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LONG DURATION EXPOSURE FACILITY (LDEF)

STRUCTURAL VERIFICATION TEST REPORT

Thomas C. Jones, Melvin H. Lucy,
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Langley Research Center
Hampton, Virginia 23665

LONG DURATION EXPOSURE FACILITY

(LDEF) STRUCTURAL VERIFICATION TEST REPORT

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SUMMARY

A series of structural load tests on the Long Duration Exposure Facility's (LDEF) primary structure have been conducted. These tests had a three-fold purpose: (1) demonstrate structural adequacy of the assembled LDEF primary structure when subjected to anticipated flight loads; (2) verify analytical models and methods used in loads and stress analysis; and (3) perform tests to comply with the Space Transportation System (STS) requirements.

Test loads were based on predicted limit loads considering all flight events. Simulation of these limit loads on specified structural elements was accomplished by applying discrete load sets to the LDEF. Monitored data consisted of load, both applied and reacted, strain, and deflection measurements.

Evaluation of the test results shows good agreement between predicted and observed load, strain, and deflection data. In addition, test data show that the LDEF structure was subjected to 1.2 times limit load to meet the STS requirements. The st uctural adequacy of the LDEF is demonstrated as a result of this test.

INTRODUCTION

The LDEF has been developed by the NASA Office of Aeronautics and Space Technology and the Langley Research Center to accommodate a set of experiments which require a free-flying exposure in space. The experiments are totally self-contained in trays which are mounted on the facility structure.

The LDEF is delivered to Earth orbit by the Space Transportation System (STS) and placed in a gravity-gradient stabilized attitude by the STS remote manipulator system. After approximately 1 year in orbit, the LDEF is retrieved on a subsequent STS flight. After it is returned from space, the trays with experiments are removed and returned to the respective experimenters for post-flight inspection and analysis.

The design of the LDEF began in the mid-seventies, with a deployable weight of approximately 13,750 lbs. During this period, the size and arrangement of elements of the primary structure were selected. The majority of experiments consisted of relatively light debris experiments. More recently, the LDEF experiment manifest has changed to the current flight complement of many different types of experiments which, in general, weigh considerably more than the debris experiments. The current deployable weight is in excess of 21,000 lbs. During this time period, the load environments have matured. Coupled STS/LDEF transient analyses (references 1 and 2) have been performed which have allowed the structure to be evaluated from a loads/stress standpoint.

Structural testing is, in general, a convincing way to demonstrate structural adequacy. For LDEF, it is a culmination of activities, all of which were directed towards establishing confidence in the integrity of the structure. There are three interrelated verification test objectives. The first is to demonstrate that the LDEF structure can withstand anticipated flight loads. The second is to verify analytical models and methods used in

the loads and stress analyses. The third is to comply with the Space Transportation System (STS) requirement which states, "Static test a flight article or equivalent to 1.2 times limit load and design to an ultimate factor of safety, such that detrimental permanent deformation is precluded."

Simulation of 1.2 times limit load on specified structural elements was accomplished by analytically investigating the application of discrete load sets. Four test set-ups which simulated the maximum flight loadings during lift-off, maneuvering, and landing were developed. The magnitude, direction, and placement of the applied test loads were determined for each.

All four test set-ups had similar instrumentation. Reacted and applied loads were recorded for all tests, and strain gage data were recorded for selected structural elements. Deflections were recorded at the LDEF/test support interface and at selected locations on the LDEF structure.

TEST ORGANIZATIONAL STRUCTURE

The organizational structure for the test, indicating the major responsibilities for each activity, is shown on figure 1.

TEST ARTICLE

The deployable LDEF consists of two distinct parts: (1) the primary structure (or facility) and (2) the trays containing the experiments. The structural verification test described herein was performed on the primary structure.

The LDEF facility consists of a structural framework whose cross-section is a 12-sided regular polygon. It is approximately 30 feet long and 14 feet in diameter. The structure (shown in fig. 2) is designed to house 72 tray/experiments around its circumference and a total of 14 tray/experiments on the ends. The primary structure is made of aluminum, except for the steel trunnions and fasteners, and weighs about 8,500 pounds.

A schematic of the primary structure showing the basic structural components is shown in figure 3. The LDEF has five mechanical interfaces with the STS. There are two main trunnions reacting loads in the longitudinal and vertical directions. A keel trunnion reacts loads in the lateral direction. Finally, there are two end support beam trunnions reacting loads in the vertical direction.

The end frames are similar and consist of mechanically fastened 6-inch extruded I-beams. Tubular diagonal members (not shown) are mechanical links between the end frames and the center ring providing additional structural stiffness in both the vertical and horizontal planes. The end support beam (ESB), which consists of welded tubes and machined fittings, is on one end of the primary structure. It is free to rotate about a center spindle.

The center ring is fabricated in sections from two 10-inch extruded channels joined by welding 1/2-inch thick plates to form a "box." Sections of this box are welded to forgings, which provide structural ties for 24 mechanically fastened longerons, 12 on either side of the center ring. The two main trunnions are

mechanically fastened to the center ring 14 inches above the horizontal plane of symmetry. In the plane of the center ring, 7-inch extruded I-beams (not shown) are used to provide rigidity. A 12-inch extruded I-beam (not shown) provides a mechanical link between the two main trunnions.

The twenty-four longerons are 7-inch extruded I-beams mechanically fastened to the end frames and center ring. They provide the mounting surface for the experiment trays in the longitudinal direction. The "T" sections, or intercostals, are mechanically fastened to the longerons and are the mounting surfaces for experiment trays in the circumferential direction.

TEST SET-UP DESCRIPTION

A special test support frame (fig. 4) was designed, fabricated, and erected in the LaRC Structures Dynamics Research Laboratory, Building 1293B. This frame, with the LDEF in place (fig. 5), simulated the LDEF/STS interfaces and was located over a massive test floor adjacent to a backstop. Figure 6 illustrates the general layout of the LDEF test facility and associated equipment. The hydraulic load maintainers (fig. 7) and data acquisition system (DAS) (fig. 8) were operated from the adjacent Control Room. The hydraulic load maintainers were operated from a single control point by a single operator. A pneumatically operated load dump control was provided to facilitate emergency shutdown of the system. The pallet-mounted hydraulic pump (fig. 9) was located in the test bay with hard lines connecting it to the load maintainers in the Control Room. Remote controls for the pump were located at a single point in the Control Room. Flex hoses connected the hydraulic load maintainers, through interface manifolds, to the appropriate hydraulic loading cylinders. The majority of these cylinders were attached directly to the floor and to the floor-mounted center beam (fig. 10). The DAS, located in the Control Room,

was connected to the LDEF instrumentation sensors through interface boxes (fig. 11) located in the test cell. The acoustic emission monitoring system (fig. 12) was separately located. Visual monitoring of the tests was performed using two remotely operated TV systems and through a shatter-proof window in the Control Room. Two-way voice communication was provided between seven of tne test team members.

LOAD APPLICATION TRAIN

A typical test load application train for dual tension type load inputs to the LDEF structure is depicted on figure 13. It consisted of a hydraulic cylinder attached to the floor or backstop with a swivel eye and connected to a load cell or load link with an appropriate adapter. The load cell was connected to a yoke arrangement by structural chain, the latter used primarily to preclude rotation under load as would be encountered when using steel cable. The yoke arrangemment consisted of cable or structural chain attached to a spreader bar and polyester straps wrapped around specific LDEF joints and attached to the spreader bar. Rubber pads were placed between the polyester straps and the LDEF structure to protect the surface finish, eliminate slippage, and better distribute the load. This loading arrangement precluded the need for any structural modifications to the LDEF. Where necessary, adjustable reinforcing blocks were utilized to prevent the load strap from overloading unsupported flanges on some structural elements.

Various quantities, types, and sizes of hydraulic cylinder and load cell/load link were used during the tests as specified in tables I(a) through I(d). These tables illustrate locations of the LDEF load input by symbol and instrumentation signal conditioner channel number. Details of the load input and application trains are also listed. All elements of the load application

trains were certified prior to test initiation. Each hydraulic cylinder and load cell/load link combination was calibrated in a vertical position prior to test initiation to establish pressure levels used in each load maintainer channel. Since some of these load application trains were inclined to the vertical when in use, the actual load readings provided by the DAS were used for controlling and individually adjusting loads. Hydraulic pump supply pressure was adjusted as necessary during incremental loading to maintain a pressure 200-300 psig above that required at a given loading step.

INSTRUMENTATION

The instrumentation objectives included assuring that the proper loading conditions on the LDEF structure were achieved; that resulting loads, stresses, strains, deflections, and angular displacements were accurately measured; and that the information was permanently recorded. All instrumentation, except the strain gages, were separately calibrated against known, traceable standards. Standard gage factors were used for the stain gage instrumentation.

