

May 1964

SITE	LABORATORY	RESEARCH INSTALLATIONS (FOR)	DESCRIPTION
CPTL	CRYOGENIC PROPELLANT TANK LAB	<u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A. Johnsen)	<p>Cryogenic propellant pressurization and dynamics testing.</p> <p>Vacuum chamber fabrication, erection, and installation is now complete. Currently, the contractor is engaged in acceptance testing of the vacuum chamber as defined by the specifications.</p> <p>A temporary storage area for Government-furnished equipment has been prepared. Purpose of the area is to control and facilitate handling of Government-furnished equipment prior to installation by the various contractors.</p> <p>Status of the remaining construction is as follows:</p> <ol style="list-style-type: none"> (1) The Balfour roll-up door for equipment access into the building is now being fabricated. Delivery is expected by June 1. (2) An engineering drafting service contract was awarded to expedite completion of electrical contract drawings for process control and data instrumentation. In support of this endeavor, an approved control panel layout was submitted. (3) The general contract was revised because of excessively high bids received on the initial advertisement. Rebids are due May 7. (4) Process piping and steam generating and distribution contracts are currently being advertised. Bids for these contracts are due on May 5. (5) A contract for reactivation of the Ransom Road sewage lift station, which serviced the Cryogenic Propellant Tank Laboratory, has been prepared and approved. This contract will be advertised by May 8. <p>Facility checkouts are scheduled to start by mid-January 1965.</p>

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CPTL	CRYOGENIC PROPELLANT TANK	<p>(9) LH₂ Fill and Drain Valve - A fabrication and installation contract was awarded to Cryovac. Four months are required to complete this contract.</p> <p>(10) Hydraulic Actuator Installation - This contract is now being advertized with award scheduled for August 19. Unfortunately, this contract was written with a 60-day completion clause, but with an optional 90-day completion. If the successful bidder takes the extra 30-days, then final completion of the facility may be delayed beyond the March 1, 1965 schedule. In order to insure completion of this contract within the 60 days, additional funds will be required.</p>	

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CPTL	CRYOGENIC PROPELLANT TANK LAB	<p>4. An A.O.C. to clean bottles for gas storage is expected to be completed by October 13. Allowing ninety days delivery, a week in transit, and seven weeks total for mounting in racks, plus field installation, the bottle farms will not be operational until March 12, 1965. Work is currently in progress on piers and footings, which are scheduled to be completed by October 7.</p> <p>The remaining work appears on schedule as follows:</p> <p>5. General Contract: This contract is 50% complete. Structural work in Building #905 is 100% complete; block walls in Building #901 are 100% complete; plumbing, heating, and electrical in 901 and 905 are 43% complete; paving is 95% complete, and the 16" air duct has been installed.</p> <p>6. Five-foot Test Tank: Specifications and design modifications will be complete by approximately October 5. Assuming a normal procurement cycle, it is estimated that the tank will not be completed before April 1, 1965. However, an estimated two week delay in the fabrication of the LH₂ vacuum-jacketed line will be required because of necessary repairs to a Government-furnished Annin valve.</p> <p>7. Process Piping: Progress at the site is on schedule. Status of sub-systems is as follows:</p> <table data-bbox="611 1267 1205 1512"> <thead> <tr> <th></th> <th style="text-align: right;"><u>% Complete</u></th> </tr> </thead> <tbody> <tr> <td>Vacuum</td> <td style="text-align: right;">85%</td> </tr> <tr> <td>Gaseous Systems</td> <td style="text-align: right;">80%</td> </tr> <tr> <td>30" Vent Stack</td> <td style="text-align: right;">100%</td> </tr> <tr> <td>LN₂ Piping</td> <td style="text-align: right;">90%</td> </tr> <tr> <td>H₂ Burnoff</td> <td style="text-align: right;">90%</td> </tr> <tr> <td>Steam and Hydraulics</td> <td style="text-align: right;">90%</td> </tr> </tbody> </table> <p>8. Pedestal, Seal and Actuator: Fabrication is now on contract with delivery due November 27.</p> <p>9. Electrical Safety System: Drawings and specifications are now being processed through Procurement.</p> <p>10. Railroad: A purchase request for design and specifications was started through the procurement cycle. A completion date of April 1 was requested.</p>		<u>% Complete</u>	Vacuum	85%	Gaseous Systems	80%	30" Vent Stack	100%	LN ₂ Piping	90%	H ₂ Burnoff	90%	Steam and Hydraulics	90%	
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CPTL	CRYOGENIC PROPELLANT TANK LAB		<ol style="list-style-type: none"><li data-bbox="535 343 1488 509">7. Designs and specifications were completed for the electrical safety contract, but the Purchase Request has not been approved. This is a critical path item, and a contract award should have been made October 9 to satisfy the construction PERT chart.<li data-bbox="535 542 1394 609">8. The railroad contract is out for bid and should be awarded in early December.<li data-bbox="535 642 1488 770">9. Designs and specifications for the five-foot test tank modifications were completed and are now in procurement. The tank cradle and shaker connection mechanism contract status is similar.

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K	CRYOGENIC PROPELLANT TANK LAB	<u>CRYOGENIC PROPELLANT TANK</u> OR0137(I.A. Johnsen)	<p>Cryogenic propellant pressurization and dynamics testing.</p> <p>The present estimated facility completion date is July 2, 1965. This is twelve weeks beyond the scheduled completion date of April 9. The \$75,000 safety system, a critical path item, is twelve weeks behind schedule. Invitations for Bids for this work are scheduled to be opened December 31. The Invitation requests a 120 to 150-day contract completion time. If awarded for a 120-day completion, the facility completion date still would be eight weeks behind schedule. The safety system delay and the required changes caused the twelve-week delay.</p> <p>Status of other work appears as follows:</p> <ol style="list-style-type: none"> (1) The \$193,000 instrumentation and control electrical contract is four weeks behind schedule and efforts are being made to bring it back on schedule. (2) The gas storage bottle cleaning contract for various Plum Brook gas storage areas was awarded November 20. The first 144 bottles should be assigned to "K" Site to keep this item on schedule. (3) Installation of the 30 KC digitizer system: The instrument cable bid opening date had to be extended several times because of no response, due to the short requested delivery time. The bid opening is scheduled for December 18. The Invitation for Bids for the cable installation has been held up until after the cable bid opening. (4) The heating plant is 98% complete. The boilers were fired for the first time on November 30. (5) The actuator vacuum seal failed in its initial operation tests, apparently due to a seizing between the seals and the actuator. The seal is currently under investigation by the responsible design group. (6) The process piping contract is 80% complete, with the vacuum-jacketed liquid hydrogen line nearly ready for delivery. All three Government-furnished Annin valves for the liquid hydrogen system were found to be defective. <p style="text-align: right;">(Continued on Page 30)</p>

SITE	LABORATORY	RESEARCH INSTALLATIONS (FOR)	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK LAB	(Continued)	<p>(7) The general construction contract is 90% complete. Remaining work is largely of an electrical nature.</p> <p>(8) Bids for the railroad contract were opened November 24. The only bid received was greater than the Government estimate. The bid is being evaluated at the present time.</p>

December 1964

SITE	LABORATORY	RESEARCH INSTALLATIONS (FOR)	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK LAB	<p data-bbox="546 389 859 486"><u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A.Johnsen)</p> <p data-bbox="546 520 1371 580">Status of construction on the various contracts is as follows:</p> <ol data-bbox="546 617 1486 1875" style="list-style-type: none"> <li data-bbox="546 617 1420 679">(1) The R. G. Beer general construction contract is 99% complete. <li data-bbox="546 712 1478 1011">(2) The instrument and control wiring contract is now estimated to be five weeks behind schedule. Valley Electric, the contractor, had assured the Government that their work force could be increased to fourteen men by December 21 in an attempt to put this contract back on schedule--to date this agreement has not been complied with, but our construction office states that the contractor has agreed to work extra time, if necessary, to meet the contract completion date of March 1. <li data-bbox="546 1036 1478 1232">(3) Bids for the electrical safety work were opened Dec. 31. The low bidder was Valley Electric with a bid of \$78,600 and 150-day completion (June 17). This contractor is presently working at the site on the instrument and control contract (Item 2), which is five weeks behind schedule. <p data-bbox="617 1265 1470 1394">The design still has to be completed for a third electrical job which includes the installation of T.V., vacuum chamber gas analyzer and research data wiring for the inside of the vacuum chamber.</p> <p data-bbox="617 1427 1453 1522">Since both of these electrical jobs are critical path items, the facility completion date will be determined by their completion.</p> <ol data-bbox="546 1556 1453 1875" style="list-style-type: none"> <li data-bbox="546 1556 1453 1715">(4) The Elsberry process piping contract is 90% complete. the vacuum-jacketed liquid hydrogen line was delivered and the installation will start the first week of January. Remaining work is primarily cleaning and testing. <li data-bbox="546 1748 1453 1875">(5) The railroad contract is currently in legal review. An amended SJO and purchase request were approved for the higher-than-expected bid. This contract should be awarded early in January. 	

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SITE	LABORATORY	RESEARCH INSTALLATIONS (FOR)	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK LAB	(Continued)	<p>(6) The heating plant is in operation, although a few minor modifications are necessary.</p> <p>(7) Hydraulic actuator seal and pedestal: The seizing failure reported from last month's test was apparently caused by an oversized shaft. The seal was changed to reduce interference, and testing is again underway. An alternate seal design is also under consideration.</p> <p>(8) Miscellaneous:</p> <p>(a) Delivery of the 30 KC digital system to Plum Brook was rescheduled to January 4, 1965.</p> <p>(b) Bids for modification of the five-foot NOMAD test tanks were excessively high. Therefore, alternate "8-Ball" tanks were substituted. Bids for this work will be opened January 7, 1965, and it is expected that the job can be completed in sixty days.</p> <p>(c) The thirteen-foot test tank which is being fabricated by Lockheed is approximately 40% complete.</p> <p>(d) The vacuum system's 36" Edwards angle valves were removed to be nickel-plated. This was necessary because of extensive oxidation.</p>
<p>NOTE: A meeting was held on December 16 with responsible groups from Lewis and Plum Brook. The estimated first run date was slipped from April 15 to July 2, which was the estimated completion date given in last month's report.</p>			

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<p>The present estimated facility completion date is August 20. This is three weeks beyond the scheduled completion date of July 30. Completion of "K" site construction continues to depend upon the completion of the critical path electrical contracts. The electrical safety contract was awarded January 15 to Valley Electric. It is estimated that the notice to proceed will be given by February 2, thereby making July 2 the contract completion date. The bids for this job were opened on December 31, 1964.</p>			
<p>Valley Electric is currently working on an instrumentation and controls electrical contract. This contract is 70% complete and approximately ten weeks behind the contract schedule. Our construction office met with the contractor and the work force has been increased to eighteen. With this change, the contract should be completed by the first week of March, or one week beyond the contract completion date of March 1.</p>			
<p>The design is nearly complete for the third electrical contract (for TV, the partial pressure analyzer, and additional research instrumentation), and this design is scheduled to be finished by February 12. This job is also a critical path item.</p>			
(Continued on Page 30)			

SITE	LABORATORY	RESEARCH INSTALLATIONS (FOR)	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK	(Continued)	<p>Status of other remaining contracts is as follows:</p> <ol style="list-style-type: none"> (1) The R. G. Beer general construction contract is 99% complete. (2) The Elsberry process piping contract is 92% complete. The system cleaning and the required vacuum-jacketed liquid hydrogen line modifications remain to be completed. (3) The Acme Construction railroad contract was awarded for \$46,625 and the notice to proceed should be given by February 1, thereby making the contract completion date April 1. (4) The "eight-ball" tank modification work should be awarded to Akron Steel Fabricators by February 4; thereby making the contract completion date June 2. (5) Lockheed reports that the 13-foot test tank fabrication is on schedule and should be completed by May 3. (6) The T. O. Murphy boiler contract was completed. (7) The SEL digital equipment is now located in "H" Bldg. The contract for procuring the instrumentation cable for the cable run from "K" site control to "H" building was awarded to General Cable on January 15, with a contract completion date of May 15. Due to required design changes, the cable installation drawings and specifications were not completed this month. (8) Handling equipment (monorail, hoist, etc.) is in preliminary design and is scheduled to be completed by February 15. (9) The hydraulic actuator pedestal was delivered and the seal is currently undergoing tests. An alternate seal design is scheduled to be completed by February 12.

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K	CRYOGENIC PROPELLANT TANK LAB	<p data-bbox="516 278 829 374"><u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A. Johnsen)</p> <p data-bbox="516 405 1464 717">The present estimated facility completion date is August 20. The controls and instrumentation electrical contract (Valley Electric) is now 91% complete. While the current status is still behind schedule, an augmented work force has increased the work tempo sufficiently to enable a probable completion within two weeks of the scheduled date. Required field changes may extend this completion date. Valley Electric was given, on February 2, the notice to proceed on the electrical safety contract, thereby establishing the contract completion date of July 2.</p> <p data-bbox="516 753 1435 1070">Design and specifications for the third electrical contract (TV, tank instrumentation, etc.) have been completed. Assuming normal procurement, an award of contract can be expected about April 1, with a probable 90-day completion. The partial pressure analyzer, essential to the hydrogen test program, was deleted from the contract in order to avoid delay. Since the analyzer is a long lead item, and installation details have not yet been worked out, constant attention must be focused on this subject to avoid postponement of hydrogen tests.</p> <p data-bbox="516 1106 1365 1137">Current developments on other contracts are as follows:</p> <ol data-bbox="524 1171 1446 1578" style="list-style-type: none"> <li data-bbox="524 1171 1446 1262">(1) Acme Construction was given notice to proceed with the railroad contract and construction is already well underway. The contract completion date is April 1. <li data-bbox="524 1298 1377 1358">(2) The support cradle for the 5-foot test tank is 35% complete and progressing on schedule. <li data-bbox="524 1387 1446 1447">(3) The liquid hydrogen fill and drain valve was received and will undergo acceptance tests in the near future. <li data-bbox="524 1483 1446 1578">(4) A contract for modification of the "eight ball" tank was awarded to Akron Steel Fabricators on February 4. The contract completion date is June 2. 	<p data-bbox="889 278 1435 338">Cryogenic propellant pressurization and dynamics testing.</p>

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March 1965

SITE	LABORATORY	RESEARCH INSTALLATIONS (FOR)	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK LAB	<u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A. Johnsen)	<p>Cryogenic propellant pressurization and dynamics testing.</p> <p>Contract status as of March 31 is as follows:</p> <ol style="list-style-type: none">(1) General construction: Construction is complete except for minor cleanup items. A final contract inspection was made March 18.(2) Process piping: The piping is complete except for<ol style="list-style-type: none">(a) Cleaning the liquid nitrogen system.(b) Installation of identification tags on system components.(c) Change order work connected with installation of stainless steel bellows in the vacuum system.(3) Electrical (controls and instrumentation): Contract change orders and system testing remain to be done.(4) Electrical (safety): The contract is approximately 5% complete.(5) Instrumentation cable from "K" to "H": The cable is scheduled to be delivered April 2 and the installation contract bid opening date is April 16.(6) Communications: The conduit installation purchase request is now in Procurement.(7) Partial pressure analyzer: The specifications for procurement are scheduled to be completed by April 16.(8) TV and tank instrumentation: The bid opening date for this contract is April 9. <p>A check of pressurization for Rooms 101 and 201 showed that these rooms are not adequately sealed to obtain 1/2" H₂O with the existing blower. Accordingly, specifications are being prepared to remedy this situation.</p>

SITE	LABORATORY	RESEARCH INSTALLATIONS (FOT)	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK LAB	A full complement of NASA mechanics have been assigned to the site; therefore, system and equipment checkouts and other necessary site work are in progress. Some of the jobs recently completed are included in the following list: (1) A preliminary check of the vacuum system. This checkout reemphasized the need for stainless steel bellows to replace the present rubber hoses. (2) Modification of the trailer stanchions on gas manifolds, disassembly, cleaning, and reassembly of the actuator seal and drive rod mechanism. (3) Modification of the cooling water system to increase flow rate to the CVC diffusion pumps. The process piping control system checkouts are scheduled to be started on April 9. The checkouts will include pressure, flow, and temperature controls, as well as heat exchanger performance. The first series of tests will be made utilizing ambient and chilled gaseous nitrogen.	

April 1965

SITE	LOCATION	RESEARCH INSTALLATIONS (FOR)	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I. A. Johnsen)</p>	<p>Cryogenic Propellant pressurization and dynamics testing.</p> <p>Contract status as of the close of this reporting period is as follows:</p> <p>(1) Electrical:</p> <p>(a) Instrumentation and Controls - 99% complete. (b) Safety-25% complete and on schedule. (c) TV and Tank Instrumentation - Notice to proceed given to Valley Electric on April 26 - Completion is set for July 26.</p> <p>(2) Process Piping:</p> <p>Notice to proceed with piping for the 13-foot test package was given to Elsberry on April 23 with completion scheduled by July 3, 1965. Delivery of flexible metal connections for the vacuum system should complete the initial process piping contract by mid-May</p> <p>(3) Partial Pressure Analyzer:</p> <p>Specifications for this unit were completed and the Purchase Request is in Procurement.</p> <p>(4) 13-Foot Test Tank:</p> <p>This test tank failed during hydrostatic test at Lockheed's plant. Design changes are in progress for a second tank scheduled for November delivery.</p> <p>(5) Ruckers Actuator Installation:</p> <p>The Contractor is expected to complete this job by May 31.</p> <p>(6) Fill and Drain Valves:</p> <p>Valves were not acceptable due to erratic operation, and were returned to the vendor for modifications.</p> <p>(7) Instrumentation Cable (901 to H): Contract award is expected by May 13.</p> <p>(Continued on Page 30)</p>

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K	CRYOGINIC PROPELLANT TANK SITE	<p data-bbox="407 325 993 357"><u>CRYOGENIC PROPELLANT TANK (Continued)</u></p> <p data-bbox="407 395 1266 491">NASA work at the site continued at a satisfactory rate during the month of April, comprised primarily of the following tasks:</p>	<ol style="list-style-type: none"> <li data-bbox="412 525 1344 751">(1) Initial pressure and flow control tests were performed on the process piping system, making use of ambient temperature nitrogen gas. NASA design loaders for the pressure regulators exhibited erratic operation and will require some modification. Temperature control checkout was temporarily precluded because of a heat exchanger gas leak. <li data-bbox="412 785 1279 846">(2) The electrical operation of the valves was checked out. <li data-bbox="412 880 1279 942">(3) The process heat exchanger was repaired and hydrostatically checked. <li data-bbox="412 976 1339 1140">(4) Prepared for the actuator installation by: <ol style="list-style-type: none"> <li data-bbox="488 1044 1339 1076">(a) removing window in Room 201 for equipment access; <li data-bbox="488 1076 1198 1108">(b) cleaning Government-furnished equipment; <li data-bbox="488 1108 1304 1140">(c) installing actuator pedestal on vacuum chamber. <li data-bbox="412 1174 1263 1270">(5) The hydraulic system was modified and the control acceptance tests on vacuum chamber door operating system was completed. <li data-bbox="412 1304 1308 1366">(6) The purge pressure indicator switches were assembled and calibrated. <li data-bbox="412 1400 1312 1461">(7) Valve operators were modified for the CVC 36" vacuum valves.

5-65

SITE	LOCATION	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A. Johnsen)	Cryogenic propellant pressurization and dynamics testing. Status of major contracts at the end of May is as follows: (1) Electrical (Safety): 75% complete, and on schedule. (2) Electrical (TV & Tank Instrumentation): 15% complete. (3) Process Piping (13-ft. Tank): 25% complete.

28 May 1965

SITE	LOCATION	RESEARCH INSTALLATION	&	DESCRIPTION
K		<p>(4) Conduits for Communication System:</p> <p>The contractor was given notice to proceed on May 24, with completion scheduled for June 21.</p> <p>(5) Partial pressure gas analyzer:</p> <p>In procurement.</p> <p>(6) Digitizer Cable Installation:</p> <p>The contract was awarded to Valley Electric on May 26, with a 60-day completion .</p> <p>(7) Liquid Hydrogen Fill and Drain Valves:</p> <p>These valves have not yet fully passed Government acceptance tests. Actuator problems were apparently solved, although static seal leaks have developed.</p> <p>(8) Ruckers Actuator Installation:</p> <p>Completion of this contract is delayed due to difficulties encountered during checkout. Replacement of some items of equipment by Ruckers is necessary before a successful checkout can be achieved.</p> <p>(9) Five-Foot Tank Modification:</p> <p>Due to procurement difficulties encountered with the manhole flange and the instrumentation connectors, it is unlikely that the first tank will be received before July 1. Assuming four weeks for tank instrumentation at Lewis, plus two to three weeks for installation and checkout at Plum Brook, This will cause a two-week delay in the start of the test program.</p> <p>(10) Vacuum System Modifications:</p> <p>Flexible metal bellows are now on hand and installation is in progress. The vacuum system checkout is scheduled to be completed during June.</p>		

(Continued on Page 30)

5-6

SITE	LOCATION	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE		<p data-bbox="462 384 1040 414">CRYOGENIC PROPELLANT TANK (Continued)</p> <p data-bbox="462 486 1224 549">Major non-contract items completed by Plum Brook personnel include the following:</p> <ol data-bbox="462 582 1333 1038" style="list-style-type: none"><li data-bbox="462 582 1230 613">(1) The liquid hydrogen system was cold-shocked.<li data-bbox="462 649 1328 680">(2) Electrical purge pressure switches were installed.<li data-bbox="462 717 1333 813">(3) Valve controller checkout for the process piping was completed, and it was determined that the heat exchanger (Taylor) controller must be modified.<li data-bbox="462 850 1295 913">(4) A static leak check was performed on the shaker seals.<li data-bbox="462 950 1333 1038">(5) A dummy mass was installed and a drive linkage was connected to the Ruckers unit so that performance checkout tests could be made.

6-65
June 1965

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A. Johnsen)		<p>Cryogenic propellant pressurization and dynamics testing.</p> <p>Completion of the facility is now largely dependent upon electrical items. Current status is as follows:</p> <p>(1) Electrical (Safety):</p> <p>An estimated three-week-time extension will be required because of change orders plus late delivery of detection heads and diesel-generator equipment.</p> <p>(2) Electrical (TV and Tank Instrumentation):</p> <p>25% complete and behind schedule due to material procurement delays. Contract completion is expected July 26.</p> <p>(3) Electrical (Cable Installation):</p> <p>Material is arriving on site, although no actual progress is evident. The August 15th completion date is still probable.</p> <p>(4) Electrical (Communications Conduit):</p> <p>Complete except for delivery and installation of 17 utility boxes. The contract should be completed by July 8,</p> <p>(6) Process Piping (13-ft. Tank):</p> <p>This contract is 50% complete.</p> <p>(7) Residual Gas Analyzer:</p> <p>Bids for this equipment were opened June 25 with the contract award expected by July 7.</p> <p>(8) 5-ft. Tank Modifications:</p> <p>The "eight ball" tank was expected to be hydrostatic tested by the first week of July. Estimated delivery to Lewis Research Center for instrumentation is July 8.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K		(9) LH ₂ Fill and Drain Valves: These valves were returned to Kemp Aero Products for seal modifications. Additional Government testing is required before final acceptance. In the meantime, NASA personnel are extensively occupied with system checkouts and other non-contract type work. Among the more prominent items are the following:	(1) Gas bottle storage racks were installed. (2) Completed vacuum checkouts on the manifold chamber, and the two CVC diffusion pumps. Checkout of the two Edwards pumps still remains. Highest vacuum obtained in the chamber up to this time is in the neighborhood of 5×10^{-5} torr. (3) Monitored Ruckers actuator installation and conducted initial checkouts. These checkouts indicated the need for replacement of certain faulty Ruckers components. Due to the long delivery cycle for these items, it is almost certain that final acceptance of the Ruckers unit will be delayed until August 30 or later.

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A.Johnsen)		Cryogenic propellant pressurization and dynamics testing. At the present time, Valley Electric is working on four, simultaneous electrical contracts at "K" Site. Contracts and their status are: (1) Electrical(Safety): Original completion date was July 2, 1965. The contract is approximately 75% complete, with major delays being caused by change orders and late delivery of material. The contractor supplied diesel-generator has not been delivered; (2) Monorail Hoist Installation: Clean-up items remain on this contract, which was scheduled to be completed July 24.

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K		<p>(3) TV and Tank Instrumentation:</p> <p>Practically no progress at all was made on this contract during the month of July. With a scheduled completion date of July 27 only 27% of the work has been accomplished. The reason for failure to meet the installation schedule was due to the late delivery of the contractor supplied material.</p> <p>(4) Cable Installation:</p> <p>Scheduled completion date is August 15, a date which must be met to satisfy the established test date. All materials are on hand and trenching was begun. However, the contract is behind schedule and only 10% complete.</p> <p>In summary, all four electrical contracts are behind schedule. From the standpoint of Operations Engineering, Valley Electric's work staff is undermanned for the tasks yet to be done. If the test date is to be met, the man-power problem will have to be remedied and material deliveries expedited.</p> <p>(5) Five-foot Test Tank:</p> <p>Welds did not pass X-ray inspection and structural warping is also evident. Therefore, weld repair and stress relieving will be required before cold shocking and hydrostatic tests. Latest delivery date is optimistically set for August 18.</p> <p>(6) LH₂ Fill and Drain Valves:</p> <p>These valves are still at the vendor's plant for necessary modifications. Kemp Aero Products apparently cannot or will not release a delivery date for return of the valves.</p> <p>(7) Residual Gas Analyzer:</p> <p>Contract for this equipment was awarded June 30 to Aerovac. Delivery is expected September 10.</p>		

SITE	SITE NAME	RESEARCH INSTALLATION	6	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE			<p>Completed work by Site personnel includes the following:</p> <ol style="list-style-type: none">(1) Vacuum system checkout to 2×10^{-5} torr completed.(2) Repaired roots blower vacuum pump.(3) Installed new seal in 30' vent stack.(4) Modified vent and pressurizing pass-through on vacuum chamber to eliminate conductive chilling of chamber walls.(5) Completed installation of Marotta loaders.(6) Modified gas manifolds.

8-65

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> OR0137(I.A. Johnsen)</p> <p>The electrical contracts should all be finished by September 15, however checkout time, plus the delay caused by the late delivery of the five-foot tank may prohibit any test run before October 15. Delays at this time can be attributed primarily to late deliveries on contractors' purchase orders, an undermanned contract work force, and fabricating problems with the five-foot diameter test tank.</p> <p>Contract status is as follows:</p> <p>(1) Monorail hoist installation - Hoist is operational, but cleanup items remain.</p> <p>(2) Electrical (Safety) - Completion on September 15 is contingent upon the September 2 delivery of the leak detection separator tank and the emergency power transfer switch.</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME RESEARCH INSTALLATION & DESCRIPTION
K	<p data-bbox="337 258 651 318">CRYOGENIC PROPELLANT TANK SITE</p> <p data-bbox="529 324 894 354">(3) Cable Installation:</p> <p data-bbox="602 391 1240 421">Estimated completion date is September 6.</p> <p data-bbox="529 455 1036 485">(4) Seals for Pressurized Rooms:</p> <p data-bbox="602 520 1414 612">The contractor has completed 30% of the job and is now waiting for delivery of doors and frames. These items are being expedited.</p> <p data-bbox="529 647 1036 677">(5) TV and Tank Instrumentation:</p> <p data-bbox="602 711 1414 868">Completion of this contract is estimated for September 15, with the exception of TV units and related connectors. A control panel assembly for purge pressure indicators is also needed for which no delivery date is available.</p> <p data-bbox="529 903 911 933">(6) Five Foot Test Tank:</p> <p data-bbox="602 967 1442 1255">Results of weld X-Rays indicated tungsten inclusions but the welds were accepted. Instrumentation brackets will be mounted inside the tank, to be followed by cold shocking, hydrostatic testing and leak testing. Additional machining is also required on the tank-cradle mounting ring. Following delivery to Lewis-Cleveland the tank will be instrumented. Akron Steel Fabricators is currently estimating three weeks for the contract completion.</p> <p data-bbox="529 1290 1008 1320">(7) LH₂ Fill and Drain Valves:</p> <p data-bbox="602 1354 1419 1415">Acceptance tests are being conducted by Lewis-Cleveland.</p> <p data-bbox="529 1449 943 1479">(8) Residual Gas Analyzer:</p> <p data-bbox="602 1514 1354 1574">The Government rejected Aero-Vac's original submittal. Amended submittals are currently due.</p> <p data-bbox="529 1614 1349 1645">Major work items completed by site personnel include:</p> <p data-bbox="513 1679 1430 1739">(1) An extended vacuum system pumpdown (two days) produced a vacuum of 2×10^{-6} torr.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE			<ul style="list-style-type: none"> <li data-bbox="536 388 1404 459">(2) Leak checked Bellfram dynamic seals, which showed 1.6×10^{-3} cc/sec leak. <li data-bbox="536 490 1404 521">(3) Completed mechanical portion of GN₂ purge system. <li data-bbox="536 551 1445 582">(4) Installed five foot tank cradle-suspension assembly. <li data-bbox="536 613 1404 684">(5) Fabricated electrical and gas pass-thrus for fill and drain valve control.

4-65

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A. Johnsen)</p> <p>The site is now ready for research test equipment installation. Only clean-up items remain, and these are detailed as follows:</p> <ol style="list-style-type: none"> (1) Electrical (Safety) - This item is 95% complete with the major remaining item being checkout of the diesel generator emergency power supply and changeover switch. (2) Cable Installation - This contract is complete except for final grading, NASA checkouts are now in process. (3) TV and Tank Instrumentation - All field work is complete. Delivery of the TV units and three spare Deutsch connectors is scheduled for October. (4) Seals for Pressurized Rooms - This contract is 30% complete and waiting for delivery of steel doors and door frames. Temporary seals were installed on the present doors, and a trial run produced a satisfactory 0.5" water pressure. (5) Residual Gas Analyzer - The analyzer has been shipped and the installation contract will be awarded October 8 (this item is not mandatory for initial tests). 	<p>Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE			<p>(6) Five Foot Test Tank - The tank is again being X-Rayed following liquid nitrogen cold shocking. Assuming that the X-Rays of the welds are satisfactory*, the tank will receive a hydrostatic test on October 8. Instrumentation will be installed at Lewis, with delivery to Plum Brook not expected prior to October 25.</p> <p>*NOTE: 10-8-65 - X-Rays showed cracks in the welds.</p> <p>(7) LH₂ Fill and Drain Valves - These valves were again returned to Kemp-Aero for modification due to continuing static seal leakage. The five-foot tank's fill and drain valve is required for the initial tank test.</p> <p>Major work items completed by site personnel during the past month include:</p> <ol style="list-style-type: none"> (1) Installation of temporary seals in pressurized rooms and a successful checkout. (2) Installation of new temperature controller on the small heat exchanger. (3) Installation of temperature probes in diffusion pumps. (4) Completed Rucker hydraulic actuator installation and operational checkout. (5) Modified and checked out burnoff.

10-65

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<u>CRYOGENIC PROPELLANT TANK</u> ORO137 (I.A.Johnsen)		Cryogenic propellant pressurization and dynamics testing. All construction contracts that have not been completed at "K" Site are in the "clean up" stage and do not constitute test restraints. It is expected that final inspections will be conducted during November. Test restraints are now in effect because of the following two items: (1) The five-foot test tank welds have been plagued with cracks and tungsten inclusions. X-ray results of the latest weld repairs were due October 29. Following verification of good welds, the tank must be hydrostatically tested and instrumented prior to "K" Site installation. Estimated delivery date to Plum Brook is December 15.

October 1965

SITE	SITE NAME RESEARCH INSTALLATION & DESCRIPTION
K	<p data-bbox="293 293 456 385">CRYOGENIC PROPELLANT TANK SITE</p> <p data-bbox="505 385 1393 519">(2) The LH₂ fill and drain valves (emergency shutoffs) are due from Kemp-Aero on November 3. These valves have had a long history of static seal leakage, and have yet to complete final acceptance tests.</p> <p data-bbox="500 549 1393 619">Major work items completed by site personnel include the following:</p> <p data-bbox="505 646 1435 938">(1) Three gaseous helium and two gaseous hydrogen checkout runs were completed at process gas temperatures of -260^oF. and +240^oF. Flow temperature and pressure controllers operated satisfactorily as did the safety systems and miscellaneous support hardware. Problems uncovered point out the need for minor modifications to the heat exchanger gas-liquid separator tank, and the possible need for additional temperature stabilization venting in the pressurizing gas line.</p> <p data-bbox="505 966 1419 1066">(2) New quick quench cooling was added to the two Edwards diffusion pumps. It is expected that this rapid pump cooling will hasten site shutdown by five hours.</p> <p data-bbox="505 1093 1435 1164">(3) Modification of the five-foot tank carriage suspension was completed.</p> <p data-bbox="505 1191 1419 1261">(4) Designed and built accumulator charging panel for the Rucker unit.</p> <p data-bbox="505 1289 1354 1325">(5) Repaired and realigned vacuum chamber door locks.</p> <p data-bbox="505 1353 1354 1423">(6) Installed oil fume eliminators on vacuum roughing pumps.</p> <p data-bbox="505 1451 1419 1644">(7) Investigated and proposed modifications to Building 905 heating system to reduce temperature fluctuations which tend to cause drift in the SEL data reduction system. A test will be performed in the near future to determine the full effect of temperature variation.</p>

11-65

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A. Johnsen)</p> <p>In preparation for forthcoming tests with liquid hydrogen a 100-gallon cylindrical tank was temporarily installed in the vacuum chamber, and expulsion tests were made using liquid nitrogen as the working fluid. This was a final operational check of all systems, excluding data requisition, so that the site is now proven ready for the test program.</p> <p>The five foot diameter tank is now in Lewis Lab for instrumentation. Delivery to Plum Brook is expected during the week of December 6, and every effort will be made to run a hydrogen test before the first of the year.</p> <p>Fill and drain valves from Kemp Aero Products are currently undergoing acceptance tests for the third time.</p> <p>(Continued on Page 29)</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION																						
K	CRYOGENIC PROPELLANT TANK SITE (Continued)			As of the end of November, the vacuum chamber was pumped down to approximately 5×10^{-6} torr for vacuum instrumentation checks, including the partial pressure analyzer.																						
-	HYDROGEN HEAT TRANSFER FAC.	<p>HYDROGEN ROCKET NOZZLE OR0137(N.D. Sanders)</p> <p>Status of major contracts:</p> <table border="0"> <thead> <tr> <th data-bbox="761 901 827 932"><u>Item</u></th> <th data-bbox="1186 870 1430 932"><u>Estimated Completion Date</u></th> </tr> </thead> <tbody> <tr> <td data-bbox="579 962 1034 993">1. Pebble bed heat exchanger</td> <td data-bbox="1235 962 1397 993">12-20-1965</td> </tr> <tr> <td data-bbox="637 1024 1141 1095">It is 90% complete. The acceptance tests are now being made.</td> <td></td> </tr> <tr> <td data-bbox="579 1126 1100 1187">2. High-pressure liquid hydrogen dewar</td> <td data-bbox="1252 1156 1397 1187">2-01-1966</td> </tr> <tr> <td data-bbox="637 1218 1174 1320">It is 90% complete and the acceptance tests are scheduled to start 1-4-1966.</td> <td></td> </tr> <tr> <td data-bbox="579 1351 860 1381">3. Piping systems</td> <td data-bbox="1252 1351 1397 1381">1-01-1966</td> </tr> <tr> <td data-bbox="637 1412 1174 1514">These systems are 92% complete and are presently being cleaned and tested.</td> <td></td> </tr> <tr> <td data-bbox="579 1545 1141 1606">4. Electrical, controls and instrumentation</td> <td data-bbox="1252 1575 1397 1606">2-01-1966</td> </tr> <tr> <td data-bbox="637 1637 1091 1667">These items are 90% complete.</td> <td></td> </tr> <tr> <td data-bbox="579 1698 1042 1729">5. Electrical, Safety system</td> <td data-bbox="1235 1698 1381 1729">Completed</td> </tr> <tr> <td data-bbox="579 1759 1050 1790">6. Electrical, Hydraulic pump</td> <td data-bbox="1235 1759 1381 1790">Completed</td> </tr> </tbody> </table> <p data-bbox="740 1851 1083 1892">(Continued on Page 30)</p>	<u>Item</u>	<u>Estimated Completion Date</u>	1. Pebble bed heat exchanger	12-20-1965	It is 90% complete. The acceptance tests are now being made.		2. High-pressure liquid hydrogen dewar	2-01-1966	It is 90% complete and the acceptance tests are scheduled to start 1-4-1966.		3. Piping systems	1-01-1966	These systems are 92% complete and are presently being cleaned and tested.		4. Electrical, controls and instrumentation	2-01-1966	These items are 90% complete.		5. Electrical, Safety system	Completed	6. Electrical, Hydraulic pump	Completed	<p>Experimental tests will be operated over chamber pressure ranges from 150 psi to 1200 psi and hot gases to 4200°R will be supplied from the pebble bed heater.</p>	
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SITE	SITE NAME	RESEARCH INSTALLATION	6	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I. A. Johnsen)		<p>Cryogenic propellant pressurization and dynamics testing.</p> <p>A liquid hydrogen expulsion test with the 5' tank was attempted on December 16. Equipment malfunctions, however, caused the test to be aborted, with the earliest possible test date now being mid-January.</p> <p>One of the failures causing cancellation was the remote vacuum readout. Prior to the test run date, the only operable vacuum readout was the Aerovac partial pressure analyzer, which also serves as the hydrogen leak detector within the chamber. Investigation of the December 16 failure indicated an overloaded circuit. While the damaged components have been replaced, the basic cause of the failure is not yet totally resolved.</p> <p>The second failure which contributed to the test cancellation was the extremely high leak rate of Valve 262 (Kemp Aero Products). An oxidizer shutoff valve from an RL-10 engine was selected as replacement, and suitable piping adapters are now being made.</p> <p>Other "K" Site activities for the month of December included the following:</p> <ol style="list-style-type: none"> (1) The original thin flexure plates of the tank 4-point suspension system were replaced by one of bonded metal and rubber construction. Dynamic tests in the 0.5 to 2.0 cps range (empty tank) indicate that lateral motion problems and resonant frequencies were eliminated from the desired test frequency range. (2) The 13-foot tank was received from Lockheed on December 28, and has been stored in Plum Brook Building 308. (3) Two contractors are still active at "K" Site, working on the installation of doors in the pressurized room, and on the enlargement of vent holes in the main building floor.

January 1966

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="545 406 870 499"><u>CRYOGENIC PROPELLANT TANK</u> OR0137(I.A.Johnsen)</p> <p data-bbox="545 540 1425 665">Five-foot tank, liquid hydrogen expulsion tests #1 and #2 were completed in January. All expulsions were made by means of 500^{OR}. gaseous hydrogen and the hemispherical injector.</p> <p data-bbox="545 706 1414 893">On January 13, seven expulsions were made, primarily for the purpose of facility shakedown, including the data acquisition system. This test day indicated a need for minor changes in controls and instrumentation hardware, as well as in operational techniques. Digital data for this date will probably not be reduced.</p> <p data-bbox="545 934 1370 1110">On January 18, eight expulsions were completed. Data was successfully obtained for five expulsions, having periods of 133, 198, 274, 333, and 400 seconds. In addition to acquiring applicable research data, the second test verified a real need for the following changes or additions:</p> <ol data-bbox="553 1152 1403 1348" style="list-style-type: none"> (1) Automatic liquid flow control. (2) Automatic data orifice differential pressure range selection. (3) An additional or improved method for liquid level sensing (5% ullage determination). <p data-bbox="545 1390 1354 1442">Site work accomplished during the month includes the following:</p> <ol data-bbox="553 1473 1446 1939" style="list-style-type: none"> (1) Liquid flow control tests using liquid nitrogen and gaseous helium. (2) The 156" tank spare parts, handling fixtures, etc., were inventoried. (3) The heat exchanger condensate return was insulated. (4) The steam-gas separator tank was modified for a combustible gas detection head. (5) The five-foot tank liquid level sensors were rewired. (6) The fill and drain valve #262 was removed and the replacement valve installed. (7) The build-up and repair of vacuum instrumentation remote readout was completed. 	<p data-bbox="911 406 1409 468">Cryogenic propellant pressurization and dynamics testing.</p>

2-66

February 1966

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="443 353 776 451"><u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A. Johnsen)</p>	<p data-bbox="808 353 1312 414">Cryogenic propellant pressurization and dynamics testing.</p> <p data-bbox="443 486 1344 578">Static expulsion tests on the five-foot tank with gaseous hydrogen and the hemispherical injector were completed during February.</p> <p data-bbox="443 609 1317 741">On February 10, four 700°R expulsions were accomplished with periods of 557, 363, 272 and 151 seconds. In addition, two 2-minute pressure-hold tests were also made at 700°R.</p> <p data-bbox="443 778 1284 901">On February 14, four 300°R expulsions were performed with periods of 418, 294, 209, and 144 seconds. One 2-minute pressure-hold test was made at 500°R and two pressure-hold tests were made at 300°R.</p> <p data-bbox="443 936 1349 1130">Pressurant for the next series of tests will be gaseous helium. An ullage gas sampling system is being installed for these tests. At the same time, the five-foot tank was returned to Lewis-Cleveland for the installation of a T.V. viewing port. Estimated date for the next test is March 23.</p> <p data-bbox="443 1160 1271 1232">Site work accomplished during the month includes the following:</p> <ol data-bbox="451 1259 1328 1790" style="list-style-type: none"> (1) The 5' tank was removed from the chamber. (2) The gas sampling system installation was started. (3) The Roots blower was removed and shipped to the factory for repairs. (4) The replacement flow meter was installed. (5) A Bendix optical liquid level sensor was installed. (6) The actuator was removed for actuator seal modification. (7) Temporary water lines were installed for diffusion pump baffle plates.

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="591 200 916 292"><u>CRYOGENIC PROPELLANT TANK</u> OROI37(I.A.Johnsen)</p> <p data-bbox="591 329 1471 517">Tests originally scheduled for March 23 have been rescheduled for April. Rescheduling was necessary due to malfunctions of the residual gas analyzer, the ullage gas sampling system, and the hydrogen tank television. Welding problems during modification of the 5-foot research tank also resulted in delays.</p> <p data-bbox="591 553 1471 645">Efforts were primarily directed to site modification and buildup for gaseous helium tests; major work areas were as follows:</p> <ol data-bbox="591 682 1471 1575" style="list-style-type: none"> (1) The 5-foot tank was removed from the vacuum chamber for modifications and reinstalled following modifications. (2) Installed television purge system. (3) Cleaned vacuum chamber and foreline pump manifold. (4) Fabricated and installed additional tank vent line. (5) Installed vacuum instrumentation for local readout with nude gage. (6) Installed 5-foot tank television following extensive leak repairs on housing. (7) Fabricated residual gas analyzer calibration system. (8) Fabricated, installed, and evaluated diffusion pump baffle plates. (9) Completed vibration control panel modifications. (10) Completed 90% of 13-foot tank instrument rake. (11) Cleaned and rebuilt residual gas analyzer head. (12) Initiated plans for 13-foot tank acceptance tests to be conducted at Plum Brook. (13) Designed, fabricated, and installed ullage gas sampling probes and related instrument vacuum pump system. <p data-bbox="591 1600 921 1627">Outside contract work:</p> <ol data-bbox="591 1643 1471 1851" style="list-style-type: none"> (1) Replacement of wooden doors with metal doors - 50% complete. (2) Relocation of fresh air intake was awarded on March 28 to Wilkes, Inc. (3) Installation of additional explosion-proof lighting will be released for bids in April. 	

April 1966

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="496 350 818 445"><u>CRYOGENIC PROPELLANT TANK</u> OROT37 (I.A. Johnsen)</p> <p data-bbox="496 479 1419 606">Work efforts for the month of April were aimed primarily at troubleshooting the tank TV and the ullage gas sampling system. As a result, there were only two test days this month.</p> <p data-bbox="496 641 1419 893">On April 27, four expulsions and one pressurization hold run were completed using 500°R helium pressurant gas and a test tank pressure of 35.6 psig. On April 29, helium was used for the pressurant gas but the testing had to be stopped when the helium manifold became plugged with desiccant from the dryer. The screen at the dryer inlet was in a position resembling a full-open butterfly valve. This problem is being investigated.</p> <p data-bbox="496 927 1403 1114">TV troubles during the month were traced to arcing in a vacuum exposed connector. The ullage sampling system has poor reliability, due primarily to signal drift, low sensitivity, and long time response of the partial pressure analyzer. In the near future, the analyzer will be replaced by a hot wire sensor.</p> <p data-bbox="496 1177 1370 1364">A recent proposal eliminates the need for acceptance testing of the 13' tank, at least to the extent called out by the tank specification. As a substitute for the liquid nitrogen proof test to 260 psi, the tank will be installed in the vacuum chamber, filled with liquid hydrogen, and subjected to a pressure of only 50 psi.</p> <p data-bbox="496 1399 1159 1429">Status of outside contracts is as follows:</p> <ol data-bbox="505 1463 1370 1689" style="list-style-type: none"> (1) Steel door and painting - 60% complete. The major task remaining is the outside painting. (2) Fresh air intake - material has been delivered. (3) Additional explosion-proof lighting - bid opening is scheduled for May 19. 	<p data-bbox="886 350 1403 415">Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="579 212 976 279"><u>CRYOGENIC PROPELLANT TANK</u> ORO137(I.A.Johnsen)</p> <p data-bbox="579 310 1458 468">On May 18 and 20, tests were successfully completed with the 5-foot tank. Tests included seven expulsions and two pressure-hold runs with 35.6 psig helium at 300°R and 700°R. Due to TV failure, one run day had to be cancelled.</p> <p data-bbox="579 489 1318 527">Tasks started or completed during May included:</p> <ol data-bbox="579 562 1509 1755" style="list-style-type: none"> (1) Cleaned desiccant from helium manifold, removed contaminated helium bottle farms and installed additional manifolding for temporary use of helium trailer tubers. (2) Modification of the ullage sampling system is in progress. Delays were incurred due to oxidized filaments which precluded bench-testing and calibration of the new hot wire sensor. (3) A fifth vent was installed in the pressurization line to facilitate pressurant gas temperature stabilization. (4) The hydraulic actuator and vacuum seal pass-through was installed. (5) The analyzer head was replaced with a new unit and the system was calibrated. (6) The 5-foot tank catch basin for slosh tests was fabricated and the basin installation was started. (7) The fabrication of vacuum baffle plates was completed and they are presently being installed. (8) The 5-foot tank instrumentation was changed for the slosh tests. (9) Liquid hydrogen mass flow meter design and engineering was completed. (10) The vacuum chamber lights were installed for TV illumination. (11) Completed two weeks of trouble-shooting and line checks on hydraulics actuator electronics. <p data-bbox="558 1808 1224 1839">Progress on outside contracts, as follows:</p> <p data-bbox="637 1875 1182 1938">Outside painting: 75% complete Air vent relocation: 80% complete</p> <p data-bbox="558 1969 1405 2070">Bids for the additional explosion-proof lighting were opened May 19, and the contract award is expected by June 6.</p>		<p data-bbox="1014 212 1488 279">Cryogenic propellant pressurization and dynamics testing.</p>

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K	CRYOGENIC PROPELLANT TANK SITE	<u>CRYOGENIC PROPELLANT TANK</u> ORO137 (I. A. Johnsen)		Cryogenic propellant pressurization and dynamics testing.
		<p>During the month of June data from eight slosh and fourteen pressure hold tests was recorded, using 300°R GH₂ and helium. All tests were performed with the 5 foot tank at the 28% ullage level. One three hour fill test was made to determine tank wall temperature gradients for application to the 13 foot tank analysis. It is expected that 5 foot tank testing will extend through August.</p>		
		<p>Additional tasks completed at the site include the following:</p>		
		<ol style="list-style-type: none"> 1. On June 6, lightning caused extensive damage to "K" Site electrical, instrumentation, controls and data acquisition systems. Approximately 8 days of repair and troubleshooting were required to correct the damage. 2. Completed installation of the five foot tank LH₂ catch basin (vacuum chamber protection). 3. Installed additional vacuum chamber pass-throughs for electrical connectors to accommodate slosh instrumentation - load cell, accelerometers, etc. 4. Completed diffusion pump baffle plate installation. 5. For improved temperature control, the Valve #256 vent line was increased to 1". In addition, gas mixing Valve #241 was relocated much nearer to the test tank. 6. Fabricated, installed and tested the spool piece necessary for five foot tank boiloff tests. 7. Completed calibration and installed GowMac hot wire sensor for ullage gas sampling. 8. Following repeated failure and troubleshooting of the COHU TV system, an alternate was prepared and installed. 9. Manufactured bakelite mounts for the thirteen foot tank rake thermopiles. 		
		Continued on Page 28		

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE (Continued)			<p data-bbox="414 378 1199 442">10. Began installation of thirteen foot tank wall instrumentation.</p> <p data-bbox="414 476 745 508">11. Contract status:</p> <ul style="list-style-type: none"> <li data-bbox="497 540 1248 636">(a) Painting - Contract was completed. However coverage was poor and contract negotiations for additional work is being considered. <li data-bbox="497 668 1281 732">(b) Fresh Air Inlet - Contract for the relocation was completed. <li data-bbox="497 763 1265 827">(c) Explosion-Proof Lighting - Contract was completed.

July 1966

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="524 389 935 451"><u>CRYOGENIC PROPELLANT TANK</u> ORO137 (I.A. Johnsen)</p> <p data-bbox="524 488 1419 679">On July 21 and 22, research data was recorded during 18 successful test runs. Tests were made with both gaseous helium and gaseous hydrogen at 300°R. Tank pressure at 50 psia was used for all these tests at either pressure-hold or pressure-slosh conditions. Likewise, all testing was performed with the five-foot tank at 55% ullage level.</p> <p data-bbox="524 716 1419 996">Three previously scheduled test dates were cancelled due to either TV malfunctions and/or gas leaks through the five-foot tank instrumentation connectors. It is believed that the use of helium as a TV purge may have caused deterioration of the camera vidicon tube. The purge gas was subsequently changed to gaseous nitrogen. Several fixes were attempted for the leaking connector, but except for actual capping (and loss) of the connector, no suitable repair procedure has yet been found.</p> <p data-bbox="524 1033 1419 1189">A thermal gradient test was performed on a 3/4" thick slab of 2219 aluminum. Data indicates that the maximum temperature gradient possible is 40°F. per inch. This value is significant for the forthcoming series of tests with the 13-foot tank.</p> <p data-bbox="524 1205 1419 1361">Following the 13-foot tank acceptance tests, the five-foot tank will be reinstalled. The 9-foot "kick stage" tanks have tentatively been scheduled for March 1967 delivery. Test planning is proceeding, based upon that delivery date.</p> <p data-bbox="524 1398 1419 1595">Procurement lead time for a new liquid hydrogen vent and manifold required to support the 13-foot diameter tank tests has been delayed. This delay apparently has resulted from questions concerning justification. If this item is not provided, expulsion flow rates required by research will have to be limited.</p> <p data-bbox="524 1632 1419 1767">Since procurement has been delayed since June 21, and this is a key item for testing the 13-foot tank, the overall research program schedule must be readjusted to reflect this delay.</p>		<p data-bbox="959 389 1411 451">Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK	<p><u>CRYOGENIC PROPELLANT TANK</u> OR0137(I.A.Johnsen)</p> <p>The 156-inch diameter spherical tank successfully passed the imposed acceptance tests on August 24. The tank was pressurized with helium to 160 psig, at four different levels of liquid hydrogen. We detected no leaks greater than 5×10^{-4} <u>std. atm. cc</u> , which was the minimum discernable leak rate possible with the facility system.</p> <p>Following this test, the 5-foot heavy wall tank was reinstalled in the vacuum chamber, and preparations are progressing for a resumption of the test series interrupted for the acceptance test. The next scheduled test with the 5-foot tank will be at the 75% ullage level.</p> <p>Leak checks on instrument connectors for the 13-foot tank indicate that about half of them have leak rates greater than specified by contract. Replacement connectors are being investigated by NASA, Lockheed, and Physical Sciences Corporation. An immediate design solution and procurement is required to meet the proposed test schedules.</p> <p>The servo module for the Ruckers' hydraulic actuator was relocated to reduce overheating and consequent DC shift of the actuator.</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p>

August 1966

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="487 385 876 449"><u>CRYOGENIC PROPELLANT TANK</u> OR0137(I.A.Johnsen)</p> <p data-bbox="487 480 1380 640">On September 14, while filling the five foot heavy walled test tank with liquid hydrogen, an approximately 5 cc/sec gas leak developed inside the vacuum chamber. The test run was rescheduled to September 15 so the condition could be corrected.</p> <p data-bbox="487 672 1380 885">On September 15, data was recorded during 18 successful passes. Tests were made using both gaseous helium and gaseous hydrogen at 300°R. All tests, both pressure-hold and pressure-slosh, were run with 75% ullage level and at a tank pressure of 50 psia. Two passes were made to checkout the controls for the next series of scheduled slosh-during-expulsion runs.</p> <p data-bbox="487 917 1347 981">On September 20, sixteen slosh and expulsion runs were made. All tests were made with 300°R gaseous hydrogen.</p> <p data-bbox="487 1012 1347 1108">On September 21, twenty slosh and expulsion runs were made. All of these tests were made with 300°R gaseous helium.</p> <p data-bbox="487 1140 1347 1236">The runs scheduled for the last week of September were postponed because of wall temperature sensor problems and central recording system difficulties.</p> <p data-bbox="487 1268 1347 1300">The status of the "K" Site test program is as follows:</p> <p data-bbox="487 1332 1347 1842"> (1) The 5-foot heavy wall tank program is nearly complete. (2) The 5-foot thin wall tank is scheduled to be delivered to Cleveland by October 24. It will take approximately three weeks to instrument the tank before it can be delivered to Plum Brook. The test program could be completed in two to three weeks. (3) The 7-foot tank is expected to be ready for testing by mid-February 1967. (4) The 13-foot tank is ready for test. If it is decided that a splash pan is necessary, testing will be delayed until approximately March 1967. </p>		<p data-bbox="893 385 1380 449">Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME RESEARCH INSTALLATION & DESCRIPTION
K	<p data-bbox="328 271 483 363">CRYOGENIC PROPELLANT TANK SITE</p> <p data-bbox="527 374 917 435"><u>CRYOGENIC PROPELLANT TANK</u> OR0137(I.A.Johnsen)</p> <p data-bbox="956 374 1373 472">Cryogenic propellant pressurization and dynamics testing.</p> <p data-bbox="527 500 1360 562">The test operations report on the thick-walled, 5-foot diameter tank is as follows:</p> <p data-bbox="605 596 1422 721">On October 11, nine expulsion-slosh data runs with 300°R. helium were completed. These tests determined the effect of anti-slosh baffles on the mass ratio (w/gas--w/liquid).</p> <p data-bbox="605 756 1386 880">On October 14, eight more data runs were completed. These tests were identical to the previous series except that the pressurant gas was changed from helium to hydrogen.</p> <p data-bbox="605 915 1390 1007">On October 20 and 26, gas injector evaluation tests were conducted. Radial and straight pipe injectors were tested.</p> <p data-bbox="605 1042 1377 1103">Boiloff testing is scheduled for the first week in November. This will complete the test program.</p> <p data-bbox="527 1138 1419 1293">The thin-walled, 5-foot tank testing is scheduled for December. Akron Steel Fabricators is expected to deliver the tank to Lewis-Cleveland by November 18. The tank will be instrumented at Cleveland, before delivery to Plum Brook.</p> <p data-bbox="527 1328 1347 1420">Preliminary drawings on the suspension system for the 9-foot kick stage tank were completed and are being reviewed.</p> <p data-bbox="527 1455 1422 1770">The estimated delivery of the vacuum chamber catch basin is February 15, 1967. Cleveland-Lewis will have the basic liner fabricated by an outside contractor. Liner installation, support hardware, and piping will be handled by Plum Brook. The railroad dewar vent system and the new gas manifold system designs were approved and purchase requests will be initiated in November. Railroad dewar blast wall construction is 50% complete and is scheduled to be finished by November 15. All of these items are required for the 13-foot tank tests.</p>

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K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A. Johnsen)</p> <p>On November 2, the 5-foot diameter thick-walled tank boil-off test was completed. During the 5½ hr test, 29.5% of the liquid was evaporated. Data was recorded at each 0.25 of an inch decrease of liquid level. This test concluded the thick-walled tank program.</p> <p>The delivery date of the five-foot diameter, thin-walled tank has been extended from November 18 to December 3. Testing is scheduled to start January 5.</p> <p>Down time between tests is being utilized to complete the instrument connector test rig, ullage sampling system modification, chamber stack modifications, and the thirteen-foot tank systems.</p> <p>Status of the splash pan and emergency drain for the thirteen-foot tank is as follows:</p> <ol style="list-style-type: none"> (1) Union Carbide Corporation, Nuclear Division, Paducah, Kentucky started fabrication of the pan on November 25. (2) Emergency drain design is 75% complete; field work has been started. <p>Railroad dewar vent design is currently being reviewed to reduce contract installation cost. Installation of the railroad dewar blast wall was completed November 25.</p> <p>The seven-foot diameter test tank is scheduled to be insulated during March. A clean room work area will be provided for this work in the compressor building, #5131.</p>		<p>Cryogenic propellant pressurization and dynamics testing.</p>

December 1966

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K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> OR0137 (I.A. Johnsen)</p> <p>On December 6, the accuracy of the hot wire hydrogen liquid level sensors was investigated. Liquid levels were measured within $\pm .050$ of an inch. The sensors will be installed in the 5' thin-walled tank at 5% and 95% ullage level. Testing is scheduled for January 17 and 18.</p> <p>The railroad dewar burnoff design is complete. The design and purchase request for material have been submitted for approval. The burnoff will be fabricated and installed in-house.</p> <p>The high-pressure gaseous hydrogen manifold will be installed by contract. The design is complete. Contract specifications will be completed by January 15.</p> <p>Delivery of the splash pan from Union Carbide Corporation, Nuclear Division, Paducah, Kentucky, is expected by January 15. The splash pan emergency drain design is complete. Field installation and purchase of materials is in progress.</p> <p>The 5' thin-walled tank instrumentation and volume calibration were completed. A portable cradle for handling the 5' thin-walled tank was fabricated.</p> <p>Status of other site projects is as follows:</p> <ol style="list-style-type: none"> (1) 13' tank instrument rake - complete (2) Stack modifications - 50% complete (3) Residual gas analyzer vacuum isolation system - 90% complete (4) Ullage sampling system - 50% complete (5) Instrument connector test rig - 40% complete 	<p>Cryogenic propellant pressurization and dynamics testing.</p>

January 1967

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="479 362 908 424"><u>CRYOGENIC PROPELLANT TANK</u> YOR1573(I.A.Johnsen)</p> <p data-bbox="487 486 1362 694">Twenty data runs were completed during January. Ten static expulsions were made with gaseous hydrogen and gaseous helium at 520°R. Ten shake expulsions were made with gaseous hydrogen and gaseous helium at 300°R. These tests completed the five-foot diameter chem milled tank program.</p> <p data-bbox="487 714 1362 880">The 13-foot diameter tank test is tentative scheduled for March 29. Procurement of the railroad gas manifold, however, is three weeks behind schedule and will delay testing to late in April. Status of other jobs required for the 13-foot tank program is as follows:</p>	<p data-bbox="941 362 1280 455">Cryogenic propellant pressurization and dynamics testing.</p> <ol data-bbox="495 911 1362 1864" style="list-style-type: none"> (1) Splash pan was delivered to the site January 31. 70% of the materials are available. Installation will begin February 2. (2) Emergency drain: Fabrication and delivery of parts is approximately 90% complete. Field work is 25% complete. Job completion is scheduled for March 1. (3) Railroad liquid hydrogen dewar vent and manifold will be installed in-house. Procurement of the high pressure manifold and vent pipe has been initiated. The electrical design will be completed by February 9. Concrete piers for pipe supports have been poured. Estimated job completion date is March 20. (4) The electrical changeover to the 13-foot tank pressurizing system is 90% complete. Piping changeover in the test cell will be started by February 1. (5) Decision on the installation of a TV port in the 13-foot tank is required. Lead time to procure and fabricate facilities for cold shocking and pressure testing the tank is approximately 16 weeks. If the TV port is required, a decision to go ahead must be made soon or the research program will be delayed.

