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GENERAL DYNAMICS | ASTRONAUTICS

CENTAUR 1D STRUCTURAL TEST

PITCH AXIS BENDING MOMENT

EID 55-7545-1

MODEL 55 CONTRACT NAS 3-3252

REPORT ~~NUMBER~~ 55B 3309-4

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REVISIONS

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1.0 INTRODUCTION:

This report presents the results of the Pitch Axis Bending Moment Structural Test performed on a Centaur 4D Test Vehicle, EID 7515-1. The vehicle was subjected to limit design loads for the Maximum Alpha Q condition at Stations 219 and 412, and to ultimate design loads (125 per cent limit) for the Maximum Alpha Q condition at Station 219. Phase I and Phase II Structural Tests were performed earlier on this test vehicle using limit and ultimate loads, and bending about the yaw axis. These earlier tests are covered in reports 55B 3309-1 and -2. Report 55B 3309-3 presents the data obtained from tank and interstage adapter strain gages with loads and bending moments applied about both the yaw and pitch axes.

2.0 TEST OBJECTIVE:

2.0.1 The primary test objective was to demonstrate the structural integrity of the Centaur Vehicle (AC-6 configuration) Station 219 and Station 412 structural interfaces when subjected to limit and ultimate design loads producing bending moments about the pitch (X-X) axis.

2.0.2 A secondary objective of the test was to establish the optimum setting for the nose fairing jettison hinge gap, and to record the load transfer to the tank mounted hinge fittings during structural loading of the test vehicle.

3.0 CONCLUSIONS:

The test objectives were achieved, and the vehicle withstood the limit and ultimate design loads. Load transfer to the jettison hinge did not exceed allowable values.

4.0 SUMMARY SHEET:

Purpose of Test:	Demonstrate structural integrity of the Centaur Vehicle (AC-6 configuration) Stations 219 and 412 structural interfaces at design limit and ultimate loads producing bending moments about the pitch axis (X-X). Determine optimum nose fairing hinge gap setting.
Manufacturer:	General Dynamics/Convair, San Diego, California
Manufacturer's Type:	Centaur 4D, EID 55-7545-1, Model 55
Drawing, Specification, or Exhibit:	General Dynamics/Convair Drawing Number 55-00045-5
Contract Number:	NAS 3-3232
Test Requestor:	G. W. Norris, Centaur Tank Structure, Department 961-8
Test Observers:	B. G. Sherwood, Centaur Tank Structures, Department 961-8 P. Bunch, Centaur Stress, Department 966-4
NASA Observer:	L. Minkler
Test Requirements Report Number:	GD/A-BTD-64-124B, dated 9 February 1965, and GD/A-BTD-64-124C, dated 14 April 1965
Quantity of Items to be Tested:	One Centaur Vehicle, EID 7545-1
Security Classification:	Unclassified
Test Start Date:	20 April 1965
Test Complete Date:	22 April 1965
Proposed Disposition of Specimen:	Retain for additional tests

5.0 DETAIL REQUIREMENTS:

5.1 Test Request:

This test was requested by the Centaur Vehicle Tank Structures Group, Department 961-8. Refer to Service Request Number 55B 3309 for test authorization.

5.2 Test Specimen:

A Centaur 4D vehicle (AC-6 configuration) was used for these tests. The vehicle tank, EID 55-7545-1 was mounted vertically in "K" Tower on a Centaur Interstage Adapter, 55-75030-1. A Centaur Surveyor Nose Fairing Barrel, 55-71209-1, was installed on the Station 219 Tank Ring. Centaur Insulation Panels, 55-74202-811, -813, -817, and -837 were installed on the fuel tank. Flight type nose fairing jettison hinges, 55-72069, and tank-mounted hinge fittings, 55-72979-11, were used. Additional production hardware that was mounted on the vehicle is defined in the vehicle configuration planning card number 55-00045-5.

5.3 Test Conditions:

The test specimen was subjected to loads simulating the limit design conditions at Station 219 and Station 412, and simulating the ultimate design loads (125 per cent limit) at Station 219, due to Maximum Alpha Q conditions. Shear loads were applied at Stations 99 and 281 in the direction of the Y-Y axis to produce bending moments about the pitch axis (X-X). Two separate test runs were made. Limit loads were used in the test run on 20 April 1965. Ultimate design loads were used in the test run on 22 April 1965. Reference temperatures were maintained on the nose fairing barrel during both test runs. The forward and aft vehicle tanks were filled with liquid nitrogen during the test.

5.4 Jigs, Fixtures, and Loading Equipment:

5.4.1 A hydraulic system was used to apply the compression, shear, and insulation panel loads on the test article. This system consisted of a hydraulic pump, three Edison Marginators for hydraulic pressure regulation, hydraulic cylinders, and load cells.

The facility hydraulic load system configuration is detailed on Point Loma Test Site Drawings KE-002 and KP-003.

5.0 DETAIL REQUIREMENTS: (Continued)

5.4 Jigs, Fixtures, and Loading Equipment: (Continued)

5.4.2 The missile compression load (Instrumentation boss L-1) was applied to the test specimen along the Z-Z axis through a load fixture (Drawing Number KS-016) bolted to the forward end of the nose fairing barrel. The tank stretch load was also reacted through this fixture using a pneumatic-hydraulic accumulator. Counterweights were used to null the weight of the fixture on the test specimen. A pneumatic cylinder (Instrumentation boss L-8) was mounted at the apex of the KS-016 fixture at Station 5.0 (Appendix A, sheet 20). This cylinder was used to apply a horizontal load in line with the Y-Y axis to counteract the horizontal component of L-1 due to bending of the vehicle.

5.4.3 A horizontal shear load was applied to the test specimen at Station 99 (Instrumentation boss L-2) through the KS-016 load fixture. The load was applied along the Y-Y axis in the +Y direction.

5.4.4 A horizontal shear load (Instrumentation boss L-3) was applied along the Y-Y axis in the -Y direction at Station 281. A load strap was used, supported off the exterior surface of the insulation panels by contoured, urethane foam shim blocks coated with fiberglass. The shim blocks were not attached to the insulation panels.

5.4.5 Vertical loads were applied to each insulation panel through a contoured steel plate bolted to the exterior surface of the panel. The panel load instrumentation bosses were L-4, L-5, L-6, and L-7, respectively, for quads I, II, III, and IV.

5.4.6 A vacuum load chamber was attached to the oxidizer tank aft bulkhead. Regulation of the vacuum pressure in the chamber produced loads on the Station 412 structural joint. This load simulates the flight "G" forces on the oxidizer tank.

5.4.7 An aerodynamic heating simulation system was used to maintain reference temperatures on the nose fairing barrel. The heating system is illustrated in Figure 44. Closed loop heat programming equipment was used. Figure 45 shows the heat lamp and reflector installation. Sheet 23 of the Appendix shows the heated zone on the nose fairing.

5.5 Instrumentation:

A detailed instrumentation list is included in the Appendix. The basic types of measurements are listed below:

5.0 DETAIL REQUIREMENTS: (Continued)

5.5 Instrumentation: (Continued)

5.5.1 Pressure - Tank ullage, intermediate bulkhead cavity, vacuum chamber, purge systems, and propellant level.

5.5.2 Load - Missile compression, missile shear, insulation panel compression, and missile bending counteraction, tank mounted nose fairing hinge fitting.

5.5.3 Deflection - Tank rings at nominal Station 219 and 412, nose fairing jettison hinge gap, and at the apex of the KS-016 load fixture. The strain gage beams used to measure the nose fairing hinge gap are shown in Figures 35 through 38.

5.5.4 Temperature - Surface temperatures on nose fairing barrel, fuel tank wall, nose fairing hinges and strain gage beams. Nose fairing purge gas.

5.5.5 Strain - Test vehicle fuel tank wall and the interstage adapter.

5.5.6 Calibration - Calibration was done in accordance with the Department 978 Instrumentation Manual.

5.6 Special Adjustments and Measurements:

5.6.1 Hinge gap - The gap between the nose fairing barrel mounted hinge pin and the tank mounted hinge fitting was adjusted prior to the limit and ultimate design load tests in accord with instructions from the Design Group, Department 961-8 (Reference GD/A-64-124C).

The following procedure was used to establish the proper gap:

1. Anvil ring installed loosely to tank ring.

2. Nose fairing assembled to tank ring/anvil ring with set-up bolts.

3. Anvil ring attach bolts tightened.

4. Tension Strap installed.

5. Set-up bolts removed. Nose fairing and load fixture counterweighted. Gap checked at nose fairing/tank ring interface.

6. Counterweight adjusted to yield a net down load (compression) at the Station 219 ring of 1800 pounds.

5.0 DETAIL REQUIREMENTS: (Continued)

5.6 Special Adjustments and Measurements: (Continued)

5.6.1 (Continued)

7. Set gap between nose fairing hinge pin and aft edge of slot in tank mounted hinge fitting at 0.40 to 0.70 inches, and record gap. At this time the strain gage beams (V7, V8, and R8, Appendix sheet 6) were set and physically calibrated.

8. Measured and recorded gap between jettison hinge and anvil splice and between nose fairing aluminum channel and Station 219 ring flange (Quads I-IV - 180°).

9. The weather skirt and inner and outer fairings were installed.

10. The weight on the Station 219 ring was relieved to 0 pounds using the counter weight.

5.6.2 The gap between the nose fairing aluminum channel and the Station 219 ring flange was monitored under several conditions during the test program.

6.0 TEST PROCEDURES:

The procedures for the limit and ultimate design load tests, pitch axis bending moment, were written to commence after the "K" Tower Systems Checkout. At this time the test vehicle was at ambient temperature. The fuel and oxidizer tank ullage pressures were being maintained at the missile vent valve pressures. The intermediate bulkhead cavity was filled with nitrogen gas at 14.5 ± 1 psia and locked off. The nose fairing hinge gap had been adjusted as outlined in 5.6.1, for the limit load test.

6.1 Station 219 and 412 Combined Limit Design Load Test, Maximum Alpha Q condition, pitch axis bending moment.

6.1.1 Start insulation panel helium purge at 25 pounds per hour and Station 208 seal purge at 20 pounds per hour one hour prior to tanking.

6.1.2 Instrumentation Recorders on.

1. Record ambient temperature strain gage data.

2. Record nose fairing hinge gap continuously during tanking.

6.1.3 Start nose fairing gaseous purge at 200 CFM and 80 ± 5°F.

6.0 TEST PROCEDURES: (Continued)

6.1 Station 219 and 412 Combined Limit Design Load Test (Continued)

6.1.5 Fill the oxidizer tank with liquid nitrogen to Station 388.0 to 390.0. Maintain the oxidizer tank ullage pressure at 14.3 to 17.5 psig with the missile vent valve while tanking. Monitor fuel tank pressure. Top tank as necessary to maintain liquid level after the initial tanking.

6.1.6 Record strain gage and tank pressure data.

6.1.7 Raise oxidizer tank ullage pressure to 19.0 to 21.0 psig.

6.1.8 Check insulation panel helium purge for 25 pounds/hour, adjust as necessary.

6.1.9 Start nose fairing heaters. Zones A and B, maintaining reference temperatures at 60°F. Validate heaters at reference temperature.

6.1.10 Fill the fuel tank with liquid nitrogen to Station 184.0 to 186.0 Maintain the fuel tank ullage pressure at 4.3 to 6.8 psig with the missile vent valve while tanking. Top tank as necessary to maintain liquid level after the initial tanking.

6.1.11 Pressurize intermediate bulkhead cavity with nitrogen to 14.5 ± 1 psia and maintain.

6.1.12 Record Zero Load at Nominal Pressure on recorders.

6.1.13 Reduce and plot strain gage and deflection data.

6.1.14 Check nose fairing hinge gap and relay information to Stress Group Test Observer.

6.1.15 Raise oxidizer tank ullage pressure to 25.0 to 27.0 psig.

6.1.16 Raise fuel tank ullage pressure to 11.0 to 12.0 psig.

6.1.17 Raise oxidizer tank ullage pressure to 30.0 to 32.0 psig.

6.1.18 Raise fuel tank ullage pressure to 17.5 to 18.5 psig.

6.1.19 Record zero load at test pressure on recorders.

6.1.20 Reduce and plot strain gage and deflection data.

6.0 TEST PROCEDURES: (Continued)

6.1 Station 219 and 412 Combined Limit Design Load Test (Continued)

6.1.21 Monitor nose fairing hinge gap and determine whether gap has closed.

6.1.22 If nose fairing hinge gap has closed, continued with hinge at this adjustment for limit and ultimate tests. If gap has not closed, continue limit test, then re-run limit test at a new gap setting that will ensure closure. Run the ultimate capacity test at the new gap setting.

6.1.23 Load test article to 20 per cent load increment, by operating the following load systems such that all loads are applied simultaneously:

(a) Evacuate vacuum chamber for 20 per cent load increment and maintain.

(b) Operate marginator until loads L-1 through L-8 are at the 80 per cent load increment and maintain.

(c) Record 20 per cent load at test pressure on recorders.

(d) Reduce and plot strain gage and deflection data.

6.1.24 At the direction of the Stress Group Test Observer repeat loading in increments of 40, 60, 80, 90, 20, 90, 100, 20, and 0 per cent. At each load increment mark recorders, reduce and plot strain gage and deflection data.

6.1.25 Lower fuel tank ullage pressure to 11.0 to 12.0 psig.

6.1.26 Lower oxidizer tank ullage pressure to 25.0 to 27.0 psig.

6.1.27 Lower fuel tank ullage pressure to 4.3 to 6.8 psig.

6.1.28 Lower oxidizer tank ullage pressure to 19.0 to 21.0 psig.

6.1.29 Record zero load at nominal pressure on recorders.

6.1.30 Reduce and plot strain gage and deflection data.

6.1.31 Evacuate the intermediate bulkhead cavity to less than 5 psia minimum. Do not allow cavity pressure to exceed 18.0 psia during vehicle warmup.

6.1.32 Drain fuel tank and maintain ullage pressure at 4.3 to 6.8 psig.

6.0 TEST PROCEDURES: (Continued)

6.1 Station 219 and 412 Combined Limit Design Load Test (Continued)

6.1.33 Record strain gage and tank pressure data.

6.1.34 Secure nose fairing purge.

6.1.35 Drain oxidizer tank.

6.1.36 Lower oxidizer tank ullage pressure to 14.3 to 17.3 psig.

6.1.37 Secure insulation panel purge and 208 Seal Purge.

6.1.38 Record strain gage and tank pressure data.

6.1.39 When test article reaches ambient temperature pressurize the intermediate bulkhead cavity to 14.5 ± 1 psia with gaseous nitrogen.

6.1.40 Record ambient temperature strain gage data.

6.1.41 Secure systems.

6.2 Station 219 Maximum Alpha Q Ultimate Design Load (pitch axis bending moment).

6.2.1 Adjust nose fairing hinge gap in accordance with information gained in 6.1.22.

6.2.2 Start insulation panel helium purge at 25 pounds/hour and 208 Seal Helium Purge at 20 pounds/hour. Start purge one hour prior to tanking.

6.2.3 Instrumentation Recorders, On.

6.2.4 Record ambient temperature strain gage data at 0 per cent load.

6.2.5 Start Nose Fairing Gaseous Nitrogen Purge at 200 CFM and 80 ± 5°F.

6.2.6 Fill the oxidizer tank with liquid nitrogen to Station 388.0 to 390.0. Maintain the oxidizer tank ullage pressure at 14.3 to 17.3 psig with the missile vent valve while tanking. Monitor fuel tank pressure. Top tank as necessary to maintain liquid level after the initial tanking.

6.2.7 Raise oxidizer tank ullage pressure to 19.0 to 21.0 psig.

6.2.8 Record strain gage and tank pressure data.

6.0 TEST PROCEDURES: (Continued)

6.2 Station 219 Maximum Alpha Q Ultimate Design Load (Continued)

6.2.9 Check insulation panel helium purge for 25 pounds/hour, adjust as necessary.

6.2.10 Fill the fuel tank with liquid nitrogen to Station 184.0 to 186.0. Maintain the fuel tank ullage pressure at 4.3 to 6.8 psig with the missile vent valve while tanking. Top tank as necessary to maintain liquid level after the initial tanking.

6.2.11 Monitor hinge gap and hinge loads continuously while tanking forward. Hinge loads shall not exceed 9000 pounds.

6.2.12 Pressurize intermediate bulkhead cavity with nitrogen to 14.5 ± 1 psia and maintain.

6.2.13 Record zero load at nominal pressure on recorders.

6.2.14 Reduce and plot strain gage and deflection data.

6.2.15 Check nose fairing hinge gap and relay information to Stress Group Test Observer.

6.2.16 Raise oxidizer tank ullage pressure to 25.0 to 27.0 psig.

6.2.17 Raise fuel tank ullage pressure to 11.0 to 12.0 psig.

6.2.18 Raise oxidizer tank ullage pressure to 29.0 to 31.0 psig.

6.2.19 Raise fuel tank ullage pressure to 17.6 to 18.6 psig.

6.2.20 Record zero load at test pressure on recorders.

6.2.21 Reduce and plot strain gage and deflection data.

6.2.22 Check nose fairing hinge gap and relay information to Stress Group Test Observer.

6.2.23 Load test article to 20 per cent load increment, by operating the following load systems such that all loads are applied simultaneously:

(a) Operate marginator until loads L-1, L-2, L-3, and L-8 are at the 20 per cent load increment and maintain.

(b) Record 20 per cent load at test pressure on recorders.

(c) Reduce and plot strain gage and deflection data.

6.0 TEST PROCEDURES: (Continued)

6.2 Station 219 Maximum Alpha Q Ultimate Design Load (Continued)

6.2.24 At the direction of the Stress Group Test Observer, repeat loading in increments of 40, 60, 80, 90, 100, 20, 100, 110, 120, and 125 per cent. At each load increment mark recorders, reduce and plot strain gage and deflection data.

6.2.25 Lower fuel tank ullage pressure to 11.0 to 12.0 psig.

6.2.26 Lower oxidizer tank ullage pressure to 25.0 to 27.0 psig.

6.2.27 Lower fuel tank ullage pressure to 4.3 to 6.8 psig.

6.2.28 Lower oxidizer tank ullage pressure to 19.0 to 21.0 psig.

6.2.29 Record zero load at nominal pressure on recorders.

6.2.30 Reduce and plot strain gage and deflection data.

6.2.31 Evacuate the intermediate bulkhead cavity to 5.0 psia minimum. Do not allow cavity pressure to exceed 18.0 psia during vehicle warmup.

6.2.32 Drain fuel tank and maintain ullage pressure at 4.3 to 6.8 psig.

6.2.33 Secure nose fairing purge.

6.2.34 Record strain gage and tank pressure data.

6.2.35 Drain oxidizer tank.

6.2.36 Lower oxidizer tank ullage pressure to 14.3 to 17.3 psig.

6.2.37 Secure insulation panel purge and 208 Seal Purge.

6.2.38 When test article reaches ambient temperature pressurize the intermediate bulkhead cavity to 14.5 $\pm$ 1 psia with gaseous nitrogen.

6.2.39 Record ambient temperature strain gage data.

6.2.40 Secure systems.

7.0 TEST RESULTS:

7.0.1 The detailed results of the pitch axis bending moment tests are presented in the tables and graphs at the end of this report. Strain gage data will be reported by the Electrical Test Laboratory Stress Measurements Group, Department 578-4 in Report Number 55B 3309-3.

7.0.2 The primary objectives of the test were met, and the vehicle satisfactorily withstood limit and ultimate design loads producing bending about the pitch (X-X) axis.

7.0.3 The gap between the aft surface of the nose fairing hinge pin and the tank mounted hinge fitting was set at 0.055-inch in accordance with the procedure described in 5.6.1. The gap did not close completely during the limit load test, so it was re-set at 0.022-inch prior to the Ultimate Design Load Test. During tanking the gap closed to 0.008-inch, and then closed completely when 20 per cent load was applied.

7.0.4 Maximum compressive load on the +Y hinge was 5000 pounds at the design ultimate (125 per cent limit) load conditions.

7.1 Station 219 and 412 Combined Limit Design Load Test.

7.1.1 The target loads for this test are shown on Figure 1 and on sheet 25 of the Appendix. Figure 1 also presents a plot of the actual load points achieved during the test. Figure 2 presents the target and actual bending moments these loads produced about Station 570, the point where the interstage adapter is anchored to the load tower base.

7.1.2 The tank ullage pressures and liquid levels, bulkhead cavity pressure and vacuum load chamber pressure are listed in Figure 3.

7.1.3 The deflections caused by the test loads are plotted in Figure 4 through 16. The 16 deflection measurements at the Station 219 ring are presented in Figures 4 through 7. The same measurements at the Station 412 ring are presented in Figure 8 through 11. Figure 12 shows the vehicle and load tower deflection at Station 2.5. Load L-8 was applied at 60 per cent load and above. This compensated for the horizontal component of L-1 load caused by vehicle deflection. Figure 13 presents the change in nose fairing hinge gap and load during tanking. The same measurements, taken during the application of test loads, are shown in Figure 14. Figure 15 presents tank mounted hinge temperatures and Figure 14 shows the deflection of the anvil ring splice bar near the +Y axis. Reference temperatures were maintained at 60 to 80°F.

7.0 TEST RESULTS: (Continued)

7.2. Station 219 Maximum Alpha Q Ultimate Design Load Test

7.2.1 The target loads for this test are shown in Figures 17 and on sheet 25 of the Appendix. The actual loads reached during the test are shown on Figure 17. All loads shown are percent of limit design load: 125 per cent limit load is 100 per cent ultimate design load.

7.2.2 The bending moment about Station 570 which resulted from the test loads is plotted in Figure 18 and compared with desired values. At full load the actual moment was 107 per cent of the desired moment. Station 570 is the base of the interstage adapter, where it is anchored to the load tower base.

7.2.3 The tank ullage pressures and liquid levels and the intermediate bulkhead cavity pressures are presented in Figure 19.

7.2.4 The deflections of the Station 219 and 412 rings are shown in Figures 20 through 27. The deflections were nominally proportional to the bending moment producing them. Deflection of the vehicle and load tower at a nominal station level of 2.5 are shown in Figure 28. The L-8 load was applied only above the 80 per cent load value, and the deflection curve slope breaks at this point. The difference between the curves for D-51 and D-52 is the absolute deflection of the load tower.

7.2.5 Figures 29 through 32 present data on the nose fairing hinge. Figure 29 presents the hinge gap, hinge load, and hinge temperature during tanking. The hinge at -Y cooled to -280°F, but the +Y hinge only dropped to -10°F. The +Y hinge was warmer because the purge gas flowing across the V7, V8 and R8 gap measurement strain gap beams also flowed across the hinge. As a result, the hinge gap change at -Y might not be the same as at +Y.

7.2.6 Figure 30 shows the hinge gap during the test. Related tank mounted hinge temperatures are shown on Figure 31. Also shown is the temperature of one of the hinge gap transducers.

7.2.7 Figure 32 shows the deflection of the anvil ring splice bar near the +Y hinge. The deflection here is comparable to the V2 deflections measured in Quads I and IV (Figure 23).

7.2.8 Reference temperatures were maintained on the nose fairing barrel (Sheet 23 of Appendix) between 60 and 80°F during the Ultimate Load Test.

7.0 TEST RESULTS: (Continued)

7.3 Special Measurements.

7.3.1 A history of the gap between the Station 219 ring and the anvil ring splice bar, and between the nose fairing barrel channel and the 219 ring near the +Y hinge location is presented in Figure 33. The gap in this area was essentially zero when the nose fairing barrel was originally installed. When the setup bolts were removed and the weight of the barrel taken off the Station 219 ring with counterweights, the gap between the barrel channel and the Station 219 ring opened up. The L2 load cylinder was hanging on the +Y side of the load fixture, causing an even greater gap near the -Y hinge. Figure 39, 40, and 41 illustrate this gap, which can be compared to the gap seen in Figures 41, 42, and 43, near the +Y hinge. The L2 load cylinder weight was removed from the +Y side of the load fixture, and some gap decrease was noted. Further reduction of the gap resulted when the nose fairing barrel counterweight was removed, and the setup bolts were installed. The final measurement was taken prior to the test when the setup bolts were removed and with an 1800-pound compression load on the Station 219 ring.

7.3.2 The gap between the tank mounted nose fairing hinge and the anvil ring splice bar is shown in Figure 34. The gap at the -Y location did not change during the test. At +Y the gap closed .005 to .010-inches during the test.

8.0 LIST OF REFERENCES:

8.1 Report Number GD/A-BTD-64-124B, dated 9 February 1965,"Structural Test Requirements for Axial Load and Bending Moment Tests of Centaur 49, EID 55-7545-1, AC-6 and On".

8.2 AVO from B. Sherwood, Department 961-8 to L. Jordan, Department 978-1 authorizing rework of hinge installation per CIC 36161-961-8-1.

8.3 Memo ACS-65-110 from A. C. Ward to G. W. Norris dated 9 April 1965, "Design Requirements of 55-72979 Hinge Fitting and Installation Procedures for "D" Series Vehicles".

8.4 AVO from W. Dittmann, Department 951-6 to R. Hinck, Department 978-1, transmitted copy of change notice number 2 of UTP AY-62-0047, and authorizing land line transfer to "K" Tower.

8.5 Report Number GD/A-BTD-64-124C, dated 14 April 1965, incorporating Revised Structural Test Requirements for the 55-7545 Pitch Moment and 219 Ring/Hinge Spring Constant Tests.

8.0 LIST OF REFERENCES: (Continued)

8.6 AVO from A. C. Ward to R. C. Hinck, dated 16 April 1965, "Monitoring Requirements for Pitch Moment Test Instrumentation, EID 55-7545".

8.7 Service Request 55B 3309, Rev. D, authorizing performance of Y-Y axis load test according to changes listed in revision to test requirements (reference 8.5, above).

8.8 AVO from A. C. Ward, Centaur Stress, to R. C. Hinck, Point Loma Test Site, changing test load values for limit load re-run so that limit test could be extended to 125 per cent of limit load values and satisfy ultimate design test requirements.

8.9 AVO from G. W. Norris, Centaur Structures, to R. C. Hinck, Point Loma Test Site, dated 21 April 1965, directed closing of hinge gap .060-inch, and defined load sequence for extended limit, ultimate design load test.

8.10 Information pertaining to the tests described in this report will be found in Engineering Data Notebook Number 7216, filed in Department 978-1, Point Loma Test Site Operations.

9.0 LIST OF PHOTOGRAPHS:

The following photographs were taken during the build up and test:

NEGATIVE NUMBER	SUBJECT
56703B	Purge box over +Y axis hinge instrumentation.
56704B	Purge box over +Y axis hinge instrumentation.
56705B	Purge box over +Y axis hinge instrumentation.
56706B	Heat lamp installation.
56707B	Anvil splice bar deflection instrumentation.
56708B	Area near hinge on +Y axis.
56709B	Purge box on +Y axis hinge instrumentation.
56759B thru	Pictures taken from TV monitors
56778B	during test run 8 (Limit Load Test).
56779B	Instrumentation icing.
56874B thru	Pictures taken from TV monitors during
56903B	test run 8A.
56914B	Hinge installation on -Y axis.
56915B	Gaps, Quad II, Station 219 assy.
56916B	Gaps, Quad III, Station 219 assy.
56917B	Hinge gap instrumentation, upper view.
56918B	Hinge gap instrumentation, end view.
56919B	Hinge gap instrumentation installation.
56920B	Gaps, Quad I, Station 219 assy.
56921B	Gaps, Quad IV, Station 219 assy.
57183B	Tank Strain Gage, spalling of waterproofing.
57184B	Tank Strain Gage, spalling of waterproofing.