Deflectometers

The deflectometers used were MOXON Inc. model 1111-703-031 linear potentiometers precalibrated at 10-VDC over a range of 3 or 6 inches depending on the intended location. They were mounted in the test facility (typical mounting shown in fig. 14(a)) at various locations and attached (fig. 14(b)) to the LDEF or its support structure by cable, swivel-eye arrangements to measure x, y, and z displacements resulting from application of loads. Table II illustrates the attachment points on the LDEF and lists the instrumentation signal conditioner channel number and measurement direction. Also listed are the locations of attachments per the LDEF standard location designation (fig. 15), gage identification number, and reference voltage at the gage. For example,

from table II, the location of signal conditioner channel number D-7 is stated as "920 FL-A x." This represents LDEF location 920F (fig. 15) at the mid-point between L and A (end view) with movement measured in the x-direction. Also listed are instrumentation channels D-37 through 48 which represent the reference deflectometers used to measure any movement of the test structure near the four trunnion mounts. To avoid any modifications of the LDEF structure, deflectometers were attached to bolts placed in existing experiment tray mounting holes nearest the desired measurement location.

Load Cells

The number, type, and range of load cells varied for each of the four tests. Each load cell was precalibrated at 10-VDC in tension and/or compression. Tables I(a) through I(d) illustrate the load input/output locations that utilized load cells. Dual load inputs resulted from single hydraulically produced and monitored load sources that were equally split through a bridle arrangement (fig. 13). The angular direction at each load input was mechanically measured at the 20 or 40 percent loading steps during each test so that its force components could be correctly resolved by the computer. Figures 16(a) through 16(d) illustrate the approximate LDEF test facility load input attachment points for the four tests. The position of the backstop with relation to LDEF is also depicted along with the location of the beams on the floor. The numbered symbols relate to the instrumentation signal conditioner "A" channel numbers.

Table I(a) shows, that for the landing load test, 22 load cells were used to measure 34 load inputs and 2 reactions. Tabulated are the channel numbers for instrumentation hook-up; type, location on LDEF, and orientation of input load; load cell capacity, identification, and supply voltage; and type and size of hydraulic cylinder. Maximum hydraulic pump supply pressure is also stated for the 100 percent test loading condition. For example, signal

conditioner channel A-29 represents a single load input where location is stated as "911CH xz." From figure 15, this corresponds, to location 911C at joint H (end view) loaded toward the ESB in the x-z plane. The angle of this load, as measured from the horizontal, was 70° in the x-z plane and 85° in the y-z plane. A 10K tension measuring load link, identified as L10-6, was used to measure a maximum anticipated load of 7.2K. It had a measured reference voltage of 10.534 VDC. Signal conditioner channel A-47 is A-29's counterpart on the opposite side of the LDEF structure.

Strain Gages

All strain gages used were single axis Micro-Measurement model CEA-13-250UW-350. In only eleven instances, (center ring and diagonals) were the output of two gages combined to provide a single measurement.

Main trunnions. - Four strain gages were attached 90° apart on the two main trunnions, as shown in figure 17, to measure LDEF reaction loads. Each main trunnion was separately calibrated in bending in a special set-up (fig. 18) using a calibrated load cell. The trunnion being tested was rotated (0°, 90°, 180°, and 270°) in the fixture such that strain gages were calibrated in tension, compression, and a neutral position depending on their orientation relative the load input. These calibration values were input to the DAS computer program to calculate trunnion reaction loads during the four tests. The trunnion was also oriented at an angle and calibrated to simulate combined x-z loading.

LDEF structure. - The remaining 81 strain gages were located on representative LDEF members where analytical analysis indicated higher strains could be anticipated (e.g., center ring members adjacent to the main trunnions, longeron sections near the center ring and main trunnions, diagonal sections near the center ring, and portions of the ESB). These locations are noted on figures 19(a) through 19(h). Specific values for dimensions A through F shown

on figures 19(a) through 19(d) are listed in table III. The figures list the LDEF member on which particular gages are located, the strain gage number, the instrumentation signal conditioner channel number, and the LDEF location identifier. In this instance, the location identifier (fig. 15) becomes more complex. For example, from figure 19(a), strain gage number 37 is located on the side of the center ring (station 911D) away from the ESB, between joints C and B. It is at section "A" on the outside face (O) of the member.

Angle of Attack Indicators

The four angle-of-attack indicators (AOAI's) used were Sundstrand model no. 2000, capable of routinely measuring up to 30° angular change about their longitudinal axis with an accuracy of ±.01°. One pair, oriented 90° to each other, were mounted on a plate attached to the end of the right main trunnion (fig. 17) to measure LDEF pitching motions and apparent bending of the main trunnions in the vertical plane. A reference pair of AOAI's, similarly oriented, were mounted on the test support structure, as close to the first pair as possible, to indicate any test structure induced motions.

Pressure Gages

Up to 20 hydraulic cylinders were simultaneously used to provide load inputs to the LDEF structure. Heise MDL H dial pressure gages (fig. 7), calibrated to 3000 psi, were attached in the lines connecting the hydraulic load maintainers to the tension and compression sides of each hydraulic cylinder. Anticipated maximum pressure for maximum load was marked on each gage during pre-test calibration and checkout operations. Pressure was monitored, but not recorded, during test operations.

Acoustic Emission Monitoring

The major components of the acoustic emission monitoring system are depicted on figure 12. During the first three tests, an interlocking series of acoustic arrays was established around the exterior circumference of the center ring. Each array consisted of four high-sensitivity sensors with a center resonant frequency of 150 kHz. A typical installation is shown on figure 20. The risetime, duration, peak amplitude, and location of acoustic events were recorded. For the last test, some of the sensors were repositioned to monitor the ESB.

DATA ACQUISITION SYSTEM DESCRIPTION

The DAS (fig. 21) consisted of 200 data channels feeding four identical 50-channel signal conditioning chassis, each of which had its own regulated power supply. These four units were connected to two HP-3497A 100-channel data acquisition control units (scanners). The scanners, in turn, were attached to a HP-9845 computer combined with a HP-9872A plotter. During test operations, the computer could activate two separate alarms through a HP-59306A relay actuator to indicate either an out-of-limits condition (buzzer) or an overload condition (horn). In the run mode, the HP-9845's cathode ray tube (CRT) continuously displayed an update of 40 consecutively-scanned channels of selected information. These 40 channels included all input and interface reaction loads plus selected strain gage and deflectometer signals. During any scanning process, if the scanned channel were determined to be in an out-of-limit condition, its associated data would be presented on the CRT in a flashing mode and the buzzer would sound. If an overload condition were found to exist during the scan function, that data would appear on the CRT in inverse video and the horn would sound. When scanning all 200 channels, if out-of-limit or overload conditions were found to exist, again the buzzer or horn would

sound. The anticipated levels for out-of-limit and overload conditions were preprogrammed. The out-of-limit level incorporated a sliding set-point which was always greater than the expected test reading by an amount equal to 10 percent of the expected maximum test value. The overload level was set at 110 percent of maximum expected load value. Several out-of-limit indications occurred and these required assessment and adjustment as necessary of the loading method, instrumentation installation, or anticipated load. An overload condition required immediate dumping of the load followed by an adjustment.

At the maximum condition and incremental loading steps, the DAS operator would command the computer's thermal printer to provide a permanent copy of the 40-channel or the complete 200-channel data, and command the computer to store the raw and reduced data on the computer's two data tapes. The printouts also presented a bar chart showing the data as a percent of maximum anticipated value. The computer also presented comparisons between input and reaction loads for total resolved components and moments about each LDEF axis. The 200 channels consisted of 78 deflectometers, up to 22 load cells, 89 strain gages, 4 angle-of-attack indicators, 4 signal conditioning chassis power supply voltages, and 3 spares. Tables IV(a) through IV(d) list the 200-channel instrumentation hook-up for each test showing signal conditioner and scanner channel numbers, function being measured, LDEF position designator, sensor identifier, and measured reference voltage at the sensor.

One problem encountered with this DAS arrangement resulted from the differences in impedance between the various load cells and the total number used for each test. The effect was to change the reference voltage applied to all instrumentation connected to signal conditioning chassis "A" from the 10-VDC level at which they were calibrated. This included all load cells and 27 of the deflectometers. For each test, it was necessary to measure the

reference supply voltage at the sensor and to correct the calibration factor used in the computer accordingly by the ratio of voltages.

A contractor generated computer program[1] was used to access the instrumentation, convert values and display them in appropriate engineering units, provide permanent printouts, store raw and reduced data on tape, and compare actual instrumentation levels with predetermined values for status checks and appropriate warnings. As a further check, the computer also compared forces and moments summed about the various LDEF axes. The computer scan channel numbers 0-49 correspond to signal conditioner channels A-1 through A-50; likewise, scan channels 50-99, 100-149, and 150-199 correspond accordingly to 1 through 50 for B, C, and D. The program was readily accessible to provide the operator the ability to correct input values as deemed appropriate.

TEST LOADS

Internal forces and moments of the LDEF primary structure were calculated considering both ground handling and flight events. In general, the limit loads result from the transient STS events of lift-off and landing. The finite element model, which is used to determine limit load at the structural element level, includes stiffness and mass representations of the primary structure and the trays/experiments. These limit loads were developed by performing transient dynamic analyses using acceleration-time histories representing both lift-off and landing conditions supplied by the Rockwell International Corporation (ref. 2). Twelve lift-off and five landing transients were considered for each of the two specific locations of the LDEF in the STS Orbiter Bay.