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K	CRYOGENIC PROPELLANT TANK SITE	<u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (I.A.Johnsen)		<p>Cryogenic propellant pressurization and dynamics testing.</p> <p>Preparations for the 13' diameter tank tests have continued through February. Status of major tasks in process is as follows:</p> <ol style="list-style-type: none"> (1) The splash pan installation is complete. Quality of material received was good, except that minor metal removal was necessary on the flange of the door neck section. (2) The emergency drain piping installation is 80% complete. All material, including the long-delayed plastic pipe, is now on hand. (3) Vent installation for the railroad hydrogen dewar is approximately 60% complete. The electrical design is now complete. The originally scheduled March 20 completion date still remains in effect. (4) Piping and related electrical changeover for the 13' tank pressurization system has fallen behind schedule. It is expected that additional manpower will remedy this problem area. (5) Instrumentation of the 13' tank walls is underway, and will be complete by March 7. Internal instrumentation rakes have been fitted to the tank brackets. The thermopile modules, which are currently being installed, are on the critical path for testing of the 13' tank. (6) No confirmation has yet been received on the installation of the 13' tank TV port. As a result, no facilities for window-proof testing are on order or in preparation. <p>First tests for the 13' tank are scheduled for April.</p>

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K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (I.A.Johnsen)</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p> <p>The 13' diameter tank tests are scheduled for April 21 with operational checkout runs scheduled for April 18 and 19. Checkout runs will include a partial fill, pressurization, expulsion and sample data acquisition.</p> <p>All mechanical type system modifications have been completed. Approximately 200 manhours of electrical work remains on these modifications. The major remaining task is the installation of internal tank instrumentation. Both the electrical and instrumentation work has been assigned extra manhours; neither job is expected to delay the test date.</p> <p>Preliminary work on the 9' diameter oblate spheroid tank is as follows:</p> <ol style="list-style-type: none"> (1) Transportation dolly and work platform have been delivered to and inspected by Lewis-Cleveland. (2) Chamber work platform fabrication was awarded and the contract completion date is May 20. (3) Access ladder design is complete and being processed for final approval. (4) <u>Suspension system design is complete; specifications are being drafted for contractor bids (IFB).</u> (5) Delivery of the Lockheed tank is scheduled for mid-May. Final proof tests will begin April 18. A contract extension (139 days) has been given to Boeing and the tank delivery is expected in July. <p>The 7' tank modification contract has been signed with Lockheed; delivery is scheduled for May 1. Fabrication of a mobile work platform will be completed by April 7th; contractor is Sandusky Fabrication and Sales. Tools required for insulating the tank are being ordered by Lewis-Cleveland personnel.</p>

April 1967

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K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="446 341 859 414"><u>CRYOGENIC PROPELLANT TANK</u> YOR1573(I.A.Johnsen)</p> <p data-bbox="446 476 1247 735">On April 28, an operations test with the 13-foot diameter tank test system was completed. Three Rosemont circuits appeared open, necessitating a modification of tank pass-through connectors. Additional time will also be required to finalize settings on the pressurant gas controllers. The first research data run with the 13-foot tank has been scheduled for May 11 and 12.</p> <p data-bbox="446 777 1247 942">The high-pressure gas manifold contract is expected to be awarded by May 10. The completion of this manifold will enable railroad tubers to be used at "K" Site and significantly expedite the 13-foot tank tests.</p> <p data-bbox="446 984 1247 1170">Final assembly of the cryogenic-vacuum hardware evaluation rig will be completed by mid-May. Primary purpose of this test rig will be to evaluate leak rates and electrical characteristics of vacuum to liquid hydrogen instrument pass-throughs.</p> <p data-bbox="446 1212 1247 1429">A semi-clean assembly room for insulating the 7- and 9-foot test tanks is in the initial planning stages. The room layout, size, and location have been finalized. Approximately 1600 square feet of floor space is required. The assembly room will be located in the Reactor Assembly, Test, and Storage (ATS) building.</p>	<p data-bbox="916 341 1247 445">Cryogenic propellant pressurization and dynamics testing.</p>

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K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> YOR1573(I.A.Johnsen)</p> <p>Four test days with the 13-foot tank at 50 psia were completed during May. Each test day consisted of two pressure ramp-hold tests and three expulsion runs. Test modes were as follows:</p> <p style="padding-left: 40px;">May 12 - GHe pressurant at 300°R May 18 - GHe pressurant at 520°R May 19 - GH₂ pressurant at 520°R May 24 - GH₂ pressurant at 300°R</p> <p>The ullage gas analyzer system design and installation were completed, and the system was used during the helium pressurant tests. For the month of June we have scheduled straight pipe injector and slosh tests.</p> <p>The connector test rig installation is nearly 75% complete. One Physical Sciences pass-through connector is available for testing. In addition, a Plum Brook experimental model is also available. It is expected that these tests will begin in late June or early July.</p> <p>On May 19, the Lockheed-built 9-foot oblate spheroid tank was received at Plum Brook. This tank was stored in the Reactor ATS Building. To facilitate later transfer to "K" Site, the tank was left in the shipping crate.</p> <p>A semi-clean room assembly area for tank insulation work was designed. This design is being processed for final approval. Erection of the contractor-built module within the ATS Building is expected by July 1. Addition of electrical work and a blower system will complete the assembly by mid-July.</p> <p>Preliminary shop work on piping and minor electrical field work was begun on the railroad high-pressure gas manifold. The contractor, Valley Electric, will begin the major field installation on June 12.</p> <p>Bids for the new pressurant gas system relief vent are scheduled to be opened June 5.</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p>

June 1967

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="537 385 932 447"><u>CRYOGENIC PROPELLANT TANK</u> YOR1573(I.A. Johnsen)</p> <p data-bbox="537 520 1305 609">Three tests were completed on the 13' tank during the month of June. A summary of runs is as follows:</p> <p data-bbox="615 648 1398 741">June 9 - Straight pipe injector tests - 2 runs June 16 - Pressure-effect tests @ 75 psia - 4 runs June 27 - Pressure-effect tests @ 35 psia - 4 runs</p> <p data-bbox="537 779 1321 1065">Fabrication of module panels for the insulation assembly area was awarded to Fries Lumber, Huron, Ohio. The original all-wood modular design was modified to incorporate a fabric-reinforced, polyethylene roof. Polyethylene, .006" thick, was also added as a portion of one wall to make use of natural lighting. Erection of this "semi-clean" room in the ATS Building should be complete by July 14.</p> <p data-bbox="537 1089 1373 1251">The railroad high-pressure manifold, contracted for by Valley Electric, is 75% complete. July 15 is the scheduled completion date. Use of this manifold will be required during the latter part of July to support 55% ullage tests on the 13' tank.</p> <p data-bbox="537 1290 1308 1390">Low bid for the new pressurant gas system relief vent was approximately 50% above the Government estimate. Price negotiations are in progress.</p>	<p data-bbox="976 385 1289 482">Cryogenic propellant pressurization and dynamics testing.</p>

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K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> YOR1573(I.A.Johnsen)</p> <p>On July 7, seven data runs at 28% ullage (13' dia. tank) with 300°R GHe were attempted. Three pressure-hold runs were acceptable. However, the four planned pressure-hold-slosh runs could not be accomplished due to severe tank depressurization effects during initial slosh conditions. Maximum tank pressure drop was 13 psi from the nominal 35 psig tank pressure.</p> <p>On July 11, 17, and 24; checkout runs to measure, analyze, and modify the tank pressure control loop were conducted. System modifications were devised, as listed below, which limited the pressure drop to only 2 psi:</p> <ol style="list-style-type: none"> (1) Modified valve #253, which was not stroking properly; (2) Increased control orifice diameter; (3) Replaced control pressure transducers with others to improve frequency response; (4) Reduced pressure control error signal; (5) Changed pressure control valve trim from linear to percentage trim; (6) Increased pressurant gas supply pressure to 450 psi; (7) Modified controller electronic circuitry to reduce pressure oscillations caused by the increased system gain. <p>On July 25, four pressure-hold-slosh tests at 28% ullage were successfully run with 300°R GH₂. One GHe test run was also made. In addition, one trial run was conducted to verify the performance of the pressure control system at 55% ullage. The remaining tests at 28% ullage with 300°R GHe are scheduled for August 3.</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME RESEARCH INSTALLATION & DESCRIPTION
K	<p>CRYOGENIC PROPELLANT TANK SITE (Continued)</p> <p><u>CRYOGENIC PROPELLANT TANK (Continued)</u></p> <p>Because of the time required to modify the pressure control system, the program did not proceed as planned for July. It is now planned to temporarily suspend the 13' diameter tank tests in order that contract obligations are satisfied with the Lockheed "kick stage" tank. Terms of the contract require acceptance testing to be performed by the end of August.</p> <p>Status of current "K" Site contracts is as follows:</p> <ul style="list-style-type: none"> (1) The high pressure railroad manifold will be completed by August 15. (2) The pressurization gas vent and relief modification contract was awarded to Lieb-Jackson, Inc., of Columbus. Site work will begin August 7 with contract completion scheduled for September 21.

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> YOR1573(I.A.Johnsen)</p> <p>During August, five test days were accomplished with the 13' tank. A sixth run day was attempted, but overspeeding of the liquid hydrogen turbine flowmeter on the second data pass forced a cancellation. All test days were accomplished using either gaseous hydrogen or helium at 300°R. Tests ranged from pressure-hold types to slosh with expulsion. The flowmeter overspeed was caused by loss of the flowmeter feedback signal to the flow controller. This, in turn, actuated the flow control valves to the 100% open position, thus overspeeding the flowmeter. This test is rescheduled for September 8, which will complete the 13' tank program.</p> <p>Insulation of the 7' Lockheed tank is approximately 30% complete. September 15 is the scheduled completion date, and the testing of this tank should begin in October.</p> <p>Two contracts were completed during August. The heat exchanger relief valve system is complete and now in operation. In addition, the railroad gas manifold was completed and was used during the last four days of testing.</p> <p>The next test series in the "K" Site program will be acceptance testing of the Lockheed 9' tank. This is basically a warm leak test. It is scheduled for September.</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p>

September 1967

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="488 348 898 415"><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (I.A.Johnsen)</p> <p data-bbox="488 485 1372 621">Four tests were run on September 12 to complete the 13' diameter tank program. The tank was then sprayed with a strippable coating and stored for possible future programs.</p> <p data-bbox="488 653 1394 720">A summary of 13' tank test modes and objectives included the following:</p> <ol data-bbox="488 751 1422 1478" style="list-style-type: none"> (1) GH₂ and GHe pressurant effects. (2) Pressurant gas temperature effects at 300°R and 520°R. (3) LH₂ outflow rates of 12.0, 8.08, 5.84, 4.82 and 4.0 lbs/sec. (4) Pressure ramp rate of 30, 60 and 90 seconds. (5) Ullage effects at 5%, 28%, 55% and 75% volumes. (6) Slosh effects at stable planar, splash planar, and unstable liquid conditions. (7) Antislosh baffle effects. (8) Thirty and 300 second tank pressure hold effects. (9) Straight pipe versus hemispherical injector effects. (10) Tank pressure effects at 50 and 75 psia. <p data-bbox="488 1514 1410 1703">Acceptance leak tests for the Lockheed 9' tank are scheduled for October 10. This tank is now in place in the "K" Site vacuum chamber. The latest delivery estimate for the Boeing 9' tank is October 23. If the present delivery schedule is met, the Boeing tank will be acceptance tested before the 7' tank insulation tests.</p>	Cryogenic propellant pressurization and dynamics testing.	

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="505 436 1081 474"><u>CRYOGENIC PROPELLANT TANK (Continued)</u></p> <p data-bbox="505 516 1325 657">Insulation and instrumentation of the 7' tank is virtually complete, except for the top and bottom hat sections. Status of the facility for insulation boil-off tests is as follows:</p> <ol data-bbox="505 695 1341 1430" style="list-style-type: none"> <li data-bbox="505 695 1341 789">(1) A new (more sensitive) tank pressure controller, sensors and valves have been installed. Wiring is now in progress. <li data-bbox="505 821 1308 947">(2) Hardware for the constant temperature bath (used to provide a constant pressure reference for the tank pressure control transducer) is available and ready for installation. <li data-bbox="505 978 1341 1178">(3) Insulation substrate purge gas control selsyn motors, valves, and drive have been delivered. Installation is in progress. Five Hastings flowmeters (to be used for measuring purge flow) are on order. Delivery of these flowmeters is the most critical item for boil off tests. <li data-bbox="505 1209 1341 1430">(4) Boil off gas measurement will be a two part system to accommodate the various flow rates associated with ground and space hold tests. Low flow will be measured by means of a standard gas meter already on hand. High flow rates will be measured either by an orifice plate or a turbine type meter. <p data-bbox="505 1461 1373 1587">Connector test rig completion has been delayed because of 7' and 9' tank efforts. Work yet remaining includes the vent stack installation, wiring of the vent fan motor, and gas detector installation.</p>		

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (I.A. Johnsen)</p> <p>Current tasks are centered about acceptance leak testing of both the Lockheed and Boeing 9' oblate tanks. The Lockheed tank testing has been completed. Two test methods indicated a maximum leak rate of 2.2×10^{-4} atm. cc He/sec. This compares with a specified leak rate of 10^{-6} cc/sec. Pending a Cleveland research decision to accept or reject the tank, it was re-crated and prepared for storage.</p> <p>The Boeing 9' tank was delivered to Plum Brook on October 25. The tank is being prepared for leak testing. These tests are planned for completion by November 10.</p> <p>The Lockheed 7' tank is in the final stages of insulation. Material has been cut for the upper and lower hat sections, and is ready for installation. Purge lines, valve operator line, and fill line adapters were fabricated and installed. Leak testing is in progress. The completely insulated tank is scheduled to be delivered to "K" Site by November 10.</p> <p>Test cell preparation for the 7' tank boil-off program is in progress. The tank pressure control system is 50% complete. Boil-off flow will be measured by a recently borrowed 23,000 CFH/hr gas meter. Procurement of Hastings flow meters for helium substrate purge measurements remains a critical item. First testing with the 7' tank should begin approximately December 1.</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (I.A. Johnsen) (CRD - R.L. DeWitt; RSD - J.V. Gillette)</p> <p>Contract acceptance leak tests were completed on the Boeing 9' diameter ablate tank. Leakage rate of the tank was less than the contract-specified 1.1×10^{-5} cc He/sec. Following completion of this test, the tank was sprayed with a strippable coating and stored in Building 9205.</p> <p>Test of the Lockheed 7' diameter tank is scheduled to begin the week of December 18. One problem area has been the tremendous amount of time needed to acquire the Hastings flow meters for insulation purge. As a result it has been necessary to provide an alternate measuring system. The 7' tank will be delivered to "K" Site and installed in the chamber on December 4. Checkouts have been planned to try to insure sufficient reliability of equipment to last through the boil-off test.</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="472 308 889 410"><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - R.L. DeWitt; RSD - J.V. Gillette)</p> <p data-bbox="472 445 1260 676">Insulation tests with the Lockheed 7' tank were rescheduled for January 8. The original schedule of December 18 did not materialize because of late delivery of the tank to the site due to insulation and weather problems. Lack of manpower during the holidays also made testing impractical.</p> <p data-bbox="472 711 1268 840">In the meantime, systems checkouts are continuing. Particular attention has been placed upon the new tank pressure control device, which is the key to accurate data during the boil-off test.</p> <p data-bbox="472 874 1247 1003">Ground has been broken for installation of a new control cable between the test facility and "K" Control. Completion of the contract is expected by mid-March.</p>	<p data-bbox="935 308 1260 410">Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="423 249 841 344"><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - R.L.DeWitt; RSD - J.V.Gillette)</p> <p data-bbox="423 381 1256 1130">On January 16, evaluation of the Lockheed insulation system was started. The insulated 7-foot diameter tank consists of a helium purged sublayer of fiberglass, an "Aclar" membrane, and three multilayer blankets of aluminized mylar with dexiglass spacers. The test sequence started with a simulated ground-hold condition and continued into a simulated space condition. The ground-hold condition was produced by purging the test chamber with nitrogen at one atmosphere pressure, starting the helium flow to the insulation purge system and loading the tank with liquid hydrogen. After the ground-hold data was obtained, the test chamber was evacuated to 100 microns with the roughing pumps and then the four diffusion pumps were started. Testing proceeded well until the heaters on the two CVC diffusion pumps burned out. The heater failure was initially attributed to the high gaseous throughput which carried the diffusion pump oil into the forepump line. The large throughput was caused by helium used to purge the insulation, plus the sublimation of nitrogen which froze on various pipe surfaces during the ground-hold.</p> <p data-bbox="423 1167 1230 1453">On January 23, the test sequence was reversed. The test chamber was evacuated using the two remaining Edwards diffusion pumps. No helium purge was used and the test tank was filled with liquid hydrogen. After obtaining the data at space conditions the vacuum system was valved off, the helium purges started and the test chamber was brought to atmospheric pressure by addition of nitrogen gas. A successful test resulted.</p> <p data-bbox="423 1489 1263 1647">On January 30, another "space-to-launch" sequence was attempted. After 16 hours of pumping, one of the two remaining Edwards pumps overheated and was valved off. Fifteen hours later the last pump overheated and the test was terminated.</p> <p data-bbox="423 1663 1263 2016">At this time it is believed that the January 30 failure of the Edwards pumps is not associated with the January 16 failure since the pumps were serviced after the January 16 run and ran satisfactorily on January 23. Extensive investigations are underway and are currently directed toward the possibility of diffusion pump oil contamination and the effects of the cold outdoor temperature environment during operation.</p>		<p data-bbox="885 249 1208 344">Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="538 343 935 466"><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - RL DeWitt; RSD - JV Gillette)</p> <p data-bbox="538 506 1331 690">No test operations were scheduled during February. Efforts, instead, were devoted to the repair and revision of the vacuum system. Some additional work was put into the modification of the connector test rig for a forthcoming "thermal link" test series.</p> <p data-bbox="538 731 1364 956">At the time of the Edwards diffusion pump failures (see January 1968 report), it was planned to replace the heaters and continue immediately with the test program. Closer investigation revealed, however, that accomplishing other vacuum system changes at this time would be the best plan. Therefore, the following work program was initiated.</p> <ol data-bbox="546 987 1372 1488" style="list-style-type: none"> (1) Removed all four diffusion pumps--cleaned boiler and nozzle assemblies. Straightened and leak-checked the two CVC diffusion pump boiler bottoms. (2) Cleaned forelines and roughing pumps. (3) Installed LN₂ baffles between diffusion pumps and angle valves. Modified forelines and water piping as necessary. (4) Installed thermocouples and an automatic shut-down system to prevent further pump heater burnouts. These thermocouples were placed on the CVC diffusion pump heaters and on the Edwards pump boiler bottoms. <p data-bbox="546 1528 1372 1692">We are still endeavoring to determine the cause of the Edwards pump failure. To prove or disprove the frozen oil theory, thermocouples were installed on the wall of one pump to determine the vertical thermal gradient.</p> <p data-bbox="546 1733 1372 1825">A revised schedule of tests is in preparation. The next space-hold/ground-hold test with the 7' tank will begin March 12.</p>	<p data-bbox="1009 343 1331 435">Cryogenic propellant pressurization and dynamics testing.</p>

March 1968

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - RL DeWitt; RSD - JV Gillette)</p> <p>Test objectives were completed on Phase 1 of the three blanket insulation system for the 7' tank. Objectives included:</p> <ol style="list-style-type: none"> (1) Verification of Lockheed test results. (2) Determination of insulation degradation resulting from cyclic tests. (3) Recording of transient data during pumpdown from atmospheric pressure to space hold conditions. <p>These tests required two, 72 hour periods (March 12-15 and March 19-21). Four ground hold and two space hold boil off tests were completed.</p> <p>The next test series with the 7' tank is scheduled for April 23. In the interim the tank will be returned to the ATS Building, where the insulation</p> <p>(Continued on Page 26)</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE (Continued)	<u>CRYOGENIC PROPELLANT TANK (Continued)</u>		
<p>will be stripped and then reinstalled. Purpose of the next test series will be to determine performance repeatability of the insulation system. The new installation will include changes necessary to support additional blankets for future tests.</p>				
<p>Recently modified vacuum equipment performed satisfactorily during March. However, during the March 12-15 test, one Edwards diffusion pump was shut down manually due to slowly increasing temperature. This was caused by a drop in oil level resulting from solidification of oil on the upper pump wall. Cell ambient temperature was higher during the March 19-21 period, and no problems were encountered. A closed loop glycol system to control the temperature of the diffusion pumps is being studied.</p>				
<p>Current cell activities are directed toward the completion of these items:</p>				
<ol style="list-style-type: none"> (1) Reinsulation of the 7' tank. (2) Completion of the control cable installation contract. (3) Build-up for and conducting of the thermal link test program. (4) Vacuum chamber leak checks and repairs. 				
<p>In addition, diffusion pump baffles recently delivered by CVC and installed have improperly machined "O" ring grooves on the Edwards pump installation. A temporary fix was installed by Plum Brook for the March tests. CVC has been notified of the error, the ring grooves will be remachined, and reimbursement from CVC will be requested.</p>				

April 1968

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT TANK SITE	<p data-bbox="516 369 912 533"><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - RL DeWitt; RSD - JV Gillette & JE Gairelli)</p> <p data-bbox="516 568 1344 727">Major effort during April was directed toward stripping insulation from the 7' tank. Because of instrumentation changes and damaged insulation components, the tests scheduled for the end of April were not accomplished.</p> <p data-bbox="516 762 1328 921">Repairs have been completed on insulation blankets and the aclar purge bag. The 7' tank was leak checked. Reinstallation of the insulation is now about 50% complete. The tank test program is scheduled to resume the latter part of May.</p> <p data-bbox="516 956 1328 1212">The thermal link test facility with thermal links installed has been checked out with LN₂. Stabilization times for the links proved much longer than predicted. This made the 150 liter LH₂ supply too small. Minor modifications are now in progress to enable use of a standard roadable dewar. This test program is planned for completion prior to resuming the 7' tank boiloff tests.</p>	<p data-bbox="987 369 1300 466">Cryogenic propellant pressurization and dynamics testing.</p>

May 1968

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT RESEARCH SITE	<u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - RL DeWitt; RSD - JV Gillette & JE Cairelli)	<p>Cryogenic propellant pressurization and dynamics testing.</p> <p>The thermal link test program was completed during May. Six thermal links of various materials and configurations were tested. Data from these tests will be used in forthcoming tests of the flat-plate calorimeter at "C" Site.</p> <p>Reinsulation of the 7-foot Lockheed tank was completed. The tank was moved back to "K" Site and reinstalled in the vacuum chamber. While the tank was at the Assembly, Test, and Storage Building, the tank piping and instrumentation pass-throughs were leak checked and some instrumentation changes were made. As an aid in determining the LH₂ saturation point in boil-off tests, a small heat source was installed in the tank. The next boil-off test is scheduled for the week of June 3.</p> <p>Downtime between insulation tests was used to conduct further system leak-checks on the 25-foot vacuum chamber. Several pass-throughs were modified as a result of these tests. Chamber pressures in the 10⁻⁶ Torr range have subsequently been achieved.</p> <p>Preparations for methane (liq. CH₄) pressurization and expulsion tests with the 5-foot thick wall tank have been started. Delivery and storage arrangements for methane are complete and various components and materials are on order. Preliminary designs for the liquid sampling system and tank instrumentation are underway.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p>	<p><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - RL DeWitt; RSD - JV Gillette & JE Cairelli)</p> <p>Two insulation boil-off tests were conducted with the Lockheed 7' tank during June. In all cases the working fluid was LH₂.</p> <p>The first test, June 4 through June 6, was an evaluation of the reinsulated tank. Since previous tests the tank had been stripped down to the Aclar substrate purge bag, repairs made, and the three multilayer blankets reinstalled.</p> <p>Following this test a fourth blanket was added to the tank. Some difficulties were encountered due to poor quality of the Lockheed-supplied blankets. A partial list of problems includes misaligned blanket support straps, buttons improperly located and ties not properly trimmed, and blankets cut oversize.</p> <p>A combination of reassigned hours and overtime enabled the job to be completed in two weeks. As a result it was possible to test the four blanket configuration June 26 through June 28.</p> <p>The next test is scheduled for July 22. This test will be with a five blanket, purged substrate insulation system.</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p>

July 1968

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	CRYOGENIC PROPELLANT RESEARCH SITE	<p data-bbox="451 358 883 487"><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - RL DeWitt; RSD - JV Gillette)</p> <p data-bbox="451 520 883 717">The five-blanket, purged substrate insulation boil-off test was completed during the period July 15 through July 18. This was the sixth test in the Lockheed 7' tank series. The seventh and final test with a six-blanket (60 layer) insulation system is scheduled for the week of August 5.</p> <p data-bbox="451 749 883 1008">To reduce insulation chilldown time during the five-blanket test, helium was admitted to raise vacuum chamber pressure to 12 microns. Chamber pressure was held constant for 2-1/2 hours after filling the LH₂ tank. Using this method the total test time was reduced approximately 10 hours. Even larger savings are expected for the six-blanket test.</p> <p data-bbox="451 1040 883 1326">Other activities include setting up for LH₂ cold wall sample tests in the "little rig". These samples are made from aluminum honeycomb cemented to an aluminum backing plate. Objectives of the test are to determine wall temperature gradients and to evaluate integrity of the adhesive bond with thermal cycling. Test results will be applied to the design of LH₂ cold walls for forthcoming shadow-shield tests.</p> <p data-bbox="451 1358 883 1588">Preparations for the liquid methane program are also underway. The Gow-Mac ullage sampling system has been calibrated for methane. The 5', thick-walled tank has been shipped to Cleveland for instrumentation. A contract was awarded for liquid sampling system solenoid valves. Delivery is expected September 30.</p>	<p data-bbox="883 358 1395 455">Cryogenic propellant pressurization and dynamics testing.</p>

August 1968

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT RESEARCH SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - RL DeWitt; RSD - JV Gillette)</p> <p>The seventh, and final, test in the Lockheed 7' tank series was performed during the period August 5 to August 7. This completes a long series of boil-off tests on the purged substrate, multi-layer insulation scheme.</p> <p>As in the previous test, vacuum chamber pressure was raised (to 14 microns) for a period of four hours after filling the LH2 tank. It is estimated that approximately 24 hours of chilldown time was saved during this six-blanket, 60 layer test.</p> <p>On August 1, 8, and 27, tests were performed on cold wall material samples in the "little rig". These tests provided a total of five temperature cycles between 200°R and LH2 temperature. The honeycomb fin temperature gradient was higher than expected. There was also evidence of bond deterioration between the fins and base plate in five of the six bonding agents tested.</p> <p>Preparations continue for the liquid methane tests scheduled to begin in October. Diaphragms in the actuator shaft seal were replaced. Piping and wiring modifications are also in progress. Bottles for the liquid methane sampling system were due August 22. This material has not been received and the supplying vendor is now on strike.</p>	<p>Cryogenic propellant pressurization and dynamics testing.</p>

September 1968

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	CRYOGENIC PROPELLANT RESEARCH SITE	<p data-bbox="520 414 949 549"><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - RL DeWitt; RSD - JV Gillette)</p> <p data-bbox="520 580 1313 745">Work continued in preparation for 5' tank methane tests during September. The vacuum chamber was checked for leaks and three major leaks were found in the TV case, the 36" chamber relief valve, and in the tubing for the LN₂ cooled baffle plates.</p> <p data-bbox="520 777 1280 839">The Aerovac residual gas analyzer was calibrated using H₂ and CH₄.</p> <p data-bbox="520 870 1247 901">The LCH₄ sampling system status is as follows:</p> <ol data-bbox="520 932 1346 1522" style="list-style-type: none"> 1. Five bottles were made available to start bottle rack assemblies. The original order of 70 bottles which has been delayed due to a strike at the supplier's plant were received on September 30. 2. The electrical wiring for the liquid sampling system is complete outside the chamber. Remaining wiring will be completed after the test tank is installed in the chamber. 3. Sample system heaters were shipped September 22. The thermostats have been delayed due to lack of materials but should be delivered by October 4. 4. Solenoid valves were shipped on September 27, but have yet to be delivered. <p data-bbox="660 1554 1007 1585">(Continued on Page 30)</p>	<p data-bbox="991 414 1313 518">Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME RESEARCH INSTALLATION & DESCRIPTION
K	<p>(Continued)</p> <p><u>CRYOGENIC PROPELLANT TANK</u> (Continued)</p> <p>5. Relief and check valve delivery is expected by October 14.</p> <p>The AEC railroad car which will be used for GCH₄ supply was checked for alignment with "K" Site gas manifold. Adapter spool pieces are needed to connect the car. Grayloc flanges are being purchased to complete the installation.</p> <p>The instrumentation on the 5' tank is slower than anticipated. The tank should be received at Plum Brook about October 10. Since at least two weeks of work remain to be done after the tank is received, the first Methane test will not be possible until late October.</p> <p>Sample cold wall tests were continued on September 5, 6, 12, 17, 18, 25, and 26 in the "little LH₂ rig". To date, nine samples with epoxied bonding (aluminum honeycomb on aluminum backing) have been tested. Major conclusions from these tests are:</p> <ol style="list-style-type: none"> 1. The high emissivity 3M black velvet paint does not crack or peel with repeated thermal cycling. 2. No degradation of the strength of the bond could be visually detected. 3. Some degree of deterioration of heat conduction was evident on all samples for at least the first cycle. <p>Three samples remain to be tested. They include aluminum honeycomb on stainless steel backing, an epoxy with aluminum filler, and a brazed sample.</p>

October 1968

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT RESEARCH SITE	<p><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - RL DeWitt; RSD - JV Gillette)</p> <p>Preparations for the methane pressurization and expulsion tests were continued during October.</p> <p>The 5' diameter thick wall tank was delivered to "K" Site October 15. The tank was installed in the chamber, and the tank instrumentation sensors verified as to location and channel. Instrumentation, TV and mechanical connections to the tank are currently being finalized. Six thousand gallons of LCH₄ have been delivered to the site. The methane test program was program was presented to the Area 20 Safety Committee and approved.</p> <p>Individual systems were checked out as follows:</p> <ol style="list-style-type: none"> 1. Operated TV 24 hours in vacuum. 2. Changed actuator pass thru seal. 3. LCH₄ sampling system was 90% completed. 4. Set up gas detectors for methane. 5. Cleaned, serviced and checked the Visicorder and strip charts. 6. Made up new (more flexible) tank instrument cables. 7. Changed controls from the 13' to 5' piping system. 8. Installed and calibrated pressure transducers. 9. Rewired pressure controller, flow controller, and run sequence timer. 10. Checked out operation of hydraulic actuator. 	<p>Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	(Continued)	<p data-bbox="495 322 1079 352"><u>CRYOGENIC PROPELLANT TANK (Continued)</u></p> <p data-bbox="495 393 1185 453">The following work was performed in the ATS Building assembly area:</p> <ol data-bbox="495 493 1339 655" style="list-style-type: none"> <li data-bbox="495 493 1339 554">1. Removed and weighed three insulation blankets from the 7' tank; <li data-bbox="495 594 1339 655">2. Removed liquid level sensors for installation in the 5' tank. <p data-bbox="495 695 1364 937">Eight days of cold wall sample testing was completed in the "little rig". Test results indicate that the aluminum honeycomb on aluminum backing with Narmco 329 sheet adhesive is the more promising combination for the 13' cryoshroud panels. Two honeycomb samples remain to be tested. These tests have conflicted with on-site contractors and the methane test preparations.</p> <p data-bbox="495 977 1388 1360">A "K" site utilization meeting was held with research and operations personnel attending. Four test programs, LPG (3 parts); 4' shadow shield; 200 layer insulation; and the 9' shadow shield, were tentatively scheduled through the next 28 months. These programs are estimated to require 17 months of actual testing. Intervals between above tests will be scheduled for the three calorimeter programs. The overall programs appear optimistically tight; however, by utilizing off-site facilities at both Plum Brook and Lewis-Cleveland, buildup in the cell area can be reduced and more actual test time realized.</p>		

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT RESEARCH SITE	<p data-bbox="558 410 959 539"><u>CRYOGENIC PROPELLANT TANK</u> YORI573 (CRD - RL DeWitt; RSD - JV Gillette)</p> <p data-bbox="558 574 1372 703">During November, three run days were scheduled for the liquid methane expulsion test series. The test hardware was the 5-foot, heavy-wall tank; using gaseous methane as the pressurant.</p> <p data-bbox="558 737 1361 895">The first two run days were largely thwarted by a liquid leak at the dewar bayonet connection, leaks through an instrumentation connector in the test tank lid, and an inability to flow at the maximum required expulsion rate.</p> <p data-bbox="558 930 1361 1058">The leaks were repaired, the liquid discharge was switched to the large 4" line, and a third test was run on November 27. Five successful runs were made.</p> <p data-bbox="558 1093 1394 1447">In addition to the methane tests, six Centaur tank instrumentation feed-thrus for B-2 were leak checked in the "little rig". Two LOX connectors were tested in LN₂ and four hydrogen connectors were tested in LH₂. A nominal 6×10^{-8} standard cubic centimeters of helium per second leak was measured on each of five connectors. Leak rate on the sixth connector was too high to measure. Apparently, there was insufficient bonding of the epoxy potting compound. Following repairs, a retest is scheduled for December 13.</p>	<p data-bbox="1032 410 1356 506">Cryogenic propellant pressurization and dynamics testing.</p>

December 1968

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT RESEARCH SITE	<p data-bbox="446 383 852 512"><u>CRYOGENIC PROPELLANT TANK</u> YOR1573 (CRD - RL DeWitt; RSD - JV Gillette)</p> <p data-bbox="446 546 1266 711">Six test days were scheduled during December. Data taken were sufficient to complete the expulsion series using gaseous CH₄ as the pressurant. Both slosh and non-slosh runs were made. All tests were at the 5% ullage start and without tank baffles.</p> <p data-bbox="446 745 1266 1003">One run day was cancelled because of much greater than anticipated gas flow rates at the initiating of slosh. This effect was also observed in previous LH₂ tests, but was much more in evidence with methane. To combat the problem, an automatic linear ramp of slosh amplitude was instituted. In addition it was necessary to increase the supply of pressurant gas available.</p> <p data-bbox="446 1037 1266 1262">The next test series is scheduled to begin during the week of January 6. This series will use helium as the pressurant gas. Repair of a GN₂ leak into the vacuum chamber and repair of the Ruckers hydraulic system must be completed prior to these tests. Also required is a new calibration of the Gow-Mac ullage gas analyzer.</p> <p data-bbox="446 1296 1266 1520">The liquid methane sampling system has not yet been successfully demonstrated. Solenoid valves, essential to operation of the system, have been leaking both through the valve and through body seals into the vacuum chamber. An in-house designed and built valve has been checked out, and these valves will be installed for the next test series.</p> <p data-bbox="446 1554 1266 1719">In addition to the methane tests, several liquid level point sensors for the Centaur LH₂ tank were calibrated in the "little rig". Calibration included voltage vs. current characteristics for the sensor, both in and out of liquid hydrogen.</p>	<p data-bbox="885 383 1250 483">Cryogenic propellant pressurization and dynamics testing.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	CRYOGENIC PROPELLANT RESEARCH SITE	<p data-bbox="505 373 906 403"><u>CRYOGENIC PROPELLANT TANK</u></p> <p data-bbox="505 439 805 502">(CRD - RL DeWitt; RSD - JV Gillette)</p> <p data-bbox="505 538 1386 757">Nine liquid methane program test days were accomplished during January. All of the desired temperature and slosh data were recorded for the helium pressurant gas series at 5% ullage. Hydrogen gas pressurant tests are now about 35% complete. Several expulsions must be rerun due to a leak discovered at the pressurant gas data orifice.</p> <p data-bbox="505 797 1268 856">Several problems have restricted test operations during the month.</p> <ol data-bbox="505 890 1386 1407" style="list-style-type: none"> <li data-bbox="505 890 1349 1049">1. The liquid sampling system did not obtain full operation. Several valve leak problems had to be solved. Because of the undersized vent line, only three of the five requested samples could be obtained. A larger vent is now being installed. <li data-bbox="505 1089 1386 1407">2. The hydraulic shaker has operated in an intermittent fashion. Evidence of poor workmanship by the vendor has been uncovered and repaired, but as of this writing, no significant trouble source has been pinpointed. Problems in this area have been serious. During one checkout, the hydraulic control was lost, and excessive "G" loads were placed into the test package. The instrumentation rake that is suspended in the 5' tank was damaged. <p data-bbox="505 1443 1333 1602">Tests scheduled for February include completion of the hydrogen and nitrogen pressurant expulsions. In addition 17 runs have been added to the methane gas pressurant program. This will add two weeks to the methane program.</p> <p data-bbox="505 1622 1414 1711">Several project meetings have been held in support of future "K" Site programs. Piping schematics and detailed schedules are being compiled for each program.</p> <p data-bbox="505 1731 1406 1890">The aluminum calorimeter was delivered to ATS Building from "J-3". The spiral wrap insulation is on hand. The tank has to be insulated before the April test runs, but it has been impossible to obtain personnel for the insulation application because of top priority work at B-2.</p>		<p data-bbox="1024 373 1349 473">Cryogenic propellant pressurization and dynamics testing.</p>

February 1969

SITE	SITE NAME RESEARCH INSTALLATION & DESCRIPTION
K	<p data-bbox="284 228 446 347">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="511 347 917 447"><u>CRYOGENIC PROPELLANT TANK</u> (CRD - RL DeWitt; RSD - JV Gillette)</p> <p data-bbox="998 347 1339 447">Cryogenic propellant pressurization and dynamics testing.</p> <p data-bbox="511 487 1347 705">Nine test days were accomplished during the month of February. All of the pressurization-expulsion tests in the liquid methane program were completed at the 5% ullage level in the unbaffled 5' tank. These tests included the remaining GHe pressurant runs, the modified GN2 pressurant runs, and additional GCH4 pressurant runs.</p> <p data-bbox="511 745 1339 1003">GN2 tests with slosh and cold gas were eliminated from the program for the reason that warm GN2 gas quantities for expulsion were significantly greater than for other propellant gases. Additional research data with GN2 would not have provided useful information. Ten GCH4 propellant runs were added to better define the large differences in pressurant quantities between static and slosh conditions.</p> <p data-bbox="511 1033 1299 1222">At this time the vacuum chamber and test tank are open. Instrumentation is being relocated for 50% ullage level tests. The test program will resume on March 11. Based upon present plans, the low pressure methane program should be complete about the end of April 1969.</p> <p data-bbox="511 1262 852 1292"><u>MULTI LAYER INSULATION</u></p> <p data-bbox="941 1262 1299 1322">Insulation tests using 30" calorimeters.</p> <p data-bbox="511 1341 1347 1471">In the 30" calorimeter program, the original multi-layer insulation has been stripped from both copper and aluminum 30" calorimeters. Preliminary checkout of the constant-tension mechanism is complete. And</p>

March 1969

SITE	SITE NAME	RESEARCH INSTALLATION	DESCRIPTION
K	CRYOGENIC PROPELLANT RESEARCH SITE	<p data-bbox="548 403 950 498"><u>CRYOGENIC PROPELLANT TANK</u> (CRD - RL DeWitt; RSD - JV Gillette)</p> <p data-bbox="548 532 1398 823">Instrumentation was relocated from the 5% to the 50% ullage level during the first week of March. This included an instrument modification to retain six liquid level sensors at the 5% ullage level. Testing was resumed on March 11 and completed on March 20. A total of six test days was required to finish the 50% ullage, 5' tank, and LCH₄ propellant expulsion tests. Tests included three pressurant gases (CH₄, GHe, and GH₂) at 400°R tank inlet temperatures.</p> <p data-bbox="548 856 1365 1111">Data was recorded for two phases of pressurization with the above gases and temperatures. The first, pressurant decay, was observed by expelling from 5% to 50% ullage and observing the decay during hold at 50% ullage for slosh and static conditions. The second, engine simulated restart, was accomplished by initiating the pressure ramp and expulsion from the 50% ullage level.</p> <p data-bbox="548 1145 1382 1399">Of the original Phase I methane program, 12 passes remain. These will be slosh tests with tank baffles at 5% ullage. In addition, 11 more slosh tests were added to the methane program to determine the effect of varied amplitude and frequencies at 50% ullage with anti-slosh baffles. Estimated completion of Phase I, low pressure, methane program is still the end of April.</p> <p data-bbox="548 1433 886 1467"><u>MULTILAYER INSULATION</u></p> <p data-bbox="548 1522 1393 1616">Application of the spiral wrap multilayer insulation on the 30" aluminum calorimeter is still in progress. (Continued on Page 31)</p>	<p data-bbox="1024 403 1349 498">Cryogenic propellant pressurization and dynamics testing.</p> <p data-bbox="980 1433 1333 1496">Insulation tests using 30" calorimeters.</p>

SITE	SITE NAME RESEARCH INSTALLATION & DESCRIPTION
K	<p data-bbox="289 254 461 286">(Continued)</p> <p data-bbox="509 322 1036 353"><u>MULTILAYER INSULATION (Continued)</u></p> <p data-bbox="509 389 1422 870">The first insulation attempt was scrubbed after applying sixty layers. The insulation had sagged, and slippage occurred between the layers. Both sag and slippage increased as successive layers of insulation were applied. The original sixty layers were removed and reapplication has started. Retaining lines secured longitudinally to the calorimeter and across every ten layers are being installed to reduce sag and slippage. In addition, the insulation is being applied with decreasing tension, as opposed to constant tension. This will maintain a constant torque in the calorimeter insulation system and eliminate excessive loading of the insulation as the number of layers are increased. Progress meetings are being held every Friday morning during the systems build-up for the calorimeter tests.</p> <p data-bbox="509 906 1328 970"><u>FUTURE PROGRAMS: MULTILAYER INSULATION; ADL SHADOW SHIELD; PENETRATION EFFECT; LIQ. CH₄ PHASES 2 & 3</u></p> <p data-bbox="509 1005 1409 1260">No significant changes in the other programs are being reported. A project meeting was held for the ADL Shadow Shield program and the preliminary SRT Task Plan was reviewed. Fabrication of the 4' test tank cold guard modification is complete and the tank is now ready to be coated with aluminized mylar. These tests are tentatively scheduled for August 1, 1969, based on earliest possible hardware delivery.</p> <p data-bbox="509 1296 1393 1391">The 13' cryoshroud checkprints are currently being reviewed. The design is considered complete, with only the final drawings and specification remaining.</p>

SITE	SITE NAME	RESEARCH INSTALLATION	& DESCRIPTION
K	CRYOGENIC PROPELLANT RESEARCH SITE	<p data-bbox="500 407 902 538"><u>CRYOGENIC PROPELLANT TANK</u> YOR2500 (CRD - RL DeWitt; RSD - JV Gillette)</p> <p data-bbox="500 572 1414 830">Twenty-eight passes were accomplished during five test days in April. These tests completed the 5' thick walled LCH₄ tank pressurization and expulsion program. These were slosh tests performed with anti-slosh baffles installed. Pressurant gases were helium and methane, each at tank inlet temperatures of 400°R and 650°R. Both partial and complete expulsions were made to observe pressurant decay and to simulate engine restart.</p> <p data-bbox="500 864 837 924"><u>MULTILAYER INSULATION</u> YOR2023</p> <p data-bbox="500 958 1398 1381">Current work efforts are being directed toward site buildup for the 30" aluminum calorimeter, continuous wrap insulation tests. The 5'-diameter methane tank and associated piping and valving have been removed. A new vent system with multiple flanges has been installed to accommodate the calorimeter, as well as future tests with cryogenic shrouds. Modified controls and new instrumentation systems are 75% completed. Piping and valve modifications are 30% complete. The major remaining work in the cell is electrical. Depending upon the availability of extra manhours for the electrical work, the calorimeter test program will begin on or about May 20.</p> <p data-bbox="500 1415 1398 1612">Assembly of research hardware is progressing on schedule at the ATS Building. The calorimeter insulation, 160-layer continuous wrap, is complete. The revised insulation procedure significantly reduced insulation sag and slippage, to the satisfaction of both the research and operations engineers.</p> <p data-bbox="500 1646 1414 1842">Remaining work at the ATS Building includes leak-checking and installation of the calorimeter manifold, heater installation on the shroud, and installation of instrumentation thermocouples. A limited amount of preassembly of the shroud and support hardware will be accomplished before shipping to "K" Site.</p>	<p data-bbox="992 407 1317 506">Cryogenic propellant pressurization and dynamics testing.</p> <p data-bbox="992 864 1349 924">Insulation tests using 30" calorimeters.</p>

(Continued on Page 33)

SITE	SITE NAME	RESEARCH INSTALLATION	&	DESCRIPTION
K	(Continued)			<p data-bbox="505 326 1333 393"><u>FUTURE PROGRAMS:</u> MULTILAYER INSULATION; ADL SHADOW SHIELD; PENETRATION EFFECT; LIQ. CH₄ PHASES II & III</p> <p data-bbox="505 425 1386 683">The 8' ADL cryoshroud is scheduled to be cold-shocked and leak-checked by High Vacuum Equipment Corporation during the week of May 5. A "K" Site operations engineer will be present to evaluate the test procedure and verify the results. An aluminized mylar coating is being applied, in-house, to the 4' test tank. The SRT Task Plan has been completed and distributed for final approval.</p> <p data-bbox="505 715 1403 1041">Test hardware for Phases II and III of the high-pressure methane program is being made ready. A fabrication contract was awarded on April 25 for two high-pressure liquid methane tanks. The contract has a 60-to 90-day completion time. Outside-fabricated tank viewports are being experimentally evaluated in LeRC-Cleveland. A high-pressure, liquid methane valve is being evaluated at Plum Brook for vacuum service. Preliminary meetings have been held to discuss controls systems and to evaluate proposed test procedures.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="261 246 423 373">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="483 375 821 439"><u>MULTILAYER INSULATION (YOR2023)</u></p> <p data-bbox="899 375 1235 439">CRD - J. E. MALOY; RSD - N. L. SCHROEDER</p> <p data-bbox="483 473 1398 663">Final site preparations and two days of pretest operations were completed with the 30-inch aluminum calorimeter, continuous wrap insulation system. These tests revealed additional minor work was required on the LH₂ fill valves, vacuum system and instrumentation. Research testing will be started on June 3 or 4.</p> <p data-bbox="483 697 1398 1280">The pretest checkouts on May 26 and 27 revealed a vacuum leak from the vacuum chamber TV purge. Ultimate chamber pressure was 3×10^{-7} torr after the purge line was isolated from the chamber. The heated shroud was operated at 83°F. Surface temperature gradients were less than 2°F as measured on six thermocouples, and oscillatory temperature drift appeared less than 1°F during a one hour period. Backpressure control of the guard and measure tanks was satisfactorily maintained at approximately 17 psia within $\pm .05$ mm Hg and $\pm .0026$ mm Hg, respectively. The measure tank boiloff rate during checkout appeared high. Subsequent check indicated the LH₂ fill line valves were not seating properly. New valve seats were installed, the valve operator stroke was adjusted, and the fill line was flushed to eliminate particles. Four liquid level sensors had been improperly terminated. They are now rewired to the proper indicator lights.</p> <p data-bbox="821 1314 1062 1339" style="text-align: center;"><u>FUTURE PROGRAMS</u></p> <p data-bbox="483 1373 760 1437"><u>8' ADL CRYOSHROUD (YOR3119)</u></p> <p data-bbox="899 1373 1224 1437">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="483 1471 1398 1731">A field inspection of the 8' ADL cryoshroud was made in Boston, Mass. The main conclusion was that additional cold leak checking would be required at K Site when the cryoshroud is delivered. The shroud is expected to be delivered in June. Additional work on the shadow shield, including instrumentation, is required. Completion and delivery will depend on approval of additional contract funding.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="293 226 464 260">(Continued)</p> <p data-bbox="781 260 1146 294" style="text-align: center;"><u>FUTURE PROGRAMS (Cont.)</u></p> <p data-bbox="513 326 1263 389"> <u>FLAT PLATE CALORIMETER</u> CRD - J. E. MALOY; (YOR2023) RSD - N. L. SCHROEDER </p> <p data-bbox="513 425 1403 677"> All major hardware for the flat plate calorimeter is available from C-Site. The insulation shield configuration design has yet to be finalized. Shields will be fabricated and installed at the Reactor ATS Building. A meeting has been scheduled to review the program and determine shroud heater requirements. A revised test program outline was requested, and a preliminary test schedule will be developed. </p> <p data-bbox="513 747 1243 811"> <u>LIQ. METHANE</u> CRD - R. L. DEWITT (YOR2500) RSD - J. E. CAIRELLI </p> <p data-bbox="513 846 1360 902"> No significant changes are reported for Phases II and III of the liquid methane program. </p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="300 225 462 352">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="495 362 836 421"><u>MULTILAYER INSULATION</u> (YOR2023)</p> <p data-bbox="917 362 1258 421">CRD - J. E. MALOY: RSD - N. L. SCHROEDER</p> <p data-bbox="495 460 1356 803">Three boiloff tests were conducted with the spiral wrapped, 160 layer, insulated calorimeter. The lowest boiloff rate recorded was approximately 4.0 SCFH. The expected rate was approximately 1.2 SCFH based on similar insulation systems. Preliminary indications are that the overall thermal coefficient will be higher for this particular system. Future tests with 100, 60, and 20 layers, plus tests with various layer densities are expected to confirm these initial results. The next test with 100 layers is scheduled for July 14.</p> <p data-bbox="495 842 1404 1254">Following the first test, June 3 - 6, 8 thermocouples were installed to verify heat inputs through the piping and suspension hardware. The second test, June 16 - 18, duplicated the first boiloff test result, approximately 4.5 SCFH. The additional instrumentation indicated the temperature gradient through the piping and suspension could not account for this greater-than-expected boiloff. The third test, June 25 through June 30, was conducted with the outer insulation net retainer removed. The retainer tie supports may have caused thermal shorting by crushing the insulation as well as creating poor insulation venting characteristics. The final boiloff rate was approximately 4.0 SCFH.</p> <p data-bbox="673 1283 1031 1323">(Continued on Page 33)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS						
K	<p data-bbox="298 234 472 270">(Continued)</p> <p data-bbox="483 304 1393 632">The spiral wrap insulation tests are requiring more time than originally anticipated. A minimum of two days of pumping at or below 5×10^{-6} Torr is required to assume the insulation is vented prior to filling the calorimeter with LH_2. Four to five days are required to attain and determine steady state conditions. After the test, two to three days warm up are required to prevent condensation on the insulation when the vacuum chamber door is opened. Configuration changes of the insulation will require approximately one week.</p> <p data-bbox="483 663 1365 793">In addition to the above tests, the "Little LH_2 Rig" was operated one day to test an MB submersible pressure transducer for zero shift and sensitivity in LH_2. This work was done for the Plum Brook calibration lab.</p> <p data-bbox="769 825 1013 856" style="text-align: center;"><u>FUTURE PROGRAMS</u></p> <table data-bbox="483 886 1219 956"> <tr> <td data-bbox="483 886 760 956"><u>8' ADL CRYOSHOULD</u> (YOR3119)</td> <td data-bbox="899 886 1219 956">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</td> </tr> </table> <p data-bbox="483 986 1409 1343">The 8' cryoshroud was delivered to Plum Brook during June. Operational tests for cold leaks and chill down characteristics are tentatively planned for August 15 while the 30" aluminum calorimeter is being reinsulated. Delivery from ADL of the completed shadow shields, with instrumentation installed, will be approximately August 30. Additional LH_2 and LN_2 dewar pads are being designed. Additional piping and piping insulation has been ordered for LN_2 service to the vacuum chamber. Hardware for transporting and suspending the 4' tank and cryoshroud is approximately 50% complete.</p> <table data-bbox="483 1373 1235 1443"> <tr> <td data-bbox="483 1373 841 1443"><u>FLAT PLATE CALORIMETER</u> (YOR2023)</td> <td data-bbox="899 1373 1235 1443">CRD - J. E. MALOY RSD - N. L. SCHROEDER</td> </tr> </table> <p data-bbox="483 1473 1013 1504">No significant changes to report.</p> <table data-bbox="483 1534 1214 1604"> <tr> <td data-bbox="483 1534 678 1604"><u>LIQ. METHANE</u> (YOR2500)</td> <td data-bbox="899 1534 1214 1604">CRD - R. L. DEWITT RSD - J. E. CAIRELLI</td> </tr> </table> <p data-bbox="483 1634 1365 1793">A new delivery date of July 30 has been established for the two high pressure tanks. A redesign of the quartz ports was required. The visible flow section and strob light system will be tested at Lewis-Cleveland during July.</p>	<u>8' ADL CRYOSHOULD</u> (YOR3119)	CRD - R. L. DEWITT; RSD - J. V. GILLETTE	<u>FLAT PLATE CALORIMETER</u> (YOR2023)	CRD - J. E. MALOY RSD - N. L. SCHROEDER	<u>LIQ. METHANE</u> (YOR2500)	CRD - R. L. DEWITT RSD - J. E. CAIRELLI
<u>8' ADL CRYOSHOULD</u> (YOR3119)	CRD - R. L. DEWITT; RSD - J. V. GILLETTE						
<u>FLAT PLATE CALORIMETER</u> (YOR2023)	CRD - J. E. MALOY RSD - N. L. SCHROEDER						
<u>LIQ. METHANE</u> (YOR2500)	CRD - R. L. DEWITT RSD - J. E. CAIRELLI						

July 1969

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="308 268 479 407">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="503 397 941 467"><u>30' CYLINDRICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="998 397 1339 467">CRD - J. E. MALOY; RSD - N. L. SCHROEDER</p> <p data-bbox="503 497 1388 954">During July both the 60 and 100 layer spiral wrapped, multilayer insulation tests were completed. Approximately one week was required for each test plus a week down time prior to each test for configuration changes, test cell preparation, and vacuum pump down. Preliminary test evaluation indicates that all the data recorded is satisfactory. At this point in the testing program there appears to be an optimum number of layers, 30 to 60, for which little or no additional thermal protection can be attained by increasing the number of insulation layers. Another test with 40 layers, therefore, has been added to the program. This portion of the program is now scheduled for completion by August 29.</p> <p data-bbox="787 984 1039 1023" style="text-align: center;"><u>FUTURE PROGRAMS</u></p> <p data-bbox="503 1043 787 1113"><u>8' ADL CRYOSHROUD</u> (YPR3119)</p> <p data-bbox="998 1043 1331 1113">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="503 1143 1372 1341">Operation tests of the shroud are now scheduled for September. Final delivery of the shroud fittings and flex lines was made in July. A meeting of Plum Brook and Lewis-Cleveland engineers is scheduled for August 1 to finalize the shroud test objectives and necessary support hardware.</p> <p data-bbox="503 1371 1347 1570">A research test plan is currently being formulated for the actual shadow shield tests with the 4' tank mounted within the 8' cryoshroud. The tank has been covered with aluminize mylar. Work is progressing in other support areas such as additional dewar pads and the suspension system.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="321 274 490 306">(Continued)</p> <p data-bbox="506 339 857 403"><u>FLAT PLATE CALORIMETER</u> (YPR2023)</p> <p data-bbox="980 339 1315 403">CRD - J. E. MALOY; NSD - N. L. SCHROEDER</p> <p data-bbox="506 439 1253 598">Penetration effects testing with the flat plate calorimeter have been moved up in the "K" Site test schedule to approximately October 15. At least five configurations will be included They are:</p> <ol data-bbox="506 632 1188 922" style="list-style-type: none"> (1) Smooth insulation with no penetrations (2) Hat section (3) Fiberglas buffer zone (4) Staggered (or interleaved) (5) At least one isotherm attachment <p data-bbox="506 956 1334 1115">Project meeting will be held each Friday morning. An updated test plan and instrumentation requirements have been completed. Insulation and instrumentation work will begin in the ATS Building during the first week of August.</p> <p data-bbox="506 1149 734 1212"><u>LIQUID METHANE</u> (YPR2500)</p> <p data-bbox="980 1149 1299 1212">CRD - R. L. DEWITT; RSD - J. E. CAIRELLI</p> <p data-bbox="506 1246 1253 1405">Fabrication of the high pressure tanks has been delayed an additional four weeks to August 30. Original fabrication time estimates by the contractor were considerably unrealistic. Other work in process includes the following:</p> <ol data-bbox="506 1439 1318 1729" style="list-style-type: none"> (1) Mass flow meters delivered and will be water calibrated (2) New seals for the view port assembly have been ordered (3) Transparent test section has been fabricated (4) Photographic support hardware has been ordered

August 1969

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="308 272 462 393">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="495 393 820 463"><u>30" CYL. CALORIMETER</u> (YPR2023)</p> <p data-bbox="982 393 1323 463">CRD - J. E. MALOY; RSD - N. L. SCHROEDER</p> <p data-bbox="495 493 1396 624">During August two data runs at 40 and 20 layers of insulation were completed. These concluded the 40-layer-per-inch density phase of testing. The calorimeter will be removed to make room for the 8' cryoshroud.</p> <p data-bbox="495 655 852 725"><u>8' DIA. ADL CRYOSHROUD</u> (YPR3119)</p> <p data-bbox="982 655 1307 725">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="495 756 1388 856">Preparations are now underway for the acceptance test of the 8' ADL Cryoshroud. The following tasks were completed during August:</p> <ol data-bbox="495 876 1404 1380" style="list-style-type: none"> (1) The shroud baffles were installed; (2) All shroud tubing was flushed and mass spectrometer leak-checked; (3) The vacuum chamber penetrations for the shroud vents were fabricated; (4) The vent control valves were built-up and are ready for installation; (5) Fill and vent piping adaptors were fabricated; (6) Conoseal gaskets were ordered. One spare set of seals was acquired from ADL. <p data-bbox="779 1401 1128 1441">(Continued on Page 29)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>(Continued)</p> <p><u>8' DIA. ADL CRYOSHOUD</u> (Continued)</p> <p>Acceptance testing is scheduled to begin the week of September 22.</p> <p>Delivery of the 4' dia. tank is scheduled for late October. Testing of the Shadow Shield Systems is tentatively scheduled to begin in late December.</p> <p><u>FLAT PLATE CALORIMETER</u> CRD - J. E. MALOY; (YPR2023) NSD - N. L. SCHROEDER</p> <p>Work was begun in preparation for insulating the Flat Plate Calorimeter. The following work was accomplished during August.</p> <ol style="list-style-type: none"> (1) A template was built for cutting out the 58" dia. insulation blankets and locating thermocouples; (2) The shroud water system was removed from "J" Site; (3) Thermocouple dynamic reference junctions were fabricated; (4) Construction of a new calorimeter support ring has been started; (5) The 2" O.D. Test Penetration is being fabricated; (6) An insulation support structure is being designed to cover the piping at the bottom of the calorimeter. <p><u>LIQUID METHANE</u> CRD - R. L. DEWITT; (YPR2500) RSD - J. E. CAIRELLI</p> <p>Due to the addition of SEMI System tests, Methane Phase II and III testing has been rescheduled to start early in June 1970.</p> <p>An attempt was made to water calibrate the mass flow meters. During the calibration, bearing problems developed and the calibrations could not be made. The meters are presently being rebuilt.</p>

Sept 1969

K

CRYOGENIC
PROPELLANT
RESEARCH
SITE30" CYL. CALORIMETER
(YPR2023)CRD - J. E. MALOY;
RSD - N. L. SCHROEDER

Work accomplished in preparation of installing the Flat Plate Calorimeter in "K" Site during the past month is as follows:

- (1) Thermocouples have been installed at all necessary locations on the calorimeter, support cone, fill and vent lines and environmental shroud.
- (2) The first insulation system consisting of 20 layers of aluminized mylar with silk netting spacer material has been fabricated and installed, complete with necessary instrumentation.
- (3) The environmental shroud has been installed on the calorimeter.
- (4) All of the necessary hardware for supporting the calorimeter in the vacuum chamber has been received.
- (5) The control panels and variacs for the calorimeter warm-up heaters are being installed.
- (6) All of the components for the environmental shroud heating system are on hand and ready for installation.