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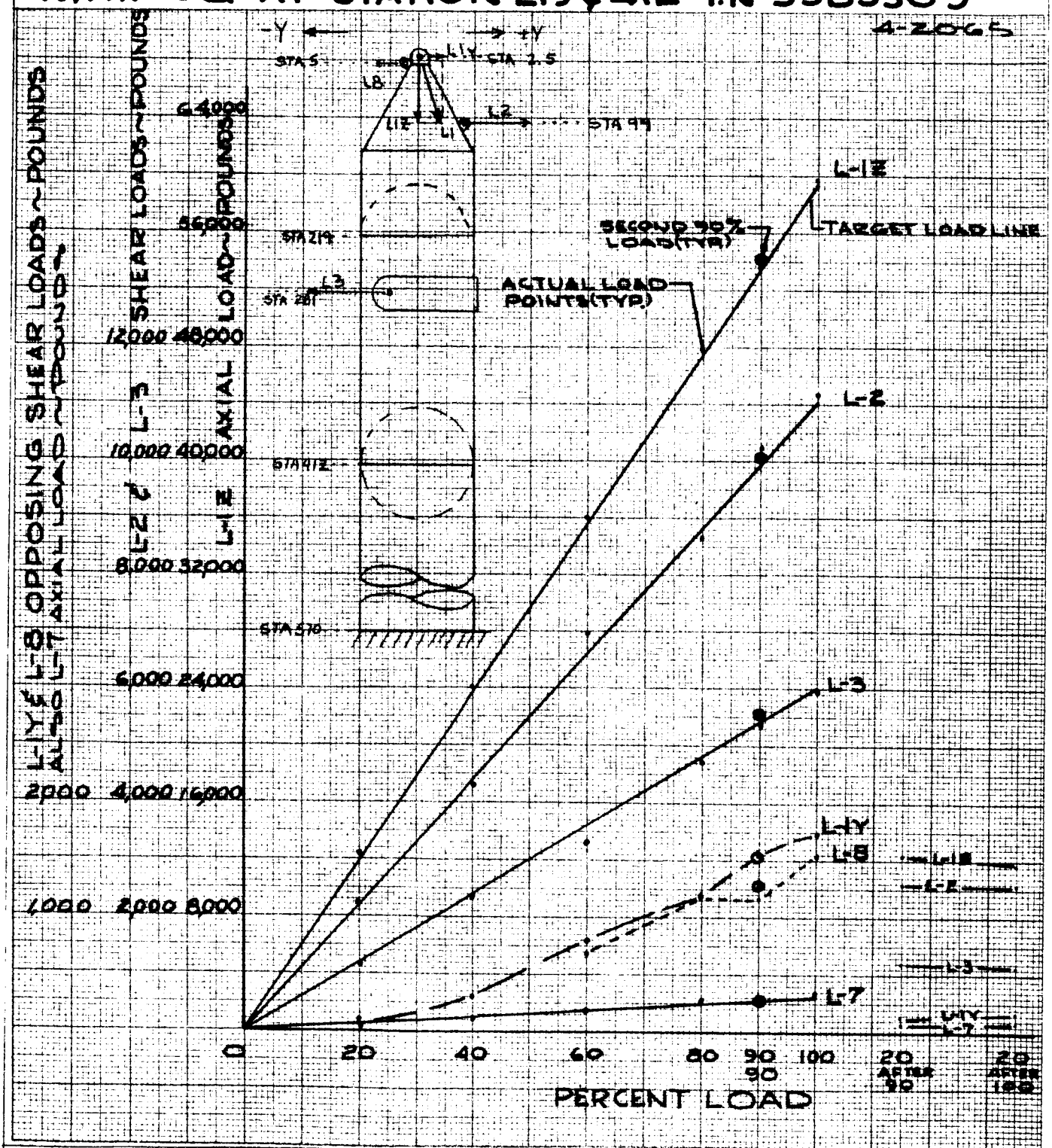
ACT. LOADS vs TARGET LOADS-DESIGN LIMIT LOADS-MAX ∝Q AT STATION 219 & 412-T.N 55B3309



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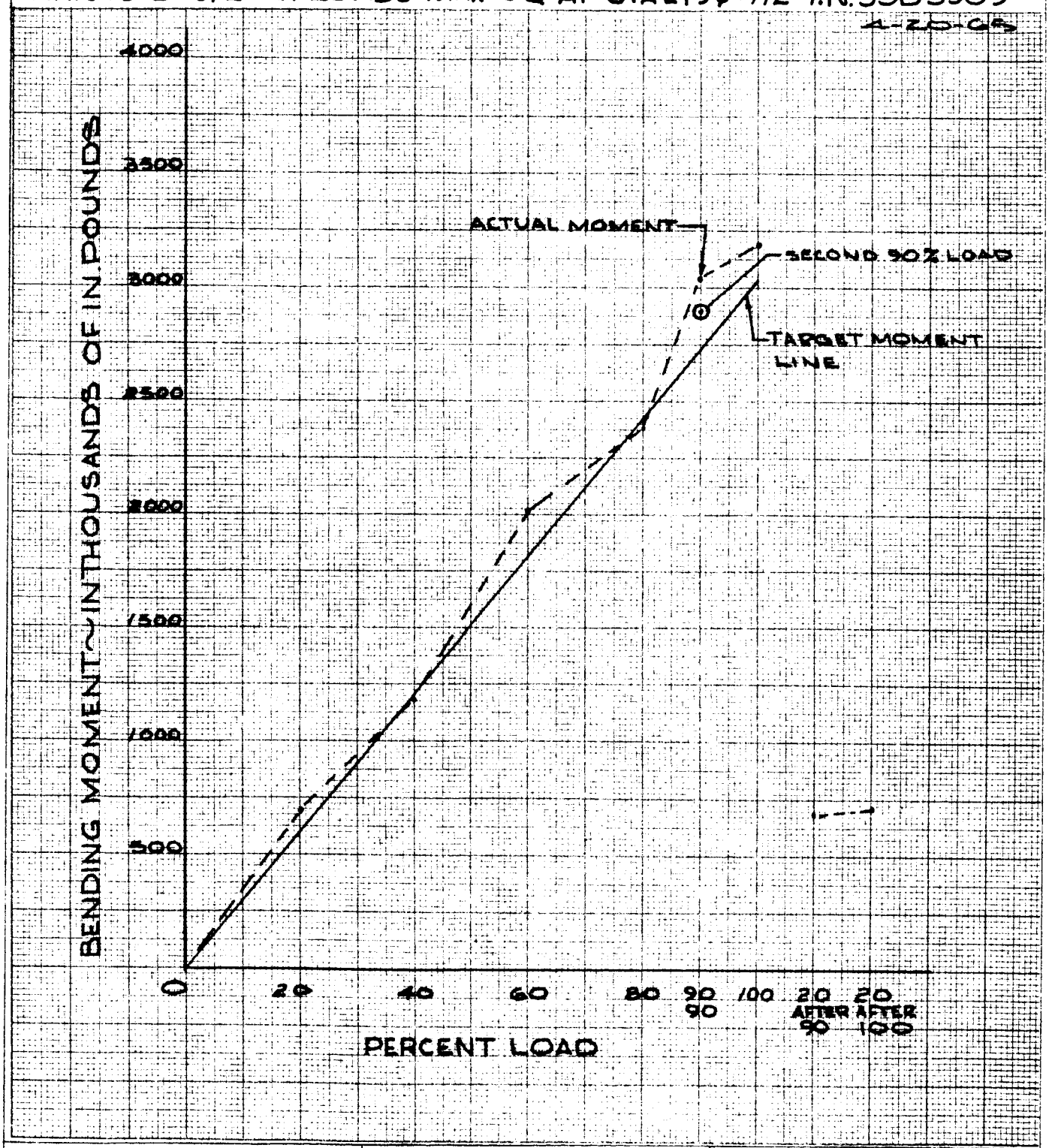
CLH	5-11-65	JSS	5.12.65		

A1107-1 (REV. 7-63)

FIGURE 1

GENERAL DYNAMICS | ASTRONAUTICS

ACT. BENDING MOMENT vs TARGET BENDING MOMENT ABOUT STA. 570-DES. LIMIT LOADS-MAX α Q AT STA 219 & 4/2-T.N. 55B3309



PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
[illegible]	3-10-65	JSS	5-12-66		

A1107-1 (REV. 7-63)

FIGURE 2

GENERAL DYNAMICS | ASTRONAUTICS

TEST NUMBER 55B3309
PRESSURES
STATION 219 and 412 COMBINED MAXIMUM ALPHA Q LIMIT DESIGN LOAD

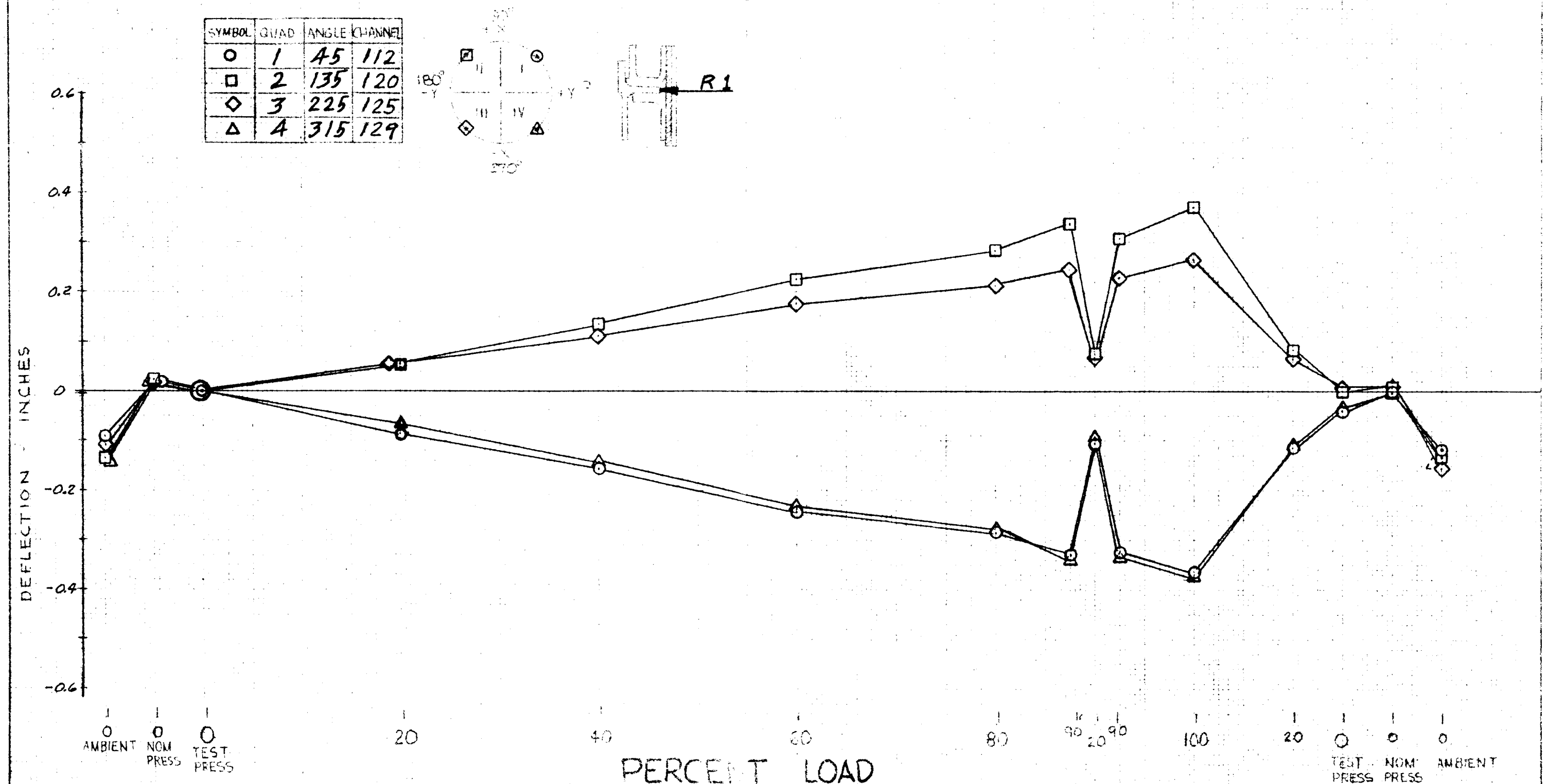
(Pitch Axis Bending Moment)

DATA POINTS	INSTRUMENTATION BOSS						
	P-1	P-2	ΔP-1	ΔP-2	P-3	P-5	
	FUEL TANK ULLAGE PRESS., PSIG	OXID. TANK ULLAGE PRESS., PSIG	FUEL TANK LIQUID LEVEL STATION LEVEL	OXID. TANK LIQUID LEVEL STATION LEVEL	BULKHEAD CAVITY PRESS., PSIA	VACUUM LOAD CHAMBER PRESS., PSIA	
0% LOAD, NOM. PRESS	4.1	19.7	190	390	16.1	14.8	
0% LOAD, TEST PRESS	18.0	30.6	189	389	16.2	14.8	
20% LOAD,	18.4	30.6	192	390	16.4	14.3	
40% LOAD,	18.4	31.3	192	390	16.3	13.9	
60% LOAD,	18.4	30.8	195	393	16.3	13.6	
80% LOAD,	18.5	30.8	196	394	16.3	13.1	
90% LOAD,	18.5	30.7	198	394	16.4	13.0	
20% LOAD,	18.5	30.7	196	394	16.4	14.4	
90% LOAD,	18.3	30.9	196	394	16.4	13.0	
100% LOAD,	18.3	31.3	196	395	16.4	12.8	
20% LOAD,	18.3	31.6	197	397	16.4	14.4	
0% LOAD,	18.4	30.5	199	397	16.4	14.8	
0% LOAD, NOM. PRESS	4.2	20.5	215	398	16.3	14.8	

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
JSS	5/12/65	JSS	5/12/65		

FIGURE 3

STATION 219 DEFLECTIONS vs PERCENT LOAD DESIGN LIMIT LOADS - MAX αQ - AT STATION 219 & 412



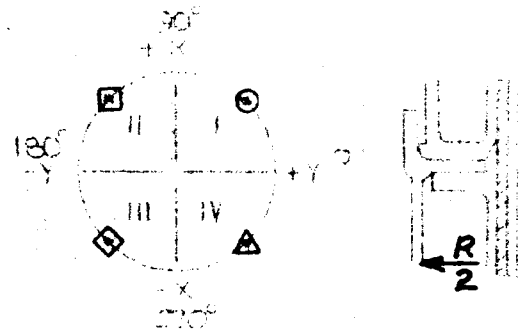
TEST NO. 55 B 3309, 4-20-65, CENTAUR EID 55-7545-

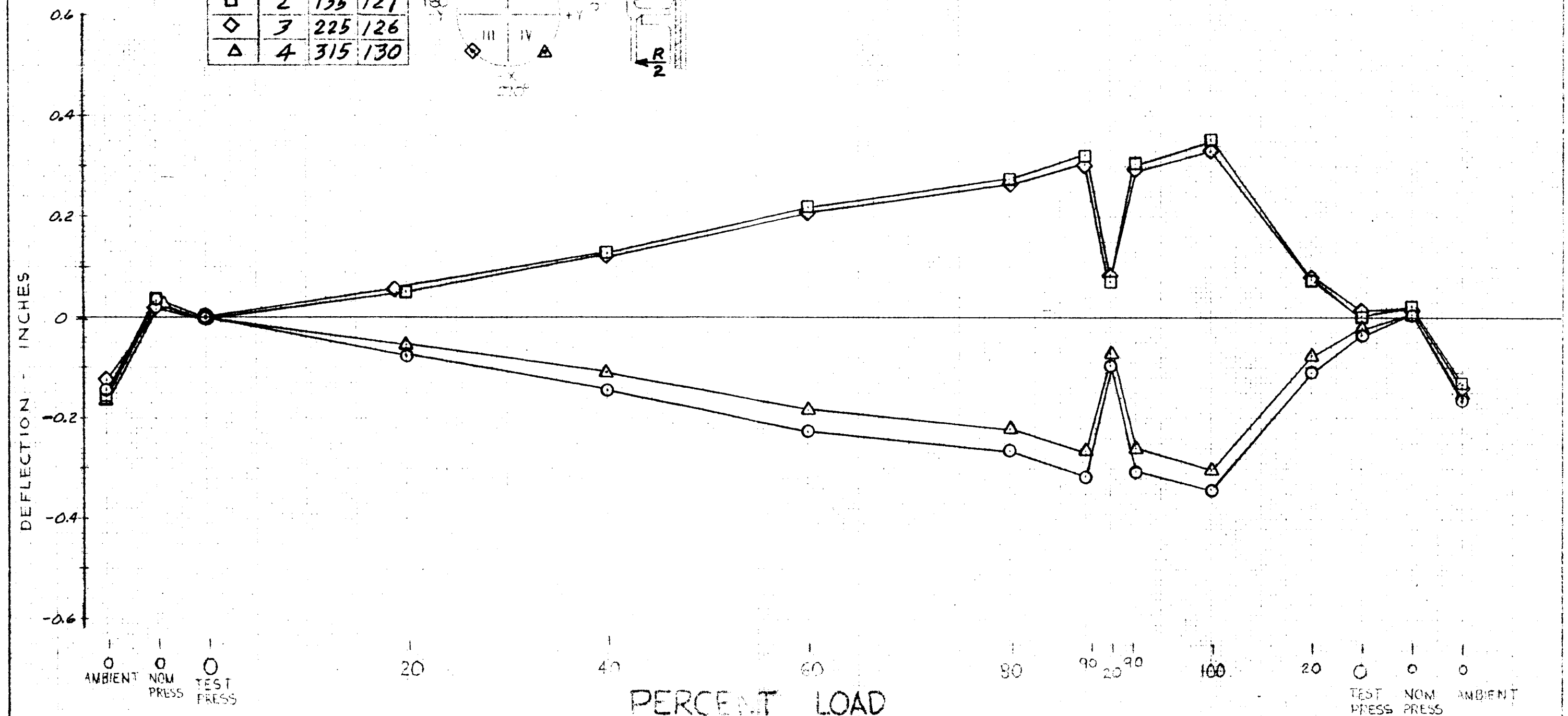
PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
JR SHELLING	4-20-65	JSS	5-12-65		

FIGURE 4

STATION 219 DEFLECTIONS vs PERCENT LOAD DESIGN LIMIT LOADS - MAX α Q - AT STATION 219 & 412

SYMBOL	QUAD	ANGLE	CHANNEL
○	1	45	113
□	2	135	121
◇	3	225	126
△	4	315	130





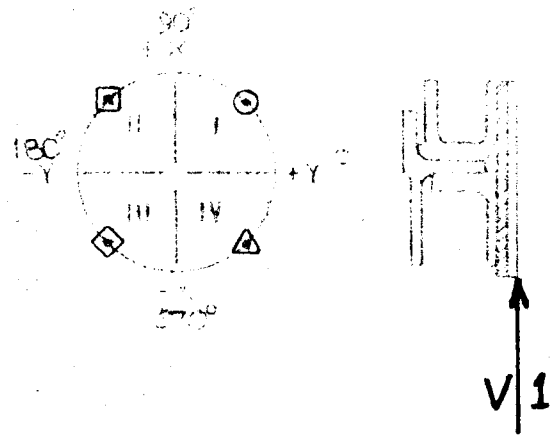
TEST NO. 55 B 3309, 4-20-65, CENTAUR EID 55-7545-1

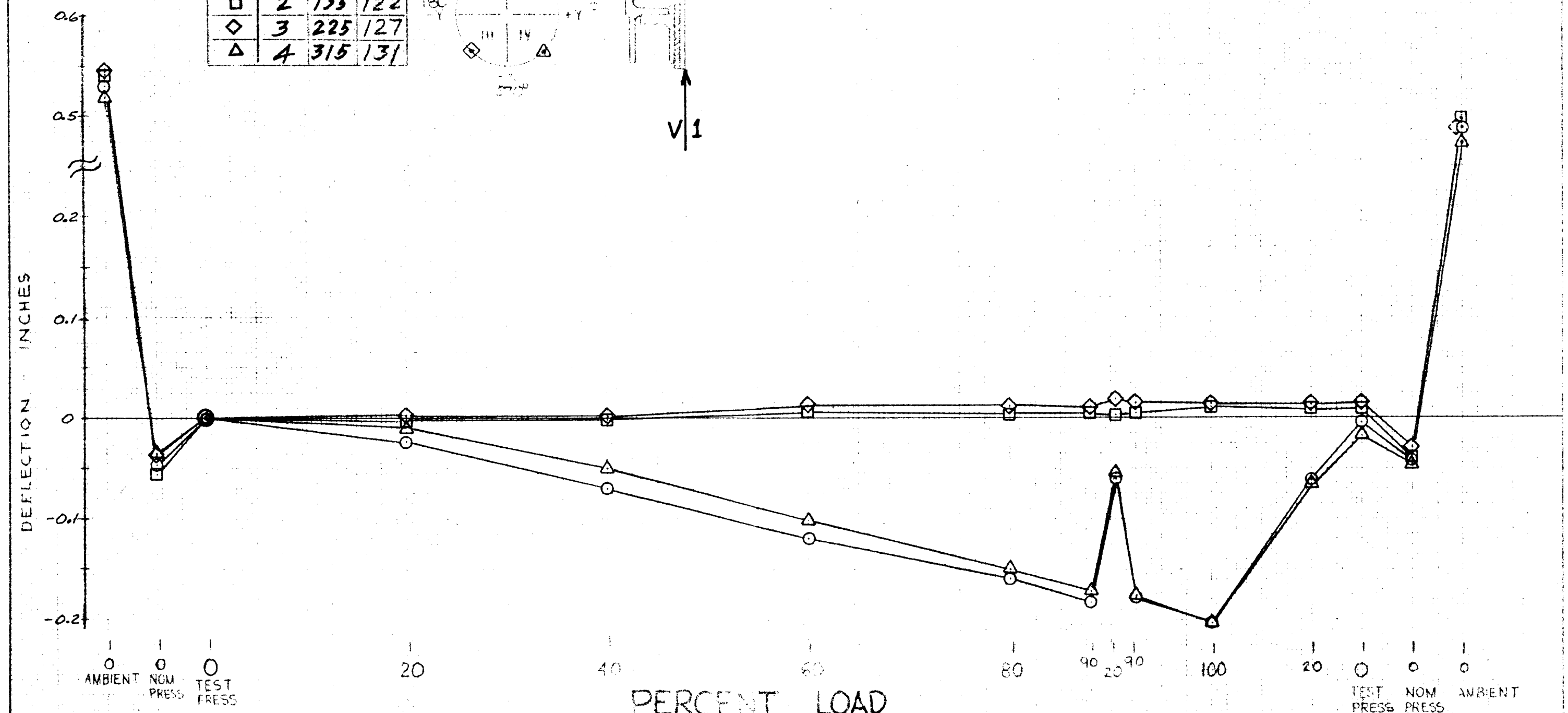
PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
CE Snelling	4-20-65	JSS	5-7-65		

FIGURE 5

STATION 219 DEFLECTIONS vs PERCENT LOAD DESIGN LIMIT LOADS - MAX αQ - AT STATION 219 & 412

SYMBOL	QUAD	ANGLE	CHANNEL
○	1	45	114
□	2	135	122
◇	3	225	127
△	4	315	131



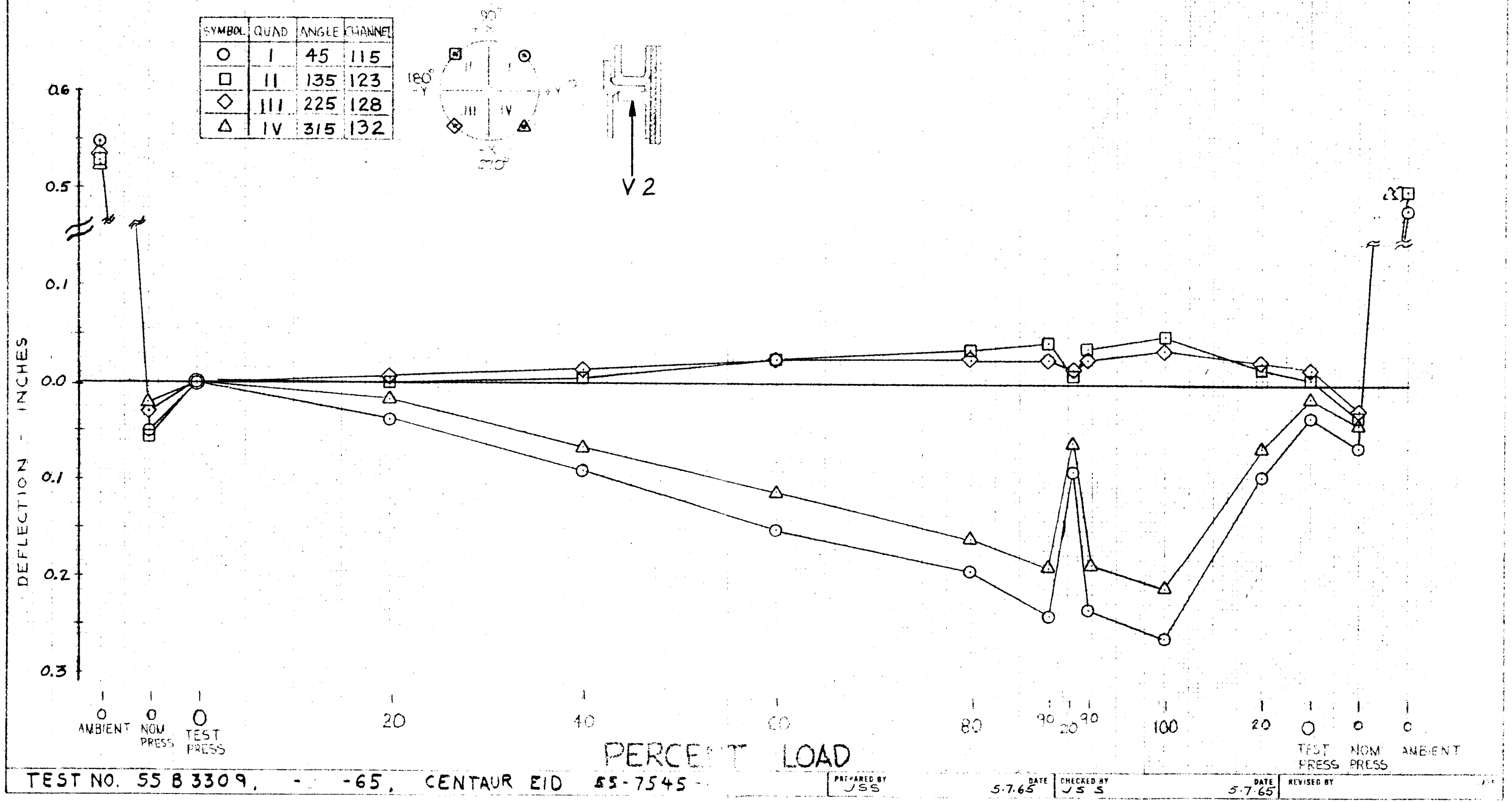


TEST NO. 55 B 3309, 4-20-65, CENTAUR EID 55-7545-1

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
		JSS	5.7.65		

FIGURE 6

STATION 219 DEFLECTIONS vs PERCENT LOAD DESIGN LIMIT LOADS - MAX ∝ Q - AT STATION 219 & 412

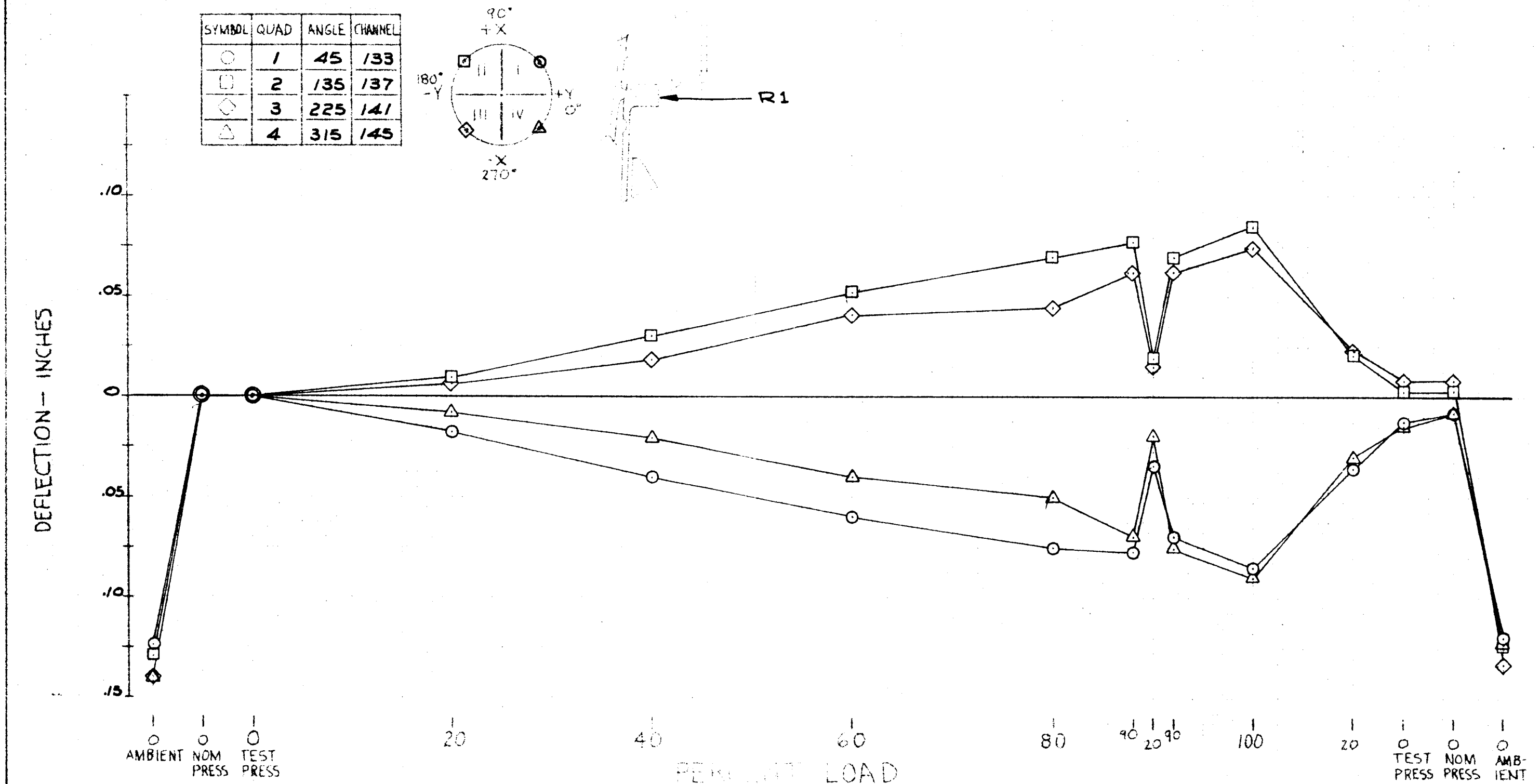


TEST NO. 55 B 3309, - -65, CENTAUR EID 55-7545

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY
JSS	5.7.65	JSS	5.7.65	

FIGURE 7

STATION 412 DEFLECTION vs PERCENT LOAD DESIGN LIMIT LOADS-MAX. ∝ Q - AT STA. 219 & 412



TEST NO 55B3309, 4-20-65, CENTAUR BID

PREPARED BY N. TAKVAM 4-20-65 DATE | CHECKED BY JSS DATE 5-10-65 | REVISED BY DATE

FIGURE 8

STATION 412 DEFLECTION vs PERCENT LOAD | DESIGN LIMIT LOADS-MAX. ∝ Q -AT STA. 219 & 412

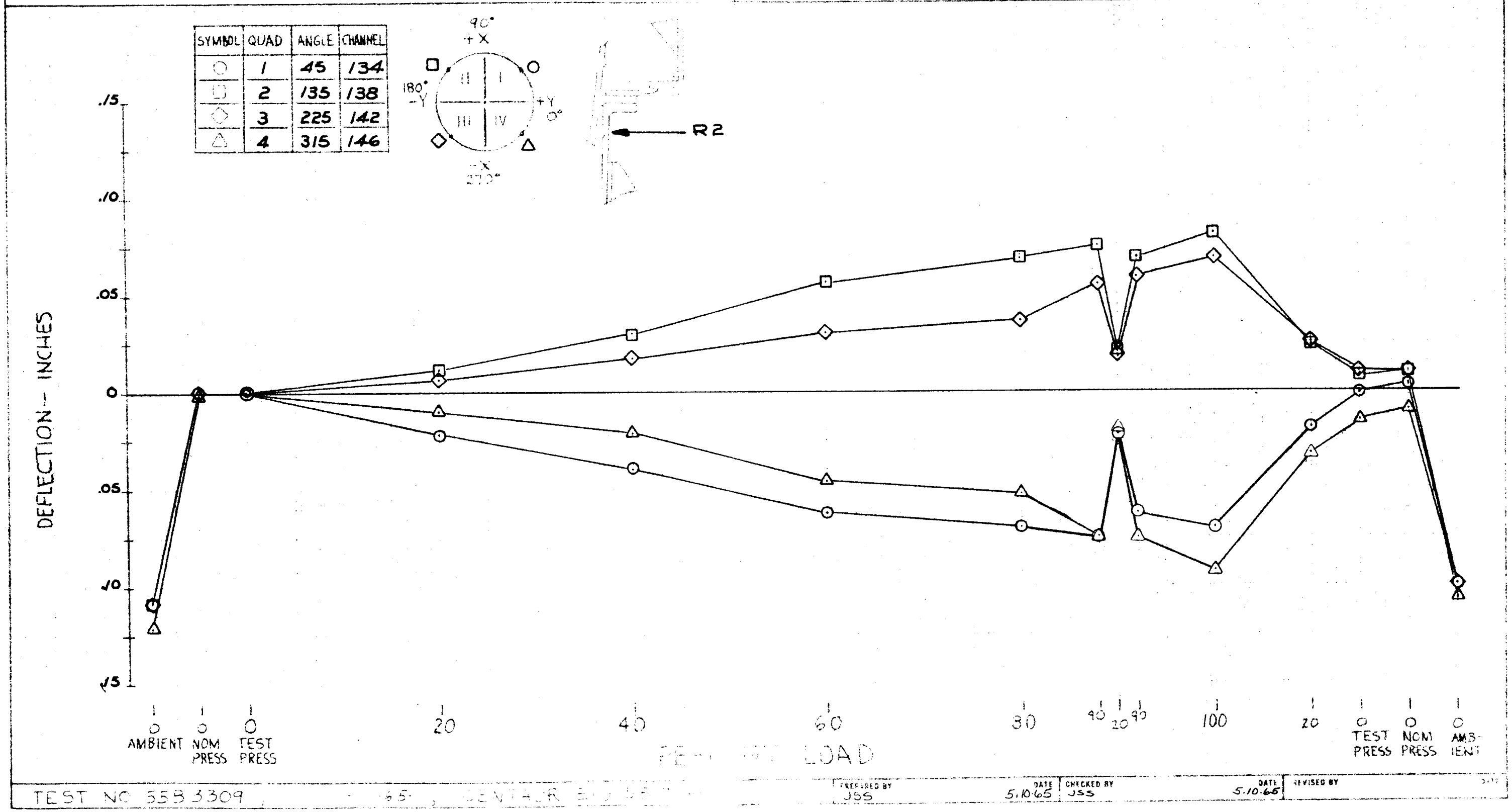
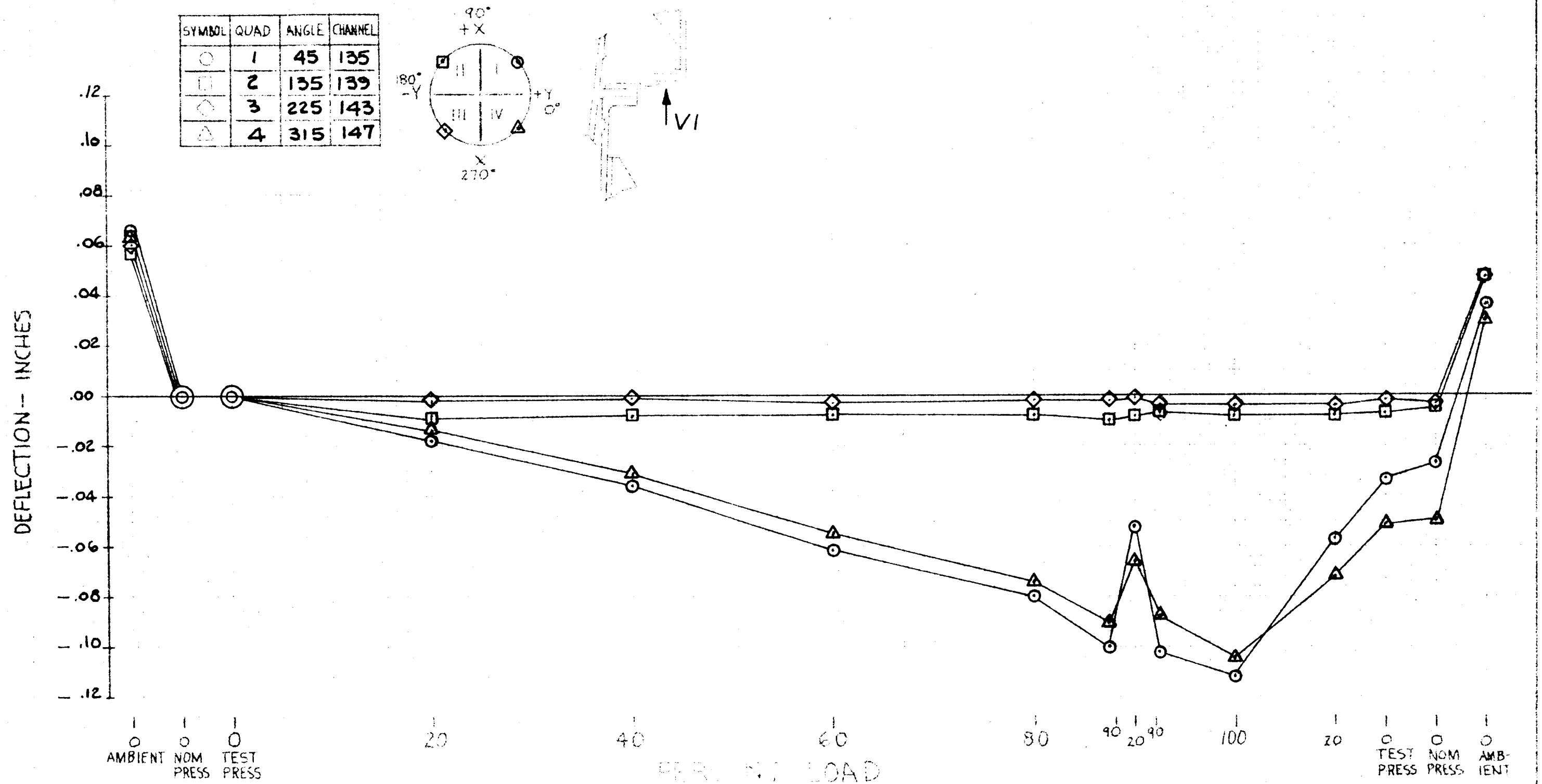