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[1] Wyle Laboratories, Scientific Services and Systems Group: Operating Instructions for the Long Duration Exposure Facility (LDEF). Document Number SD63145-115RO-D3, April 1982. (Unpublished)

Verification test loads were defined as 1.2 times limit loads and is equal to the applied test loads which include those resulting from a 1G environment. These verification test loads were determined by iterative static analyses. Load sets were altered until internal forces and moments of selected structural elements were similar to 1.2 times flight loads. In addition, reaction loads were required to be at least 1.2 times flight induced reaction loads. Four tests were required to load all selected members to verification levels. The four tests were labeled as, (I) landing, (II) lift-off, (III) maneuvering, keel, and (IV) landing, ESB. A stress analysis using test loads was performed to show that no structure would be damaged as a result of testing.

Table I(a) locates the points where the test loads were applied for Test I - Landing. The loads from this configuration induced verification loading of the center ring, diagonals, trunnions, and longerons. This test used 20 hydraulic cylinders and 34 load input points. The second test is shown in a schematic in table I(b). Twelve hydraulic cylinders were used to apply 14 loads. Verification test loads were applied to the center ring, diagonals, trunnions, and longerons. The third test. representing a flight maneuver, was relatively simple. It required that discrete loads be applied at six locations on the center ring, as shown on table I(c), to achieve the verification test load on the keel trunnion and adjacent elements of the center ring. The final test loaded the ESB and end frame members to 1.2 times the limit load which represented a landing condition. Table I(d) locates the three applied loads used in this test.

RESULTS AND DISCUSSION

The success of the LDEF Structural Verification Test is based on an examination of load, strain, and deflection test data which show agreement with analytical predictions. During the four tests, selected elements of the LDEF structure were subjected to 120 percent of anticipated limit load. In achieving the test load on certain elements, others were subjected to levels other than limit, but in no case to levels that would cause structural damage.

Loads

The integrated loads listed in table V for the four tests consist of the applied load, 120 percent of limit load, and reacted load. Figure 3 identifies and locates components of the LDEF primary structure with respect to the longitudinal, vertical, and lateral directions. The desired 120 percent of limit load was met for all tests as shown by an examination of the applied and reacted loads. For all test configurations, the applied and reactive loads should be of equal magnitude. The largest difference occurred in Test III. The instrumentation for this test configuration did not allow measurement of the lateral frictional loads at the main trunnion. Inclusion of frictional loads would tend to reduce the difference in these measured loads.

Stresses

Table VI summarizes predicted and measured stresses for the most severely loaded member of each type of LDEF structural element. The first column represents 120 percent of the predicted stress due to the limit load condition. The second column represents the actual measured stress at the same point due to applied test loads. The third column represents the computed stresses using the applied test load.

Diagonals. - The eight LDEF diagonals have ball-joints at each end to minimize the transfer of moment. Of the eight, four were strain-gaged to define axial load. The resulting tensile stress of 5304 psi (table VI) was within 1/2 percent of the 120 percent tensile limit stress value. Using the applied load from Test I, the predicted stress for this member exceeded the measured (S.G. #94 on fig. 19-G) stress of 5304 psi by 6 psi. The limit compressive stress times 120 percent was -3372 psi. The measured test stress of -4111 psi exceeded the anticipated compressive stress by 21.9 percent. The predicted compressive stress based on the applied loads for this member was -4140 psi.

End Support Beam. - The ESB was instrumented to define both bending moment and axial force in two of the four hollow aluminum tubular members. The limit stress times 120 percent for the lower tube was 12,090 psi and was measured at 10,697 psi (S.G. #114 on fig. 19-H).

Center Ring. - The most highly stressed members of the center ring are directly above and below the main trunnions. The limit stress times 1.2 for the member below the main trunnion was 5,292 psi (S.G. #53 on fig. 19-D) which includes the contribution from axial force and two bending moments. The measured stress was 127.3 percent of 1.2 times limit stress. At this same point, the predicted stress based on the applied loads was 88.9 percent of the measured. The limit stress times 1.2 for the center ring members above the main trunnions was -5,412 psi compared with a corresponding measured stress of -5,505 psi (S.G. #37 on fig. 19-A). The predicted stress at this same point was -5,240 psi.

Longerons. - The limit stress for the longeron above the main trunnion has an axial compressive stress times 120 percent of -268 psi. The peak predicted axial stress of -312 psi was 2 percent greater in magnitude than the measured value (S.G.'s #73 through #80 on fig. 19-E).

Deflections

Vertical deflection versus length of the LDEF is shown on figures 22(a) through 22(d). The first two of these figures show deflections resulting from Test I. Figure 22(a) shows those deflections along the length of a longeron directly above the main trunnion and figure 22(b) shows those deflections along the bottom-most longeron. Applied loads for Test I are principally in the vertical direction. Examination of the resulting measured deflection data does not suggest a need for either a significant translational or rotational rigid body correction. Figures 22(c) and 22(d) refer to the vertical deflections of the same longerons due to Test II. For this test, the applied load components in the vertical and longitudinal directions were more nearly equal than in Test I. Measured deflection at the support locations, while small, is not consistent and therefore can not be used as a correction for rigid body motion. Examination of the deflection data shown on figure 22(c) does suggest that a rigid body translation and rotation has taken place. A rigid body correction obtained by enforcing like displacements equal at the main trunnion (LDEF length - 190 inches) and the longeron at the ESB end (LDEF length - 360 inches) substantially improves the predicted and measured deflection data for both longerons.

For all test loadings, the deflection along the length of LDEF, both above and below the main trunnion, show good agreement between measured and computed. The test data consistently indicated a slightly stiffer structure than was predicted by the analysis.

Post-Flight Inspection

During Test II, the acoustic monitoring instrumentation indicated a localized activity in the region of the right main trunnion. Post-test inspection did reveal a weld imperfection in a fillet weld on a gusset which was repaired by local surface grinding. Post-test visual, eddy current, and dye penetrant examinations of the center ring and ESB welds indicated no additional anomalies.

CONCLUSIONS

All test objectives were achieved. A review of test data and post-test inspection of the flight hardware shows that the LDEF structure is adequate to survive all flight induced loads. Test data comparisons with analyses demonstrate good agreement when examining load, strain, and deflection data. This agreement verifies the analytical models and methods used in the loads and stress analyses. Since the test loads were at least equal to 1.2 times anticipated flight loads, the final test objective, "Static test a flight article to 1.2 times limit load and design to an ultimate factor of safety such that detrimental permanent deformation is precluded as a result of test," was also met.

REFERENCES

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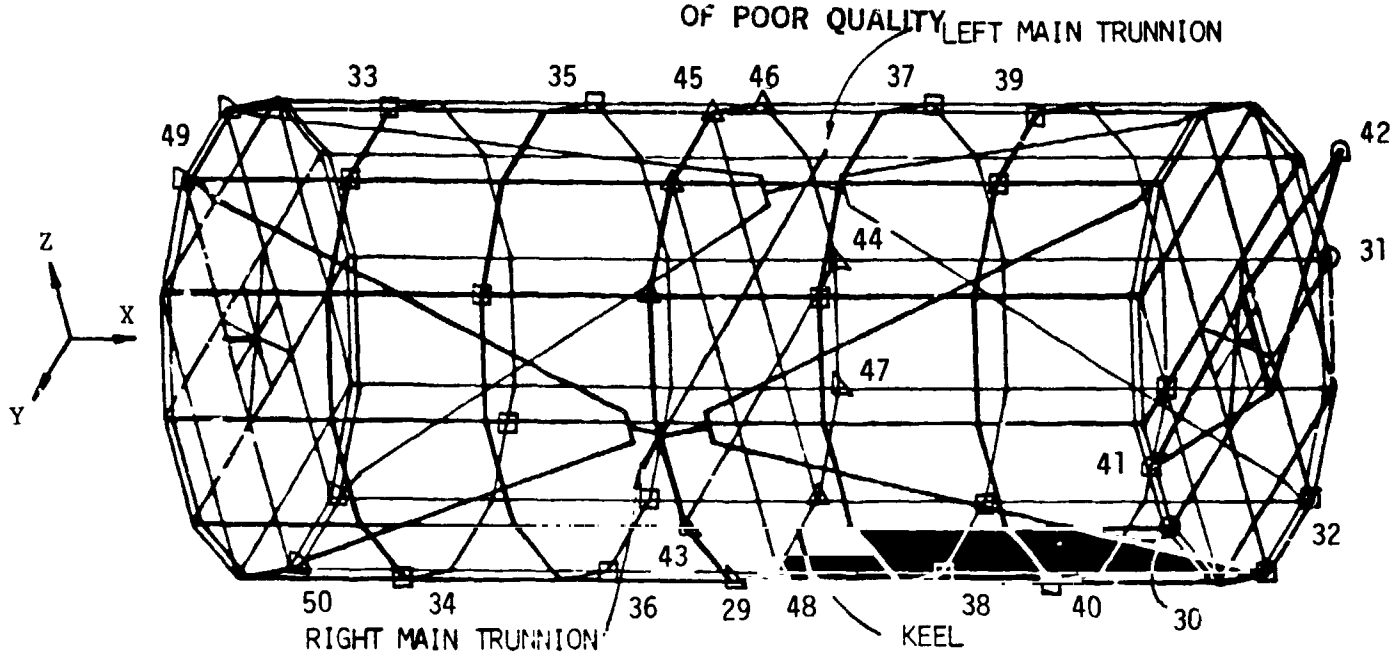
2. Chao, R. S.; Leang, J. T.; and Conner, J. M.: Load Data Book for Long Duration Exposure Facility (LDEF) Cargo System. Rockwell International, Space Operations/Integration and Satellite Systems Division, STS82-0307, April 1982.