It is expected that the complete system will be ready for testing by the middle of October.

8' DIA. ADL CRYOSHROUD
(YPR3119)CRD - R. L. DEWITT;
RSD - J. V. GILLETTE

On September 22 and 23 the 8' ADL Cryoshroud was leak checked in the "K" Site vacuum chamber. With 40 psig He pressure in the shroud tubing, the overall warm He leakage rate was 2.1×10^{-3} std cc/sec. After filling the shroud with LH₂ and maintaining a 20 psig line pressure the overall H₂ leak rate measured over $\frac{1}{2}$ hours was 1.48×10^{-3} scc/sec. After the leak test and cold shock, the shroud was inspected. Several welds were cracked. All of the tubes appeared to be sound, however one of the tack welds holding the tubing to the #2 baffle was separated. Remaining weld cracks were in areas where reinforcing angles and channels were fastened to the skin with both tack welds and bolts. These welds do not appear to have significant structural value to the shroud. If repaired, they would probably fail on subsequent cooldowns.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="305 286 477 318">(Continued)</p> <p data-bbox="508 355 1401 548">During the checkout a leak was discovered in one of the diffusion pumps. The pump was valved off throughout the test. Subsequent leak checking revealed a leak in LN₂ baffle above the diffusion pump. The baffle will be removed for repairs before installing the flat plate calorimeter for the next series of tests.</p> <p data-bbox="508 582 1321 677">Delivery of the 4' dia. tank is still scheduled for late October. Testing of the Shadow Shield System is expected to begin in late December.</p> <p data-bbox="508 743 735 805"><u>LIQUID METHANE</u> (YPR2500)</p> <p data-bbox="967 743 1287 805">CRD - R. L. DEWITT; RSD - J. E. CAIRELLI</p> <p data-bbox="508 838 1385 966">The "see through" flow section was cold shocked in LN₂ and hydrostatic tested. The section failed at 500 psi. Maximum test pressure was to have been 1000 psi. The flow section is being redesigned.</p> <p data-bbox="508 999 1338 1224">One of the LCH₄ shut off valves for use inside the vacuum chamber was tested with LN₂ in the "D" Site vacuum chamber. The pneumatic operator was cycled with no significant leakage at a chamber pressure of 2×10^{-6} torr. However, the valve would not shut tight when it was cold. The valve is presently in the valve shop for repair.</p> <p data-bbox="508 1294 686 1355"><u>SEMI SYSTEM</u> (YPR1327)</p> <p data-bbox="967 1294 1304 1355">CRD - J. R. FADDOUL; RSD - N. L. SCHROEDER</p> <p data-bbox="508 1389 1321 1516">Description: Self Evacuating Multilayer Insulation on a 30' dia. cylindrical LH₂ tank, mounted inside the 8' dia. shroud. Shroud is to be water heated to 70°F.</p> <p data-bbox="508 1550 1417 1775">A meeting was held September 17 between Lewis-Cleveland and Plum Brook personnel to discuss hardware and facility requirements and for a preliminary review of the task plan. Linde is supplying the tank and insulation. Delivery is expected early in February. Design has been started by Lewis-Cleveland on the tank fill tube and instrumentation.</p>

October 1969

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="315 280 480 409">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="525 409 819 479"><u>PENETRATION EFFECT</u> (YPR2023)</p> <p data-bbox="992 409 1334 479">CRD - W. R. JOHNSON; RSD - N. L. SCHROEDER</p> <p data-bbox="525 508 1384 578">Installation of the flat plate calorimeter in the "K" Site vacuum chamber was completed.</p> <p data-bbox="525 608 1417 737">All necessary piping was installed and leak-checked. Also completed was the installation and checkout of the environmental shroud heating system and the calorimeter tank warm-up heater control system.</p> <p data-bbox="525 767 1384 866">Instrumentation terminations between the test article and the site were completed and functional tests were performed.</p> <p data-bbox="525 896 1430 1025">The wiring for the edge guard heaters was completed between the test cell and the control room. But several control panel components were not received from the manufacturer. Delivery is expected in early November.</p> <p data-bbox="525 1055 1414 1353">During the checkout of the calorimeter tank warm-up heaters, power to the 4000 watt outer cold guard heater was accidentally left on overnight. This resulted in the calorimeter surface heating up to about 385°F, and a slight discoloration of the silk netting spacer material between the first few layers of aluminized mylar insulation blanket resulted. It was decided to replace this blanket, and work is presently underway to accomplish this task.</p> <p data-bbox="525 1383 1364 1453">It is expected that the first test will be performed during the first week of November.</p> <p data-bbox="525 1483 830 1552"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="992 1483 1310 1552">CRD - R. L. DEWITT; RSD - J. E. CAIRELLI</p> <p data-bbox="525 1582 1372 1642">The 8' cryoshroud was moved from "K" Site to the ATS Building where it was disassembled for repairs.</p> <p data-bbox="525 1671 1372 1840">The work was done by a service man from High Vacuum Equipment Corp. Work was confined to the top and bottom covers, and consisted of grinding the cracked welds, installing additional screw fasteners, and repainting the high emissivity surface. The 4' tank,</p> <p data-bbox="773 1870 1120 1910">(Continued on Page 33)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="315 300 483 333">(Continued)</p> <p data-bbox="516 369 1010 403"><u>SHADOW SHIELD TESTS</u> (Continued)</p> <p data-bbox="516 435 1382 498">shadow shields, and all related hardware were received from ADL, which completed this contract.</p> <p data-bbox="516 532 1382 626">Buildup of the test package at the ATS Building will begin early in November. The assembly should be ready for moving to 'K' Site sometime in December.</p> <p data-bbox="516 660 1352 817">A penetration for the third LH₂ supply, inside the vacuum chamber, was installed. The LH₂ piping, two more chamber penetrations, and two LN₂ supply lines will be installed during downtime between tests with the flat plate calorimeter.</p> <p data-bbox="516 850 1365 914">Insulation for the 8' shroud has been designed and is being procured.</p> <p data-bbox="516 948 1317 1011"><u>LIQUID METHANE</u> CRD - T. O. MCINTIRE; (YPR2500) RSD - J. E. CAIRELLI</p> <p data-bbox="516 1045 1430 1174">The two high pressure stainless steel tanks were received at Plum Brook. Plans are being made to provide a work area where the tanks can be assembled with their suspension system and interconnecting piping can be fabricated.</p> <p data-bbox="516 1208 1300 1272"><u>13-FT. CRYOSHROUD</u> CRD - R. L. DEWITT; (YPR3119) RSD - J. E. CAIRELLI</p> <p data-bbox="516 1306 1414 1496">A 4' x 4' cryoshroud wall sample is being tested with LN₂ at 'K' Site. The tests are temperature cycles in air between ambient outside temperature and LN₂ temperature. The purpose of testing is to observe the performance of the glue joint between the honeycomb face material and the aluminum sheet backing.</p> <p data-bbox="516 1530 1300 1594"><u>SEMI-SYSTEM</u> CRD - J. R. FADDOUL; (YPR1327) RSD - J. E. CAIRELLI</p> <p data-bbox="516 1628 1352 1721">Linde design of the test tank has been completed and fabrication begun. Delivery of the complete package is still expected in early February.</p> <p data-bbox="516 1755 1430 1819">Lewis-Cleveland design has been completed and fabrication begun on the tank fill tube and instrumentation.</p> <p data-bbox="764 1850 1109 1884">(Continued on Page 35)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="305 294 479 320">(Continued)</p> <p data-bbox="495 359 706 385"><u>FACILITY ITEM</u></p> <p data-bbox="495 425 1393 618"><u>Repair of Vacuum System LN₂ Baffle:</u> Close inspection of the leaking LN₂ baffle revealed a crack in the copper tubing, which is coiled around the baffle. The crack appeared to be caused by metal fatigue in the area where the LN₂ feedline joined the baffle coil. The feedlines were not made to allow for thermal contraction.</p> <p data-bbox="495 652 1409 811">To avoid a recurring problem with thermal cycling, the inner baffle assembly was rotated with respect to the outer shell to provide a 90° bend in the feedlines. This should greatly reduce any stresses caused by thermal cycling.</p> <p data-bbox="495 844 1360 970">Since there are four LN₂ baffles in the vacuum system, and all have similar construction, the probabilities are high that the remaining baffles will also develop leaks.</p>

Novemebr 1969

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="313 294 472 419">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="505 425 792 489"><u>PENETRATION EFFECT</u> (YPR2023)</p> <p data-bbox="964 425 1300 489">CRD - J. E. MALOY RSD - N. L. SCHROEDER</p> <p data-bbox="505 522 1317 906">Two full scale tests were performed on the Flat Plate Calorimeter during the first and third weeks of November. The insulation system for both tests consisted of 20 shields of aluminized mylar with two layers of silk net spacer material between each shield. All control and instrumentation systems functioned normally but preliminary data indicate that the LH₂ boil-off rate in the measure tank is considerably higher than predicted. An investigation is presently under way to uncover any possible heat leaks that would have this effect on the boil-off rate.</p> <p data-bbox="505 940 808 1003"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="964 940 1281 1003">CRD - R. E. DEWITT RSD - J. E. CAIRELLI</p> <p data-bbox="505 1037 1317 1294">Additional work was accomplished during November in preparation for the shadow shield tests at K Site. A project meeting was held on November 14 to review the work assignments and man-hours required to assemble and install the shadow shield test package in K Site. As a result of this meeting, a work schedule was prepared and distributed to those involved.</p> <p data-bbox="505 1327 1349 1618">The inner high emissivity surface on the 8' cryoshroud cylindrical section was cleaned and repainted. This was due to poor vendor quality control. A contract to fabricate insulation for the outside of the 8' cryoshroud has not yet been awarded due to lack of bidders. Part of this work may have to be done in-house. Work was started on developing a technique for installing aluminized-mylar radiation shields inside the shadow shield support struts.</p> <p data-bbox="505 1652 1365 1844">Paint used to produce the high emissivity surface on the shadow shield support struts appears to have excessive outgassing properties under vacuum and 700°R operating conditions. The struts will be baked in an evacuated container to remove the volatiles. Work has begun at Lewis to assemble the bake-out container.</p> <p data-bbox="623 1878 967 1914">(Continued on Page 29)</p>

NARRATIVES ON ADJOINING PAGE

K SITE

TASK J.O.	PROGRAM	STATUS	SCHEDULE
YPR2500	LIQUID METHANE Project being reevaluated.	

CHANGES: Schedule deleted.
(Since last report)

TASK J.O.	PROGRAM	STATUS	SCHEDULE
YPR3119	SHADOW SHIELD TESTS (13' Cryoshroud) First sample test terminated.	

CHANGES: None
(Since last report)

TASK J.O.	PROGRAM	STATUS	SCHEDULE
YPR1327	SEMI -SYSTEM Delivery of tank heads delayed. Most of Lewis-Cleveland fabricated equipment was completed.	1st Test, Week Feb. 23, 1970 - Delivery, early Feb. 1970.

CHANGES: None
(Since last report)

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="318 294 492 324">(Continued)</p> <p data-bbox="525 363 1020 393"><u>SHADOW SHIELD TESTS</u> (Continued)</p> <p data-bbox="525 433 1400 552">Vacuum jacketed piping for the third LH₂ supply inside the vacuum chamber was fabricated in the Plum Brook weld shop, and it is now being installed. Work should be completed the first week in December.</p> <p data-bbox="525 592 1334 652">Buildup of the test package at the ATS building is expected to be completed by late December.</p> <p data-bbox="525 691 1334 751"><u>LIQUID METHANE</u> CRD - T. O. MCINTIRE; (YPR2500) RSD - J. E. CAIRELLI</p> <p data-bbox="525 791 1351 850">The methane program is being reevaluated. All test buildup has been stopped.</p> <p data-bbox="525 890 1318 950"><u>13-FT. CRYOSHOULD</u> CRD - R. L. DEWITT; (YPR3119) RSD - J. E. CAIRELLI</p> <p data-bbox="525 990 1351 1069">The LN₂ temperature cycle tests on a 4' X 4' sample of coldwall were terminated after 49 cycles. Inspection of the sample after testing showed:</p> <ol data-bbox="525 1109 1334 1268" style="list-style-type: none"> <li data-bbox="525 1109 1301 1168">(1) The weld joints between "D" tubes and plate showed no signs of deterioration. <li data-bbox="525 1208 1334 1268">(2) The glue bond between plate and honeycomb had serious crazing. <p data-bbox="525 1308 1334 1397">Attempts are being made to speed the contractor in perfecting the glue bonding technique and delivery of a new sample.</p> <p data-bbox="525 1437 1318 1496"><u>SEMI-SYSTEM</u> CRD - J. R. FADDOUL; (YPR1327) RSD - J. E. CAIRELLI</p> <p data-bbox="525 1536 1400 1685">Delivery of the hemispherical tank heads to Linde has been delayed because of the G.E. strike. Therefore, delivery of the test package to Lewis-Cleveland will be delayed. A revised schedule is not yet available.</p> <p data-bbox="525 1725 1384 1785">All Lewis-Cleveland fabricated equipment is complete, except for the guard tank purge bag.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="331 250 496 379">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="540 383 831 445"><u>PENETRATION EFFECT</u> (YPR2023)</p> <p data-bbox="984 383 1321 445">CRD - W. R. JOHNSON; RSD - N. L. SCHROEDER</p> <p data-bbox="540 479 1321 801">The investigation into the problem of high LH₂ boil-off from the measure tank of the flat plate calorimeter continued through the past month. The shroud was changed from the normal water heated test configuration to a LH₂ cooled system to completely cold guard the measure tank. This system was tested with a resultant LH₂ boil-off of 22 SCFH instead of the expected zero boil-off. To verify that there were no gas leaks into the system, the measure tank was allowed to boil dry.</p> <p data-bbox="675 811 1019 842">(Continued on Page 29)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="337 264 505 393">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="548 399 1024 429"><u>PENETRATION EFFECT</u> (Continued)</p> <p data-bbox="548 463 1300 622">The boil-off dropped to zero as expected. A second test was performed with all instrumentation cable, power cables, and any other heat path into the system disconnected. Very little change was noted.</p> <p data-bbox="548 658 1300 781">Design and construction of the calorimeter are presently being investigated to see if there are problems in these areas to explain the high boil-off rate.</p> <p data-bbox="548 817 854 880"><u>SHADOW SHIELD TESTS</u> (YPR3119).</p> <p data-bbox="992 817 1308 880">CRD - R. J. STOCKL RSD - J. E. CAIRELLI</p> <p data-bbox="548 916 1317 1075">Additional work on the flat plate calorimeter and heavy year-end leave have delayed buildup of the shadow shield package. It is now planned to complete this assembly in the ATS building in early February.</p> <p data-bbox="548 1111 1333 1304">The 7' tank was removed from the ATS building and placed in storage. The tank transport vehicle remains in the clean room, however. It will be used to support the shadow shield hardware during assembly and to transport the test package to "K" Site.</p> <p data-bbox="548 1339 1349 1562">For the 8' cryoshroud, baffles are being modified to correct for excessive warpage which occurred during fabrication. This work is being done by contract with completion scheduled for early January. A contract was also let for the fabrication of an insulation system for the outside of the 8' shroud. Delivery is expected late in January.</p> <p data-bbox="548 1598 1373 1757">Vacuum jacketed piping for the third LH₂ supply line inside the chamber was installed, cold-shocked, and proof tested. Shop fabrication of the new LN₂ supply piping into the vacuum chamber was also completed. Installation is planned for January.</p> <p data-bbox="548 1793 1382 1880">Requirements for an additional and flowing LH₂ guard on the fill and vent lines to both measure and guard tanks were defined. Design work was begun on this</p> <p data-bbox="678 1890 1024 1920">(Continued on Page 31)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="332 268 495 397">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="535 397 1039 427"><u>SHADOW SHIELD TESTS</u> (Continued)</p> <p data-bbox="535 457 1266 526">item as well as for the tank internal instrumentation rake.</p> <p data-bbox="535 556 1274 745">Miscellaneous work completed includes a vacuum bakeout of the shadow shield struts, a water volume calibration of the 4' tank and the development of a method for installing radiation shields inside the shadow shield support struts.</p> <p data-bbox="535 815 771 884"><u>LIQUID METHANE</u> (YPR2500)</p> <p data-bbox="982 815 1323 884">CRD - T. O. MCINTIRE; RSD - J. E. CAIRELLI</p> <p data-bbox="535 914 1291 1013">A methane task plan was formulated and approved at the CRD section level. It is now awaiting branch level approval.</p> <p data-bbox="535 1073 820 1143"><u>13-FT. CRYOSHROUD</u> (YPR3119)</p> <p data-bbox="982 1073 1307 1143">CRD - R. L. DEWITT; RSD - J. E. CAIRELLI</p> <p data-bbox="535 1182 1323 1341">Contractor has been working to perfect the honeycomb bonding techniques. A cold wall sample is expected to be delivered to Lewis-Cleveland in January. Thermal cycle tests will then be performed at "K" Site to check bond performance.</p> <p data-bbox="535 1401 722 1471"><u>SEMI-SYSTEM</u> (YPR1327)</p> <p data-bbox="982 1401 1307 1471">CRD - J. R. FADDOUL; RSD - J. E. CAIRELLI</p> <p data-bbox="535 1510 1274 1610">The hemispherical tank heads were delivered to Linde. Delivery of the completed test package to Lewis-Cleveland is expected March 2, 1970.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="321 252 483 372">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="532 383 820 443"><u>PENETRATION EFFECT</u> (YPR2023)</p> <p data-bbox="971 383 1307 443">CRD - W. R. JOHNSON; RSD - N. L. SCHROEDER</p> <p data-bbox="532 479 1372 766">One test was performed on the flat plate calorimeter during the month of January. The high boil-off rate of LH₂ in the measure tank continued to be a problem. However, a significant drop to 7.5 SCFH from a previous rate of 22.0 SCFH was observed after the installation of LH₂ cold guards in the measure tank fill and vent lines. This confirmed the suspicion that convection of GH₂ in these lines was the cause of the high boil-off rate.</p> <p data-bbox="532 802 1323 927">The calorimeter was removed from the test chamber. A modification of the measure tank fill and vent system will be required to eliminate the gas convection problem.</p> <p data-bbox="532 963 1323 1124">The 30-inch diameter cylindrical calorimeter with a 20 layer spiral wrapped insulation system in presently being installed at "K" Site. Testing of the 30-inch calorimeter is expected to start the second week of February.</p> <p data-bbox="532 1161 836 1221"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="971 1161 1291 1221">CRD - R. J. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="532 1257 1307 1318">Work accomplished in support of the shadow shield task is as follows:</p> <ol data-bbox="532 1354 1323 1870" style="list-style-type: none"> (1) Instrumentation rake is complete and has been received at Plum Brook. (2) The secondary cold guard is complete and will be installed by the end of February. (3) The installation of the internal radiation shields in the shadow shield support struts has been completed. (4) Thermocouple installation on the outside surface of the support struts is in progress and should be completed by the end of February. (5) The 4' ADL calorimeter has been cleaned since the water volume calibration. <p data-bbox="657 1886 998 1919">(Continued on Page 29)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="326 240 488 365">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="537 369 1024 399"><u>SHADOW SHIELD TESTS</u> (Continued)</p> <p data-bbox="537 433 1268 498">(6) Two vacuum chamber LN₂ supply lines were installed, cold-shocked and proof tested.</p> <p data-bbox="537 528 1333 628">(7) The task of covering the outside surface of the 8' cryoshroud with aluminized mylar is in progress.</p> <p data-bbox="613 658 1349 757">Also the modification of the baffles is almost complete with delivery expected by the second week of February.</p> <p data-bbox="537 787 1333 852">It is expected that the shadow shield test package will be complete by the second week of March.</p> <p data-bbox="537 882 764 948"><u>LIQUID METHANE</u> (YPR2500)</p> <p data-bbox="984 882 1317 948">CRD - T. O. MCINTIRE; RSD - J. E. CAIRELLI</p> <p data-bbox="537 978 1317 1077">The test plan formulated and approved at the CRD section level is still awaiting action at the CRD branch level.</p> <p data-bbox="537 1107 813 1172"><u>13-FT. CRYOSHOUD</u> (YPR3119)</p> <p data-bbox="984 1107 1300 1172">CRD - R. L. DEWITT; RSD - J. E. CAIRELLI</p> <p data-bbox="537 1202 1349 1333">Another cold wall sample has been completed by the contractor and will be sent to Plum Brook the first week of February. This sample will then be tested at "K" Site to check honeycomb bond performance.</p> <p data-bbox="537 1363 716 1429"><u>SEMI-SYSTEM</u> (YPR1327)</p> <p data-bbox="984 1363 1300 1429">CRD - J. R. FADDOUL; RSD - J. E. CAIRELLI</p> <p data-bbox="537 1459 1349 1622">The delivery of the tank heads to Linde as reported last month was in error. Labor problems have prevented the fabrication of the tank heads. The expected delivery date of the test package to LeRC has slipped to May 4, 1970.</p>

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

CRYOGENIC
PROPELLANT
RESEARCH
SITE

PENETRATION EFFECT CRD - J. E. MALOY;
(30' CYL. CALORIMETER) RSD - N. L. SCHROEDER
(YPR2023)

One test was performed during the month of February. This test was a repeat of the final test of the previous series which ended in August of 1969. Results were almost identical and showed no serious degradation of the insulation during the six month storage period. This 20 layer test also served as a base line condition for the next tests which will be performed with 15, 10 and 5 layers of insulation. The next test will probably be delayed until the last week of March due to a shortage of manpower caused by "B-2" operations.

SHADOW SHIELD TESTS CRD - R. J. STOCHL;
(YPR3119) RSD - J. E. CAIRELLI

During the cleaning of the ADL 4' calorimeter following the water volume calibration, a leak was discovered in the brazed joint where the stainless support neck enters the copper tank. Preliminary attempts to rebraze only the leaking area failed so the whole joint was rebrazed. The calorimeter was leak checked and cold shocked with LN₂. The final leak check is in progress at this time.

The straightened baffles for the 8' cryoshroud were delivered during the month of February.

All other work on the shadow shield hardware has almost come to a complete halt due to lack of manpower.

LIQUID METHANE CRD - T. O. MCINTIRE
(YPR2500) RSD - J. E. CAIRELLI

The test plan has been approved at all levels and work will start on this program in the near future.

13-FT. CRYOSHROUD CRD - R. L. DEWITT;
(YPR3119) RSD - J. E. CAIRELLI

The second cold wall sample shipped to LeRC-Cleveland by the contractor was unsatisfactory and returned without testing. A meeting with the contractor will be setup to discuss the latest problems.

SEMI-SYSTEM CRD - J. R. FADDOUL;
(YPR1327) RSD - J. E. CAIRELLI

No change in delivery date for tank heads or schedule.

Feb. 1970

March 1970

SITE	SITE NAME	RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	CRYOGENIC PROPELLANT RESEARCH SITE	<p data-bbox="532 343 1300 439"><u>PENETRATION EFFECT</u> CRD - J. E. MALOY; (30" CYL. CALORIMETER) RSD - N. L. SCHROEDER (YPR2023)</p> <p data-bbox="532 459 1300 711">Three tests were performed on the 30" aluminum, cylindrical calorimeter during the month of March. The test configuration consisted of the aluminized mylar/silk net system with 15, 10 and 5 layers of insulation. Preliminary tests results indicated that system performance was better than predicted for the lower number of radiation shields.</p> <p data-bbox="532 741 1300 930">One more test on the calorimeter will be performed with all of the radiation shields removed. The calorimeter will then be sent to the ATS Building where a new 160 layer spiral wrap insulation system will be installed for testing at a later date.</p> <p data-bbox="532 966 1300 1025"><u>SHADOW SHIELD TESTS</u> CRD - R. J. STOCHL; (YPR3119) RSD - J. E. CAIRELLI</p> <p data-bbox="532 1055 1300 1308">During March the test package buildup work continued at the ATS Building. The 8' cryo-shroud cylindrical section was covered with aluminized mylar. Stiffener rings were added to the shroud baffles, and baffles were sand-blasted to remove damaged paint. All shroud Rosemount temperature sensors were installed. Lead wires remain to be installed.</p> <p data-bbox="532 1343 1300 1473">Weld work to install a flowing cold guard on the guard tank was completed and cold shocked. Guard tank Rosemount temperature sensors were installed except for lead wires.</p> <p data-bbox="532 1496 1300 1880">The mass spectrometer leak check of the rebrazed neck joint showed no significant leak after cold shocking with LN₂. Aluminized mylar coating damaged during the neck joint repair was replaced. The 30 layer insulation blankets were cut out, fitted to the measure tank and thermocouples were installed. Insulation work will be completed the first week in April. The shadow shield support strut instrumentation was completed, and a new work stand, for handling the shadow shield test package, was fabricated on contract and delivered to Plum Brook.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="321 278 483 407">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="544 413 771 479"><u>LIQUID METHANE</u> (YPR2500)</p> <p data-bbox="954 413 1274 479">CRD - T. O. MCINTIRE RSD - J. E. CAIRELLI</p> <p data-bbox="544 544 1274 610">The purchase request for LCH₄ sampling system valves was approved and is now in Procurement.</p> <p data-bbox="544 675 820 741"><u>13-FT. CRYOSHOUD</u> (YPR3119)</p> <p data-bbox="954 675 1274 741">CRD - R. L. DEWITT; RSD - J. E. CAIRELLI</p> <p data-bbox="544 806 1274 933">A third cold wall sample was received from the contractor. A series of over 70 thermal cycles with LN₂ resulted in no detectable damage to the sample.</p> <p data-bbox="544 997 722 1064"><u>SEMI-SYSTEM</u> (YPR1327)</p> <p data-bbox="954 997 1274 1064">CRD - J. R. FADDOUL; RSD - J. E. CAIRELLI</p> <p data-bbox="544 1128 1274 1195">The Semi-System test plan has been written and is being circulated through CRD for approval.</p> <p data-bbox="544 1225 1274 1352">The tank heads were received by Linde and tank fabrication is in progress. The completed assembly is expected to be delivered to Lewis-Cleveland the first week in May.</p> <p data-bbox="544 1387 1274 1453">The He purge bag for the guard tank is presently being fabricated in Cleveland.</p>

April 1970

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="300 252 462 383">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="511 383 1274 483"><u>PENETRATION EFFECT</u> CRD - J. E. MALOY; (30" CYL. CALORIMETER) RSD - N. L. SCHROEDER (YPR2023)</p> <p data-bbox="511 514 1274 735">The final test of the series on the 30" dia. aluminum cylindrical calorimeter was completed during the month of April. The calorimeter was removed from the chamber. It is awaiting shipment to the ATS Building, where a new insulation system will be installed on the calorimeter as soon as manpower becomes available.</p> <p data-bbox="511 776 1274 997">The new insulation system will consist of 160 layers of aluminized mylar shields with "Tissueglass" instead of silk netting spacer material. The insulation will be applied in a continuous spiral wrap using the constant tension device at a layer density of 40 layers per inch.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="289 244 451 373">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="495 373 803 437"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="950 373 1274 433">CRD - R. J. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="487 467 1258 755">Test package buildup continued at the ATS Building. The 30 layer insulation blanket for Test #2 was completed using the test tank as a template. Thermocouples were installed as required on the blanket. The next step was to mate the guard tank and measure tank and place then in the new work stand. The strut support ring, struts, and payload simulator were then installed on the measure tank.</p> <p data-bbox="487 791 1258 984">Instrumentation work completed included the installation of all Rosemount temperature sensor lead wires on the test tank, guard tank and on the 8' dia. cryo-shroud. Instrument rakes were also installed in both tanks.</p> <p data-bbox="487 984 1258 1272">During the continuity check of the strut thermocouples, after assembly of the tank, several couples were found to be open or shorted. The payload and all the struts were removed. Repairs were made to the strut wiring. Then the struts and payload were reinstalled. At this same time it was also decided to paint the payload emitting - surface black to produce a high emissivity.</p> <p data-bbox="495 1272 1258 1341">Several relatively major facility modifications were also completed in April.</p> <p data-bbox="487 1371 1258 1540">Two new LN₂ supply lines into the chamber were completed, and a new N₂ roof vent was installed. The 7000 gal. LN₂ dewar from "J" site was moved to "K". New penetration and vent lines for the flowing LH₂ cold guard were also installed.</p> <p data-bbox="487 1560 1258 1699">It is expected that the test package will be moved to "K" site during the first week in May. The anticipated starting date for the first series of Shadow Shield tests is June 1.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="293 254 454 377">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="487 387 714 447"><u>LIQUID METHANE (YPR2500)</u></p> <p data-bbox="933 387 1258 447">CRD - T. O. MCINTIRE RSD - J. E. CAIRELLI</p> <p data-bbox="487 487 1258 546">The bid opening for LCH₄ sampling valves will be May 1.</p> <p data-bbox="487 586 755 646"><u>13-FT CRYOSHROUD (YPR3119)</u></p> <p data-bbox="933 586 1258 646">CRD - R. L. DEWITT; RSD - J. E. CAIRELLI</p> <p data-bbox="487 675 1258 765">Construction of the 13' Cryoshroud has begun. The work accomplished by the contractor to date is as follows:</p> <ol data-bbox="487 805 1258 1162" style="list-style-type: none"> (1) Bonding of honeycomb to the sides, bottom and top panels is completed. (2) All components have received two coats of the required three coats of paint. (3) Assembly of the side panels to the top and bottom manifold rings is complete. (4) Leak checking is partially complete. All leaks found have been repaired. <p data-bbox="487 1192 673 1252"><u>SEMI-SYSTEM (YPR1327)</u></p> <p data-bbox="933 1192 1258 1252">CRD - J. R. FADDIOL; RSD - J. E. CAIRELLI</p> <p data-bbox="487 1282 1258 1411">All performance tests, including leak test, pressure test and vibration test have been completed on the test tank by Linde. The Semi-System package is due to be shipped from Linde May 11.</p> <p data-bbox="487 1441 1258 1699">Due to delays in the Shadow Shield test program, the Semi-System hardware will have to be stored for at least a month before it can be tested. Therefore, preparations are underway to provide a CO₂ purged cover bag for the Semi-System to prevent insulation deterioration during storage. Four (4) 50 lb. bottles of high purity CO₂ are on hand for this purpose.</p>

May 1970

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="305 262 464 385">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="480 389 828 481"><u>PENETRATION EFFECT</u> (30' CYL. CALORIMETER) (YPR2023)</p> <p data-bbox="954 389 1292 449">CRD - J. J. MALOY; RSD - N. L. SCHROEDER</p> <p data-bbox="480 512 1292 739">The installation of the new 160 layer insulation system on the 30' aluminum calorimeter has been postponed due to the full test schedule at "K" site. It is expected that six to nine months will elapse before the test can be re-scheduled. The insulation work will be performed immediately preceding the new test date.</p> <p data-bbox="480 771 1292 870">This program will be dropped from the monthly status report until work is resumed.</p> <p data-bbox="480 930 782 997"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="971 930 1292 997">CRD - R. V. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="480 1029 1292 1129">All test package buildup work at the ATS Building was completed. The test tanks and 8' cryoshroud were moved to "K" Site.</p> <p data-bbox="480 1160 1292 1387">The test tanks were then assembled to the cryoshroud. But before moving the test assembly into the chamber, all tubing connections were leak checked. Leaks were found in the welds which join the Marman flanges to the guard tank tubes. After much difficulty, the leaks were repaired using silver solder.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="310 280 475 405">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="488 375 899 405"><u>SHADOW SHIELD TESTS (CONT)</u></p> <p data-bbox="488 443 1317 598">At that time the test assembly was moved into the chamber. Plumbing, instrument and electrical connections were made to the test package. Heater power supplies and temperature controls for the payload simulator were also installed.</p> <p data-bbox="488 638 1317 827">For control of the experiment and its environment, cryoshroud controls were built and installed. In addition a new boiloff valve was installed parallel to the measure tank boiloff valve to increase the boiloff control flow range.</p> <p data-bbox="488 866 1317 1115">The research people have requested a change in the measure tank fill line piping. This change consists of installing a liquid shutoff valve inside the chamber close to the test tank and installing a vent line and valve in the liquid fill line. The purpose of the change is to provide a means for prechilling the liquid fill line before topping off the measure tank.</p> <p data-bbox="488 1155 1317 1244">The anticipated starting date for the first series of shadow shield tests is now June 15.</p> <p data-bbox="488 1314 711 1373"><u>LIQUID METHANE</u> (YPR2500)</p> <p data-bbox="997 1314 1317 1373">CRD - T. O. MCINTIRE RSD - J. E. CAIRELLI</p> <p data-bbox="488 1413 1317 1473">Bids were opened May 1 for LCH₄ sampling valves. G. W. Dahl Co., Inc. was the low bidder.</p> <p data-bbox="488 1512 1317 1661">One prototype 2-way valve has been received and is being acceptance tested. If the tests prove the valve to be satisfactory, the contract will be awarded for (6) 2-way and (6) 3-way valves.</p> <p data-bbox="602 1850 948 1880">(Continued of Page 35)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="300 268 462 387">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="479 397 738 467"><u>13-FT CRYOSHROUD</u> (YPR3119)</p> <p data-bbox="982 397 1307 467">CRD - R. L. DEWITT; RSD - J. E. CAIRELLI</p> <p data-bbox="479 497 1307 626">The 13' cryoshroud is completely fabricated. Preliminary leak checking is complete. Final acceptance testing at the contractor's plant will be done the first week in June.</p> <p data-bbox="479 656 1307 725">The expected delivery date for the 13' shroud is June 15.</p> <p data-bbox="479 785 657 854"><u>SEMI-SYSTEM</u> (YPR1327)</p> <p data-bbox="982 785 1307 854">CRD - J. R. FADDOUL; RSD - J. E. CAIRELLI</p> <p data-bbox="479 884 1307 1003">The completed Semi-System test package was delivered to the ATS Building. It will be stored in the ATS Building until the first series of Shadow Shield tests is complete.</p>

June 1970

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="337 260 505 389">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="548 393 854 459"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="1024 393 1344 459">CRD - R. V. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="548 493 1349 558">The measure tank fill line modifications were completed and the cryoshroud insulation installed.</p> <p data-bbox="548 592 1349 687">Two system checkout runs using LH₂ were performed during June.</p> <p data-bbox="548 721 1349 882">The first checkout run was made on June 19. Several hydrogen leaks developed while chilling the 8' cryoshroud and the test tanks causing the vacuum to decay. The run was aborted to determine the cause of the leaks.</p> <p data-bbox="548 916 1349 1149">Inspection of the SSP tube fittings used to connect LH₂ lines inside the chamber showed signs of leaks when tested with helium in LN₂. The tube fittings were modified to accept copper nose cones of the type used on AN fittings. The modified fittings proved to be leak-free in LN₂.</p> <p data-bbox="548 1182 1349 1439">The second checkout run was started on June 23. The cryoshroud was chilled with LH₂ and the temperature controlled between 40° and 50°R. LH₂ required for a 16-hour period of no heat load shroud operation was 800 gallons. The individual shroud temperature controls work well but interact when operated at the same time. LH₂ flow capacity should be increased.</p> <p data-bbox="548 1473 1349 1606">An H₂ leak developed when the measure tank was filled with LH₂. Also the test tank LH₂ shut off valves 248 and 262 showed signs of the leakage from the operators.</p> <p data-bbox="548 1640 1349 1765">With the payload heaters turned off, the measure tank boil-off reached 23 SCF/hr. after only two hours from fill.</p> <p data-bbox="651 1805 1000 1844">(Continued on Page 35)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="293 280 456 409">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="500 413 992 445"><u>SHADOW SHIELD TESTS</u> (Continued)</p> <p data-bbox="500 479 1333 574">The payload heaters were turned on to check the payload temperature control. At 600°R payload temperature the heaters separated from the payload.</p> <p data-bbox="500 612 1333 773">Although the payload did not reach the 700°R operating temperature, the measure tank boiloff far exceeded the 120 SCF/hr. anticipated boiloff. The test was terminated to inspect the test package.</p> <p data-bbox="500 811 1333 995">Inspection showed the heaters separated from the payload. A check of the measure tank surface showed no serious degradation of the aluminized mylar emissivity. The degradation was not sufficient to account for the high boiloff observed during the test.</p> <p data-bbox="500 1033 1333 1190">A series of tests will be made to determine a suitable method for re-attaching the payload heaters. Repairs will be attempted without removing the test package from the chamber.</p> <p data-bbox="672 1228 1328 1260">The next anticipated run date is July 13.</p> <p data-bbox="500 1294 727 1353"><u>LIQUID METHANE</u> (YPR2500)</p> <p data-bbox="1003 1294 1328 1353">CRD - T. O. MCINTIRE RSD - J. E. CAIRELLI</p> <p data-bbox="500 1389 1333 1552">The prototype 2-way valve was tested and appeared to have minor problems which should be readily corrected. The contract was therefore awarded to G. W. Dahl for the 12 sampling valves. Delivery should be by late September 1970.</p> <p data-bbox="500 1588 1333 1781">Due to the heavy schedule of test work in the "K" Site chamber, it is unlikely that this project can be worked before calendar year 1972. Therefore, this job will be dropped from the report until such time as manpower and test time become available.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="316 248 1323 367"> <u>CRYOGENIC PROPELLANT RESEARCH SITE</u> <u>RESEARCH PROPULSION MODULE</u> RSD - J. V. GILLETTE (YPR3762) </p> <p data-bbox="511 367 1323 884"> The 13' cryoshroud and handling cart were delivered to Plum Brook for storage prior to RPM testing. The heat sealed plastic covering blew off while enroute from Massachusetts. As a result the special high emissivity surfaces were degraded due to an accumulation of dirt, road dust, and bugs. In some areas the high emissivity black paint had been scraped during handling. The entire honeycomb and baffle surfaces will have to be cleaned and spot painted prior to testing in the vacuum chamber. The shroud did not appear to have any structural damage during shipment. Both the shroud and the handling cart are being stored in Building #9205. A protective plastic cover will be placed over the shroud to reduce further accumulation of dirt and dust. </p> <p data-bbox="511 904 1323 984"> <u>SEMI-SYSTEM</u> CRD - J. R. FADDIOL; (YPRI327) RSD - J. E. CAIRELLI </p> <p data-bbox="511 994 1323 1182"> The Semi-System test package has been bagged and is being purged with a small continuous flow of CO₂. Purging is necessary to prevent contamination of the CO₂ in the insulation panels. The purge will continue until the semi-system package is installed in 'K' Site. </p>

July 1970

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="326 247 488 379">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="516 348 821 415"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="1052 348 1369 415">CRD - R. V. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="516 449 1377 707">Following the June 23 run attempt, the shadow shield test package was opened to reinstall the heaters on the payload. Both adhesive and mechanical clamps were used to hold the heaters. The original adhesive selected by ADL was used but with the addition of a primer coating recommended by the adhesive manufacturer. Eight additional thermocouples were installed between the heater blankets and payload.</p> <p data-bbox="516 741 1377 929">The tank surface emissivity was checked using a portable comparator. The mylar covering on the upper half of the measure tank appeared excessively deteriorated. It was therefore replaced. Two minor leaks were found and repaired in the measure tank piping.</p> <p data-bbox="516 963 1377 1151">Shadow shield testing was resumed on July 20, 1970. Prior to flowing LH₂ into the system, the payload heaters were turned on. The heater power supplies operated only at full power and would not regulate. Testing was delayed until the following day to allow time to repair the power supplies.</p> <p data-bbox="516 1185 1377 1709">On the following day, July 21, 1970, the cryoshroud and test tanks were filled with LH₂. The measure tank was filled first. Chamber pressure before filling the measure tank was 2×10^{-6} torr. After filling, the chamber pressure was up to 5×10^{-5} torr, (Approximately 13 atm. cc/sec. leak). With the guard tank cold but not filled, the chamber pressure increased to 2×10^{-4} torr, (Approximately 52 atm. cc/sec. leak). With the guard tank filled to the top, the chamber pressure exceeded 1.5×10^{-3} torr. The payload heaters were operated continuously during the run to maintain the payload temperature at approximately 530° R. Almost full power was required to maintain temperature. The large LH₂ leak prevented obtaining reliable research data. However, LH₂ runs were made on July 22 and 23 to accomplish the following:</p> <p data-bbox="516 1743 1377 1810">(1) To improve shroud temperature controls under operating conditions.</p> <p data-bbox="659 1844 938 1876">(Continued on Page</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="305 250 467 382">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="516 284 690 317">(Continued)</p> <p data-bbox="516 343 1372 407">(2) To improve the payload temperature controls under operating conditions.</p> <p data-bbox="516 427 1372 460">(3) To determine source area of LH₂ leaks.</p> <p data-bbox="516 486 1372 550">(4) To determine effectiveness of LH₂ shutoff valves inside the chamber.</p> <p data-bbox="516 576 1372 956">Following test runs, the LH₂ piping was again checked for leaks. Two small leaks² were found in the modified SSP tube fitting, and a larger leak was found in the measure tank LH₂ shutoff valve flange seal. All SSP fittings were replaced with AN type tube fittings. The Raco flange seal was replaced with a Creavey seal. The three instrument feed thrus used on the test tank were removed and leak checked in LN₂. The feed thrus from the top of the cold guard tank were tight while warm, but leaked excessively when chilled in LN₂. The other two connectors had less than 10⁻⁵ atm. cc/sec. leak both warm and cold.</p> <p data-bbox="516 976 1372 1132">Preparations are now underway to make a LH₂ cold shock and vacuum leak check the first week in August. If the test is successful, the test package will be completely assembled and boil-off testing resumed during the week of August 10, 1970.</p> <p data-bbox="516 1166 1372 1230"><u>RESEARCH PROPULSION MODULE</u> RSD - J. V. GILLETTE (YPR3762)</p> <p data-bbox="516 1256 1372 1471">Repairing, cleaning, and repainting of the 13' cryo-shroud surfaces were negotiated with the contractor, Tenvac. Tenvac agreed to recondition the surfaces and has completed spot replacement of damaged honeycomb. Final cleaning and painting will be accomplished when the modified, conical shroud bottom is delivered in September.</p> <p data-bbox="516 1497 1372 1654">Design and procurement of the shroud heater system (blanket heaters, DC power supplies, and temperature controllers) are currently in progress. An equipment search is being conducted in Cleveland and Plum Brook to locate existing power supplies and controllers.</p> <p data-bbox="516 1679 1372 1836">Due to the lack of a formally published Test Plan (reference LHB 8220.2) and module design, some areas of the test facility build up are not adequately defined. Specifically, the assembly-clean room requirements and some piping requirements are lacking.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="305 268 462 393">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="511 399 690 463"><u>SEMI -SYSTEM</u> (YPRI327)</p> <p data-bbox="1047 399 1372 463">CRD - J. R. FADDOUL; RSD - J. E. CAIRELLI</p> <p data-bbox="511 524 1372 715">The Semi-System test package has been bagged and is being purged with a small continuous flow of CO₂. Purging is necessary to prevent contamination of the CO₂ in the insulation panels. The purge will continue until the semi-system package is installed in "K" Site.</p>

August 1970

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="300 268 462 387">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="495 367 795 427"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="1023 367 1339 427">CRD - R. V. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="495 457 1347 685">The LN₂ cold shock and vacuum leak check of the test assembly was completed during the first week of August. The system was able to maintain a chamber pressure of 4.8x10⁻⁵Torr with both the measure tank and cold guards filled with LH₂. Final assembly of the completed test package was then completed in preparation for the first series of tests.</p> <p data-bbox="495 705 1347 1063">The first test configuration for the base line test consisted of the complete test package assembly (measure tank, cold guards, payload simulator, and support struts) enclosed in the 8' diameter cryo-shroud but without any shadow shields installed. During the period of August 13 through August 21, Phase I tests (utilizing LH₂ in both the test package and the cryo-shroud) were completed. Steady state data consisting of support strut temperature profiles and measure tank boil-off rate were recorded with the payload simulator at LH₂ temperature, 530°R and 700°R.</p> <p data-bbox="495 1083 1347 1322">After allowing the test package to warm up and making some minor plumbing changes outside of the vacuum chamber, Phase II of the test was completed during the period of August 24 through August 27. Phase II tests utilized LN₂ in the measure tank and cold guard and LH₂ in the cryo-shroud. Steady state data was recorded for payload simulator temperatures of 530°R and 700°R.</p> <p data-bbox="495 1341 1347 1481">Preparations for removal of the test package from the chamber are in progress. After removal from the site, the tank will be sent to the ATS clean room where build-up for the next test series will be performed.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="300 288 462 407">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="503 387 1347 447"><u>RESEARCH PROPULSION MODULE</u> RSD - J. V. GILLETTE (YPR3762)</p> <p data-bbox="503 477 1347 765">An evaluation of instrument lead wire for RPM thermal studies will be conducted during September in the "K" site "little rig". The design and build up have been completed for the test fixture and necessary instrumentation. The test objective is to evaluate the noise level associated with small lead wires on platinum resistor temperature probes. The smaller wire (.003, .005, or .010 as opposed to 24 AGW) is preferred to reduce heat leaks in the forthcoming RPM tests.</p> <p data-bbox="503 795 1347 1043">A presentation of the clean room-assembly area requirements was made at Plum Brook by the research personnel. Specifications included humidity, temperature, and cleanliness levels plus an estimate of required floor space. A study has been initiated through the Engineering Division to determine where this assembly area can be located to meet the necessary clean room standards.</p> <p data-bbox="503 1083 1347 1302">The design was completed for the 13' shroud warm-up system, and the power supplies, heater pads, and instrument amplifiers were placed on order. The original intended supplier for heater pads may not be able to meet electrical resistance specifications. This is not expected to be a problem, however, as other supply sources are available.</p> <p data-bbox="503 1341 1347 1520">An engineering study of the requirements for cryogenic flow measurements in five locations was completed. Venturi tubes will be used for the module fill and expulsion flow measurements on both tanks. Flow measurements required for the initial 13" shroud tests will be made with a turbine type meter.</p> <p data-bbox="503 1560 1347 1620"><u>SEMI-SYSTEM</u> CRD - J. R. FADDOUL; (YPR1327) RSD - J. E. CAIRELLI</p> <p data-bbox="503 1659 1347 1838">Installation of the Semi-System test package into the "K" Site vacuum chamber will begin as soon as the shadow shield test package removal is completed. It is expected that installation will be completed during the month of September and that testing will begin early in October.</p>

September 1970

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="300 248 462 377">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="535 347 844 417"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="1015 347 1331 417">CRD - R. V. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="535 447 1347 864">Following the first series of shadow shield tests, a leak check of the 4" diameter ADL tank showed excessive leakage in the area of union between the stainless steel neck and the copper tank wall. Close visual inspection of the joint showed a large void under part of the braze fillet. The tank was sent to Cleveland for repair. The stainless steel neck has been cut off at the copper sleeve on the tank wall. A copper ring will be furnace brazed to the stainless steel neck. Then the copper ring will be welded to the copper tank sleeve. The tank will then be LN₂ cold shocked and leak tested at Lewis-Cleveland.</p> <p data-bbox="535 894 1339 1023">While at Lewis-Cleveland the tank will also be fitted with mounting pads to locate the strut support ring. The tank should return to Plum Brook the first week in October.</p> <p data-bbox="535 1053 1339 1123"><u>RESEARCH PROPULSION MODULE</u> RSD - J. V. GILLETTE (YPR4173)</p> <p data-bbox="535 1153 1339 1500">Boeing Aircraft Company is currently fabricating the 15 layer insulation blankets. The blankets are comprised of alternate layers of aluminized mylar and silk netting. Three sets of two blankets each have been contracted for these tanks; no spare blankets were ordered. Representatives from Plum Brook and Cleveland were present to inspect the initial forming operations. Due to forming problems which required development of new techniques, the work appears 2 - 3 weeks behind schedule.</p> <p data-bbox="535 1540 1339 1799">Noise level tests on .003", .005", and .010" diameter instrument lead wires were completed in September. Initial data evaluation indicates that no increase in noise level was discernible with the smaller wire. Temperature readings in LH₂ did not appear to be in error. Following data playback and close evaluation of the data, a test report will be distributed.</p> <p data-bbox="673 1819 1023 1868">(Continued on Page 35)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="289 224 454 353">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="527 324 1133 353"><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p data-bbox="527 389 1339 552">The 13-foot shroud honeycomb surfaces have been completely repaired and repainted by the contractor, TENVAC. The shroud and all associated pieces have been bagged and sealed from environmental dust and dirt deposits during storage.</p> <p data-bbox="527 588 1339 751">Fabrication of the conical shroud bottom has been delayed due to forming problems. TENVAC is in the process of developing new rolling procedures; delivery date has been tentatively set for the latter part of November.</p> <p data-bbox="527 787 1339 970">The shroud heater system instrument amplifiers have been delivered. The order for heater pads has been placed, and delivery is expected on schedule. The system power supplies are currently out for bid; specifications were written to include standard commercial units.</p> <p data-bbox="527 1005 1339 1268">Thirteen-foot shroud/shadow shield test details are still being finalized. The shadow shield thermal tests will be accomplished with the shroud checkout test. A series of preliminary material tests have been initiated. These tests are to determine stretch properties of the X-850 membrane material plus the adhesive qualities of the tape and glue at cryogenic temperatures.</p> <p data-bbox="527 1304 1339 1367"><u>SEMI-SYSTEM</u> CRD - J. R. FADDOUL; (YPR1327) RSD - J. E. CAIRELLI</p> <p data-bbox="527 1403 1339 1526">The Semi-System test package is being installed in the "K" Site vacuum chamber. Installation will be completed the first week in October and testing will begin the second week in October.</p> <p data-bbox="527 1562 690 1586"><u>OTHER WORK</u></p> <p data-bbox="527 1602 1339 1685">The new LH₂ piping to the R.R.dewars is being installed and should be completed the first week in October.</p> <p data-bbox="527 1721 1339 1785">The contractor is on the job constructing the flood control system for "K" Control Building.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
HTF	<p data-bbox="300 241 617 342">HYPERSONIC TUNNEL FACILITY (Continued)</p> <p data-bbox="535 372 1339 675">Plum Brook Rocket System Division has recently spent a considerable effort in closely planning the use of manpower to support the active test sites. Successful use of this planning depends upon timely completion of scheduled tasks. And only four weeks after the approval of the plan, HTF has apparently already slipped three weeks due to contract implementation considerably different from that information which was fed into the plan.</p> <p data-bbox="535 695 1339 1098">Repairs to the 30" steam line are still not completed. The original hydro test indicated a leak in one of the bellows joints. A patch for this bellows was ordered, received, and welded into place. However, refilling the pipe with water revealed another leak on a girth weld of the same bellows joint. Steam ejector checks are planned for the last three weeks of November following repairs now in progress. Plum Brook has recommended the purchase of a new bellows joint as a safer approach than the questionable repair of the existing bellows.</p> <p data-bbox="535 1118 1339 1290">The oxygen piping contract was awarded to Mechanical Fabricators, Inc. The completion is scheduled to be 30 days following the delivery of the last of six oxygen bottles. These are still scheduled for delivery January 14, 1971, from Riley Stoker Company.</p>
K	<p data-bbox="300 1320 462 1441">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="535 1411 844 1481"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="1006 1411 1331 1481">CRD - R. J. STOCHL RSD - J. E. CAIRELLI</p> <p data-bbox="535 1512 1339 1643">Repair work at Cleveland was completed on the 4' diameter ADL tank. The tank was returned to Plum Brook. It was then LN₂ cold shocked and mass spectrometer leak checked. No leaks were found.</p> <p data-bbox="535 1673 1339 1804">Work is under way to build up the test configuration for the second series of shadow shield tests. The present schedule shows the shadow shield tests resuming in mid-January 1971.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="308 248 479 377">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="552 347 1356 417"><u>RESEARCH PROPULSION MODULE</u> RSD - J. V. GILLETTE (YPR4173)</p> <p data-bbox="552 447 1356 735">Fabrication of the insulation blankets is behind schedule. The contractor, Boeing Aircraft Company, has requested a six week delivery extension from mid-November to January 1, 1971. The primary problem is in the thermal vacuum forming of the X-850 cover material. This is a reinforced aluminized mylar which exhibits "spring-back" in the die instead of retaining the form of the die.</p> <p data-bbox="552 775 1356 1093">Preliminary 13' cryoshroud test build up was started during the last week of October. The shroud was moved from storage to "K" site where the round head honeycomb retaining screws were replaced with counter sunk flat head screws. This modification was required for installation of the heater pads. A series of cryogenic tests were conducted on the D. C. 93-046 adhesive and primer to assure adequate adhesion of heater pads at LH2 temperatures.</p> <p data-bbox="552 1133 1356 1381">The shroud heater system components are all on hand except for the power supplies and additional heater pads. Bid opening for the power supplies is scheduled for November 6. The additional heater pads are required due to modifications of the layout configuration. The additional pads for one baffle and the new conical shroud bottom will be ordered during the first week of November.</p> <p data-bbox="552 1421 1356 1650">The modified conical shroud bottom delivery may be again rescheduled beyond November 30. The shroud bottom and a cryoshroud vacuum tank are both being fabricated by TENVAC. The contractor may require additional time to deliver the conical bottom if it becomes necessary to expedite the cryoshroud vacuum tank for early RPM component testing at RETF.</p> <p data-bbox="552 1679 1015 1699">Other RPM activities include:</p> <p data-bbox="552 1729 1356 1819">(1) Safety approval of fire resistant fabric enclosure for a clean room assembly area at K site.</p> <p data-bbox="730 1858 1079 1898">(Continued on Page 31)</p>

NARRATIVES ON ADJOINING PAGE

SEMI -SYSTEM		K SITE	YPR1327
STATUS		SCHEDULE	
K	First test completed and tank was shipped to Goddard. Tank is scheduled to be returned LN ₂ piping to railroad dewars completed.	November 16, 1970.	