FIGURE 9

STATION 412 DEFLECTION vs PERCENT LOAD | DESIGN LIMIT LOADS-MAX. ∝ Q - AT STA. 219 & 412



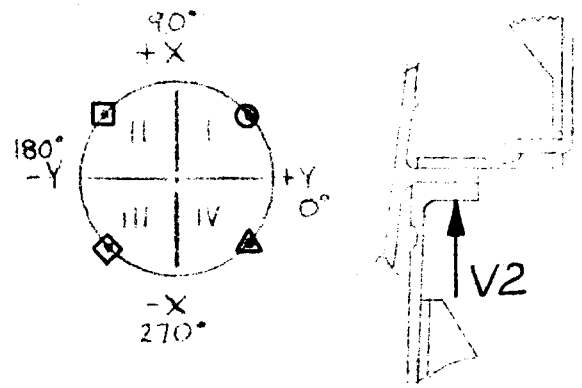
TEST NO 55B3309 , 4 20 65 , CENTAUR E[illegible]

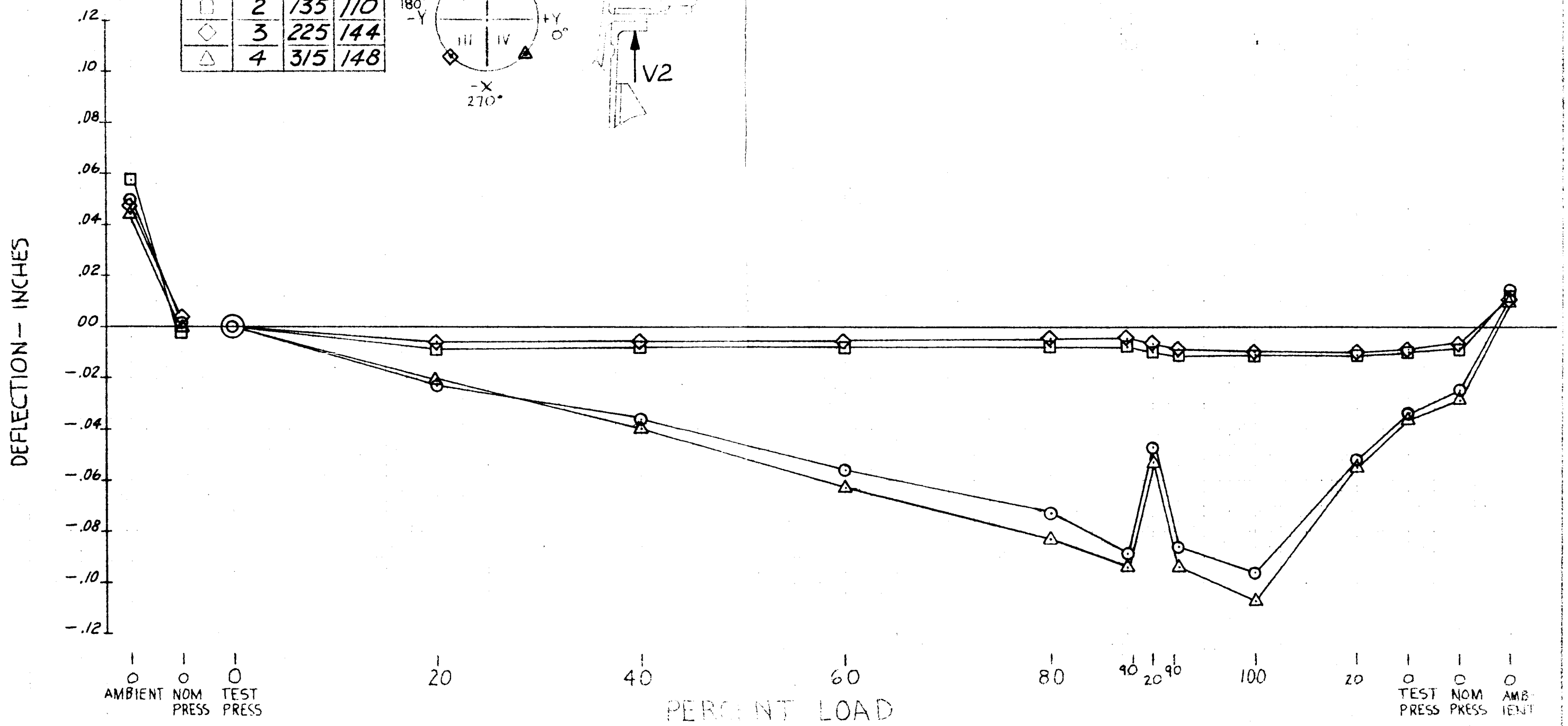
PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
CR SNELLING	4-21-65	JSG	5.10.65		

FIGURE 10

STATION 412 DEFLECTION vs PERCENT LOAD | DESIGN LIMIT LOADS-MAX. ∝ Q - AT STA. 219 & 412

SYMBOL	QUAD	ANGLE	CHANNEL
○	1	45	136
□	2	135	110
◇	3	225	144
△	4	315	148



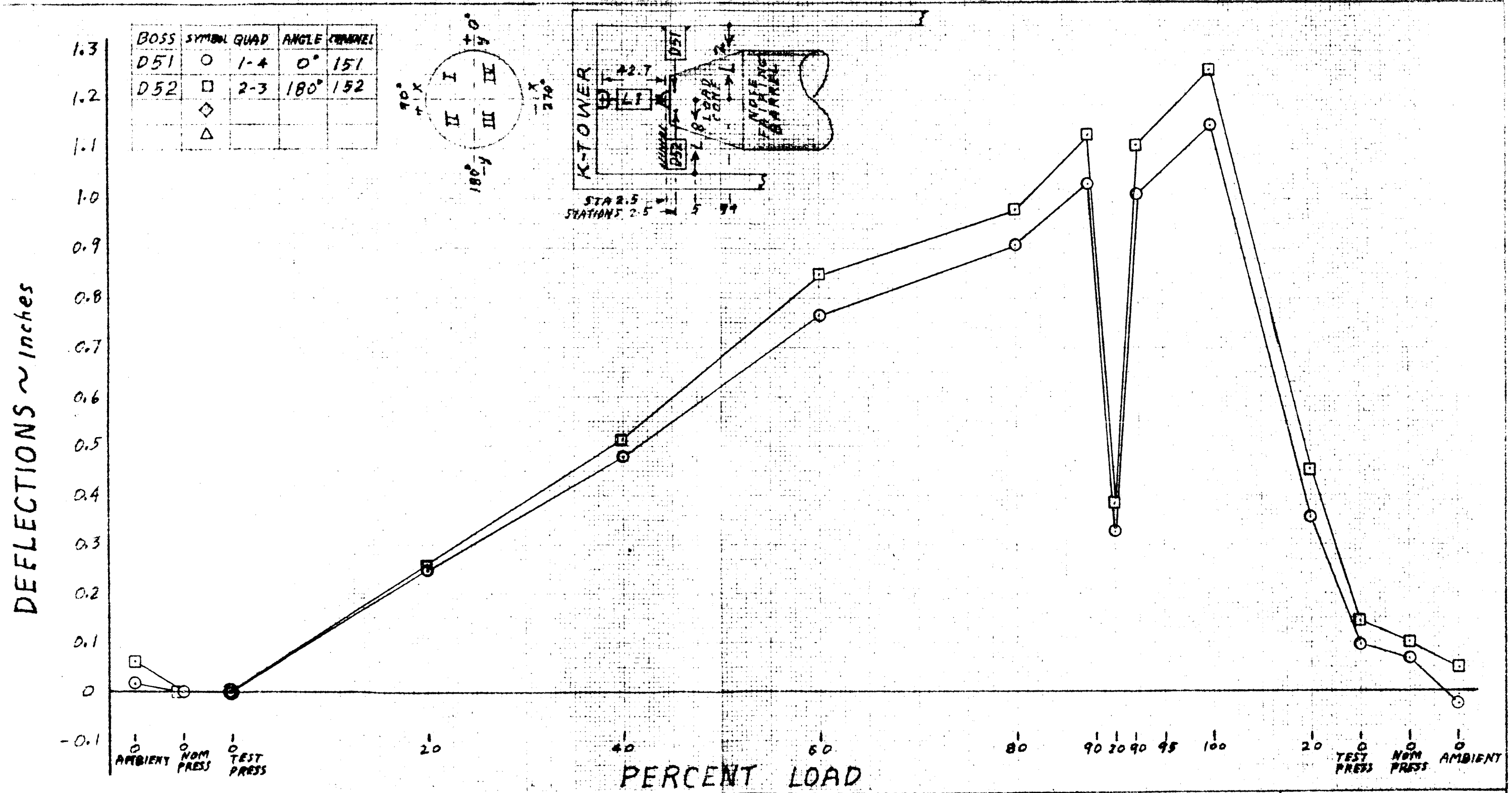


TEST NO 55B 3309 , 4-20-65 , CENTAUR EID 55-754

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
CR SNELLING	4-21-65	JSS	5-10-65		

FIGURE 11

STATION 3.5 DEFLECTIONS vs PERCENT LOAD, DESIGN LIMIT LOADS-MAX α Q-AT STA. 21,98 / 412



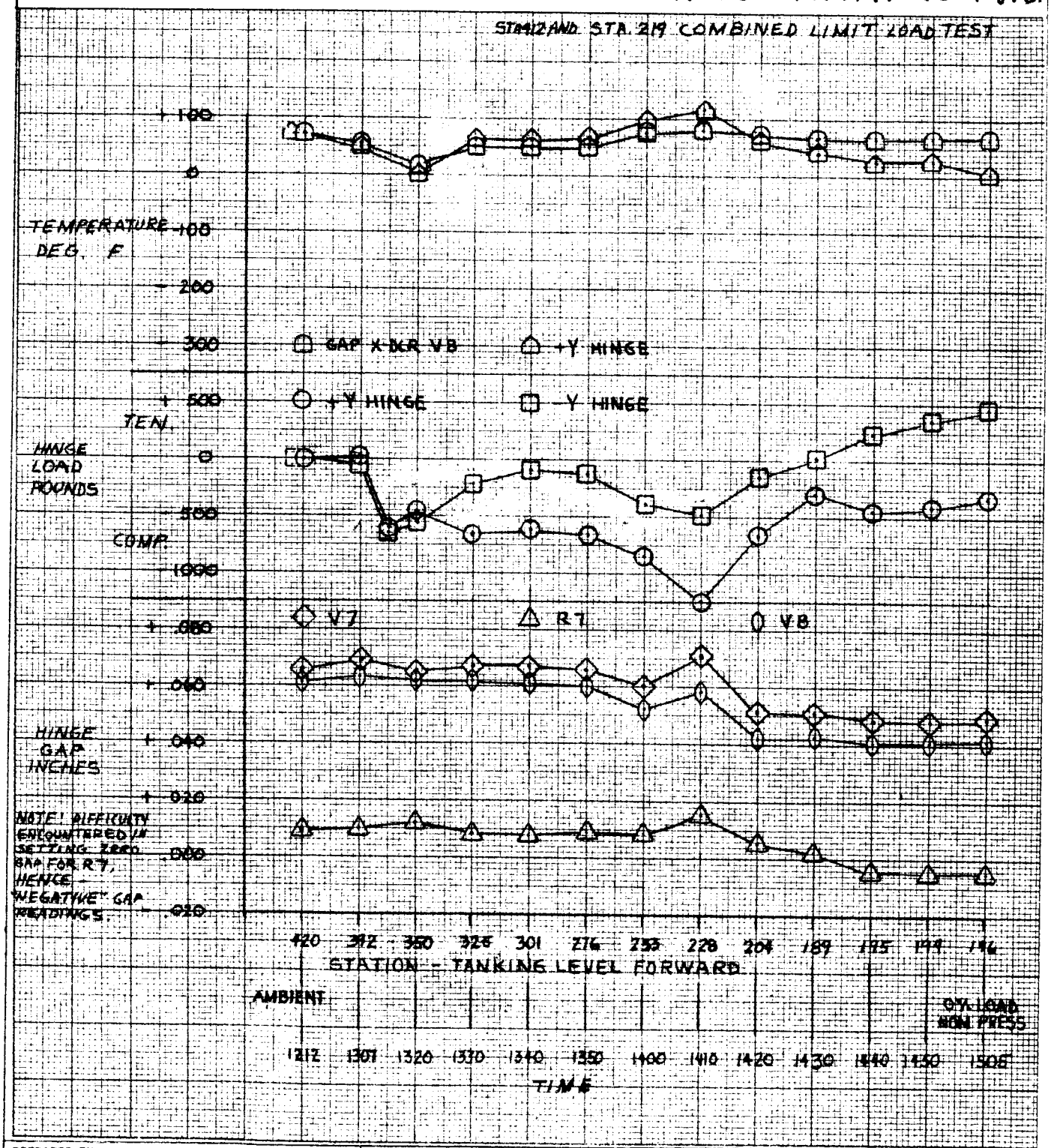
TEST NO 5533309, 4-20-65, CENTAUR EID 55-7545-1

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
CR SNELLING	4-20-65	JSS	5-7-65		

FIGURE 12

GENERAL DYNAMICS | ASTRONAUTICS

NOSE FAIRING HINGE DATA DURING TANKING FWD.



PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
JSS	5.3.65	JSG	5.20.65		

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FIGURE 13

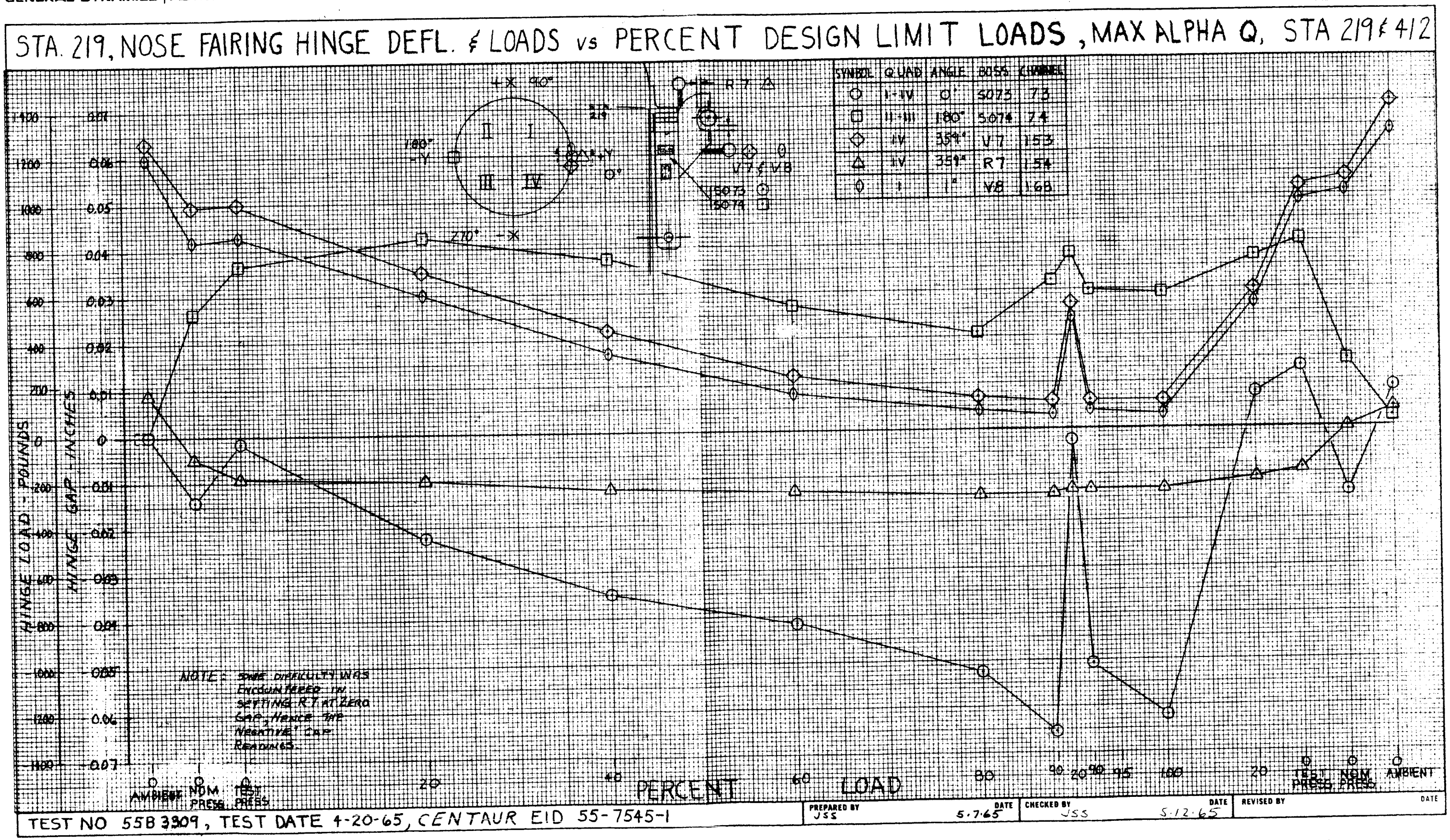
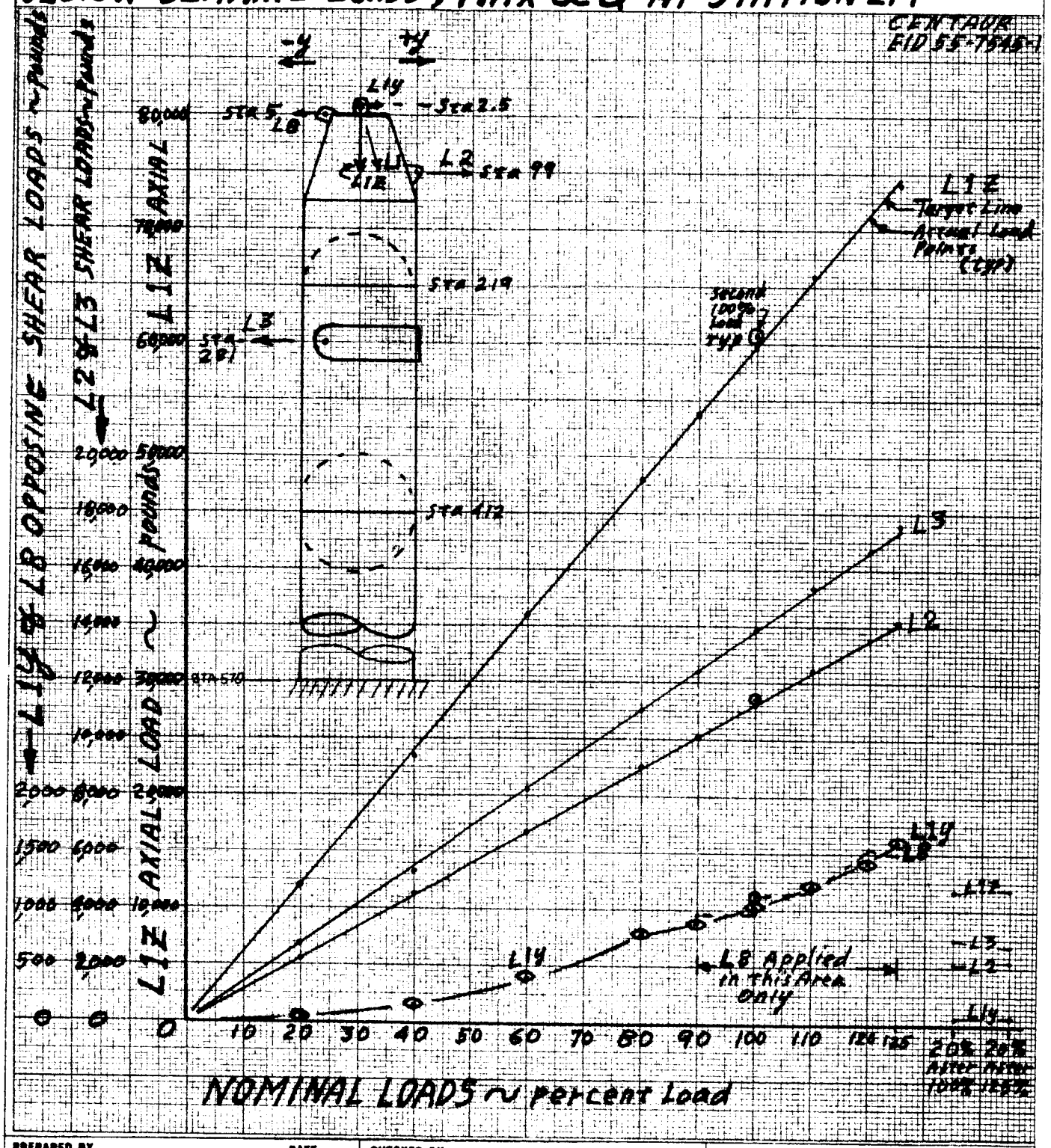

STA. 219, NOSE FAIRING HINGE DEFL. & LOADS vs PERCENT DESIGN LIMIT LOADS, MAX ALPHA Q, STA 219 & 412
SYMBOL | QUAD | ANGLE | BOSS | CHANNEL
○ | I-IV | 0° | S073 | 73
□ | II-III | 180° | S074 | 74
◇ | IV | 359.4° | V7 | 153
△ | IV | 359.4° | R7 | 154
◊ | I | 1° | V8 | 168
+X 90°
180° -Y
+Y 0°
270° -X
I
II
III
IV
R7
V7 & V8
S073
S074
HINGE LOAD - POUNDS
HINGE GAP - INCHES
NOTE: SOME DIFFICULTY WAS ENCOUNTERED IN SETTING R7 AT ZERO GAP, HENCE THE NEGATIVE GAP READINGS.
AMBIENT
NOM PRESS
TEST PRESS
PERCENT LOAD
TEST NO 55B3309, TEST DATE 4-20-65, CENTAUR EID 55-7545-1
PREPARED BY JSS
DATE 5-7-65
CHECKED BY JSS
DATE 5-12-65
REVISED BY
DATE

FIGURE 14

GENERAL DYNAMICS | ASTRONAUTICS

ACTUAL LOADS VS TARGET LOADS, TEST 55B3309, 4-22-65
DESIGN ULTIMATE LOADS, MAX αQ AT STATION 219



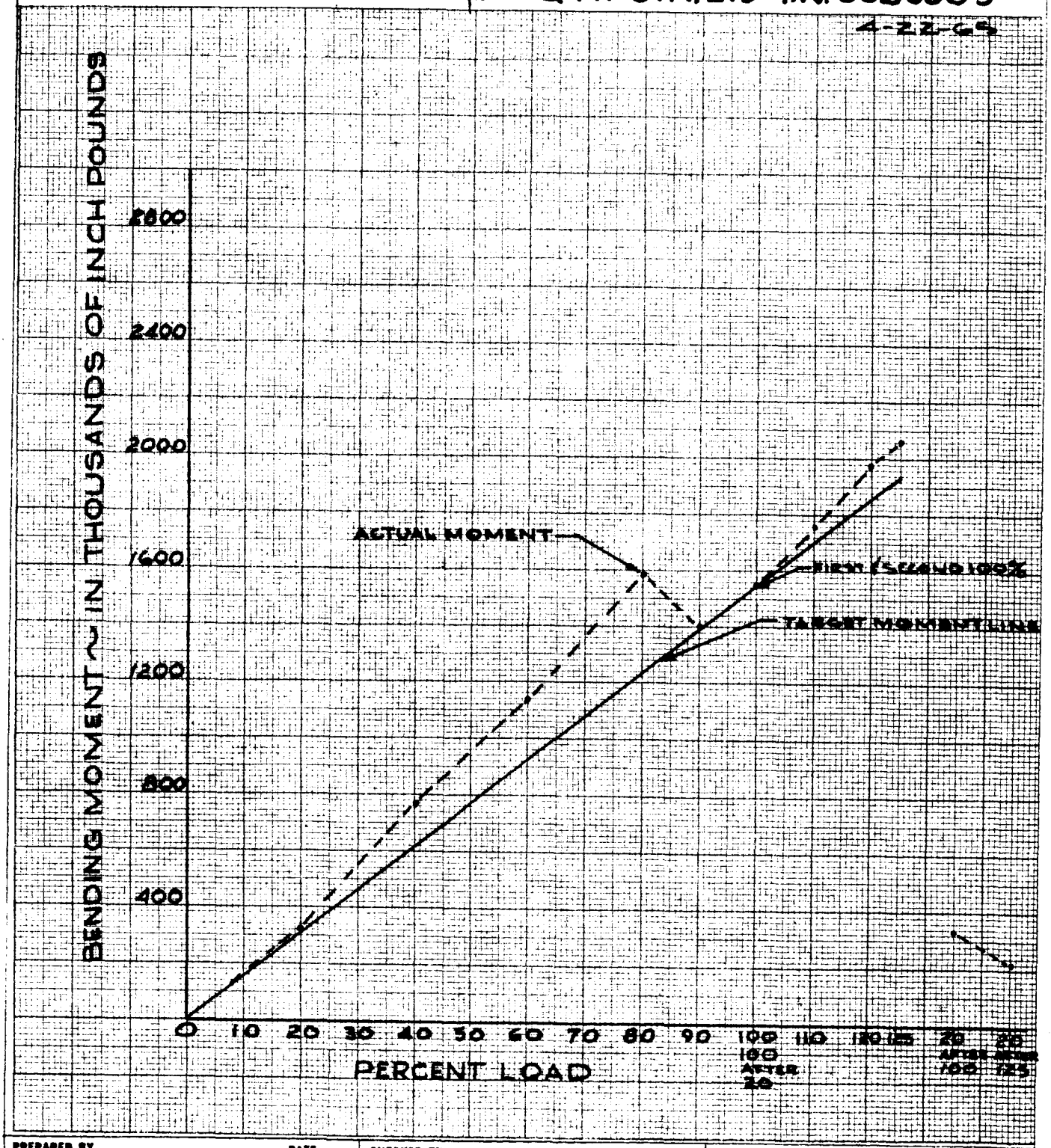
PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
Jones	5-2-65	JSB	5-20-65		

A1107-1 (REV. 7-63)

FIGURE 17

GENERAL DYNAMICS | ASTRONAUTICS

ACT. BENDING MOMENT vs TARGET BENDING MOMENT ABOUT STA. 570-DES. ULT. LOADS-MAX α Q AT STA. 219-T.N. 55B3309



PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
[illegible]	5-5-65	JSS	6-4-65		

A1107-1 (REV. 7-63)

FIGURE 18

TEST NUMBER 55B3309
PRESSURES
STATION 219 MAXIMUM ALPHA Q ULTIMATE DESIGN LOAD

(Pitch Axis Bending Moment)

