPW3060) RSD - T. W. BRINK</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>A successful checkout of the GN₂ heater to 3000°F was completed. A requirement for heater cooldown rate of 15°F per hour can present problems in case of power failure. A study of the heater is being initiated to investigate cooldown and heat-up rates.</p> <p>Heater power level input was too high at the minimum power input for automatic control. A change to permit lower power inputs is being made.</p> <p>Mach 5 calibration run will start in early June if the flex hoses for the water system arrive in early May.</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>The GN₂ heater bake-out was completed to 3000°F. During this period, the instrumentation and controls were thoroughly tested and potential problems were resolved. It was noted that to manually maintain a slow and accurate heat-up or cooldown rate, 100% of the time and attention of the panel operator is required. A change of the low power level input could clear the problem.</p> <p style="text-align: center;">(Continued on Page 41)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

CENTAUR STANDARD SHROUD TESTS B-3 YPQ4239

<p>CONTRACT MODS AND FACILITY CHECK OUT COMPLETION</p> <p>INSTALLATION AND SYSTEM CHECK OUT COMPLETION.</p> <p>CRYOGENIC TESTS SCHEDULED FOR</p> <p>STRUCTURE TEST SCHEDULED FOR.</p>	<p>December 1971.</p> <p>July 1972.</p> <p>July thru October 1972</p> <p>November 1972.</p>
<p><u>ITEMS COMPLETED</u></p> <p>Design of structure and floor modifications.</p> <p>Explosion-proof lighting fixtures received.</p> <p>Camera locations submitted to Lockheed.</p> <p>Flow schematic and valve list (gas and feed systems)</p> <p>Strain gage signal conditioning networks tested.</p> <p>B-1 LH₂ level probe removed.</p> <p>PR initiated for loading cylinder controllers.</p> <p>Protection circuit design work (vent and bulkhead)</p> <p>Ordered tank pressure transducers.</p> <p>Prototype hydraulic actuator tested.</p>	
<p><u>ITEMS IN PROGRESS</u></p> <p>Equipment removal contract</p> <p>Design of shroud catchnet system, work platform.</p> <p>Design of cameras and lighting electrical.</p> <p>Design of gas and propellant feed systems.</p> <p>Specifications for ΔP transducers.</p>	<p>Start week of May 3,</p> <p>Complete week of June 17.</p>

CHANGES: Progress schedules added.

SECTION II

PLUM BROOK ROCKET SYSTEMS DIVISION

TEST OPERATIONS REPORT

FOR THE MONTH OF

MAY 1971

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

B-3

ROCKET DYNAMICS
AND CONTROL
FACILITY

CENTAUR STANDARD
SHROUD TESTS
(YPQ4239)

LVD - J. C. HUMPHREY;
RSD - W. E. KLEIN

SUMMARY

The problem of the corroded and leaking spotwelds on the 7562 Centaur tank has been resolved by imposing a 2/3 load restriction on the aft tank mounting ring.

The equipment removal contract is near completion and site showing for the structural contract has been held.

Design of the shroud catchnet system, propellant feed and vent systems is proceeding satisfactorily.

DISCUSSION

OPERATIONS

Launch Vehicles Division has received a memo from GD/C listing their recommendations for using the 7562 Centaur tank. We can use the tank providing we do not exceed two-thirds of the rated loads at the aft tank mounting ring (412 ring).

(Continued on Page 39)