CHANGES: Schedule change.
(since last report)

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="307 264 472 385">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="550 324 1158 354"><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p data-bbox="555 385 1364 479">(2) Completed the design and initiated installation of 4" LH₂ vacuum jacketed supply line in the vacuum chamber.</p> <p data-bbox="555 506 1364 566">(3) Completed the changeover from a 4" inlet to a 1-1/2" inlet LH₂ line on the 13' cryoshroud.</p> <p data-bbox="550 606 731 667"><u>SEMI-SYSTEM (YPR1327)</u></p> <p data-bbox="997 606 1356 667">CRD - J. R. FADDOUL; RSD - J. E. CAIRELLI</p> <p data-bbox="550 693 1356 822">The first test on the Semi-System was completed. The boiloff rate appeared to reach a steady state value of 43 SCFH (approximately 43 BTU/hr heat leak).</p> <p data-bbox="550 848 1356 909">Inspection of the Semi-System test package showed the following degradation of the insulation:</p> <p data-bbox="555 929 1356 1165"> (1) (2) external thermocouples had lifted from the surface. (2) The bottom insulation panels separated from the tank fasteners. (3) The glued seams between insulation panels separated in some areas. </p> <p data-bbox="550 1191 1356 1346">The above mentioned items were repaired at K site. The tank was then shipped to Goddard for vibration testing. The tank is due to return to K site on November 16 for the second and final test now scheduled for late November.</p> <p data-bbox="550 1387 715 1417"><u>OTHER WORK</u></p> <p data-bbox="550 1447 1356 1507">The new LH₂ piping to the R.R. dewars has been completed.</p> <p data-bbox="550 1534 1356 1695">The "K" Control Building flood control system contract is approximately 90% completed. Job is presently waiting for Government approval of plans for steps over the dike. All work should be completed during November.</p> <p data-bbox="550 1721 1356 1882">Poles have been set and all new fixtures installed for the additional exterior lighting for "K" site. The contractor is held up for delivery of underground cable. This contract should be completed during November.</p>

November 1970

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="305 248 467 373">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="516 347 815 407"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="987 347 1302 407">CRD - R. J. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="516 447 1312 632">Build up work on the test configuration for the second series of shadow shield tests is continuing at the ATS Building. This work is expected to be completed in time for installation into "K" Site the second week of December. Testing will resume in mid-January.</p> <p data-bbox="516 705 928 765"><u>RESEARCH PROPULSION MODULE</u> (YPR4173)</p> <p data-bbox="987 705 1312 765">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="516 805 1312 958">Heater pads were installed on the 13' cryoshroud walls, top, and two baffles during November. Over 260 individual heater pads were required. Additional heaters for the shroud bottom and the third baffle plate are currently in Procurement.</p> <p data-bbox="516 997 1312 1248">Electrical terminations for the shroud wall heater were completed. Approximately 25% of the top terminations were completed. Thermocouples for the temperature control were installed, as well as over one half of the shroud Rosemount instrumentation. Work on the shroud was stopped as scheduled on November 23 to prepare for the second series testing of the Semi-System.</p> <p data-bbox="516 1288 1312 1375">Bids were opened for the power supplies for shroud heater control system during November. Delivery is scheduled for mid-December.</p> <p data-bbox="516 1415 1312 1634">The preliminary design and assembly procedure is complete for the 10' shadow shield. Shadow shield parts are scheduled for delivery from Cleveland during December. An estimated 160 man hours will be required for the assembly which is scheduled for completion in December, pending the availability of manpower.</p> <p data-bbox="516 1673 1312 1892">Preliminary design for the ATS clean room modification is completed. Modifications include an air lock entry, equipment access door, temperature and humidity control, and air distribution and filter system. Final drafting and purchase of materials will be initiated in December.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="308 262 470 387">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="516 361 1120 393"><u>RESEARCH PROPULSION MODULE</u> (Continued)</p> <p data-bbox="516 427 1315 652">The primary area of concern at "K" Site is an adequate supply of manpower. Thermocouple shop hours applied to the ADL Shadow Shield buildup in the ATS Building were less than requested. This resulted in a later-than-scheduled completion, which is very close to impacting the overall RPM schedule.</p> <p data-bbox="516 685 1315 844">In addition,manhours requested for the application of heater strips to the cryoshroud was underestimated. This will require some further manpower expenditure between now and the cryoshroud test date to catch up.</p> <p data-bbox="516 878 698 944"><u>SEMI-SYSTEM</u> (YPR1327)</p> <p data-bbox="993 878 1315 944">CRD - J. R. FADDOUL; RSD - J. E. CAIRELLI</p> <p data-bbox="516 978 1315 1069">Vibration testing at Goddard on the Semi-System package was completed. The tank was returned to Plum Brook November 18.</p> <p data-bbox="516 1103 1315 1262">Inspection of the test package showed damage to several of the insulation panels. Damage was apparently due to overpressure in the space behind the panels. The panels still look to be structurally and thermally sound.</p> <p data-bbox="516 1296 1315 1395">In order to avoid repair of the insulation panels, the entire package will be enclosed in a plastic bag and purged with CO₂.</p> <p data-bbox="516 1427 1315 1526">The Semi-System test package is presently being installed at "K" Site with testing expected to begin December 7.</p>

December 1970

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="322 248 487 377">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="553 377 1362 447"><u>RESEARCH PROPULSION MODULE (YPR4173)</u> CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="553 477 1362 646">The RPM build up and test schedule has been modified to reflect the new hydrogen tank delivery of May 1. The chemically milled gore panels are requiring more set up time than was originally estimated by the manufacturer.</p> <p data-bbox="553 675 1362 904">All hardware for the RPM, prototype 10' shadow shield has been delivered from LeRC-Cleveland. Assembly will start by the 1st of the year in ATS. Completion is scheduled no later than February 1. However, this date is dependent on the available manpower. Thermocouple shop personnel have been in short supply the past several months.</p> <p data-bbox="553 934 1362 1123">Manufacture of the 13' cryoshroud conical bottom has not been completed. A heater control circuit will be designed for the original flat bottom and additional heater strips will be purchased to avoid test delays if the conical bottom is not delivered as scheduled.</p> <p data-bbox="553 1153 1362 1322">Boeing Aircraft Co., has completed and shipped the LH2 tank insulation system. Delivery is expected by January 7. Purchase requests for instrumentation and controls connectors and pins were written for current and future RPM requirements.</p> <p data-bbox="553 1351 1362 1620">The H-F module electrical wiring design is approximately 50% complete. Design of the supporting "K" site electrical wiring is in the preliminary stages. Purchase of electrical hardware will be initiated during January. The H-F module instrument wiring harness design was completed. The harness layout is designed to mate with present and new facility cables.</p>

SITE	SITE NAME RESEARCH INSTALLATION * (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="321 268 483 395">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="544 399 722 465"><u>SEMI-SYSTEM</u> (YPR1327)</p> <p data-bbox="1016 399 1336 465">CRD - J. R. FADDOUL; RSD - J. E. CAIRELLI</p> <p data-bbox="544 510 1336 707">On December 7 we began the second SEMI-system test. For this test the entire test package was enclosed in a plastic bag and purged with CO₂. The test was terminated on the following day with a steady state boiloff rate of 1630 SCFH. This was approximately four times the expected value.</p> <p data-bbox="544 741 1336 838">The high boiloff rate was caused by poor vacuum in the insulation panels. The lowest pressure recorded in the panels during the run was 25μ Hg.</p> <p data-bbox="544 872 1336 999">To bring the boiloff rate to acceptable levels the purge bag was removed and the insulation panel port covers removed. This permitted the panels to be evacuated to the vacuum chamber pressure.</p> <p data-bbox="544 1034 1336 1100">On December 14 the test was re-run. Steady state boiloff for this test was 38 SCFH.</p> <p data-bbox="544 1135 1336 1221">The SEMI-System tank has been removed from 'K' Site and sent to LeRC-Cleveland. The insulation panels will be removed there and inspected.</p>
<u>SPECIAL RESEARCH PROJECT</u>	
	<p data-bbox="535 1322 824 1419"><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM</u> (YPY2752)</p> <p data-bbox="1011 1356 1333 1387">RSD - V. S. PETERSON</p> <p data-bbox="532 1453 1336 1780">A series of 0-9000 RPM spin up tests of the first pressure measuring system have been successfully run on the SE-13 Cold Spin Test Rig. The tests were made to compile data to assess the repeatability, accuracy, and reliability of the system. The test data will be reduced to tabulations and plots of comparable speed points of the spin up and spin down excursions. Preliminary examination of the data shows the system is repeatable, accurate, and reliable and</p>

(Continued on Page 43)

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
HTF	<p data-bbox="285 270 444 361">HYPERSONIC TUNNEL FACILITY</p> <p data-bbox="474 369 984 401"><u>HRE (GARRETT ENGINE) (Continued)</u></p> <p data-bbox="477 441 1276 600">The high pressure water system was worked on by the pipe shop, and some prefabrication work has begun. Final tie-ins cannot be done until the Hot Train components are in place. The job is approximately 10% complete.</p> <p data-bbox="477 636 1276 795">The high pressure GN₂ tie-in to the diluent injection flange, and film cooling flange were begun. Again, final tie-in cannot be done until the hot train is in place. The job is approximately 20% complete.</p> <p data-bbox="477 830 1276 1053">Assembly of the hot train will begin as soon as the bakeout test is complete. At this time, it appears that this will be during the weeks of March 8 to March 26, 1971 dependent upon availability of manpower. Note that repairs to the damaged power ports will delay the entire HTF schedule from four to six weeks.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="299 250 464 379">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="475 349 979 383"><u>SHADOW SHIELD TESTS</u> (Continued)</p> <p data-bbox="475 419 1290 578">A second test with the insulation removed and the test tank filled with LN₂ was started on January 26 and is now in progress. Results of this test are not yet available. The test will be completed the first week of February.</p> <p data-bbox="475 648 1290 707"><u>RESEARCH PROPULSION MODULE</u> CRD - R. L. DEWITT; (YPR4173) RSD - J. V. GILLETTE</p> <p data-bbox="475 743 1290 966">The prototype 10' diameter shadow shield is about 75% complete. One radiation shield is complete and the second shield requires hold down tabs. To finish the prototype, the radiation shields must be stretched, assembled, marked for instrumentation, disassembled, instrumented and reassembled.</p> <p data-bbox="475 1001 1290 1294">Purchases for the semi-clean insulation assembly area modifications are well underway. Bids for the air conditioning blower unit and cooling units have been received and are being evaluated. Purchase request for the air conditioning installation will be written in early February. The construction modification purchase requests are being processed. An award of contract for the roll up door will be made by February 5.</p> <p data-bbox="475 1329 1290 1542">The 13' cryoshroud bottom has been delivered. A Contract extension has been granted to TENVAC to complete the conical bottom by the end of February. Heater pads are available for installation on the flat bottom and one remaining baffle plate. Additional heater pads are being ordered for the conical bottom.</p> <p data-bbox="475 1578 1290 1638">The LH₂ tank cold guard design is ready for final review which will be accomplished by February 5th.</p> <p data-bbox="475 1673 1290 1807">A purchase request for the design, fabrication and installation of the K site fabric enclosed semi-clean assembly area has been written and is in process.</p> <p data-bbox="584 1842 938 1876">(Continued on Page 39)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

<p>Cold Spin testing scheduled for</p> <p>Advanced system drawings modified and released for manufacture.</p>	<p>January 2, 1971 to April 26, 1971.</p>
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CHANGES: Schedule added.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="289 260 451 389">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="467 353 1073 389">RESEARCH PROPULSION MODULE (continued)</p> <p data-bbox="467 425 1271 554">The H-F module electrical wiring design is complete and ready for final review. Design of the electrical and instrument interface between the module and facility is in process.</p> <p data-bbox="467 590 1271 846">Instrument connectors to be used on the cold guards are being tested in the K Site "little rig". These tests are to determine e.m.f. levels between pins due to thermocouple effects when the connector approaches LH₂ temperatures. Acceptability of a standard off the shelf connector may reduce costs as well as save time by eliminating the need for long lead custom manufactured connectors.</p>
SPECIAL RESEARCH PROJECT	
<p data-bbox="467 980 760 1075"><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM (YPY2752)</u></p> <p data-bbox="946 1009 1271 1045" style="text-align: right;">RSD - V. S. PETERSON</p> <p data-bbox="467 1109 1271 1304">The Cold Spin Test Rig data taken last month was shown to be inconclusive because of the pressure polarity reversals and overranging. Plans are being made to change some ranges and re-route some of the pressure connections. Testing is expected to continue throughout the month of February.</p> <p data-bbox="467 1339 1271 1562">The advanced rotating 72 channel temperature and pressure measuring system drawings have been modified to include the changes expressed in the comments made by involved personnel from the Air Breathing Engine Division and the I & C Division. The drawings have subsequently been released for manufacture.</p>	

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

SHADOW SHIELD TESTS	K SITE	YPR3119
TESTS ARE IN PROGRESS		
Two tests completed in February.		
Next test scheduled for	March 8, 1971.	

CHANGES: Schedule added.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="267 248 430 367">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="462 347 763 407"><u>SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="933 347 1250 407">CRD - R. J. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="462 447 1258 566">During February two shadow shield tests were completed. Both were made with LH₂ in the cryoshroud, LN₂ in the test tanks and with two shadow shields installed.</p> <p data-bbox="462 606 1258 725">In order to maintain a constant tank pressure at steady state conditions, heat was added to the measure tank. This was done by means of light bulbs mounted inside the measure tank.</p> <p data-bbox="462 765 1258 954">For the first test, shadow shields were equally spaced between the tank and payload. With the payload temperature maintained at 530°R, the heat energy required to maintain steady state conditions was .872 watts. For a payload temperature of 700°R the power requirement dropped to .843 watts.</p> <p data-bbox="462 994 1258 1182">The second test was made with the shadow shields moved close to the payload. The spacing between payload and measure tank remained the same as for the earlier test. The payload temperature was held at 700°R. Steady state heater power was .63 watts.</p> <p data-bbox="462 1222 1258 1411">Hydrogen leakage from the dewar 8" bayonet connections has been a problem during long duration tests. Midway through the first test, a rubber O-ring seal in the LH₂ railroad dewar 8" bayonet was replaced with a spring loaded teflon (Creavey) seal. No leakage has developed since.</p> <p data-bbox="462 1451 1258 1699">The shadow shield test package was due to be removed from K site and modified for the final test configuration. But an additional run has been requested using the present configuration but with strut insert modifications. The next shadow shield test is scheduled for March 8. Following this, the shadow shield test will be removed and the 13' cryoshroud test installed in the chamber.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

RESEARCH PROPULSION MODULE K SITE YPR4173

<p>13' CRYOSHOULD TEST SCHEDULED TO START</p> <p>LH₂ TANK TEST PROGRAM SCHEDULED TO START</p> <p>Cryoshroud instrumentation and assembly scheduled to be completed.</p> <p>ATS building semi-clean assembly area proceeding as scheduled.</p> <p>Air conditioning and blower order let.</p> <p>Air lock construction completed.</p> <p>Roll up door ordered.</p> <p>Fabrication of 13' cryoshroud is scheduled to be completed</p> <p>LH₂ tank cold guard is in drafting.</p> <p>PR for (K) semi-clean area was approved.</p> <p>Low cost instrument connectors were tested at K site "Little Rig!"</p>	<p>April 12, 1971.</p> <p>June 1971.</p> <p>Week of March 18.</p> <p>March 16, 1971.</p>
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CHANGES: Schedules added.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="289 226 454 353">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="483 322 896 389"><u>RESEARCH PROPULSION MODULE</u> (YPR4173)</p> <p data-bbox="954 322 1276 389">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="483 421 1279 580">The 13' cryoshroud tests have been tentatively rescheduled to begin the week of April 12. Rescheduling was required because of a two week extension of the ADL 8' cryoshroud research program for an additional test.</p> <p data-bbox="483 616 1279 1029">The 13' cryoshroud test includes one prototype 10' shadow shield and the payload simulator. Instrumentation and assembly of the shadow shield will be complete by the middle of March. Some delay was encountered with the shield instrumentation in developing satisfactory strain gage application techniques. The payload simulator has been completed at Lewis and is ready for delivery to Plum Brook. Six Rosemount temperature transducers must be installed prior to installing the payload simulator. The cryoshroud is ready to install, except for completion of the heater terminations on the shroud bottom.</p> <p data-bbox="483 1065 1279 1351">Modifications to the ATS building semi-clean insulation assembly area are progressing on schedule. A contract for purchase of the air conditioning and blower units has been let. Installation of the units is on a separate purchase request currently in procurement. Construction of the air-lock personnel entry is complete. The new roll up door has been ordered and will be installed in-house.</p> <p data-bbox="483 1387 1279 1610">The 13' cryoshroud conical bottom is reportedly in final stages of fabrication. All sheet metal forming is complete. All but the lower cooling tubes have been welded in place, and approximately 75% of the honeycomb installed. Shipment from the contractor's TENVAC plant is expected on the 16th of March.</p> <p data-bbox="483 1646 1279 1773">A design review of the LH₂ tank cold guard has been completed with respect to materials, fabrication, and thermal characteristics. The cold guard design is currently in drafting.</p> <p data-bbox="565 1813 906 1848">(Continued on Page 45)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

First pressure measuring system cold spin test stopped for another project. Slip ring needs repair will be shipped to manufacturer. Design of the 5 range pressure transducer is complete and fabrication should be completed by	April 30, 1971.
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CHANGES: Run schedule changed.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="280 214 451 343">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="475 310 1081 343">RESEARCH PROPULSION MODULE (Continued)</p> <p data-bbox="475 379 1276 508">The purchase request for the design, fabrication, and installation of the K site fabric enclosed semi-clean assembly area has been approved. Request for bids will be made early in March.</p> <p data-bbox="475 542 1276 801">Tests were conducted on low cost instrument connectors with the K site "little rig". The test results were inconclusive due to emf levels observed between various pins. These emf levels were not present on previous tests with the 8' cryoshroud. Further testing will be made on the 8' cryoshroud. Reviews may also be conducted in the "little rig".</p>
SPECIAL RESEARCH PROJECT	
<p data-bbox="475 960 768 1059"><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM (YPY2752)</u></p> <p data-bbox="954 990 1276 1019">RSD - V. S. PETERSON</p> <p data-bbox="475 1089 1276 1536">The first pressure measuring system has been removed from the Cold Spin Test Rig and will be re-installed at a later date. The rig is being used for another project. During this "off the rig" period, the first pressure measuring system will be refitted with different range pressure transducers. The slip ring will again be exchanged back to the original reworked one. Four channels of the replacement slip ring appear to have broken or poor contacts to the lead wires that connect the rotor contact discs to the terminal block. Since the ring is still under warranty, it will be shipped back to the manufacturer for repair.</p> <p data-bbox="475 1566 1276 1854">All phases of the procurement of items for the advanced rotating 72 channel temperature and pressure measuring system are on schedule. The Engineering design work for the 5 range pressure transducers has been completed. Datametrics is now waiting for delivery of the materials and parts needed to build the first unit. The target completion date of April 30, 1971 looks good at this time.</p>	

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
HTF	<p>HYPERSONIC TUNNEL FACILITY (Continued)</p> <p style="text-align: center;"><u>CONTROLS</u></p> <p>The steam regulating system operated satisfactorily during ejector check out. Maximum run time before loss of 200 psig controlled pressure was 275 sec.</p> <p>The events recorder-controller trip system to monitor the HRE engine water pressures has been checked out. The programmer block skip and reader advance modifications are complete and checked out.</p> <p>The facility flow computer is due at Plum Brook the early part of April.</p> <p>The abort program for the CF-16 computer has been compiled and is approximately 50% checked out.</p>
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>The K site test program is proceeding on schedule. The first of two series of ADL shadow shield tests is complete. The 13' cryoshroud for the RPM program is being installed. It is likely that GDC difficulties with the RPM LH₂ tank fabrication will cause major changes in future schedules.</p> <p><u>SHADOW SHIELD TESTS</u> CRD - R. J. STOCHL ; (YPR3119) RSD - J. E. CAIRELLI</p> <p>The final test of the second series of ADL shadow shield tests was completed on March 12. This test (#4A) was added to the original test plan. The purpose of this test was to obtain more information on the effect of the shield mounting method on the shield temperatures.</p> <p>The ADL shadow shield test package has been removed from K site and is presently at the ATS building undergoing configuration changes for the final series of ADL tests. This series of tests is expected to begin the first of June.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="284 244 446 373">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="462 343 876 403"><u>RESEARCH PROPULSION MODULE</u> (YPR4173)</p> <p data-bbox="933 343 1258 403">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="462 443 1258 801">As of March 18, all of the K site effort has been directed to build-up for the 13' cryoshroud tests, first test in the RPM program. Site changeover and build-up is approximately 1/3 complete. Currently the major stack-up (hardware assembled and hanging from the crane hook before lowering into the cryoshroud) consists of the index rails, the shroud top, the payload simulator with support ring, and two baffles. Hardware yet to be assembled on the stack-up includes the shadow shield assembly plus the 3rd baffle plate.</p> <p data-bbox="462 840 1258 1318">The 13' cryoshroud was delivered to K site on schedule and the previously installed heater strips are in final stages of being wired. Some difficulties have been encountered in this first time assembly due to necessary hardware modifications, field matching and fitting of parts and handling problems due to the size and weight of the pieces being assembled in a minimum size work area. The sequence of remaining major events is to complete the stack-up with all instrument and control wire runs, install the stack-up in the shroud, install the closed circuit TV, and install the total shroud test package in the vacuum chamber. The shroud tests are anticipated to begin the week of April 12.</p> <p data-bbox="462 1357 1258 1516">The 13' cryoshroud conical bottom was delivered from TENVAC during March. The conical bottom will not be used until Part 2 of the RPM test program. Heaters and instrumentation will be installed during late May and the first part of June.</p> <p data-bbox="462 1556 1258 1675">Bid requests for the K site fabric enclosure were sent out about March 15, with a 30-day response period. Air conditioning equipment for this assembly area is now in engineering design.</p> <p data-bbox="462 1715 1258 1795">A major schedule change appears imminent in the K site - RPM test program. The LH₂ tank delivery is expected to slip approximately 15 weeks beyond the</p> <p data-bbox="576 1854 917 1884">(Continued on Page 49)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="289 274 454 397">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="467 373 1071 397">RESEARCH PROPULSION MODULE (Continued)</p> <p data-bbox="467 437 1266 656">May 1 scheduled delivery. The delay is being caused by tank material which exhibits grain structure, plus a mismatch between tank hemispheres beyond acceptable tolerances. The tank contractor is GDC. A new test schedule is being formulated which may fill in available site time with the vertical calorimeter, technology test program.</p> <p data-bbox="467 695 706 725"><u>INSTRUMENTATION</u></p> <p data-bbox="467 755 1266 1172">The 13' shroud, 10' shield, and payload simulator, have been instrumented. The site cabling and balance panels have been modified for strain gages. Additional connector data was taken during the ADL Tank test. Based on the data, commercial, off-the shelf type connectors may be purchased for the RPM project. However, one more test will be conducted in the "Little Rig" to support this decision. The logic design for the data link from the B-Control computer complex to the K site terminal was completed. 50% of the software job to provide tabular data in engineering units to the terminal was completed.</p> <p data-bbox="467 1212 592 1242"><u>CONTROLS</u></p> <p data-bbox="467 1272 1266 1431">All 13' cryoshroud subassembly wiring for the four heater control systems has been completed. The control room/test cell wiring and the three payload simulator control systems wiring is complete with only the vacuum chamber wiring remaining unfinished.</p> <p data-bbox="467 1471 1266 1620">The wiring of the new payload temperature control valve is nearly complete and will be finished during the first week of April. All vacuum chamber wiring should be complete two weeks after the shroud is hung in chamber.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM YPY2752

Delivery of the prototype 5 range pressure transducer is scheduled for	April 30, 1971.
The 10 channel pressure and 62 channel temperature measuring system, bid opening is scheduled for . . .	April 12, 1971

CHANGES: Schedules added.

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

The procurement of items for the advanced rotating 10 channel pressure and 62 channel temperature measuring system is on schedule with no foreseen problems. The bid opening for the system package is April 12, 1971. Delivery of the prototype five range rotatable pressure transducer for spin testing is scheduled for April 30, 1971. The first model rotatable 10 channel pressure measuring system is now off the ERB SE-13 Cold Spin Rig for installation of different range transducers and the replacement of the defective slip ring assembly. It will be returned to the rig upon the completion of other turbine blade tests now in progress.

The first model rotating 10 channel pressure measuring system will again be installed in the cold spin rig with major modifications in the pressure tubing runs from the blade to the pressure measuring system. The testing will be confined to the effects of radial tubing runs to the circumference of the rotating disc. The original test turbine blade will not be used because an unpredictable aerodynamic structural interference is created when the rotating test blade passes the structural members of the test rig. Testing will concentrate on verifying the correction calculations required to compensate for the effects of air centrifuging in the radial pressure tubing runs, and will also provide additional operating experience for the overall pressure measuring system. The previous data taken is not too reliable because of poor internal wiring contacts within the slip ring and the turbulence problem.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

SHADOW SHIELD TESTS	K SITE	YPR3119
ATS BUILD-UP OF TEST CONFIGURATION #5		Mid May.
Scheduled completion by		

CHANGES: Schedule change

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

VERTICAL CALORIMETER	K SITE	YPR2023
TESTING TO BEGIN		September 1971.

CHANGES: None.

RESEARCH PROPULSION MODULE	K SITE	YPR4173
13' CRYOSHROUD TEST SCHEDULED TO START		May 3, 1971.
LH ₂ TANK TEST PROGRAM SCHEDULED TO START		October 1971.
<u>ITEMS COMPLETED</u>		
Shroud assembly installed.		
Conceptual air conditioning design completed.		
RPM insulation blankets delivered.		
LN ₂ expulsion line contract awarded		May 1971.
Connector data affirmed.		
13' shroud, 10' shield and payload simulator placed in vacuum chamber.		
Control wiring for cryoshroud completed.		
New payload temperature control valve checked out.		
TV camera installed and checked out.		
<u>ITEMS IN PROGRESS</u>		
Service line seals being leak checked.		
Aluminized mylar radiation curtains being installed.		
Enclosure being relined.		
4" LH ₂ line into vacuum chamber		May 1971.
Instrumentation data link.		

CHANGES: Schedules added.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="321 237 483 366">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="495 372 820 433"><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="974 372 1291 433">CRD - J. E. MALOY; RSD - J. E. CAIRELLI</p> <p data-bbox="495 473 1299 665">A delay in the RPM program because of late hydrogen tank delivery has simulated renewed interest in basic multilayer insulation studies. A series of tests using spiral wrap insulation on the vertical calorimeter is now being planned. Testing is expected to begin early in September.</p> <p data-bbox="495 725 917 796"><u>RESEARCH PROPULSION MODULE</u> (YPR4173)</p> <p data-bbox="974 725 1291 796">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="495 826 1299 1441">Testing of the 13' cryoshroud, payload simulator, and 10' shadow shield assembly has been delayed approximately 4 weeks. Test rescheduling was required due to extended leak repairs and lengthy leak checks on the shroud. Approximately 20 helium leaks in the 10⁻⁶ to 10⁻⁴ std cc/sec range were found in the shroud "D" tube welds and in the flex hose brazed ends. In addition, the contractor supplied hoses and shroud service lines required cleaning to remove scale and brazing flux. Approximately 500 unscheduled manhours have been required due to the contractor's (TENVAC) shoddy workmanship and inept leak check methods. At the time of this writing the shroud assembly is in the chamber complete with operable closed circuit T.V. Service line seals are being leak checked. The aluminized mylar radiation curtains are being installed. Tests are currently rescheduled to begin during the first week of May.</p> <p data-bbox="495 1471 1299 1663">Only one bid was received for the K site fabric enclosure although 43 potential bidders were included in the advertisement. The bid of \$36,600 was not within available funds. The job will be sent out by May 7, for readvertisement. The "small business" clause will be omitted from the new IFB.</p> <p data-bbox="495 1703 1299 1864">The K Site air-conditioning system conceptual design is complete. Final design and layout detail is in progress. Some Plum Brook surplus equipment will be utilized, such as a 25-ton air-conditioning condensing unit, switch gear panel,</p> <p data-bbox="592 1874 950 1905">(Continued on Page 49)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="326 274 488 405">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="500 435 1300 530">and a temperature monitor and control unit. Use of this surplus equipment represents approximately a \$2,500 cost saving.</p> <p data-bbox="500 566 1300 691">Final shipment of the RPM insulation blankets was received from Boeing Aircraft. The surface emissivity of the blankets was inspected, and the blankets stored on tank contoured forms.</p> <p data-bbox="500 727 1300 919">Other facility work in process includes fabrication and installation of a new 4" LH₂ line into the vacuum chamber. This item is being worked in-house, and will be accomplished during May. A contract for an LN₂ expulsion line has been awarded. This, too, is planned for installation during May.</p> <p data-bbox="500 955 743 983"><u>INSTRUMENTATION</u></p> <p data-bbox="500 1020 1300 1145">The "Little Rig" was operated to affirm previous connector data. The positive results obtained allowed us to purchase off-the-shelf commercial connectors for future tests.</p> <p data-bbox="500 1181 1300 1306">The 13' shroud with the 10' shield and payload simulator was placed in the environmental chamber. The mating of the test package to the site instrument cabling was routine.</p> <p data-bbox="500 1342 1300 1467">Fabrication of the K Data Link is nearly complete. Checkout of the B-Control end has begun. A number of general software routines for the terminal have been completed.</p> <p data-bbox="500 1503 634 1532"><u>CONTROLS</u></p> <p data-bbox="500 1568 1300 1693">The vacuum chamber wiring for the 13' cryoshroud is complete. The four heater control systems for the shroud have been operationally checked out with satisfactory results.</p> <p data-bbox="500 1729 1300 1891">The final electrical checkout of the payload simulator heaters revealed multi-resistance paths to ground. It was found that two heaters had low resistance shorts and that the remaining ten heaters measured from 20K to 500K ohms to ground.</p> <p data-bbox="646 1903 992 1931">(Continued on Page 51)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.), - PROJECT ENGINEERS
K	<p data-bbox="305 260 472 389">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="483 349 1089 383">RESEARCH PROPULSION MODULE (Continued)</p> <p data-bbox="483 419 1284 612">It was decided to disconnect the shorted heaters and attempt to run the payload simulator with the remaining heaters. It is hoped that the heaters will not deteriorate any further during the runs. The quality of workmanship on the payload simulator as received at Plum Brook was very poor.</p> <p data-bbox="483 648 1284 711">The new payload temperature control valve has been satisfactorily checked out.</p> <p data-bbox="483 747 1284 906">The TV camera to be used for viewing the shadow shield was installed in the shroud and checked out locally. Cleveland research personnel observed these tests and were satisfied that the system would meet their requirements.</p>
SPECIAL RESEARCH PROJECT	
<p data-bbox="483 1039 773 1129"><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM (YPY2752)</u></p> <p data-bbox="959 1069 1284 1099" style="text-align: right;">RSD - V. S. PETERSON</p> <p data-bbox="816 1168 930 1198" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="483 1234 1284 1357">The first model of the 10 channel rotating pressure measuring system has been refurbished and returned to the ERB SE-13 Cold Spin Rig for further testing and application experience.</p> <p data-bbox="483 1393 1284 1622">Construction of the mechanical components for the advanced model (Mod II) is underway by contract and is scheduled for completion by June 14, 1971. This unit will have 10 pressure channels each having 5 continuously scanned ranges and 62 temperature channels. Delivery of the first 5 range pressure transducer is expected by the end of May, 1971.</p> <p data-bbox="800 1657 963 1687" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="483 1723 1284 1892">The first model rotating 10 channel pressure measuring system has been reinstalled on the ERB SE-13 Cold Spin Test Rig. The changes made in the pressure measuring system are: the replacement of the slip ring assembly, the replacement of the</p> <p data-bbox="565 1900 914 1930" style="text-align: center;">(Continued on Page 53)</p>	

SPECIAL RESEARCH PROJECT/STANDARDS & CALIBRATION LAB/INSTR. DATA COMPUTER

SPECIAL RESEARCH PROJECT

(Continued)

dual row ball bearings, and the installation of five new pressure transducers and five original pressure transducers. One side of each of the 10 differential pressure transducers is manifolded to a common line that routes back through the slip ring assembly to an atmospheric opening at the center rear of the pressure measuring system. With this tubing configuration, all the pressure transducers can be calibrated from 0-10 psig at the same time. All transducers will be electrically spamed to produce the same output at 10 psig. Testing will be made throughout the month of May 1971.

STANDARDS AND CALIBRATION
LABORATORY

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Work hours on completed jobs</u>
SPF	33 hours
B-2	103 hours
HTF	34 hours
K	17 hours
Reactor	14 hours

The work backlog is 850 hours.

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

The Rocket Systems Division ADP Acquisition Plan has been revised to reflect the purchase of two systems, one each for Edwards FRC and Rocket Systems, in order to save money for NASA. The revised plan has been forwarded to NASA Headquarters and revised purchase requirements have been forwarded to procurement.

Design was begun on the installation requirements for the RSD Data Computer. Design of hardware interfaces and some software requirements has begun. These will be itemized upon completion of individual items.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
	STATUS	SCHEDULE

CHANGES: (schedule changes since last report)

VERTICAL CALORIMETER	K SITE	YPR2023
TEST PACKAGE MOVED TO ATS BUILDING.		
Heater layout and heater purchase request in process		Complete week of June 1.

CHANGES: Completion date added.

RESEARCH PROPULSION MODULE	K SITE	YPR4173
LH ₂ TANK TEST PROGRAM SCHEDULED TO START		October to March 1972.
13' CRYOSHROUD, 10' SHADOW SHIELD, LH ₂ TANK, AND SUPPORT STRUTS		May to July 1972.
H-F SYSTEM		July 15 to Dec. 1972.
FLOX SYSTEM		Feb 1973 to March 1974.
Systems performance check out mods.		May 11 thru May 15.
Fabric enclosure being readvertised		
Site airconditioning design completed and in Procurement.		
LN ₂ fill and expulsion line being installed		mid-June completion.
4" LH ₂ line being installed		July 1 complete.

CHANGES: Schedules added.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS	
K	CRYOGENIC PROPELLANT RESEARCH SITE	<u>ADL SHADOW SHIELD TESTS (Continued)</u> <u>CONTROLS</u> Minor control system changes were made for the 13' cryoshroud check-out tests. No problems are anticipated in converting back to the original configuration.
	<u>VERTICAL CALORIMETER</u> (YPR2023)	CRD - J. E. MALOY; RSD - J. E. CAIRELLI <u>OPERATIONS</u> The vertical calorimeter and related hardware have been moved from storage to the ATS Building. We are presently making preparations to install the multilayer insulation. <u>CONTROLS</u> A closed loop heater system is planned for the vertical calorimeter body to facilitate tank warm up. A four circuit shroud warm up control system is planned utilized the 8' cryoshroud from ADL. Heater layout will be completed and heaters ordered the first week in June.
	<u>RESEARCH PROPULSION MODULE</u> (YPR4173)	CRD - R. L. DEWITT RSD - J. V. GILLETTE <u>OPERATIONS</u> The 13' cryoshroud, payload simulator, and 10' shadow shield assembly was tested May 11 through May 15. As a systems performance checkout test, all objectives were satisfactorily accomplished for the shroud and shadow shield. The payload simulator failed structurally and will require a new design. The shadow shield exhibited no detrimental characteristics. Areas of prime concern were thermally induced deformation of the support ring and excessive wrinkling of the 10' diameter reflective surfaces. The overall system leak rate was 0.18 std cc GN ₂ /sec with the system operating cold and at 20.3 psid LH ₂ . Minimal steady state LH ₂ consumption was recorded at 111 (Continued on Page 53)

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="310 266 472 393">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="505 359 1122 393"><u>RESEARCH PROPULSION MODULE</u> (Continued)</p> <p data-bbox="505 449 1300 608">gph with the payload simulator cold at 45°R, and 165 gph with the simulator at 490°R. Three heater strips on the cryoshroud bottom loosened during the test. One heater control power supply malfunctioned during the test.</p> <p data-bbox="505 642 1295 671">To-do items resulting from the test include:</p> <ol data-bbox="505 703 1300 1164" style="list-style-type: none"> (1) Redesign and build a new payload simulator. The new unit will consist of a single aluminum plate with LH₂ coolant "D" tubes, and heater strips mounted between the "D" tubes. (2) Replace several conoseal flanges on the cryoshroud. (3) Repair one known leak in the shroud top, and recheck the entire shroud system for leaks. (4) Replace heater strips on shroud bottom. (5) Repair heater control power supply. <p data-bbox="505 1198 1300 1324">The cryoshroud conical bottom will be leak checked and heater strips applied as soon as manpower is available. The conical bottom is not required until Part II testing in 1972.</p> <p data-bbox="505 1357 1300 1483">The K site air-conditioning system design was completed in May and is currently in procurement. As written, the job calls for one general contractor to supply equipment and do the installation.</p> <p data-bbox="505 1516 1300 1701">Other facility RPM work now in progress includes installation of the LN₂ fill and expulsion line and and the new 4" LH₂ line. The LN₂ piping is on an outside contract; completion is estimated by mid-June. The LN₂ line is being done in-house and may be completed by July 1.</p> <p data-bbox="574 1791 919 1821">(Continued on Page 55)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="334 274 496 399">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="524 369 1125 399"><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p data-bbox="524 435 764 465"><u>INSTRUMENTATION</u></p> <p data-bbox="524 498 1321 652">The check-out test of the 13' shroud with the 10' shield and payload simulator was completed. One surface sensor failed during the test due to the failure of the adhesive used on the payload simulator heaters.</p> <p data-bbox="524 691 654 721"><u>CONTROLS</u></p> <p data-bbox="524 755 1321 876">The five LH₂ temperature control loops on the 13' cryoshroud performed well during shroud check-out tests. Temperature deviations were approximately <u>+20F.</u></p> <p data-bbox="524 910 1321 1135">The heaters on the payload simulator separated from the plate during shroud tests. The heaters have a thin layer of silicone rubber which is easily rubbed off and provides a very poor bonding surface. A new heater design is being planned using a series of small heaters between the "D" tubes on the top of the simulator.</p> <p data-bbox="524 1168 1321 1322">Only one of the four cryoshroud heater circuits was put into automatic operations and it performed satisfactorily. The check-out tests were terminated before the other circuits warmed to the full setpoint temperature.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM YPY2752

System installed and test run (SE-13 Cold Spin Test Rig) Next run scheduled for Delivery of five range pressure transducer scheduled for	Early June. June 15, 1971.
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CHANGES: Schedule change.

STANDARDS AND CALIBRATION LABORATORY

302 hours of work completed. 1020 hours of backlog. 38 out of 53 (B-2) transducers failed acceptance test.	
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CHANGES: None.

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

Cold Spin Rig testing was again started (ERB SE-13) but was less than successful. During the first run, the pressure tubing connecting the transducers pulled loose from the rotor disc and was sheared off by a structural member. The pressure measuring unit was not damaged and performed satisfactorily prior to the tubing failure. The failure has postponed further testing until early June.

Delivery of the first 5 range pressure transducer for use in the advanced model (Mod 11) pressure measuring system will be delayed approximately 15 days. Receipt of this transducer is now expected by June 15, 1971.

DISCUSSION

The first model rotating 10 channel pressure measuring system was reinstalled on the SE-13 Cold Spin Test Rig. The excessive vibration problem, that appeared during the previous installation, was essentially eliminated by dynamically balancing both the pressure measuring system and the spin rig disc. After a brief running period, during which the pressure measuring system worked well, some of the hold down straps that bonded the pressure measuring tubes to the face of the spin rig disc became detached. This allowed the tubing group to respond to the high G forces and bow out far enough for a rig structural member to chop them off. The tubing will be replaced and strapped down by a stronger method. Testing is expected to be continued early in June, 1971.

STANDARDS AND CALIBRATION
LABORATORY

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-2	186 hours
K	24 hours
HTF	44 hours
SPF	48 hours

(Continued on Page 59)

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS	SCHEDULE	

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER

<p>Procurement of RSD computer approved by Headquarters. Purchase Request for floor mods initiated. K Site Data Link proceeding. SEL data acquisition system transmission line change checked out. SEL to XDS 9300 data link preliminary design completed. Long lead items ordered. Detail design begun.</p>	
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CHANGES:

STANDARDS AND CALIBRATION
LABORATORY (Continued)

Thirty-eight of fifty-three cryogenic transducers for B-2 failed acceptance tests and were returned to the vendor. The first two repaired units will be retested in early June. Total backlog is 1020 hours.

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

Verbal approval to proceed with the RSD Computer procurement was received from NASA Headquarters. An RFP is being prepared for procuring an XDS9300 and related hardware. We must now obtain GSA approval to permit Lewis Procurement to send the RFP's out to the bidders.

The purchase request for installation of a raised floor for the computer site was initiated and is in the approval cycle.

Fabrication and check out of the K Site Data Link is proceeding. The K Site fabrication is complete. A few changes remain before check out can begin. B-Control check out will be completed after the K Site work is finished.

Check-out of the transmission line change to the SEL Data Acquisition System is complete.

Preliminary design of the SEL to XDS 9300 data link is complete. Long lead time parts have been ordered and detail design has begun.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
	STATUS	SCHEDULE

CHANGES: (schedule changes since last report)

SHADOW SHIELD TESTS	K SITE	YPR3119
TEST SCHEDULE		June to Sep 15
Testing resumed		June 22.
LH ₂ phase completed		June 26.
LN ₂ testing scheduled to be completed		July 2.
Check out of 8' shroud and ADL tank completed.		

CHANGES: Schedule added.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="313 254 475 379">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="818 345 932 375" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="501 405 1396 663">LH₂ testing of the #6 shadow shield configuration was completed on June 26 after four days of tests. However, some data discrepancies occurred. With a payload temperature of 530°R the heatleak was about three times greater than for a payload temperature of 700°R! Preliminary indications are that the discrepancy may be due to the fact that the environmental test pressure was about 1½ decades higher for the 530° payload test.</p> <p data-bbox="501 697 1396 795">The assembly enclosure, platform, and air-conditioning contracts have been awarded with completion of all items expected by October 11.</p> <p data-bbox="501 817 1380 880">Vertical Calorimeter buildup has been slow due to vacations and thermocouple work at other sites.</p> <p data-bbox="501 914 868 978"><u>ADL SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="1057 914 1373 978">CRD - R. J. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="501 1003 662 1033"><u>OPERATIONS</u></p> <p data-bbox="501 1067 1408 1425">Installation of the #6 shadow shield test configuration into the K site vacuum chamber was completed during June. Testing was resumed on June 22. The LH₂ phase of this series of tests was completed June 26, 1971. The test was conducted at 530°R and 700°R payload temperatures. Steady state heat flux at 530°R payload temperature was 1/5 BTU/Hr. At 700°R payload temperature the boiloff was 0.5 BTU/Hr. The heat flux at 530°R was much higher than expected and may have been caused by the relatively high shroud internal pressure of $\approx 1 \times 10^{-5}$ torr. Shroud pressure with the payload at 700°R was $\approx 5 \times 10^{-7}$ torr.</p> <p data-bbox="501 1457 1347 1520">Testing with LN₂ in the test tanks is presently under way. This phase should be complete July 2, 1971.</p> <p data-bbox="501 1554 946 1584"><u>INSTRUMENTATION AND CONTROLS</u></p> <p data-bbox="501 1616 1349 1679">The check out of instrumentation on the 8 foot shroud and ADL tank was completed (193 channels on SEL).</p> <p data-bbox="501 1713 1364 1844">A lightning strike caused several controller cards and Preston amplifiers to go bad but all systems were corrected in time to complete the run of June 22. All cards will be repaired in-house.</p> <p data-bbox="594 1874 940 1904" style="text-align: center;">(Continued on Page 47)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

VERTICAL CALORIMETER K SITE YPR2023

<p>TEST SCHEDULE</p> <p>50% of calorimeter thermocouples were fabricated. Heater layout completed. Heaters ordered.</p>	<p>Nov thru Dec 1971.</p>
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CHANGES: Schedule added.

RESEARCH PROPULSION MODULE K SITE YPR4173

<p>TESTING SCHEDULE</p> <p><u>ITEMS COMPLETED</u></p> <p>Fabric enclosure awarded Air conditioning contract awarded. One quadrant of the 13' cryoshroud bottle was leak ck'd. New payload simulator design completed and units ordered.</p> <p><u>ITEMS IN PROGRESS</u></p> <p>Fabric enclosure installation schedule Vacuum chamber platform installation schedule Air conditioning installation schedule LN₂ and LH₂ piping installation completion estimate LH₂ and two oxidizer tanks scheduled to be delivered.</p>	<p>Nov 1971; Jan 1971 thru Jan 1973.</p> <p>June 28.</p> <p>July 29 to Sep 27. July 12 to Aug 26. July 12 to Oct 11. End of July. August.</p>
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CHANGES: Schedule changed.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="299 227 464 348">CRYOGENIC PROPELLANT RESEATCH SITE</p> <p data-bbox="492 324 819 389"><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="992 324 1311 389">CRD - J. E. MALOY; RSD - J. E. CAIRELLI</p> <p data-bbox="492 425 657 455"><u>OPERATIONS</u></p> <p data-bbox="492 489 1348 616">Work on the vertical calorimeter has been held up due to lack of manpower. The only work accomplished during June was to fabricate approximately half the thermocouples required to instrument the calorimeter.</p> <p data-bbox="492 651 624 681"><u>CONTROLS</u></p> <p data-bbox="492 715 1367 903">The layout of the heaters on the entire cryoshroud is complete and all the necessary units are on order. No new expenditures except for the heaters are expected. Existing equipment will be utilized for all vertical calorimeter tests. Heater gluing will be done at Plum Brook.</p>
	<p data-bbox="492 943 915 1003"><u>RESEARCH PROPULSION MODULE</u> (YPR4173)</p> <p data-bbox="992 943 1311 1003">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="492 1040 657 1070"><u>OPERATIONS</u></p> <p data-bbox="492 1104 1384 1266">The K site fabric enclosure for the clean room assembly area was awarded to R. L. Kuss and Company on June 28. The notice to proceed will be given following approval of shop drawings. On-site work is expected to begin by July 29 with the job completed by September 27.</p> <p data-bbox="492 1300 1433 1427">The vacuum chamber external platform contract was delayed an additional week due to the current shadow shield tests. The new start date is July 12. Work is to be completed in 45 days.</p> <p data-bbox="492 1461 1351 1588">The air conditioning contract for the K site assembly area has been awarded. Work at the site will begin July 12. This is a 90 day contract, which requires completion no later than October 11.</p> <p data-bbox="492 1622 1400 1749">The above three contracts conflict with the present K site test schedule. The shadow shield and the vertical calorimeter programs are currently being reevaluated for a new test schedule.</p>

(Continued on Page 49)

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="300 215 462 343">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="495 313 1096 343"><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p data-bbox="495 382 1291 499">The installation of the LN₂ and LH₂ lines was not completed because of the extended shadow shield testing in June. Completion of both jobs is anticipated by the end of July.</p> <p data-bbox="495 539 1274 656">One quadrant of the 13' cryoshroud conical bottom was leak checked. The room temperature leak rate exceeded full scale, 10⁻⁵ std cc He/sec., on the Veeco leak detector.</p> <p data-bbox="495 695 1372 891">The hydrogen tank and the two oxidizer tanks are expected to be delivered in August. A request will be submitted to extend the 30 day contractual requirement for warm He acceptance leak checks of the tanks. The three tanks together will probably require 60 calendar days to test.</p> <p data-bbox="495 931 625 950"><u>CONTROLS</u></p> <p data-bbox="495 989 1388 1244">A new payload simulator heater design is complete and all units are on order. Individual units will be glued to approximately the same area as before but on the opposite face of the simulator between the 'D' tubes. All gluing will be done at Plum Brook. One power supply failed during the initial 13' cryoshroud check out, but it has since been repaired. Since the unit was in warranty, there was no cost to the Government.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM YPY2752

SE-13 Spin Rig being reworked.	Delivered.
Advanced model system package	July 15, 1971.
5 range pressure transducer scheduled delivery . . .	

CHANGES: Schedule change.

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

During the ERB SE-13 Cold Spin Rig shutdown period while new pressure tubes were being installed, an investigation was made to determine the cause of electrical zero shift in some of the pressure transducer channels after each spin up run. This problem was found to be caused by excessive clamping pressure on the case of the pressure transducers. Corrective measures are now being taken to eliminate the problem.

The advanced model (Mod 11) pressure measuring system package has been delivered on time. Delivery of the first 5 range pressure transducer for use in the system has again been delayed. It is expected to be delivered by July 15, 1971.

DISCUSSION

The electrical zero shift problem with the first model rotating 10 channel pressure measuring system was found to be caused by a design error in the transducer holders. The pressure transducer holder cavity depth was too shallow and caused the pressure transducer case to be compressed when bolted in the system. The compression force varied as a function of temperature and was caused by differences in thermal coefficient of expansion. During each spin up test the heat generated by the mercury slip ring assembly was directed toward the transducer holders by the slip ring fan. The cold spin rig rotation is opposite that of the J-75 engine for which the fan exhaust direction was designed. Prior to the installation of the pressure measuring system on the SE-13 rig, the system was tested with the correct rotation and the temperature problem went unnoticed.

NARRATIVES ON ADJOINING PAGE

PROJECT

STATUS

CHANGES: (schedule changes since last report)

STANDARDS AND CALIBRATION LABORATORY

308 hours of work completed.

38 of B-2 transducers being reworked by manufacturer.

11 of HTF transducers were returned to manufacturer.

CHANGES: None.

INSTRUMENTATION DATA COMPUTER

Proceeding with procurement of Data Computer.

Award made for installation of raised floor for computer site.

"K" Site end of Data Link being checked out.

CHANGES: None.

STANDARDS AND CALIBRATION LABORATORY

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-2	132 hours
HTF	158 hours
K	10 hours
Reactor	8 hours

The 36 cryogenic pressure transducers for B-2 have not been returned by the manufacturer. Two transducers were rechecked after testing by MB; however, the same problems existed. Eleven of 50 transducers for HTF failed acceptance tests and were returned to MB. Tests failed were primarily thermal sensitivity, thermal zero, and thermal hysteresis.

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

All approvals were received to proceed with procurement of the Data Computer. The RFP was sent out and has been returned. Negotiations have been held and a contract is imminent at this point.

Bids were received for installation of a raised floor for the computer site and an award has been made.

Checkout of the K site end of the K Data Link has begun.

Radio Frequency Interference problems were encountered on the transmission line change to the SEL Data Acquisition System. The complete status of this task as reported last month is withdrawn until the RFP problem is cleared.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
HTF	<p>HYPERSONIC TUNNEL FACILITY <u>HRE (GARRETT ENGINE)</u></p> <p><u>CONTROLS</u></p> <p>mode of the diluent GN₂ valve is automatically switched from weight flow control to 2 psig purge pressure control. Careful timing of the switching points is required to prevent a mode transfer while the set point is too high as occurred during the subject run. To prevent a recurrence of this problem, mode transfer will be initiated when the heater pressure reaches 4.5 psig rather than 7 psig. The set point will be ramped to the purge level in 30 microseconds rather than 1.6 second. Using these conditions a successful run was achieved. A review of the data indicates that these settings will be satisfactory for all run conditions.</p> <p>The XDS-CF-16 and SDS-910 computers performed very successfully in sequencing and aborting the calibration runs. Minor changes in the program are required to completely mask out a data channel and for changing limits. Card reader problems and run schedules prevented making the changes during July.</p> <p>A problem with the alternating data channel checker hardware was found and a modified circuit is now being fabricated.</p>
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>SUMMARY</u></p> <p>LN₂ testing of the #6 shadow shield test configuration was completed on July 2. LH₂ repeat testing showed a higher heat flux than the June testing due to a higher shroud pressure.</p> <p>The contractors working on the enclosure, platforms, and air conditioning are progressing satisfactorily toward a completion by October 1.</p> <p>Testing was completed in the little rig for the pressure transducer to be used for POGO in B-2. This transducer is a PCB Piezotronics model 112M06. The transducer was calibrated with GHe at room, at LN₂, and at LH₂ temperatures. Test results show it to be very good at the low</p> <p>(Continued on Page 45)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="277 268 446 387">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="470 367 771 397"><u>SUMMARY</u> (Continued)</p> <p data-bbox="470 427 1291 526">temperatures, changing less than one percent in sensitivity from that measured at room ambient down to 20°K.</p> <p data-bbox="470 556 844 626"><u>ADL SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="1015 556 1339 626">CRD - R. J. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="470 656 633 685"><u>OPERATIONS</u></p> <p data-bbox="470 725 1356 914">The LN₂ phase of testing with the #6 shadow shield test configuration was completed July 2, 1971. Testing was conducted at 530°R and 700°R payload temperatures. The steady state heat flux was - 1.87 BTU/hr. at 530°R payload temperature and at 700°R payload temperature was - 1.71 BTU/hr.</p> <p data-bbox="470 944 1356 1172">Between July 6, 1971 and July 13 another test was made with LH₂. Repeat of the 530°R payload test resulted in a steady state heat flux of 2.3 BTU/hr. at a shroud vacuum of $\sim 4.4 \times 10^{-5}$ Torr. This heat flux was higher than that measured during the original 530°R run made in June. Shroud pressure for this test was higher than that of the June test.</p> <p data-bbox="470 1202 1388 1361">A null test, with the payload near LH₂ temperature, was also performed at two shroud pressure levels. At approximately 4.4×10^{-6} Torr shroud pressure the heat flux was .63 BTU/hr. At approximately 1×10^{-4} Torr the heat flux rose of 1.7 BTU/hr.</p> <p data-bbox="470 1401 1323 1500">The ADL test package has been removed from K site and moved to the ATS Building. There it is being changed back to the #1 test configuration.</p> <p data-bbox="470 1530 1380 1630">While at the ATS Building the cold guard tank will also be checked for leaks, which appeared during the last series of runs. If possible, the leaks will be repaired.</p> <p data-bbox="470 1659 1372 1719">The test package is expected to be returned to K site by mid-August.</p> <p data-bbox="470 1759 1315 1789">Testing will then resume the first week in September.</p> <p data-bbox="568 1858 917 1898">(Continued on Page 47)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

VERTICAL CALORIMETER	K SITE	YPR2023
TEST SCHEDULE		Nov thru Dec 1971.
All thermocouples fabricated. Tube flattening method developed for vacuum sensing between insulation layers.		

CHANGES: None

RESEARCH PROPULSION MODULE	K SITE	YPR4173
TESTING SCHEDULE		Nov 1971; Jan 1972 thru Jan 1973
<u>ITEMS COMPLETED</u>		
Two tank lid instrument pass-throughs cold leak checked		
New LN ₂ line installed		
<u>ITEMS IN PROGRESS</u>		
Fabric enclosure area assembly	Sep 24 (completion)	
Vacuum chamber external platforms installation . .	Sep 24 (completion)	
Air conditioning installation in the assy area . .	Sep 24 (completion)	
Leak checking 13' shroud		
8' cryoshroud heater strips installation		
13' cryoshroud flat bottom heater strip installation		
LH ₂ line installation	80% complete	

CHANGES: Schedule changes

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="300 252 462 383">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="479 352 1047 393"><u>ADL SHADOW SHIELD TESTS</u> (Continued)</p> <p data-bbox="479 413 722 453"><u>INSTRUMENTATION</u></p> <p data-bbox="479 483 1291 554">Test #6 for the shadow shield program ended July 12 after three weeks of testing.</p> <p data-bbox="479 584 1274 675">Three days were spent on the evaluation of a high-frequency-response cryogenic transducer to be used for the Centaur POGO tests at B-2.</p> <p data-bbox="479 715 1274 776">All facility transducers were removed for cleaning and recalibration.</p> <p data-bbox="479 816 609 846"><u>CONTROLS</u></p> <p data-bbox="479 876 1339 967">The ADL shadow shield was successfully tested at 530°R and 700°R. No serious problems were encountered with any systems during these tests.</p>
	<p data-bbox="479 1008 803 1068"><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="998 1008 1323 1068">CRD - J. E. MALOY; RSD - J. E. CAIRELLI</p> <p data-bbox="479 1098 641 1128"><u>OPERATIONS</u></p> <p data-bbox="479 1159 1356 1360">Work on the vertical calorimeter has been progressing very slowly due to lack of manpower. However, all thermocouples for the calorimeter have been fabricated. Also a method has been worked out to flatten 3/8" O.D. thin walled tube to be used for remote sensing of the vacuum between insulation layers.</p>
	<p data-bbox="479 1401 901 1461"><u>RESEARCH PROPULSION MODULE</u> (YPR4173)</p> <p data-bbox="998 1401 1323 1461">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="479 1491 641 1522"><u>OPERATIONS</u></p> <p data-bbox="479 1552 1372 1884">Three outside contractors are currently working at K site RPM tasks. Jobs being done under these contracts include the assembly area fabric enclosure, the vacuum chamber external platforms, and the assembly area air conditioning. All three contracts are scheduled for completion by the third week of September. No major tests are scheduled during this time. Primary efforts will be directed toward leak checking the 13' shroud and installing heater strips on the 8' cryoshroud and the 13' cryoshroud flat bottom.</p> <p data-bbox="592 1884 933 1925">(Continued on Page 49)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="280 250 446 379">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="475 349 899 379"><u>RESEARCH PROPULSION MODULE</u></p> <p data-bbox="475 413 831 443"><u>OPERATIONS</u> (Continued)</p> <p data-bbox="475 483 1317 803">Two tank lid instrument connector pass throughs were cold leak checked in the "little rig". The first connector was leak checked after 12 thermal cycles with LH₂. The leak rates for both connectors were less than 10⁻⁸ std cc GH₂/sec. Including spares, there are ten connectors total. The remaining eight will be cold leak checked without thermal cycling. Based on relative leak rates the connector will be rated for selective application as lid connectors, bulkhead connectors, and spares.</p> <p data-bbox="475 836 1344 902">Installation of the new LN₂ line is complete. The in-house installation of the LH₂ line is 80% complete.</p> <p data-bbox="475 936 1317 1095">The vehicle equipment bay piping requirements were reviewed by research and operations personnel. As a result, configuration changes are in process which will significantly reduce the facility GHe piping requirements for the K site tests.</p> <p data-bbox="475 1129 1393 1288">Work on the 13' cryoshroud conical bottom was stopped pending further negotiations with the fabricator, TENVAC. Negotiations are in process for a refund because of the shroud work not meeting specifications and a possible rework of the conical bottom by TENVAC.</p> <p data-bbox="475 1322 1317 1453">Initial shipments of miscellaneous vehicle hardware have been received at Plum Brook. Storage will be accomplished in the ATS Building assembly area prior to cleaning and installation.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

<p>ZERO SHIFT problem corrected.</p> <p>5-range pressure transducer delivery date August 30, 1971.</p>	
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CHANGES: Schedule change.

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

The pressure transducer electrical zero shift problem in the first rotating pressure measuring system has been solved. Several ERB SE-13 Cold Spin Rig runs were made during this month with satisfactory data showing the problem has been corrected.

Delivery of the first 5 range pressure transducer for use in the advanced model (Mod 11) pressure measuring system is still being delayed due to a range sensitivity shift problem.

DISCUSSION

The electrical zero shift problem with the first model rotating 10 channel pressure measuring system has been corrected by placing shims under each of the ten pie shaped transducer holders. This fix prevents the temperature dependent expansion forces from compressing the cases of the pressure transducers. The SE-13 Cold Spin Test Rig will be set up to test the accuracy of measuring cooling air mass flow through hollow turbine blades.