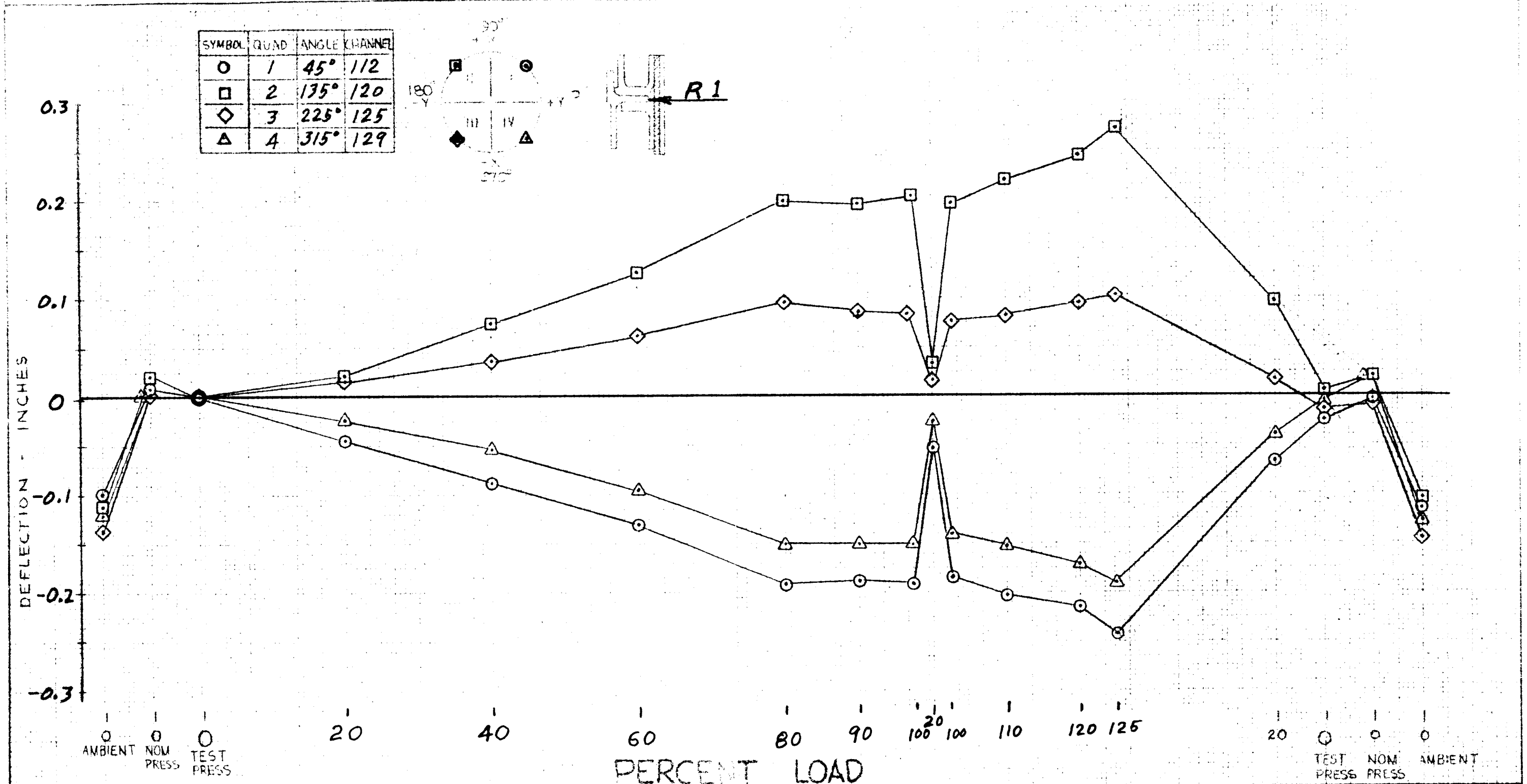
DATA POINTS	INSTRUMENTATION BOSS					
	P-1	P-2	ΔP-1	ΔP-2	P-3	P-5
	FUEL TANK ULLAGE PRESS., PSIG	OXID. TANK ULLAGE PRESS., PSIG	FUEL TANK LIQUID LEVEL STATION LEVEL	OXID. TANK LIQUID LEVEL STATION LEVEL	BULKHEAD CAVITY PRESS., PSIA	VACUUM LOAD CHAMBER PRESS., PSIA
0% LOAD, NOM. PRESS	4.1	20.1	180	388	14.6	not used
0% LOAD, TEST PRESS	18.2	31.1	182	385	15.0	
20% " " "	18.4	31.1	182	385	15.3	
40% " " "	18.5	30.1	182	385	14.8	
60% " " "	18.5	30.6	182	386	14.8	
80% " " "	18.4	30.1	180	387	14.8	
90% " " "	18.5	30.2	180	388	14.8	
100% " " "	18.5	31.1	179	389	14.6	
20% " " "	18.6	30.6	179	390	14.6	
100% " " "	18.4	31.0	179	392	14.6	
110% " " "	18.6	30.5	177	393	14.6	
120% " " "	18.5	31.3	176	393	14.6	
125% " " "	18.6	30.3	176	394	14.6	
20% " " "	18.6	30.8	176	394	14.6	
0% LOAD, TEST PRESS	18.5	31.8	177	394	14.6	
0% LOAD, NOM. PRESS	4.3	19.8	198	396	14.2	not used

PREPARED BY JSS DATE 5/12/65 | CHECKED BY JSS DATE 5/12/65 | REVISED BY DATE

FIGURE 19

GENERAL DYNAMICS | ASTRONAUTICS

STATION 219 DEFLECTIONS vs PERCENT LOAD | DESIGN ULTIMATE LOADS - MAX αQ - AT STATION 219

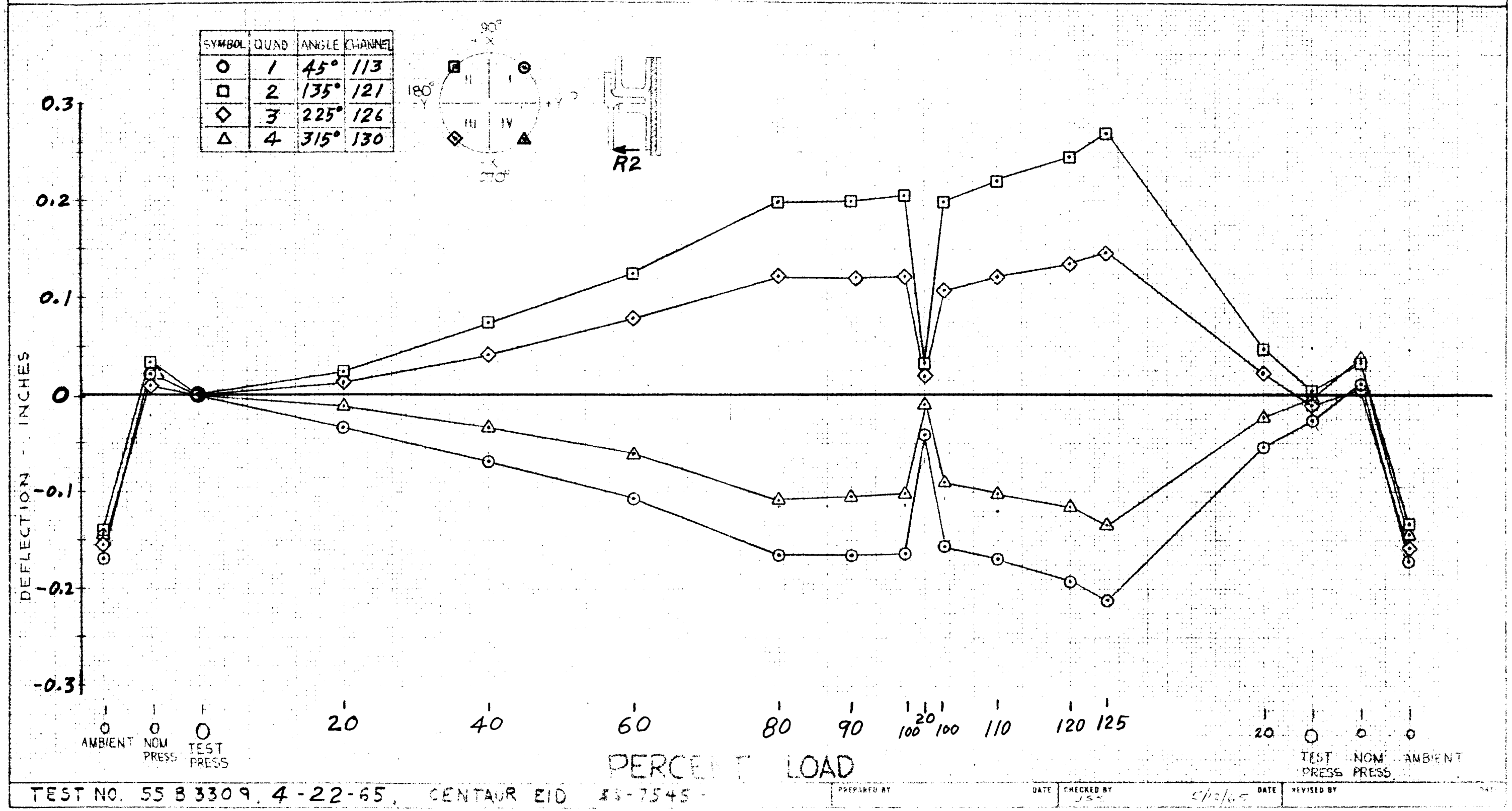


TEST NO. 55 B 3309, 4-22-65, CENTAUR EID 55-7545

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
		JGS	5/12/65		

FIGURE 20

STATION 219 DEFLECTIONS vs PERCENT LOAD | DESIGN ULTIMATE LOADS - MAX αQ - AT STATION 219



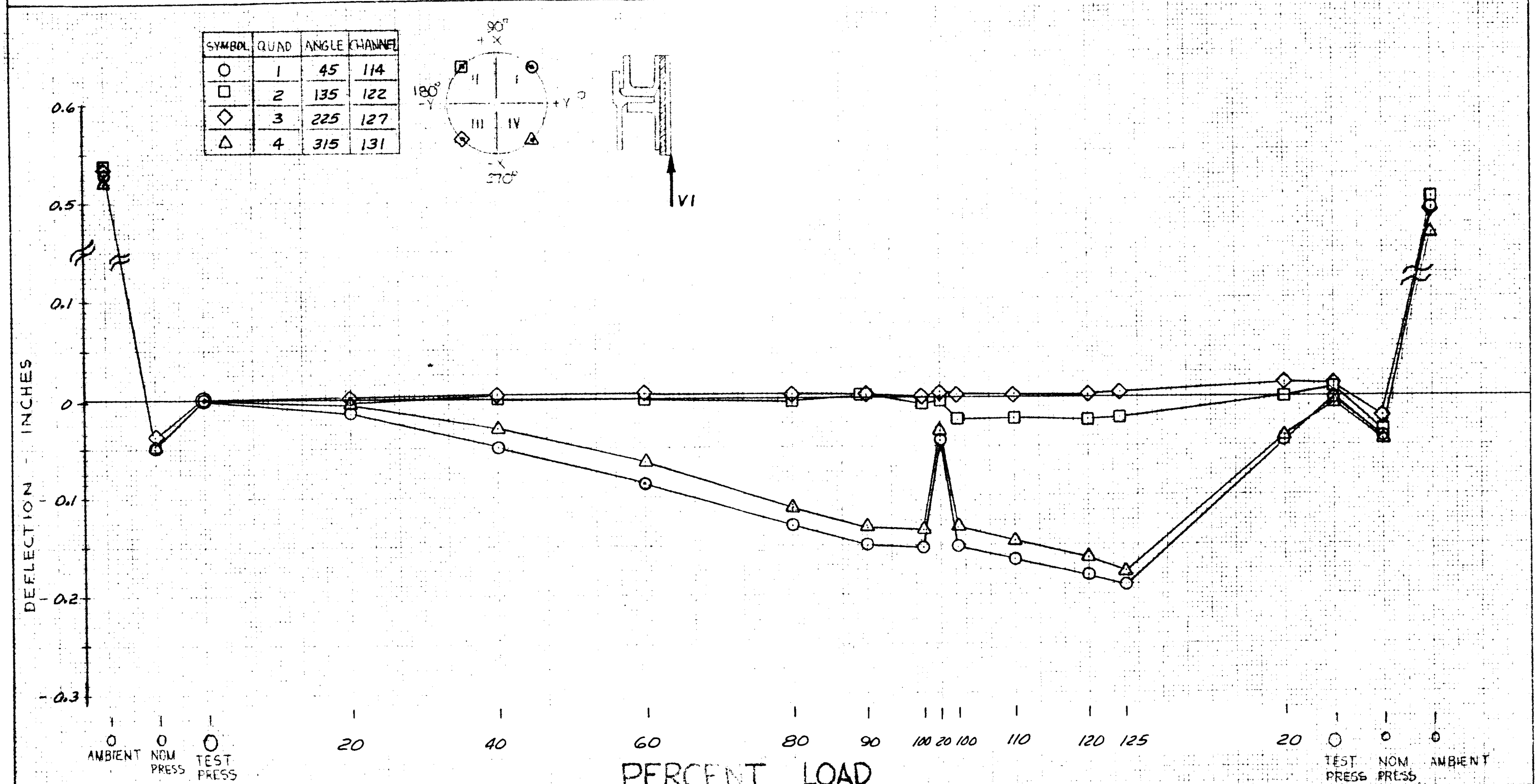
TEST NO. 55 B 3309, 4-22-65, CENTAUR EID 55-7545

PREPARED BY | DATE | CHECKED BY | DATE | REVISED BY

FIGURE 21

GENERAL DYNAMICS | ASTRONAUTICS

STATION 219 DEFLECTIONS vs PERCENT LOAD — DESIGN ULTIMATE LOADS - MAX ∝ Q - AT STATION 219

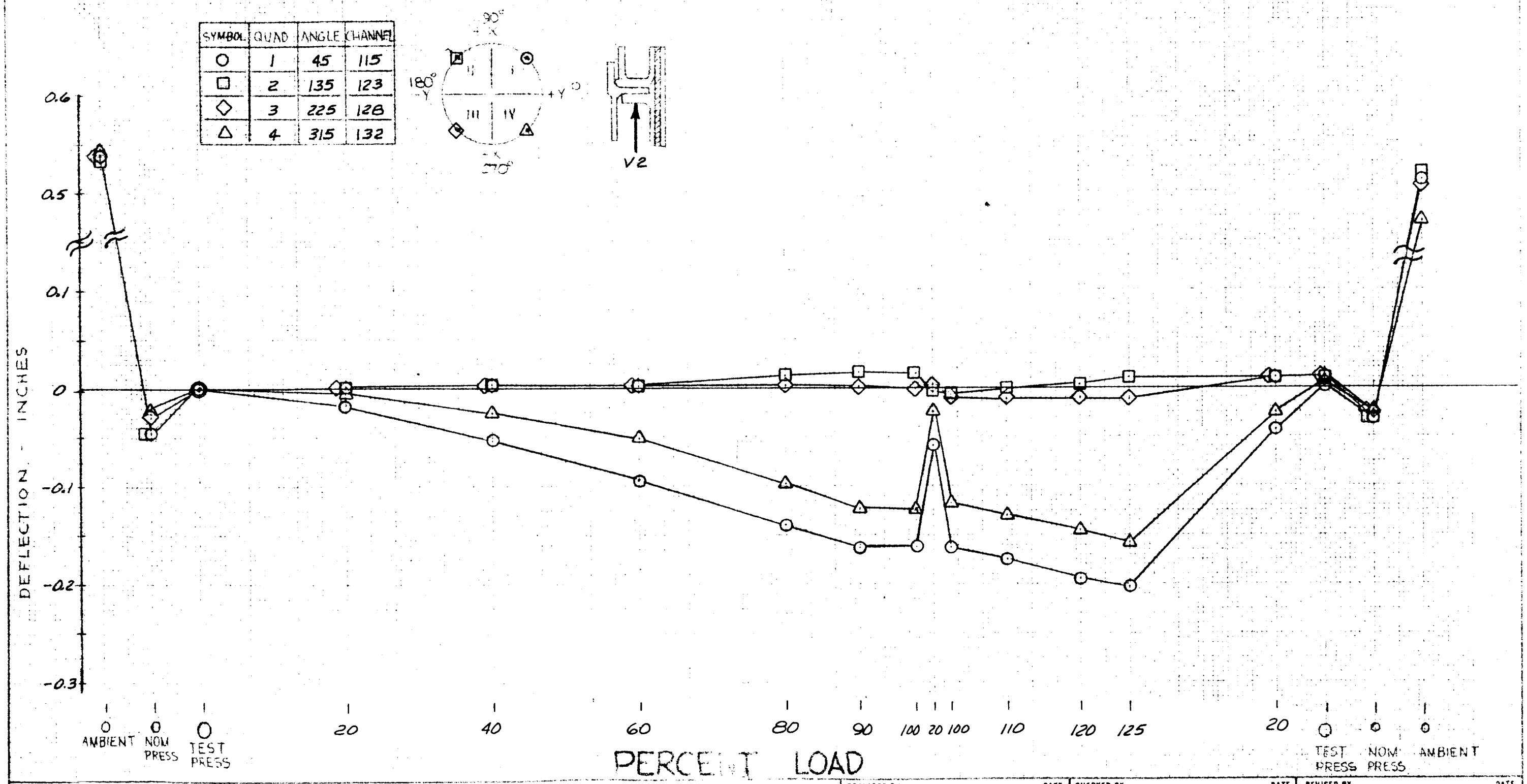


TEST NO. 55 B 3309, 4-22-65, CENTAUR EID 55-7545-1

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
		JSS	5/12/65		

FIGURE 22

STATION 219 DEFLECTIONS vs PERCENT LOAD | DESIGN ULTIMATE LOADS - MAX ∝ Q - AT STATION 219



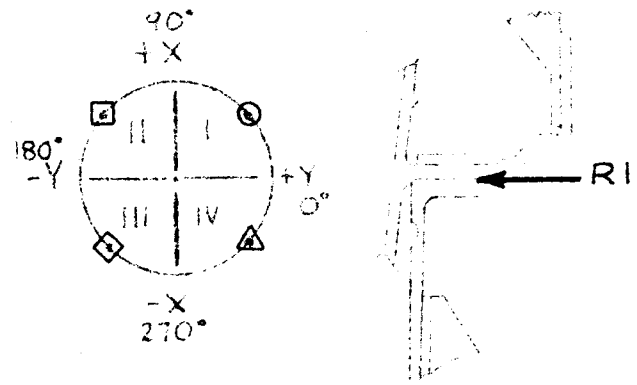
TEST NO. 55 B 3309, 4-22-65, CENTAUR EID 55-7545-

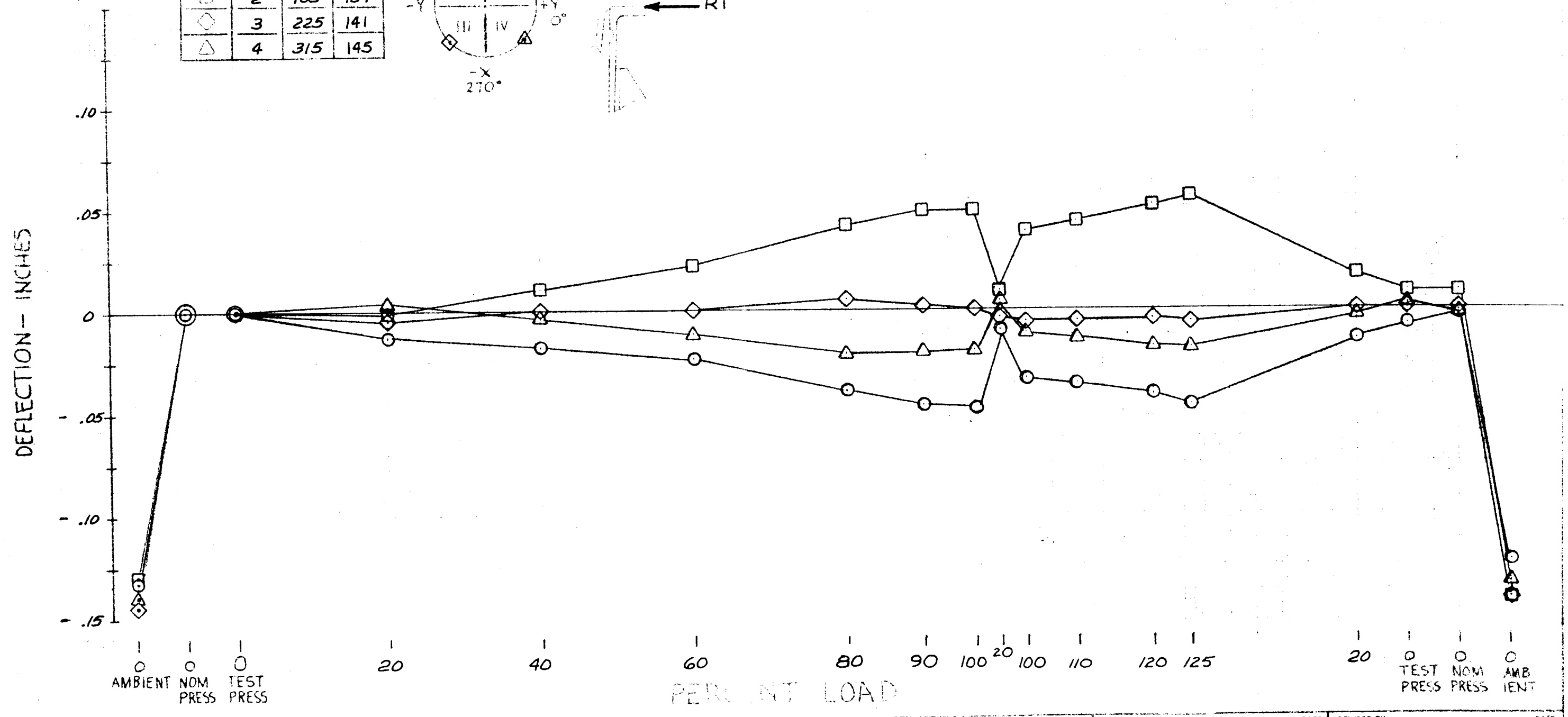
PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
		JSS	5.12.65		

FIGURE 23

STATION 412 DEFLECTION vs PERCENT LOAD DESIGN ULTIMATE LOADS-MAX. α Q-AT STA. 412

SYMBOL	QUAD	ANGLE	CHANNEL
○	1	45	133
□	2	135	137
◇	3	225	141
△	4	315	145



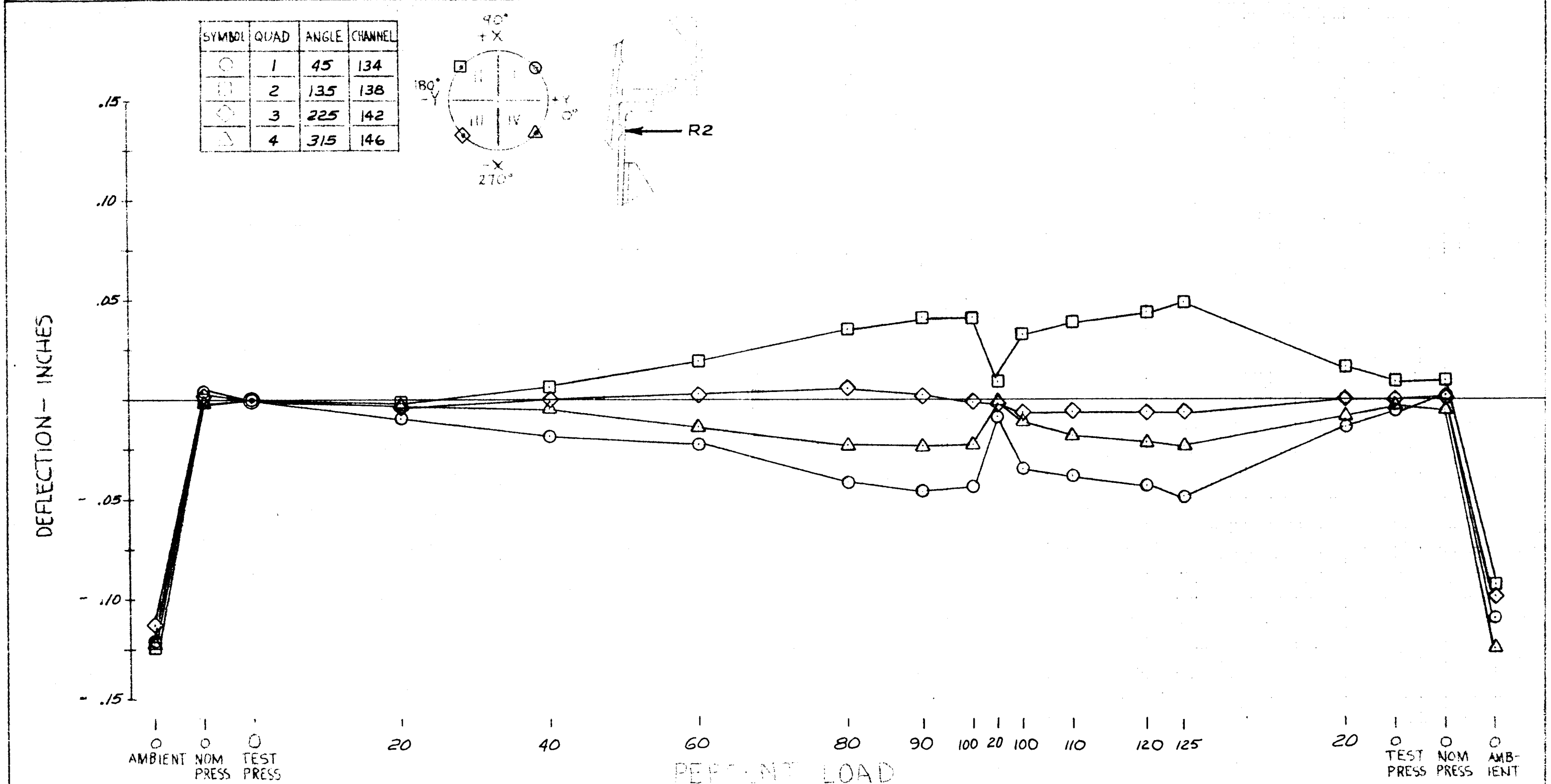


TEST NO 55B3309, 4-22-65, CENTAUR EID 55-1545

PREPARED BY CR SNELLING DATE 4-22-65 | CHECKED BY JSS DATE 5.12.65 | REVISED BY DATE

FIGURE 24

STATION 412 DEFLECTION vs PERCENT LOAD DESIGN ULTIMATE LOADS-MAX. ∝ Q - AT STA. 412

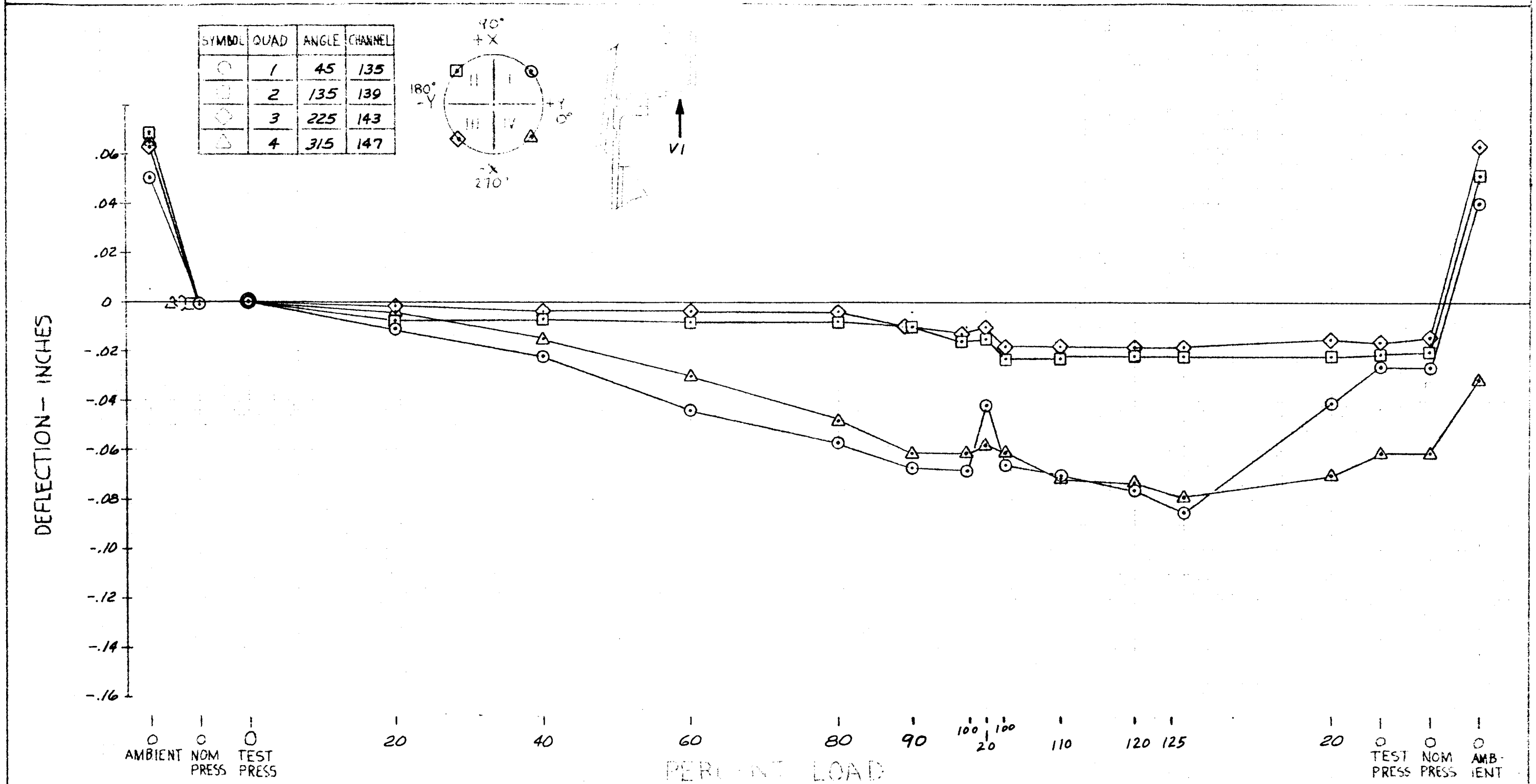


TEST NO 55B3309, 4-22-65, CENTAUR EID 55-

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
CR SNELLING	4-22-65	JSS	5.12.65		