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="316 319 673 414">ROCKET DYNAMICS AND CONTROL FACILITY (Continued)</p> <p data-bbox="511 446 1323 574">The equipment removal contract is in progress and the 46,000 gallon run tank has been removed. The contract should be completed during the first week in June.</p> <p data-bbox="511 606 1323 734">The site showing for the structural contract was held May 25, 1971. The bid opening is scheduled for June 3, 1971. The contract calls for completion by October 1, 1971.</p> <p data-bbox="511 766 1323 872">Most of the loading fixtures will be made in Paducah, Kentucky, by the AEC. This was necessary to meet the dates required by the schedule.</p> <p data-bbox="511 904 1323 1223">The Plum Brook Engineering Division has continued the effort on the mechanical design of the shroud catchnet system and the three moveable work platforms. Work has been started on the 180° model of the shroud half. This model will be used to proof test the catcher system. Work has continued on the electrical control design for the high speed movie cameras, lighting, and valves. Full time effort must be given to these tasks if the schedule is to be met.</p> <p data-bbox="511 1255 1323 1553">The explosion-proof fixture and lamp proposed for the camera lighting was tested. It was found that the glass was the hottest point of the fixture. The temperature reached 675°F in one hour and was leveling off. Since the allowable temperature per the electrical code is approximately 850°F and since plans call for operating these lights for only about 15 minutes, this fixture-lamp combination is considered satisfactory.</p> <p data-bbox="511 1585 1323 1713">Preliminary sketches of the propellant feed and vent systems are now in progress and are to be submitted the first part of June for approval. Final drawings will follow.</p> <p data-bbox="511 1744 755 1776"><u>INSTRUMENTATION</u></p> <p data-bbox="511 1808 1323 1904">The second series of strain gage evaluations has been completed. Although the data has not been completely evaluated, some salient details are</p> <p data-bbox="600 1936 950 1968">(Continued on Page 41)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="310 325 683 421">ROCKET DYNAMICS AND CONTROL FACILITY (Continued)</p> <p data-bbox="505 459 1317 651">available; the noise level realized with the chevron bridge circuitry, as read on the noise checker at "H" Building, is quite acceptable. The average peak-to-peak noise is one part in 500 on a 5 MV channel. The scatter between gages also appears to be low.</p> <p data-bbox="505 689 1317 785">The Digital Volt Meter for the 400 channel scanner has been repaired and installed, a few minor problems remain to be corrected.</p> <p data-bbox="505 823 1317 919">The analog servo-resolver circuitry necessary to display wind direction on the SEL has been developed and will be tested shortly.</p> <p data-bbox="505 955 634 983"><u>CONTROLS</u></p> <p data-bbox="505 1019 1317 1178">Delivery date for the loading cylinder controllers is June 30. Proposals in response to the RFP for the loading cylinders are due the 10th of June. A purchase request for the servo valves is now in the procurement cycle.</p> <p data-bbox="505 1215 1317 1342">A hydraulic loading system design review committee has met twice. No major exceptions to the present design were encountered. A final report is now being formulated by the committee.</p>
HTF	<p data-bbox="302 1402 464 1498">HYPERSONIC TUNNEL FACILITY</p> <p data-bbox="496 1502 818 1566"><u>HRE (GARRETT ENGINE)</u> (YPW3060)</p> <p data-bbox="948 1502 1305 1566">P&CD - E. A. LEZBERG; RSD - T. W. BRINK</p> <p data-bbox="818 1604 932 1632"><u>SUMMARY</u></p> <p data-bbox="488 1668 1305 1955">Pre-run set-up is scheduled for June 17 and calibration runs of the tunnel with Mach 5, 7 and 6 nozzles is planned from June 21 through July 16. Water system installations are proceeding right up to run time and may cause delay depending on part deliveries and piping manpower. Contractual work continues on the Hydrogen Heater System and the Gaseous Oxygen System which will be needed for the HRE Program.</p> <p data-bbox="591 1966 932 1993">(Continued on Page 43)</p>

SECTION II

PLUM BROOK ROCKET SYSTEMS DIVISION

TEST OPERATIONS REPORT

FOR THE MONTH OF

JUNE 1971

SITE B-3 SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
ROCKET DYNAMICS
AND CONTROL
FACILITY

CENTAUR STANDARD
SHROUD TESTS
(YPQ4239)

LVD - J. C. HUMPHREY;
RSD - W. E. KLEIN

SUMMARY

The equipment removal contract has been completed and the structural contract was awarded to Sandusky Fabricating and Sales, Inc. for \$99,950 and 120 days completion. This contract was negotiated for a reduction from 180 day completion to 120 day completion. This shortened completion date has returned the pressure to the Plum Brook Engineering Division for expeditious completion of the design work.

DISCUSSION

On June 2, the day before the structural contract bids were to be opened, the contract was extended from 120 day to 180 day completion time. This was done because several of the contractors receiving the IFB were stating they could not meet the 120 day completion time. This caused fears that there would be no response on the IFB or that the prices would be too high. As a result of the contract time extension, six bids were received. The contract was awarded to Sandusky Fabricating and Sales, Inc., for \$84,950. Subsequent to the award, a 120 day completion was negotiated for an increase of \$15,000. and a \$250. per day liquidated damages clause. This total contract price of \$99,950 was less than the original government estimate and also less than the next bidder. Schedules are now being revised to show the extent of the impact of the contract modification.

The Plum Brook Engineering Division has continued their design efforts. The Mechanical Engineering Branch effort was devoted to the 180 degree shroud half model and the propellant feed and vent systems. Design work is almost complete on the shroud model and some of the work is now in drafting. The design and drafting on the vacuum jacketed portion of the liquid hydrogen supply line is virtually complete. Work is continuing on the rest of the propellant feed and vent systems. The Electrical Engineering Branch has continued work on the electrical control design, the high speed movie camera, lighting, and valves.

The equipment removal contract is now complete.