The range sensitivity shift problem with the advanced system 5 range pressure transducer has caused at least one month delay in delivery of the transducer. Data-metrics seems to be unable to solve the problem that apparently cropped up after the transducer's electrical circuit boards were conformal coated with epoxy. The coating is needed to anchor the electrical components to the circuit board so as to prevent failures due to the high G forces produced by rotation.

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK NO.

STATUS

CHANGES: (schedule changes since last report)

STANDARDS AND CALIBRATION LABORATORY

528 hours of work completed.

Transducer manufacturer has 36 of B-2 transducers.

3 transducers are scheduled to be reworked by 8-2-71.

CHANGES: None.

INSTRUMENTATION DATA COMPUTER

Negotiations for the computer contract are complete.

Computer floor being installed.

K Site End of Data Link being checked out - 95% complete.

Design in progress on Data link between SEL and XDS
9300.

CHANGES: None.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-2	171 hours
HTF	177 hours
SPF	185 hours
Reactor	16 hours
B-3	20 hours
H-Bldg	59 hours

The 36 cryogenic pressure transducers for B-2 have not been returned by the manufacturer. Three transducers have been completely disassembled and rebuilt by MB. These transducers will be tested the week of August 2. If they pass acceptance tests, then the remaining 33 transducers will be rebuilt and delivered the first week in September.

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

Negotiations for the computer contract are complete. Procurement is waiting on pricing background information. The contract is written and is awaiting procurement approval, based on receipt of background prices, before signing can take place.

The contract for the computer floor in B-Control Building was awarded and installation has begun.

Detail design has begun on the data link between the SEL data acquisition systems and the XDS 9300 Data Computer.

Checkout of the K Site End of the K Data Link is 95% complete. It remains to tie the B-Control End and K Site End together and exercise the link with a computer. This will begin as soon as a computer (XDS CF16A) is available.

The RFI problem on the transmission line modification to the SEL Data Acquisition System remains to be cured. No work was attempted because the systems were in continual use.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
HTF	<p data-bbox="310 264 472 353">HYPERSONIC TUNNEL FACILITY</p> <p data-bbox="505 326 675 353">(Continued)</p> <p data-bbox="505 393 1300 493">(5) Preliminary calculations and design work were done for the total temperature probes on the hot GH_2 weight flow measurement system.</p> <p data-bbox="505 522 1333 652">(6) All thermocouples on the Garrett HRE Engine were resistance checked for integrity. These readings also begin a history for the maintenance of the thermocouple systems on the engine.</p> <p data-bbox="505 687 630 715"><u>CONTROLS</u></p> <p data-bbox="505 751 1398 1009">For the oxygen run in September, the control system will be operated in the final configuration that will be used for engine testing. Two Rosemount probes and and signal conditioning equipment are being added to measure the gas temperature at the diluent N_2 and diluent O_2 orifices. These temperatures will be used in the weight flow calculation that produces setpoint signals for the diluent N_2 and diluent O_2 control loops.</p> <p data-bbox="505 1039 1333 1099">The purge control loop will be modified to prevent a possible overpressure while on purge control.</p> <p data-bbox="505 1139 1414 1397">The program for the CF-16 abort system has been modified to completely mask out any data channel not required. The alternate channel electronics has also been modified. The final check out of the CF-16 program changes and alternate channel electronics cannot be completed until the completion of the current B-2 runs. The SDS-910 computer sequence and abort program has also been modified to facilitate changing abort limits between runs.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE (Continued)</p> <p>The eight "POGO" transducers for B-2 were acceptance tested and calibrated in the "Little Rig".</p> <p>RPM tank delivery from GD/C has been further delayed due to leaks. Earliest hydrogen tank delivery is now late September.</p>
	<p><u>ADL SHADOW SHIELD TESTS</u> CRD - R. J. STOCHL; (YPR3119) RSD - J. E. CAIRELLI</p> <p><u>OPERATIONS</u></p> <p>Assembly of the ADL #1 test configuration was terminated at the ATS Building. On July 30 the test package was moved to K site for completion. The work at the ATS Building was delayed due to lack of manpower.</p> <p>The cold guard tank was leak checked. The only leaks found were in one of the electrical connectors and one flange seal. Both the connector and seal were replaced, which has seemingly eliminated the leaks.</p> <p>Installation of the ADL package is presently underway at K Site. Testing is expected to begin the week of September 27.</p> <p><u>INSTRUMENTATION</u></p> <p>The 4' ADL tank has been returned to the site to repeat test #1 and is presently being checked out.</p> <p><u>CONTROLS</u></p> <p>The gluing of heaters on the cryoshroud top and bottom sections is complete, and the barrel section is approximately one-half complete. The remaining gluing and wiring will be completed after the final ADL testing in September.</p> <p>(Continued on Page 45)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
	STATUS	SCHEDULE

CHANGES: (schedule changes since last report)

VERTICAL CALORIMETER	K SITE	YPR2023
TEST SCHEDULE		Nov thru Dec 1971.
Parts being fabricated to adapt new cold guard to the 8' Shroud.		

CHANGES: None

RESEARCH PROPULSION MODULE	K SITE	YPR4173
TESTING SCHEDULE		November 1971; Jan 1972 thru Jan 1973.
<u>ITEMS COMPLETED</u>		
Vacuum chamber external platform installation.		
Hydrogen tank instrument rake cleaned; LH ₂ line installation.		
13' cryoshroud flat bottom heater strips installed.		
Payload simulator reworked.		
4" LH ₂ line to chamber completed.		
B-2 "POGO" system tested and calibrated.		
<u>ITEMS IN PROGRESS</u>		
Fabric enclosure assembly area.		
Air conditioning installation for the assy area.		30% (Oct 10 completion)
High pressure He line installation		25% complete.
Oxidizer tank leak check		Sep 3 (completion)
Hydrogen tank delivery		Last week September.
Facility transducers being installed.		
Tank fill and expulsion 'Venturi Tubes' being reworked.		

CHANGES: Schedules added.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="305 256 475 385">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="502 352 678 385">(Continued)</p> <p data-bbox="502 419 827 485"><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="968 419 1290 485">CRD - J. E. MALOY; RSD - J. E. CAIRELLI</p> <p data-bbox="502 520 665 552"><u>OPERATIONS</u></p> <p data-bbox="502 586 1311 808">Due to lack of manpower, essentially no work was accomplished on the vertical calorimeter during August. In order to avoid delay in the K site schedule, the ATS Building work on the Vertical Calorimeter must be completed by the first week in October. This will require support from the thermocouple shop and K site mechanical personnel.</p> <p data-bbox="502 842 1276 939">Design of a new cold guard to adapt the vertical calorimeter to the 8' shroud has been finalized, and parts are being fabricated.</p> <p data-bbox="502 973 923 1040"><u>RESEARCH PROPULSION MODULE</u> (YPR4173)</p> <p data-bbox="968 973 1290 1040">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="502 1074 665 1106"><u>OPERATIONS</u></p> <p data-bbox="502 1141 1377 1362">RPM tank delivery from GD/C has been further delayed due to leaks in the oxidizer tank. The present anticipated GD/C schedule is to complete the oxidizer tank leak check by September 3. This will be followed by the hydrogen tank leak check. Earliest possible hydrogen tank delivery is now estimated for the last week of September.</p> <p data-bbox="502 1397 1372 1554">The payload simulator was dismantled, cleaned and polished by an outside contractor. New mounting brackets are being added in the Lewis-Cleveland shops. Heater strip installation and instrumentation will be completed by Plum Brook for the January tests.</p> <p data-bbox="502 1588 1372 1846">No leak checking was accomplished on the 13' cryo-shroud walls due to lack of manpower. The shroud bottom was leak checked and two more leaks were found. Additional leak checking on the flat bottom will be required after repairs. Regluing of heater strips on the flat bottom was completed. Negotiations to rework the conical bottom by the contractor, TENVAC, have not materialized.</p> <p data-bbox="601 1880 951 1921">(Continued on Page 47)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="300 254 462 379">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="495 350 1096 383"><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p data-bbox="495 419 1356 709">Other RPM work completed by Plum Brook included cleaning the hydrogen tank instrument rake. The rake is now ready for final assembly and instrumentation. The tank fill and expulsion venturi tubes are being reworked for K site installation. Lead-in piping and transducer tubing are being added. The high pressure helium line installation is approximately 25% complete. And the 4" vacuum jacketed LH₂ supply line to the chamber was completed.</p> <p data-bbox="495 745 1242 935">Installation of the K site fabric enclosure is proceeding on schedule. Iron work is about 50% completed. An additional zippered opening was added to the contract. This contractor will be delayed at least three days while the ADL test package is assembled in the vacuum chamber.</p> <p data-bbox="495 971 1339 1128">The fabric enclosure air pressurization and refrigeration system installation contract is 30% complete. All materials have been received except the air handler and expansion coil assembly. Contract completion is expected by October 10.</p> <p data-bbox="495 1165 1388 1354">The new air-conditioning system in the ATS Building assembly area malfunctioned. The trouble was traced to a defective solenoid valve. A new valve is on order, and the system will be back on-line by September 10. In addition, a new drain line was installed to prevent condensate run-off into the assembly area.</p> <p data-bbox="495 1391 738 1423"><u>INSTRUMENTATION</u></p> <p data-bbox="495 1459 1323 1584">The facility transducers are being installed after cleaning and recalibration. Five are being replaced due to the higher standards placed on transducers since they were initially installed.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

5-range pressure transducer received. SE-13 test rig being modified.	
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CHANGES: Schedule

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE (Continued)</p> <p><u>MISCELLANEOUS K SITE ITEMS</u></p> <p><u>OPERATIONS</u></p> <p>The contract work to install platforms on both sides of the K site chamber and in the south bay area has been completed. The north burnoff support system was straightened. Cables were added between supports to prevent movement of the supports. This work was accomplished by contract.</p> <p><u>INSTRUMENTATION (YPQ4240)</u></p> <p>Eight PCB Piezotronics pressure transducers for the B-2 "POGO" program were tested and calibrated in LH₂. This work was done in the "Little Rig". There was no interference with the contract work being done at K site.</p>
	<p><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM (YPY2752)</u> RSD - V. S. PETERSON</p> <p><u>SUMMARY</u></p> <p>The first rotating pressure measuring system will be used to check out the accuracy of measuring cooling air mass flow through hollow turbine blades. The SE-13 Cold Spin Test Rig is presently being modified to make this test.</p> <p>The first 5 range pressure transducer for use in the advanced model (Mod 11) pressure measuring system has been delivered to Plum Brook Station.</p> <p><u>DISCUSSION</u></p> <p>The advanced pressure measuring system 5 range pressure transducer was finally delivered after being overdue for nearly four months. It is presently scheduled to be acceptance tested in the Plum Brook Calibration Lab. A static calibration will be made to insure the transducer's compliance with the purchase order specifications. Subsequent to successful static</p> <p>(Continued on Page 51)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

STANDARDS AND CALIBRATION LABORATORY

<p>276 hours of work completed.</p> <p>Transducer manufacturer has 36 of B-2 transducers and is rebuilding - scheduled completion</p> <p>Two MB transducer were retested.</p>	<p>Sep 10, 1971.</p>
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CHANGES: Schedule added.

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (Continued)

test results, the transducer will be spin tested. The transducer will be mated with the I&C Division developed digital data system where the required 10K HZ carrier signal and DC voltages are supplied via the system's rotary transformer type signal transfer device.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-2	152 hours
HTF	24 hours
K	80 hours
SPF	16 hours
Reactor	4 hours

MB Transducer Contract Status

Two cryogenic transducers were re-tested during August. From the results of these tests it appears that MB has located the area of failure. MB is now rebuilding all of the transducers returned. We should start receiving the first of these during the second week of September.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER

<p>Awarded contract for XDS9300 Computer. . (90 day del) .</p> <p>Computer floor installed.</p> <p>Check out of K Site End of Data Link complete.</p> <p>Integrated check out (B-Control and K)</p> <p>Design and fabrication in progress on Data Link between SEL and XDS 9300.</p> <p>Interconnect junction box design for XDS 9300</p> <p>CF 16 software routines being debugged.</p>	<p>August 10, 1971</p> <p>90% complete.</p> <p>50% complete.</p>
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CHANGES: None.

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

The computer contract was awarded to Xerox Data Systems on August 10, 1971. The contract provides for delivery of the XDS 9300 within 90 days from that date.

The installation of the computer floor is complete. Temporary AC power remains to be installed prior to the arrival of the XDS 9300. Permanent power and air conditioning will not be available until after the computer is installed.

Detail design of the data link between the SEL data acquisition systems and the XDS 9300 Data Computer is 85% complete and fabrication has begun. A manual control and display panel remains to be designed.

Detail design for an interconnect Junction Box for the XDS 9300 is 50% complete.

Check out of the K Site End of the K Data Link is complete. The B-Control End and the K Site End have been linked together over 5000 feet of coax. The integrated check out is 90% complete. CF16 software routines are now being debugged to provide K site input/output from the data computer.

The RFI problem on the SEL Data Acquisition System transmission line modification has been cured. The problem was, in fact, not RFI, but digital leakage resulting from an incorrect disable voltage.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
HTF	<p data-bbox="293 264 722 330">HYPERSONIC TUNNEL FACILITY (Continued)</p> <p data-bbox="483 345 1328 411">to determine the cause for the insulation failures at the top of the nitrogen heater.</p> <p data-bbox="483 433 613 463"><u>CONTROLS</u></p> <p data-bbox="483 489 1380 713">Valves for the gas sampling system have been installed and wired. The shutdown circuit has been modified to eliminate the possibility of a shutdown without the illumination of an annunciator window. The diluent N₂ control valve will be operated in the flow control mode only. For the Mach 6 runs with oxygen the two psi purge will be supplied through the film cooling flange.</p> <p data-bbox="483 737 1364 896">The CF-16 abort program has been reworked to simplify changes and the alternate channel electronics have been reinstalled. Check out cannot be made until the lightning repair damage to the CRS memory interface is completed.</p> <p data-bbox="483 920 1380 1304">Preliminary examination of the previous calibration run data has caused the Rocket Systems Division to strongly suspect an inherent instability in the flow through the nitrogen heater core. Indication of a one hertz oscillation in certain heater pressures are indicated. The source is suspected to be the very small pressure drop across the heater core and the high heating rate for the gas passing through the core. The seriousness of such an instability has yet to be determined. To date, adverse effects have not been detected in the tunnel flow stream, however some of the heater insulation problem may be related to the flow instability.</p> <p data-bbox="483 1327 1360 1387">The data are being more fully analyzed and additional instrumentation will be installed for the upcoming run.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>ADL SHADOW SHIELD TESTS</u> (YPR3119) CRD - R. J. STOCHL; RSD - J. E. CAIRELLI</p> <p><u>OPERATIONS</u></p> <p>Installation of the ADL #1 configuration in the K Site chamber is complete. The resumption of testing has been rescheduled to the week of October 4. This was done for the following reasons:</p> <ol style="list-style-type: none"> (1) Lack of manpower due to leave and reassignments to assist at B-2 and HTF and vertical calorimeter buildup at the ATS Building; (2) To allow contract work to continue uninterrupted on the fabric enclosure; (3) To complete installation of heaters on the 8' diameter cryoshroud. <p><u>INSTRUMENTATION</u></p> <p>Instrumentation was completed and tested for support of the October testing.</p> <p><u>CONTROLS</u></p> <p>Check out for the ADL run in early October was completed this month. No problems were encountered.</p>
	<p><u>VERTICAL CALORIMETER</u> (YPR4173) CRD - J. E. MALOY; RSD - J. V. GILLETTE</p> <p><u>OPERATIONS</u></p> <p>Due to limited manpower, only the following vertical calorimeter work was accomplished during September:</p> <ol style="list-style-type: none"> (1) The tank surface was cleaned and foam ends trimmed to uniform diameters. (2) The between wrap, vacuum sensing tubes were formed and their mounting holes and attachments provided. (3) The guard tank heating and control thermocouples were installed. <p>(Continued on Page 49)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

RESEARCH PROPULSION MODULE K SITE YPR4173

<p>TESTING SCHEDULE</p> <p>CRYOTESTS SCHEDULED FOR</p> <p>INSULATED LH₂ TANK TESTS SCHEDULED TO BEGIN . . .</p> <p><u>ITEMS COMPLETED</u></p> <p>8 Physical Science connectors were tested.</p> <p>1 Inconel glass connector tested.</p> <p>Oxidizer tank delivered.</p> <p><u>ITEMS IN PROGRESS</u></p> <p>LH₂ tank scheduled to be shipped</p> <p>LH₂ tank being leak tested.</p> <p>Fabric enclosure</p> <p>Enclosure air handler delivery</p> <p>Enclosure air handler installation estimated . . .</p>	<p>Jan 1972 thru Jan 1973</p> <p>Early December</p> <p>March 15, 1972.</p> <p>October 15, 1971</p> <p>70% complete</p> <p>November 1, 1971</p> <p>November 15, 1971</p>
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CHANGES: Schedules

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="326 274 488 399">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="516 369 1032 403"><u>VERTICAL CALORIMETER</u> (Continued)</p> <p data-bbox="521 433 1390 532">(4) The practice wrap of the calorimeter to establish proper tension to achieve 50 layers per inch, was completed.</p> <p data-bbox="516 564 1373 723">Wrapping of the actual insulation to be tested will begin the first week of October. The Vertical Calorimeter buildup at the ATS Building is expected to be finished by the last week in October and testing will begin at K Site in late November.</p> <p data-bbox="516 761 764 791"><u>INSTRUMENTATION</u></p> <p data-bbox="516 823 1338 888">Thermocouples for monitoring the insulation thermal profile are being installed at the ATS Building.</p> <p data-bbox="516 922 651 952"><u>CONTROLS</u></p> <p data-bbox="516 986 1357 1085">The two guard tank warm up control loops were finalized and all equipment is on hand. It has been decided to make both systems closed loop.</p>
	<p data-bbox="516 1115 938 1180"><u>RESEARCH PROPULSION MODULE</u> (YPR4173)</p> <p data-bbox="997 1115 1325 1180">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="516 1212 683 1242"><u>OPERATIONS</u></p> <p data-bbox="516 1278 1357 1437">The RPM test schedule was revised to reflect slippage caused by late delivery of the LH₂ tank. The LH₂ tank cryotests are scheduled for early December; the insulated LH₂ tank tests are scheduled to begin March 15.</p> <p data-bbox="516 1471 1357 1602">The oxidizer tank was delivered last month from GDC and stored in Building 9215. The LH₂ tank is not expected to be shipped before October 15. Currently the hydrogen tank is being leak tested by GDC.</p> <p data-bbox="516 1634 1373 1924">The K Site assembly area fabric enclosure is 70% complete and the fabric rollup door is installed. A stop order was given to the contractor to permit testing of the ADL #1 configuration. The contractor will not return to finish the installation until October 18. The air handler for the enclosure pressurization and air-conditioning will not be delivered until November 1. Approximately two additional weeks will be required for installation.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

Acceptance test delayed until repairs are made on Cal Lab pressure standard. SE-13 spin rig being modified.	
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CHANGES: None.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="308 274 467 401">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="500 369 1101 401"><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p data-bbox="500 433 1429 691">Eight Physical Science connectors have been cold leak tested in the "little rig". Measured leak rates have not exceeded 10^{-8} std cc He/sec. The last connector leak tested was also checked for thermally induced emf's between pins. Some low level "noise" was observed during the transient cool down period; however, no significant emf's were indicated. A full report of the induced emf's is in process.</p> <p data-bbox="500 727 1364 886">All the RPM vehicle wire leads have now been assigned connector pin numbers. Completion of this task allows 19 individual cable runs to be fabricated in LeRC-C leaving only seven cables to be fabricated at Plum Brook during the vehicle assembly.</p> <p data-bbox="500 918 743 950"><u>INSTRUMENTATION</u></p> <p data-bbox="500 982 1315 1109">Connector wire designations have been made. One of the inconel-glass connectors was tested for thermal voltaic characteristics during the hydrogen proof testing cycle.</p>
	<p data-bbox="500 1176 792 1268"><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM (YPY2752)</u></p> <p data-bbox="977 1204 1299 1236">RSD - V. S. PETERSON</p> <p data-bbox="850 1304 967 1335"><u>SUMMARY</u></p> <p data-bbox="500 1367 1318 1526">The static acceptance test of the first five range pressure transducer for use in the advanced model (Mod II) pressure measuring system has been delayed due to repairs being made on the Calibration Lab's pressure standard.</p> <p data-bbox="500 1558 1370 1717">The SE-13 cold spinning that is being used to test the first pressure measuring system has been shutdown for modifications needed for the upcoming turbine blade cooling air flow tests. The first rotating pressure measuring system will be used to make these tests.</p> <p data-bbox="837 1749 1000 1781"><u>DISCUSSION</u></p> <p data-bbox="500 1805 1318 1908">A careful examination of the advanced pressure measuring system five range pressure transducer has (Continued on Page 53)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

STANDARDS AND CALIBRATION LABORATORY

<p>229 Manhours of work completed.</p> <p>1020 hours of backlog.</p> <p>12, B-2 transducers returned from the manufacturer.</p>	
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CHANGES: None.

INSTRUMENTATION DATA COMPUTER

<p><u>ITEMS COMPLETED</u></p> <p>K Data Link hardware checked out. PR for keyboard CRT units initiated. Houston Instruments digital plotter received. CF-16A digital controller received.</p> <p><u>ITEMS IN PROGRESS</u></p> <p>Data acquisition system to XDS 9300 data link logic fabrication</p> <p>Data acquisition system panel design</p> <p>Design of interface between CF/6A's and XDS9300 . .</p>	<p>30% complete.</p> <p>60% complete.</p> <p>20% complete.</p>
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CHANGES: None.

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (Continued)

led to some doubt as to its ability to withstand the high G forces encountered at 9000 RPM rotational speeds. A cord wood construction technique was used to mount the electronic components on a printed circuit board. This assembly technique does not give the longer length components very much physical support. Datametrics is presently evaluating the possibility of completely encapsulating the interior of the package so as to provide the necessary physical support for the components. Encapsulation does not allow easy repair of a defective unit.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-2	103 hours
K	41 hours
HTF	24 hours
SPF	48 hours
Reactor	24 hours
Total	1020 hours

Twelve of the defective MB cryogenic transducers for B-2 have been returned from the manufacturer. They are presently being cleaned before evaluation.

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

Check out of the K Data Link hardware is complete. Software generation for CF16A operation of the link is proceeding as time permits.

A purchase request for three Keyboard CRT units was initiated.

(Continued on Page 55)

INSTRUMENTATION DATA
COMPUTER (Continued)

The Houston Instruments digital plotter has been received.

One CF-16A digital controller was received along with an I/O teletype and miscellaneous I/O circuit boards. Included is the plotter coupler board to be used to operate the Houston Instrument plotter.

Detail design of the data acquisition system to XDS 9300 data link logic is complete. Fabrication is about 30% complete. This does not include the associated manual control and display panel. The panel design is 60% complete.

No further work has been accomplished on the interconnect junction box for the XDS 9300. The design remains 50% complete.

Detail design has begun and is about 20% complete for the interface between the two CF/6A's and the XDS 9300.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="290 278 500 368">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="806 379 918 405" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="484 441 1318 566">The ADL Shadow Shield configuration #1 testing was completed between October 6 and October 13. This testing completes this program and the hardware will be placed in storage.</p> <p data-bbox="484 602 1318 727">The vertical calorimeter has been wrapped with 160 layers of multilayer insulation. Thermocouples and vacuum sensing tubes were installed during wrapping. Testing is scheduled for late November.</p> <p data-bbox="484 764 1318 856">The "K" Site fabric enclosure and air conditioning package is behind schedule with completion expected in late November.</p> <p data-bbox="484 893 1400 989">The RPM hydrogen tank arrived at Plum Brook on October 29, approximately 10 months late. Acceptance testing of the LH₂ tank and the FLOX tank will begin in November.</p>
	<p data-bbox="484 1056 852 1120"><u>ADL SHADOW SHIELD TESTS</u> (YPR3119)</p> <p data-bbox="964 1056 1301 1120">CRD - R. J. STOCHL; RSD - J. E. CAIRELLI</p> <p data-bbox="484 1157 645 1183"><u>OPERATIONS</u></p> <p data-bbox="484 1219 1318 1344">A repeat of the ADL Shadow Shield configuration #1 test was completed between October 6 and October 13. This marks the end of YPR3119 shadow shield testing at "K" Site.</p> <p data-bbox="484 1380 1351 1570">All testing was performed with LH₂ in the test tanks and in the cryoshroud. Data was obtained at 530° and 700°R payload temperatures. For the null test the payload was chilled to near LH₂ temperature. The null test was performed at five different levels of shroud vacuum.</p> <p data-bbox="484 1606 1339 1832">Boiloff measurements for the 530° and 700°R payload temperatures were in the range of predicted values. But the boiloff rates for the null tests were higher than predictions for the indicated shroud vacuum. The boiloff did agree with the predictions if the shroud pressure was actually close to the indicated chamber pressure.</p> <p data-bbox="550 1880 898 1911" style="text-align: center;">(Continued on Page 49)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO) - PROJECT ENGINEERS
K	<p data-bbox="285 270 451 399">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="477 369 1036 399"><u>ADL SHADOW SHIELD TESTS</u> (Continued)</p> <p data-bbox="477 439 1308 691">In preparation for the upcoming vertical calorimeter tests, an addition test was attempted during the shadow shield test program. This additional test was to determine the effect of adding a long, thin tube to the mouth of the G.E. ionization gauge of the type used at "K" Site. The vertical calorimeter will use this same arrangement to measure vacuum between layers of insulation.</p> <p data-bbox="477 727 1338 1041">Two identical G.E. ionization gauges were used. One was attached to a long thin tube. The other had no tube. Both were mounted inside the 8' shroud with their open ends close together. The outputs of both gauges were observed during evacuation of the chamber. Unfortunately the referenced gauge, without the tube extension, became inoperable after a short period of operation, before filling the test tanks. All shroud vacuum measurements taken after that time were made with the modified vacuum gauge.</p> <p data-bbox="477 1077 605 1107"><u>CONTROLS</u></p> <p data-bbox="477 1139 1354 1327">A total of four power supplies from the payload and shroud control systems were sent back to the factory for repair or modification. The problems arose during the Shadow Shield testing in October, but did not delay the test. The power supplies will be required for RPM testing.</p>
	<p data-bbox="477 1363 800 1423"><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="954 1363 1276 1423">CRD - J. E. MALOY; RSD - J. V. GILLETTE</p> <p data-bbox="477 1459 1321 1650">During October the 30" vertical calorimeter was wrapped with 160 layers of multilayer insulation. Insulation thermocouples and four vacuum sensing tubes were installed during wrapping. The calorimeter is presently being fitted with the remaining instrumentation, support adaptor and fill lines.</p> <p data-bbox="477 1685 1308 1815">The test package will be sent to "K" Site the first week in November. Testing is expected to begin late in November. However it may be rescheduled to allow LH₂ testing of the RPM hydrogen tank.</p> <p data-bbox="586 1856 932 1888">(Continued on Page 51)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="293 258 456 385">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="483 354 992 385">VERTICAL CALORIMETER (Continued)</p> <p data-bbox="483 421 727 451"><u>INSTRUMENTATION</u></p> <p data-bbox="483 479 1281 540">Installation of thermocouples in the insulation is complete.</p> <p data-bbox="483 566 613 596"><u>CONTROLS</u></p> <p data-bbox="483 614 1300 741">The top and the barrel of the 8' cryoshroud heater wiring were completed this month. Only the bottom remains to be wired and this work will be completed in the first week of November.</p>
	<p data-bbox="483 778 899 838"><u>RESEARCH PROPULSION MODULE (YPR4173)</u></p> <p data-bbox="959 778 1281 838">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="483 876 643 907"><u>OPERATIONS</u></p> <p data-bbox="483 939 1360 1262">The "K" Site assembly area fabric enclosure will not be completed until late November. In addition to the government Stop Order to permit the final shadow shield test, additional time was lost because zippers on the roll up door were installed incorrectly. The door has been returned to the contractor's plant where new zippers will be installed. All hardware for the air-conditioning and air pressurization system is on hand. The air system installation will be completed by mid-November.</p> <p data-bbox="483 1296 1360 1487">The RPM hydrogen tank arrived from GDC on October 29, approximately three weeks later than scheduled. Un-carting and preparations for the warm leak acceptance tests and bracket addition for the LH₂ and FLOX tanks have been installed. Testing will begin about November 10, 1971.</p> <p data-bbox="483 1522 1295 1685">The last two Physical Science connectors (10 total) were cold leak tested. As with the previous eight connectors the measured leak rates did not exceed 10⁻⁸ std cc He/sec. A test report of the connector cold leak tests will be distributed.</p> <p data-bbox="483 1719 1308 1846">The payload simulator is scheduled to be shipped to Plum Brook for installation of the heater strips. Installation of hardware mounting blocks and thermal shorting pads is being completed in LeRC-C.</p> <p data-bbox="581 1880 922 1911">(Continued on Page 53)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

5 range pressure transducer static acceptance test completed.	
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CHANGES: None.

STANDARDS AND CALIBRATION LABORATORY

351 manhours of work completed. 1165 hours of backlog. Factory repaired B-2 transducers, 3 out of 5 failed tests.	
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CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS																		
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>RESEARCH PROPULSION MODULE</u> (Continued)</p> <p><u>INSTRUMENTATION</u></p> <p>The rake assembly for the LH₂ tank has been completed.</p>																		
<p><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM</u> (YPY2752) V. S. PETERSON</p> <p><u>SUMMARY</u></p> <p>The static acceptance test of the first five range pressure transducer for use in the advanced model (Mod II) pressure measuring system has been completed. It does not meet specifications for linearity at 40°F.</p> <p><u>DISCUSSION</u></p> <p>The Plum Brook standards laboratory has completed a thorough static evaluation of the first test model of the 5-range pressure transducer intended to be used in the advanced 10 channel pressure and 62 channel temperature measuring system. C.G.S. Data-metrics, the transducer manufacturer, did not include in their report a 40°F linearity test. The linearity deviation at 40°F exceeds our specification by 100%. Discussion with Datametrics in the following month will bring a satisfactory solution to this problem.</p>																			
<p><u>STANDARDS AND CALIBRATION LAB</u> RSD - D. H. WEIKLE</p> <p>A summary of work completed this month is as follows:</p> <table border="0"> <thead> <tr> <th data-bbox="495 1510 561 1540"><u>Site</u></th> <th data-bbox="784 1510 1239 1540"><u>Time spent on completed jobs</u></th> </tr> </thead> <tbody> <tr> <td>B-2</td> <td>123 hours</td> </tr> <tr> <td>HTF</td> <td>18 hours</td> </tr> <tr> <td>K</td> <td>14 hours</td> </tr> <tr> <td>SPF</td> <td>53 hours</td> </tr> <tr> <td>Reactor</td> <td>17 hours</td> </tr> <tr> <td>LeRC-C Acceptance Test of rotating transducer</td> <td>38 hours</td> </tr> <tr> <td>Direct run support-B-2</td> <td><u>88</u> hours</td> </tr> <tr> <td>Total</td> <td>351</td> </tr> </tbody> </table> <p>(Continued on Page 55)</p>		<u>Site</u>	<u>Time spent on completed jobs</u>	B-2	123 hours	HTF	18 hours	K	14 hours	SPF	53 hours	Reactor	17 hours	LeRC-C Acceptance Test of rotating transducer	38 hours	Direct run support-B-2	<u>88</u> hours	Total	351
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Total	351																		

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS	SCHEDULE	

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER

<u>ITEMS COMPLETED</u>	Familiarization training for CF16A completed.
<u>ITEMS IN PROGRESS</u>	Refurbishment of XDS progressing. Software for K Site functional demonstration data link 80% complete. Data computer interfaces progressing.

CHANGES: None.

STANDARDS AND
CALIBRATION LAB (Continued)

The B-2 cryogenic transducers repaired at the factory are being retested. Three out of five again failed acceptance tests. Tests on additional transducers are now in progress.

Total Calibration Laboratory Backlog - 1165 hours.

INSTRUMENTATION DATA
COMPUTER

J. L. HARROLD

The invoice for the Edwards FRC XDS9300 was received and paid, realizing an additional 3% discount for prompt payment.

The Plum Brook XDS9300 is presently in the check out phase of the refurbishment cycle at XDS. XDS installation personnel visited Plum Brook to discuss and plan for installation in December 1971 or January 1972.

The CF16A familiarization training was accomplished in October.

The progress on the numerous interfaces related to the data computer is given in tabular form below. The figures are percent complete.

<u>Description</u>	<u>Chassis</u>		<u>Panel</u>	
	<u>Design</u>	<u>Fab.</u>	<u>Design</u>	<u>Fab.</u>
SEL to XDS9300	100%	60%	90%	0%
XDS9300 Junction Box	80%	0%	N/R	N/R
2 CF16A Interconnect Boxes	100%	0%	0%	0%
2 CF16A to XDS9300	40%	0%	0%	0%

N/R = Not Required

Other required interfaces will be added to the table in the future as they are begun.

Functional demonstration software for the "K" Site data link is 80% complete. This software provides the functional subroutines necessary for inclusion in operating programs to be generated later.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
HTF	<p>HYPERSONIC TUNNEL FACILITY (Continued)</p> <p>The SDS910/CF-16 sequence and abort program performed successfully during the H₂ and O₂ runs. The intermittent CRS memory flag generation and 910 interface problems which occurred prior to these runs have been corrected.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="276 228 487 328">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="446 328 958 367"><u>VERTICAL CALORIMETER</u> (Continued)</p> <p data-bbox="446 387 1274 427">The work completed at K Site includes the following:</p> <p data-bbox="446 457 1315 626">At K Site the shroud lid and support structure were assembled and hung on the site crane. The test package was then mated to the shroud lid. The support tube thermocouple rake was installed, and X-Ray radiographs were taken of the insulation.</p> <p data-bbox="446 646 1299 785">But at this point mechanical work is held up in order to complete assembly of the thermocouple pins into connectors and installation of the vacuum gauges and their cables on the test package.</p> <p data-bbox="446 805 1258 904">It is estimated that three to four weeks delay to the calorimeter test program has resulted from the delay in instrumentation.</p> <p data-bbox="446 934 698 974"><u>INSTRUMENTATION</u></p> <p data-bbox="446 1003 1331 1162">The connections to the calorimeter have been completed, allowing the site mechanics to proceed with the installation of the calorimeter in the chamber. Additional wiring has been provided for the extra Hasting flow meters.</p> <p data-bbox="446 1192 1315 1262">The data link conversion program for K Site is approximately 85% complete.</p> <p data-bbox="446 1292 584 1331"><u>CONTROLS</u></p> <p data-bbox="446 1361 1347 1580">Heater wiring on the 8' cryoshroud and all interconnecting wiring was completed in November. The remaining wiring from the shroud to the chamber pass-through will be completed within 2 to 3 days time after the calorimeter/shroud package is hung in the chamber. Existing heater control circuits will be used for both shroud and tank warmup temperature control.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

RESEARCH PROPULSION MODULE	K SITE	YPR4173
<p>TESTING SCHEDULE</p> <p><u>ITEMS COMPLETED</u> Fabric enclosure completed. ATS Clean Room cleaned. LH₂ and LF₂ tanks warm leak checked. Tank support brackets were installed. LH₂ tank installed in support ring. Tank structure damage repaired.</p> <p><u>ITEMS IN PROGRESS</u> Hardware and LH₂ tank internal instrumentation are being installed for cold leak test.</p> <p>LF₂ tank being crated for storage.</p>		<p>Jan 1972 thru Jan 1974</p>

CHANGES: None.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="289 262 500 353">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="467 393 880 457"><u>RESEARCH PROPULSION MODULE (YPR4173)</u></p> <p data-bbox="945 393 1263 457">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="467 493 630 520"><u>OPERATIONS</u></p> <p data-bbox="467 556 1331 779">The K Site assembly area fabric enclosure is complete. Air conditioning system flow rate was established as satisfying the contract specifications. The enclosure will be acceptance tested in December by establishing a 0.1" H₂O pressure differential between the inside and outside of the enclosure. The maximum allowable air flow required to pressurize is 2000 CFM.</p> <p data-bbox="467 815 1344 978">In preparation for RPM assembly and insulation work all non-essential equipment was removed from the ATS Building clean room and the area was extensively cleaned. Clean room procedure will be established and adhered to in this area throughout the RPM project.</p> <p data-bbox="467 1009 1334 1196">Both the LH₂ and LF₂ tanks were successfully warm leak tested for contract acceptance. Total measured leaks were 1.4×10^{-7} scc GHe/sec for the LH₂ tank and 4.4×10^{-8} scc GHe/sec on the LF₂ tank. Support brackets for both tanks were located and welded on the mid and aft vehicle structures.</p> <p data-bbox="467 1232 1344 1491">While the tank was installed in the midstructure, the LH₂ tank flight weight struts were installed, adjusted, and safety wire locked. Presently the LH₂ tank is installed in the tank support ring with brass struts. Hardware addition and internal instrumentation for the LH₂ tank cold leak test is in progress. The LF₂ tank is being recreated and will be placed in storage until needed.</p> <p data-bbox="467 1526 1351 1713">Damage to both the mid and aft structure has occurred during shipping. In both cases the damage was repaired or considered minor. Additional lift points and protective crating will be used to prevent other damage during future transport between Lewis-Cleveland and Plum Brook.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

SITE

TASK NO.

STATUS

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

Pressure transducer failed to meet static specifications. Negotiations are in progress to resolve this problem.

STANDARDS AND CALIBRATION LABORATORY

298 manhours of work completed.

1416 hours of backlog. (251)manhours increase from last report.)

Three out of ten Tabor H₂O₂ transducers were rejected.

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

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

V. S. PETERSON

SUMMARY

The absence of CGS Datametrics management and engineering project personnel from their plant at the same time has delayed a firm decision as to what action they will take in solving the 5-range rotatable pressure transducer problem.

DISCUSSION

As reported last month, the 5-range rotatable pressure transducer failed to meet static specifications when tested at the Plum Brook Station Standards Lab. Furthermore the transducer's electronic circuit layout with respect to component mounting appears to be faulty and its chances of surviving the 9000 RPM developed "G" forces are very slim. We feel that a redesign of the electronic circuit board is mandatory and the major costs for the rework must be borne by CGS Datametrics. Negotiations will be continued to bring a satisfactory solution to both the static specification and the hostile high G problems.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-2	133 hours
B-3	6 hours
HTF	49 hours
K	50 hours
SPF	28 hours
LeRC-C Rotatable Pressure Transducer	32 hours
	<hr/>
	298 hours

Time has not permitted the testing of additional MB cryogenic transducers. The factory believes it has solved the drift problem. Three out of ten Tabor H₂O₂ transducers were rejected because their builtin reference failed.

Total backlog - 1416 hours.

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER

<p><u>ITEMS COMPLETED</u> Inspected XDS 9300 in California. Computer installation requirements agreed upon.</p> <p><u>ITEMS IN PROGRESS</u> XDS 9300 being refurbished. Scheduled completion . . . Electrical and air-conditioning installation bid opening The chassis and panels for numerous computer inter- faces are being worked on.</p>	<p>First of December</p> <p>December 3</p>
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CHANGES: None

INSTRUMENTATION DATA
COMPUTER

J. L. HARROLD

An inspection of the Plum Brook XDS9300 was made at the XDS refurbishment center in California. Re-furbishment is expected to be complete the first week in December. Shipping will proceed shortly thereafter with delivery expected by the end of December.

A second visit was made to Plum Brook by the XDS installation representative. Final installation requirements were agreed upon by XDS and NASA.

Bids for electrical and air conditioning installation requirements for the computer facility are due December 3, 1971. It is not expected that the electrical and air conditioning installation will be complete until the first week of February 1972. It has been decided to delay installation of the XDS9300 to prevent interference with the facility contracts, even though the XDS 9300 will be delivered earlier.

The progress on the numerous interfaces related to the data computer is given below in tabular form. The figures are percent complete.

<u>Description</u>	<u>Chassis</u>		<u>Panel</u>	
	<u>Design</u>	<u>Fab.</u>	<u>Design</u>	<u>Fab.</u>
SEL to XDS9300	100%	70%	100%	0%
XDS9300 to Junction Box	100%	5%	N/R	N/R
2-CF16A Intercon. Boxes	100%	20%	10%	0%
2-CF16A to XDS9300	90%	0%	5%	0%
* HTF Heater Link	20%	0%	0%	0%

N/R = Not Required

* The HTF Heater Link design was begun early, pending approval of the requirement. It must be implemented in a very short time to realize its full effectiveness. The requirement is in addition to the RSD Computer Plan, but will be implemented at the same time.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
HTF	<p data-bbox="310 284 472 379">HYPERSONIC TUNNEL FACILITY</p> <p data-bbox="488 343 915 379"><u>INSTRUMENTATION</u> (Continued)</p> <p data-bbox="488 413 1284 508">Design of the hot GH₂ fuel total temperature probe is 100% complete. Purchase requests for materials are in Procurement.</p> <p data-bbox="488 542 1317 638">Data amplifier outputs (64) are being wired into the scanner patchboard. The wiring is approximately 50% complete.</p> <p data-bbox="488 671 1365 767">The preliminary design to automate the GN₂ heater was presented and reviewed. The design should be finalized in early January.</p> <p data-bbox="488 801 1284 836">Flow sheets for the HRE engine program were begun.</p> <p data-bbox="488 870 618 906"><u>CONTROLS</u></p> <p data-bbox="488 930 1365 1125">For the Mach 7 run on December 2 with diluent N₂ in the O₂ system, the controls transducer for heater pressure was moved from the annulus back to the heater inlet. This essentially eliminated the heater pressure oscillations (13 H₂) that were present on the previous run.</p> <p data-bbox="488 1159 1382 1214">The GH₂ fuel metering Venturi water and air calibrations are complete.</p> <p data-bbox="488 1248 1349 1343">The GH₂ fuel control valve check out at the valve shop is complete. The five control valves are at the site ready for contractor installation.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>SUMMARY</u> (Continued)</p> <p>Hardware installation on the RPM LH₂ tank was delayed due to misalignment of vent line, fill line, and mixer motor nozzle as received from LeRC-C. These items were returned for rework.</p> <p>The ATS Building clean room assembly area has been cleaned and is now ready for work requiring clean room procedures.</p>
	<p><u>VERTICAL CALORIMETER</u> (YPR2023) CRD - J. E. MALOY; RSD - J. E. CAIRELLI.</p> <p>During December the installation of the 30" diameter vertical calorimeter into the K Site vacuum chamber was completed.</p> <p>On December 15, "Bake Out" of the test package was initiated. During this time the newly installed shroud heaters were used to warm the test package from room temperature to 130°F. On the following day the vacuum chamber was evacuated and the "Bake Out" continued overnight.</p> <p>On December 17, the first test of the 160 layer insulation series was started. This test was performed with LH₂ in the test tanks and in the shroud. This test was intended to be a "null test" with the boiloff expected to approach zero. On December 23 the "null test" was completed after zero boiloff was recorded by making use of the measure tank fill line cold guard.</p> <p>Upon completion of the "null test" the shroud was heated to 530°R. To speed up the temperature stabilization of the insulation, the vacuum chamber pressure was raised to approximately 1x10⁻³ Torr by admitting Helium. When the temperatures reached a level near the expected value, the chamber was again evacuated to approximately 1x10⁻⁵ Torr. The time saved by adding Helium is estimated to be approximately 90 hours. Boiloff measured at steady state with the 530°R shroud was 6.5 SCFH.</p> <p>On December 29, while attempting to refill the cold guard tanks, a liquid hydrogen leak developed in one section of</p> <p>(Continued on Page 43)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

RESEARCH PROPULSION MODULE

K SITE

YPR4173

<p>TEST SCHEDULE</p> <p><u>ITEMS COMPLETED</u> Mixer motor nozzle redesign and mods completed. All LH₂ tank hardware on hand. Liquid methane tank delivered and stored. ATS clean room area ready. Fiberglass forms for LH₂ tank delivered. Vehicle mid and aft structure returned to Cleveland. Equipment bay parts were received. Payload simulator heaters checked out & delivered to site. Equipment box and LH₂ switchplate heater control system was redesigned.</p>	<p>Jan 1972 thru Jan 1974</p>
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CHANGES: None.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS	
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>VERTICAL CALORIMETER (Continued)</u></p> <p>the 1½ inch vacuum jacketed transfer line. Testing was terminated on December 30. Examination of the line showed that the leak was in the inner pipe. The section of line is being removed for repair. Further testing with 160 layers of insulation will not resume until the line repairs are complete, perhaps as soon as the week of January 10, 1972.</p> <p><u>INSTRUMENTATION</u></p> <p>Instrumentation was completed in support of the run date. All measurements appeared satisfactory.</p> <p><u>CONTROLS</u></p> <p>The shroud top, side, and bottom heater control systems worked correctly after installation in the chamber. The guard tank upper heater had an 800 ohm short to ground and the bottom guard heater was satisfactory. Since the tank insulation was wrapped over the heaters, it was impossible to correct the short. The D.C. voltage supply to the heaters is floating so the single short to ground caused no operating difficulty, but the short should be corrected at the first opportunity. Both guard tank heater control systems worked correctly after installation in the chamber.</p> <p>No control problems were experienced during the December calorimeter run.</p>	
	<p><u>RESEARCH PROPULSION MODULE (YPR4173)</u></p> <p><u>OPERATIONS</u></p> <p>Hardware addition to the LH₂ tank was not started in December due to unexpected modifications required on the vent line, fill line, and the mixer motor nozzle. Both the vent and the fill lines required additional shop work before they could be installed. The cause for the errors in line dimensions is not presently understood since both lines were previously matched</p> <p>(Continued on Page 45)</p>	<p>CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="280 284 446 413">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="454 383 1063 413"><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p data-bbox="454 447 1323 705">to the vehicle mockup in Lewis-Cleveland. A design review of the mixer motor nozzle revealed that maximum flow would only produce marginal LH₂ circulation. The resulting nozzle redesign and modification is now completed. The hardware modification delayed assembly by approximately two weeks. All tank hardware for the LH₂ tank cryotest is now on hand. Assembly will begin the first week of January.</p> <p data-bbox="454 735 1356 864">The liquid methane tank was delivered in December and stored in Building #9215. Warm leak acceptance tests must be completed by February 1 to meet control requirements.</p> <p data-bbox="454 894 1339 1063">The ATS Building clean room assembly area is now ready for work requiring clean room procedures. Scaffolding, for work around the tank, has been cleaned. The only remaining preparation is the acquisition and cleaning of hand tools.</p> <p data-bbox="454 1093 1339 1192">Fiberglass forms for insulating the vent line, fill line, and strut penetrations were delivered and checked for proper lay-up on the LH₂ tank.</p> <p data-bbox="454 1222 1274 1282">The vehicle mis and aft structures were returned to Cleveland for cleaning, instrumenting and painting.</p> <p data-bbox="454 1312 1339 1411">All parts for the equipment bay assembly were delivered to Plum Brook for cleaning, and assembly is scheduled to begin January 10 in the Plum Brook white room.</p> <p data-bbox="454 1421 706 1451"><u>INSTRUMENTATION</u></p> <p data-bbox="454 1481 1339 1580">Research Propulsion Module instrumentation requirements for LH₂ cryogenic leak tests have been reviewed. No major problems are apparent at this time.</p> <p data-bbox="454 1600 592 1630"><u>CONTROLS</u></p> <p data-bbox="454 1659 1356 1789">All heaters for the payload simulator have been checked out before gluing. The heaters and layout have been delivered to the site mechanics to be glued at the first opportunity.</p> <p data-bbox="454 1799 1404 1928">A redesign of the equipment bay box and LN₂ switchplate heater control systems was necessary due to new heat transfer studies. This redesign is complete and will cause no problems or delay.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK NO.

STATUS

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

The five range pressure transducer returned to manufacturer for rework.

STANDARDS AND CALIBRATION LABORATORY

232 manhours of work completed.

1258 hours of backlog.

New shipment of MB Transducers are being tested.

RESEARCH

& (TASK NO.) - PROJECT ENGINEERS

**TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)**

RSD - V. S. PETERSON

SUMMARY

The CGS Datametrics model 1089 five range rotatable pressure transducer has been returned to the manufacturer. The circuit mounting problem will be corrected and the turn around time for this work is estimated to be one month.

DISCUSSION

As a result of discussions between the primary parties concerned (Plum Brook, LeRC-C Air Breathing Engines, and Datametrics), the model 1089 transducer will be reworked rather than redesigned. The rework approach was chosen as the best means to speed up the completion of the advanced rotating model 10 channel pressure and 62 channel temperature measuring system.

**STANDARDS AND
CALIBRATION LAB**

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-2	39 hours
B-3	22 hours
HTF	82 hours
K	39 hours
SPF	<u>50</u> hours
	232 hours
Total Backlog	1258 hours

A new shipment of MB transducers, both standard and cryogenic type, are being tested. The acceptance rate appears to be increasing. The judgement is based on a relatively small sample.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER B CONTROL

<p><u>ITEMS COMPLETED</u></p> <p>Electrical and A/C Contracts award XDS 9300 was shipped from California Design of chassis (2-CF16A to XDS9300) completed.</p> <p><u>ITEMS IN PROGRESS</u></p> <p>Electrical and A/C installation expected completion. . Work on chassis and panels for numerous computer interfaces is proceeding.</p>	<p>Week of Feb 1, 1972.</p>
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CHANGES: Schedule added.

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

Electrical and air conditioning installation contracts were awarded and work began early in December. Completion is expected by the first week of February.

The XDS 9300 was shipped the last day of December from California. Arrival is expected at Plum Brook during the second week of January.

The progress on the numerous interfaces related to the data computer is given below in tabular form. The figures are percent complete.

<u>Description</u>	<u>Chassis</u>		<u>Panel</u>	
	<u>Design</u>	<u>Fab.</u>	<u>Design</u>	<u>Fab.</u>
SEL to XDS9300	100%	95%	100%	10%
XDS9300 Junction Box	100%	75%	N/R	N/R
2-CF16A Intercon. Box	100%	80%	20%	0%
2-CF16A to XDS9300	100%	0%	5%	0%
HTF Heater Link	30%	30%	5%	0%

N/R = Not Required

January 1972

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
	STATUS	SCHEDULE

CHANGES: (schedule changes since last report)

VERTICAL CALORIMETER	K SITE	YPR202
RESUME TESTING		mid-March.
<u>ITEMS COMPLETED</u> First part of Calorimeter tests completed. 158 measurements were performed satisfactorily. 1½" vacuum-jacketed transfer line repaired and instld.		
<u>ITEMS IN PROGRESS</u> Installing RPM LH ₂ tank for cryotesting.		

CHANGES: Schedule.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="272 268 483 368">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="751 379 865 409" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="464 445 1263 697">Repairs to the hydrogen line were completed. The results of vertical calorimeter testing this month definitely points out the need for a cold guard around the center support tube before any further testing is conducted. The vertical calorimeter will be removed and necessary support tube modifications made to maintain a constant 37°R under all test conditions.</p> <p data-bbox="464 733 1219 862">The RPM LH₂ tank is expected to be complete and ready for transport from ATS Building to K-Site by February 7. The cold leak test, I-1B, will commence around the end of February.</p>
	<p data-bbox="464 899 789 959"><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="927 899 1243 959">CRD - J. E. MALOY; RSD - J. E. CAIRELLI</p> <p data-bbox="751 995 914 1026" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="464 1060 626 1090"><u>OPERATIONS</u></p> <p data-bbox="464 1120 1344 1221">The 1½" vacuum-jacketed transfer line, which failed during operation in December was repaired and reinstalled.</p> <p data-bbox="464 1257 1344 1382">Following shutdown on December 29, the vacuum chamber was partially pressurized with GN₂ to 1M Hg. and maintained at that level until January 10, when the chamber was again evacuated to ~5x10⁻⁶ torr.</p> <p data-bbox="464 1419 1344 1745">Testing with 160 layers of insulation was resumed on January 13. The first half of this test was with 530°R shroud temperature. It was intended to make a comparison with the 530°R shroud test performed in December. The December run differed in that the insulation had been exposed to helium at 1M Hg. pressure prior to testing. The steady state boiloff was 7.05 SCFH, which was identical to the December run. A difference in boiloff would have indicated the presence of gas trapped between the layers of insulation.</p> <p data-bbox="464 1782 1308 1866">The second half of testing was performed with the cryoshroud temperature maintained at 140°R with LN₂. Chamber pressure was raised to approximately 1x10⁻³</p> <p data-bbox="578 1897 927 1927" style="text-align: center;">(Continued on Page 39)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="251 248 414 377">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="446 347 771 377"><u>VERTICAL CALORIMETER</u></p> <p data-bbox="446 407 795 447"><u>OPERATIONS</u> (Continued)</p> <p data-bbox="446 477 1258 606">torr by introducing helium, then recirculated to stabilize insulation temperatures. An estimated three days of testing were thus eliminated. Steady state boiloff was 0.8 SCFH.</p> <p data-bbox="446 636 1291 825">In order to determine the effect of the tank support temperature a heater, located at the top of the support tube, was energized at 7.8 watts of power. The resultant steady state boiloff was 2.85 SCFH, proving that the calibration tank is not thermally isolated from the support tube.</p> <p data-bbox="446 864 1226 994">It was subsequently decided that further vertical calorimeter testing would be curtailed until the support tube is modified to maintain a constant 37°R under all test conditions.</p> <p data-bbox="446 1023 1258 1212">Preparations are presently underway to install the RPM LH₂ tank in the K-Site chamber for cryotesting. While the RPM tests are in progress, the vertical calorimeter will be disassembled and modified. Vertical calorimeter testing is expected to resume in mid-March.</p> <p data-bbox="446 1252 690 1282"><u>INSTRUMENTATION</u></p> <p data-bbox="446 1312 1177 1341">The 158 measurements performed satisfactorily.</p> <p data-bbox="446 1381 576 1411"><u>CONTROLS</u></p> <p data-bbox="446 1441 1291 1510">Run support was provided during the month of January. All control systems performed satisfactorily.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="284 282 446 413">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="479 413 1258 483"><u>RESEARCH PROPULSION MODULE</u> CRD - R. L. DEWITT; (YPR4173) RSD - J. V. GILLETTE</p> <p data-bbox="763 544 925 574" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="479 614 641 645"><u>OPERATIONS</u></p> <p data-bbox="479 675 1356 715">Work completed on the LH₂ tank during January included:</p> <ul data-bbox="479 735 1339 1068" style="list-style-type: none"> (1) Trial spin-up of mixer motor. (2) Installation of instrument rake, mixer motor and tank hatch. (3) Fitting and cleaning of valves and tubing to be mounted on LH₂ tank. (4) Removal, cleaning and reinstallation of 24 strut, monoball end fittings. <p data-bbox="479 1098 1339 1260">Practice braze joints with the Aeroquip induction brazing machine are currently being made. Before brazing could begin a mobile power supply was constructed to provide 150 Amp, 220 vac, single phase power. A new cooling water supply was also installed.</p> <p data-bbox="479 1290 1339 1491">The LH₂ tank is expected to be complete and ready for transport to K-Site by February 7, 1972. The tank cold leak test, 1-1B, will be delayed approximately one week to the end of February due to the unscheduled removal of the vertical calorimeter from the vacuum chamber.</p> <p data-bbox="479 1522 1339 1723">The liquid methane tank was successfully warm leak tested for contract acceptance. Measured leak rates were 3.97×10^{-8} scc GHe/sec on the hatch and 6.80×10^{-9} scc GHe/sec on the bottom penetration. Total maximum allowable leak was 1×10^{-6} sec GHe/sec. The tank has been recreated and stored in Building #9215.</p> <p data-bbox="479 1753 1339 1915">Assembly of the equipment bay hardware has not been started. This was due, in part, to receipt of tubing which did not meet diameter tolerances. In addition, other jobs with higher priority were being completed by the shop personnel.</p> <p data-bbox="568 1915 917 1945" style="text-align: center;">(Continued on Page 43)</p>

NARRATIVES ON ADJOINING PAGE

SPECIAL RESEARCH PROJECT

TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

Agreement made on 5-range pressure transducer rework.	
Rework scheduled to be completed by	early February, 1972.

CHANGES: None.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
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K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p><u>INSTRUMENTATION</u></p> <p>The LH₂ tank instrumentation rake was mounted and checked. Positions were located for the external platinum resistance thermometers on the LH₂ tank. Interconnect cable requirements were determined and construction was started.</p>
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<p><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM (YPY2752)</u></p>	<p>SPECIAL RESEARCH PROJECT RSD - V. S. PETERSON-</p>
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SUMMARY

The CGS Datametrics model 1089 five-range rotatable pressure transducer rework negotiations have led to an interim fix that will allow us to proceed with the spin testing of this transducer. The rework is now expected to be completed early in February 1972.

DISCUSSION

The rework agreement with the contractor covers the removal of a quantity of soft silastic potting material that covers a group of electronic components that were added for temperature compensation. There is a real risk that the removal process may damage some components and they may have to be replaced. After the successful completion of the removal of the silastic material and replacement of damaged parts, the interior of the transducer case will be completely filled with a hard and clear potting compound. This potting process will provide the physical support for the circuit components that are now poorly mounted on the circuit board in a vertical cord wood fashion. The original intent was to use a conformal coating of plastic over low profile components to secure them to the board whereby defective components could be replaced. Datametrics did not follow the philosophy and built the first unit without consulting with NASA. Complete encapsulation negates the repair concept and essentially makes the transducer a throw away item if it becomes defective. A complete repackaging design will be necessary to restore the repairability concept. It is uncertain at this time whether the redesign costs are warranted.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

STANDARDS AND CALIBRATION LABORATORY

<p>453 manhours of work completed.</p> <p>1189 hours of backlog.</p>
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INSTRUMENTATION DATA COMPUTER B CONTROL

<p><u>ITEMS COMPLETED</u> XDS9300 was received. Installed and checked out XDS CF16A digital controller with mini-Rads. Disc operating system was written (so that the mini-Rads would be used)</p> <p><u>ITEMS IN PROGRESS</u> Electrical and air conditioning installation contracts expected completion Work on chassis and panels proceeding. Software systems are being formulated Platinum resistance thermometer thermocouples and Z-table generation is Plot routines Floating point math routines</p>	<p>early February.</p> <p>90% complete. 90% complete. 90% complete.</p>
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CHANGES: None.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-2	74 hours
B-3	87 hours
HTF	73 hours
K	149 hours
SPF	<u>70 hours</u>
	453 hours
Total Backlog	1189 hours

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

The XDS9300 was received and will be installed during February.