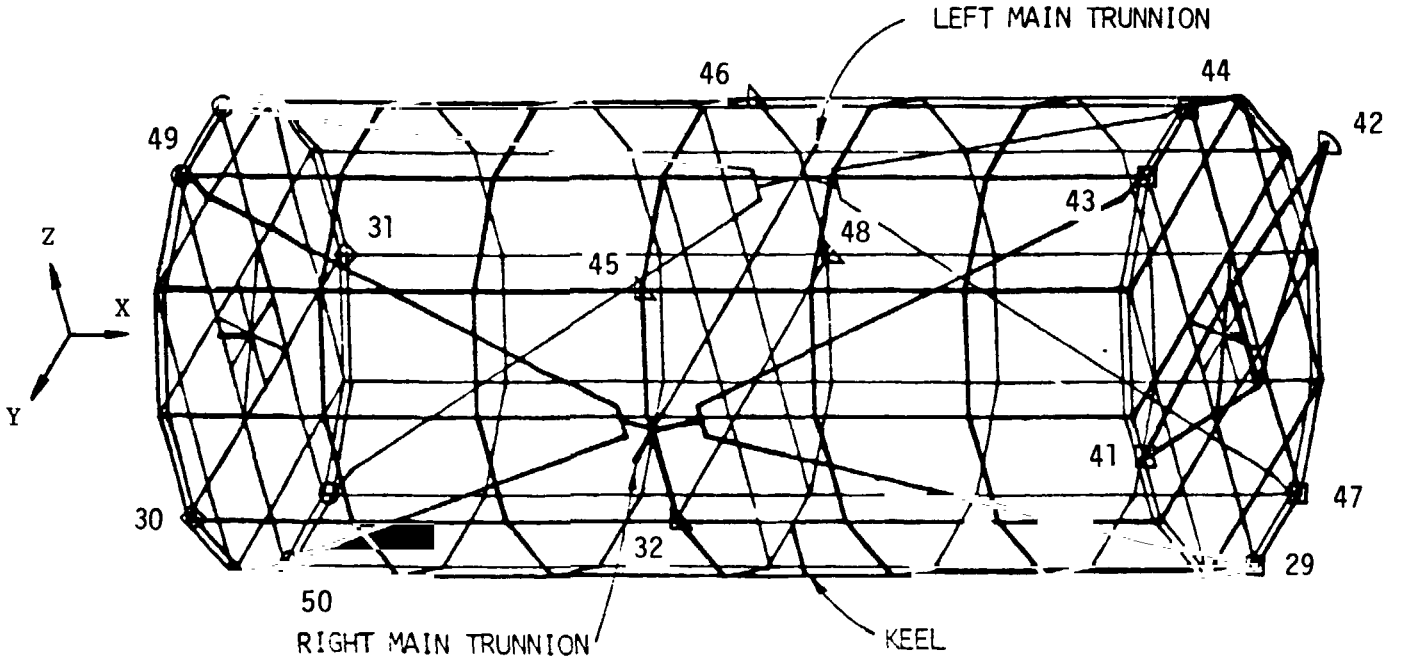
3000 psi PUMP PRESS MAX.

SYM.	CHAN. NO.		LOAD INPUT			LOAD CELL		HYD. CYL.	
	SIG. CONDT.	SCANNER	TYPE OF	LOCATION	MEAS. % XZ/YZ	IDENT. #	VOLT. @ GAGE	TYPE	PISTON AREA IN2
△	A-29	28	SGL	911CH XZ	70/85	L10-6	10.534	P/HBB2HLS14	4.125
○	A-30	29	SGL	916AI Z	90/87	L5-1	9.984	HYDRO N2C	2.35
○	A-31	30	SGL	916AD Z	89/93	L5-2	9.980	HYDRO N2C	2.357
□	A-32	31	DUAL	916AF-G Z	87/89	5-77	10.529	P/HBB2HLS14	1.460
□	A-33	32	DUAL	936EA-L Z	86/90	L5-4	9.993	P/HBB2HLS14	1.460
□	A-34	33	DUAL	936EE-H Z	89/91	5-38	10.517	P/HBB2HLS14	1.460
□	A-35	34	DUAL	936DB-K Z	86/92	5-39	10.519	P/HBB2HLS14	1.460
□	A-36	35	DUAL	936DF-G Z	90/90	5-40	10.513	P/HBB2HLS14	1.460
□	A-37	36	DUAL	936CB-K Z	81/90	5-41	10.561	P/HBB2HLS14	1.460
□	A-38	37	DUAL	936CF-G Z	87/90	5-43	10.518	P/HBB2HLS14	1.460
□	A-39	38	DUAL	936BA-L Z	83/90	5-45	10.517	P/HBB2HLS14	1.460
□	A-40	39	DUAL	936BE-H Z	80/90	5-46	10.513	P/HBB2HLS14	1.460
* □	A-41	40	SGL	RESBTRUN Z	---	L10-5	9.877	---	---
* □	A-42	41	SGL	LESBTRUN Z	---	L12-10	10.532	---	---
△	A-43	42	SGL	911CI XZ	61.5/92	L10-7	10.531	P/HBB2HLS14	4.125
△	A-44	43	SGL	911CD XZ	62.5/81	L10-8	10.532	P/HBB2HLS14	4.125
△	A-45	44	DUAL	911CA-L XZ	62/90	20-58	9.967	P/HTC2HLS33	7.660
△	A-46	45	DUAL	911CE-K XZ	70/90	20-59	9.928	P/HTC2HLS33	7.660
△	A-47	46	SGL	911CE XZ	70/93	L10-9	10.532	P/HBB2HLS14	4.125
□	A-48	47	DUAL	911CF-G XZ	58.25/90	20-73	9.965	P/HTC2HLS33	7.660
□	A-49	48	DUAL	920FA-L XZ	47.5/90	20-77	9.965	P/HTC2HLS33	7.660
□	A-50	49	DUAL	920FF-G XZ	48.5/90	20-76	9.929	P/HTC2HLS33	7.660

* REACTION LOAD

Above @ 20% Load

TABLE I A.- LOAD INPUT LOCATION AND INFORMATION FOR "LANDING" TEST



CONTROL ROOM SIDE

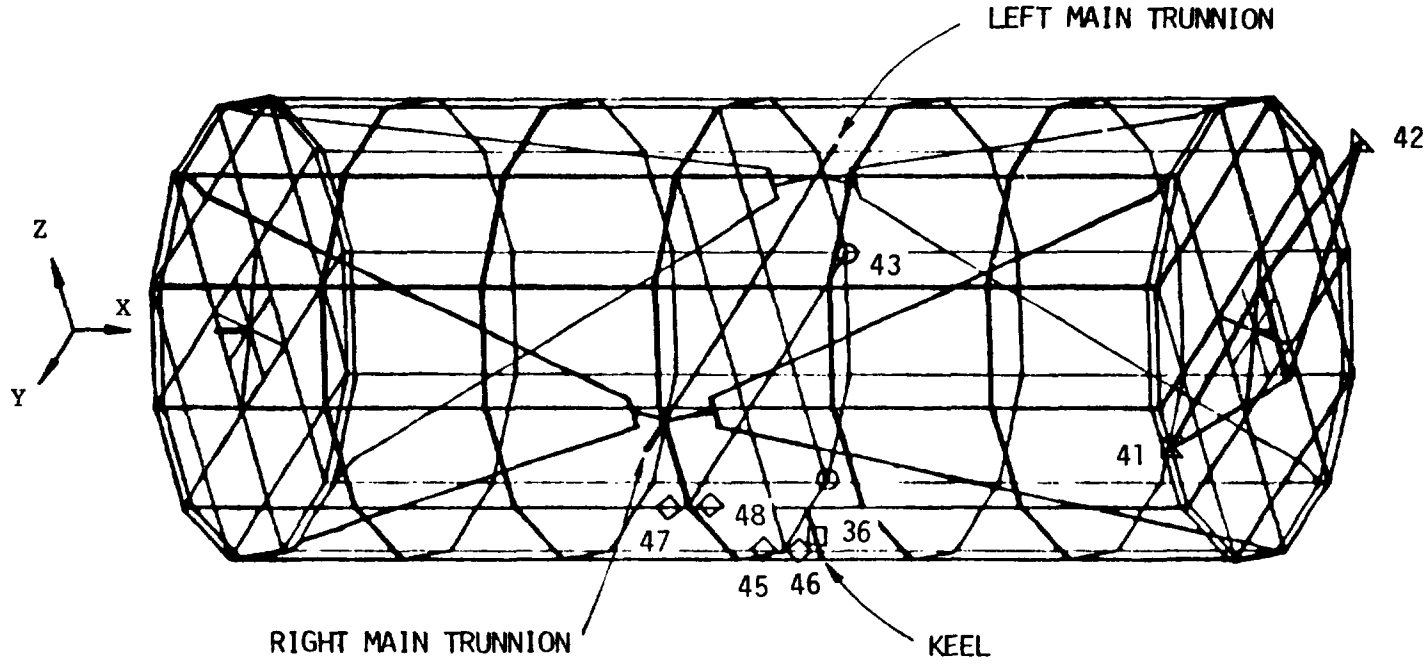
NUMBERS SHOWN ARE SIGNAL CONDITIONER CHANNEL "A" NUMBERS

2500 psi PUMP PRESS MAX.