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

CENTAUR STANDARD SHROUD TESTS B-3 YPQ4239

<p>HINGE SPRING RATE TEST</p> <p>CRYO-UNLATCH TESTS</p> <p>STRUCTURAL TESTS</p> <p>HINGE LOADING TESTS</p> <p><u>ITEMS COMPLETED</u></p> <p>Structural contract awarded. 50,000# load cells received. 10,000# load cells ordered. Servo valve contract awarded. Some servo controllers were shipped.</p> <p><u>ITEMS IN PROGRESS</u></p> <p>180 degree shroud half model design. Propellant feed design. Vent system design. Electrical control design. Camera, lighting and valve electrical design. Load cells being calibrated. Hydraulic loading cylinder design.</p>	<p>June 1972. Sep to Nov 15, 1972. Feb to Jun 1973. Jan 1974.</p>
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CHANGES: Schedules added.

SECTION II

PLUM BROOK ROCKET SYSTEMS DIVISION

TEST OPERATIONS REPORT

FOR THE MONTH OF

JULY 1971

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

B-3 ROCKET DYNAMICS
AND CONTROLFACILITY CENTAUR STANDARD
SHROUD TESTS
(YPQ4239)LVD - J. C. HUMPHREY;
RSD - W. E. KLEINSUMMARY

The shroud half model design is complete and has been sent to LVD for approval. Design and drafting of the shroud catcher and model hinge is nearly complete. Control circuit design is now in drafting. Camera and lighting locations have been sent to Lockheed for approval.

Shroud handling procedures and design concepts will be discussed with Lockheed the week of August 30 in Cleveland.

Failsafe manifolds, cylinders and controllers for the Hinge and Jettison tests have been ordered.

DISCUSSIONOPERATIONS

The Plum Brook Mechanical Engineering Branch completed their design effort on the shroud half model. The drawings have been sent to Launch Vehicles Division for their approval. Design and drafting is proceeding on the shroud catcher and model hinge. These drawings should be complete about August 1, 1971. The snubber system concepts are almost complete and should go to drafting about August 1, 1971. The drawing for the vacuum jacketed portion of the liquid hydrogen supply line has been approved and signed off. The drawing for the rest of the liquid hydrogen supply line is complete and check prints have been distributed for comments.

Lockheed is coming to Cleveland for a series of meetings during the week of August 30, 1971. All of the above information will be discussed with them at that time.

The Plum Brook Electrical Engineering Branch completed their design effort on 20 new valve control circuits. These circuits are now in drafting. Drawings have been marked up for minor changes to about 20 existing valve control circuits. A work order has been written to do this work in-house. The camera location drawings have been redone again and have been sent to Lockheed for approval. A drawing showing the location of the lighting was also sent. These two items have been a problem

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY <u>CENTAUR STANDARD</u> <u>SHROUD TESTS</u></p> <p><u>OPERATIONS</u> (Continued)</p> <p>area from the start and the locations must be settled now to meet the schedules. Work is progressing on the control schematics for the cameras and lights. Purchase requests have been written for most of the components for the camera and light control circuits.</p> <p>Shroud handling procedures have been written and sent to Lockheed for comment. These procedures will be discussed the week of August 30. Work is progressing on the control panel layouts and the pneumatic system flow schematic.</p> <p><u>INSTRUMENTATION</u></p> <p>The 12 additional load cells have been ordered. This completes the known requirements.</p> <p>Since the shroud is scheduled to be listed at SPF following the B-3 tests, several coordination meetings with SPF personnel have been held to insure the mutual use of all instrumentation. Further coordination requires sufficient information from Cleveland to resolve common measurements.</p> <p>The second set of strain gage accuracy tests have not yet been made due to technician shortage. It is expected that these tests will be completed the first week in August.</p> <p><u>CONTROLS</u></p> <p>Wiring of the bulkhead delta-P error monitor is 10% complete.</p> <p>The controllers and servo valves required for the main loading tests have been received. The PR and specifications for the failsafe manifolds, cylinders, and controllers required for the Hinge and Jettison tests have been written. The load simulator for the proof test has been ordered. Work has started on wiring prints and cable requirements for the main load tests. A work order to the shop for repair and checkout of the necessary servo valves for the Hinge tests is also in progress.</p>