FIGURE 25

STATION 412 DEFLECTION vs PERCENT LOAD DESIGN ULTIMATE LOADS-MAX. αQ -AT STA.219

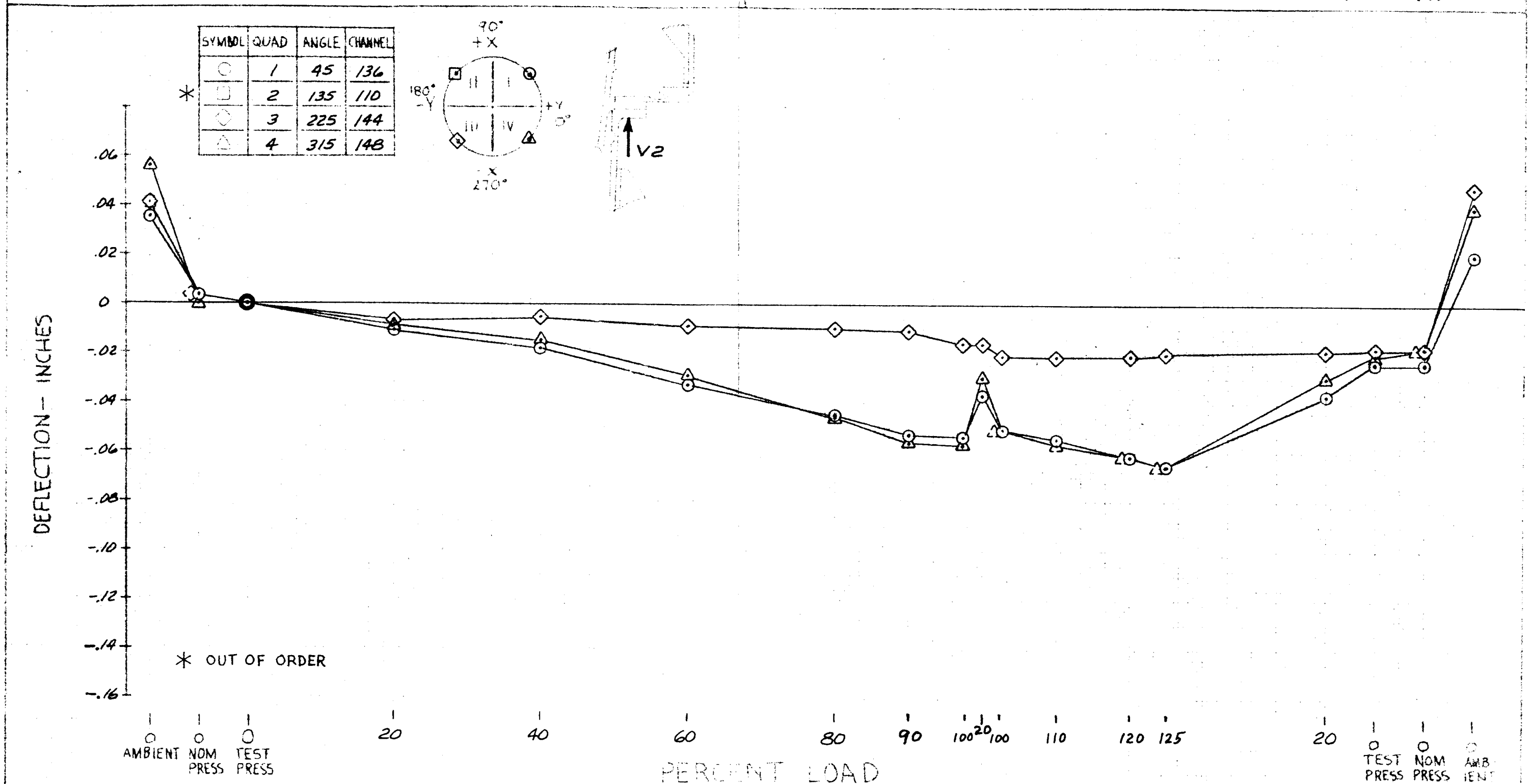


TEST NO 55B3309, 4-22-65, CENTAUR EID 55 7545

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
J.S.	5-1-65	JSS	5-12-65		

FIGURE 26

STATION 412 DEFLECTION vs PERCENT LOAD | DESIGN ULTIMATE LOADS-MAX. αQ -AT STA. 219



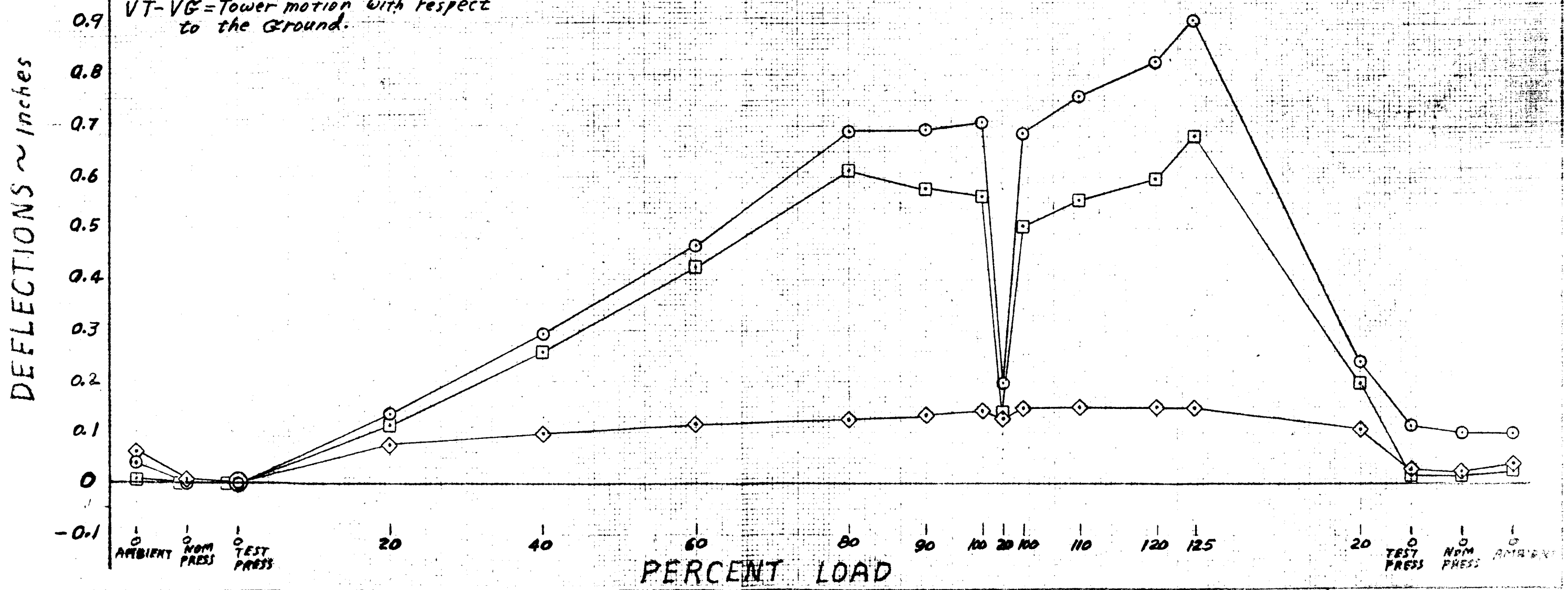
TEST NO 55B3309 , 4 22-65 , CENTAUR BID 55-7545 | PREPARED BY | DATE 5/1/65 | CHECKED BY JSS | DATE 5.12.65 | REVISED BY | DATE

FIGURE 27

STATION 3.5 DEFLECTIONS vs PERCENT LOAD, DESIGN ULTIMATE LOADS-MAX α Q -AT STA. 219

*	BOSS	STATION	QUAD	ANGLE	ANGLE	DIRECTION
VT	D51	○	1-4	0°	151	y
VG	D52	□	2-3	180°	152	y
VT	D49	◇	1-2	90°	149	x
VG	D50	△	3-4	270°	150	x

*VT=Vehicle motion with respect to the test Tower.
VG=Vehicle motion with respect to the Ground.
VT-VG=Tower motion with respect to the Ground.



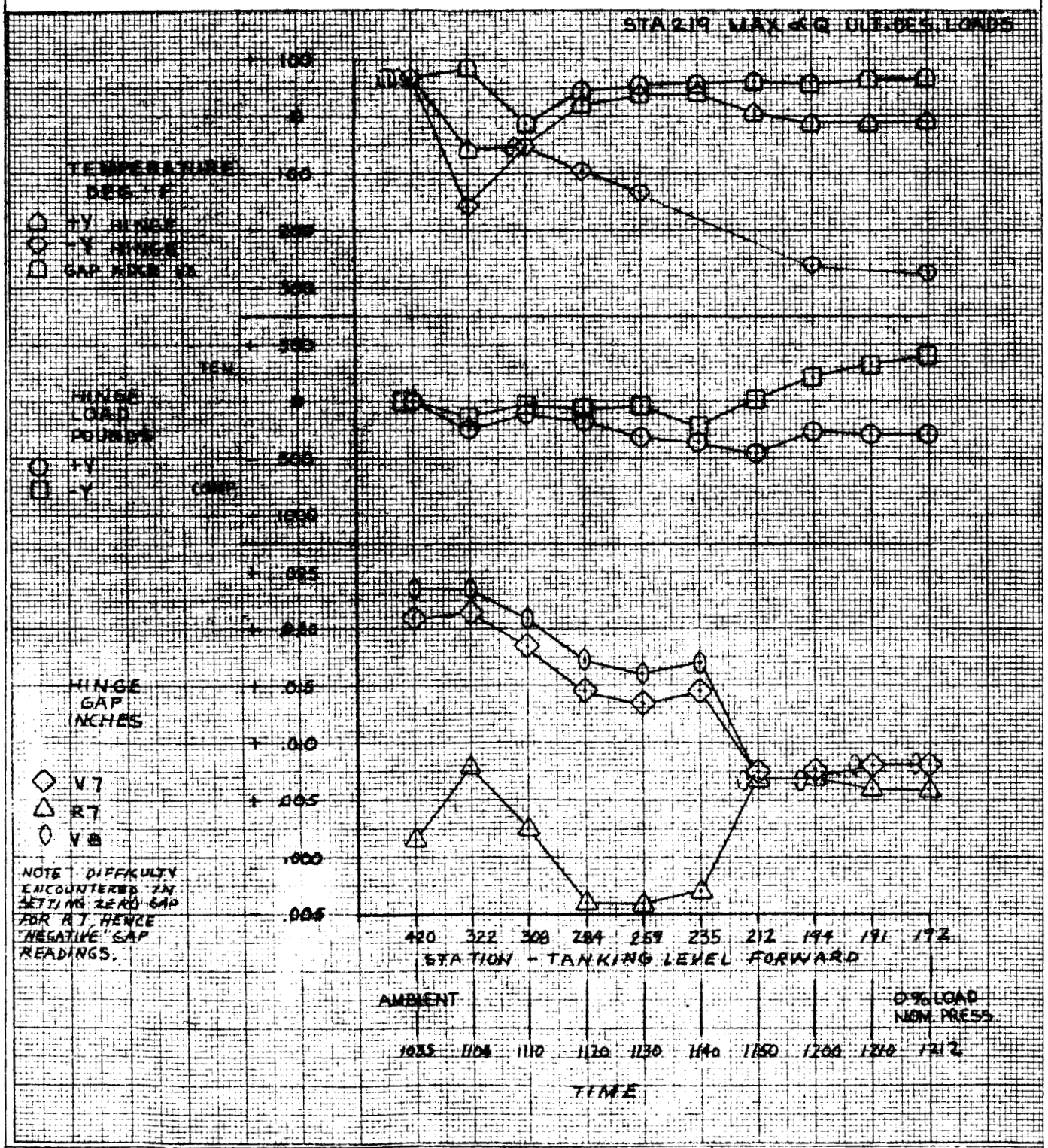
TEST NO 5533309, 4-22-65, CENTAUR EID 55-7545-1

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY
JSS	4-27-65	JSS	5-12-5	

FIGURE 28

GENERAL DYNAMICS | ASTRONAUTICS

NOSE FAIRING DATA DURING TANKING FWD.

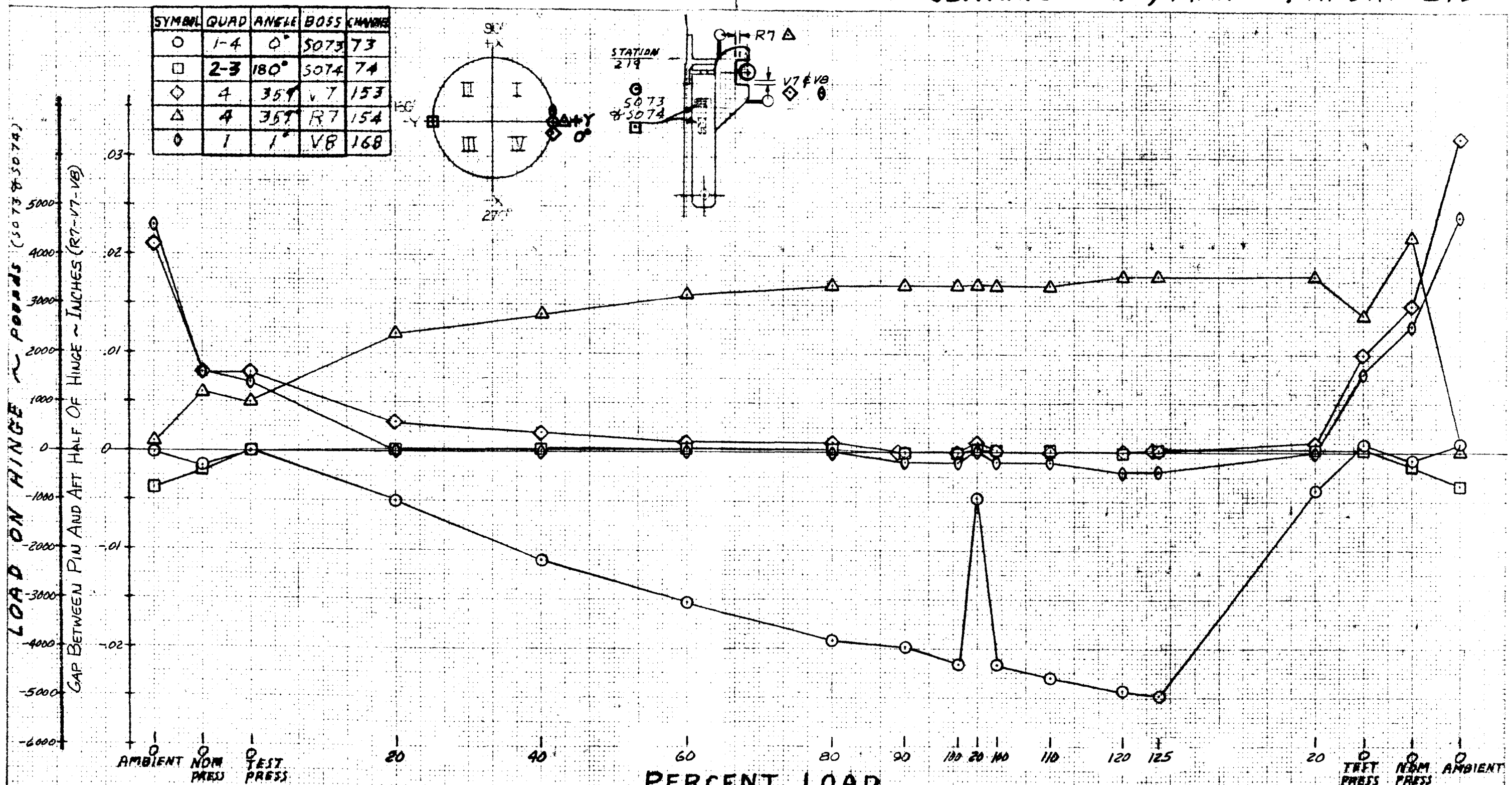


PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
JSS	5-5-65	JSS	5-20-65		

A1107-1 (REV. 7-63)

FIGURE 29

STA 219 NOSE CONE HINGE DEFLECTIONS & LOADS vs % LOAD | DESIGN **ULTIMATE** LOADS, MAX αQ AT STA. 219

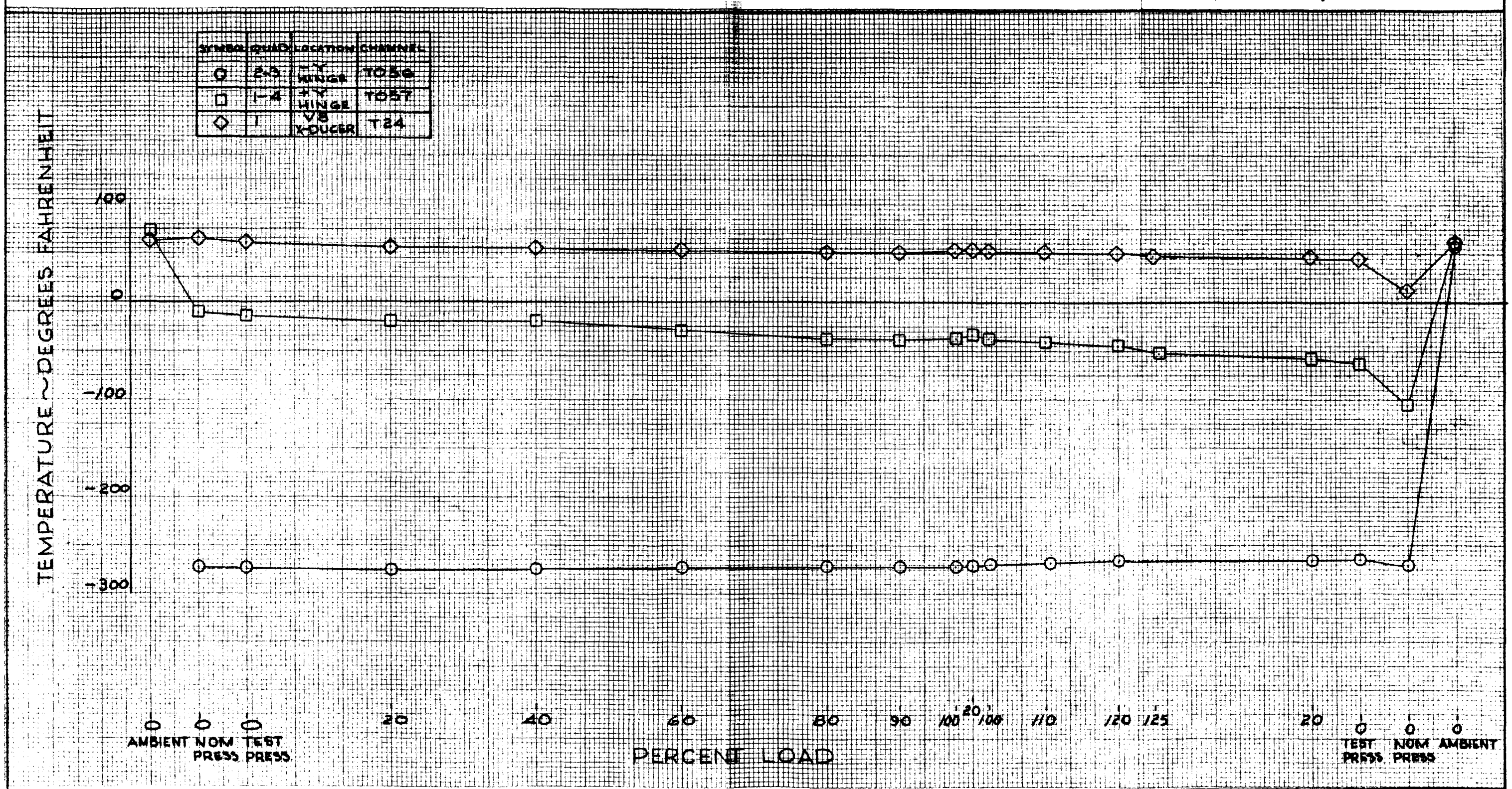


TEST NO 55B3309, 4-22-65, CENTAUR EID 55-7545-1

PREPARED BY	DATE	CHECKED BY	DATE	REVIEWED BY
Jones	4-22-65	JSS	5-12-65	

FIGURE 30

NOSE CONE HINGE TEMPERATURES vs PERCENT LOAD — DESIGN ULT. LOADS-MAX. ∝Q AT STA. 219

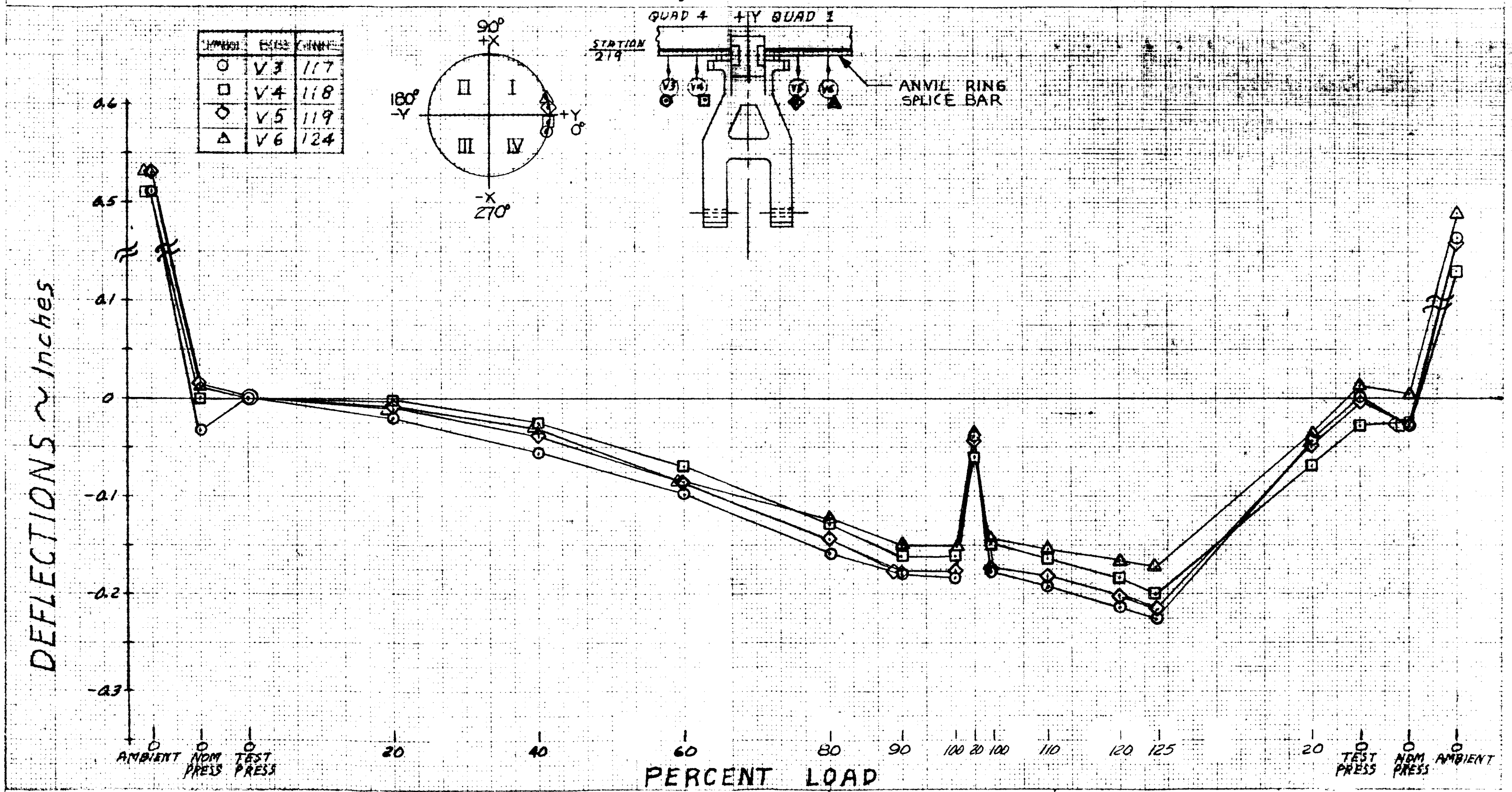


TEST NO. 55B3309 DATE: 4-22-65 CENTAUR EID 55-7545-1

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
[illegible]	4-30-65	JSS	5-12-65		

FIGURE 31

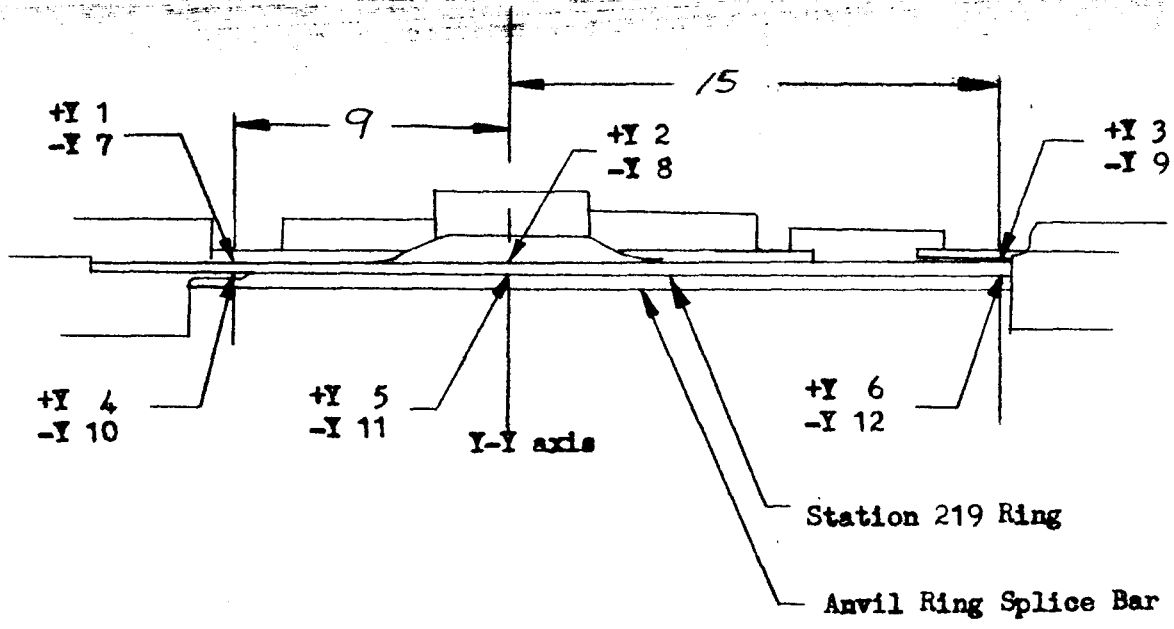
STATION 219 DEFLECTIONS vs PERCENT LOAD, DESIGN ULTIMATE LOADS-MAX ∝ Q-AT STATION 219



TEST NO 55B3309, 4-22-65, CENTAUR EID 55-7545-1 JSS 5-6-65 JSS 5-12-65

FIGURE 32

GAPS BETWEEN THE STATION 219 RING, THE NOSE FAIRING BARREL CHANNEL, AND THE ANVIL RING SPLICE BAR



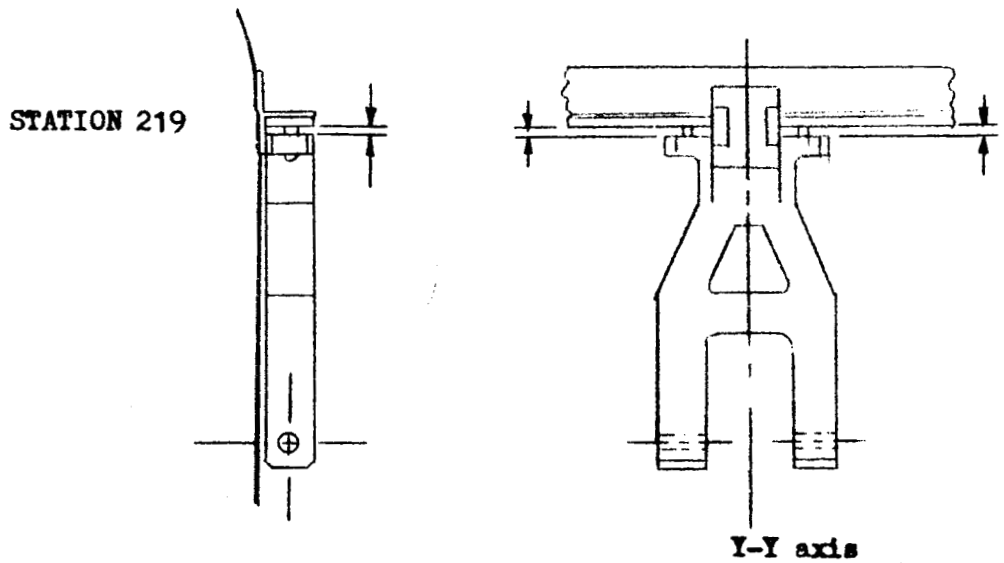
Location of Gap Measurements

LOCATION NUMBER	AS INSTALLED ON 6 April 65	COUNTERWEIGHT ON, SET UP BOLTS REMOVED 14 April 65	LOAD CYL L2 REMOVED 14 April 65	COUNTERWEIGHT REMOVED, 11K POUNDS COMP ON STA 219 RING 4/14/65	GAP CLOSED WITH SET UP BOLTS, BOLTS REMOVED, 1800 POUNDS COMP LOAD ON STA219 RING 4/14/65
1	.006	.060	.052	.038	.028
2	.000	.060	.038	.020	.034
3	.000	.030	.021	.011	.012
4	.000	.002	.002	.002	.002
5	.004	.005	.003	.003	.002
6	.003	.009	.005	.005	.008
7	.000	.028	.030	.027	—
8	.000	.000	.000	.000	—
9	.000	.009	.009	.009	—
10	.000	.003	.005	.003	—
11	.004	.004	.008	.025	—
12	.003	.007	.008	.012	—

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
JSS	5.13.65	JSS	5.13.65		

FIGURE 33

GAP BETWEEN THE TANK MOUNTED NOSE FAIRING
HINGE FITTING AND THE ANVIL RING SPLICE BAR



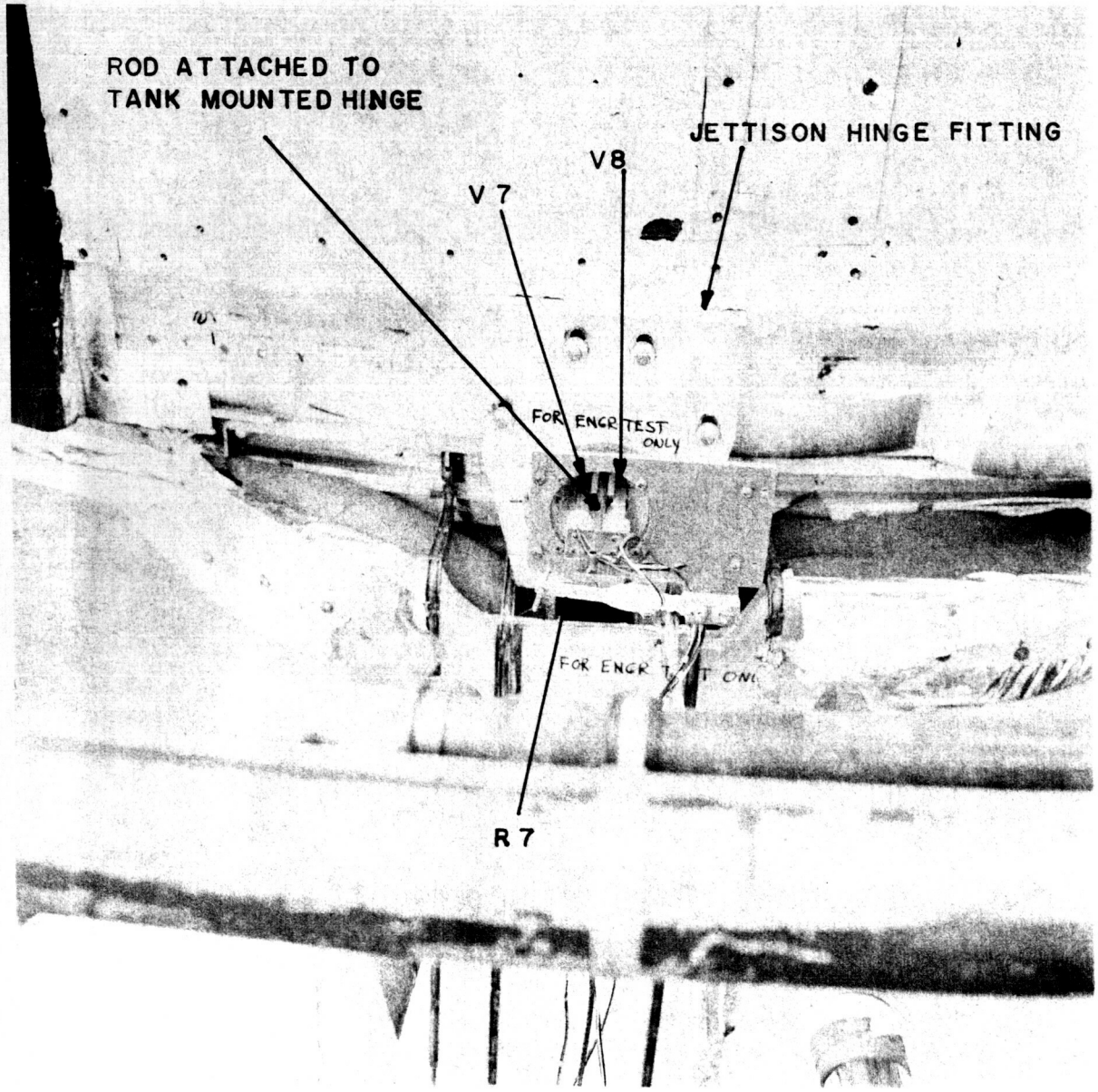
CONDITION LOCATION	QUAD IV	QUAD I	QUAD II	QUAD III
Inspected on 14 April 1965	.049	.049	.054	.054
+Y Hinge fitting remachined, gap measured just prior to test.	.061	.075	.049	.050
After test.	.056	.065	.049	.050