SYM.	CHAN. NO.		LOAD INPUT			LOAD CELL		HYD. CYL.	
	SIG. CONDT.	SCANNER	TYPE OF	LOCATION	MEAS Z XZ/YZ	IDENT. #	VOLT. @ GAGE	TYPE	PISTON AREA IN^2
◇	A-30	29	SGL	920FI Z	90°	L5-4	9.985	HYDRO N2C	2.357
◇	A-31	30	SGL	920FD Z	90°	L5-2	9.982	HYDRO N2C	2.357
□	A-29	28	SGL	916AG XZ	40°	L10-6	10.534	P/HBB2HLS14	4.125
□	A-47	46	SGL	916AF XZ	39°	L10-9	10.534	P/HBB2HLS14	4.125
* △	A-41	40	SGL	RESBTRUN Z	----	L10-5	9.983	---	---
* △	A-42	41	SGL	LESBTRUN Z	- --	L12-10	10.530	---	---
□	A-43	42	SGL	916AL XZ	28°/	L10-7	10.538	P/HBB2HLS14	4.125
□	A-44	43	SGL	916AA XZ	25°/	L10-8	10.534	P/HBB2HLS14	4.125
△	A-45	44	SGL	911CK XZ	55°/9°	20-58	9.967	P/HTC2HLS33	7.660
△	A-46	45	SGL	911CB XZ	55°/10°	20-59	9.928	P/HTC2HLS33	7.660
△	A-32	31	SGL	911CI XZ	60°/4°	20-65	9.900	P/HTC2HLS33	7.660
△	A-48	47	SGL	911CD XZ	60°/3°	20-73	9.965	P/HTC2HLS33	7.660
○	A-49	48	DUAL	920FA-L XZ	5°/	20-77	9.931	P/HTC2HLS33	7.660
○	A-50	49	DUAL	920FF-G XZ	5°/	20-76	9.933	P/HTC2HLS33	7.660

* REACTION LOAD

TABLE I B.- LOAD INPUT LOCATION AND INFORMATION FOR "LIFTOFF" TEST



CONTROL ROOM SIDE

NUMBERS SHOWN ARE SIGNAL CONDITIONER CHANNEL "A" NUMBERS

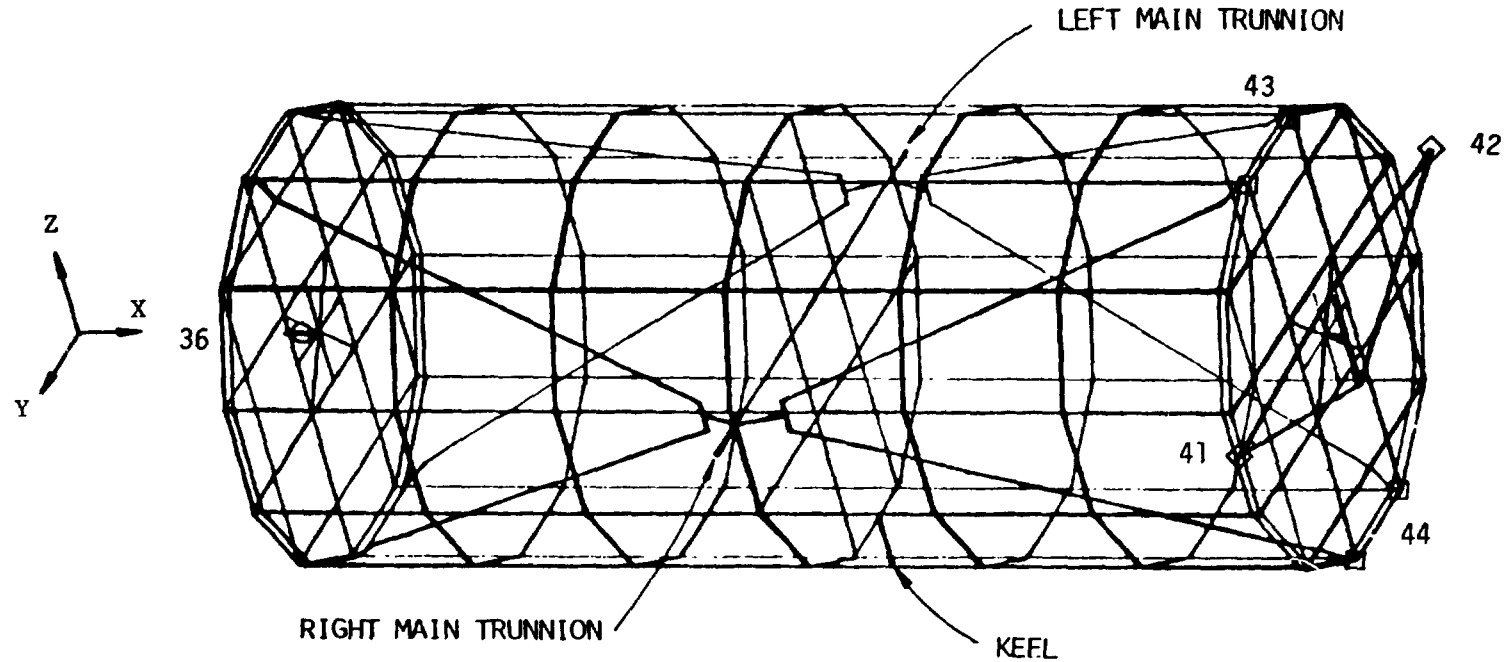
1500 psi PUMP PRESS MAX.

	SYM.	CHAN. NO.		LOAD INPUT			LOAD CELL		HYD. CYL.	
		SIG. CONDT.	SCANNER	TYPE OF	LOCATION	MEAS XZ/YZ	IDENT. #	VOLT. @ GAGE	TYPE	PISTON AREA IN^2
*	□	A-36	35	SGL	KEEL Y	---	50-23	10.518	---	---
*	△	A-41	40	SGL	RESBTRN Z	---	L10-5	9.982	---	---
*	△	A-42	41	SGL	LESBTRUN Z	---	L12-10	10.529	---	---
	○	A-43	42	SGL	911CDD Y	0°	L10-8	10.525	P/HBB2HLS14	4.125
	○	A-44	43	SGL	911CDF Y	.5°DWN	L10-6	10.531	P/HBB2HLS14	4.125
**	◇	A-45	44	SGL	911DI Y	2°DWN	L10-7	10.534	P/HBB2HLS14	4.125
**	◇	A-46	45	SGL	911CI Y	2°DWN	L10-9	10.530	P/HBB2HLS14	4.125
**	◇	A-47	46	SGL	911DG Y	1°DWN	L5-4	9.977	P/HBB2HLS14	4.125
**	◇	A-48	47	SGL	911CG Y	1°DWN	L5-2	9.968	P/HBB2HLS14	4.125

* REACTION LOAD

** Ea. Located 8.4" Either Side of Cntr. of Cntr. Ring ↑ Above @ 40% Load

TABLE I c.- LOAD INPUT LOCATION AND INFORMATION FOR "KEEL" TEST

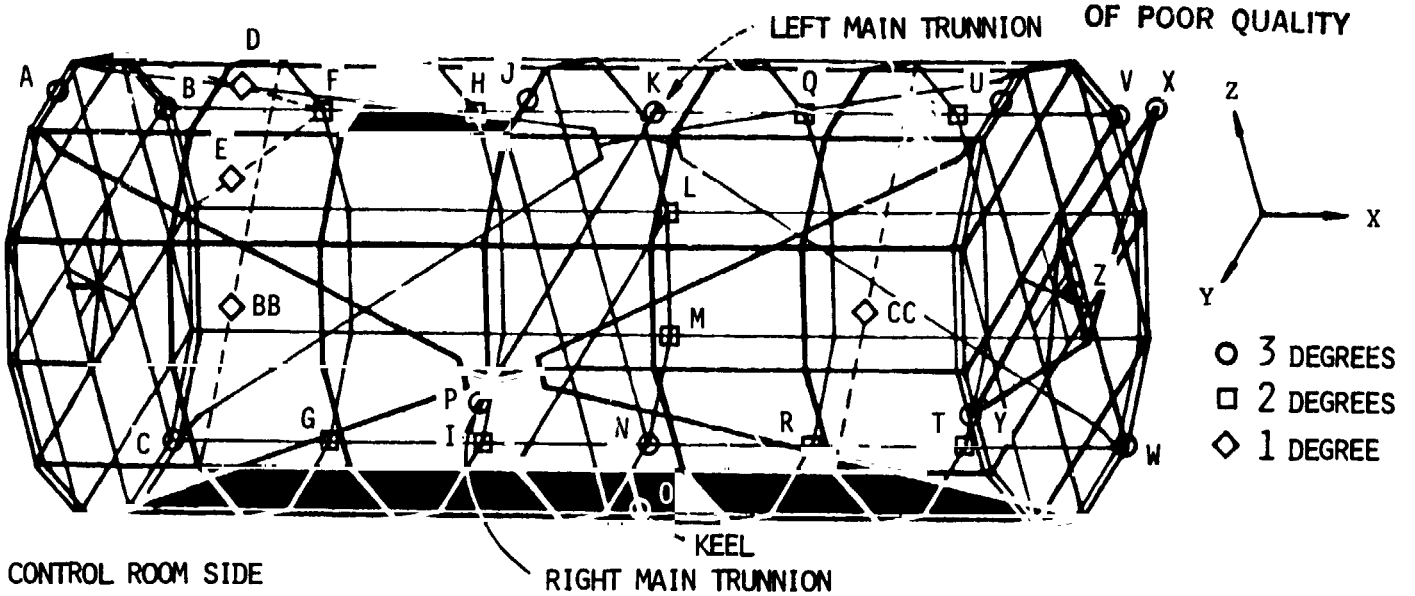


2000 psi PUMP PRESS MAX.