SECTION II
 PLUM BROOK ROCKET SYSTEMS DIVISION
 TEST OPERATIONS REPORT
 FOR THE MONTH OF
 AUGUST 1971

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY <u>CENTAUR STANDARD</u> <u>SHROUD TESTS</u> (YPQ4239)</p> <p style="text-align: right;">LVD - J. C. HUMPHREY; RSD - W. E. KLEIN</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>Design effort is on schedule in all phases except the movable platforms, cameras and shroud pyrotechnics. The structural steel contractor is on schedule. The technique for welding of thermocouples to samples of the aluminum shroud has not been successful at this time. Lockheed is reviewing their techniques for necessary changes.</p> <p>Control actuators and controllers for the structural test are ready for inspection. Electrical prints for</p> <p style="text-align: center;">(Continued on Page 33)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="272 304 646 400">ROCKET DYNAMICS AND CONTROL FACILITY (Continued)</p> <p data-bbox="467 434 1268 529">this installation are nearly complete. Purchase requests for the hinge test actuators and the 1/2 model loading actuator are in procurement.</p> <p data-bbox="792 566 959 597" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="467 632 630 663" style="text-align: center;"><u>OPERATIONS</u></p> <p data-bbox="467 697 1393 857">A series of meetings with LeRC and Lockheed personnel started August 31 and will end September 2. No major changes resulted from the August 31 meeting on the catchnet mechanism being designed by Plum Brook Engineering Division.</p> <p data-bbox="467 891 1328 1115">Plum Brook Engineering Division is on schedule in all phases except the design effort on the movable work platforms. Information is still needed from Launch Vehicles Division on cameras and shroud pyrotechnics to finalize those phases of the design effort. This information must be forthcoming soon to remain on schedule.</p> <p data-bbox="467 1149 1279 1283">Rocket Systems Division has to order the loading cables in September to remain on schedule. The design review of the gas and liquid flow schematic must be completed in September.</p> <p data-bbox="467 1317 1360 1476">The structural steel contractor has been in the test stand since early August. His work is progressing satisfactorily, both in speed and in quality. Barring any major problem, this contract should be completed on or ahead of schedule.</p> <p data-bbox="467 1510 711 1542" style="text-align: center;"><u>INSTRUMENTATION</u></p> <p data-bbox="467 1576 1385 1710">The second strain gage accuracy tests were delayed to the first week in September due to B-2 manpower priority. Construction of stain gage balance panels will begin after analysis of the test data.</p> <p data-bbox="467 1740 1401 1859">Spot welding of the thermocouples to samples of the aluminum shroud by Lockheed at Plum Brook was unsuccessful. Lockheed is to review their techniques and supply detailed information.</p> <p data-bbox="591 1893 943 1925" style="text-align: center;">(Continued on Page 35)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY (Continued)</p> <p><u>CONTROLS</u></p> <p>The purchase requests for the hinge test hydraulic loading actuators, 1/2 model jettison hydraulic loading actuator, and failsafe manifolds are all currently in the procurement cycle. The seven hydraulic loading actuators for the structural test are scheduled for inspection at the contractor plant the week of September 22. Servo valves for the hinge tests are currently being checked at the valve shop. The controllers for the structural test are being inspected at the standards lab. Prints for the controls patchboard and controller interconnections are complete and work has been started. Electrical prints for the installation of the controllers and hydraulic loading actuators are 95% completed. Equipment required for the hydraulics proof test has been received. The purchase request for cables, turnbuckles and associated hardware is waiting final dimensions for cable lengths. These dimensions are due from Lewis-Cleveland in one week.</p>
HTF	<p>HYPERSONIC TUNNEL FACILITY HRE (GARRETT ENGINE) P&CD - E. A. LEZBERG; (YOW4891) RSD - T. W. BRINK</p> <p><u>SUMMARY</u></p> <p>The Garrett Engine has arrived at Plum Brook and various checks are being made on it by the Garrett technician.</p> <p>Several modifications and rebuilding of components in the mechanical, instrumentation, and control systems have been accomplished in preparation for the oxygen runs in the latter part of September. Most of these changes were necessary after the calibration test results were completed.</p> <p>Contractors continue on engine fuel and water piping and the Schlieren System with little or no slippage apparent at this time.</p> <p>(Continued on Page 37)</p>