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
jss	5/14/65	JSS	5/14/65		

FIGURE 34

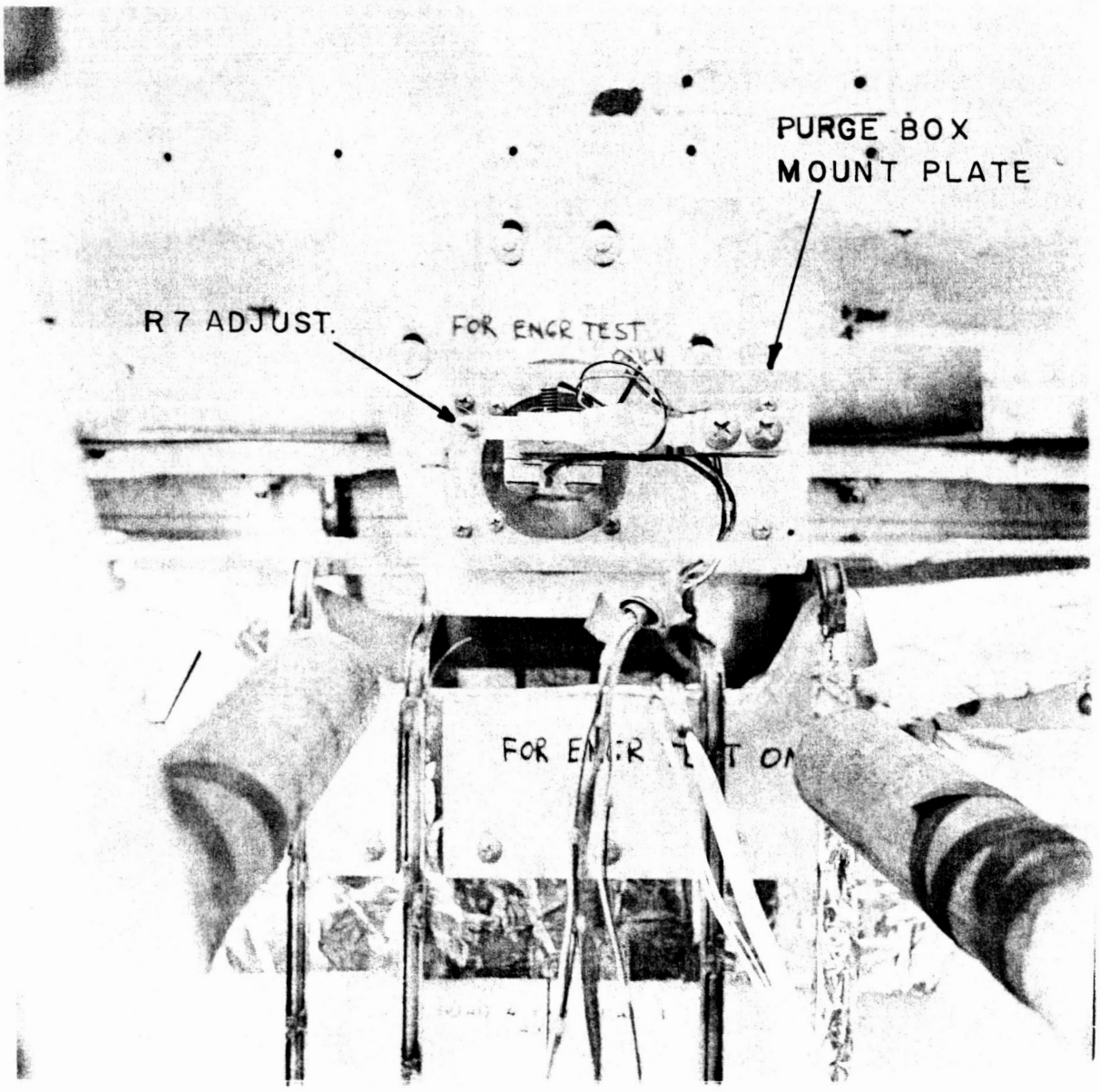
PHOTO INDEX

PICTURE NUMBER	FIGURE NUMBER	PAGE NUMBER
56917B	35	51
56918B	36	52
56705B	37	53
56708B	38	54
56914B	39	55
56915B	40	56
56916B	41	57
56921B	42	58
56920B	43	59
56706B	44	61