SYM.	CHAN. NO.		LOAD INPUT			LOAD CELL		HYD. CYL.	
	SIG. CONDT.	SCANNER	TYPE OF	LOCATION	MEAS Z, XZ/YZ	IDENT. #	VOLT. @ GAGE	TYPE	PISTON AREA IN^2
○	A-36	35	SGL	FESS Z	90/90	50-10	10.533	P/HBB2HLS14	19.640
* ◇	A-41	40	SGL	RESBTRUN Z	---	50-98	10.543	---	---
* ◇	A-42	41	SGL	LESBTRUN Z	---	50-34	9.982	---	---
□	A-43	42	DUAL	916AA-L Z	90/90	L12-10	10.538	P/HTC2HLS33	7.660
□	A-44	43	DUAL	916AF-G Z	90/90	L10-7	10.580	P/HTC2HLS33	7.660

* REACTION LOAD

TABLE I D.- LOAD INPUT LOCATION AND INFORMATION FOR "END SUPPORT BEAM" TEST



SIG. CONDT. CH. #	LTR/ / DIR		LOCATION		IDENT. NO.	VOLT. @ GAGE
D-7	A	X	920FL-A	X	D 01	9.976
D-8	A	Y	920FL-A	Y	D 02	10.000
D-9	A	Z	920FL-A	Z	D 21	9.995
D-10	B	X	920FC	X	D 03	9.988
D-11	B	Y	920FC	Y	D 04	9.985
D-12	B	Z	920FC	Z	D 22	9.993
A-26	C	X	920FF	X	D 05	10.641
D-2	C	Y	920FF	Y	D 06	9.992
A-27	C	Z	920FF	Z	D 23	10.650
C-49	D		936EC-920FB		D 07	9.714
C-50	E		936EC-920FD		D 08	9.705
D-22	F	Y	936EC	Y	D 09	9.990
D-23	F	Z	936EC	Z	D 24	9.990
D-30	G	Y	936EF	Y	D 83	10.000
D-31	G	Z	936EF	Z	D 25	9.993
D-20	H	Y	936DC	Y	D 11	9.999
D-21	H	Z	936DC	Z	D 26	9.995
D-28	I	Y	936DF	Y	D 12	10.000
D-29	I	Z	936DF	Z	D 27	9.995
D-4	J	X	911C/DL-A	X	D 13	9.997
D-5	J	Y	911C/DL-A	Y	D 14	10.018
D-6	J	Z	911C/DL-A	Z	D 15	9.993
A 2	K	X	LM TRUN	X	D 16	10.561
A-3	K	Y	LM TRUN	Y	D 17	10.523
A-4	K	Z	LM TRUN	Z	D 18	10.642
D-32	L	Y	911C/DD	Y	D 19	9.993
D-33	L	Z	911C/DD	Z	D 20	10.002
C-45	M	Y	911C/DE	Y	D 31	10.558
C-46	M	Z	911C/DE	Z	D 68	9.707
D-3	N	X	911C-F	X	D 33	10.010
A-28	N	Y	911C-DF	Y	D 34	10.581
D-34	N	Z	911C-DF	Z	D 35	9.989
A-14	O	X	KEEL	X	D 36	10.641
A-15	O	Y	KEEL	Y	D 37	10.642
A-16	O	Z	KEEL	Z	D 38	10.651
A-5	P	X	RM TRUN	X	D 39	10.256
A-6	P	Y	RM TRUN	Y	D 40	10.526
A-7	P	Z	RM TRUN	Z	D 41	10.643
D-18	Q	Y	936CC	Y	D 42	9.994
D-19	Q	Z	936CC	Z	D 43	9.996

SIG. CONDT. CH. #	LTR/ / DIR		LOCATION		IDENT. NO.	VOLT. @ GAGE
D-26	R	Y	936CF	Y	D 44	9.996
D-27	R	Z	936CF	Z	D 45	9.994
D-16	S	Y	936BC	Y	D 46	10.002
D-17	S	Z	936BC	Z	D 47	9.995
D-24	T	Y	936BF	Y	D 48	9.991
D-25	T	Z	936BF	Z	D 80	9.999
A-17	U	X	916AL	X	D 50	10.651
A-18	U	Y	916AL-A	Y	D 51	10.523
A-19	U	Z	916AL-A	Z	D 52	10.652
D-13	V	X	916AC	X	D 53	10.000
D-14	V	Y	916AC	Y	D 54	9.993
D-15	V	Z	916AC	Z	D 55	9.993
A-24	W	X	916AF	X	D 56	10.532
A-20	W	Y	916AF	Y	D 57	10.581
A-25	W	Z	916AF	Z	D 58	10.646
A-8	X	X	LESB TRUN	X	D 59	10.517
A-9	X	Y	LESB TRUN	Y	D 60	10.582
A-10	X	Z	LESB TRUN	Z	D 61	10.645
A-11	Y	X	RESB TRUN	X	D 62	10.534
A-12	Y	Y	RESB TRUN	Y	D 63	10.530
A-13	Y	Z	RESB TRUN	Z	D 64	10.644
A-21	Z	X	ESBS	X	D 65	10.527
A-22	Z	Y	ESBS	Y	D 66	10.612
A-23	Z	Z	ESBS	Z	D 67	10.645
C-47	CC		936BC-BI		D 29	9.706
C-48	BB		936EC-EI		D 30	9.704
D-37			LMTEST STRU	X	D 70	9.983
D-38			LMTEST STRU	Y	D 71	9.991
D-39			LMTEST STRU	Z	D 72	9.990
D-40			RMTEST STRU	X	D 73	9.995
D-41			RMTEST STRU	Y	D 74	9.998
D-42			RMTEST STRU	Z	D 75	10.000
D-43			LETEST STRU	X	D 76	9.996
D-44			LETEST STRU	Y	D 77	9.997
D-45			LETEST STRU	Z	D 78	9.995
D-46			RETEST STRU	X	D 32	10.005
D-47			RETEST STRU	Y	D 69	10.002
D-48			RETEST STRU	Z	D 79	10.002

TABLE II. - DEFLECTOMETER DESIGNATION AND LOCATION

LOCATION CODES	A	B	C	D	E	F
Bay 9/Sec A fwd				3.032		
Sec A aft				3.032		
Sec B fwd			3.06			
Sec B aft			3.09			
℄ hole inboard fwd					5.957	16.817
out fwd					8.537	19.387
inboard aft					6.007	16.797
out aft					8.567	19.387
2" above gusset inboard fwd		8.517				
out fwd		11.097				
inboard aft		8.567				
out aft		11.127				
Tang top hole inboard fwd	18.817					
out fwd	21.387					
inboard aft	18.797					
out aft	21.387					
Bay 10/Sec A fwd			3.06			
Sec A aft			2.98			
Sec B fwd				3.02		
Sec B aft				3.00		
℄ hole inboard fwd	8.357	25.037				
out fwd	11.087	27.767				
inboard aft	8.467	25.162				
out aft	11.177	27.864				
Bay 3/Sec A fwd				3.08		
Sec A aft				3.06		
Sec B fwd			3.06			
Sec B aft			3.06			
℄ hole inboard fwd					5.96	16.787
out fwd					8.567	19.387
inboard aft					5.887	16.777
out aft					8.597	19.407
2" above gusset inboard fwd		8.79				
out fwd		11.397				
inboard aft		8.819				
out aft		11.427				
Tang top hole inboard fwd	18.787					
out fwd	21.387					
inboard aft	18.777					
out aft	21.407					
Bay 2/Sec A fwd			3.00			
Sec A aft			3.00			
Sec B fwd				3.01		
Sec B aft				3.01		
℄ hole inboard fwd	8.537	25.217				
out fwd	11.193	27.902				
inboard aft	8.380	25.117				
out aft	11.047	27.807				