SECTION II
PLUM BROOK ROCKET SYSTEMS DIVISION
TEST OPERATIONS REPORT
FOR THE MONTH OF
SEPTEMBER 1971

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY <u>CENTAUR STANDARD</u> LVD - J. C. HUMPHREY; <u>SHROUD TESTS</u> RSD - W. E. KLEIN (YPQ4239)</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>Conceptual design of the CSS Catcher System is being changed. Lockheed's final shroud design dictates lower catcher requirements. When the new concepts are finalized, a new time schedule will be determined.</p> <p>Several items are slipping behind schedule. All efforts are being taken to boost the manpower required to do the tasks.</p> <p style="text-align: center;">(Continued on Page 37)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="295 327 665 425">ROCKET DYNAMICS AND CONTROL FACILITY (Continued)</p> <p data-bbox="812 457 974 489" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="487 521 657 553" style="text-align: center;"><u>OPERATIONS</u></p> <p data-bbox="487 585 1372 1074">Major changes are being considered in the CSS catcher system designed by the Plum Brook Engineering Division. Design of the catcher system started before a design was finalized by Lockheed for the shroud. Therefore, the catcher requirements have been changed as the final design of the shroud evolved. Plum Brook now finds itself in the position of having a catcher system designed that is not totally compatible with the Lockheed designed shroud. Some parts of the system will have to be redesigned to keep the loads put into the shroud by the catcher system at a lower than anticipated level. When the new concepts are finalized and approved, a new time schedule will be determined. By the end of the first week in October, the overall impact on the schedule should be known.</p> <p data-bbox="487 1106 1356 1298">Launch Vehicles Division still owes Plum Brook information on the camera locations between the shroud and Centaur tank and those on top of the tank. No design effort is being put into this area. This information is long past due and will now start impacting the schedule.</p> <p data-bbox="487 1330 1339 1521">A number of PR's and contracts are now in various phases of the procurement cycle. These include such items as work platforms and miscellaneous steel work, loading cables and miscellaneous hardware, piping installation, shroud model, and electrical components for valve and camera controls and camera lights.</p> <p data-bbox="487 1553 1388 1755">The structural steel contractor is progressing quite satisfactorily. It appears at this time that he will also receive a change to his contract to fabricate and install some additional miscellaneous items. Included will be the additional building structural steel changes needed to perform the hinge and vent fin tests.</p> <p data-bbox="487 1787 1291 1883">Rocket Systems Division is behind schedule on the propellant and purge gas flow schematic and on the control panel layouts.</p> <p data-bbox="592 1947 941 1979" style="text-align: center;">(Continued on Page 39)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS	
B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY (Continued)</p> <p><u>INSTRUMENTATION</u></p> <p>The straingage accuracy tests were completed. Purchase orders have been placed for power supplies, load cells, and special pressure transducers needed for the hydraulic proof tests.</p> <p><u>CONTROLS</u></p> <p>Electrical prints for the controllers and associated load control system have been finished and work has started on these items in B-Control. Sketches for the Failsafe System have been sent to engineering and some material has been placed on order. Most of the items required for the hydraulic proof test have been purchased or are in Outside Fabrication. Cables, turnbuckles, and wire are also in the procurement cycle.</p> <p>Design work has started on the remaining cable and hardware required by the radial proof tests.</p>	
HTF	<p>HYPERSONIC TUNNEL FACILITY</p> <p><u>HRE (GARRETT ENGINE)</u> P&CD - E. A. LEZBERG; (YOW4891) RSD - T. W. BRINK</p> <p><u>SUMMARY</u></p> <p>Final set-up, corrections, and modifications, for the GO₂ calibration were underway during the first two weeks in September. On September 13 the pre-run heat up of the GN₂ heater was started. Excessive heat was noted on the upper heater shell and cooldown was initiated with GN₂. Disassembly revealed minor damage near the top of the GN₂ heater. Repair parts and design improvements are being machined by contract. Reassembly, vacuum pumpdown, heat up and pre-run check out will be accomplished by the last week in October.</p> <p>A gaseous oxygen run is scheduled for the week of November 2 with a possible Mach 7 rerun scheduled for the week of November 8.</p> <p>(Continued on Page 41)</p>	

SECTION II
 PLUM BROOK ROCKET SYSTEMS DIVISION
 TEST OPERATIONS REPORT
 FOR THE MONTH OF
 OCTOBER 1971

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-2	<p data-bbox="289 708 456 836">SPACECRAFT PROPULSION RESEARCH FACILITY</p> <p data-bbox="483 810 751 874"><u>ADVANCED CENTAUR</u> (YPQ4240)</p> <p data-bbox="1003 810 1300 874">LVD - S. V. SZABO; RSD - J. E. SHOLES</p> <p data-bbox="743 900 1024 932" style="text-align: center;"><u>D-1T TEST VEHICLE</u></p> <p data-bbox="808 949 927 981" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="483 1006 1349 1102">Fifteen 2nd burn engine start test autosequences were performed during the week of October 4. Thirteen of these tests produced valid engine start data.</p> <p data-bbox="483 1129 1365 1225">Four 3rd burn engine start test autosequences were made during the week of October 25. All were successful and included a 105 second "POGO" run.</p> <p data-bbox="483 1251 1333 1347">Additional 3rd burn testing and "POGO" test runs are scheduled for the week of November 1. This series will complete Phase I of the D-1T test program.</p> <p data-bbox="483 1372 1393 1725">Very considerable effort was expended to accommodate the request for "POGO" data. Special pressure transducers were ordered, manufactured, airshipped, evaluated, etc., within about one week. It was then discovered that Cleveland has standardized on IRIG format and abandoned its capability to handle FM data recorded in the Ampex format which has been standard at Plum Brook. Further, the requirements were suddenly expanded so that a third FM System was necessary. A machine of questionable quality was obtained from CURE, repaired, and temporarily installed.</p> <p data-bbox="483 1751 1344 1910">Although every effort was expended to accommodate the requests, work conditions bordered on the impossible. We hope that satisfactory data were obtained but the usual Rocket Systems Division stamp of quality just cannot be offered for this case.</p>

B-3

ROCKET DYNAMICS
AND CONTROL
FACILITY

CENTAUR STANDARD
SHROUD TESTS
(YPQ4239)

LVD - J. C. HUMPHREY;
RSD - W. E. KLEIN

SUMMARY

The structural steel contract is complete. An installation contract for the loading fixtures, cylinders, etc. is being prepared. This contract may be the pacing item for the hydraulic proof test.