Electrical and air conditioning installation contracts are proceeding towards an early February completion.

The XDS CF16A Digital Controller equipment was installed with their Mini RAD's and checked out.

The progress on the numerous interfaces related to the data computer is given below in tabular form. The figures are percent complete:

<u>Description</u>	<u>Chassis</u>		<u>Panel</u>	
	<u>Design</u>	<u>Fab.</u>	<u>Design</u>	<u>Fab.</u>
SEL to XDS9300	100%	100%	100%	50%
XDS9300 Junction Box	100%	100%	N/R	N/R
2-CF16A Intercon. Box	100%	100%	50%	10%
2-CF16A-XDS9300	100%	70%	5%	0%
HTF Heater Link	50%	30%	5%	0%
DC Power Distr.	100%	70%	100%	100%

N/R = Not Required

Check out of the various interfaces will begin in February.

INSTRUMENTATION DATA
COMPUTER SOFTWARE SYSTEMS

RSD - I. KRAMARCHUK

Software systems are being formulated and implemented for the CF16 mini-computers. The same software is applicable to the mini, alone, and to the combined mini - XDS9300 computer complex. The immediate objective is to give the K-Site RPM project on-line data from the mini-computer.

- (1) - Thermocouple and Z-Table (for platinum resistance thermometers) generation is 90% complete.
- (2) Plot routines and floating point math routines are 90% complete.
- (3) A Disc Operating System was written so that the mini Rads would be usable. XDS has practically no software available for the Rads, as yet.

February 1972 .

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="297 334 505 425">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="883 431 997 461" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="485 495 1333 622">The necessary parts of the vertical calorimeter have been sent to Lewis-Cleveland for modification and installation of an additional cold guard. Testing is expected to resume in April.</p> <p data-bbox="485 657 1365 784">The RPM LH₂ tank assembly was moved to K-Site and is now in the vacuum chamber. Final installation is about 50% complete. Testing will start around the middle of March.</p> <p data-bbox="485 818 1300 883">The 13' cryoshroud is at B-2 Site for leak checking and mating with the conical bottom.</p> <p data-bbox="699 1086 1045 1116" style="text-align: center;">(Continued on Page 43)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="285 298 496 395">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="477 435 799 495"><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="951 435 1269 495">CRD - J. E. MALOY; RSD - J. E. CAIRELLI</p> <p data-bbox="808 532 971 560" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="477 596 639 624" style="text-align: center;"><u>OPERATIONS</u></p> <p data-bbox="477 661 1321 822">During February the Vertical Calorimeter was removed from the K-Site vacuum chamber. The test package was disassembled and the center support tube was removed from the vertical calorimeter (this was done without disturbing the 160 layers of insulation).</p> <p data-bbox="477 854 1351 1048">The center support tube, mounting flange, and all hardware which attached directly to the mounting flange and calorimeter tanks were sent to Lewis-Cleveland for modification. Modifications also include shortening of the measure tank fill line dip tube and the addition of Rosemount temperature sensors.</p> <p data-bbox="477 1080 1334 1141">All Lewis-Cleveland modifications are expected to complete by March 3.</p> <p data-bbox="477 1177 1338 1274">The assembly of the vertical calorimeter test package will not actively begin until the present RPM LH₂ tank test is completed.</p> <p data-bbox="477 1306 1338 1366">Vertical calorimeter testing is expected to resume the first week in April.</p>
	<p data-bbox="477 1439 889 1499"><u>RESEARCH PROPULSION MODULE</u> (YPR4173)</p> <p data-bbox="951 1439 1269 1499">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="808 1536 971 1564" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="477 1600 639 1628" style="text-align: center;"><u>OPERATIONS</u></p> <p data-bbox="477 1665 1383 1923">During February the LH₂ tank assembly was completed for the tank cryo-leak test. Work included final fitting of all tank valve and tubing runs and induction brazing all tube fittings. Following assembly, all fittings were carefully mass-spec'd for zero detectable leakage. The multilayer insulation purge system and insulation support studs were included in the tank assembly. The tank was transported to K-Site and is currently</p> <p data-bbox="555 1923 899 1955" style="text-align: center;">(Continued on Page 45)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="289 270 500 364">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="480 405 1084 439"><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p data-bbox="480 471 1360 600">in the vacuum chamber. Tank to facility piping is approximately 50% complete. The instrumentation and electrical work is well underway to meet an anticipated test the week of March 13, 1972.</p> <p data-bbox="480 633 1341 697">The 13' shroud was moved to B-2 where new flanges will be installed and the entire shroud warm leak checked.</p> <p data-bbox="480 729 1344 858">The test plan for the LH₂ tank cryo-test was finalized and Test Plan Supplement #4 was approved. In support of latest work estimates the overall K-Site and ATS schedule was revised for the RPM program.</p> <p data-bbox="480 891 1036 923">Other RPM work activities included:</p> <ol data-bbox="480 955 1328 1673" style="list-style-type: none"> (1) Payload Simulator: heater installation 50% complete. (2) Safety Permit: Test details presented and procedures approved. (3) Solenoid mounting panel: Installation 75% complete. (4) Control Panel modifications: layout approved and drawings in process. (5) Insulation panels: Assembly Area (ATS Bldg) cleaned and ready for insulation work. All hardware (forms, special tools, etc.) were delivered to the assembly area. (6) Equipment Bay: System is completely assembled, cleaned and being leak checked. (7) Electrical: Termination boxes and conduit runs have been started for June Tests 1-2 & 3. <p data-bbox="480 1705 1360 1866">A four day test was conducted in the "little rig". The test objective was to determine temperature effects on ionization gage vacuum pressure readings. Simultaneous readings for both a "warm" gage and a "cold" gage were recorded between 10⁻³ and 10⁻⁸ Torr. Preliminary</p> <p data-bbox="643 1878 987 1911">(Continued on Page 47)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

5 range rotatable pressure transducer repaired and returned.

Transducer is undergoing static specification compliance tests.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROEECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>RESEARCH PROPULSION MODULE</u> (Continued)</p> <p>data indicated that temperature effects were of little or no significance in the temperature range tested. Both operation and research test reports will be written.</p> <p><u>INSTRUMENTATION</u></p> <p>Instrumentation for the March tests is 80% complete. Work consisted of tank instrumentation installation, and site wiring changes. An events recorder has been added to the facility, and it has been decided to use a multipoint recorder to monitor liquid levels.</p> <p><u>CONTROLS</u></p> <p>The four power supplies which were sent back to the factory for repair have been returned and checked out. All power supplies to be used with the various heater control systems are now operational.</p>
SPECIAL RESEARCH PROJECT	
<p><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM</u> (YPY2752) RSD - V. S. PETERSON</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>The rework on the CGS Datametrics Model 1089 five range rotatable pressure transducer has been completed. The transducer is now at Plum Brook and is being tested for contract static specification compliance by the Standards Laboratory.</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p>A visual inspection of the reworked transducer revealed that Datametrics did, as instructed, remove the silastic potting material and completely filled the transducer interior with hard transparent potting compound. Early data taken shows the transducer's static performance has shifted in values from the original data. Both zero and full scale outputs have been affected by the potting material. Further testing will continue to determine the performance of the transducer.</p>	

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

STANDARDS AND CALIBRATION LABORATORY

<p>237 manhours of work completed.</p> <p>1300 manhours of backlog.</p>

INSTRUMENTATION DATA COMPUTER B CONTROL

<p><u>ITEMS COMPLETED</u> XDS9300 installed. Design of 2-CF16A to XDS9300 interface completed. Design of 2-CF16A interconnect box completed. Fabrication of DC Power distributable chassis compltd. Design of HTF heater link chassis completed. Design of 9300 line receiver chassis completed. Design of 9300 I/O cables completed.</p> <p><u>ITEMS IN PROGRESS</u> XDS9300 check out nearing completion. Contractual XDS standard software yet to be received. Electrical & AC installation Work on chassis and panels proceeding.</p>	<p>95% complete.</p>
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CHANGES: None.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-2	70 hours
B-3	33 hours
HTF	66 hours
K	20 hours
SPF	36 hours
Reactor	<u>12 hours</u>
	237 hours
Total Backlog	1300 hours

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

The XDS 9300 has been installed and check out is nearing completion. The XDS standard software requested in the contract has not been received. Action is proceeding to obtain the software before completion of check out.

Electrical and air conditioning installations are 95% complete.

The progress on the numerous interfaces related to the data computer is given below in tabular form. The figures are percent complete.

<u>Description</u>	<u>Chassis</u>		<u>Panel</u>		<u>Check Out</u>
	<u>Design</u>	<u>Fab.</u>	<u>Design</u>	<u>Fab.</u>	
SEL to XDS9300	100%	100%	100%	70%	0%
XDS9300 Junc Box	100%	100%	N/R	N/R	0%
2-CF16A Inter Bx	100%	100%	100%	30%	0%
2-CF16A-XDS9300	100%	100%	100%	20%	0%
DC Pwr Distrib	100%	100%	100%	100%	0%
HTF Heater Link	100%	50%	60%	10%	0%
9300 Line Recvr					
Chassis	100%	0%	N/R	N/R	0%
9300 I/O Cables	100%	0%	N/R	N/R	0%
HTF Htr Link Cab	10%	10%	N/R	N/R	0%

N/R = Not Required.

Check out has been delayed because of HTF Heater Link Design. Check out is beginning the first week of March.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER SOFTWARE

<u>ITEMS COMPLETED</u>	
'K' program coding completed.	
CF-16 mini-RADS - program coding completed.	
CF-16 mini-plot routines and floating point match routines completed.	
<u>ITEMS IN PROGRESS</u>	
'HTF' heating control and monitoring system flow diagram	70% complete.
'HTF' heating control and monitoring system program coding	5% complete.
'K' data flow diagram	95% complete.
'K' data reporting system check out	60% complete.
CF-16 mini-RADS flow diagram	95% complete.
CF-16 mini-RADS check out	80% complete.
Platinum and thermocouple table generator	95% complete.

CHANGES: None.

INSTRUMENTATION DATA
COMPUTER SOFTWARE SYSTEMS

RSD - I. KRAMARCHUK

(1) HTF Heater Control and Monitoring System:

Flow Diagram	70% complete
Program Coding	5% complete
Check out	0% complete

(2) K-Site Data Reporting System:

Flow Diagram	95% complete
Program Coding	100% complete
Check out	60% complete

(3) General Disc Software for the CF-16 Mini-RADs:

Flow Diagram	95% complete
Program Coding	100% complete
Check out	80% complete

(4) Platinum and thermocouple table generation is 95% complete.

(5) The plot routines and the floating point math routines for the CF-16 computer are essentially complete.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="323 314 532 405">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="833 411 946 439" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="496 475 1295 637">The modified center support tube assembly for the vertical calorimeter was delivered to K-Site on March 10. Assembly is nearly complete and testing will resume as soon as the RPM LH₂ tank test is complete. This is expected sometime in April.</p> <p data-bbox="496 671 1344 929">The RPM LH₂ tank assembly leak test started on March 20. Excessive leakage required the chamber to be opened and leaks in the pressurization line repaired. The warm leak test was repeated on March 30 and will continue into the cold portion in April. Problems have plagued the mixer motor inside the tank and it is probable that the motor will not run at LH₂ temperatures.</p> <p data-bbox="496 963 1312 1124">The 13' shroud is being leak tested in B-2 and is progressing satisfactorily. The conical bottom leak test showed a very poor piece of hardware. The project group in Cleveland will make a decision to repair or replace with an outside contract.</p> <p data-bbox="618 1322 954 1354" style="text-align: center;">(Continued on Page 37)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="289 298 500 399">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="467 429 784 499"><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="930 429 1255 499">CRD - J. E. MALOY; RSD - J. E. CAIRELLI</p> <p data-bbox="768 530 930 560"><u>DISCUSSION</u></p> <p data-bbox="467 600 630 631"><u>OPERATIONS</u></p> <p data-bbox="467 661 1312 893">Modifications to the center support tube were completed during the first week of March by Lewis-Cleveland shops. Following assembly of the center support tube to the upper mounting flange and related parts, it was then cold-shocked and mass spectrometer leak checked at the South 40 test area. The support tube assembly was delivered to K-Site on March 10.</p> <p data-bbox="467 923 1287 1084">Plum Brook personnel then installed all instrumentation on the center support tube. The Measure Tank dip tube was shortened, instrumentation relocated, and multi-layer insulation blankets were made to cover the top and bottom of the calorimeter tanks.</p> <p data-bbox="467 1114 1295 1346">Procurement and fabrication was initiated for parts necessary to construct a fixture to unwrap and save MIL material from the vertical calorimeter. This fixture will allow removal of insulation with minimal effort as different layer testing is required. The first test starts with 160 layers and the layers decrease with successive testing.</p> <p data-bbox="467 1376 1287 1507">Vertical calorimeter testing is expected to resume the third week of April. This is subject to change depending upon the results of the RPM hydrogen tank testing.</p> <p data-bbox="467 1538 711 1568"><u>INSTRUMENTATION</u></p> <p data-bbox="467 1608 1360 1669">Additional Rosemount temperature sensors were installed to meet additional requirements of the next test series.</p> <p data-bbox="467 1699 597 1729"><u>CONTROLS</u></p> <p data-bbox="467 1770 1344 1901">All of the power supplies for the Vertical Calorimeter have been reinstalled and hooked up to the loads. The work required for the Vertical Calorimeter control system is approximately 90% complete.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.

CHANGES: (schedule changes since last report)

RESEARCH PROPULSION MODULE K SITE YPR4173

LH ₂ CRYO TESTS	thru Apr 3, 1972.
LH ₂ TANK TESTS	Jun 26 to Aug 6, 1972.
F ₂ TANK TESTS	Aug 14 to Sep 25, 1972.
LH ₂ TANK WITH SHADOW SHIELD TEST	Oct to Feb 1973.
LH ₂ & LF ₂ SYSTEM TESTS	Apr to Sep 1973.
<u>ITEMS COMPLETED</u>	
LH ₂ tank assembled and ready for testing.	
Cold leak tests conducted	Mar 22, 1972.
Pressurization line leaks repaired.	
Changed electrical pass-through connector.	
Changed transducers.	
Completed LH ₂ warm leak test	Mar 30, 1972.
Instrumentation requirements completed for second series of tests.	
<u>ITEMS IN PROGRESS</u>	
Pumping down for second cold leak test	Apr 3 est'd compl date.
Installing heater strip to payload insulator	80% complete.
Fabricating tank vent & propellant line insulation covers	90% complete.
Fabricating lid and bottom insulation covers.	
Assembling floating temperature plate.	
Instrumenting tank struts.	

CHANGES: Cryo test schedule.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="284 304 493 403">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="474 439 779 504"><u>RESEARCH PROPULSION</u> <u>MODULE</u> (YPR4173)</p> <p data-bbox="951 439 1271 504">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="777 560 938 590" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="474 624 636 655"><u>OPERATIONS</u></p> <p data-bbox="474 701 1352 1024">The LH₂ tank assembly (tank, valving, and tubing runs) leak test, RPM test 1-1b, was started on March 20. A facility leak delayed actual testing one day. On March 21 a warm leak test was conducted with the tank at 60 psia and 5×10^{-6} Torr chamber pressure. A maximum leak of 2 to 6×10^{-3} std cc GHe/sec was measured on the tank and pressurization line. Selective leak rate measurements of tank and service lines at various pressures indicated this was primarily due to the pressurization line.</p> <p data-bbox="474 1094 1287 1249">On March 22, cold leak tests were conducted and the motor spinup was attempted. Cold leak rates were essentially the same as with the system warm. The mixer motor spinup was not accomplished due to a shorted connector.</p> <p data-bbox="474 1320 1352 1542">The vacuum chamber was opened, leaks in the pressurization line were repaired, a tank lid electrical pass-through and connector were changed, and the Venturi 25 psia transducer was changed to a 50 psia transducer. On March 30, the warm leak test was repeated. The tank warm leak rate was measured at 3×10^{-4} std cc GHe/sec. No leak was detected in the pressurization line.</p> <p data-bbox="474 1582 1320 1834">Due to an apparent high outgassing background in the chamber the system was pumped out over the weekend. A cold leak test will be made April 3 and the mixer motor spinup attempted once more. Assuming the tank system leak rate does not substantially increase, and a successful mixer motor spinup is accomplished, the tank will be ready for installing the insulation by April 10.</p> <p data-bbox="565 1905 906 1935" style="text-align: center;">(Continued on Page 41)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="297 308 500 409">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="483 449 784 510"><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p data-bbox="483 550 1328 893">Warm leak tests on the 13' shroud were started in March at the B-2 Facility. The conical bottom leaks are numerous. Many are too large to measure with a standard Veeco Mass Spectrometer. A decision will be made in the near future as to whether the conical bottom is to be repaired or replaced with a new conical bottom. Further "mass specing" has been directed to the shroud vertical walls. Maximum single allowable leaks have been set at 1×10^{-7} std cc GHe/sec. The overall allowable leak rate is not to exceed 1×10^{-5} std cc GHe/sec.</p> <p data-bbox="483 933 1312 1185">Heater strip addition to the payload insulator is 80% complete. The remainder of this job is primarily electrical terminations. Insulation covers for the LH₂ tank vent and propellant lines are 90% complete. Forms for the tank lid and bottom insulation covers are in process. Assembly of the "floating temperature" plate has been started in the "white" room.</p> <p data-bbox="483 1255 719 1286"><u>INSTRUMENTATION</u></p> <p data-bbox="483 1326 1279 1447">Instrumentation requirements for the second series of tests have been received. The tank struts are currently being instrumented by the thermocouple shop.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.

STATUS	SCHEDULE

CHANGES: (schedule changes since last report)

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM YPY2752

5 range rotatable pressure transducer is being installed in Spin Test Rig.	
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CHANGES: None.

NO ITEMIZED DATA SUMMARY FOR STANDARDS AND CALIBRATION LAB - See Page 43

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

The Datametrics Model 1089 five range rotatable pressure transducer is presently being installed in the I&C Division's Shaft Data Systems Spin Rig. The rotational performance will be checked out over a speed range covering zero to 9000 RPM. Upon successful performance, the speed tests will then be extended to cover the speed range of 9000-18000 RPM needed for future programs.

DISCUSSION

The transducers zero and full scale outputs (static calibration) for each of the five pressure ranges have a slightly greater spread than is desirable. In order to speed up the advanced system program, it has been decided to proceed into the spinning evaluation. Present plans are to use a computer for engine test data gathering and computations. Since there will be so many correction factors, such as air centrifuging and air temperature, the zero and span corrections for each range will not appreciably add to the computer work load.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-2	99 hours
B-3	40 hours
B-3	48 hours (direct support)
K	33 hours
HTF	67 hours
SPF	58 hours
Reactor	1 hour
	<hr/>
	346 hours
Total Backlog	1400 hours

NO ITEMIZED DATA SUMMARY FOR INSTRUMENTATION DATA COMPUTER - See Page 45

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

The XDS 9300 hardware is functioning properly, with one exception. The proper hardware for simultaneous access to three separate memories was not supplied. A proposal is expected soon for completion of this requirement. Library software has been partially received and rendered operational. Acceptance of the system will be made when the library software is complete and the simultaneous memory access proposal is received, evaluated and negotiated.

Fabrication of the data computer interfaces has stalled in order to concentrate sufficient effort to rendering the HTF Heater Link operational as well as other site requirements. The HTF Heater Link digital hardware phase is nearing completion and will allow the software phase to soon proceed unimpeded.

The raw data input from the SEL data acquisition systems to one CF16A digital controller is operational. The K Data Link is operational through the same CF16A. This means that software for temporary service for K Site can proceed unimpeded.

The progress of the numerous interfaces related to the data computer and HTF Heater Link is given below in tabular form.

<u>Description</u>	<u>Chassis</u>		<u>Panel</u>		<u>Check Out</u>
	<u>Design</u>	<u>Fab.</u>	<u>Design</u>	<u>Fab.</u>	
SEL to XDS 9300	100%	100%	100%	70%	20%
XDS 9300 Junction Box	100%	100%	N/R	N/R	0%
2-CF16A Intercon Box	100%	100%	100%	30%	70%
2-CF16A - XDS 9300	100%	100%	100%	20%	0%
DC Power Distribution	100%	100%	100%	100%	100%
9300 Line Recvr Chas	100%	0%	N/R	N/R	0%
9300 I/O Cables	100%	30%	N/R	N/R	0%
HTF Heater Link	100%	100%	100%	100%	50%
HTF Heater Link Cabs	100%	60%	N/R	N/R	50%

N/R = Not Required.

NO ITEMIZED DATA SUMMARY FOR INSTRUMENTATION DATA COMPUTER SOFTWARE SYSTEMS -

See Page 47

INSTRUMENTATION DATA
COMPUTER SOFTWARE SYSTEMS

RSD - I. KRAMARCHUK

(1) HTF Heater Control and Monitoring System:

Flow Diagram	80% complete
Program Coding	70% complete
Check Out	20% complete

(2) K-Site Data Reporting System:

Flow Diagram	95% complete
Program Coding	100% complete
Check Out	65% complete

(3) General Disc Software for the CF-16 Mini-RADS:

Flow Diagram	95% complete
Program Coding	100% complete
Check Out	80% complete

(4) Platinum and Thermocouple table generation is essentially complete.

(5) Check out of the 9300 software furnished by XDS has begun.

April 1972

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

VERTICAL CALORIMETER K SITE YPR2023

<p>TESTING SCHEDULED TO RESUME</p> <p>TECHNOLOGY TESTS</p> <p><u>ITEMS COMPLETED</u></p> <p>Vertical Calorimeter center support tube installed. Kinney vacuum pumps removed and sent to LeRC-C. Three insulation blankets were fabricated. Additional temperature sensors installed.</p> <p><u>ITEMS IN PROGRESS</u></p> <p>Kinney vacuum pumps being rebuilt and reinstalled scheduled for</p>	<p>Week of May 1, 1972. Apr to Jun 5, 1972.</p> <p>May 15, 1972.</p>
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CHANGES: Start of testing schedule changed.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS	
K	<p data-bbox="256 233 467 324">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="732 368 846 399" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="448 435 1230 560">The Vertical Calorimeter has been reassembled and mounted inside the 8' cryoshroud and installed in the chamber. Testing is scheduled for the first week in May.</p> <p data-bbox="448 596 1312 661">On April 3, 1972, the RPM LH₂ tank was filled a second time with LH₂ and test J-1b was completed.</p> <p data-bbox="448 697 1279 983">New requirements for an ultimate operating vacuum of 5×10^{-7} Torr require the chamber to be cleaned and polished. A contract will be written for this task. A reduction of chamber pressure from 1×10^{-7} Torr to 1×10^{-6} Torr results in an increase of unwanted heat from 0.05 BTU/hr. to 0.9 BTU/hr. from gaseous conduction. The total heat leak into the test package is 0.3 BTU/hr. assuming that gaseous conduction is not a contributing path of heat addition.</p>	
	<p data-bbox="448 1024 769 1084"><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="751 1155 911 1185" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="448 1221 607 1251"><u>OPERATIONS</u></p> <p data-bbox="448 1282 1338 1669">The Vertical Calorimeter center support tube modification was installed with no apparent problems. The calorimeter test assembly was installed in the chamber, and testing will begin the first week of May. Some delay in the test buildup was encountered when the KT-500 Kinney vacuum pump failed. The pump was removed and shipped to Lewis-Cleveland to be rebuilt. Parts are being delivered from the manufacturer, and the pump will be reinstalled by May 15. Vacuum chamber pump down for the Vertical Calorimeter tests will be attempted by using the two smaller (KT-250) pumps.</p> <p data-bbox="448 1705 688 1735"><u>INSTRUMENTATION</u></p> <p data-bbox="448 1766 1295 1856">Additional temperature sensors were installed to meet the new requirements in support of the test scheduled for early May.</p>	<p data-bbox="911 1024 1230 1084">CRD - J. E. MALOY; RSD - J. V. GILLETTE</p> <p data-bbox="578 1866 922 1897" style="text-align: center;">(Continued on Page 35)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

RESEARCH PROPULSION MODULE K SITE YPR4173

<p>LH₂ TANK TESTS</p> <p>F₂ TANK TESTS</p> <p>LH₂ TANK WITH SHADOW SHIELD TEST</p> <p>LH₂ & LF₂ SYSTEM TESTS</p> <p><u>ITEMS COMPLETED</u></p> <p>LH₂ tank cold leak test completed and moved to ATS. (ATS) tank support delivered and assembled. Tank upper coolie hat fitted, and upper & lower units insulated. Tank strut monoball end fittings were cleaned. Payload simulator heater strip installation is compltd Floating temperature plate assy completed & C/O. 4 T/C reference junctions returned for Mfg. Instrumentation review meeting held Payload simulator wiring design completed.</p> <p><u>ITEMS IN PROGRESS</u></p> <p>An LH₂ mixer motor is being tested. LH₂ tank is being insulated. Working on PR for chamber cleaning & wall polishing contract. Re-evaluating splash pan requirements. Proceeding on 13' cryoshroud "mass specing" at B-2. 13' cryoshroud flanges are being replaced. New conical bottom being manufactured. Mixer motor power supply being checked. Payload simulator wiring sch'd to be comp by</p>	<p>Jul 31 to Sep 11, 1972.</p> <p>Sep 18 to Oct 30, 1972.</p> <p>Nov 1972 to Mar 1973.</p> <p>May to Oct 1973.</p> <p>Apr 21, 1972.</p> <p>May 31, 1972.</p>
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CHANGES: Test schedule extended five weeks.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>VERTICAL CALORIMETER</u> (Continued)</p> <p><u>CONTROLS</u></p> <p>Systems worked satisfactorily during prerun check out for the May 1 run.</p>
	<p><u>RESEARCH PROPULSION</u> CRD - R. L. DEWITT; <u>MODULE</u> (YPR4173) RSD - J. V. GILLETTE</p> <p><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>RPM Test 1-1b, LH₂ tank cold leak test, was completed in April. Due to the chamber high background gas, a definite leak rate could not be measured. The tank leak rate, however, is not greater than 1×10^{-3} std cc GH₂/sec while cold and at 60 psid. This leak rate is acceptable for future testing with a 5×10^{-7} Torr chamber pressure. The second attempted mixer motor spin-up was still not successful in LH₂. The power supply is being checked. A similar motor is being tested at Lewis-Cleveland to determine why the LH₂ tank mixer motor will not run. Following test 1-1b, the tank was removed from the facility and transported to the ATS Building. Insulation is being applied for the forthcoming TPM tests 1-2a and 2b, near earth and thermal null tests respectively.</p> <p>Because of the new ultimate operating chamber pressure requirement, 5×10^{-7} Torr, work is being initiated to improve the present ultimate chamber pressure. A purchase request for a chamber cleaning and wall polishing contract will be written. One potential contractor has indicated this will be a 4 to 5 week task. The RPM test program will be rescheduled accordingly. The diffusion pump cooling water will be temperature conditioned to improve pump operation within any temperature environment. Unused cables and tubes inside the chamber will be removed. Seals and wall pass-thrus will be extensively leak checked. The splash pan requirements are being evaluated. The pan surface accounts for approximately one-third of the outgassing area. In addition,</p> <p>(Continued on Page 37)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="267 292 487 393">CRYOGENIC PROPULSION RESEARCH SITE</p> <p data-bbox="462 423 771 493"><u>RESEARCH PROPULSION MODULE</u> (Continued)</p> <p data-bbox="462 524 1315 655">cleaning between the pan and chamber wall cannot be accomplished within vacuum cleanlines requirements. Acceptable leak rates on the 13' cryoshroud have been redefined.</p> <p data-bbox="462 685 1364 1108">Work on the 13' cryoshroud "mass specing" has progressed well at B-2. The first "once around" leak measurements were completed for each section. This included all tubes and most individual welds. The total leak rate is 3.67×10^{-5} std cc He/sec. Six welds have been selected for rewelding. These repairs should reduce the total leak rate to 2.2×10^{-6} std cc He/sec. All the shroud flanges are being replaced to eliminate the poor quality and improperly installed flanges supplied by the manufacturer. A new shroud conical bottom has been designed by Lewis-Cleveland. It is presently being manufactured by outside contractors. The new conical bottom will not be required until Part II testing.</p> <p data-bbox="462 1139 1364 1461">Work in the ATS Building assembly area is proceeding on schedule. The tank support "A" frame was delivered and assembled. The tank upper coolie hat was fitted, and insulation blankets for both upper and lower coolie hats were completed. The tank strut monoball end fittings were cleaned and are ready for assembly. Heater strip installation was completed on the payload simulator. Electrical terminations and instrumentation remain to be done. In addition to the RPM work, three insulation blankets were fabricated for the Vertical Calorimeter.</p> <p data-bbox="462 1491 1315 1562">The floating temperature plate assembly has been completed and leak checked in the "white" room.</p> <p data-bbox="462 1592 706 1622"><u>INSTRUMENTATION</u></p> <p data-bbox="462 1653 1315 1824">The mixer motor 3-phase power supply is being checked in the Standards Lab before its return to Cleveland. LH₂ tests on another mixer motor will then be run in Cleveland to determine motor starting characteristics in LH₂.</p> <p data-bbox="576 1874 933 1915">(Continued on Page 39)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

SITE

TASK NO.

STATUS

CHANGES: (schedule changes since last report)

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

5-range rotatable pressure transducer successfully
tested over 0-9000 RPM range.

CHANGES: None.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPULSION RESEARCH SITE</p> <p><u>RESEARCH PROPULSION MODULE</u></p> <p><u>INSTRUMENTATION</u> (Continued)</p> <p>The four thermocouple reference junctions have been returned from Dynascience and will be acceptance tested in May.</p> <p>A meeting with R. Dewitt and P. Wanhainen was held on April 21 to review in detail the instrumentation requirements for tests 2a and 2b.</p> <p><u>CONTROLS</u></p> <p>The payload simulator wiring print is complete and has been given to the electricians. Wiring should be completed by the end of May.</p>

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

The Datametrics Model 1089 five-range rotatable pressure transducer was successfully operated over a speed range of 0-9000 RPM. Further testing over a speed range of 9000-18000 RPM has been temporarily delayed due to a malfunction in the I&C Division's Shaft Data Spin Rig.

DISCUSSION

The successful transducer tests covering the speed range of 0-9000 RPM meets the requirements originally specified for the present Air Breathing Engine Division needs. Future turbine research will require spinning pressure transducer measurements covering a speed range of 0-18000 RPM. The model 1089 has a good chance to meet the performance capability for the extended speed requirement. A decision will be made during the early part of May 1972 to determine the location of the future spin testing as well as the specific pressure requirement needs for the Air Breathing Engine Turbine Research.

NARRATIVES ON ADJOINING PAGE

PROJECT

SITE

TASK NO.

STATUS

CHANGES: (schedule changes since last report)

STANDARDS AND CALIBRATION LAB

367 hours completed.

1075 hours of backlog.

CHANGES: None.

INSTRUMENTATION DATA COMPUTER

Heater Link digital hardware is essentially complete.
Check out of analog multiplexer system has started.
Interfaces related to the data computer are progressing in fabrication and check out.

CHANGES: None.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-3	156 hours
HTF	149 hours
K	28 hours
SPF	27 hours
Reactor	<u>7</u> hours
	367 hours
Total Backlog	1075 hours

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

The XDS 9300 has not been accepted because of small outstanding hardware and software requirements, as mentioned last month. The software requirement has been partially completed. A proposal has been submitted to Procurement to pay 95% of the system price. The remaining 5% is to be withheld until the outstanding items are complete. In return for 95%, we shall be permitted to use and interface with the system.

The HTF Heater Link digital hardware is essentially complete. Check out of the analog multiplexor system is currently beginning. It has been held up for delivery of a power supply.

The progress of numerous interfaces related to the data computer and the HTF Heater Link is given below in tabular form:

<u>Description</u>	<u>Chassis</u>		<u>Panel</u>		<u>Check Out</u>
	<u>Design</u>	<u>Fab.</u>	<u>Design</u>	<u>Fab.</u>	
SEL to XDS 9300	100%	100%	100%	90%	30%
XDS 9300 Junc Box	100%	100%	N/R	N/R	0%
2-CF16A Intercon Box	100%	100%	100%	100%	70%
2-CF16A - XDS 9300	100%	100%	100%	50%	0%
DC Power Distribution	100%	100%	100%	100%	100%
2-CF16A - TEC CRT	100%	0%	N/R	N/R	0%
9300 Line Rec Chassis	100%	100%	N/R	N/R	0%
9300 I/O Cables	100%	80%	N/R	N/R	0%
HTF Heater Link	100%	100%	100%	100%	90%
HTF Heater Link Cabs	100%	100%	N/R	N/R	90%

N/R = Not Required.

INSTRUMENTATION DATA COMPUTER SOFTWARE SYSTEMS

(See write up - Page 43)

INSTRUMENTATION DATA
COMPUTER SOFTWARE SYSTEMS

RSD - I. KRAMARCHUK

(1) HTF Heater Control and Monitoring System:

Hardware check out program	80% complete
Flow Diagram	80% complete
Program Coding	80% complete
Check out	20% complete

(2) K-Site Data Reporting System:

Flow Diagram	95% complete
Program Coding	100% complete
Check out	65% complete

(3) General Disc Software for the CF-16 Mini-RADS:

Flow Diagram	95% complete
Program Coding	100% complete
Check out	80% complete

(4) Data Display System Software (CF-16):

Flow Diagram	60% complete
Program Coding	30% complete
Check out	20% complete

(5) Check out and familiarization with the XDS-furnished software was accomplished with 15% of one man's time. This involved running the software, and communication with the XDS 9300 software expert in California to overcome various problems.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="256 348 467 439">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="768 479 881 510" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="435 546 1295 641">Two tests were completed with the vertical calorimeter 160 layer insulation system. Next test will be with the 100 layer system.</p> <p data-bbox="435 677 1263 737">The RPM payload simulator work is in progress in the ATS Building.</p> <p data-bbox="435 774 1263 903">Centaur Standard Shroud work in B-3 and site work at the Hypersonic Test Facility has taken manpower from K-site. This is on a minimum basis but does affect the K-site test program to varying degrees.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K.	<p data-bbox="256 308 467 405">CRYOGENIC PROPULSION RESEARCH SITE</p> <p data-bbox="435 439 755 506"><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="954 439 1279 506">CRD - J. E. MALOY; RSD - J. V. GILLETTE</p> <p data-bbox="751 540 914 570"><u>DISCUSSION</u></p> <p data-bbox="435 606 597 637"><u>OPERATIONS</u></p> <p data-bbox="435 667 1328 1221">Two tests were completed with the vertical calorimeter 160 layer continuous wrap insulation system. The null test was conducted with all systems (measure tank, guard tanks, and shroud) filled with LH₂. Steady state boil-off was approximately 0.1 SCFH. The warm test, shroud at 530°R, yielded a steady state boil-off of 0.8 SCFH. Both boil-off rates were commensurate with the theoretical heat leak rates. The insulation temperature gradient was more characteristic of a conductive heat transfer profile rather than the predicted radiation heat transfer profile. It is possible that the insulation may have slipped and thermally shorted to an end cold guard. During the next unwrapping the insulation will be inspected for slippage. The "H" Building central recorder malfunctioned and no data was recorded during the night of May 22. Fortunately the test package was still cooling down and no steady data was lost.</p> <p data-bbox="435 1255 1344 1548">Further vertical calorimeter testing has been temporarily suspended because all site personnel were reassigned to other facilities. Because of these delays the vertical calorimeter test schedule will require modification. As of this writing, the 160 layer tests with 140°R surrounds temperature have already been deleted from the program. The next calorimeter test will be with the 100 layer system. The earliest possible date to resume testing is June 19.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

RESEARCH PROPULSION MODULE K SITE YPR4173

LH ₂ TANK TESTS	Jul 31 to Sep 11, 1972.
F ₂ TANK TESTS	Sep 18 to Oct 30, 1972.
LH ₂ TANK WITH SHADOW SHIELD TEST	Nov 72 to Mar 73.
LH ₂ & LF ₂ SYSTEM TESTS	May to Oct 1973.
<u>ITEMS COMPLETED</u>	
Vehicle forward, aft & midstructures were completed. (painted and instrumented)	
Spare mixer motor was run at 61°R.	
Step-down transformers were installed.	
Revised instrumentation requirements were received.	
Cable fabrication & instrumentation installation drawings received.	
Drift problem in thermocouple reference junction has been corrected.	
<u>ITEMS IN PROGRESS</u>	
Payload simulator being assembled.	
Thermocouple reference junctions being calibrated.	

CHANGES: None.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="253 318 462 419">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="428 453 732 520"><u>RESEARCH PROPULSION MODULE (YPR4173)</u></p> <p data-bbox="950 453 1268 520">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="745 550 906 580" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="428 616 589 647"><u>OPERATIONS</u></p> <p data-bbox="428 681 1320 872">The payload simulator work is in progress at the ATS Building on an "as available" basis of manpower. Heater electrical terminations and instrumentation remain to be done. As a result of the manpower shortage, virtually all other field work has stopped on the 13' shroud leak checking and welding and the tank insulation buildup.</p> <p data-bbox="428 909 1338 1070">The vehicle forward, aft and midstructures were completed (painted and instrumented) in Lewis-Cleveland and are ready for shipment to Plum Brook. All the major hardware required to complete the RPM program will be on hand when these structures arrive at Plum Brook.</p> <p data-bbox="428 1106 672 1137"><u>INSTRUMENTATION</u></p> <p data-bbox="428 1171 1292 1362">The spare RPM mixer motor was run in Cleveland at a temperature of 61°R. Overload was encountered at 36 volts and 0.52 Amps. Step-down transformers were installed which allowed overload at 44 volts and 0.625 Amps. Therefore, the K-site motor should run if there are no mechanical problems.</p> <p data-bbox="428 1399 1292 1491">Revised instrumentation requirements were received and are being incorporated in an RPM 1-2a & b flow sheet and digital format.</p> <p data-bbox="428 1528 1247 1590">All necessary drawings have been received for cable fabrication and instrumentation installation.</p> <p data-bbox="428 1626 1276 1753">The drift problem in the Chromel Constantan Thermocouple Reference Junction (CR/CN TCRJs) has been corrected by Dynascience. The TCRJs are currently being calibrated.</p>

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

The 9000-18000 RPM test program for the Datametrics Model 1089 five-range rotatable pressure transducer has been delayed due to personnel changes in the I&C Division. A decision will be made early in June that will establish the direction and goals relative to the pressure measurement needs for the Air Breathing Engine Division turbine development programs.

DISCUSSION

During the early part of June, the original ten-channel rotating pressure measuring system will be returned to Plum Brook. New type 49-NC pressure transducers and a new style slip ring will be installed. The slip ring has a larger diameter hole through its rotor for easier routing of thermocouple extension wires through the package. This will require some mechanical modifications to the package structure. The advanced ten-channel pressure and sixty-two channel temperature rotating measuring system with the type 1089 pressure transducers will be evaluated for use in the new higher RPM research programs.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-3	56 hours
HTF	20 hours
K	42 hours
SPF	41 hours
Reactor	12 hours
Direct Labor support for B-3	<u>16 hours</u>
	187 hours
Total Backlog	1042 hours

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER

XDS9300 not accepted because of hardware discrepancies.
XDS9300 software requirement completed.

Proposal for simultaneous access to XDS9300 received from
Xerox - not acceptable - Work will be accomplished by NASA.

Interfaces related to the data computer are progressing in
fabrication and check out.

CHANGES: None.

INSTRUMENTATION DATA COMPUTER SOFTWARE SYSTEMS

(See write up - Page 49)

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

The XDS9300 has not been accepted because of small outstanding hardware discrepancies. These are waiting for parts at the present time.

The XDS9300 software requirement has been completed.

The proposal for simultaneous access to the XDS9300 memories was received from Xerox and is unacceptable. NASA personnel will accomplish the job as time permits with considerable savings of money.

The progress of numerous interfaces related to the data computer and the HTF Heater Link is given below in tabular form:

<u>Description</u>	<u>Chassis</u>		<u>Panel</u>		<u>Check Out</u>
	<u>Design</u>	<u>Fab.</u>	<u>Design</u>	<u>Fab.</u>	
SEL to XDS9300	100%	100%	100%	100%	60%
XDS9300 Junction Box	100%	100%	N/R	N/R	0%
2-CF16A Intercon Box	100%	100%	100%	100%	80%
2-CF16A-XDS9300 I/F	100%	100%	100%	100%	10%
DC Power Distribution	100%	100%	100%	100%	100%
2-CF16A-TEC CRT	100%	50%	N/R	N/R	0%
9300 Line Rec Chassis	100%	100%	N/R	N/R	0%
9300 I/O Cables	100%	100%	N/R	N/R	0%
CF16A Interrupt Timer	100%	100%	N/R	N/R	100%
HTF Heater Link	100%	100%	100%	100%	95%
HTF Heater Link Cabs.	100%	100%	N/R	N/R	95%

N/R = NOT REQUIRED.

INSTRUMENTATION DATA
COMPUTER SOFTWARE SYSTEMS

RSD - I. KRAMACHUK

(1) HTF Heater Control and Monitoring System:

Hardware check out program	95% complete
Flow Diagram	85% complete
Program Coding	85% complete
Check out	50% complete
Multiplexer check out software	40% complete

(Continued on Page 51)

INSTRUMENTATION DATA
COMPUTER SOFTWARE SYSTEMS (Continued)

(2) K-Site Data Reporting System:

Essentially completed basic display and conversion programs. Refinements will be made upon receiving specific research requirements.

(3) General Disc Software for the CF-16 Mini-Rads:

No change from last month.

(4) Data Display System Software (CF16):

No change from last month.

(5) Received LeRC-C thermocouple conversion routine based on National Bureau of Standards research. Applicability to our on-line XDS9300 computer has not been determined.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="289 270 495 364">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="824 370 938 399" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="477 433 1388 528">The 160 layer insulation test on the Vertical Calorimeter was started on June 19, 1972 and was completed seven days later. Final boil-off was approximately 1.15 SCFH of GH₂.</p> <p data-bbox="477 562 1383 657">The system was warmed up and the insulation was unwrapped to 100 layers. The 100 layer test program is scheduled to start approximately July 1, 1972.</p> <p data-bbox="477 691 1417 852">The RPM buildup continued in the ATS Building on insulation blankets and wiring of the payload simulator. The LH₂ tank lower hat blanket is 70% complete and the valve cover blanket was started. Insulation work is the critical path item as all RPM components are now at Plum Brook.</p> <p data-bbox="477 887 1369 981">A purchase request for cleaning and polishing the vacuum chamber walls has been written and is in the procurement cycle.</p>
	<p data-bbox="477 1050 797 1110"><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p data-bbox="1015 1050 1333 1110">CRD - J. E. MALOY; RSD - J. V. GILLETTE</p> <p data-bbox="812 1145 971 1173" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="477 1209 639 1237"><u>OPERATIONS</u></p> <p data-bbox="477 1272 1398 1661">On June 19 the Vertical Calorimeter with 160 layers insulation and a 530°R surrounds temperature was started. This was a rerun on the 160 layer warm system to verify the "fix" required due to slippage of insulation layers. The slippage had caused the outer layer to thermally short, which reduced the effective heat leak into the measure tank. A thermal barrier of 1/4" foam sheet and aluminized mylar was placed over the exposed insulation ends. The test required 7 days continuous running and was terminated when the insulation temperature profile and the tank boil-off appeared to reach steady state. Final boil-off was approximately 1.15 SCFH of GH₂.</p> <p data-bbox="477 1695 1349 1822">Following the 160 layer test the system was warmed up, the vacuum broken and the insulation unwrapping process was completed. The 100 layer insulation warm test will begin on approximately July 1.</p> <p data-bbox="610 1886 951 1915" style="text-align: center;">(Continued on Page 49)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT SITE TASK NO.

STATUS	SCHEDULE
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CHANGES: (schedule changes since last report)

RESEARCH PROPULSION MODULE K SITE YPR4173

LH ₂ TANK TESTS	Oct 16 - Nov 15, 1972
LF ₂ TANK TESTS	Jan 1973 - Feb 1973
LH ₂ TANK WITH SHADOW SHIELD TEST	Feb 1973 - Jun 1973
LH ₂ & LF ₂ SYSTEM TESTS	Sep 1973 - Feb 1974
<u>ITEMS COMPLETED</u>	
Payload simulator heater wiring & terminations complete.	
6 Rosemounts located and installed.	
Cleaning & polishing RFP for chamber walls completed and PR in Procurement.	
Vehicle forward, aft and mid structures were delivered.	
Preliminary inst. flow sheet & digital format complete.	
<u>ITEMS IN PROGRESS</u>	
Fabricating special insulation blankets & wiring for payload simulator.	
LH ₂ tank lower blanket	70% completed.
Valve cover blanket started.	
Rosemount & T/C terminations.	
CR/CN TCRJ's calibration is	90% completed.

CHANGES: Test Schedule

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPULSION RESEARCH SITE <u>VERTICAL CALORIMETER</u> (Continued)</p> <p><u>INSTRUMENTATION</u></p> <p>(1) Eight thermocouples were removed with the insulation removal.</p> <p>(2) No other changes in existing instrumentation.</p>
	<p><u>RESEARCH PROPULSION</u> <u>MODULE</u> (YPR4173)</p> <p>CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>Work continued in the ATS Building on the make up of special insulation blankets and wiring of the payload simulator. The LH₂ tank lower hat blanket is 70% complete and fabrication of the valve cover blanket was started. The payload simulator heater wiring and terminations were completed. The six Rosemounts were located and installed on the simulator. Rosemount and thermocouple terminations are all that remain to be done on the simulator. Insulation work appears to be the critical path item in the RPM build-up.</p> <p>An RFP has been written for cleaning and polishing the vacuum chamber walls. The purchase request is currently in procurement. A 30-day advertisement for bids will be required due to the estimated cost of \$15,000.00.</p> <p>No additional welding was accomplished on the 13' cryo-shroud. Welding is expected to resume by the end of July.</p> <p>The vehicle forward, aft, and mid structures were delivered to Plum Brook as scheduled. Delivery of all major RPM components to Plum Brook is now complete.</p> <p><u>INSTRUMENTATION</u></p> <p>(1) A preliminary flow sheet and digital format was completed and sent to LeRC-Cleveland.</p> <p>(Continued on Page 51)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

SITE

TASK NO.

STATUS

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

The 10-channel rotating pressure measuring system was returned to PBS.

Mechanical design changes will be made to accommodate new components.

CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
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K	<p>CRYOGENIC PROPULSION RESEARCH SITE</p> <p><u>RESEARCH PROPULSION MODULE</u> (Continued)</p> <p><u>INSTRUMENTATION</u> (Cont)</p> <p>(2) Rosemount instrumentation was completed on the payload simulator.</p> <p>(3) Calibration of the CR/CN TCRJ's is 90% complete.</p>
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SPECIAL RESEARCH PROJECT

<p><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM</u> (YPY2752)</p>	<p>RSD - V. S. PETERSON</p>
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SUMMARY

The original ten-channel rotating pressure measuring system has been returned to Plum Brook. The system package will undergo some mechanical design changes that will accommodate new components purchased by the Lewis-Cleveland Air Breathing Engine Division.

DISCUSSION

Modifications to the original system are now being made to include a new style 13-channel mercury slip ring, a printed circuit type slip ring terminal block, and modified Langley type 49NC variable reluctance pressure transducers. The pressure transducers have larger diameter O-ring seals that are intended to place the sealing compression forces at a transducer case position that is less sensitive to internal compressive loads. The slip ring terminal block is larger in diameter and will enable easy replacement of the pressure transducers when range changes are required.

The original pressure measuring system will be used for all of the J-75 engine tests.

The advanced system with its 5-range scanning Datametrics pressure transducers and 72-channel shaft data system will be evaluated for the new 0-18,000 RPM turbine research programs.

NARRATIVES ON ADJOINING PAGE

PROJECT

SITE

TASK NO.

STATUS

CHANGES: (schedule changes since last report)

STANDARDS AND CALIBRATION LAB

400 hours completed.

1210 hours of backlog.

CHANGES: None.

INSTRUMENTATION DATA COMPUTER

XDS9300 not accepted because of hardware discrepancies.

The remaining interfaces related to the data computer and the
HTF Heater Link are being checked out.

CHANGES: None

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-3	47 hours
HTF	10 hours
HTF Direct Labor Support	153 hours
K	4 hours
B-2 (accept test transducers)	77 hours
H-Bldg	22 hours
H-Bldg Cal Lab Equip	83 hours
SPF	10 hours
Reactor	4 hours
	<hr/>
	400 hours
Total Backlog	1210 hours

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

HARDWARE

The XDS9300 remains not accepted because of remaining small hardware discrepancies. These are waiting for parts and XDS manpower.

The progress of numerous interfaces related to the data computer and the HTF Heater Link is given below in tabular form. Items that showed complete last month have been deleted.

<u>Description</u>	<u>Chassis</u>		<u>Panel</u>		<u>Check Out</u>
	<u>Design</u>	<u>Fab.</u>	<u>Design</u>	<u>Fab.</u>	
SEL to XDS9300	100%	100%	100%	100%	60%
XDS9300 Junction Box	100%	100%	N/R	N/R	20%
2-CF16A Intercon Box	100%	100%	100%	100%	90%
2-CF16A-XDS9300 I/F	100%	100%	100%	100%	70%
2-CF16A-TEC CRT	100%	100%	N/R	N/R	50%
9300 Line Rec Chassis	100%	100%	N/R	N/R	20%
9300 I/O Cables	100%	100%	N/R	N/R	25%
HTF Heater Link	100%	100%	100%	100%	100%
HTF Heater Link Cabs	100%	100%	N/R	N/R	100%

N/R = Not Required

(Continued on Page 55)

NARRATIVES ON ADJOINING PAGE

PROJECT

SITE

TASK NO.

STATUS

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER SOFTWARE SYSTEMS

HTF Heater Control and monitoring system progressing.

K-Site data reporting system used on B-3 run.

"Quick Load" for SEL data tapes is being converted to XDS 9300.

CHANGES: None.

INSTRUMENTATION DATA
COMPUTER SOFTWARE SYSTEMS

RSD - I. KRAMARCHUK

Reassignments because of priority site workloads and cutback in personnel have necessitated reorganization of full and part-time personnel available for this task, and a redefinition of priorities in this area. Low priority items that showed no progress last month will be dropped until progress can be reported.

Progress this month has been minimal because of familiarization time and lack of manpower.

(1) HTF Heater Control and Monitoring System:

<u>Description</u>	<u>% Complete</u>
Hardware check-out program	98
Flow Diagram	85
Program Coding	90
Check-Out	80
Multiplexer check-out software	85

(2) K-Site Data Reporting System:

This capability was used successfully for the B-3 tests in its present form. This item will not be reported again until further progress is made.

(3) Data Display System Software (CF16A)

This work has been taken over by another person and familiarization and organization is the only progress.

(4) Quick Look for SEL Data Tapes:

A summer student is in the process of converting an existing program for the XDS910 to be used on the XDS9300. The conversion is 30% complete in its existing form. Improvements will be made when the existing form is working.

July 1972

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

VERTICAL CALORIMETER

K SITE

YPR2023

TEST SCHEDULE	To end Sep 1972.
40 LAYER TESTING SCHEDULED TO START	Aug 9, 1972.
100 & 60 layer insulation tests completed in 24 test days.	
<u>ITEMS COMPLETED DURING TESTING PERIOD</u>	
System was leak checked.	
Repaired cold guard fill line leak.	
<u>ITEMS IN PROGRESS</u>	
Unwrapping calorimeter for 40 layer tests.	

CHANGES: None.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>All of the 100 and 60 layer insulation tests on the Vertical Calorimeter were completed during July.</p> <p>The boil-off for the 100 layer 530°R surrounds temperature test was 2.1 SCFH. The boil-off for the 60 layer, 530°R surrounds test was 2.0 SCFH and 0.40 SCFH for the 140°R surrounds temperature.</p> <p>The Calorimeter is being unwrapped for the 40 layer tests in August.</p> <p>On the Research Propulsion Module progress has been slow due to lack of manpower. The upper and lower "coolie hats" have been completed and a sample meteoroid shield panel was fitted to the tank mockup. The design of a water cooling system for the diffusion pumps is complete.</p>
	<p><u>VERTICAL CALORIMETER</u> (YPR2023)</p> <p style="text-align: right;">CRD - J. E. MALOY; RSD - J. V. GILLETTE</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>All of the 100 layer and 60 layer insulation tests were completed during July. They required a total 24 test days. Preliminary control room data of insulation temperature gradients and corresponding boil-off rates indicated these tests were successful.</p> <p>The boil-off for the 100 layer 530°R surrounds temperature test was 2.1 SCFH. This was larger than predicted, but was attributed to an unusually high vacuum pressure of 3×10^{-5} Torr.</p> <p>During the unwrapping operation for the 60 layer tests the system was leak checked. A vacuum leak in the cold guard fill line was located and subsequently repaired. The vacuum for the remainder of tests was 2×10^{-6} Torr in the chamber and approximately 5×10^{-7} Torr inside the cold shroud. Hydrogen boil-off for the 60 layer, 530°R surrounds temperature test was 2.0 SCFM and 0.40 SCFM with the 140°R surrounds temperature.</p> <p style="text-align: center;">(Continued on Page 45)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS	
K	<p data-bbox="298 258 506 350">CROYGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="472 389 979 419"><u>VERTICAL CALORIMETER (Continued)</u></p> <p data-bbox="472 455 1349 580">Currently, the vertical calorimeter is being unwrapped for the 40 layer tests, which include surrounds temperatures of 37°R, 140°R, and 530°R. Tests are scheduled to start August 9, 1972.</p> <p data-bbox="472 616 714 647"><u>INSTRUMENTATION</u></p> <p data-bbox="472 683 1382 741">Instrumentation was set up and monitored for run support. All systems functioned properly.</p> <p data-bbox="472 778 602 808"><u>CONTROLS</u></p> <p data-bbox="472 844 1354 1030">During both 100 and 60 layer insulation tests, repeated calibration shifts occurred on the guard transducer. Both runs were completed and all other control systems functioned satisfactorily. The guard transducer is scheduled to be checked and calibrated the first week in August. This should cause no program delay.</p>	
	<p data-bbox="472 1100 779 1159"><u>RESEARCH PROPULSION MODULE (YPR4173)</u></p>	<p data-bbox="997 1100 1333 1159">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="837 1195 1000 1225"><u>DISCUSSION</u></p> <p data-bbox="472 1262 634 1292"><u>OPERATIONS</u></p> <p data-bbox="472 1328 1354 1641">Of the 320 manhours scheduled for insulation build up during July, only 180 manhours were actually available. The upper and lower "coolie hats" were completed, including the final trim and installation of the Velcro hook and pile. Side insulation panels and one of two top blankets were completed for the tank equator valve box. A sample meteoroid shield panel was fitted to the tank mockup and marked for velcro fastener locations. Mockup work on templates for the support strut covers was started.</p> <p data-bbox="472 1677 1354 1806">The purchase request for cleaning and polishing the vacuum chamber walls is still in the procurement cycle. The estimated issuance date is August 21, pending approval from Headquarters.</p> <p data-bbox="574 1842 919 1872">(Continued on Page 47)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS	SCHEDULE	

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

<p>Datametrics Advanced System Pressure Transducer Spin Tests are scheduled to be completed in</p>	<p>August 1972.</p>
<p><u>ITEMS COMPLETED</u></p>	
<p>Modified rear bearing slip ring shaft coupler and accessory drive. Slip ring stator clamps fabricated. Printed Circuit type slip ring wire terminal mounting ring fabricated.</p>	
<p><u>ITEMS IN PROGRESS</u></p>	
<p>Assembling 10-channel rotating pressure measuring sys.</p>	

CHANGES: Spin Test schedule

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS	
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>RESEARCH PROPULSION MODULE</u></p> <p><u>OPERATIONS</u> (Continued)</p> <p>The design for a controlled-temperature water-cooling-system for the diffusion pumps is complete, and an SJO is in process. Installation is estimated to begin October 1, 1972.</p> <p><u>INSTRUMENTATION</u></p> <p>No instrumentation work was accomplished on the RPM project due to B-3 manpower priority. Two spare amplifiers were ordered for the L&N strip chart recorders.</p>	
SPECIAL RESEARCH PROJECT		
	<p><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM</u> (YPY2752)</p> <p style="text-align: right;">RSD - V. S. PETERSON</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>The original ten channel rotating pressure measuring system is now in the process of being rebuilt. All of the new components required for this task are now on hand, including those fabricated by the Plum Brook machine shop. The system assembly will be completed by mid-August 1972.</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p>The last of the components needed to start the process of assembly have been fabricated. They include the modified rear ball bearing slip ring shaft coupler and accessory drive, a new slip ring stator clamp, and a mounting ring for a printed circuit type slip ring wire terminal disc.</p> <p>The Datametrics model 1089 advanced system pressure transducer spin tests are expected to be completed during August 1972. The spin tests will complete the model 1089 performance data up to and including 18,000 RPM as a requirement for the advanced turbine development programs. Firm requirements for the 18,000 RPM rotating pressure measuring system have not yet been negotiated with the Air Breathing Engines Division.</p>	

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

STANDARDS AND CALIBRATION LAB

512 hours completed.
1172 hours of backlog.

CHANGES: None

INSTRUMENTATION DATA COMPUTER HARDWARE SYSTEMS

XDS9300 not accepted because of hardware discrepancies.
The remaining interfaces related to the data computer and the HTF Heater Link are being checked out.

CHANGES: None

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-3	185 hours
B-3 Direct Support	22 hours
HTF	112 hours
K	15 hours
SPF	19 hours
PBRF	2 hours
H-Bldg	17 hours
Standards Lab Equipment	<u>140</u> hours
	512 hours
Total Backlog	1172 hours

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

HARDWARE

The XDS 9300 remains not accepted. XDS service to eliminate the remaining discrepancies stopped on July 17, 1972. A formal letter of rejection was sent to Xerox on July 20, 1972. A letter dated July 20, 1972 was received from Xerox demanding payment. A contract meeting is scheduled for August 2, 1972 to resolve the problem of discrepancies and payment. Meanwhile the XDS 9300 has been inoperative from July 15, 1972.

The progress of numerous interfaces related to the data computer is given below in tabular form. The HTF Heater Link hardware has been deleted since it was complete last month. Progress on interfaces to the XDS 9300 was stalled because of the XDS 9300 being inoperative.