TABLE III. - STRAIN GAGE LOCATION CODE DIMENSIONS

CHAN NO. SIG. CONDT	SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT @ GAGE
A-1	[illegible]	PWR SUPP	A REF Vo		10.850
A-2	1	DEFL	LM TRUN K-X	D-16	10.561
A-3	2	DEFL	LM TRUN K-Y	D-17	10.523
A-4	3	DEFL	LM TRUN K-Z	D-18	10.642
A-5	4	DEFL	RM TRUN P-X	D-39	10.256
A-6	5	DEFL	RM TRUN P-Y	D-40	10.526
A-7	6	DEFL	RM TRUN P-Z	D-41	10.643
A-8	7	DEFL	LESB TRUN X-X	D-59	10.517
A-9	8	DEFL	LESB TRUN X-Y	D-60	10.582
A-10	9	DEFL	LESB TRUN X-Z	D-61	10.645
A-11	10	DEFL	RESB TRUN Y-X	D-62	10.534
A-12	11	DEFL	RESB TRUN Y-Y	D-63	10.530
A-13	12	DEFL	RESB TRUN Y-Z	D-64	10.644
A-14	13	DEFL	KEEL O-X	D-36	10.641
A-15	14	DEFL	KEEL O-Y	D-37	10.642
A-16	15	DEFL	KEEL O-Z	D-38	10.651
A-17	16	DEFL	916AL-A U-X	D-50	10.651
A-18	17	DEFL	916AL-A U-Y	D-51	10.523
A-19	18	DEFL	916AL-A U-Z	D-52	10.652
A-20	19	DEFL	916AF W-Y	D-57	10.581
A-21	20	DEFL	ESBS Z-X	D-65	10.527
A-22	21	DEFL	ESBS Z-Y	D-66	10.612
A-23	22	DEFL	ESBS Z-Z	D-67	10.645
A-24	23	DEFL	916AF W-X	D-56	10.532
A-25	24	DEFL	916AF W-Z	D-58	10.646
A-26	25	DEFL	920FF C-X	D-05	10.641
A-27	26	DEFL	920FF C-Z	D-23	10.650
A-28	27	DEFL	911C-DF N-Y	D-34	10.581
A-29	28	LOAD CELL	911CH XZ	L-10-6	10.534
A-30	29	LOAD CELL	916AI Z	L5-1	9.984
A-31	30	LOAD CELL	916AD Z	L5-2	9.980
A-32	31	LOAD CELL	916AF-G Z	5-77	10.529
A-33	32	LOAD CELL	936EA-L Z	L5-4	9.993
A-34	33	LOAD CELL	936EE-H Z	5-38	10.517
A-35	34	LOAD CELL	936DB-K Z	5-39	10.519
A-36	35	LOAD CELL	936DF-G Z	5-40	10.513
A-37	36	LOAD CELL	936CB-K Z	5-41	10.561
A-38	37	LOAD CELL	936CF-G Z	5-43	10.518
A-39	38	LOAD CELL	936BA-L Z	5-45	10.517
A-40	39	LOAD CELL	936BE-H Z	5-46	10.513
A-41	40	LOAD CELL	RESB TRUN Z	L10-5	9.877
A-42	41	LOAD CELL	LESB TRUN Z	L12-10	10.532
A-43	42	LOAD CELL	911CI XZ	L10-7	10.531
A-44	43	LOAD CELL	911CD XZ	L10-8	10.532
A-45	44	LOAD CELL	911CA-L XZ	20-58	9.967
A-46	45	LOAD CELL	911CB-K XZ	20-59	9.928
A-47	46	LOAD CELL	911CE XZ	L10-9	10.532
A-48	47	LOAD CELL	920CF-G XZ	20-73	9.965
A-49	48	LOAD CELL	920FA-L XZ	20-77	9.965
A-50	49	LOAD CELL	920FF-G XZ	20-76	9.929

CHAN NO. SIG. CONDT	SCAN	FUNC.	LOCATION	IDENT NO.	VOLT @ GAGE
B-1	50	PWR SUPP	B REF Vo		10.000
B-2	51	Str. Ga.	LM TRUN +Z	89	9.9655
B-3	52	Str. Ga.	LM TRUN +X	92	9.9657
B-4	53	Str. Ga.	RM TRUN +Z	29	9.9659
B-5	54	Str. Ga.	RM TRUN +X	30	9.9658
B-6	55	Str. Ga.	911DC-DBO	33	10.000
B-7	56	Str. Ga.	911CC-DBO	34	10.000
B-8	57	Str. Ga.	911DC-DBI	35	10.000
B-9	58	Str. Ga.	911CC-DBI	36	10.000
B-10	59	Str. Ga.	911DC-BAO	37	10.000
B-11	60	Str. Ga.	911CC-BAO	38	10.000
B-12	61	Str. Ga.	911DC-BAI	39	10.000
B-13	62	Str. Ga.	911CC-BAI	40	10.000
B-14	63	Str. Ga.	911C-DJ-IAO	0	10.000
B-15	64	Str. Ga.	911C-DC-DBOI	41*	10.000
B-16	65	Str. Ga.	911C-DC-BAOI	42*	10.000
B-17	66	Str. Ga.	911DC-DAO	43	10.000
B-18	67	Str. Ga.	911CC-DAO	44	10.000
B-19	68	Str. Ga.	911DC-DAI	45	10.000
B-20	69	Str. Ga.	911CC-DAI	46	10.000
B-21	70	Str. Ga.	911C-DC-DAOI	47*	10.000
B-22	71	Str. Ga.	911DC-BBO	48	10.000
B-23	72	Str. Ga.	911CC-BBO	49	10.000
B-24	73	Str. Ga.	911DC-BBI	50	10.000
B-25	74	Str. Ga.	911CC-BBI	51	10.000
B-26	75	Str. Ga.	911C-DC-BBOI	52*	10.000
B-27	76	Str. Ga.	911DJ-IBO	53	10.000
B-28	77	Str. Ga.	911CJ-IBO	54	10.000
B-29	78	Str. Ga.	911DJ-IBI	55	10.000
B-30	79	Str. Ga.	911CJ-IBI	56	10.000
B-31	80	Str. Ga.	911C-DJ-IBOI	57*	10.000
B-32	81	Str. Ga.	911DJ-KBO	58	10.000
B-33	82	Str. Ga.	911CJ-KBO	59	10.000
B-34	83	Str. Ga.	911DJ-KBI	60	10.000
B-35	84	Str. Ga.	911CJ-KBI	61	10.000
B-36	85	Str. Ga.	911C-DJ-KBOI	62*	10.000
B-37	86	Str. Ga.	911DJ-IAO	63	10.000
B-38	87	Str. Ga.	911CJ-IAO	64	10.000
B-39	88	Str. Ga.	911DJ-IAI	65	10.000
B-40	89	Str. Ga.	911CJ-IAI	66	10.000
B-41	90	Str. Ga.	911C-DJ-IAI	67	10.000
B-42	91	Str. Ga.	911DJ-KAO	68	10.000
B-43	92	Str. Ga.	911CJ-KAO	69	10.000
B-44	93	Str. Ga.	911DJ-KAI	70	10.000
B-45	94	Str. Ga.	911CJ-KAI	71	10.000
B-46	95	Str. Ga.	911C-DJ-KAOI	72*	10.000
B-47	96	Str. Ga.	911DC-920FCAOU	73	10.000
B-48	97	Str. Ga.	911DC-920FCAOL	74	10.000
B-49	98	Str. Ga.	911DC-920FCAIU	75	10.000
B-50	99	Str. Ga.	911DC-920FCAIL	76	10.000

*Combined Gages

Channels A-24 through B-13 were used for 40 channel scan of selected information.

TABLE IV A.- INSTRUMENTATION HOOK-UP, "LANDING" TEST

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT @ GAGE
C-1	100	PWR SUPP	C REF Vo		10.004
C-2	101	Str. Ga.	911DC-920FCBOU	77	10.004
C-3	102	Str. Ga.	911DC-920FCBOL	78	10.004
C-4	103	Str. Ga.	911DC-920FCBIU	79	10.004
C-5	104	Str. Ga.	911DC-920FCBIL	80	10.004
C-6	105	Str. Ga.	911DF-920FFAOU	81	10.004
C-7	106	Str. Ga.	911DF-920FFAOL	82	10.004
C-8	107	Str. Ga.	911DF-920FFAIU	83	10.004
C-9	108	Str. Ga.	911DF-920FFAIL	84	10.004
C-10	109	Str. Ga.	911DF-920FFBOU	85	10.004
C-11	110	Str. Ga.	911DF-920FFBOL	86	10.004
C-12	111	Str. Ga.	911DF-920FFBIU	87	10.004
C-13	112	Str. Ga.	911DF-920FFBIL	88	10.004
C-14	113	Str. Ga.	RM TRUN -Z	31	9.9615
C-15	114	Str. Ga.	RM TRUN -X	32	9.9614
C-16	115	Str. Ga.	LM TRUN -X	90	9.9612
C-17	116	Str. Ga.	LM T[illegible] -Z	91	9.9614
C-18	117	Str. Ga.	911D[illegible]-920FFUL	93*	10.004
C-19	118	Str. Ga.	911CC-916AFUL	94*	10.004
C-20	119	Str. Ga.	911DC-920FAUL	95*	10.004
C-21	120	Str. Ga.	911CC-916AAUL	96*	10.004
C-22	121				
C-23	122				
C-24	123				
C-25	124				
C-26	125				
C-27	126				
C-28	127				
C-29	128				
C-30	129				
C-31	130	Str. Ga.	TRAY	105	10.004
C-32	131	Str. Ga.	TRAY	106	10.004
C-33	132	Str. Ga.	TRAY	107	10.004
C-34	133	Str. Ga.	TRAY	108	10.004
C-35	134				
C-36	135				
C-37	136				
C-38	137				
C-39	138				
C-40	139				
C-41	140				
C-42	141				
C-43	142				
C-44	143				
C-45	144	DEFL	911C/DE M-Y	D-31	10.558
C-46	145	DEFL	911C/DE M-Z	D-68	9.707
C-47	146	DEFL	936BC-BI CC	D-29	9.706
C-48	147	DEFL	936EC-EI BB	D-30	9.704
C-49	148	DEFL	936EC-920FB D	D-07	9.714
C-50	149	DEFL	936EC-920FD E	D-08	9.705