The new concept for the catching system is complete and final design has started. This design change may cause a two to four week delay in the schedule.

Both pyro-system designs have been started but information on the locations of the movie cameras inside the shroud is still needed from Launch Vehicles Division.

DISCUSSION

OPERATIONS

The structural steel contract has now been completed. Mechanics and electricians are now working in the test stand. The Mechanics are oiling the aft ring on the Centaur tank to inhibit further corrosion in the spot welds. Work has started on the hydraulic lines for the hydraulic proof test scheduled for December. Some of the equipment needed for the proof test is now arriving, but some is not scheduled for delivery until the first part of December. Late delivery of some of these items could delay the start of the hydraulic proof test.

The electricians are installing conduits and connecting wires that were removed for the structural steel contract. The old control panel and graphic panel in "B" control have been removed.

The installation of the loading fixtures, cylinders, etc. for the hydraulic proof test will be contracted and a purchase request is now being processed and

(Continued on Page 37)

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="256 314 503 408">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="438 412 613 442">(Continued)</p> <p data-bbox="435 480 1269 668">specifications and assembly drawings are being completed. This contract could well become the pacing item for the proof test since we need approximately two weeks after the fixtures are stacked to install instrumentation and control wiring and to run check out tests.</p> <p data-bbox="431 706 1315 932">A list of jobs and the manhours needed to complete each job has been completed for the mechanics. There is a total of approximately 1800 manhours work remaining between now and the first of January. This list will now be transferred to a calendar schedule, based on equipment deliveries to determine weekly manhour requirements.</p> <p data-bbox="431 970 1315 1195">The new concepts for the catching system are virtually complete and the final design effort has begun. The new design has no movable framework and the shroud will see significantly lower stress levels. The exact impact of the design change on the schedule is still not known, but may cause a two to four week delay in the schedule.</p> <p data-bbox="431 1234 1308 1459">The design effort and specifications are nearly complete for the piping contract. This contract should be ready to go out for bid in about two weeks. Plum Brook personnel will install the purge tubing for the tank and shroud. The gas and propellant control panel and the test stand wiring for the cryogenic systems have been included in this contract.</p> <p data-bbox="431 1498 1295 1719">Launch Vehicles Division still owes Plum Brook information on the locations of the movie cameras inside the shroud. Additional information was received on the pyrotechnic systems at the end of this month. Plum Brook now has sufficient information to design the electrical controls and safety interlocks for both pyro systems.</p> <p data-bbox="496 1817 850 1847">(Continued on Page 39)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="282 306 526 400">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="464 406 639 434">(Continued)</p> <p data-bbox="464 472 708 500"><u>INSTRUMENTATION</u></p> <p data-bbox="459 538 1308 666">Strain gage installation for the hydraulic proof testing has started. The strain gage power supplies and the load cells have been received. The load cells are presently being calibrated.</p> <p data-bbox="459 704 591 732"><u>CONTROLS</u></p> <p data-bbox="456 770 1370 1023">Approximately 50% of the control room wiring for the load control loops has been completed. The Δ P monitor is completed except for check out. The Engineering Division is still working on the failsafe circuits. Most of the mechanical and electrical hardware required has already been received. Two of the seven hydraulic loading cylinders have been acceptance checked with good results.</p> <p data-bbox="456 1061 1240 1123">The following is the status of purchase requests currently in the procurement cycle:</p> <ol data-bbox="459 1157 1208 1549" style="list-style-type: none"> <li data-bbox="459 1157 1208 1219">(1) Hinge, vent fin, and jettison cylinders - Bid opening - 11-2-71. <li data-bbox="459 1253 1078 1281">(2) Axial cables - Delivery 11-18-71. <li data-bbox="459 1315 1143 1376">(3) Adaptors, rods and proof test parts - Bid opening - 10-29-71. <li data-bbox="459 1410 1175 1472">(4) Additional turnbuckles, etc. - Delivery 11-18-71. <li data-bbox="459 1506 1289 1534">(5) Lateral proof test cables - Delivery 12-15-71. <p data-bbox="456 1581 1354 1674">Hydraulic panels, cylinder and tubing installation are currently being laid out by operations. The valve shop has started locating parts.</p>