<u>Description</u>	<u>Chassis</u>		<u>Panel</u>		<u>Check Out</u>
	<u>Design</u>	<u>Fab.</u>	<u>Design</u>	<u>Fab.</u>	
SEL to XDS9300	100%	100%	100%	100%	60%
XDS9300 Junction Box	100%	100%	N/R	N/R	20%
2-CF16A Intercon Box	100%	100%	100%	100%	100%
2-CF16A-XDS9300 I/F	100%	100%	100%	100%	70%
2-CF16A-TEC CRT	100%	100%	N/R	N/R	100%
9300 Line Rec Chassis	100%	100%	N/R	N/R	20%
9300 I/O Cables	100%	100%	N/R	N/R	25%

N/R = Not Required

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS	SCHEDULE	

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER SOFTWARE SYSTEMS

HTF Heater Control and monitoring system progressing 95% complete. Data Display System temporary display capability routine. Flow diagrams, programs and check outs are in progress. 'Quick Look' for SEL data tapes. Conversion for XDS 910 to XDS 9300 completed. CF16A debug utility program modified.
--

CHANGES: None.

INSTRUMENTATION DATA
COMPUTER (Continued)

SOFTWARE

(1) HTF Heater Control and Monitoring System:

The initial use of this automatic system is planned for the week of August 7, 1972. The software for the initial application is 95% complete.

(2) Data Display System (CF-16A):

This requirement is being implemented in a manner to provide a temporary capability without the XDS9300. Minimal rework will be required to provide the operational capability using the XDS9300. This will provide a run capability while the total system is being developed.

Temporary Display Capability

<u>Routines</u>	<u>Flow Diag.</u>	<u>Prog.</u>	<u>C/O</u>
Pattern/Request Table Sv	90%	90%	80%
Eng Unit Data Image Gen	10%	10%	10%
Raw Data Accum & Convert	5%	0%	0%
Main Eng Unit Data Display Program	20%	20%	0%

(3) Quick Look for SEL Data Tapes:

The necessary conversions from XDS910 to XDS9300 are 100% complete. The program in its converted form remains to be checked out. The check out has been delayed because the XDS9300 has been inoperative.

(4) CF-16A Debug Utility Program:

This program was modified to allow input and output for the CRT Displays. This allows immediate response as compared to using the teletype for I/O.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="316 258 527 352">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="836 358 950 389" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="519 419 1339 520">The Vertical Calorimeter test program is completed. The 40-layer insulation tests were the last of this series.</p> <p data-bbox="519 550 1356 620">Only 36 manhours were available for assembly work in the ATS Building, for the RPM program.</p> <p data-bbox="519 651 1372 872">A new schedule has been made showing Tests I-2 & 3 starting in January. In order to meet this schedule, 800-900 manhours have to be worked between September 10 and December 10 preparing the RPM assembly in the ATS Building. Any deletion of manpower by the B-3 CSS program and the HTF-HRE program will impact this schedule.</p>
	<p data-bbox="519 973 844 1044"><u>VERTICAL CALORIMETER</u> (YOR2023)</p> <p data-bbox="1063 973 1388 1044">CRD - J. E. MALOY; RSD - J. V. GILLETTE</p> <p data-bbox="836 1074 998 1104" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="519 1135 690 1165"><u>OPERATIONS</u></p> <p data-bbox="519 1195 1372 1457">The Vertical Calorimeter, 40-layer insulation tests were completed in August. The 40-layer system was tested with three different surrounds temperatures of 40°R, 140°R and 530°R. These tests complete the vertical calorimeter spiral wrap insulation research program. As currently scheduled the vertical calorimeter will be removed from the K-Site vacuum chamber and stored at Plum Brook.</p> <p data-bbox="519 1487 1388 1850">The three calorimeter tests required a total of 17 consecutive test days. Data were automatically recorded each hour, except for brief down times to change equipment. Data acquisition was also off for four evenings and part of one weekend to avoid lightning damage from impending thunderstorms. Vacuum chamber pressure was maintained at 2×10^{-6} Torr. With cryopumping, the pressure inside the shroud varied from 5×10^{-8} to 1×10^{-7} Torr. Approximate steady state hydrogen boil off for the 40°R, 140°R and 530°R tests was respectively 0.3 SCFH, 0.6 SCFH and 3.0 SCFH.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>VERTICAL CALORIMETER</u> (Continued)</p> <p><u>INSTRUMENTATION</u></p> <p>Run support was provided for the first half of August.</p>
	<p><u>RESEARCH PROPULSION</u> CRD - R. L. DEWITT; <u>MODULE</u> (YOR4173) RSD - J. V. GILLETTE</p> <p><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>Because of the calorimeter tests and lack of manpower, no RPM tasks were completed during August in the test cell, and only 36 manhours were available in the assembly area for insulation work. An estimates 800 man-hours will be required to complete the tank insulation assembly.</p> <p>Other RPM tasks currently in progress are as follows:</p> <ol style="list-style-type: none"> (1) Meteoroid shield is on an outside fabrication contract; estimated completion is September 28. (2) Splash pan modification design is complete. (3) The new diffusion pump cooling water system design is complete and a purchase request for installation is in procurement. (4) The vacuum chamber cleaning contract is currently being advertised. Bids are due in by October 2, 72. (5) The electrical design drawings are 75% complete. (6) The 13' cryoshroud new flange installation is 60% complete. This job is being done on a "manpower as available" basis. The new conical shroud bottom will be assembled by an outside contractor. The contract is presently in the procurement process. <p><u>INSTRUMENTATION</u></p> <p>Cable buildup and instrumentation requirements were given to FSD for the next phase of work to be completed. Also thermocouple requirements were given to the shop.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

<p>FINAL SPIN UP TESTS</p> <p><u>ITEMS COMPLETED</u> Pressure transducer system reassembled with larger hollow slipring shaft.</p> <p><u>ITEMS IN PROGRESS</u> Pressure transducers being installed in pie-shaped holders</p>	<p>Sep 1972.</p> <p>Complete early Sep.</p>
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CHANGES: Schedule

STANDARDS AND CALIBRATION LAB

<p>585 manhours completed.</p> <p>1329 manhours of backlog.</p>

CHANGES:

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

The original ten-channel rotating pressure transducer system has been reassembled with the larger hollow slipring shaft. The installation of ten pressure transducers in the pie-shaped holders will be completed early in September 1972. Shortly thereafter the system will be returned to LeRC-Cleveland for dynamic balancing and then reinstallation in the ERB SE-13 cell.

DISCUSSION

The installation of the ten pressure transducers requires the careful removal of some plastic encapsulant that seals the transducer electrical lead wires. In the condition as received from the manufacturer, the transducers cannot be inserted into the pie-shaped holders because of the plastic interference.

The Datametrics model 1089 advanced system pressure transducer is now expected to undergo the final spin up tests to 18000 RPM during the second week in September 1972.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-3	343 manhours
B-3 Direct Labor	215 manhours
H-Bldg Cal Lab Equipment	<u>27</u> manhours
Total	585 manhours
Total Backlog	1329 manhours

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER HARDWARE SYSTEMS

<p>XDS 9300 has been accepted, all discrepancies corrected.</p> <p>Significant progress made on interfaces to XDS 9300.</p>

CHANGES: None.

INSTRUMENTATION DATA COMPUTER SOFTWARE SYSTEMS

HTF Heater Control & Monitoring System	97% complete.
Pattern/Request Table service, data image gen., raw data accum. & convert, and data display in progress.	
DEL Data Tapes quick look check out	60% complete.

CHANGES: None

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

HARDWARE

The XDS 9300 has been accepted and full payment has been made to Xerox. A contract meeting was held August 2, 1972 to resolve the problems of discrepancies and payment. The following week Xerox repaired all the discrepancies. The system is now performing satisfactorily.

Significant progress has been made on the interfaces to the XDS 9300 since acceptance. Progress is shown in tabular form. Since check out was the only task incomplete last month, only check out progress will be reported here.

<u>Description</u>	<u>Check Out</u>
SEL to XDS 9300	90%
XDS 9300 Junction Box	80%
2 - CF16A - XDS 9300 I/F	100%
9300 Line Receiver Chassis	90%
9300 I/O Cables	80%

The tasks that showed complete last month are not shown here.

SOFTWARE

(1) HTF Heater Control and Monitoring System:

The software for the initial application is 97% complete. It remains to be updated, reassembled and checked. The system has been operated on line during August (See HTF Status).

(2) Data Display System (CF16A):

Temporary Display Capability

<u>Routines</u>	<u>Flow Diag</u>	<u>Prog</u>	<u>C/O</u>
Pattern/Request Table Service	90%	90%	90%
Engineering Unit Data Image Gen.	50%	50%	50%
Raw Data Accum & Convert	50%	50%	5%
Main Eng. Unit Data Display Prog.	75%	75%	0%

(3) Quick Look for SEL Data Tapes:

The check out is 60% complete.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="280 304 492 399">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="802 405 915 431" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="488 469 1279 592">The Vertical Calorimeter is being disassembled for inspection and storage. Bids are due to be opened on October 5 for cleaning and polishing of the vacuum chamber.</p> <p data-bbox="488 631 1292 788">All RSD engineering manpower has been detailed for 90 days starting September 25 to B-3 Facility for the Centaur Standard Shroud Program. A minimum amount of work on the RPM buildup can be continued in the ATS Building with coverage by CRD engineers.</p> <p data-bbox="553 943 898 975" 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)

VERTICAL CALORIMETER K SITE YOR2023

<p>Calorimeter being disassembled.</p> <p>RSD Engineers detailed to B-3 Centaur Standard Shroud Program.</p>	
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CHANGES: None.

RESEARCH PROPULSION MODULE K SITE YOR4173

<p>TESTS I-2 & 3</p> <p>TESTS I-4, 5, 6, 7, & 8</p> <p>TESTS II-1 thru 8</p> <p>RSD Engineering detailed to B-3 Centaur Standard Shroud Program.</p> <p>Cooling pumps controlled tank water system contract was awarded.</p> <p>13' cryoshroud repairs are in progress.</p>	<p>Apr - Jun 1973</p> <p>Aug 1973 - Dec 1973</p> <p>Mar 1974 - Aug 1974</p> <p>Sep 21, 1972.</p>
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CHANGES: Schedule changes.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECY ENGINEERS
K	<p data-bbox="292 282 503 372">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="479 413 803 473"><u>VERTICAL CALORIMETER</u> (YOR2023)</p> <p data-bbox="998 413 1323 473">CRD - J. E. MALOY; RSD - J. V. GILLETTE</p> <p data-bbox="795 514 966 540"><u>DISCUSSION</u></p> <p data-bbox="479 574 641 600"><u>OPERATIONS</u></p> <p data-bbox="479 635 1291 762">As manpower permits the calorimeter is being dis- assembled for inspection and storage. No further tests are planned for this experiment. This report section will be terminated.</p>
	<p data-bbox="479 826 787 887"><u>RESEARCH PROPULSION</u> <u>MODULE</u> (YOR4173)</p> <p data-bbox="998 826 1323 887">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="795 927 966 953"><u>DISCUSSION</u></p> <p data-bbox="479 997 641 1024"><u>OPERATIONS</u></p> <p data-bbox="479 1058 1323 1280">Insulation technicians were once again assigned to the ATS Building in mid-September. On September 25 all engineering personnel were removed from K-Site and were transferred to B-3 Facility to work on the CSS Program. Any engineering coverage for insulation work will be provided by Cleveland engineers from the Chemical Rockets Division.</p> <p data-bbox="479 1320 1323 1572">In the meantime, bids will be opened on October 5 for cleaning and polishing of the vacuum chamber walls. An attempt to eliminate the emergency drain pan for the duration of the RPM Program was not approved by the Area Safety Committee. A supplementary contract is now in Procurement to modify (reduce in size) the drain pan to more accurately reflect the needs of the RPM tankage.</p> <p data-bbox="479 1612 1323 1764">A contract to install a controlled temperature water system for the cooling pumps was awarded September 29. This new system will permit the use of better pump fluid for improved vacuum levels. Repairs to the 13' cryoshroud are still in progress.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

SITE

TASK NO.

STATUS

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

Unit refurbished with new transducers.

New shaft installed.

System returned to LeRC-Cleveland.

CHANGES: None.

STANDARDS AND CALIBRATION LAB

477 manhours completed.

1471 manhours of backlog.

CHANGES: None.

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

The original ten channel rotating pressure transducer system has been returned to LeRC-Cleveland after being refurbished with ten new style pressure transducers and a slip ring assembly having a larger diameter hollow shaft.

DISCUSSION

The larger diameter hollow ship ring shaft will allow heavier gauge or more pairs of thermocouple extension wires to be routed through the pressure measuring system to the rear mounted shaft data temperature measuring system.

The Datametrics model 1089 advanced system pressure transducer 18000 RPM spin tests have been delayed by problems with the I&C Division's spin test rig.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on completed jobs</u>
B-3	172 manhours
B-3 Direct Labor	277 manhours
HTF	14 manhours
SPF	<u>14 manhours</u>
	477 manhours
Total Backlog	1471 manhours

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER HARDWARE SYSTEMS

<p>Significant progress made on interfaces to XDS 9300.</p> <p>The remaining four tasks are 80 to 95% complete.</p>

CHANGES: None.

INSTRUMENTATION DATA COMPUTER SOFTWARE SYSTEMS

HTF Heater Control & Monitoring System	97% complete.
Pattern/Request Table service, data image gen., raw data accum. & convert, and data display in progress.	
SEL Data Tapes quick look check out	75% complete.

CHANGES: Percentage complete.

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

HARDWARE

Progress made on the interfaces to the XDS 9300 through the month of September is shown in the following table:

<u>Description</u>	<u>Check Out</u>
SEL to XDS 9300	95%
XDS 9300 Junction Box	80%
9300 Line Receiver Chassis	95%
9300 I/O Cables	85%

The tasks that showed completed last month are not shown here.

SOFTWARE

(1) HTF Heater Control and Monitoring System:

Same status as last month, due to B-3 work load.

(2) Data Display System (CF16A):

Temporary Display Capability

<u>Routines</u>	<u>Flow Diag</u>	<u>Prog</u>	<u>C/O</u>
Pattern/Request Table Service	100%	95%	95%
Engineering Unit Data Image Gen.	80%	55%	50%
Raw Data Accum. & Convert	95%	95%	95%
Main Eng. Unit Data Display Prog.	90%	75%	0%

(3) Quick Look for SEL Data Tapes:

The check out is 75% complete.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

RESEARCH PROPULSION MODULE	K SITE	YOR4173
TESTS I-2 & 3		Apr - Jun 1973.
TESTS I-4, 5, 6, 7, & 8		Aug 1973 - Dec 1973.
TESTS II-1 thru 8		Mar 1974 - Aug 1974.
Cleaning and polishing vacuum chamber est'd complete .		Dec 15, 1972
Insulating & assembling LH ₂ tank		70% complete.
Refurbishing 13' shroud.		

CHANGES: Schedule change.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="276 231 487 332">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="462 342 779 413"><u>RESEARCH PROPULSION MODULE</u> (YPR4173)</p> <p data-bbox="998 342 1331 413">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="812 443 933 473" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="462 504 1266 635">The cleaning and polishing contract for the vacuum chamber has been extended to include additional grinding on deeply pitted areas. Completion date is December 15.</p> <p data-bbox="462 655 1282 756">Insulation and assembly of the LH₂ tank is 70% complete and about 250 manhours of work remain to be done.</p> <p data-bbox="462 776 1315 876">Operations engineering manpower has been returned to the site and work is progressing towards a March test date.</p> <p data-bbox="795 897 966 927" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="462 947 633 977"><u>OPERATIONS</u></p> <p data-bbox="462 1008 1339 1169">The vacuum chamber cleaning and polishing contract has been extended by approximately 100 manhours. The contract extension was required to provide additional grinding on some deeply pitted surface areas. The anticipated contract completion is now December 15.</p> <p data-bbox="462 1199 1315 1401">Refurbishment of the 13' shroud is still in progress on an "as available" manpower basis. At this time, one flange remains to be changed. One leak has been located and required repair welding. A final overall warm leak check is required. The new conical bottom will not be available until approximately January 15.</p> <p data-bbox="462 1421 1364 1844">Insulation and assembly of the LH₂ tank is approximately 70% complete with an estimated 250 manhours remaining. All gore sections have been located and installed on the tank. The fill and vent line covers and the valve box insulation are finished. The fill line elbow cover is the only speciality piece not completed. One of the last tasks to be completed will be the transfer of the LH₂ tank from its present "A" frame support to the vehicle structure. The transfer must be accomplished outside the clean room due to insufficient floor space. In order to minimize contamination from humidity and airborne dust particles the transfer will be done during an off-shift period.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

Original system modified and being used in SE-13.

CHANGES: None.

STANDARDS AND CALIBRATION LAB

471 manhours completed.
1374 manhours of backlog.

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

The original ten channel rotating pressure transducer system is now being used for tests in the ERB-SE13 spin rig. It has been modified to incorporate four pressure channels and three thermocouple channels.

DISCUSSION

The ERB SE-13 tests are being made to confirm the mathematical formulas derived by the I&C Division that predict the effects of centrifugal force and temperatures on rotating pressure lines routed between the turbine blade and the pressure transducer.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-3	112 hours
HTF	43 hours
K	31 hours
SPF	84 hours
Cal Lab Equip Cal.	173 hours
B-3 Direct Labor	<u>28</u> hours
	471 hours
Total backlog	1374 manhours

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS	SCHEDULE	

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER HARDWARE SYSTEMS

<p>A combination interface was begun to provide three major and two minor hardware interfaces.</p> <p>Printer/time code/thumbwheel switch interface - logic chassis & control panel requirements have been designed and are 10% fabricated.</p>

INSTRUMENTATION DATA COMPUTER SOFTWARE SYSTEMS

<p>HTF Heater Control & Monitoring System tested and ready for operation.</p> <p>Engr Unit data image gen in process.</p> <p>Main engr unit data display prog. in process.</p> <p>"X-Y" composite CRT display in process.</p> <p>Raw data accum. & convert</p> <p>9300-CF16A Able Assembler was completed.</p> <p>K-Link engr unit display program was completed.</p>	<p>95% complete.</p>
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INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

HARDWARE

A combination interface was begun to provide three major and two minor hardware interfaces.

(1) Major interfaces

- a. Provision to allow 9300 and dual CF16A access to a remote Versatec Printer/Plotter.
- b. Provision to allow the 9300 and dual CF16A to read Binary or BCD time code from the SEL Remote Time System.
- c. Provision to allow the dual CF16A to read remote thumbwheel switches.

(2) Minor interfaces

- a. Six sense switches for each of the dual CF16As.
- b. Provision to allow the Controls' CF16A to read Binary or BCD Time Code. The logic control is not included.

The Printer/Time Code/Thumbwheel Switch interface includes both logic chasses and control panel requirements. The design is 100% complete and fabrication is 10% complete.

No progress was attempted on the 9300 simultaneous memory access compatibility problem reported last month.

SOFTWARE

(1) HTF Heater Control and Monitoring System was tested on line successfully during the month. Software is considered satisfactory for unmanned operation.

(Continued on Page 49)

INSTRUMENTATION DATA
COMPUTER

SOFTWARE (Continued)

(2) Data Display System (CF16A)

Temporary Display Capability

<u>Routines</u>	<u>Flow Diag.</u>	<u>Prog.</u>	<u>C/O</u>
Pattern/Request Table Serv	Reported 100%	last month	
Engr Unit Data Image Gen	90%	78%	78%
Raw Data Accum & Convert	96%	96%	96%
Main Eng Unit Data Disp Prog	95%	95%	95%
X-Y Composite CRT Display	5%	5%	0%

(3) 9300-CF16A Able Assembler

This item is 100% complete.

(4) The K-Link Engineering Unit Display Program is 100% checked out.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="298 290 509 385">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="488 417 792 481"><u>RESEARCH PROPULSION MODULE (YPR4173)</u></p> <p data-bbox="979 417 1300 481">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="821 514 980 546"><u>DISCUSSION</u></p> <p data-bbox="488 580 1349 995">Cleaning and polishing of the 25' diameter vacuum chamber is complete. The splash pan was reduced in size; a modified lip was installed, and the splash pan reinstalled in the chamber. The four 36" diffusion pumps were drained, cleaned and recharged with Convalex #10 fluid. A warm chamber pumpdown will be conducted the week of January 8, 1973 to evaluate the effect of the system modifications and to determine overall, bare chamber performance. Following the warm vacuum test the 13' cryoshroud will be installed and the performance evaluated for the cold chamber and the leak rate will be determined for the modified cryoshroud.</p> <p data-bbox="558 1026 899 1058">(Continued on Page 37)</p>

December 1972

NARRATIVES ON ADJOINING PAGE

PROJECT

SITE

TASK NO.

STATUS

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

Preliminary evaluation made of test data.

Side-mounted air blast cooling system to be modified
to more efficiently dissipate heat.

CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p>Other facility preparation for RPM tests included the installation of a 56 pair thermocouple cable. LH₂ cold guard leak checking is 90% complete and a thermal coating was applied to the floating temperature plate.</p> <p>Assembly of the fixed temperature plate was completed. Installation of electronics in the control room was started.</p> <p>Ninety percent of the facility electrical prints are complete. They were reviewed and are ready for final signatures.</p> <p>Tank insulation is proceeding nearly on schedule. All the gore sections, the bottom coolie hat, and the fill and vent/pressurization insulation covers were completed. The meteoroid shield was started, and the first instrument and electrical cables were run to the valve box.</p>
<p style="text-align: center;">SPECIAL RESEARCH PROJECT</p> <p><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM (YPY2752)</u> RSD - V. S. PETERSON</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>The original ten channel rotating pressure transducer system with its new style slip ring and 49 NC pressure transducers has exhibited satisfactory performance in measuring cooling air flow rates through a rotating hollow turbine blade with internal cooling passages.</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p>Preliminary evaluation of test data obtained from the ERB-SE-13 flow instrumented hollow turbine blade and rotating pressure measuring system configuration has shown it to yield one-half the overall error than all previous methods used. The slip ring temperature rose to an undesirable level at speeds near 9000 RPM. The side-mounted air blast cooling system for the slip ring will be modified to include heat transfer fins to more efficiently dissipate the heat.</p>	

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-3	178 hours
HTF	74 hours
SPF	61 hours
H-Bldg	<u>73</u> hours
	386 hours
Total Backlog	1432 hours

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

HARDWARE

The Printer/Time Code/Thumbwheel Switch interface fabrication is 90% complete. The Versatec printer/plotter was received.

The 9300 simultaneous memory access compatibility problem reported in November was remedied. Now the 9300 program, RAD direct access, 2 SEL data acquisition system direct access, and 2 CF16A direct access to the 9300 memories can operate simultaneously without error. Error checking and display were installed for the 2 CF16A direct access interface.

SOFTWARE

- (1) HTF Heater Control and Monitoring System - Time did not permit any further progress on this item. It remains satisfactory for unmanned operation.
- (2) Data Display System (CF16A)
Temporary Display Capability

Further progress will be minimal on this temporary capability to allow full effort on providing display of data for the Centaur Shroud Structural Tests. The temporary capability is usable in its present form.

(Continued on Page 41)

INSTRUMENTATION DATA
COMPUTER (Continued)

SOFTWARE (Cont)

<u>Routines</u>	<u>Flow Diag.</u>	<u>Prog.</u>	<u>C/O</u>
Engr Unit Data Image Gen.	100%	80%	78%
Raw Data Accum & Convert	100%	100%	96%
Main Eng Unit Data Disp Prog	100%	100%	100%
X-Y Composite CRT Display	5%	5%	0%

(3) Centaur Shroud Structural Tests

Some preliminary planning is the only progress to report.
The project includes:

Extensive conversion to engineering units by 9300.

X-Y composite data display on CRT.

Display of engineering unit data on CRTs.

Plotting of X-Y engineering unit data.

Recall of X-Y engineering unit data for plotting.

The total 9300-dual CF16A system must be used for this capability.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS		
K	<p data-bbox="321 294 532 389">CRYOGENIC PROPELLANT RESEARCH SITE</p> <table data-bbox="511 419 1299 485"> <tr> <td data-bbox="511 419 820 485"><u>RESEARCH PROPULSION MODULE (YPR4173)</u></td> <td data-bbox="971 419 1299 485">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</td> </tr> </table> <p data-bbox="799 520 961 550" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="511 586 673 616" style="text-align: center;"><u>OPERATIONS</u></p> <p data-bbox="511 651 1388 1003">The primary work effort was in the ATS building clean room to prepare the RPM vehicle for shipment to K-Site. The vehicle structure was shipped to the reactor ATS building and uncrated. The fuel tank insulation was completed, and the tank was mounted in the structure. All instrumentation on the tank, tank support struts, and vehicle structure was completed. Seventeen braze joints were required to complete tubing runs on the tank and in the equipment bay. The payload simulator was moved into ATS clean room, the aft surface was cleaned, and 75 pre-test emissivity readings recorded.</p> <p data-bbox="581 1020 925 1050" style="text-align: center;">(Continued on Page 29)</p>	<u>RESEARCH PROPULSION MODULE (YPR4173)</u>	CRD - R. L. DEWITT; RSD - J. V. GILLETTE
<u>RESEARCH PROPULSION MODULE (YPR4173)</u>	CRD - R. L. DEWITT; RSD - J. V. GILLETTE		

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
HTF	<p data-bbox="321 284 487 379">HYPERSONIC TUNNEL FACILITY</p> <p data-bbox="516 385 1023 419"><u>HRE (GARRETT ENGINE)</u> (Continued)</p> <p data-bbox="516 453 1393 548">to conclude that it is not necessary to pump down the transducers every run day, however, it is still necessary to blow the moisture out of the engine lines.</p> <p data-bbox="516 582 1409 709">The thrust stand has been recalibrated since all interferences have been removed from the HRE engine. There now appears to be good agreement between the calibration and thrust stand load cells.</p> <p data-bbox="516 747 646 782"><u>CONTROLS</u></p> <p data-bbox="516 812 1315 872">All the controllers at HTF have been modified with test jacks for use in pre-run check out.</p> <p data-bbox="516 909 1344 1036">The diluent GN₂ control loop is being modified for fine control temperature correction. The amount of correction will be $\pm 200^{\circ}\text{R}$. Check out of the control loop will be in February.</p> <p data-bbox="516 1070 1312 1104">The next HTF run will be with injectors 1A and 1B.</p>
K	<p data-bbox="321 1165 535 1260">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="516 1292 820 1352"><u>RESEARCH PROPULSION MODULE (YPR4173)</u></p> <p data-bbox="976 1292 1295 1352">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="802 1393 964 1427"><u>DISCUSSION</u></p> <p data-bbox="516 1457 678 1491"><u>OPERATIONS</u></p> <p data-bbox="516 1522 1393 1870">The primary work effort was in the ATS building clean room to prepare the RPM vehicle for shipment to K-Site. The vehicle structure was shipped to the reactor ATS building and uncrated. The fuel tank insulation was completed, and the tank was mounted in the structure. All instrumentation on the tank, tank support struts, and vehicle structure was completed. Seventeen braze joints were required to complete tubing runs on the tank and in the equipment bay. The payload simulator was moved into ATS clean room, the aft surface was cleaned, and 75 pre-test emissivity readings recorded.</p> <p data-bbox="586 1891 927 1925">(Continued on Page 29)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="292 292 503 403">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="495 433 803 504"><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p data-bbox="495 524 1364 856">In K-Site, the vacuum chamber warm pump down was accomplished during January. The ultimate pressure for the bare chamber was 2×10^{-6} Torr. Three leaks were found in the diffusion pump baffles and one leak in the emergency drain valve flapper seal. The leaks have been repaired and an additional warm pump down is anticipated to determine the bare chamber ultimate vacuum level. The cold pump down which was originally planned will not be done due to insufficient time before the scheduled test date of March 1, 1973.</p> <p data-bbox="495 887 1388 1078">The K-Site assembly area was washed down and the floor was painted. Clean room standards are now in effect. The 13' cryoshroud was cleaned and is currently in the assembly area. The shroud top and baffle sections are being fitted to the vertical barrel section. Status of other site work is as follows:</p> <ol data-bbox="503 1108 1315 1602" style="list-style-type: none"> (1) Completed modification of stationary LN₂ dewar vent. (2) Started process piping modifications. (3) Controls work (cable runs, terminations, controller installation, etc.) is approximately one-third complete. (4) Leak checks and modifications to the LH₂ cold guard are complete and the guard is ready to insulate. (5) Instrumentation work (panel build-up, wiring, etc.) in the control room has been started. <p data-bbox="495 1622 738 1663"><u>INSTRUMENTATION</u></p> <p data-bbox="495 1683 1323 1743">Total test package sensor installation and wiring is approximately 90% complete.</p> <p data-bbox="495 1764 1339 1834">Interconnect cables from test package to chamber wall have not been started.</p> <p data-bbox="609 1864 958 1905">(Continued on Page 31)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
	STATUS	SCHEDULE

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

Intensive effort to be made to produce 20,000 RPM
ten-channel rotary pressure measuring system.

LeRC developed shaft data sys to be included if
time and space permit.

CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>RESEARCH PROPULSION MODULE</u></p> <p><u>INSTRUMENTATION</u> (Continued)</p> <p>Other completed items are:</p> <ol style="list-style-type: none"> (1) Thermocouple cable installation from wall to Instrument Room. (2) Thermocouple oven installation. (3) Mixer motor panel. (4) Shroud sensor check out. (5) LH₂ tank, insulation, struts, and structure sensors and wiring checked to connectors on Hat Box.
	<p>SPECIAL RESEARCH PROJECT</p> <p><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM</u> (YPY2752) RSD - V. S. PETERSON</p> <p><u>SUMMARY</u></p> <p>An intensive effort will be made during the early part of this year to produce a 20,000 RPM ten channel rotary pressure measuring system. It will be made available for the LeRC Advanced Turbine Research programs.</p> <p><u>DISCUSSION</u></p> <p>Experience and technology gained during the development of the original ten channel 9,000 RPM rotary pressure measuring system will be used to shorten the time to build the advanced system. It is the intention to design the advance system around presently available pressure transducers. If time and space permit, the LeRC developed shaft data system will be included to allow both temperature and pressure measurements to be processed by the system.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

STANDARDS AND CALIBRATION LAB

<p>244 manhours completed.</p> <p>1672 manhours of backlog.</p>

CHANGES: None.

INSTRUMENTATION DATA COMPUTER SYSTEMS

<p><u>HARDWARE SYSTEM</u> Printer/Time Code/Thumbwheel switch interface fab completed. Check out is Paper Tape Equipment ordered for CF16A. Further planned interfaces cancelled.</p> <p><u>SOFTWARE SYSTEM</u> Final program changes completed, program reassembled, and check out is proceeding for HTF Heater C&M Sys. Work begun on requirements for CSS Tests.</p>	<p>90% complete.</p>
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CHANGES: None.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-3	31 hours
HTF	23 hours
K	16 hours
H-Bldg	59 hours
Special Project (for V. Peterson)	23 hours
Direct Labor B-3 and K-Site	<u>92</u> hours
	244 hours
Total backlog	1672 hours

INSTRUMENTATION DATA
COMPUTER

RSD - J. L. HARROLD

HARDWARE

Fabrication of the Printer/Time Code/Thumbwheel Switch Interface was completed. Check out is 90% complete. Additions were necessary to allow printing under interrupt control.

Paper Tape Equipment for the CF16A Input/Output has been ordered.

Work on the further planned interfaces have been cancelled because of Station phase out.

SOFTWARE

(1) HTF Heater Control and Monitoring System:

The final program changes, replacing temporary patches, have been made. The program has been reassembled and check out is proceeding.

(2) Centaur Shroud Structural Tests:

Work has begun on this software requirement. The requirement includes the general planned concept for displaying and plotting converted test data. An added special for the structures

(Continued on Page 35)

INSTRUMENTATION DATA
COMPUTER

SOFTWARE (Continued)

test includes display, storage, and plotting composite X-Y data.

The total system requires new programs for the 9300, the 'A' CF16A and the 'B' CF16A.

- a. The 9300 program requirements include:

Initialization of Multiplexer Pattern Information.

Data Accumulation for Conversion; On Line, Play-back and Data Recording.

Data Conversion; Multiplexer Pattern Data and Specials.

- b. The 'A' CF16A Program requirements include:

Data Storage of X-Y information for recall.

Plotting of X-Y information on recall.

Pattern initialization.

- c. The 'B' CF16A program requirements include:

Pattern initialization.

Normal CRT display servicing (2 CRTs).

X-Y composite CRT display servicing (1 CRT).

Output printing of CRT images.

Time insertion in CRT image.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="292 292 503 393">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="479 413 787 483"><u>RESEARCH PROPULSION</u> <u>MODULE</u> (YPR4173)</p> <p data-bbox="950 413 1274 483">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="779 514 941 544" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="479 574 641 614"><u>OPERATIONS</u></p> <p data-bbox="479 635 1356 997">Assembly of the vehicle forward section for Phase 1 testing was completed in February. This included installation of heaters and insulation on the equipment bay, and insulating the cold guard duct. Tubing runs were completed from the floating temperature plate to the valve box. The equipment bay and payload simulator were partially installed on the vehicle structure. The assembled vehicle was shipped to K-Site under a dry nitrogen covering. Final installation of the equipment bay, payload simulator and related tubing runs on the vehicle are currently in process.</p> <p data-bbox="479 1018 1388 1290">In the facility, work continued on a limited manpower basis. Baffles were fitted to the 13' cryoshroud, and cover plate fabricated and installed around the top of the cryoshroud barrel section. The cryoshroud top and baffles were hung from the facility hook in preparation for delivery of the vehicle. An electrical penetration was installed in the vacuum chamber wall. Tubing and piping runs and valve installation are still in progress.</p> <p data-bbox="479 1310 1339 1360">Electrical work at the site has progressed as follows:</p> <ol data-bbox="479 1380 1388 1804" style="list-style-type: none"> (1) Completed all cable runs from the vacuum chamber. (2) Completed control room graphic flow panel. (3) Installed new valve operator relay and fuse cabinet. (4) Valve cycle counter installed and wired. (5) Fabricated auto-sequence panel. Delivery of the time delay relay will not be until March 15. (6) Completed the new area warning system installation. It is ready for check out. <p data-bbox="625 1864 974 1905" style="text-align: center;">(Continued on Page 35)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="289 294 500 389">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="483 425 1081 455"><u>RESEARCH PROPULSION MODULE (Continued)</u></p> <p data-bbox="483 491 1398 586">Work in the ATS Building will now continue on a build up of the two shadow shields. The clean room was cleaned, fabrication equipment brought in, parts inventoried, etc.</p> <p data-bbox="483 622 1370 878">The SEL validation check was completed and the results are being reviewed. The Data Link scanner system will require one week to install, plus check out time. Other work areas, such as instrumentation, controls, and facility mechanical work are approximately 2-3 weeks from completion plus check out time. The first test run is currently planned for the last week of March, pending the availability of manpower.</p> <p data-bbox="483 915 1386 1010">Plans are being prepared for an orderly shutdown of the facility after completion of the currently scheduled test program.</p> <p data-bbox="483 1046 721 1076"><u>INSTRUMENTATION</u></p> <p data-bbox="483 1112 1354 1167">Test package sensor installation and wiring is approximately 95% complete.</p> <p data-bbox="483 1203 1382 1257">The interconnect cables from test package to chamber wall are approximately 70% complete.</p> <p data-bbox="483 1294 1382 1368">Remaining instrumentation installation and check out is awaiting installation of the test package in the chamber.</p> <p data-bbox="483 1405 610 1435"><u>CONTROLS</u></p> <p data-bbox="483 1469 1354 1524">All final controls design work and prints are completed for the LH₂ tank testing.</p> <p data-bbox="483 1560 1370 1655">Installation of hardware is complete and the wiring is 75% finished. Systems check out should begin the second week in March.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK NO.

STATUS

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

Checking suitable commercial pressure transducers.
New type of signal transfer devices being studied.

STANDARDS AND CALIBRATION LAB

399 man hours of work completed.
1651 manhours of backlog.

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

A conceptual design is presently underway that will lead to the construction of a 23,000 RPM multichannel temperature and pressure measuring system. The pressure system must accommodate static pressures in the order of 600 PSI.

DISCUSSION

A cursory examination of commercial pressure transducer types suitable for the high speed requirement is now underway. The multichannel capacitance type pressure transducer that failed during spin tests at LeRC-Cleveland will not be a candidate for this system in view of the short time schedule that will not allow another try. A study of new type signal transfer devices is also being made at this time.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-3	163 hours
HTF	33 hours
K	45 hours
SPF	18 hours
H-Bldg	31 hours
K-Site & B-3 Direct Labor	<u>109</u> hours
	399 hours
Total Backlog	1651 hours

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS	SCHEDULE	

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER SYSTEMS

<u>HARDWARE SYSTEM</u>	
Printer/Time Code/Thumbwheel Switch Interface check out completed.	
Constructing remote control switch panels.	
Installing remote data viewing console cabins.	
<u>SOFTWARE SYSTEMS</u>	
HTF Heater control & monitoring system C/O complete.	
<u>9300 Program</u>	
Initialization of multiplexer pattern info	70% complete.
On-Line Data accumulation	20% complete.
Data recording	10% complete.
Playback accumulation	5% complete.
Data conversion/multiplexer/Specials	20% complete.
<u>"A" CF16A Program</u>	
X-Y information plotting for recall	10% complete.
<u>"B" CF16A Program</u>	
Pattern initialization	40% complete.
Normal CRT display servicing	15% complete.
X-Y composite CRT display servicing	5% complete.
Output printing of CRT images	90% complete.
Time insertion in CRT images	90% complete.
Revisions of Temporary Display Program for HTF . . .	90% complete.

CHANGES: None.

INSTRUMENTATION
DATA COMPUTER

RSD - J. L. HARROLD

HARDWARE

Check out of the Printer/Time Code/Thumbwheel Switch Interface is 100% complete and operational under interrupt control.

Switch panels are being constructed for remote control of the CF16A programs.

The console cabinets for remote data viewing are being installed. This item will provide a CRT viewing station for converted test data remote from the computer area and convenient to other data sources.

SOFTWARE

(1) HTF Heater Control and Monitoring System:

Check out is complete for this item and the system is operational.

(2) Centaur Shroud Structural Tests:

(a) 9300 program requirements:

Initialization of Multiplexer Pattern Information, 70% complete.

On Line Data Accumulation, 20% complete.

Data Recording, 10% complete.

Playback Accumulation, 5% complete.

Data Conversion; Multiplexer Pattern Data and Specials, 20% complete.

(b) "A" CF16A Program:

Data storage of X-Y information for recall, 0% complete.

Plotting of X-Y information for recall, 10% complete.

INSTRUMENTATION DATA COMPUTER (Continued)

(c) "B" CF16A Program:

Pattern initialization, 40% complete.

Normal CRT display servicing (2 CRTs), 15% complete.

X-Y composite CRT display servicing (1 CRT), 5% complete.

Output printing of CRT images, 90% complete.

Time insertion in CRT images, 90% complete.

(3) Temporary Display Program:

Revisions were necessary to allow the programs' use for HTF. Revisions are 90% complete.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="293 278 500 370">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="483 385 786 451"><u>RESEARCH PROPULSION</u> <u>MODULE</u> (YPR4173)</p> <p data-bbox="954 385 1273 451">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="769 485 927 512" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="483 552 643 578"><u>OPERATIONS</u></p> <p data-bbox="483 612 1370 935">The payload simulator was mated to the vehicle forward structure in the K-Site clean room. Tubing runs were completed for the equipment bay and the floating temperature plate to the vehicle. The cryoshroud lid with the necessary baffle for Phase I testing was attached to the vehicle and the assembly was then installed in the cryoshroud. The cold guard was mounted on the cryoshroud and the duct fitted from the cold guard to the vehicle. Most of the tubing runs from the vehicle to the cold guard were completed.</p> <p data-bbox="483 969 1354 1064">The entire assembly was installed in the vacuum chamber and piping from the chamber wall to the package is approximately 10% complete.</p> <p data-bbox="483 1098 1403 1292">Insulation of the equipment bay and cold guard was completed. The duct insulation will be permanently installed upon completion of the tubing runs from the vehicle to the cold guard. Mylar tape was attached to the upper ring of the forward structure and five thermocouples were attached to the ring for temperature data.</p> <p data-bbox="483 1326 1338 1358">Electrical work at the site has progressed as follows:</p> <ol data-bbox="488 1393 1370 1715" style="list-style-type: none"> (1) Remote operated valves have been connected to accommodate Phase I testing. (2) The Data Link system has been installed and checked out. (3) The Safety system is being checked out. (4) The time delay relay for the auto-sequence panel has not been delivered. <p data-bbox="483 1749 1321 1876">At the ATS Building the aluminum rings for the shadow shields were fitted to the transport rings with minor modifications. The aluminum rings were cleaned and readied for assembly of the shields. Sheets of X-850</p> <p data-bbox="581 1891 927 1923" style="text-align: center;">(Continued on Page 41)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="300 284 511 379">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="492 413 1089 445"><u>RESEARCH PROPULSION MODULE</u> (Continued)</p> <p data-bbox="492 479 1382 606">were cut and glued. Four sheets are now available for final trimming, stretching and fitting onto the aluminum rings. The tabs necessary for joining two X850 sheets around the shadow shield ring were cut.</p> <p data-bbox="492 641 732 673"><u>INSTRUMENTATION</u></p> <ol data-bbox="492 707 1333 1157" style="list-style-type: none">(1) Interconnect cables from the test package to the wall are 90% complete.(2) Five additional thermocouples were installed.(3) Test package sensor (thermocouples and platinum resistance thermometers) is completed.(4) Check out through the data system has not been started.(5) Pressure transducers have not been installed.(6) The Digital Data Link was moved to "K" Control. <p data-bbox="492 1191 618 1223"><u>CONTROLS</u></p> <p data-bbox="492 1257 1377 1384">Wiring is approximately 95% complete and check out of some systems has been started with completion expected by the second week in April. New wiring for the Baratron and equipment bay heater was completed in March.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS	SCHEDULE	

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YPY2752

Evaluating new types of pressure transducers.

STANDARDS AND CALIBRATION LAB

574 manhours of work completed.

1526 manhours of backlog.

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

Two new types of pressure transducers that look like they might satisfy the electrical and reliability requirements of this program are being studied for the best mechanical mounting technique in this 23,000 RPM system. Two of each type will be purchased for evaluation.

DISCUSSION

As a means of keeping this program within the bounds of allowable time, transducer evaluation will be concentrated on one or two types that we feel will work in this high speed application. The design for a test rig to spin test the transducers will be started shortly.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time spent on completed jobs</u>
B-3	235 hours
HTF	85 hours
K	4 hours
SPF	29 hours
H-Bldg	80 hours
Direct Labor B-3	<u>141 hours</u>
	574 hours
Total Backlog	1526 hours

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER SYSTEMS

<p><u>HARDWARE SYSTEM</u> Installed & checked out CF16As & remote control switch panels. Completed remote data viewing console. CF16As high speed paper tape punch is operational. Fabricating an audio/visual alert unit.</p> <p><u>SOFTWARE SYSTEM</u> Centaur Shroud Structural Tests <u>9300 Program</u> Completed initialization of multiplexer pattern info. Completed on line data accumulation. Data recording system 90% complete. Playback accumulation 30% complete.</p> <p><u>CF16A Program</u> Data storage of X-Y info for recall 85% complete. Plotting of X-Y info for recall 85% complete. Pattern initialization 90% complete. Normal CRT display servicing 90% complete. X-Y component CRT display servicing 90% complete. Completed output printing of CRT images. Completed line insertion in CRT images. Initial version of structural tests software is operational. Correcting and making improvements. Completed temporary display program for HTF,</p>	
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CHANGES: None.

INSTRUMENTATION
DATA COMPUTER

RSD - J. L. HARROLD

HARDWARE

Switch panels for remote control of the CF16A programs have been installed, checked out and are operational.

The remote data viewing console has been completed.

The high speed paper tape punch is now operational for the CF16As. The paper tape reader has not arrived.

An audio/visual unit is being fabricated to alert when significant errors or a computer failure has occurred in the hardware structure.

SOFTWARE

(1) Centaur Shroud Structural Tests:

(a) 9300 program requirements:

Initialization of Multiplexer Pattern Information, 100% complete.

On Line Data Accumulation, 100% complete.

Data Recording, 90% complete.

Playback Accumulation, 30% complete.

(b) "A" CF16A Program:

Data storage of X-Y information for recall, 85% complete.

Plotting of X-Y information for recall, 85% complete.

(c) "B" CF16A Program:

Pattern initialization, 90% complete.

Normal CRT display servicing (2 CRTs), 90% complete.

X-Y Composite CRT display servicing (1 CRT), 90% complete.

(Continued on Page 47)

INSTRUMENTATION
DATA COMPUTER (Continued)

Output printing of CRT images, 100% complete.

Time insertion in CRT images, 100% complete.

The initial version of the software for the structural tests is basically operational. Minor deficiencies remain to be corrected and operating improvements are being implemented.

(2) Temporary Display Program:

Revisions required for HTF use are 100% complete.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="300 268 511 367">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="487 387 1307 457"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (YPR4173)</u> CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="803 487 966 516" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="487 546 657 576"><u>OPERATIONS</u></p> <p data-bbox="487 616 1404 834">Work has progressed at the facility on an "as available" manpower basis; consequently, the work slipped approximately one week during April. The primary manpower shortage is with site technicians, and, to a lesser extent, with service support groups. As of this writing, progress with controls systems is practically at a standstill with no foreseeable change.</p> <p data-bbox="487 864 1421 1282">Work completed in April was primarily inside the vacuum chamber. Additional scaffolding was added in the chamber. All the remaining spool pieces were cold shocked and leak tested. Ninety percent of the tubing and piping runs were completed in the chamber. The Tank-cold guard radiation duct was insulated. Several openings in the payload simulator were taped over. The cable cope tray was installed. All pressure transducers and temperature sensors were installed. The instrumentation cables were wrapped with mylar tape. Facility check sheets for the C.P.S.P. Tests are complete, and safety committee approval has been obtained for all of Phase I testing.</p> <p data-bbox="487 1312 1404 1799">In the ATS Building assembly area the four, ten foot diameter, aluminized mylar shadow shield sheets were completed, including all trimming, and the tabs glued in place. The tabs (144 total) will also be sewn to assure a secure installation. The four sheets were also pre-stretched. Prior to assembling the shadow shields for transport to K-Site, the sheet seams must be taped and 30 thermocouples fabricated and installed on the sheets. Strut openings must also be cut in the four sheets. To complete the rims for final assembly, a high emissivity coating will be applied, and the rims matched to the handling rings. The two shadow shields are scheduled for completion by June 1. A spare sheet will be fabricated if there is sufficient time before the ATS Building is closed.</p> <p data-bbox="584 1819 933 1858" style="text-align: center;">(Continued on Page 29)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS	SCHEDULE	

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YOY2752

<p>Mechanical design on the ten channel pressure, and 62 channel temperature, test rig has been started. Spin rig test site tentatively selected. Signal transfer device was received. Two new type pressure transducers were received. Design progressing on data system</p>	<p>Complete May.</p>
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CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p style="text-align: center;"><u>INSTRUMENTATION</u></p> <p>Work remaining before test:</p> <ol style="list-style-type: none"> (1) Instrumentation check out to instrument room. (2) Control room instrument check out meters, strip charts, etc. (3) Noise checks through data system. (4) Data Link program and check out. (5) Complete transducer installation outside tank. <p style="text-align: center;"><u>CONTROLS</u></p> <p>During this report period, time was devoted to chamber wiring and providing a baffle heater control system which is a new requirement. Installation, wiring, and check out of all systems should be completed early in May.</p>
<p><u>SPECIAL RESEARCH PROJECT</u></p> <p><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM</u> (YPY2752) RSD - V. S. PETERSON</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>The mechanical design has been started for a ten channel pressure and 62 channel temperature test rig to be located at Plum Brook. It will be first used to test and evaluate pressure transducer performance over speed ranges up to 23,000 RPM. This test rig will be universal in nature in that it will have the capability for both the transducer tests and the final design complete system package tests.</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p>A test site at Plum Brook has been tentatively selected for the spin rig installation. A signal transfer device and two new type pressure transducers for test evaluation have been received. Because of the large number of analog</p> <p style="text-align: center;">(Continued on Page 31)</p>	

NARRATIVES ON ADJOINING PAGE

PROJECT

SITE

TASK NO.

STATUS

STANDARDS AND CALIBRATION LAB

513 hours of work completed.

1612 hours of backlog.

INSTRUMENT DATA COMPUTER ITEMIZED DATA ON PAGE 33

SPECIAL RESEARCH PROJECT (Continued)

signals to be handled by the system, a rotating data processing system somewhat like the LeRC-Cleveland designed Shaft Data System will be made part of the final rotating package. The design for the data system will be completed during the month of May 1973. Components for a bread board check out circuit will be ordered shortly thereafter.

STANDARDS AND CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
B-3	200 hours
HTF	27 hours
K	14 hours
SPF	17 hours
H-Bldg	46 hours
Direct Labor K-Site	193 hours
Direct Labor B-3 Site	<u>16 hours</u>
	513 hours
Total Backlog	1612 hours

INSTRUMENTATION DATA COMPUTER

RSD - J. L. HARROLD

HARDWARE

The high speed paper tape reader arrived and is operational.

The audio/visual unit, to alert when significant errors or a computer failure has occurred, has been installed and is operational.

The K-Site console was moved to K-Site control room. The Data Link remains to be adjusted for proper operation.

(Continued on Page 33)

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER SYSTEMS

<u>HARDWARE SYSTEM</u>	
Received and installed high speed paper tape reader.	
Installed audio/visual unit.	
K-Site console moved to K-Site control room.	
<u>SOFTWARE SYSTEM</u>	
B-3 Shroud tests software are operational.	
Expanded requirements and improvements continues.	
<u>9300 program requirements</u>	
Data recording	90% complete.
Playback Accumulation	30% complete.
Operational improvements	20% complete.
<u>"A" CF16A Program requirements</u>	
Data Storage and X-Y info for recall	90% complete.
Plotting of X-Y info for recall	90% complete.
Operational improvements	20% complete.
<u>"B" CF16A Program requirements</u>	
Pattern initialization	100% complete.
CRT display servicing	95% complete.
X-Y composite CRT display servicing	95% complete.
Revising temporary display program.	
Revising "K" Data Link Program.	

INSTRUMENTATION DATA COMPUTER (Continued)

SOFTWARE

(1) Centaur Shroud Structural Tests:

All parts of this requirement have been operational for B-3 Tests. However, expanded operating requirements and basic improvements necessitate updated versions. This work continues on all phases and is reflected by small changes in the percent complete figures compared to last month. Items with 100% figures from last month are deleted for this report:

(a) 9300 program requirements:

Data Recording, 90% complete.
Playback Accumulation, 30% complete.
Operational improvements, 20% complete.

(b) "A" CF16A Program:

Data storage of X-Y information for recall, 90% complete.

Plotting of X-Y information for recall, 90% complete.

Operational improvements, 20% complete.

(c) "B" CF16A Program:

Pattern initialization, 100% complete.

Normal CRT display servicing (2 CRTs), 95% complete.

X-Y composite CRT display servicing (1 CRT), 95% complete.

(2) Temporary Display Program:

Further revisions are necessary for ease of operation and loading. These revisions will continue as time permits.

(3) K Data Link Program:

Revisions are being made to incorporate the K-Site operating requirements.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="269 260 480 349">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="456 389 867 453"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (YPR4173)</u></p> <p data-bbox="992 389 1312 453">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="773 485 932 518"><u>DISCUSSION</u></p> <p data-bbox="456 548 618 582"><u>OPERATIONS</u></p> <p data-bbox="451 612 1386 1164">A warm, system leak check was performed on the CPSP test hardware during May. The original schedule called for the first leak check under hard vacuum only after all work inside the chamber was finished. The warm system leak check, however, was performed when instrument technicians were not available to complete work inside the chamber. The diffusion pumps were operated for approximately 5 days to obtain an ultimate pressure of 9×10^{-6} Torr with the vehicle fuel tank, tubing runs, equipment bay, payload simulator, cryoshroud, and the cold guard evacuated. The previous bare chamber ultimate pressure was 2×10^{-6} Torr. All the chamber wall electrical and mechanical ports were mass speced. The conclusion was that the hardware was outgassing and/or evacuation of system virtual leaks is extremely slow and will require extensive pumping prior to future tests. Results of the leak test on vacuum pumpdown are as follows:</p> <p data-bbox="456 1194 1325 1353">(1) There was no apparent back streaming of diffusion pump oil.</p> <p data-bbox="456 1288 1325 1353">(2) A cold guard leak greater than 0.10 std cc GHe/sec was traced to a faulty Conoseal gasket.</p> <p data-bbox="532 1397 878 1431">(Continued on Page 31)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="266 270 472 359">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="456 399 883 459"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (Continued)</u></p> <p data-bbox="456 489 1365 588">(3) The fuel tank leak rate was measured at 5×10^{-4} std cc GHe/sec which is the same as measured during the tank acceptance test approximately one year previous.</p> <p data-bbox="456 618 1349 717">(4) A high current flow noted in the fuel tank pressurization solenoid valve and subsequently traced to a partially shorted wire.</p> <p data-bbox="456 747 1317 946">(5) The equipment bay has an immeasurably large leak. The exact location has not yet been determined, and a repair could required considerable time. An alternative, since the equipment bay hardware is not operated during the boil off tests, is to evacuate all the equipment bay tubing runs.</p> <p data-bbox="456 976 1317 1005">(6) Wiring was replaced on one diffusion pump heater.</p> <p data-bbox="451 1035 1377 1164">All mechanical work is complete inside the vacuum chamber except for hanging cryoshroud mylar curtains and a final chamber clean up. With a normal complement of mechanics and technicians, testing could be started in 1 to 2 weeks.</p> <p data-bbox="451 1194 1349 1324">Shadow shield build up in the ATS Building, clean room is complete. Before mounting the shields in the handling fixture for delivery to K-Site, four additional thermocouples are to be mounted.</p> <p data-bbox="451 1363 695 1393"><u>INSTRUMENTATION</u></p> <p data-bbox="456 1423 1138 1453">(1) Four damaged Rosemounts were replaced.</p> <p data-bbox="456 1483 1328 1512">(2) Cable for additional thermocouples was fabricated.</p> <p data-bbox="456 1542 1057 1572">(3) Solenoid valves were checked out.</p> <p data-bbox="451 1612 878 1642">Work remaining before test:</p> <p data-bbox="456 1671 1247 1701">(1) Instrumentation check out to instrument room.</p> <p data-bbox="456 1731 1279 1801">(2) Control room instrument check out meters, strip charts, etc.</p> <p data-bbox="456 1830 1057 1860">(3) Noise checks through data system.</p> <p data-bbox="537 1880 878 1910">(Continued on Page 33)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

SITE

TASK I

STATUS

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YOY27!

Review meeting held May 30, 1973.
Slip ring ordered and received.
New pressure transducer ordered and received.
Design completed for 72-channel multiplexer and demultiplexer.
Design started on 12-channel rotatable pressure transducer container.

CHANGES: None.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="321 250 529 339">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="509 379 943 443"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u> (Continued)</p> <p data-bbox="516 479 1101 508">(4) Data Link program and check out.</p> <p data-bbox="509 544 643 574"><u>CONTROLS</u></p> <p data-bbox="509 610 1409 830">All heater wiring in the vacuum chamber was completed and checked out in May. Control room wiring for all the control systems was also completed. A closed loop check out for heater controls and the boil off system should be completed by the second week in June. All auxiliary control systems will be checked out by the first week in June.</p>
<p data-bbox="764 932 1149 962" style="text-align: center;"><u>SPECIAL RESEARCH PROJECT</u></p> <p data-bbox="509 997 800 1095"><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM</u> (YPY2752)</p> <p data-bbox="956 1029 1279 1059" style="text-align: right;">RSD - V. S. PETERSON</p> <p data-bbox="846 1129 959 1159" style="text-align: center;"><u>SUMMARY</u></p> <p data-bbox="509 1194 1393 1415">On the morning of May 30, 1973, all groups concerned with the advanced turbine research project met at LeRC-Cleveland to discuss the present status and set guides for the future course of the 23,000 RPM pressure and temperature measuring system development. At this time it was agreed by all that only after June 30, 1973 could we implement a meaningful work schedule.</p> <p data-bbox="813 1453 976 1483" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="509 1518 1344 1578">The following development program elements have been completed:</p> <ol data-bbox="509 1614 1377 1896" style="list-style-type: none"> (1) Selection and procurement of a 23,000 RPM slip ring. It is capable of 40,000 RPM operation and has been received at Plum Brook. (2) Selection of one or two types of pressure transducers that could operate at 23,000 RPM. A Setra System capacitance type has been purchased and received at Plum Brook. Another type will be ordered for evaluation. <p data-bbox="708 1896 1057 1926" style="text-align: center;">(Continued on Page 35)</p>	

NARRATIVES ON ADJOINING PAGE

PROJECT

STATUS

CHANGES: (schedule changes since last report)

STANDARDS AND CALIBRATION LAB

474 manhours of work completed.

1535 manhours of backlog.

SPECIAL RESEARCH PROJECT (Continued)

- (3) A paper design for a 72 channel MOSFET multiplexer and demultiplexer has been completed. This is a simplified version of the first stage of the LeRC-Cleveland developed shaft data system. It will mate with the slip ring signal transfer method.
- (4) A 12 channel rotatable pressure transducer container has been partially designed.

The following development program elements are yet to be completed:

- (1) Completion of the rotatable pressure transducer housing for transducer evaluation as well as a part of the complete system.
- (2) The design and fabrication of a 23,000 RPM spin test rig for component evaluation and the final system tests.
- (3) The design and fabrication of the complete system.

STANDARDS AND CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
B-3	99 hours
HTF	46 hours
K	11 hours
SPF	67 hours
B-2	17 hours
H-Bldg	42 hours
Direct Labor	
K-Site	112 hours
B-3 Site	32 hours
B-2 Site	<u>48 hours</u>
	474 hours
Total Backlog	1535 hours

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER SYSTEMS

<u>SOFTWARE</u>	
Expanded requirements and improvements continue for Centaur Shroud Structural Test.	
9300 operational improvements	40% complete.
"A" CF16A Programs	
Completed Data storage of X-Y info recall.	
Completed X-Y recall plotting.	
"B" CF16A Programs	
Completed X-Y composite CRT display servicing.	
Normal CRT display servicing	98% complete.
Making revisions to K Data Link.	