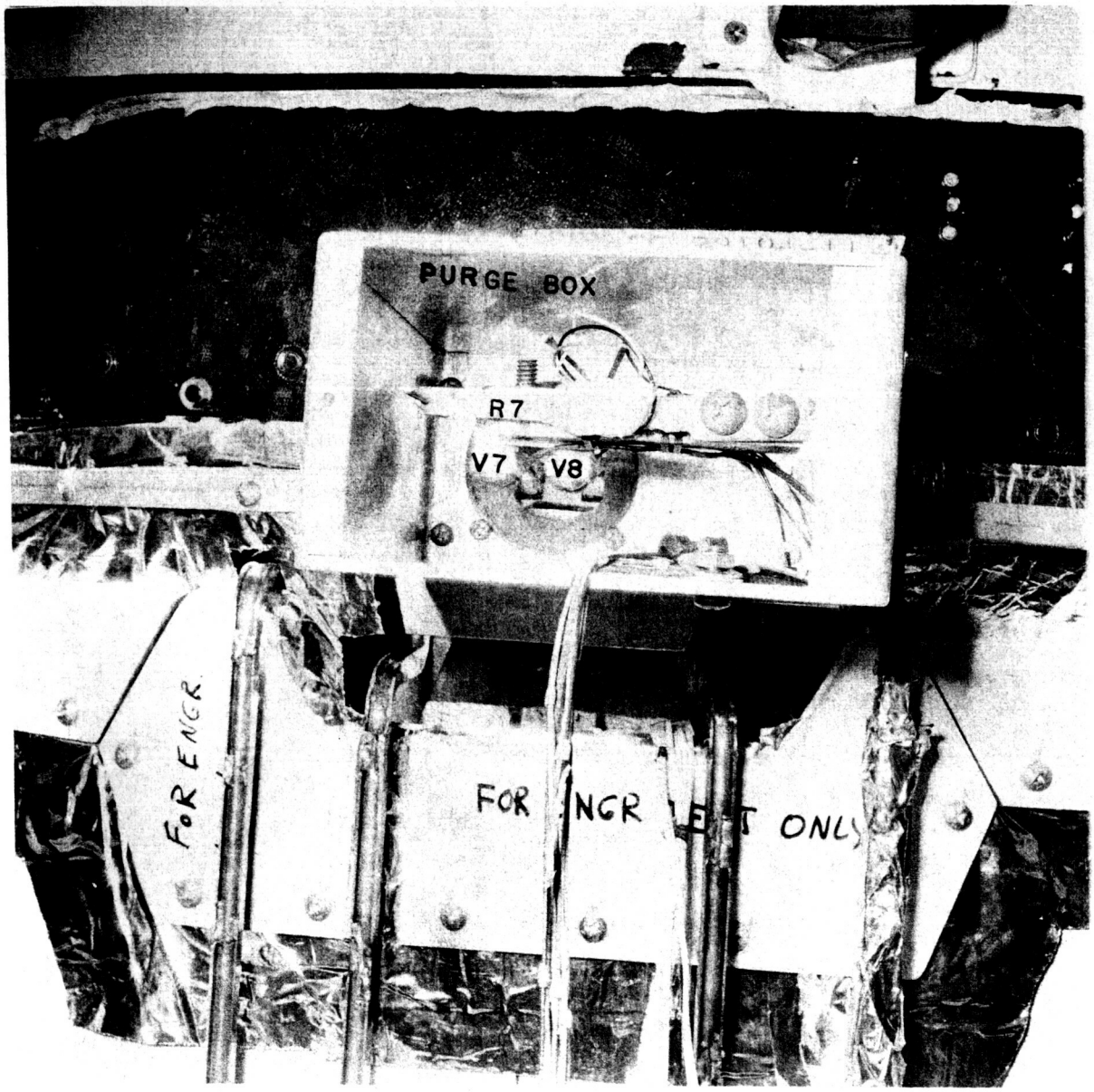
HINGE INSTRUMENTATION ON + Y AXIS

FIGURE 35



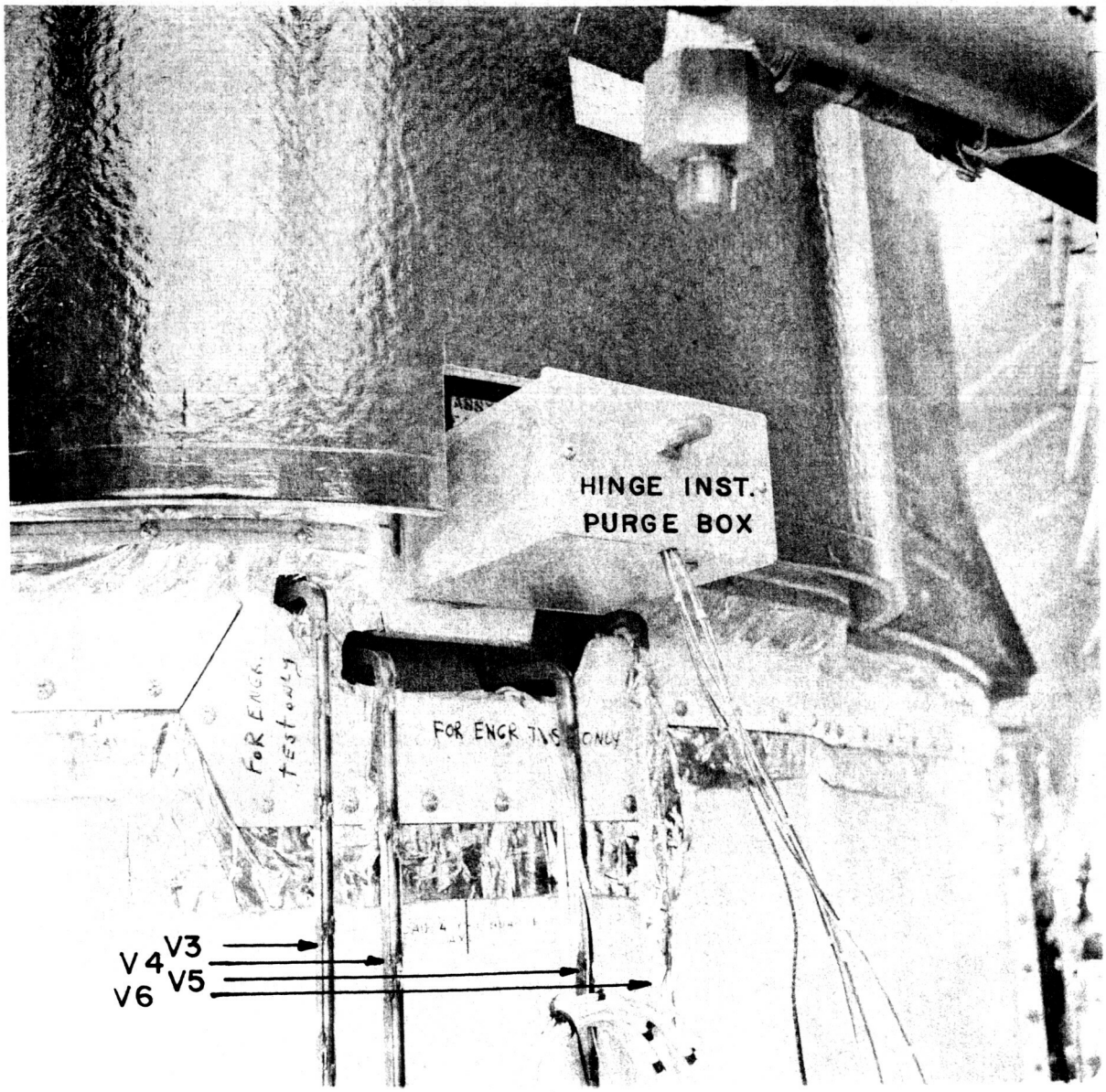
HINGE INSTRUMENTATION DETAILS

FIGURE 36



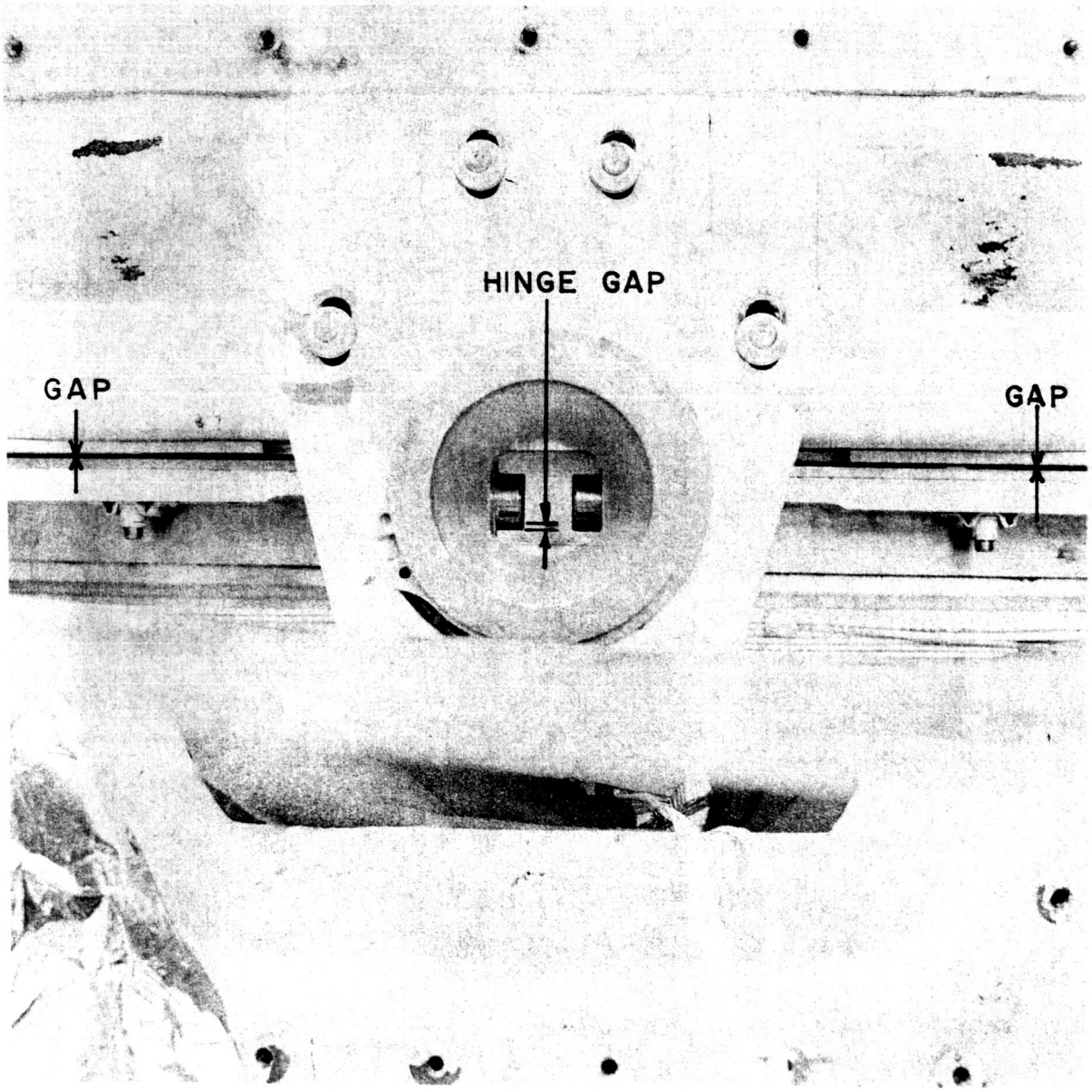
HINGE INSTRUMENTATION ON + Y AXIS

FIGURE 37



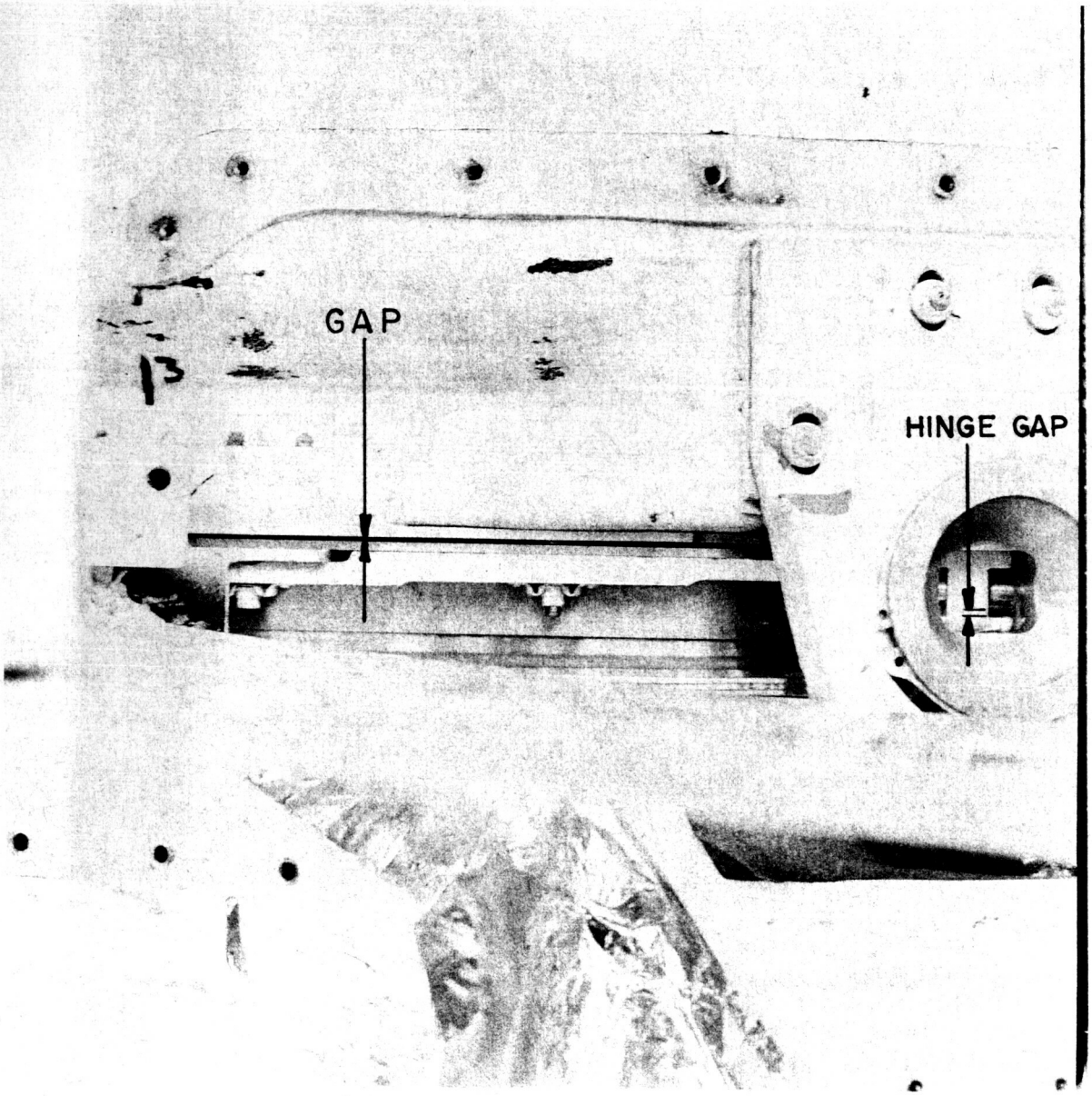
HINGE INSTRUMENTATION ON +Y AXIS

FIGURE 38



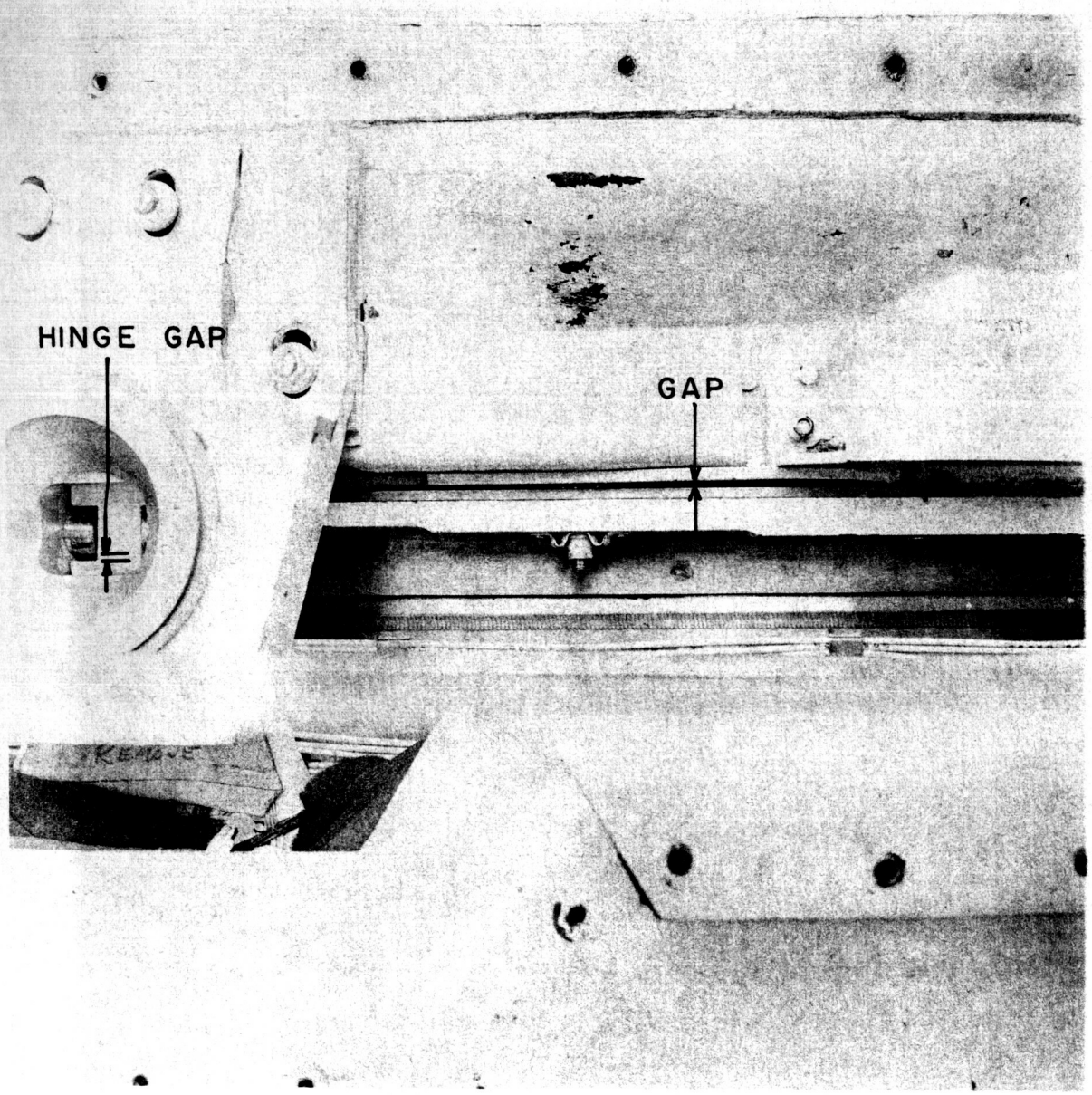
HINGE ON -Y AXIS

FIGURE 39



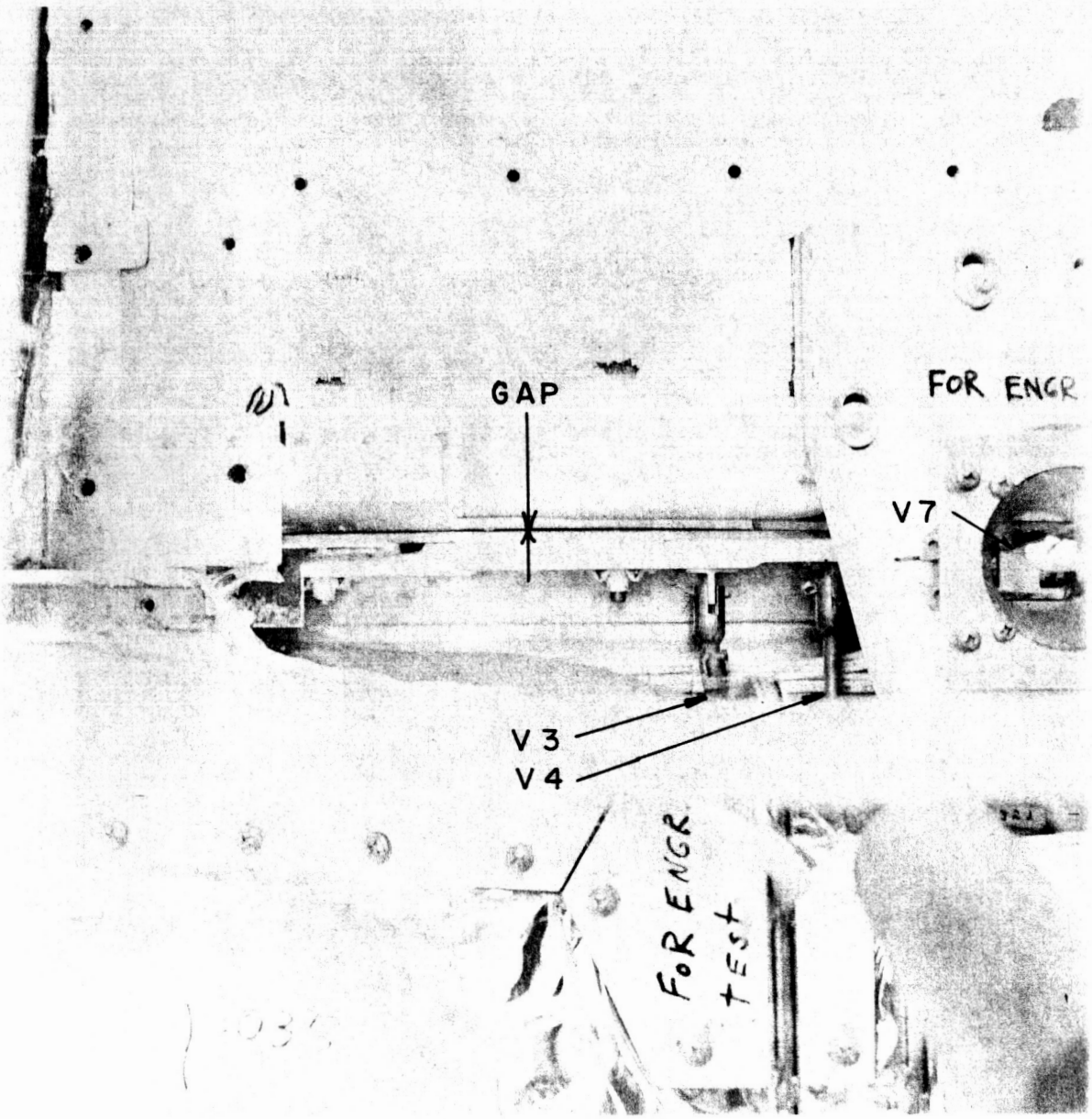
GAPS - QUAD II

FIGURE 40



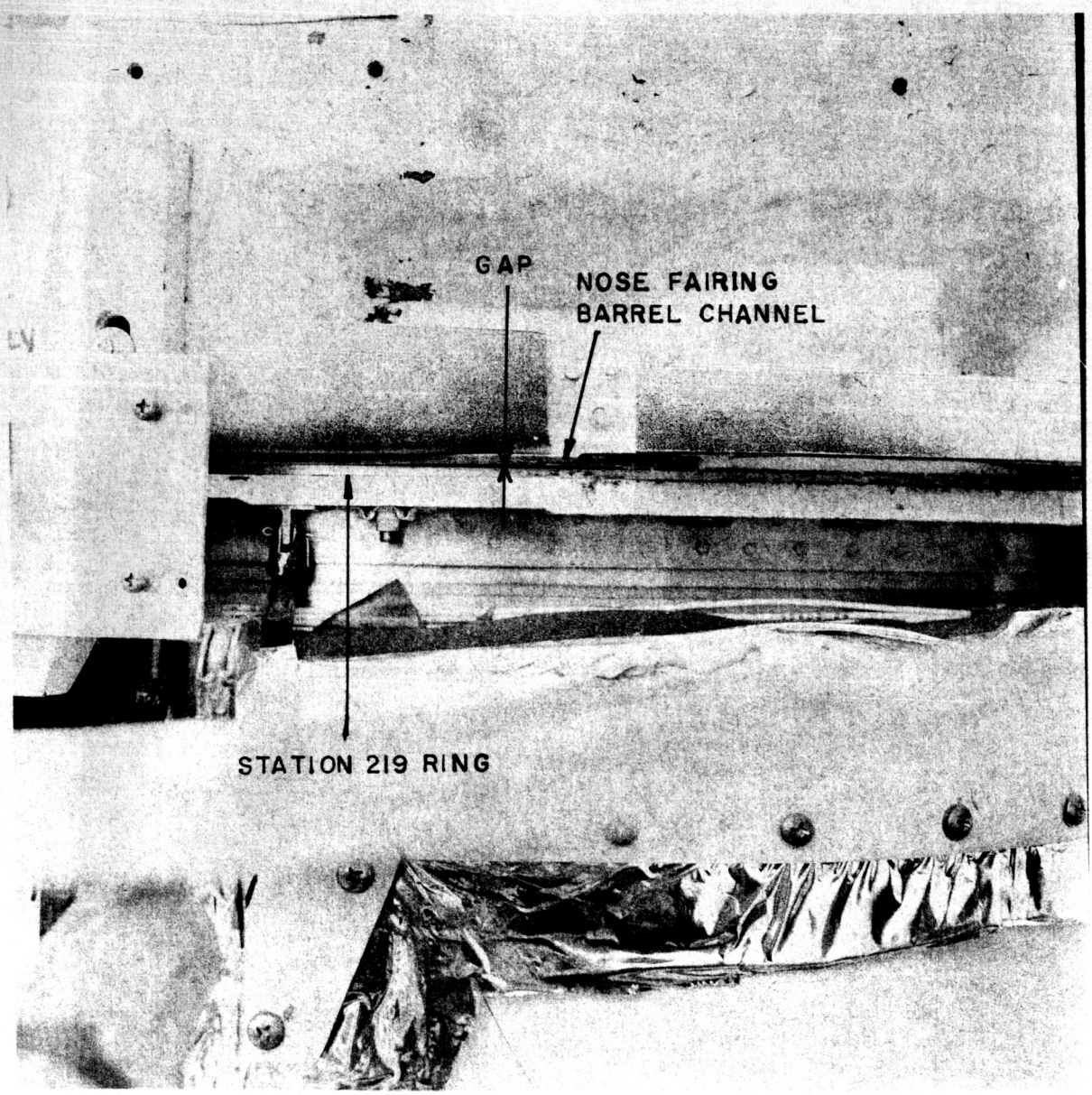
GAPS - QUAD III

FIGURE 41



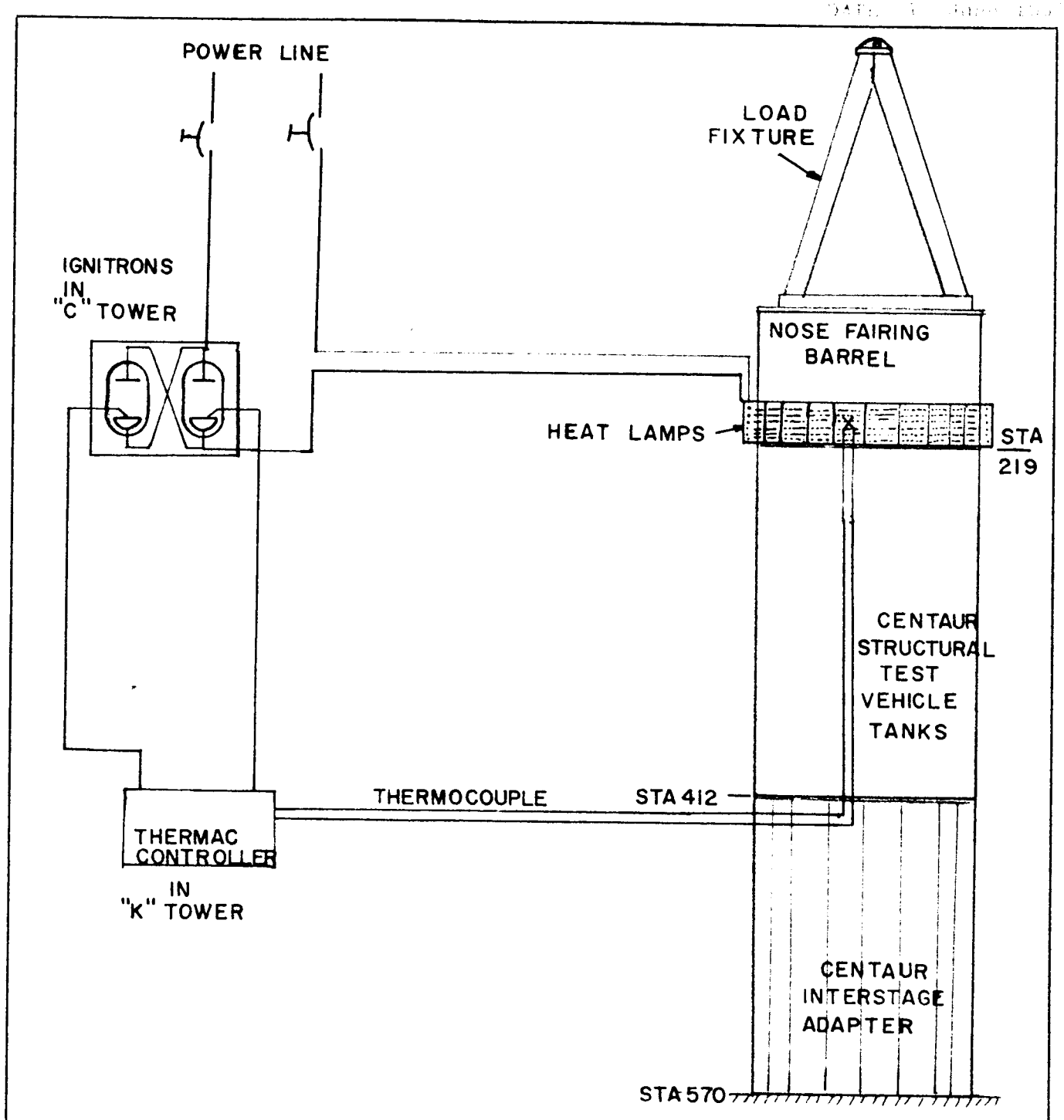
GAPS - QUAD IV

FIGURE 42



GAPS - QUAD I

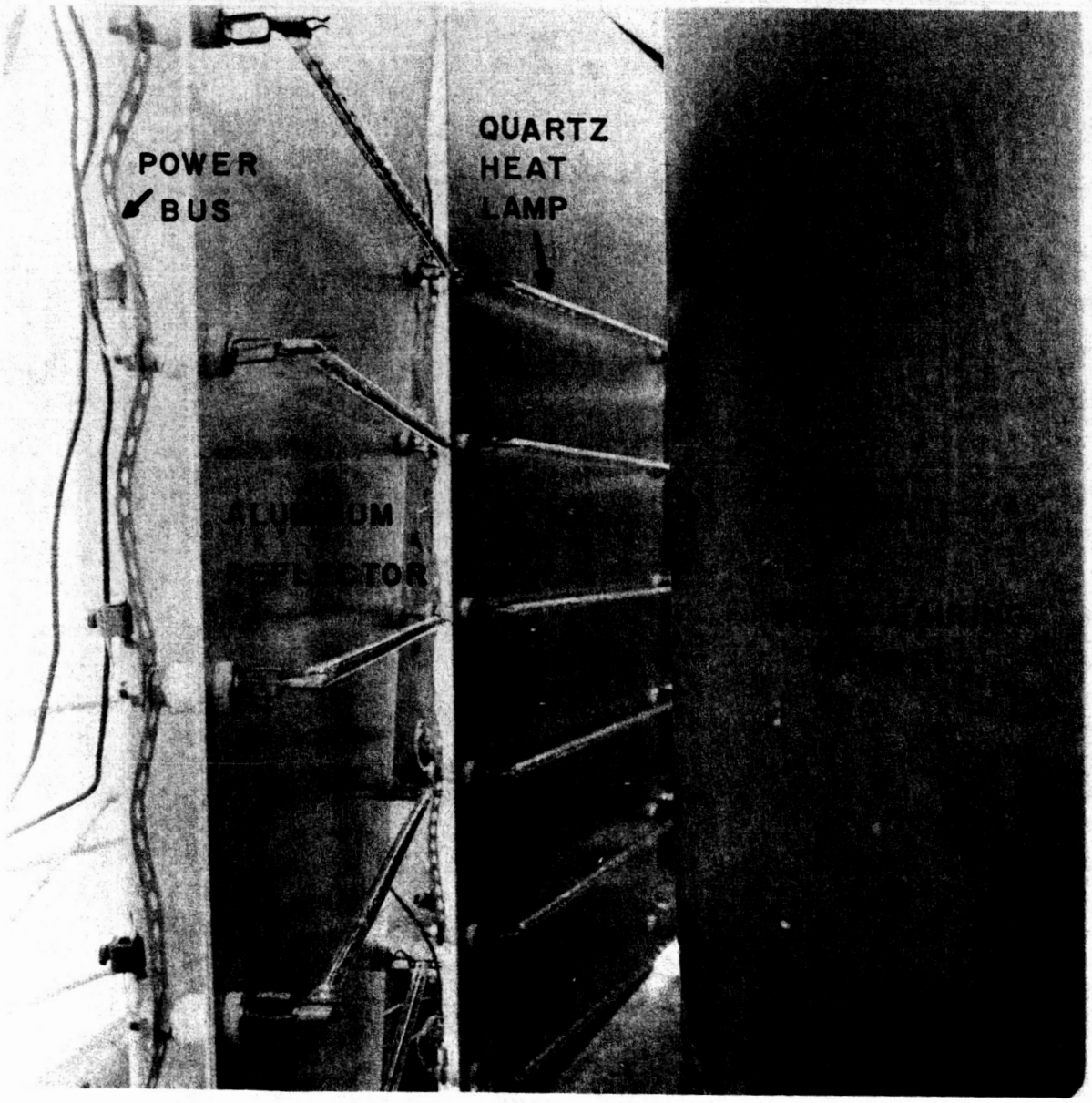
FIGURE 43



SIMULATED AEROHEAT SYSTEM

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
JSG	6-7-65				

FIGURE 44



STRUCTURAL HEATING SYSTEM

FIGURE 45

APPENDIX

INSTRUMENTATION REQUEST

SHEETS 1 THROUGH 26

INSTRUMENT ION REQUEST

SHEET 1 OF 26

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-64	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED			RECORDER INFO.		SIGNAL CONDITION TYPE	TRANS-DUCER TYPE	REV. NO.	TEST DATE
			RANGE	ACCURACY	FREQ. RESPONSE	TYPE	CHAN.				
P-1	Press.	Fuel Tank Ullage (see sh. #21)	0-25psig	1 0/0	Static	Dual Brown & 200 ch	156	STL 692	Stath.	1	
P-2	"	Oxid. Tank Ullage "	0-50psig	"	"	"	157	"	"	2	
P-3	"	Bulkhead Cavity Vacuum "	0-25psig	"	"	Dual Brown		"	"	3	
P-4	"	Insul. Panel Purge "	0-200 psig	"	"	"		"	"	4	
* P-5	"	Vacuum Chamber "	0-20psig	"	"	200 ch & Moseley	155	"	"	5	
P-6	"	Nose Fairing Purge "	0-15psig	"	"	Dual Brown		"	"	6	
P-9	"	Fwd. Purge Ring "	0-200 psig	"	"	"		"	"	7	
ΔP-1	Press. Diff.	Fuel Level "	0-7 psid	"	"	C Brown & 200 ch	158	"	"	8	
ΔP-2	"	Oxid. Level "	0-3 psid	"	"	"	159	"	"	9	
ΔP-3	"	Insul. Panel Purge "	0-5 psid	"	"	Dual Brown		"	"	10	
ΔP-4	"	Nose Fairing Purge "	0-5 psid	"	"	"		"	"	11	
										12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
Brown	1 in/min	1 min	10 hr
Moseley	1 in/min	1 min	4 hr

REMARKS: Moseley to be located on control side of blockhouse

* Used only for limit load test.

TEST ENG. SIGNATURE: J. Steibel

TEST ENG. LEADMAN: F. R. Jordan

INSTR. ENG. LEADMAN:

A1554 (REV. 10-64)

Report No. 65
Page No.
Date 16 June

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED			RECORDER INFO.		SIGNAL CONDITION TYPE	TRANS-DUCER TYPE	REV. NO.	TEST DATE
			RANGE	ACCURACY	FREQ. RESPONSE	TYPE	CHAN.				
-	Valve Posns.	For "K" Tower Control Valves Wired to EA Recorders	-	-		EA				1	
L-1	Load	Missile Compression (see sh. #22)	0-200K	1 0/0	Static	X-Y, 200 chMoseley	101	STL 692	STL	2	
L-2	"	Missile Shear Sta 99 "	0-20K	"	"	Moseley & 200 ch	102	"	"	3	
L-3	"	Missile Shear Sta 281 "	0-20K	"	"	"	103	"	"	4	
* L-4	"	Insul. Panel Quad I "	0-1K	"	"	"	104	"	"	5	
* L-5	"	Insul. Panel Quad II "	"	"	"	200 Digital	105	"	"	6	
* L-6	"	Insul. Panel Quad III "	"	"	"	"	106	"	"	7	
* L-7	"	Insul. Panel Quad IV "	"	"	"	"	107	"	"	8	
L-8	"	Side Load Sta 5.5	0-10K	"	"	Moseley & 200 ch	108			9	
P-8	Press.	N/F Purge Press.	0-1 psig	"	"	Dual Brown			5 psi	10	
										11	
										12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
Moseley	1 in/min	1 min	4 hr
EA	1 in/min	1 min	10 hr

REMARKS: L-1 thru L-4 & L-8 to be recorded on 200 Digital via Retransmit Slide Wire

* Used only for limit load test.

TEST ENG. SIGNATURE: J. Steibel

TEST ENG. LEADMAN: [illegible]

INSTR. ENG. LEADMAN

A1854 (REV. 10-64)

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED			RECORDER INFO.		SIGNAL CONDITION TYPE	TRANS-DUCER TYPE	REV. NO.	TEST DATE
			RANGE	ACCURACY	FREQ. RESPONSE	TYPE	CHAN.				
D-1	Deflect. Sta 219	Quad I (45°) R1	±1"	1 0/0	Static	200 Digital	112	XI101	Lock-heed	1	
D-2	"	" R2	"	"	"	"	113	"	"	2	
D-3	"	" V1	+ .5 to -1.5 "	"	"	"	114	"	"	3	
D-4	"	" V2	"	"	"	"	115	"	"	4	
D-5	"	+Y Axis V3	"	"	"	"	117	"	" ~~XI120~~	5	
D-10	"	+Y Axis V4	"	"	"	X-Y +200Dig.	118	"	"	6	
										7	
										8	
										9	
										10	
										11	
										12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs
30 Digital	~~1 ch/sec~~	none	~~10 hrs~~

REMARKS:

TEST ENG. SIGNATURE: J. Steibel

TEST ENG. LEADMAN: [illegible]

INSTR. ENG. LEADMAN:

A1554 (REV. 10-64)

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED: RANGE	ACCURACY	FREQ. RESPONSE	RECORDER INFO.: TYPE	CHAN.	SIGNAL CONDITION TYPE	TRANSDUCER TYPE	REV. NO.	TEST DATE
D-19	Deflect. Sta 219	+Y Axis V5	+5 to -1.5	1 0/0	Static	200 Dig.	119	XI101	Lockheed	1	
D-20	"	Quad II (45°) R1	±1	"	"	200 Digital	120	"	Lock-Heed	2	
D-21	"	" R2	"	"	"	"	121	"	"	3	
D-22	"	" V1	+.5 to -1.25	"	"	"	122	"	"	4	
D-23	"	" V2	"	"	"	"	123	"	"	5	
D-24	"	+Y Axis V6	+5 to -1.5	"	"	"	124	"	"	6	
D-25	"	Quad III (45°) R1	±1	"	"	"	125	"	Lock-Heed	7	
D-26	"	" R2	"	"	"	"	126	"	"	8	
D-27	"	" V1	+5 to -1.25	"	"	"	127	"	"	9	
D-28	"	" V2	"	"	"	"	128	"	"	10	
D-29	"	Quad IV (45°) R1	±1	"	"	"	129	"	"	11	
D-30	"	" R2	"	"	"	"	130	"	"	12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs

REMARKS:

TEST ENG. SIGNATURE: [signature]

TEST ENG. LEADMAN: [signature]

INSTR. ENG. LEADMAN

A1554 (REV.10-64)

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Strucutral Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED			RECORDER INFO.		SIGNAL CONDITION TYPE	TRANSDUCER TYPE	REV. NO.	TEST DATE
			RANGE	ACCURACY	FREQ. RESPONSE	TYPE	CHAN.				
D-31	Deflect. Sta 219	Quad IV (45°) V1	+5 to -1.25	1 0/0	Static	200 ch	131	XI101	Lock-heed	1	
D-32	"	" V2	"	"	"	200 Digital	132	"	"	2	
D-33	Deflect. Sta 412	Quad I (45°) R1	±1	"	"	"	133	"	"	3	
D-34	"	" R2	"	"	"	"	134	"	"	4	
D-35	"	" V1	-1.75 to +.25	"	"	"	135	"	"	5	
D-36	"	" V2	"	"	"	"	136	"	"	6	
D-37	"	Quad II (45°) R1	±1	"	"	"	137	"	"	7	
D-38	"	" R2	"	"	"	"	138	"	"	8	
D-39	"	" V1	-1.75 to +.25	"	"	"	139	"	"	9	
D-40	"	" V2	"	"	"	"	140	"	"	10	
D-41	"	Quad III (45°) R1	±1	"	"	"	141	"	"	11	
D-42	"	" R2	"	"	"	"	142	"	"	12	
D-43	"	" V1	-1.75 to +.25	"	"	"	143	"	"	13	
D-44	"	" V2	"	"	"	"	144	"	"	14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs

REMARKS

TEST ENG. SIGNATURE

TEST ENG. LEADMAN

INSTR. ENG. LEADMAN

A1504 (REV. 10-64)

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED			RECORDER INFO.		SIGNAL CONDITION TYPE	TRANS-DUCER TYPE	REV. NO.	TEST DATE
			RANGE	ACCURACY	FREQ. RESPONSE	TYPE	CHAN.				
D-45	Deflect. Sta 412	Quad IV (45°) R1	±1	1 0/0	Static	200 Digital	145	XI101	Lock-heed	1	
D-46	"	" R2	"	"	"	"	146	"	"	2	
D-47	"	" V1	-1.75 to +.25	"	"	"	147	"	"	3	
D-48	"	" V2	"	"	"	"	148	"	"	4	
D-49	Load Fixture Deflect	Sta 3.5, Defl. measured from Load Tower to +X	±3.0 in.	"	"	"	149	"	"	5	
D-50	"	Sta 3.5 Abs. Veh. Defl. to -X	"	"	"	"	150	"	"	6	
D-51	"	Sta 3.5 Veh. Defl. measured from Load Tower to +Y	"	"	"	200 Dig. & X-Y	151	"	"	7	
D-52	"	Sta 3.5 Abs. Veh. Defl. to -Y	"	"	"	200 Digital	152	"	"	8	
D-53	Defl. Hinge	NF Hinge Gap, +Y Axis, V7	0 to .07	"	"	200 Digital	153	"	STL	9	
D-54	"	NF Hinge Rad. Pos. +Y Axis R7	"	"	"	"	154	"	"	10	
	N O T E:	Plus (+) indicates upward deflection for vertical transducers								11	
		Plus (+) indicates inboard deflection [illegible] radial transducers								12	
D-55	Defl. Hinge	NF Hinge Gap, +Y axis, V8, QI	0 to .07	1[illegible]	static	200 Digital	168	"	"	13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs
Brown	1 in/min	1 min	10 hrs

REMARKS:

TEST ENG. SIGNATURE: [illegible]

TEST ENG. LEADMAN: [illegible]

INSTR. ENG. LEADMAN:

A1554 (REV. 10-64)

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED RANGE	ACCURACY	FREQ. RESPONSE	RECORDER INFO. TYPE	CHAN.	SIGNAL CONDITION TYPE	TRANSDUCER TYPE	REV. NO.	TEST DATE
S001	Strain	Sta 225 Quad I 73° Z Direction Outside	±2.0KME	5 0/0	Static	200 ch	001	XI101	see remarks	1	
S002	"	B " "	±3.5KME	"	"	200 Digital	002	"	"	2	
S003	"	C " "	"	"	"	"	003	"	"	3	
S004	"	Z " Inside	±2.0KME	"	"	200 ch	004	"	"	4	
S005	"	B " "	±3.5KME	"	"	200 Digital	005	"	"	5	
S006	"	C " "	"	"	"	"	006	"	"	6	
S007	"	Sta 225 QuadI 81°30'Z Direction Single Outside	±2.0KME	"	"	"	007	"	"	7	
S008	"	B " "	±3.5KME	"	"	"	008	"	"	8	
S009	"	C " "	"	"	"	"	009	"	"	9	
S010	"	Z " Inside	±2.0KME	"	"	"	010	"	"	10	
S011	"	B " "	±3.5KME	"	"	"	011	"	"	11	
S012	"	C " "	"	"	"	"	012	"	"	12	
S013	"	Sta 225 Quad I-II 90° Z Direction Outside	±2.0KME	"	"	200 ch	013	"	"	13	
S014	"	B " "	±3.5KME	"	"	200 Digital	014	"	"	14	
S015	"	C " "	"	"	"	"		"	"	15	

RECORDER INFORMATION TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	sch/sec	none	10 hrs

REMARKS: All are Single Strain Gages, type FNB-50-12-E Active Gage 120 nom.

TEST ENG. SIGNATURE

TEST ENG. LEADMAN

INSTR. ENG. LEADMAN

A1584 (REV. 10-64)

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED			RECORDER INFO.		SIGNAL CONDITION TYPE	TRANS-DUCER TYPE	REV. NO.	TEST DATE
			RANGE	ACCURACY	FREQ. RESPONSE	TYPE	CHAN.				
S016	Strain	Sta 225 Quad I-II 90° Z Direction Inside	±2.0KME	5 0/0	Static	200 ch	016	XI101	see remarks	1	
S017	"	B " "	±3.5KME	"	"	200 Digital	017	"	"	2	
S018	"	C " "	"	"	"	"	018	"	"	3	
S019	"	Sta 225 Quad II 98°30'Z Direction Outside	±2.0KME	"	"	"	019	"	"	4	
S020	"	B " "	±3.5KME	"	"	"	020	"	"	5	
S021	"	C " "	"	"	"	"	021	"	"	6	
S022	"	Z " Inside	±2.0KME	"	"	"	022	"	"	7	
S023	"	B " "	±3.5KME	"	"	"	023	"	"	8	
S024	"	C " "	"	"	"	"	024	"	"	9	
S025	"	Sta 225 Quad II 107° Z Direction Outside	±2.0KME	"	"	"	025	"	"	10	
S026	"	B " "	±3.5KME	"	"	"	026	"	"	11	
S027	"	C " "	"	"	"	"	027	"	"	12	
S028	"	Z " Inside	±2.0KME	"	"	"	028	"	"	13	
S029	"	B " "	±3.5KME	"	"	"	029	"	"	14	
S030	"	C " "	"	"	"	"	030	"	"	15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs

REMARKS: All are Single Strain Gages, type FNB-50-12-E, Active Gage, 120 nom.

TEST ENG. SIGNATURE

TEST ENG. LEADMAN

INSTR. ENG. LEADMAN

A1554 (REV. 10-64)

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED RANGE	ACCURACY	FREQ. RESPONSE	RECORDER INFO. TYPE	CHAN.	SIGNAL CONDITION TYPE	TRANSDUCER TYPE	REV. NO.	TEST DATE
S031	Strain	Sta 241 Quad I 48° Z Direction Outside	±2.0KME	5 0/0	Static	200 Digital	031	XI101	see remarks	1	
S032	"	C " "	±3.5KME	"	"	"	032	"	"	2	
S033	"	Z " Inside	±2.0KME	"	"	"	033	"	"	3	
S034	"	C " "	±3.5KME	"	"	"	034	"	"	4	
S035	"	Sta 241 Quad I 73° Z Direction Outside	±2.0KME	"	"	"	035	"	"	5	
S036	"	C " "	±3.5KME	"	"	"	036	"	"	6	
S037	"	Z " Inside	±2.0KME	"	"	"	037	"	"	7	
S038	"	C " "	±3.5KME	"	"	"	038	"	"	8	
S039	"	Sta 241 Quad I-II 90° Z Direction Outisde	±2.0KME	"	"	200 ch	039	"	"	9	
S040	"	C " "	±3.5KME	"	"	200 Digital	040	"	"	10	
S041	"	Z " Inside	±2.0KME	"	"	"	041	"	"	11	
S042	"	C " "	±3.5KME	"	"	"	042	"	"	12	
S043	"	Sta 241 Quad III 107° Z Direction Outside	±2.0KME	"	"	"	043	"	"	13	
S044	"	C " "	±3.5KME	"	"	"	044	"	"	14	
S045	"	Z " Inside	±2.0KME	"	"	"	045	"	"	15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs

REMARKS: All are Single Strain Gages, type FNB-50-12-E, Active Gage 120 Ω nom.

TEST ENG. SIGNATURE

TEST ENG. LEADMAN

INSTR. ENG. LEADMAN

A1004 (REV. 10-64)

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED RANGE	ACCURACY	FREQ. RESPONSE	RECORDER INFO. TYPE	CHAN.	SIGNAL CONDITION TYPE	TRANSDUCER TYPE	REV. NO.	TEST DATE
S046	Strain	Sta 241 107° Quad II C Direction Inside	±3.5KME	5 0/0	Static	200 Digital	046	XI101	see remarks	1	
S047	"	Sta 241 135° Quad II Z Direction Outside	±2.0KME	"	"	"	047	"	"	2	
S048	"	C " "	±3.5KME	"	"	"	048	"	"	3	
S049	"	Z " Inside	±2.0KME	"	"	"	049	"	"	4	
S050	"	C " "	±3.5KME	"	"	"	050	"	"	5	
S051	"	Sta 241 225° Quad III Z Direction Outisde	±2.0KME	"	"	"	051	"	"	6	
S052	"	C " "	±3.5KME	"	"	"	052	"	"	7	
S053	"	Z " Inside	±2.0KME	"	"	"	053	"	"	8	
S054	"	C " "	±3.5KME	"	"	"	054	"	"	9	
S055	"	Sta 241 270° Quad III-IV Z Direction Outisde	±2.0KME	"	"	200 ch	055	"	"	10	
S056	"	C " "	±3.5KME	"	"	200 Digital	056	"	"	11	
S057	"	Z " Inside	±2.0KME	"	"	"	057	"	"	12	
S058	"	C " "	±3.5KME	"	"	"	058	"	"	13	
S059	"	Sta 241 315° Quad IV Z Direction Outisde	±2.0KME	"	"	"	059	"	"	14	
S060	"	C " "	±3.5KME	"	"	"	060	"	"	15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs

REMARKS: All are Single Gages, type FNB-50-12-E, Active Gage, 120 nom.

TEST ENG. SIGNATURE: J. Steibel

TEST ENG. LEADMAN: [illegible]

INSTR. ENG. LEADMAN:

A1554 (REV. 10-64)

INSTRUMENTATION REQUEST

SHEET 11 OF 26

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED: RANGE	ACCURACY	FREQ. RESPONSE	RECORDER INFO.: TYPE	CHAN.	SIGNAL CONDITION TYPE	TRANSDUCER TYPE	REV. NO.	TEST DATE
S061	Strain	Sta 241 Quad IV 315° Z Direction Inside	±2.0KME	5 0/0	Static	200 Digital	061	XI101	see remarks	1	
S062	"	C " "	±3.5KME	"	"	"	062	"	"	2	
S063	"	Sta 397 Quad I 45° Z Direction Outside	±2.0KME	"	"	"	063	"	"	3	
S064	"	C " "	±3.5KME	"	"	"	064	"	"	4	
S065	"	Sta 397 Quad II 125° Z Direction "	±2.0KME	"	"	200 ch	065	"	"	5	
S066	"	C " "	±3.5KME	"	"	200 Digital	065	"	"	6	
S067	"	Sta 397 Quad III 225° Z Direction "	±2.0KME	"	"	"	066	"	"	7	
S068	"	C " "	±3.5KME	"	"	"	067	"	"	8	
S069	"	Sta 397 Quad III-IV 270° Z Direction "	±2.0KME	"	"	"	069	"	"	9	
S070	"	C " "	±3.5KME	"	"	"	070	"	"	10	
S071	"	Sta 397 Quad IV 305° Z Direction "	±2.0KME	"	"	200 ch	071	"	"	11	
S072	"	C " "	±3.5KME	"	"	200 Digital	072	"	"	12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs

REMARKS: All are Single Strain Gages, type FNB-50-12-E, Active Gage, 120 nom.

TEST ENG. SIGNATURE: J. Steibel

TEST ENG. LEADMAN: L. R. McLean

INSTR. ENG. LEADMAN:

A1554 (REV. 10-64)

INSTRUMENTATION REQUEST

SHEET 1 OF 26

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED			RECORDER INFO.		SIGNAL CONDITION TYPE	TRANSDUCER TYPE	REV. NO.	TEST DATE
			RANGE	ACCURACY	FREQ. RESPONSE	TYPE	CHAN.				
S077	Strain	Quad I Sta 547.56 Stiffener 9	±2.5KME	5 0/0	Static	200 Digital	077	XI101	See remarks	1	
S078	"	Quad I Sta 475.21 Stiffener 9	"	"	"	"	078	"	"	2	
S079	"	Quad I Sta 430.94 Stiffener 13	"	"	"	"	079	"	"	3	
S080	"	Quad I Sta 418.75 Stiffener 13½	"	"	"	"	080	"	"	4	
S081	"	Quad II Sta 418.75 Stiffener 18	"	"	"	"	081	"	"	5	
S082	"	Quad II Sta 475.21 Stiffener 21	"	"	"	"	082	"	"	6	
S083	"	Quad II Sta 445.94 Stiffener 24	"	"	"	"	083	"	"	7	
S084	"	Quad II Sta 430.94 Stiffener 24	"	"	"	"	084	"	"	8	
S085	"	Quad II Sta 445.94 Stiffener 26½	"	"	"	"	085	"	"	9	
S086	"	Quad II Sta 445.94 Stiffener 28	"	"	"	"	086	"	"	10	
										11	
										12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs

REMARKS:

S077-S079, Full Bridge 350 Ω

S081-S089, Full Bridge 350 Ω

S080 ½ Bridge 350 Ω

TEST ENG. SIGNATURE: J. Steibel

TEST ENG. LEADMAN: [illegible]

INSTR. ENG. LEADMAN:

A1854 (REV. 10-64)

INSTRUMEN[illegible]TION REQUEST

SHEET 13 OF 26

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED: RANGE	ACCURACY	FREQ. RESPONSE	RECORDER INFO.: TYPE	CHAN.	SIGNAL CONDITION TYPE	TRANSDUCER TYPE	REV. NO.	TEST DATE
S087	Strain	Quad II Sta 430.94 Stiffener 28	±2.5KME	5 0/0	Static	200 Digital	087	XI101	see remarks	1	
S088	"	Quad III Sta 475.21 Stiffener 39	"	"	"	"	088	"	"	2	
S089	"	Quad III Sta 430.94 Stiffener 42	"	"	"	"	089	"	"	3	
S073	"	N/F Hinge, Q I-IV, + Y Axis MLX	±5000 lb	"	"	X-Y 200 Dig.	073	"		4	
S074	"	N/F Hinge, Q II-III, -Y Axis MLX	"	"	"	"	074	"		5	
AA484S -A	"	Quad I Sta 496.75 Ring between Stiffener 60 and 1	±3.0KME	"	"	200 Digital	091	"	see remarks	6	
AA485S -A	"	Quad II Sta 496.75 Ring between Stiffener 15 and 16	"	"	"	"	092	"	"	7	
AA486S -A	"	Quad II Sta 496.75 Ring between Stiffener 20 and 21	"	"	"	"	093	"	"	8	
AA829S -A	"	Quad II Sta 526.07 Ring between Stiffener 20 and 21	"	"	"	"	094	"	"	9	
AA624S -A	"	Quad III Sta 547.01 Inside Stiffener 32	±3000 ME	"	"	"	095	"	"	10	
										11	
										12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs

REMARKS:
S087-S089 Full Bridge 350
AA4845 + AA8295 Single Gage 350
AA4855 + AA4865 Single Gage 120
AA6245 Single Gage 350

TEST ENG. SIGNATURE: J. Steibel
TEST ENG. LEADMAN: [illegible]
INSTR. ENG. LEADMAN:

A1554 (REV.10-64)

Report No. 55B 3309-4
Page No. 75
Date 16 June 1965

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED: RANGE	ACCURACY	FREQ. RESPONSE	RECORDER INFO.: TYPE	CHAN.	SIGNAL CONDITION TYPE	TRANSDUCER TYPE	REV. NO.	TEST DATE
AA625S -A	Strain	Quad I Sta 547.01 Inside Stiffener 2	±3000 ME	5 0/0	Static	200 Digital	096	XI101	see remarks	1	
AA626S -B	"	Quad I-II Sta 547.01 Inside Stiffener 15	"	"	"	"	097	"	"	2	
AA627S -A	"	Quad III-IV Sta 547.01 Inside Stiffener 45	"	"	"	"	098	"	"	3	
AA628S -A	"	Quad III Sta 547.01 Inside Stiffener 32	"	"	"	"	099	"	"	4	
AA629S -A	"	Quad I Sta 547.01 Inside Stiffener 2	"	"	"	"	100	"	"	5	
										6	
										7	
										8	
										9	
										10	
										11	
										12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs

REMARKS: All gages single 350

TEST ENG. SIGNATURE: J. Steibel

TEST ENG. LEADMAN: L. R. Carlson

INSTR. ENG. LEADMAN:

A1994 (REV. 10-64)

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED: RANGE	ACCURACY	FREQ. RESPONSE	RECORDER INFO.: TYPE	CHAN.	SIGNAL CONDITION TYPE	TRANSDUCER TYPE	REV. NO.	TEST DATE
T051	Temp.	Sta 225 Quad I 85°45' Outside	+170 to -330°F	5 0/0	Static	200 Digital	161	STL 618	see remarks	1	
T052	"	Sta 225 Quad I 85°45' Inside	"	"	"	"	162	"	"	2	
T053	"	Sta 241 Quad I 50° Outside	"	"	"	"	163	"	"	3	
T054	"	Sta 241 Quad I 50° Inside	"	"	"	"	164	"	"	4	
T055	"	Sta 397 Quad I 47° Outside	"	"	"	"	165	"	"	5	
T056	"	Tank Mounted NF Hinge, - Y axis	"	"	"	"	166	"	"	6	
T057	"	Tank Mounted NF Hinge, + Y axis	"	"	"	"	167	"	"	7	
										8	
										9	
										10	
										11	
										12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs

REMARKS: T051-T055, AA683T-AA686T are CVA 27-01287-7 Tem. Sensors. AA710T-AA713T are 30 Ga. Copper-Constantan Thermocouples.