SECTION II
 PLUM BROOK ROCKET SYSTEMS DIVISION
 TEST OPERATIONS REPORT
 FOR THE MONTH OF
 NOVEMBER 1971

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
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B-3	<p>ROCKET DYNAMICS AND CONTROL FACILITY</p> <p style="margin-left: 40px;"><u>CENTAUR STANDARD</u> <u>SHROUD TESTS</u> (YPQ4239)</p> <p style="margin-left: 40px;">LVD - J. C. HUMPHREY; RSD - W. E. KLEIN</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>The stack-up contract for the hydraulic proof test will be awarded December 3. Work will start December 8 with a completion of 21 days required. Starting date for the hydraulic proof test is January 10 and is still valid at this time.</p> <p>Site showing for the piping and electrical contract is December 15 with the bid opening scheduled for December 29. This contract must be completed by April 1 so the system validation tests can be started July 1.</p> <p>Any further changes and/or additions to the requirements or test plan will probably impact the starting date for the cryogenic separation test program which is scheduled for August 15.</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>The contract for the "stack-up" of the equipment for the hydraulic proof test should be awarded about December 1, 1971 and the contractor is scheduled to start work the week of December 6, 1971. The last items needed for this contract are due December 17. The contractor has a required completion time of three weeks.</p> <p style="text-align: center;">(Continued on Page 35)</p>
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SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="310 314 558 406">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="493 412 669 442">(Continued)</p> <p data-bbox="488 478 1382 604">The B-3 mechanics are installing accumulator panels, hydraulic lines, etc. for the hydraulic proof test. They have also checked out a Stokes vacuum pump for installation in the stand by the "stack-up" contractor.</p> <p data-bbox="488 640 1430 836">The B-3 electricians have virtually completed reinstalling all of the conduit and wires that had to be removed for the structural steel contract. They are also working on various other jobs needed for the hydraulic proof test. The hydraulic proof tests are expected to start during the week of January 10, 1972.</p> <p data-bbox="488 872 1365 1127">The IFB for the mechanical piping and electrical contract has been mailed. The site showing is scheduled for December 15 and the bid opening will be December 29. The contract has to be completed by April 1, 1972 to be on schedule. We have requested the contractor to start the upper level work first. This will allow us to start stacking flight hardware after he is complete down to level four.</p> <p data-bbox="488 1164 1365 1453">The design effort on the new light weight catcher systems has been nearly completed and parts are going out for fabrication. An analog computer run was made by Cleveland the last week in November. This information gave expected net forces more than double those which we had previously received. The exact impact on the schedule is still not known, but is expected to add one week on the completion of the catcher system proof tests.</p> <p data-bbox="488 1489 1344 1744">The present schedule shows the preparations for the catcher system proof test starting about February 22, 1972. About the last week in November we were requested to simulate the shroud springs in the model actuator system. This was a change in concept and required the addition of a load cell in the actuator assembly. We presently feel this can be done without impacting the overall schedule.</p> <p data-bbox="488 1781 1360 1906">The above problems are typical of several we have had with this and other systems. Design information we request from Cleveland is almost always later than the original request date and usually received at the last</p> <p data-bbox="586 1927 954 1957">(Continued on Page 37)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="310 306 553 400">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="493 406 667 436">(Continued)</p> <p data-bbox="493 474 1333 634">possible date to meet schedule. There have been several instances where the final information is significantly different than preliminary information received at an earlier date. The catcher system has probably been the worst example of this.</p> <p data-bbox="493 668 1382 895">In addition, the program objectives and effort required have multiplied over the original estimates based on information received more than a year ago. All of the above changes have been absorbed without changing the end date. The schedule is now so tight that no further schedule perturbations can be tolerated without changing the end date.</p> <p data-bbox="493 932 732 961"><u>INSTRUMENTATION</u></p> <p data-bbox="493 995 1393 1283">The strain gage installation on the loading cylinders is complete. Connector locations on the Titan skirt have been established, and the strain gage installations are progressing. The scanner has been repaired and is now working. The SEL has been repaired and will be qualified the first week in December. All components required to support the hydraulic proof test are on hand. Heavy Facilities Service Division support is scheduled for the last two weeks in December.</p> <p data-bbox="493 1319 618 1349"><u>CONTROLS</u></p> <p data-bbox="493 1383 1409 1670">The hydraulic loading actuators have been checked out and are ready for shipment to B-3. Electrical is installing the failsafe circuits and servo valve wiring. The hinge, vent fin and jettison cylinders have been ordered. The lateral proof test cables are due December 15, 1971. Work has started designing valve actuators and tack protection systems for the Centaur tank. Preliminary design work has begun on the model jettison "spring" simulation and camera speed feedback circuits.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