CHANGES: None

SOFTWARE

(1) Centaur Shroud Structural Tests:

All parts of this requirement have been operational for B-3 Tests. However, expanded operating requirements and basic improvements necessitate updated versions. This work continues on all phases and is reflected by small changes in the percent complete figures compared to last month. Items with 100% figures from last month are deleted for this report:

(a) 9300 program requirements:

Data Recording, 90% complete.
Playback Accumulation, 30% complete.
Operational improvements, 40% complete.

(b) "A" CF16A Program:

Data storage of X-Y information for recall,
100% complete.

Plotting of X-Y information for recall, 100%
complete.

Operational improvements, 50% complete.

(c) "B" CF16A Program:

Normal CRT display servicing (2 CRTs), 98%
complete.

X-Y composite CRT display servicing (1 CRT),
100% complete.

(2) Temporary Display Program:

Further revisions are necessary for ease of operation and loading. These revisions will continue as time permits.

(Continued on Page 39)

INSTRUMENTATION DATA COMPUTER (Continued)

(3) K Data Link Program:

Revisions are being made to incorporate the K-Site operating requirements.

(4) HTF Data Requirements:

Plans are being made to provide quick look plotted and graphic calculated data.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="295 266 506 358">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="467 395 870 459"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (YPR4173)</u></p> <p data-bbox="977 395 1302 459">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="834 491 1000 520" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="467 556 633 584" style="text-align: center;"><u>OPERATIONS</u></p> <p data-bbox="467 620 1399 883">During June the primary work efforts were concentrated toward completing the instrumentation and controls systems and accomplishing a satisfactory warm leak check. Both the instrumentation and control systems are three to four days from completion plus check out. Continued system leak checking revealed an equipment bay pressurization valve was leaking. The leak was repaired by installing a (Continued on Page 25)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="272 268 483 362">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="448 399 797 433"><u>OPERATIONS</u> (Continued)</p> <p data-bbox="448 465 1372 661">new operator-stem and seal assembly. The subsequent 10 day pumpdown revealed yet another 10^{-3} std cc GHE/sec leak in the cold guard fill line. The leak was traced to a faulty conoseal gasket. This was the second fill line gasket which failed to seat; consequently, the three remaining gaskets were replaced in that line.</p> <p data-bbox="448 695 1339 822">Between chamber pumpdowns the cryoshroud mylar curtains were installed and the final chamber clean up was accomplished. As of this writing the third chamber pumpdown is in process.</p> <p data-bbox="448 856 1404 951">The two shadow shield assemblies are now complete including all instrumentation. They are supported in special handling fixtures, covered with plastic bags and purged.</p> <p data-bbox="448 987 690 1022"><u>INSTRUMENTATION</u></p> <p data-bbox="448 1054 873 1088">Work remaining before test:</p> <ol data-bbox="448 1118 1307 1346" style="list-style-type: none"> <li data-bbox="448 1118 1258 1185">(1) Instrumentation check out to instrument room - 20% complete. <li data-bbox="448 1215 1307 1282">(2) Control room instrument check out - meters, strip charts, etc. - 80% complete. <li data-bbox="448 1312 1274 1346">(3) Data Link Program and check out - 50% complete. <p data-bbox="448 1378 576 1413"><u>CONTROLS</u></p> <p data-bbox="448 1445 1356 1641">All control systems wiring is complete with the exception of the lightning protection circuitry now being added to the heater control system. Off-line check out and set up of control systems is now 95% complete. The cryoshroud vent and fill valves are operational and ready for the cold leak tests scheduled for the first week of July.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK I

STATUS

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YOY27

Design delayed due to staff changes and vacation schedules.

Design of pressure transducer housing will begin again on July 26.

STANDARDS AND CALIBRATION LAB

357 manhours of work completed.

1488 manhours of backlog.

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

Plum Brook staff changes and vacation schedules have delayed the special research project progress. Full project effort will begin again on or about July 26, 1973.

DISCUSSION

The task and schedule outlined in last month's report will start after July 26, 1973 with an increased effort to make up lost time. The key item of this project is the 23,000 RPM testing of the pressure transducers. Maximum effort will be concentrated on the completion of the design for the pressure transducer housing which will serve for both the testing phase and the final package.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
B-3	78 hours
HTF	23 hours
K	17 hours
SPF	20 hours
H-Bldg	48 hours
Direct Labor	
K-Site	88 hours
B-3 Site	<u>83</u> hours
	357 hours
Total Backlog	1488 hours

NARRATIVES ON ADJOINING PAGE

PROJECT	TASK
STATUS	SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER SYSTEMS

<u>SOFTWARE</u>	
9300 program requirements	
Data recording	95% complete.
Playback accumulation	40% complete.
Operational improvements	40% complete.
"A" CF16A program	100% complete.
"B" CF16A program	100% complete.
Making revisions to K-data link program.	
Revisions to HTF Quick Look data	50% complete.

CHANGES: None

INSTRUMENTATION
DATA COMPUTER

RSD - J. L. HARROLD

SOFTWARE

(1) Centaur Shroud Structural Tests:

All parts of this requirement are operational. Testing at B-3 will be complete very early in July. Items with 100% figures from last month are deleted for this report:

(a) 9300 program requirements:

Data Recording, 95% complete.
Playback Accumulation, 40% complete.
Operational improvements, 40% complete.

(b) "A" CF16A Program - 100% complete.

(c) "B" CF16A Program - 100% complete.

(2) K-Data Link Program:

Revisions are being made to incorporate the K-Site operating requirements.

(3) HTF Data Requirements:

The requirements for quick look data have been received from the research engineers. Program modifications are 50% complete.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="305 300 513 393">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="477 419 876 479"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (YPR4173)</u></p> <p data-bbox="987 419 1308 479">CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="813 514 974 544" style="text-align: center;"><u>DISCUSSION</u></p> <p data-bbox="477 578 639 608"><u>OPERATIONS</u></p> <p data-bbox="477 644 1357 830">As of this writing seven test days have been completed in the near earth configuration C.P.S.P. Test 1-2a and it is scheduled for completion August 1 or 2. A null test, 1-2b; a deep space test, 1-3a; and a second near earth test, 1-3b, are scheduled for August through September 3.</p> <p data-bbox="477 868 1377 1089">The final chamber pump down was initiated on July 9, 2 weeks prior to filling the tanks with LH₂. Evacuation of the tank insulation appeared to slow the vacuum chamber pump down. Final chamber pressure was 5X10⁻⁶ Torr. After filling the tanks and during subsequent testing, the pressure has held between 1x10⁻⁶ and 2X10⁻⁶ Torr.</p> <p data-bbox="613 1127 941 1157" style="text-align: center;">(Continued on Page 17)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="310 284 521 379">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="483 395 915 459"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u> (Continued)</p> <p data-bbox="483 485 1398 774">Shortly after loading the tanks, an erratic output was noted in the fuel tank pressure control system. This was traced to 50 mm pressure pulses in the pressure sensing line. A surge tank, which appeared to eliminate the pulses, was installed in the sensing line, however the reason for the pulses has not yet been determined. Additional instrumentation is being installed to verify the tank pressure and to further determine the cause of the pressure pulses.</p> <p data-bbox="483 794 1349 923">In addition to test set up and actual test operations, the GN₂ electrical purge system was modified and new personnel at K-Site spent time training and familiarizing themselves with the K-Site systems.</p> <p data-bbox="483 943 727 971"><u>INSTRUMENTATION</u></p> <ol data-bbox="493 995 1365 1292" style="list-style-type: none"> (1) One cryogenic pressure transducer inside the vacuum chamber was lost due to lightning. Since this measurement was not vital to the test, no attempt was made to replace the transducer. (2) One Rosemount temperature sensor was lost on the tank during filling of the tank with LH₂. (3) Two transducers were replaced after the test program was started to provide better range coverage. <p data-bbox="483 1322 1365 1387">No other significant instrumentation problems have been encountered to this date.</p> <p data-bbox="483 1413 1365 1600">Run support is being given on a regular time and reasigned hours basis for daytime data acquisition. Data acquisition is on an automatic basis for after hours with Facilities Service Division personnel on call in the event of thunderstorm activity which could damage data acquisition equipment.</p> <p data-bbox="483 1614 613 1643"><u>CONTROLS</u></p> <p data-bbox="483 1675 1409 1903">Final check of all control systems was completed and no operational problems were found. Heater systems have been lightning protected to guard against controller and power failures. Sense line oscillations on tank pressure control were damped with a large surge tank to achieve satisfactory control, but the basic problem still remains. Steps are being taken to eliminate the problem.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

TAS

STATUS

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YO'

Ordered second type pressure transducer.

Designing housings for two types of pressure transducers.

STANDARDS AND CALIBRATION LAB

382 manhours of work completed.

1758 manhours of backlog.

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

Full project effort has been resumed on July 30, 1973. A second type pressure transducer that may be suitable for the 23,000 RPM system has been ordered for test and evaluation.

DISCUSSION

The design for two types of pressure transducer rotatable housings is now underway. The pressure transducers that have been selected as best candidates for this program are manufactured by Setra Systems, Inc., and National Semiconductors. The latter device has been ordered and features a rectangular silicon wafer pressure sensing diaphragm with a four element strain sensing bridge formed by integrated circuit techniques. It also features an I.C. junction transistor located at the diaphragm center that can be used for precise temperature indication on control of the diaphragm temperature for improved accuracy.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
B-3	63 hours
SPF	23 hours
HTF	61 hours
K	51 hours
H-Bldg	24 hours
Direct Support K	<u>160</u> hours
Total	382 hours
Total Backlog	1758 hours

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TAS
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER SYSTEMS

<u>HARDWARE</u>	
Designed and installed a repeater for K-Data Link	
Designed and installed a controllable counter.	
<u>SOFTWARE</u>	
K-Data Link program completed.	
9300 Program requirements:	
Playback Accumulation	50% complete.
Operational improvements	70% complete.
Special equation requirements	60% complete.
"A" CF16A Program:	
Modifying plotting program	60% complete.
"B" CF16A Program:	
Modifying triple CRT display program	60% complete.

CHANGES: None.

INSTRUMENTATION
DATA COMPUTER

RSD - J. L. HARROLD

HARDWARE

A repeater to demodulate and remodulate the K-Data Link signal between B-Control and K-Site was designed and installed in H-Building. The repeater restores signal strength over the long distance and provides reliable detection adjustment margins.

A controllable elapsed milliseconds counter was designed and installed in the computer interfaces. The counter can be controlled and read by the XDS9300 for use with the HTF test plots.

SOFTWARE

(1) Centaur Shroud Structural Tests:

These tests were completed during July. The incomplete items of XDS9300 data recording, playback accumulation and operational improvements will be developed primarily for the HTF tests in the near future. Any further progress for Centaur Shroud tests will be delayed until the Engineering Evaluation Test requirements are defined.

(2) K-Data Link Program:

This program is now operational with only minor improvements required as problems occur.

(3) HTF Data Requirements:

Revisions to the programs used for the Centaur Shroud Structural Tests are being made.

(a) 9300 program requirements:

Data Recording, 95% complete.
Playback Accumulation, 50% complete.
Operational improvements, 70% complete.
Special equation requirements, 60% complete.

(b) "A" CF16A Program - The plotting program is being modified to allow special plots and profiles. The modifications are 60% complete.

(c) "B" CF16A Program - The triple CRT display program is being modified to provide a visual profile of pressures on one CRT. The modification is 60% complete.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

CRYOGENIC PROPELLANT STORAGE PROGRAM K YOR4

TESTS I-2 & 3 to RESUME	Sep 12, 1973.
TESTS I-4, 5, 6, 7, & 8	Nov-Mar 15, 1974.
<u>ITEMS COMPLETED</u>	
Removed top cooling lines.	
Installed insulation between baffle and payload simulator.	
Added one Rosemount sensor to insulator gap.	
Verified mixer motor operation.	
Replaced a chamber transducer.	
Lightning protected circuits moved to equipment instrumentation interconnection.	
Changed tank boil-off valve trim.	
<u>ITEMS IN PROGRESS</u>	
Preparing for Test 1-2b scheduled for	Sep 12, 1973.

CHANGES: Run schedule changed.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="267 248 479 337">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="454 367 1291 447"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (YPR4173)</u> CRD - R. L. DEWITT; RSD - J. V. GILLETTE</p> <p data-bbox="787 467 950 506"><u>DISCUSSION</u></p> <p data-bbox="454 536 617 566"><u>OPERATIONS</u></p> <p data-bbox="454 596 1274 765">The null test, 1-2b, was not performed as scheduled during August due to vacuum leaks and a operational error which damaged three vacuum diffusion pumps. The initial vacuum chamber pump down for Test 1-2b is now scheduled for September 12.</p> <p data-bbox="446 795 1388 1341">The first run attempt during the first week in August was unsuccessful due to hydrogen leaks in the cryoshroud top. The leaks were traced to three 45° mitered joints in the aluminum "D" tubing. Since the cryoshroud top has a history of developing new leaks it was assumed that the welded joints are fatiguing due to thermally induced stresses. There are twenty such joints in the cryoshroud top, and extensive down time would be required to modify the top. Since the cryoshroud baffle and the vehicle payload simulator are coplanar, sufficient cooling may be possible via the baffle and simulator without flowing LH₂ on top. Therefore, the top cooling lines have been disconnected and the spaces between the cryoshroud walls and the baffle and between the baffle and the payload simulator have been covered with multilayer insulation to prevent incident thermal radiation from reaching the vehicle.</p> <p data-bbox="446 1371 1388 1471">The second run was aborted due to a cold leak in the fuel tank fill line. This leak was traced to a pressure transducer fitting that had been installed after the last test.</p> <p data-bbox="446 1500 1372 1699">The third run attempt on August 30 failed because of overheating and subsequent damage to three diffusion pumps. The damage was confined to the loss of lead fillets around the cooling water coils. The overheating was caused by not establishing proper cooling water flows when the pumps were initially started.</p> <p data-bbox="446 1729 698 1759"><u>INSTRUMENTATION</u></p> <p data-bbox="454 1789 1356 1858">(1) Two shroud insulation Rosemounts and one Rosemount on the tank lid failed after cooldown on August 24.</p> <p data-bbox="576 1858 933 1898">(Continued on Page 15)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

TA:

STATUS

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YOY

Proceeding on design for 23,000 RPM system package.

CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u> (Continued)</p> <p>These sensors cannot be replaced without removing insulation.</p> <p>(2) One Rosemount was added to measure insulator gap temperature.</p> <p>(3) Mixer motor was verified running at ambient temperature. It was also started during tank fill with LH₂. All motor performance data appeared normal.</p> <p>(4) A transducer inside the chamber that had failed earlier due to lightning was replaced.</p> <p><u>CONTROLS</u></p> <p>Several equipment failures were recorded due to lightning even though the landlines were protected. The lightning protection circuits were moved to the equipment interconnection so that they protect the cell wiring. Also, the measure tank boiloff valve trim was changed to permit higher accuracy control at low boiloff flow.</p>
<p style="text-align: center;"><u>SPECIAL RESEARCH PROJECT</u></p> <p><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM</u> (YPY2752) RSD - V. S. PETERSON</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>A 23,000 RPM system package design is nearly complete. This package will contain ten National Semiconductors integrated circuit type pressure transducer mounted with critical elements close to the package spin axis.</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p>Because of the extreme G forces developed at 23,000 RPM, this package design locates each pressure transducer close to the spin axis in an axial stack up</p> <p style="text-align: center;">(Continued on Page 17)</p>	

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK

STATUS

STANDARDS AND CALIBRATION LAB

317 manhours of work completed.

1651 manhours of backlog.

SPECIAL RESEARCH PROJECT (Continued)

configuration. Each of the ten pressure transducers will be mounted in an easily removable "hockey puck" shaped container. A split type transducer containment structure allows easy replacement. The package design follows the previously described guidelines wherein the transducer spin test package configuration will be the best design suitable for inclusion as one section of the final ten channel pressure and 62 channel temperature measurement system.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
HTF	191 hours
K	33 hours
B-3	2 hours
SPF	45 hours
K-Site Direct Support	<u>46</u> hours
	317 hours
Total Backlog	1651 hours

INSTRUMENTATION
DATA COMPUTER

RSD - J. L. HARROLD

HARDWARE

No hardware additions or modifications were made this month.

SOFTWARE

(1) K-Data Line Program:

Improvements were completed and this program is now fully operational.

(Continued on Page 19)

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TA
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER

<u>SOFTWARE</u>	
K-Data Program fully operational.	
9300 Program Requirements (HTF)	
On line accumulation & data recording	95% complete.
Playback accumulation	70% complete.
Operational improvements	85% complete.
Special equation requirements	90% complete.
"A" CF16A Program (HTF)	
Plotting program modifications	90% complete.
New plotting program	20% complete.
"B" CF16A Program (HTF)	
Triple CRT display modifications	95% complete.
Vertical roll style formats for tabular data . . .	15% complete.

CHANGES: None.

INSTRUMENTATION DATA COMPUTER (Continued)

SOFTWARE (Continued)

(2) HTF Data Requirements:

(a) 9300 Program requirements:

On Line Accumulation and Data Recording, 95%
complete.

Playback Accumulation, 70% complete.

Operational improvements, 85% complete.

Special equation requirements, 90% complete.

(b) "A" CF16A Program:

Plotting program modifications for use with
the Versatec printer/plotter, 90% complete.

New plotting program for use with the Houston
Instruments Digital Plotter, 20% complete.

(c) "B" CF16A Program:

The modification to the triple CRT display
program to provide a visual profile of pres-
sures on one CRT is 95% complete.

Work has begun to provide a vertical roll
style format of tabular data and is 15% complete.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="240 266 454 357">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="435 361 1230 429"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u> (YPR4173) CRD - R. L. DEWITT; RSD - N. L. SCHROEDER</p> <p data-bbox="750 461 863 489"><u>SUMMARY</u></p> <p data-bbox="435 524 1338 747">The Null Test, I-2B and the Deep Space Hold Test, I-3a were completed after repairs on the damaged vacuum diffusion pumps had been accomplished. The Near Earth Test, I-3b, is in progress with completion expected by October 6. Installation of the shadow shields, required for all remaining tests, will begin about October 9 with completion expected about mid-November.</p> <p data-bbox="734 783 896 811"><u>DISCUSSION</u></p> <p data-bbox="435 846 597 874"><u>OPERATIONS</u></p> <p data-bbox="435 910 1260 978">Repairs to the cooling coils on the three damaged vacuum diffusion pumps was completed on September 8.</p> <p data-bbox="500 994 847 1021">(Continued on Page 13)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="235 272 446 362">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="430 403 852 463"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (Continued)</u></p> <p data-bbox="430 493 1307 564">A function check of the complete vacuum system was then performed to verify proper operation.</p> <p data-bbox="430 594 1274 756">The Null Test, I-2b was started on September 14 with filling of the LH₂ tank, in the chamber. Flow of LH₂ to the 13' cryoshroud was started on September 15. Steady state conditions were reached on September 21 with a final boil-off rate of 0.095 SCFH.</p> <p data-bbox="430 796 1339 987">Changeover to the Deep Space Hold Test configuration, Test I-3a, was accomplished September 23 by cutting off LH₂ flow to the payload simulator and warming it up. Steady State Point 1 was reached September 26 with a boil-off rate of 3.35 SCFH at a chamber pressure of 2.1 x 10⁻⁶ Torr and a cryoshroud pressure of 1.0 x 10⁻⁵ Torr.</p> <p data-bbox="430 1018 1339 1179">Deep Space Hold Steady State Point 2 was reached September 28 with a boil-off rate of 4.70 SCFH after increasing shroud pressure to 4.9 x 10⁻⁵ Torr by turning off two diffusion pumps and bleeding Helium into the chamber through a calibrated orifice.</p> <p data-bbox="430 1209 1323 1340">Deep Space Hold Steady State Point 3 was reached September 30. Completion of this test is expected by October 6 after which the site will be down for approximately 6 weeks for a test configuration change.</p> <p data-bbox="430 1380 673 1411"><u>INSTRUMENTATION</u></p> <p data-bbox="430 1441 1323 1501">Run support was provided for completion of Tests 2b, 3a, and 3b.</p> <ol data-bbox="438 1532 1299 1834" style="list-style-type: none"> (1) Mixer motor operated satisfactorily in LH₂ during Test 2b. (2) One pressure transducer used only for providing meter readout failed. (3) Interstitial Pressure Baratron will be tested in calibration laboratory to determine accuracy at 10⁻⁶ Torr line pressure. <p data-bbox="503 1864 852 1905">(Continued on Page 15)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK

STATUS

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

Y0Y275

Design for 23,000 RPM system package scheduled to be completed week of Oct.

CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u> (Continued)</p> <p><u>CONTROLS</u></p> <p>The rewiring of the lightning protection circuits appears to be satisfactory. Several lightning storms have caused no damage since the rewiring. The heater control systems have performed well under all run conditions.</p>
<p style="text-align: center;"><u>SPECIAL RESEARCH PROJECT</u></p> <p><u>TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM</u> (YPY2752) RSD - V. S. PETERSON</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>The fabrication drawings for the 23,000 RPM spin test rig will be completed during the first week of October 1973. The rig will be used to evaluate the performance of any pressure transducer selected for use in the ten channel system.</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p>The spin test rig will be driven at speeds ranging from zero to 23,000 RPM by a small General Electric air turbine. The turbine will be slightly modified to allow insertion of a small diameter tube that will pass through the center of the turbine shaft. Pressurization of the test transducer will be made via this tube by an ultra-miniature rotary seal comprised of a non-rotating hyperdermic needle pierced through the axial center of a soft rubber-like rotating seal contained at the exhaust end of the drive turbine assembly. This technique should provide a 23,000 RPM rotary air union that is not commercially available.</p> <p>The anticipated outside shop fabrication time for the spin rig components should be about one month. We can then expect to spin test the selected pressure transducers during the later part of November 1973.</p>	

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK N

STATUS

STANDARDS AND CALIBRATION LAB

495 manhours of work completed.

1451 manhours of backlog.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
SPF	68 hours
B-3	96 hours
K	29 hours
HTF	73 hours
H Bldg	213 hours
Direct Support	<u>16</u> hours
Total	495 hours
Total Backlog	1451 hours

INSTRUMENTATION
DATA COMPUTER

RSD - J. L. HARROLD

HARDWARE

No tasks to report.

SOFTWARE

(1) HTF Data Requirements:

(a) 9300 Program Requirements:

On Line Accumulation, Data Recording, Playback Accumulation and Special Equation requirements are all operational. A tabulation printout of selected parameters has been provided for playback and is also operational.

Program improvements are necessary to increase the output rate of playback since output is rather slow in its present form. These improvements are 30% complete.

(b) "A" CF16A Program:

Plotting program modifications for use with the Versatec printer/plotter are complete.

A plotting program for use with the Houston Instruments Digital Plotter is operational.

(Continued on Page 19)

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK N
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER

<u>SOFTWARE</u>	
K-Data Program fully operational.	
9300 Program Requirements (HTF)	
On line accumulation & data recording	100% complete.
Playback accumulation	100% complete.
Operational improvements	100% complete.
Special equation requirements	100% complete.
Program improvements	30% complete.
"A" CF16A Program (HTF)	
Plotting program modifications	100% complete.
New plotting program	100% complete.
"B" CF16A Program (HTF)	
Triple CRT display modifications	100% complete.
Vertical roll style formats for tabular data . . .	40% complete.

CHANGES: None.

INSTRUMENTATION DATA
COMPUTER (Continued)

The size of alpha/numeric characters must be increased for Datafax transmission to Langley.

(c) "B" CF16A Program:

The provision for a visual profile of pressures on one CRT is operational.

Work on a vertical roll style format of tabular data is 40% complete.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

CRYOGENIC PROPELLANT STORAGE PROGRAM K YOR4

TESTS I-4, 5, 6, 7 & 8 run schedule	Nov-Mar 15, 1974.
<u>ITEMS COMPLETED</u>	
Removed Deep Space Test.	
Installed Near Earth Test - I-3b	
Completed Near Earth Test (I-3b)	Oct. 3, 1974.
Removed test hardware from chamber.	
Tank removed from shroud and disconnected from payload simulator.	
Replaced wiring on LH ₂ pressurization valve.	
Disconnected and labeled (I-3b) instrument cables.	
<u>ITEMS IN PROGRESS</u>	
Installing shadow shield.	
Repairing leaks in the cryoshroud top section.	
Making test article configuration changes	Est'd comp 11-28-73
Testing interstitial pressure Baratron.	
Repairing equipment damaged during lightning storm .	Est'd comp 11-30-73.

CHANGES: None

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

K CRYOGENIC PROPELLANT RESEARCH SITE

CRYOGENIC PROPELLANT STORAGE PROGRAM (YPR4173) CRD - R. L. DEWITT; RSD - N. L. SCHROEDER

SUMMARY

The final test of the Group I test series, Near Earth Test I-3b, has been successfully completed. The test hardware has been removed from the chamber and work is in progress on the shadow shield installation for the Group II test configuration.

DISCUSSION

OPERATIONS

Changeover from the Deep Space Test configuration to the Near Earth Test, I-3b, was accomplished by cutting off the flow of LH2 to the cryoshroud and electrically heating it to a temperature of 530°R. Steady state conditions were reached on October 3 with a boil-off rate of 82.0 SCFH at a chamber pressure of 2.5x10-6 Torr and a shroud pressure of 1.1x10-5 Torr.

The complete test assembly consisting of the cryoshroud, insulated LH2 tank in its structure, payload simulator, and cold guard tank, were removed from the chamber as a unit. The tank, in its support structure, was then removed from the shroud and disconnected from the payload simulator in preparation for the installation of shadow shields and additional instrumentation required for the remaining tests.

A malfunction of the LH2 pressurization valve, HCV-2511C which was noticed during the draining of the LH2 tank at the completion of the test, was traced to a short in the wiring in the tank valve box under the insulation. The wiring was replaced and an operation check of the valve performed.

Work is also in progress to repair leaks in the "D" tubing 45° mitered joints of the cryoshroud top section which had developed during a previous run attempt.

The test article configuration change is on schedule with completion expected by the last week of November.

(Continued on Page 19)

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="267 262 487 352">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="446 393 893 453"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u> (Continued)</p> <p data-bbox="446 493 690 524"><u>INSTRUMENTATION</u></p> <p data-bbox="446 554 1274 614">Instrumentation cables were disconnected and labeled after completion of Test I-3b.</p> <p data-bbox="446 655 1307 715">Calibration laboratory tests of the Interstitial Pressure Baratron are in progress.</p> <p data-bbox="446 756 1356 816">All reference ovens are scheduled for on site calibration checks during week of October 29, 1973.</p> <p data-bbox="446 856 1356 917">Instrumentation changes for next series of tests have not been received.</p> <p data-bbox="446 947 576 977"><u>CONTROLS</u></p> <p data-bbox="446 1018 1339 1199">Due to a late season lightning storm, all eight programmable power supplies suffered some damage. One supply was damaged seriously. In addition to these failures, some of the lightning protection circuitry was also damaged. All failures occurred at the site leaving the control room undamaged.</p> <p data-bbox="446 1239 1339 1532">Repairs have been initiated on all damaged equipment and replacement parts have been ordered where necessary. All repairs should be complete by the end of November. No cause could be found that would justify the damage to the protective circuitry since it had protected the equipment during several previous lightning storms. The equipment failure occurred after the data taking and during warmup. No damage to the test hardware was observed as a result of the power supply failure.</p>

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK

STATUS

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM

YOY27

Completed 23,000 RPM spin test rig drawings.

Proceeding on the contracting of spin rig fabrication.

G. E. Air Turbine delivered to PB Machine Shop.

Received 40 lead 16-channel multiplexer integrated circuits.

CHANGES: None.

STANDARDS AND CALIBRATION LAB

499 manhours of work completed.

1300 manhours of backlog.

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

The fabrication drawings for the 23,000 RPM spin test rig have been completed. The procurement process is now underway wherein an outside fabrication shop will receive a contract to build the rig components.

DISCUSSION

The General Electric air turbine is now in the Plum Brook Machine Shop where an attempt to drill a 1/8" hole through the axial center of the turbine shaft will be made. The success of this operation will depend upon the type of shaft metal as well as its hardness. An arc discharge method may be needed to bore the hole.

The 40 lead dual in line package 16-channel random/sequential access multiplexer integrated circuits have been received at Plum Brook. They will be used to breadboard a 72-channel analog multiplexer and demultiplexer as one method to be evaluated for routing the 72-channels through a rotating signal transfer device.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
HTF	202 hours
K	5 hours
B-3	22 hours
SPF	38 hours
H & Cal Lab	103 hours
Rotary X-ducer Project	32 hours
Direct Support K-Site	<u>97</u> hours
Total	499 hours
Total Backlog	1300 hours

NARRATIVES ON ADJOINING PAGE

PROJECT

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

CHANGES: (schedule changes since last report)

INSTRUMENTATION DATA COMPUTER

<u>SOFTWARE</u>	
9300 Program Requirements (HTF) Program to increase output rate	90% complete.
"A" CF16A Program (HTF) Completed program to use Houston Plotter.	
"B" CF16A Program (HTF) Vertical roll style formats for tabular data	75% complete.
Planning program for "F" Site requirement for visual engineering units display.	

CHANGES: None.

INSTRUMENTATION
DATA COMPUTER

RSD - J. L. HARROLD

HARDWARE

No tasks to report.

SOFTWARE

(1) HTF Data Requirements:

(a) 9300 Program Requirements:

Program improvements to increase output rate of playback are 90% complete. Minor changes are continually being made to meet unique equation requests.

(b) "A" CF16A Program:

Operation programs are in use with the increased size of alpha/numeric characters on the Houston Instruments Plotter. Milliseconds are being added to the plot heading times.

(c) "B" CF16A Program:

Work on a vertical roll style format of tabular data is 70% complete.

(2) "F" Site:

Special requirements for visual engineering units for this requirement are minimal and are in the planning stage.

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

CRYOGENIC PROPELLANT STORAGE PROGRAM K YOR41

TESTS I-4, 5, 6, 7, & 8 RUN SCHEDULE	Jan-Apr 15, 1974
<u>ITEMS COMPLETED</u>	
Repairs and leak tests to cryoshroud top completed. Performed complete leak test of vacuum chamber. Repaired facility valve leaks. Resolved instrumentation problems. Installed additional instrumentation. Built transducer test manifold. Tests completed on Interstitial Pressure Baratron. Calibrated all temperature reference ovens. Received power supply capacitors.	
<u>ITEMS IN PROGRESS</u>	
Investigating over-pressure vent system leak. Calibrating Baratron diff. pressure transducer. Installing sensors and terminating cabling. Evaluating data for Interstitial Pressure Baratron tests.	

CHANGES: Schedule Change.

SITE	SITE NAME RESEARCH INSTALLATION & TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u> (YPR4173) CRD - R. L. DEWITT; RSD - N. L. SCHROEDER</p> <p style="text-align: center;"><u>SUMMARY</u></p> <p>Changeover to the new test configuration is in progress. Repairs are being made to facility hardware following a post test chamber leak check. Instrumentation changes have been resolved and a new interstitial pressure measurement system is being developed.</p> <p style="text-align: center;"><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>Repairs to the cryoshroud top have been completed, the unit cold shocked with LN₂ and a mass spec leak test performed. During the modification of the test hardware, a complete post test leak check of the vacuum chamber was performed. Several internal leaks were detected in facility valves to the chamber and were repaired. A significant external leak in the chamber over-pressure vent system was also detected. This problem is currently under investigation.</p> <p>Preliminary data from the Group I test series indicated several discrepancies in the existing instrumentation and the need for additional instruments at various locations in the insulation blankets and on the support structure. All of these problems have been resolved and the additional instrumentation installed.</p> <p>Insulation blanket interstitial pressure measurements continue to be a problem. No meaningful results were obtained during the last tests. A test manifold has been built and is presently being utilized to calibrate and verify the performance of the Baratron differential pressure transducer under high vacuum conditions. Two additional Baratron units will then be installed inside the chamber to measure shroud and interstitial pressures.</p> <p>The installation of the shadow shields and complete re-assembly of the test hardware has been delayed until the chamber leaks have been repaired and manpower is available. It is expected that the facility will be ready to resume research testing in early January.</p> <p style="text-align: center;">(Continued on Page 17)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM	Y0Y2]
Fabricating 23,000 RPM Spin Test Rig Received second type pressure transducer.	50% complete Sched comp date - Ja

CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u> (Continued)</p> <p><u>INSTRUMENTATION</u></p> <p>Instrumentation changes and additions were received November 1, 1973. Sensor installation and cable terminations for the new instrumentation is approximately complete.</p> <p>Calibration laboratory tests of the Interstitial Pressure Baratron have been run. The data is being evaluated.</p> <p>All temperature reference ovens have been calibrated.</p> <p><u>CONTROLS</u></p> <p>No controls work was accomplished at K-Site this month. Power supply capacitors were received at the end of the month and repair will begin in December.</p>

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

The 23,000 RPM spin test rig fabrication was not given to an outside shop and is now approximately 50% completed by the Plum Brook machine shop. They predict a completion date early in January 1974.

DISCUSSION

We have received a second type pressure transducer for evaluation in the spin test rig. The pressure transducers are Kulite Semiconductor model VQS-500-100 and they cover the range of +100 psi to -30 psi. If this transducer is chosen for the final system design, care must be exercised in routing the system pressure lines to the transducer so that the high side of the pair always reached the + pressure input part of the transducers.

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK

STATUS

STANDARDS AND CALIBRATION LAB

491 manhours of work completed.

1244 manhours of backlog.

INSTRUMENTATION DATA COMPUTER

9300 Program Requirements (HTF)

Completed program to increase output rate.

"B" CF16A Program (HTF)

Completed vertical roll style formats for tabular data.

CHANGES: None.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
HTF	228 hours
SPF	72 hours
B-2	32 hours
B-3	10 hours
F	16 hours
K	98 hours
H	15 hours
Direct Support K-Site	<u>20 hours</u>
	491 hours
Total Backlog	1244 hours

INSTRUMENTATION
DATA COMPUTER

RSD - J. L. HARROLD

The incomplete tasks reported last month are now operational except for minor site oriented specifics. With the cancellation of further significant plans in this area because of Station standby plans and the completion of the present tasks, it seems appropriate to declare the system operational in the present status. Any further reporting will be done with the particular site using the system.

The effort in this area will focus on documentation and supporting operational use for the sites.

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="261 254 472 345">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="435 379 850 445"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (YPR4173)</u></p> <p data-bbox="976 379 1317 445">CRD - R. L. DEWITT; RSD - N. L. SCHROEDER</p> <p data-bbox="786 479 899 504"><u>SUMMARY</u></p> <p data-bbox="435 538 1349 663">Assembly of the test hardware to the new test configuration is in progress. Repairs to facility hardware have been completed. Interstitial pressure measurement system problems have not as yet been resolved.</p> <p data-bbox="737 703 899 729"><u>DISCUSSION</u></p> <p data-bbox="435 769 597 795"><u>OPERATIONS</u></p> <p data-bbox="435 828 1333 922">The leak check of the vacuum chamber has been completed with repairs being made to correct all significant leaks that were detected. (Continued on Page 11)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TA
STATUS		SCHEDULE

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM	Y0
Fabricating 23,000 RPM Spin Test Rig	85% complete.
Assembly of rig scheduled to be completed	Jan 11, 1974.

CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u></p> <p><u>OPERATIONS</u> (Continued)</p> <p>Assembly of the test hardware is in progress. The shadow shields have been installed in their proper location but final adjustments and tensioning are yet to be accomplished. The payload simulator, cryo-shroud top and radiation baffles have also been mated to the main structure.</p> <p>Check out of the interstitial pressure transducers to be used in the next test have been inconclusive. Accurate readings in the 10^{-5} to 10^{-6} Torr range were not obtained with the present test set-up. An attempt will be made to simulate actual test conditions by installing the transducers in the "D" site vacuum chamber. Necessary work to accomplish this task in in progress.</p> <p>It is expected that the facility will be ready to resume research testing by the end of January.</p>

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

The Plum Brook machine shop has estimated the fabrication of the components for the 23,000 RPM pressure transducer spin test rig to be 85% complete. Assembly of the rig is expected to begin during the first and second week of January 1974.

DISCUSSION

Room 104 in D-Site test building has been tentatively selected for the spin test rig installation and operation. This room is in an unoccupied rear area of D-Site. The test rig can be remotely operated from a control station at the northwest corner of the building test area. Room 104 can be viewed through a window in the test area. The Area 2C Safety Committee will be requested to approve this location and test program.

NARRATIVES ON ADJOINING PAGE

PROJECT

STATUS

STANDARDS AND CALIBRATION LAB

249 manhours of work completed.

1231 manhours of backlog.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
HTF	24 manhours
SPF	66 manhours
B-2	31 manhours
B-3	8 manhours
K	89 manhours
H	<u>31 manhours</u>
Total	249
Total Backlog	1231 manhours

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="365 193 573 289">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="521 331 919 412"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (YPR4173)</u></p> <p data-bbox="1092 336 1430 412">CRD - R. L. DEWITT; RSD - N. L. SCHROEDER</p> <p data-bbox="841 453 951 485"><u>SUMMARY</u></p> <p data-bbox="521 529 1382 715">Changeover to the new test configuration is almost complete. The test assembly has been installed in the vacuum chamber and final connections are in progress. The interstitial pressure measuring system has been checked out and is also being installed.</p> <p data-bbox="829 729 1167 763">(Continued on Page 15)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="370 176 579 268">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="546 304 1129 331"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u></p> <p data-bbox="708 370 872 397"><u>DISCUSSION</u></p> <p data-bbox="546 434 710 461"><u>OPERATIONS</u></p> <p data-bbox="546 497 1455 817">Final alignment and tensioning of the shadow shields and positioning of the radiation baffles has been completed. This task was delayed when it was discovered that the conoseal flanges on the baffles had not been replaced along with those on the cryoshroud and were defective. These flanges were replaced and the baffles leak checked. The vehicle was then installed in the cryoshroud and the complete assembly placed in the chamber. Connection and leak checking of all service lines inside the chamber is presently under way.</p> <p data-bbox="546 853 1438 1172">Checkout and calibration of the interstitial pressure Baratron Unit under simulated operating conditions in the vacuum chamber at "D" site has been completed. The unit was subjected to several vacuum cycles with the new sense lines installed and it was determined that reliable results could be obtained at pressures down to 10^{-5} Torr. The Baratron Unit has been mounted in a special insulated box and will be installed inside the cryoshroud to keep the sensing lines as short as possible.</p> <p data-bbox="546 1208 1405 1300">It is expected that all facility checkouts will be completed by February 15, 1974 and full scale testing will resume at that time.</p> <p data-bbox="546 1336 789 1364"><u>INSTRUMENTATION</u></p> <p data-bbox="546 1400 1405 1583">Calibration of the Interstitial Pressure Baratron was completed in the "D" site vacuum chamber. The transducer with its associated temperature control and temperature monitoring components is being installed at "K" site for the 1-4 series of tests.</p> <p data-bbox="546 1619 1422 1698">All instrumentation wiring was completed to connectors on the test vehicle.</p> <p data-bbox="745 1859 1091 1887">(Continued on Page 17)</p>

NARRATIVES ON ADJOINING PAGE

PROJECT	SITE	TASK NO.
STATUS	SCHEDULE	

CHANGES: (schedule changes since last report)

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM YOY2752

Machining last test-rig item.	
Developed optical speed measurement system.	

CHANGES: None

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u></p> <p><u>CONTROLS</u></p> <p>Final repair of all power supplies for the heater control system on the shroud was completed this month. Almost all units have been returned to their racks and rewired to the appropriate system. Hookup to shroud load will be completed by the second week in February. Work has begun on resurrecting the hybrid computer for the large gas meter flow rate readout.</p>

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY PRESSURE MEASURING SYSTEM (Y0Y2752)

RSD - V. S. PETERSON

SUMMARY

Rocket Systems Division support personnel covering the control and operations portions of the 23,000 RPM spin test rig are now in the process of preparing the site location and installation of the pressure transducer test rig at "D" site. The National Semiconductor IC pressure transducer will be the first type to be evaluated during February 1974.

DISCUSSION

The spin test rig's last item to be completed by the Plum Brook machine shop is a hypodermic needle type rotary pressure feed that will supply selectable pressure to the test transducer over a speed range of 0 - 23,000 RPM. The speed of the rig will be measured by an optical technique that uses a short wave length ultraviolet light source and an ultraviolet sensitive photo resistor sensor to produce a constant amplitude-six pulse per revolution speed signal. Dual sensors will be used, one for control (over speed shut down) and one for continuous speed measurement. The ultraviolet sensing technique will provide ideal speed signals free of the interference problems caused by room lighting and the speed variable signal amplitudes encountered with conventional magnets sensing techniques.

NARRATIVES ON ADJOINING PAGE

PROJECT

TASK NO.

STATUS

STANDARDS AND CALIBRATION LAB

394 manhours of work completed.

1181 manhours of backlog.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
HTF	122 manhours
SPF	102 manhours
B-2	23 manhours
B-3	63 manhours
H	48 manhours
K	<u>36 manhours</u>
Total	394
Total Backlog	1181 manhours

SITE	SITE NAME RESEARCH INSTALLATION &(TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (YPR4173)</u> CRD - R. L. DEWITT; RSD - N. L. SCHROEDER</p> <p><u>OPERATIONS</u></p> <p>Installation of the vehicle in the vacuum chamber is complete. All piping and tube runs have been installed and a complete function and leak check performed. Final connection and check out of all instrumentation and controls cables and hardware has also been accomplished. Preparations for installation of the vehicle cold guard duct covering and the hanging of the aluminized mylar radiation shield on the outside of the cryoshroud are in progress. This task will complete the pre-test operations.</p> <p>(Continued on Page 15)</p>
	<p>a selected number of abort channels will be tied in early in March. The circuit operation will be verified, and remaining channels wired in as time permits.</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="305 359 513 464">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="464 510 894 579"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (Continued)</u></p> <p data-bbox="464 627 1330 825">The assembly of the interstitial pressure Baratron box has been completed and the unit installed inside the cryoshroud. Preliminary readings observed during the ambient systems checks with the vacuum chamber pumped down to the 10^{-5} Torr range indicate that the unit and all associated hardware is operating properly.</p> <p data-bbox="464 863 1344 1081">Several days delay in the mass spec leak check of the vehicle in the chamber was experienced due to a loss of facility cooling water pressure and subsequent damage to one diffusion pump. The pump was repaired and additional protective thermocouples installed which sense cooling water outlet temperature in addition to the existing heater and oil temperatures.</p> <p data-bbox="464 1119 1357 1241">Preparations for the shadow shield portion of the test series are almost complete. It is expected that testing will begin during the first week of March and continue through the first week of April.</p> <p data-bbox="464 1278 704 1308"><u>INSTRUMENTATION</u></p> <p data-bbox="464 1346 1373 1375">Interstitial Pressure Baratron was installed and checked.</p> <p data-bbox="464 1413 1179 1442">Thermocouples on Baratron box were installed.</p> <p data-bbox="464 1480 1211 1509">Thermocouple reference ovens were recalibrated.</p> <p data-bbox="464 1547 1325 1577">Strip chart recorders in control room were calibrated.</p> <p data-bbox="464 1614 1317 1661">All instrumentation work inside test chamber has been completed.</p> <p data-bbox="464 1698 591 1728"><u>CONTROLS</u></p> <p data-bbox="464 1766 1357 1913">Chamber wiring was completed and all heater circuits checked out satisfactory. Some minor controller repair is needed but this work should be completed by the first week in March. All other control systems are ready for the run.</p>

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YOY2752)

RSD - V. S. PETERSON

DISCUSSION

The 23,000 RPM spin test rig fabrication was completed this month by the Plum Brook Machine Shop. It was then transferred to LeRC-Cleveland for balancing. The ball bearings in the General Electric air turbine drive for the rig were found to be defective. A minor change in the method used to retain one of the spin rig's ball bearings was recommended.

The spin test rig was returned to Plum Brook for the bearing replacement and bearing retention changes. It will then be returned to Lewis-Cleveland for balancing during the latter part of March 1974. Preparation of "D" Site for the installation of the spin rig is now in progress.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
HTF	89 manhours
K	45 manhours
B-3	80 manhours
SPF	39 manhours
H Building	20 manhours
Total	273 manhours
Direct Support K Site	48 manhours
Total Backlog	1205 manhours

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="235 278 446 374">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="394 421 1224 495"><u>CRYOGENIC PROPELLANT</u> CRD - R. L. DEWITT; <u>STORAGE PROGRAM (YPR4173)</u> RSD - N. L. SCHROEDER</p> <p data-bbox="602 540 1036 574">SCHEDULE - THROUGH MAY 1974</p> <p data-bbox="521 614 1146 761"><u>SCHEDULE CHANGE</u> - THE RUN SCHEDULE HAS BEEN EXTENDED TO THE END OF MAY. THIS WAS NECESSARY DUE TO THE PROBLEMS IN EARLY MARCH IN GETTING THE SITE ON LINE</p> <p data-bbox="745 804 862 838"><u>SUMMARY</u></p> <p data-bbox="394 878 1260 985">Experimental testing was resumed during this reporting period. A Near Earth Test was completed and the Null Test is in progress.</p> <p data-bbox="724 1034 886 1068"><u>DISCUSSION</u></p> <p data-bbox="404 1117 570 1151"><u>OPERATIONS</u></p> <p data-bbox="404 1187 1222 1347">Mass spec leak checking of the test hardware while maintaining a vacuum in the chamber was completed during the first week of March. Final preparations were completed and the chamber pumped down to the low 10^{-6} Torr range for test.</p> <p data-bbox="404 1381 1255 1636">During pre-run operational checks of all systems, a short in the shroud closed loop heater circuit caused damage to three D.C. power supplies. Investigation indicated the problem was inside the chamber which required breaking the vacuum for access. Repairs to the wiring and power supplies were accomplished and test preparations resumed after a delay of about one week.</p> <p data-bbox="404 1668 1304 1827">The test was started on March 15 with the filling of the measure tank and cold guard with LH_2. Steady state Near Earth data was taken on March 18 and 19. Boil-off from the tank was approximately 85 SCFH and agrees closely with the two previous Near Earth tests.</p> <p data-bbox="537 1991 870 2025">(Continued on Page 7)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="277 348 675 453">CRYOGENIC PROPELLANT <u>RESEARCH SITE</u> (Continued)</p> <p data-bbox="436 491 786 527"><u>OPERATIONS</u> (Continued)</p> <p data-bbox="436 575 1382 852">On March 22 an attempt was made to cool down the cryoshroud in preparation for the Null Test. A ruptured weld in the top baffle of the cryoshroud caused termination of the test. Inspection of the baffle revealed that the faulty weld could not be reached without disassembly of the shroud. It was determined that the loss of this baffle would not seriously affect test results and it was taken out of the cryoshroud LH₂ flow circuit.</p> <p data-bbox="436 884 1398 1041">The chamber was pumped down and a cold gas leak check on the cryoshroud and another mass spec leak check of the chamber was performed before resuming research testing. The cryoshroud was filled on March 30 and the measure tank and cold guard on March 31 for the Null portion of the test program.</p> <p data-bbox="436 1104 675 1140"><u>INSTRUMENTATION</u></p> <p data-bbox="436 1171 1333 1392">Run support was provided for test series 1-4C and beginning 1-4A. No significant instrumentation problems have been encountered. The K Data Link has not been reliable because of lightning damage and electrical transients. The thermocouple reference ovens were checked for calibration stability. All were still within specifications.</p> <p data-bbox="436 1461 565 1497"><u>CONTROLS</u></p> <p data-bbox="436 1528 1341 1650">Finished power supply repair and completed total heater system check out. Two hydraulic actuators on boil off valves were found to have end seal leaks. These were repaired and the boil off system check out was completed.</p>

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

SUMMARY

The 23,000 RPM pressure transducer test rig has undergone the ball bearing retention modifications that were recommended by the LeRC - Cleveland balancing group. New ball bearings for the G.E. system drive turbine have been ordered.

DISCUSSION

As soon as the drive turbine is equipped with the new bearings, the spin rig will be assembled and delivered to the LeRC-Cleveland balancing group. The preparation of Plum Brook D Site for the installation of the spin test rig is proceeding slowly. The running of the rig and generation of spin performance data for the pressure transducers will be late in May 1974 or early June 1974.

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

A summary of work completed this month is as follows:

<u>Site</u>	<u>Time Spent on Completed Jobs</u>
B-3	157 hours
K	53 hours
HTF	43 hours
H Building	29 hours
Direct Support	
K-Site	96 hours
B-3 Site	<u>12</u> hours
	390 hours
Total Backlog	990 hours

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (YPR4173)</u> CRD - R. L. DEWITT; RSD - N. L. SCHROEDER</p> <p>SCHEDULE - THROUGH MAY 1974</p> <p><u>SUMMARY</u></p> <p>Experimental testing continued during this reporting period. Three Null tests and three deep space tests were successfully completed and a Near Earth test series is in progress.</p> <p><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>Full scale testing of the complete research vehicle with shadow shields continued during this reporting period.</p> <p>(Continued on Page 7)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
HTF	<p>HYPERSONIC TUNNEL FACILITY</p> <p><u>HRE (GARRETT ENGINE) (Continued)</u></p> <p>4-23-74 Reading 99 4-23-74 Reading 100 4-23-74 Reading 101 4-23-74 Reading 102 4-24-74 Reading 103 4-24-74 Reading 104 4-24-74 Reading 105</p> <p>Reading 97 was the exhaust gas analysis run. Gas analyzer data was lost - the gas sampling probes collected large quantities of water and plugged the metering orifice to the gas analyzer.</p> <p><u>CONTROLS</u></p> <p>During the month of April, the final Mach 5 tests were completed. Run set up and run support were provided. Minor problems were encountered with the facility flow computer and the XDS 910 peripherals but were corrected without delaying the run schedule.</p>
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (YPR4173)</u> CRD - R. L. DEWITT; RSD - N. L. SCHROEDER</p> <p>SCHEDULE - THROUGH MAY 1974</p> <p><u>SUMMARY</u></p> <p>Experimental testing continued during this reporting period. Three Null tests and three deep space tests were successfully completed and a Near Earth test series is in progress.</p> <p><u>DISCUSSION</u></p> <p><u>OPERATIONS</u></p> <p>Full scale testing of the complete research vehicle with shadow shields continued during this reporting period.</p> <p>(Continued on Page 7)</p>

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

K CRYOGENIC PROPELLANT RESEARCH SITE

CRYOGENIC PROPELLANT STORAGE PROGRAM (Continued)

The Null Test under ultimate vacuum conditions was completed on April 5, 1974 with a steady state LH₂ boil off rate of 0.2358 SCFH at a cryoshroud pressure of 1.1 x 10⁻⁶ Torr. The second test of this series was accomplished by raising the shroud pressure with a helium bleed to an intermediate level of 1.0 x 10⁻⁵ Torr. A steady state boil-off rate of 0.2459 SCFH was recorded on April 8, 1974. The last Null Test point at the highest shroud pressure of 7.0 x 10⁻⁵ Torr resulted in a steady state boil-off rate of 0.3818 SCFH on April 9, 1974.

The helium bleed to the chamber and LH₂ flow to the payload simulator was stopped in preparation for the Deep Space Tests. During the warm-up of the payload simulator, the heater power supply failed. Repairs were accomplished and testing continued. The Deep Space Test at an ultimate shroud pressure of 2.1 X 10⁻⁶ Torr resulted in a steady state LH₂ boiloff of 0.344 SCFH on April 16, 1974. The intermediate pressure test was accomplished by again utilizing a helium bleed to raise shroud pressure to 1.2 X 10⁻⁵ Torr. A steady state boiloff rate of 0.494 was recorded on April 17, 1974. The final test at a higher shroud pressure of 7.6 X 10⁻⁵ Torr on April 19, 1974 resulted in a steady state LH₂ boiloff rate of 1.66 SCFH.

Several times during the test series, erratic tank pressure and boiloff rates indicated a possible leak in the measure tank vent system. A back-up burst disc was installed down stream of the existing facility relief system to verify zero leakage and a re-run of the ultimate pressure Null Test performed. Results of this test were almost identical to the previous test and it was concluded that the problem was not an internal leak which would have affected the boiloff data for several previous tests.

(Continued on Page 8)

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="360 317 568 415">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="518 449 948 512"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (Continued)</u></p> <p data-bbox="518 562 1367 1079">A shortage in the supply of liquid hydrogen made it necessary to stop the Null and Deep Space portions of the test series and go into Near Earth Testing with a warm shroud until LH₂ was again available. During this warm-up cycle of the payload simulator, a malfunction in the heater circuit caused an over-temperature condition. This resulted in the apparent failure of an LH₂ cooling tube joint and subsequent rise in chamber pressure to the 10⁻³ Torr range. This cooling loop was isolated and chamber pressure returned to the 10⁻⁷ Torr range. This problem had little impact on the test program as cooling of the payload is only necessary for Null Tests and that portion of the program has been successfully completed.</p> <p data-bbox="518 1108 1390 1268">A delay of about five days was experienced due to trouble shooting and repair of the shroud and payload simulator heater power supplies and circuits. This problem was finally resolved and full scale Near Earth testing resumed on April 30, 1974.</p> <p data-bbox="518 1302 766 1335"><u>INSTRUMENTATION</u></p> <p data-bbox="518 1365 1407 1591">Run support was provided for test series 1-4a and 1-4b. The K-Data Link continued to be unreliable in operation. After an analysis by the digital computer people responsible, it was determined that the system could not be repaired until K-Site was off-line. However, a restart capability was added to the software which has improved the operation somewhat.</p> <p data-bbox="518 1621 1374 1843">An air conditioner failure for the instrument room caused some temporary instrument drift primarily in the interstitial pressure baratron and in the thermocouple reference junctions. The air conditioner was repaired and the thermocouple reference ovens were checked for drift and correction factors determined for those out of specifications.</p> <p data-bbox="518 1877 1361 1940">The interstitial pressure boratron later failed when a leak developed in the payload simulator.</p> <p data-bbox="578 1974 911 2007">(Continued on Page 9)</p>

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p>CRYOGENIC PROPELLANT RESEARCH SITE</p> <p><u>CRYOGENIC PROPELLANT STORAGE PROGRAM (Continued)</u></p> <p><u>CONTROLS</u></p> <p>Run support is being provided on a continuous basis for the Null, Deep Space, and Near Earth tests. The boiloff control systems and the shroud LH₂ control systems are functioning satisfactorily. However, the shroud and payload simulator heater power supplies and associated circuits have again experienced damage due to electrical transients. The lighting protection circuitry has been removed since it is apparent that the existing configuration is not providing any protection, and only adds to the work load of trouble shooting and replacing component parts.</p>

<p><u>STANDARDS AND CALIBRATION LAB</u></p>	<p>RSD - D. H. WEIKLE</p>
<p>A summary of work completed this month is as follows:</p>	
<p><u>Site</u></p> <p>HTF</p> <p>B-2</p> <p>K</p> <p>B-3</p> <p>SPF</p> <p>F</p> <p>Rotating Transducer Project</p> <p>K-Site direct labor</p>	<p><u>Time Spent on Completed Jobs</u></p> <p>60 hours</p> <p>120 hours</p> <p>24 hours</p> <p>53 hours</p> <p>43 hours</p> <p>4 hours</p> <p>56 hours</p> <p><u>20 hours</u></p> <p>380 man hours</p>

SPECIAL RESEARCH PROJECT

TEN CHANNEL ROTARY
PRESSURE MEASURING
SYSTEM (YPY2752)

RSD - V. S. PETERSON

The Station Director has decided that the work associated with placing D-Site into standby condition cannot be further delayed. Therefore, testing at D-Site cannot be accomplished.

Problems have been encountered in replacing deflective bearings in the turbine drive and in the balancing of the test hardware. Effort to assemble the test rig on its independent mounting plate will continue on a manpower availability basis. Every effort will be made to end up with a completely assembled rig that can be run in Cleveland or at one of the active Plum Brook shop areas. Of course, any Plum Brook testing will be very minimal to verify that the test transducers are satisfactory for high rotational speeds.

May 1974

SITE	SITE NAME RESEARCH INSTALLATION & (TASK NO.) - PROJECT ENGINEERS
K	<p data-bbox="331 304 537 399">CRYOGENIC PROPELLANT RESEARCH SITE</p> <p data-bbox="537 439 854 499"><u>CRYOGENIC PROPELLANT STORAGE PROGRAM</u></p> <p data-bbox="1040 439 1377 499">CRD - R. L. DEWITT; RSD - N. L. SCHROEDER</p> <p data-bbox="727 526 1187 556">SCHEDULE - COMPLETE JUNE 1974</p> <p data-bbox="821 570 935 600"><u>SUMMARY</u></p> <p data-bbox="537 600 1284 697">Experimental testing was concluded during this reporting period. Preparations are underway to place the facility in a standby condition.</p> <p data-bbox="789 731 951 762"><u>DISCUSSION</u></p> <p data-bbox="537 798 699 828"><u>OPERATIONS</u></p> <p data-bbox="537 858 1333 1080">Full scale testing of the complete test vehicle with shadow shields continued into the month of May. Several re-runs of earlier Deep Space Tests were performed to verify repeatability of previous recorded data. Results were almost identical to previous tests and proved the integrity of earlier test results.</p> <p data-bbox="537 1120 1349 1282">The final test of the 1-4 series was completed on May 15, 1974. Post test operations were completed on May 17, 1974 and preparations for placing the test facility in standby condition were started the week of May 20, 1974.</p> <p data-bbox="537 1316 789 1346"><u>INSTRUMENTATION</u></p> <p data-bbox="537 1376 1292 1443">Run support was provided for completion of test series 1-4.</p> <p data-bbox="537 1477 1414 1624">The shroud ion gage system was removed for calibration. The interstitial baratron was removed for repair. A list of work to be accomplished before the next test series was given to the research engineer.</p> <p data-bbox="537 1645 675 1675"><u>CONTROLS</u></p> <p data-bbox="537 1695 1357 1786">All control systems performed satisfactorily during the final K Sites in May. All systems were left intact and in an operational status.</p>

STANDARDS AND
CALIBRATION LAB

RSD - D. H. WEIKLE

Specific site manpower expenditure records were not kept during this reporting period. Site test runs were supported as needed. The pressure transducer inventory record brought up to date to show status of transducers returned from test sites. A suggested standby condition for the standards lab was submitted to the Instrument and Controls Branch Chief.