TEST ENG. SIGNATURE: J. Steibel

TEST ENG. LEADMAN: [illegible]

INSTR. ENG. LEADMAN:

A1554 (REV. 10-64)

INSTRUMENTATION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED			RECORDER INFO.		SIGNAL CONDITION TYPE	TRANSDUCER TYPE	REV. NO.	TEST DATE
			RANGE	ACCURACY	FREQ. RESPONSE	TYPE	CHAN.				
T-1A	Temp.	Sta 202.5, Q I (56°) see sh. # 23	32°F to 500°F	5 0/0	Static	Ther-mac		none	CU/CN T/C	1	
T-1B	"	" Q I (57°) "	"	"	"	Dual Brown		"	"	2	
T-1C	"	" +X Axis "	"	"	"	"		"	"	3	
T-1D	"	" QII (1°) "	"	"	"	Ther-mac		"	"	4	
T-1E	"	" QII (15°) "	"	"	"	Dual Brown		"	"	5	
T-1F	"	" QII (14°) "	"	"	"	Ther-mac		"	"	6	
T-1G	"	" QIV (20°) "	"	"	"	Dual Brown		"	"	7	
T-1H	"	" QIV (21°) "	"	"	"	Ther-mac		"	"	8	
										9	
										10	
										11	
										12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs
Brown	1 in/min	1 min	10 hrs

REMARKS:

TEST ENG. SIGNATURE: J. Steibel

TEST ENG. LEADMAN: [illegible]

INSTR. ENG. LEADMAN:

A1554 (REV. 10-64)

INSTRUMENT ION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED			RECORDER INFO.		SIGNAL CONDITION TYPE	TRANS-DUCER TYPE	REV. NO.	TEST DATE
			RANGE	ACCURACY	FREQ. RESPONSE	TYPE	CHAN.				
T-2A	Temp.	Sta 217.0, QI (57°) (see sh. #23)	32°F to 500°F	5 0/0	Static	200 Digital	160	none	CU/CN T/C	1	
T-2B	"	" QII (15°) "	"	"	"	Dual Brown		"	"	2	
T-2C	"	" QII (14°) "	"	"	"	Ther-Mac		"	"	3	
T-2D	"	" QIV (20°) "	"	"	"	Dual Brown		"	"	4	
T-2E	"	" QIV (21°) "	"	"	"	Ther-Mac		"	"	5	
										6	
										7	
										8	
										9	
										10	
										11	
										12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION
200 Digital	5 ch/sec	none	10 hrs
Brown	1 in/min	1 min	10 hrs

REMARKS;

TEST ENG. SIGNATURE: J. Steibel

TEST ENG. LEADMAN: T. R. Nelson

INSTR. ENG. LEADMAN:

A1564 (REV. 10-64)

INSTRUMENT ION REQUEST

TEST TITLE	TEST ENG.	TEST NO./RUN NO.
EID 55-7545-1 Structural Test	J. Steibel	55B 3309

TEST AREA	REQUEST DATE	TEST DATE	INSTR. ENG.	CHARGE NO.
"K" Tower	4-1-65	4-13-65	E. Davis	K201706

MEAS. NO.	TYPE OF MEAS.	DESCRIPTION AND LOCATION OF THE MEASUREMENT	PARAMETERS DESIRED			RECORDER INFO.		SIGNAL CONDITION TYPE	TRANS-DUCER TYPE	REV. NO.	TEST DATE
			RANGE	ACCURACY	FREQ. RESPONSE	TYPE	CHAN.				
T-17	Temp.	Heat Exchanger (1A) Water	+32° to +100°F	5 0/0	Static	Meter	1	none	CU/CN T/C	1	
T-18	"	Heat Exchanger (1B) Water	"	"	"	"	2	"	"	2	
T-19	"	Heat Exchanger (2A) Water	"	"	"	"	3	"	"	3	
T-20	"	Heat Exchanger (2B) Water	"	"	"	"	4	"	"	4	
T-21	"	Nose Fairing Purge Gas	"	"	"	"	5	"	"	5	
T-22	"	Fuel Tank Bulk Temp (Sump)	Amb. to -320°F	"	"	Dual Brown			TSI	6	
T-23	"	Fuel F-D Line	"	"	"	"			"	7	
T24	"	NF Hinge gap X-ducer, V8.	"	"	"	200 Digital	169		CU/CN	8	
										9	
										10	
										11	
										12	
										13	
										14	
										15	

RECORDER INFORMATION

TYPE	SPEED	TIMING MARKS	RUN DURATION

REMARKS:

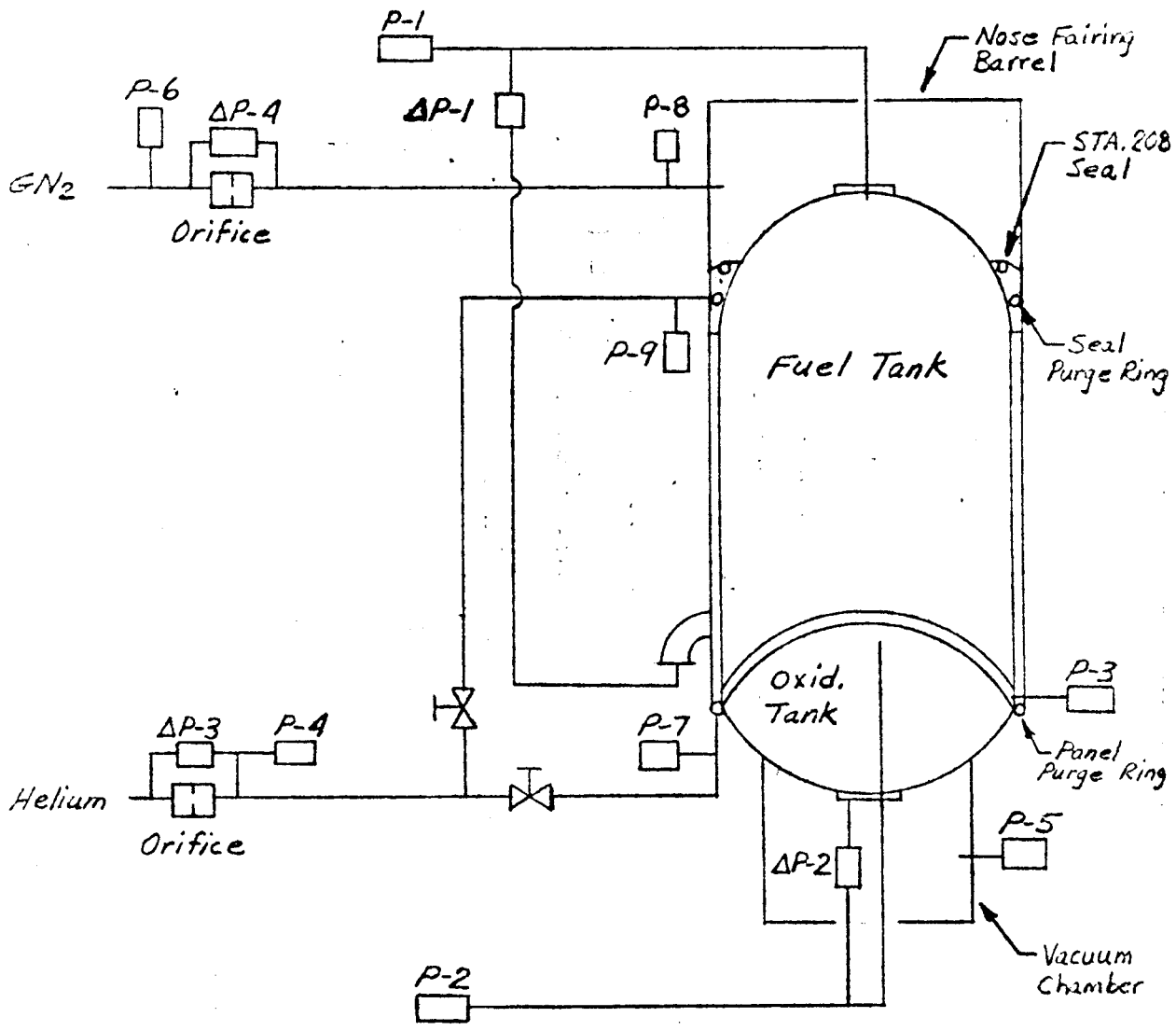
TEST ENG. SIGNATURE: J. Steibel

TEST ENG. LEADMAN: [illegible]

INSTR. ENG. LEADMAN:

A1884 (REV. 10-64)

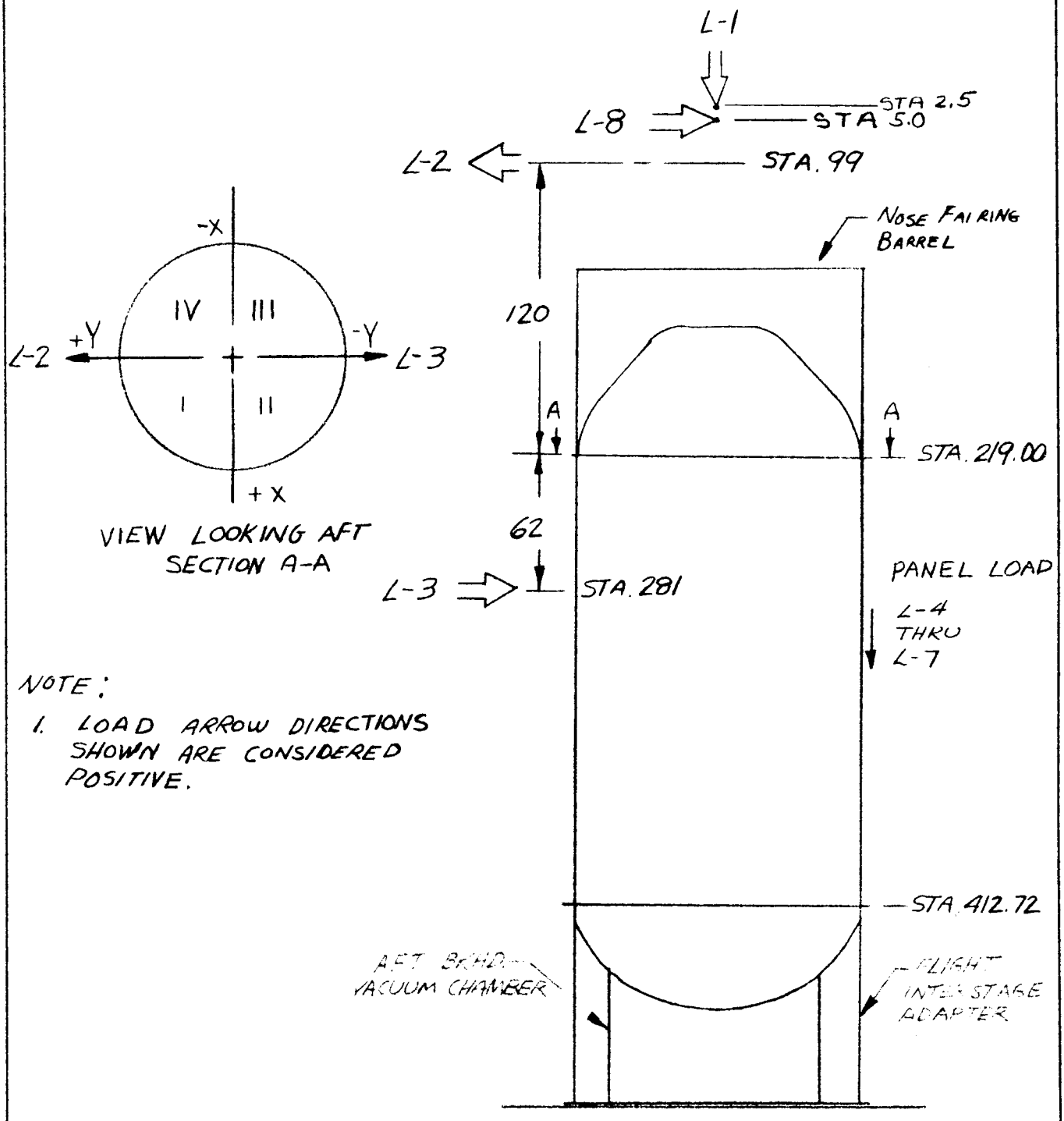
PRESSURE TRANSDUCER SCHEMATIC



PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
J. STEIBEL	4-7-65				

A706-1 (1-62)

STATION 219 & 412 TEST LOAD LOCATIONS

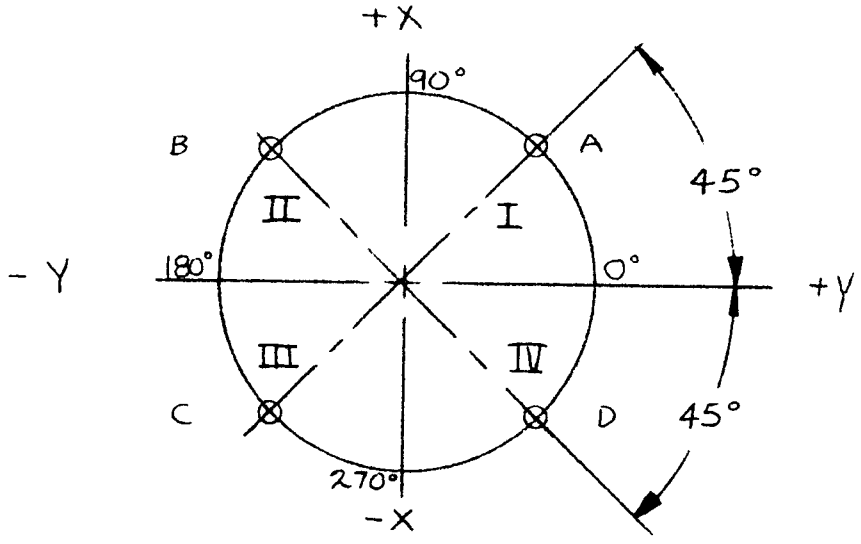


NOTE:

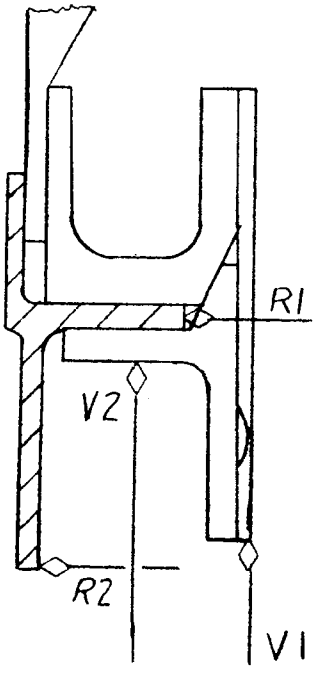
1. LOAD ARROW DIRECTIONS SHOWN ARE CONSIDERED POSITIVE.

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
J. STEIBEL	4.7.65				

LOCATIONS
STATION 219 DEFLECTION INSTRUMENTATION



VIEW FACING AFT - STA 219

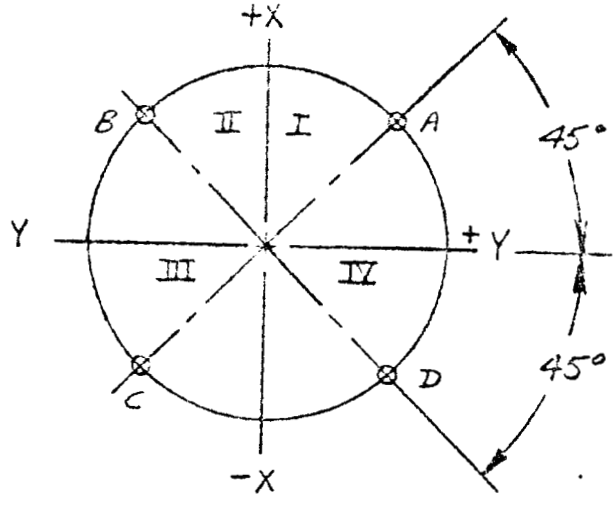


NOTE: THESE MEASUREMENTS ARE TO BE TAKEN AT A, B, C + D.

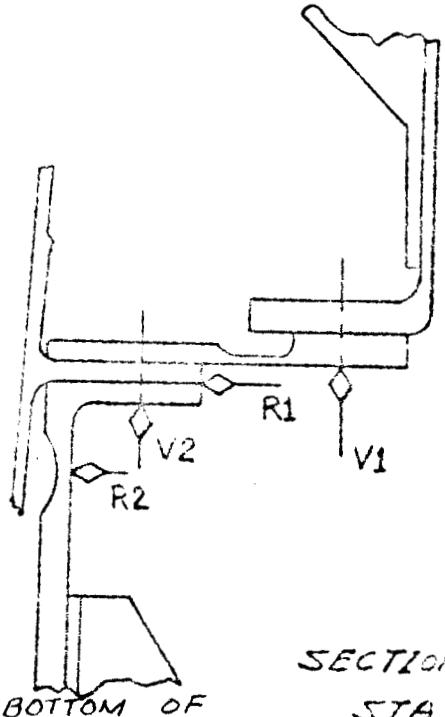
STA. 219

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY
J. STEIBEL				

STATION 412 DEFLECTION INSTRUMENTATION LOCATIONS



VIEW LOOKING AFT STA. 412



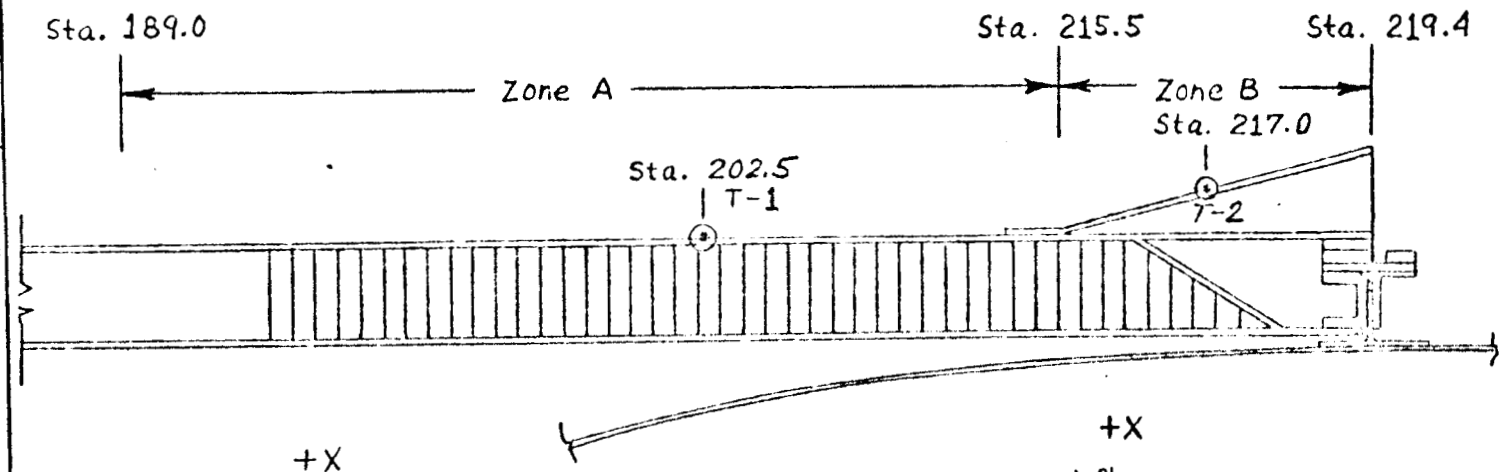
SECTION A, B, C, D
STA. 412

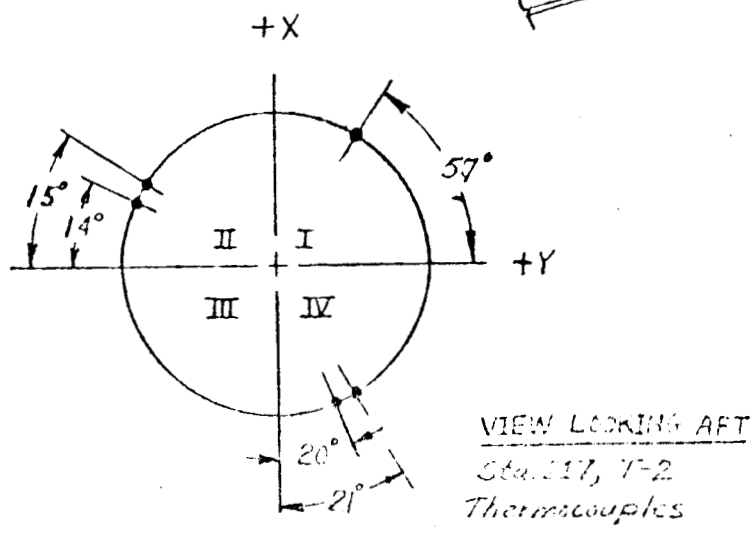
NOTE: BOTTOM OF INTERSTAGE ADAPT. IS STA. 570

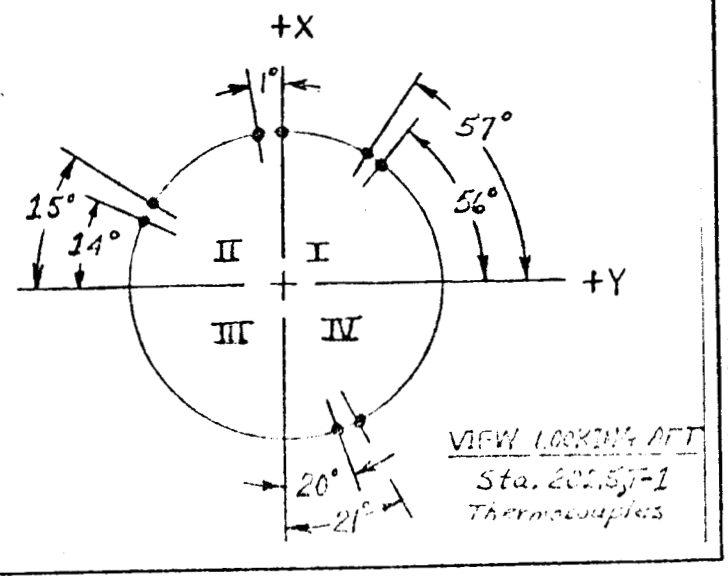
PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
J. STEIBEL	4.8.64				

HEAT ZONE AND THERMOCOUPLE LOCATIONS FOR VEHICLE NOSE FAIRING

NOTE: 1. PAINT NOSE FAIRING EXTERIOR SURFACE BLACK AFT OF STA 185.

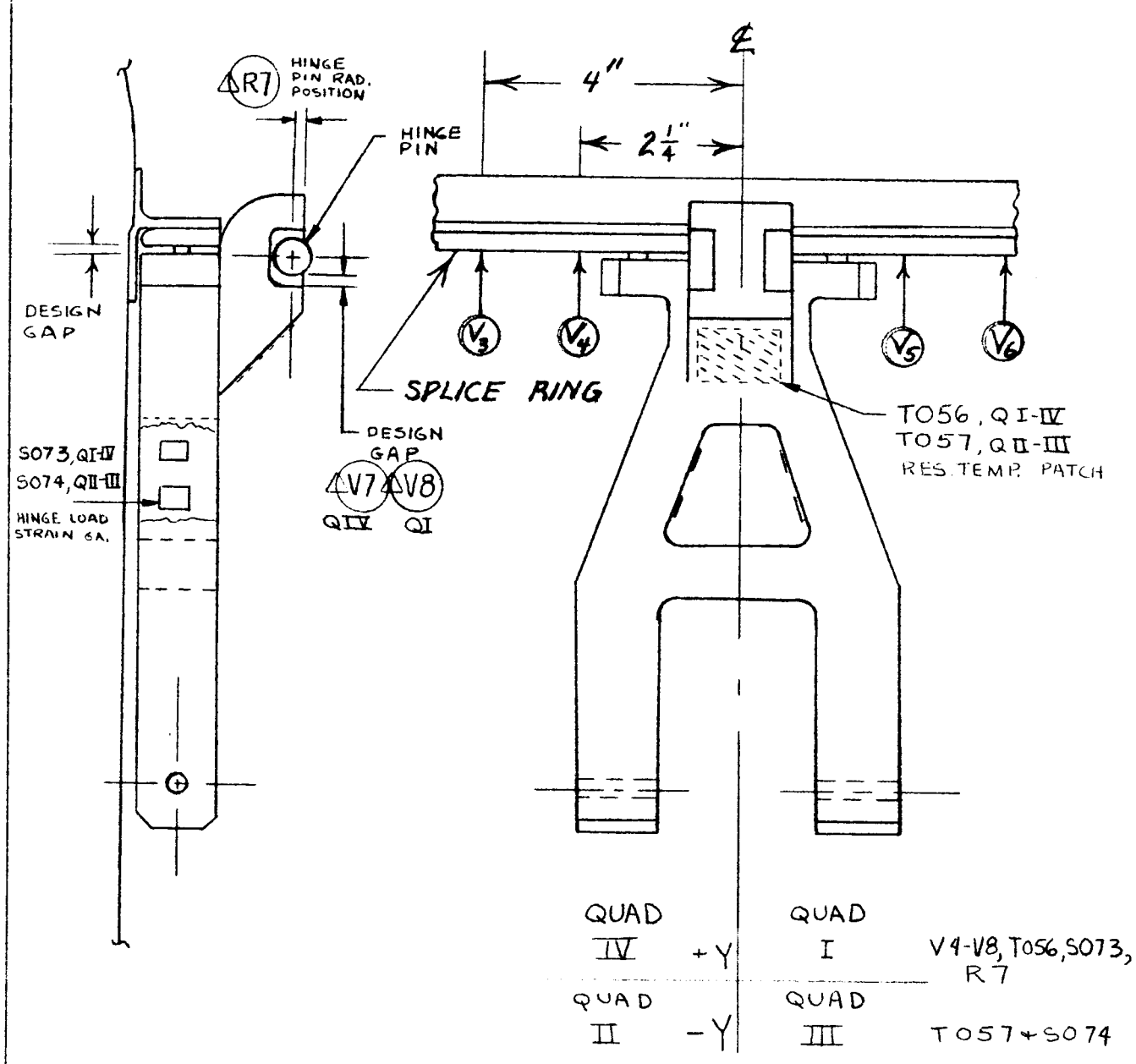






PREPARED BY J. STEIBEL DATE 4-8-65 CHECKED BY DATE REVISED BY DATE

STATION 219, Y AXIS, LOCATION OF NOSE FAIRING HINGE INSTRUMENTATION



PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
H.A.	3-25-65				

TABLE I - TEST NO. 55B 3309 TEST REQUIREMENT CONDITIONS

TEST TITLE AND DATA POINTS	COMP. LOAD L-1, LB.	SHEAR LOAD L-2, LB.	SHEAR LOAD L-3, LB.	PANEL LOAD L-4 THRU L-7, LB.	VAC. CHAMBER PSIG NEG.	BKHD. CAVITY PRESS, PSIA	FUEL TANK ULLAGE, PSIG	OXID. TANK ULLAGE PSIG	PROPELLANT LEVEL
TEST NO. 8 Y-Y AXIS									
STATION 219 & 412 COMBINED MAX αQ LIMIT DESIGN LOADS									
0% LOAD, NOM. PRESS	0	0	0	0	0	14.5±1.	5.±1.	20.±1.	
0% LOAD, TEST. PRESS	0	0	0	0	0		18.1±.5	31.±1.	
20% LOAD, " "	11880	2250	1200	60	0.38±.1				
40% LOAD, " "	23760	4500	2400	120	0.76±.1				
60% LOAD, " "	35640	6750	3600	180	1.14±.1				
80% LOAD, " "	47520	9000	4800	240	1.52±.1				
90% LOAD, " "	53460	10125	5400	270	1.71±.1				
100% LOAD, " "	59400	11250	6000	300	1.90±.1	14.5±1.	18.1±.5	31.±1.	FUEL TANK STA 184-186 OXID. TANK STA 388-390
TEST NO. 9 Y-Y AXIS									
STATION 219 MAX αQ ULTIMATE DESIGN LOADS.									
0% LOAD, NOM PRESS	0	0	0	0	0	14.5±1.	5.±1.	20±1.	
0% LOAD, TEST PRESS	0	0	0				18.1±.5	30.±1.	
20% LOAD, " "	11 880	2250	2780						
40% " " "	23,760	4500	5560						
60% " " "	35,640	6750	8330						
80% " " "	47,520	9000	11,120						
90% " " "	53,460	10,125	12,500						
100% " " "	59,400	11,250	13,900						
110% " " "	65,400	12,380	15,300						
120% " " "	71,400	13,500	16,700						
125%	74,300	14,100	17,400	0	0	13.5±1	18.1±.5	30.±1.	

PREPARED BY DATE CHECKED BY DATE REVISED BY DATE

TABLE 2, INSTRUMENTATION SUMMARY SHEET

TEST TITLE	TYPE MEASUREMENT: PRESSURE	LOAD	DEFLECTION (STA. 219)	DEFLECTION (STA 412)	TEMPERATURE (FACILITY)	DEFLECTION LOAD FIXT.
STA. 219 & 412 MAX α Q LIMIT DESIGN LOAD (PITCH AXIS MOMENT)	P1 THRU P9 ΔP1 THRU ΔP4	L1 THRU L8	D1 THRU D5, D10, D19 THRU D32 D53 AND D54	D33 THRU D-48	T17 THRU T24	D51 AND D52
STA. 219 MAX α Q - ULTIMATE DESIGN LOAD (PITCH AXIS MOMENT)	P1 THRU P-4 P6 THRU P-9 ΔP1 THRU ΔP4	L1 THRU L3 AND L8	D1 THRU D5, D10, D19 THRU D32 D53 AND D54	D33 THRU D48	T17 THRU T24	D51 AND D52

TEST TITLE	TYPE MEASUREMENT: TEMP. (STA 219) HEAT ZONE A & B	TEMP. (STA 412) ZONE C,D,E,F & TANK WALL	STRAIN GAGES - TANK & N/F HINGES	STRAIN GAGES INTERSTAGE ADAPTER	STRAIN GAGE AREA TEMPERATURE	LANDLINES REQ'D.
STA. 219 & 412 MAX α Q LIMIT DESIGN LOAD (PITCH AXIS MOMENT)	T1A THRU T1H T2A THRU T2E	———	S-001 THRU S-074	AA 484 THRU 486 AA 829 AA 624 THRU 629 (PRIMARY SA, BACKUP SB) S077 THRU S 089	T051 THRU 055	186
STA. 219 MAX α Q - ULTIMATE DESIGN LOAD (PITCH AXIS MOMENT)	↓		↓	↓	↓	181

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE
H.A.	3/26/5				