CENTAUR STANDARD SHROUD TESTS B-3 YPQ4239

<p>HINGE SPRING RATE TEST</p> <p>CRYO-UNLATCH TESTS</p> <p>STRUCTURAL TESTS</p> <p>HINGE UNLOADING TESTS</p> <p><u>ITEMS COMPLETED</u></p> <p>Stokes vacuum pump checked out.</p> <p>Reinstalled conduit and wiring (removed for contractor)</p> <p>Mechanical piping and electrical contracts out for bid</p> <p>Strain gages installed on loading cylinders.</p> <p>The scanner and SEL have been repaired.</p> <p>All of the instrumentation components for the hydrogen proof test are on hand.</p> <p>Hinge, vent fin and jettison cylinders were ordered.</p> <p><u>ITEMS IN PROGRESS</u></p> <p>Accumulator panels, pipe lines, etc. for hydraulic proof test being installed</p> <p>Design for catcher system nearly completed.</p> <p>Failsafe circuits and servo rake wiring being instld.</p> <p>Designing valve actuators & Centaur track protectors.</p> <p>PRE design started on model jettison "spring" and camera feedback circuits.</p>	<p>June 1 - 15, 1972.</p> <p>Aug 15 - Nov 15, 1972.</p> <p>Feb - June, 1973.</p> <p>Jan 1974.</p> <p>Bid opening - 12-29-71</p> <p>Jan 10, 1972</p>
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CHANGES: Schedules changed.

SECTION II
PLUM BROOK ROCKET SYSTEMS DIVISION
TEST OPERATIONS REPORT
FOR THE MONTH OF
DECEMBER 1971

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
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B-3	ROCKET DYNAMICS AND CONTROL FACILITY
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CENTAUR STANDARD
SHROUD TESTS
(YPQ4239)

LVD - J. C. HUMPHREY;
RSD - W. E. KLEIN

SUMMARY

Preparations for the hydraulic proof test are progressing satisfactorily and the scheduled test dates between January 10 and 21, 1972 will be met. The 1/2 shroud model catch system test is scheduled for February 21, 1972 and all necessary equipment is on order.

(Continued on Page 33)

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
B-3	<p data-bbox="282 327 526 425">ROCKET DYNAMICS AND CONTROL FACILITY</p> <p data-bbox="448 427 621 459">(Continued)</p> <p data-bbox="803 470 964 502" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="444 534 607 566" style="text-align: center;"><u>OPERATIONS</u></p> <p data-bbox="444 597 1305 859">Installation is on schedule and the hydraulic proof test will be run between January 10 and 21, 1972. The stack-up contract is completed. Only a few minor problems in fitting up and checking out all of the hydraulic proof test equipment have been encountered. It now appears we should be finished taking data by January 21, 1972. Tear down of the equipment will start following the last test.</p> <p data-bbox="444 895 1289 1023">All equipment for the 1/2 shroud model catch system test is now on order. All scheduled deliveries support the existing schedule. We should be ready to start testing by February 21, 1972.</p> <p data-bbox="444 1059 1338 1315">The bids for the piping contract were opened on December 29, 1971. Five bids were received. Four of these were at, or below, the Government estimate. The bids will be reviewed by the Legal Office at Cleveland before the contract is awarded. The contractor has 90 days to complete the contract and this will place the completion around April 1, 1972, thereby maintaining our schedule.</p> <p data-bbox="444 1351 688 1383" style="text-align: center;"><u>INSTRUMENTATION</u></p> <p data-bbox="444 1415 1305 1513">The instrumentation for the hydraulic proof test is 90% complete. No problems are expected in supporting this test during the week of January 10, 1972.</p> <p data-bbox="444 1549 1256 1647">The instrumentation requirements for the 1/2 model shroud catch system tests that are to follow the hydraulic proof tests have not been finalized yet.</p> <p data-bbox="444 1683 1289 1838">The instrumentation for the structural tests has started. The deflectometers are on order. The orders for all components should be complete by the next report period. The assembly of the signal conditioning boxes has started.</p> <p data-bbox="526 1902 867 1934" style="text-align: center;">(Continued on Page 35)</p>

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

B-3

CONTROLS

All hardware for the B-2 hydraulic proof test has been installed. The HTF sequence and abort program is being modified for B-3. The CF-16A has been installed and the CF-16A -910 computer interface has been checked out. The hydraulic system at B-3 has been cleaned and checked out. All run information, relay assignments, and programmer data has been finalized and data cards are being prepared. The model Jettison Cylinder has been received and will be checked out at "D" Site. The disc brake test is currently being designed by engineering. These tests will be conducted at "D" Site. Actuators and equipment for the Centaur tank pressurization are in Procurement. Check lists, recording flow sheets, and other proof test run requirements are approximately 70% complete.

HTF

HYPERSONIC TUNNEL FACILITY

HRE (GARRETT ENGINE)
(YOW4891)

P&CD - E. A. LEZBERG;
RSD - T. W. BRINK

SUMMARY

On December 2, a successful Mach 7 calibration run was made with nitrogen. Because of failure of the "O" ring seal between the mixer and nozzle adapter, no Mach 7 run was made with oxygen diluent.

The tunnel has been given over to the hydrogen and water piping contractor for completion by March 15, 1972. The Garrett Engine installation and calibration will follow with the engine test target date set for the first week in August.

DISCUSSION

OPERATIONS

A successful Mach 7 calibration run with nitrogen was made on December 2. This all-nitrogen test resulted (for the second time) in a burned "O" ring

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