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT @ GAGE
D-1	150	PWR SUPP	D REF Vo		10.240
D-2	151	DEFL	920FF C-Y	D-06	9.992
D-3	152	DEFL	911C-DF N-X	D-33	10.010
D-4	153	DEFL	911C/DL-A J-X	D-13	9.997
D-5	154	DEFL	911C/DL-A J-Y	D-14	10.018
D-6	155	DEFL	911C/DL-A J-Z	D-15	9.993
D-7	156	DEFL	920FL-A A-X	D-01	9.976
D-8	157	DEFL	920FL-A A-Y	D-02	10.000
D-9	158	DEFL	920FL-A A-Z	D-21	9.995
D-10	159	DEFL	920FC B-X	D-03	9.988
D-11	160	DEFL	920FC B-Y	D-04	9.985
D-12	161	DEFL	920FC B-Z	D-22	9.993
D-13	162	DEFL	916AC V-X	D-53	10.000
D-14	163	DEFL	916AC V-Y	D-54	9.993
D-15	164	DEFL	916AC V-Z	D-55	9.992
D-16	165	DEFL	936BC S-Y	D-46	10.002
D-17	166	DEFL	936BC S-Z	D-47	9.995
D-18	167	DEFL	936CC Q-Y	D-42	9.994
D-19	168	DEFL	936CC Q-Z	D-43	9.996
D-20	169	DEFL	936DC H-Y	D-11	9.999
D-21	170	DEFL	936DC H-Z	D-26	9.995
D-22	171	DEFL	936EC F-Y	D-09	9.990
D-23	172	DEFL	936EC F-Z	D-24	9.990
D-24	173	DEFL	936BF T-Y	D-48	9.991
D-25	174	DEFL	936BF T-Z	D-80	9.999
D-26	175	DEFL	936CF R-Y	D-44	9.996
D-27	176	DEFL	936CF R-Z	D-45	9.994
D-28	177	DEFL	936DF I-Y	D-12	10.000
D-29	178	DEFL	936DF I-Z	D-27	9.995
D-30	179	DEFL	936EF G-Y	D-10	10.000
D-31	180	DEFL	936EF G-Z	D-25	9.993
D-32	181	DEFL	911C/DD L-Y	D-19	9.993
D-33	182	DEFL	911C/DD L-Z	D-20	10.002
D-34	183	DEFL	911C-DF N-Z	D-35	9.989
D-35	184	AOAI	TEST STR PITCH	Q-10	
D-36	185	AOAI	TEST STR ROLL	Q-9	
D-37	186	DEFL	LM TEST STRU X	D-70	9.983
D-38	187	DEFL	LM TEST STRU Y	D-71	9.991
D-39	188	DEFL	LM TEST STRU Z	D-72	9.990
D-40	189	DEFL	RM TEST STRU X	D-73	9.995
D-41	190	DEFL	RM TEST STRU Y	D-74	9.998
D-42	191	DEFL	RM TEST STRU Z	D-75	10.000
D-43	192	DEFL	LE TEST STRU X	D-76	9.996
D-44	193	DEFL	LE TEST STRU Y	D-77	9.997
D-45	194	DEFL	LE TEST STRU Z	D-78	9.995
D-46	195	DEFL	RE TEST STRU X	D-32	10.005
D-47	196	DEFL	RE TEST STRU Y	D-69	10.002
D-48	197	DEFL	RE TEST STRU Z	D-79	10.002
D-49	198	AOAI	RM TRUN PITCH	Q-11	
D-50	199	AOAI	RM TRUN ROLL	Q-12	

*Combined Gages

TABLE IV A. (CONTD.)- INSTRUMENTATION HOOK-UP, "LANDING" TEST

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT. @ GAGE
A-1	0	PWR SUPP	A REF Vo		10.850
A-2	1	DEFL	LM TRUN K-X	D-16	10.561
A-3	2	DEFL	LM TRUN K-Y	D-17	10.523
A-4	3	DEFL	LM TRUN K-Z	D-18	10.642
A-5	4	DEFL	RM TRUN P-X	D-39	10.256
A-6	5	DEFL	RM TRUN P-Y	D-40	10.526
A-7	6	DEFL	RM TRUN P-Z	D-41	10.643
A-8	7	DEFL	LESB TRUN X-X	D-59	10.517
A-9	8	DEFL	LESB TRUN X-Y	D-60	10.582
A-10	9	DEFL	LESB TRUN X-Z	D-61	10.645
A-11	10	DEFL	RESB TRUN Y-X	D-62	10.534
A-12	11	DEFL	RESB TRUN Y-Y	D-63	10.530
A-13	12	DEFL	RESB TRUN Y-Z	D-64	10.644
A-14	13	DEFL	KEEL O-X	D-36	10.641
A-15	14	DEFL	KEEL O-Y	D-37	10.642
A-16	15	DEFL	KEEL O-Z	D-38	10.651
A-17	16	DEFL	916AL-A U-X	D-50	10.651
A-18	17	DEFL	916AL-A U-Y	D-51	10.523
A-19	18	DEFL	916AL-A U-Z	D-52	10.652
A-20	19	DEFL	916AF W-Y	D-57	10.581
A-21	20	DEFL	ESBS Z-X	D-65	10.527
A-22	21	DEFL	ESBS Z-Y	D-66	10.612
A-23	22	DEFL	ESBS Z-Z	D-67	10.645
A-24	23	DEFL	916AF W-X	D-56	10.532
A-25	24	DEFL	916AF W-Z	D-58	10.646
A-26	25	DEFL	920FF C-X	D-05	10.641
A-27	26	DEFL	920FF C-Z	D-23	10.650
A-28	27	DEFL	911C-DF N-Y	D-34	10.581
A-29	28	LOAD CELL	916AG XY	L-10-6	10.534
A-30	29	LOAD CELL	920FI Z	L5-4	9.985
A-31	30	LOAD CELL	920FD Z	L5-2	9.982
A-32	31	LOAD CELL	911CI XZ	20-65	9.900
A-33	32				
A-34	33				
A-35	34				
A-36	35				
A-37	36	Str. Ga.	RM TRUN -Z	31	
A-38	37	Str. Ga.	LM TRUN -Z	91	
A-39	38	Str. Ga.	RM TRUN -X	32	
A-40	39	Str. Ga.	LM TRUN -X	90	
A-41	40	LOAD CELL	RESB TRUN Z	L10-5	9.983
A-42	41	LOAD CELL	LESB TRUN Z	L12-10	10.530
A-43	42	LOAD CELL	916AL XZ	L10-7	10.538
A-44	43	LOAD CELL	916AA XZ	L10-8	10.534
A-45	44	LOAD CELL	911K XZ	20-58	9.967
A-46	45	LOAD CELL	911CB XZ	20-59	9.928
A-47	46	LOAD CELL	916AF XZ	L10-9	10.534
A-48	47	LOAD CELL	911CD XZ	20-73	9.965
A-49	48	LOAD CELL	920FA-L XZ	20-77	9.931
A-50	49	LOAD CELL	920FF-G XZ	20-76	9 933

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT. @ GAGE
B-1	50	PWR SUPP	B REF Vo		10.000
B-2	51	Str. Ga.	LM TRUN +Z	89	9.9655
B-3	52	Str. Ga.	LM TRUN +X	92	9.9657
B-4	53	Str. Ga.	RM TRUN +Z	29	9.9659
B-5	54	Str. Ga.	RM TRUN +X	30	9.9658
B-6	55	Str. Ga.	911DC-DBO	33	10.000
B-7	56	Str. Ga.	911CC-DBO	34	10.000
B-8	57	Str. Ga.	911DC-DBI	35	10.000
B-9	58	Str. Ga.	911CC-DBI	36	10.000
B-10	59	Str. Ga.	911DC-BAO	37	10.000
B-11	60	Str. Ga.	911CC-BAO	38	10.000
B-12	61	Str. Ga.	911DC-BAI	39	10.000
B-13	62	Str. Ga.	911CC-BAI	40	10.000
B-14	63	Str. Ga.	911C-DJ-IAO	0	10.000
B-15	64	Str. Ga.	911C-DC-DBOI	41*	10.000
B-16	65	Str. Ga.	911C-DC-BAOI	42*	10.000
B-17	66	Str. Ga.	911DC-DAO	43	10.000
B-18	67	Str. Ga.	911CC-DAO	44	10.000
B-19	68	Str. Ga.	911DC-DAI	45	10.000
B-20	69	Str. Ga.	911CC-DAI	46	10.000
B-21	70	Str. Ga.	911C-DC-DAOI	47*	10.000
B-22	71	Str. Ga.	911DC-BBO	48	10.000
B-23	72	Str. Ga.	911CC-BBO	49	10.000
B-24	73	Str. Ga.	911DC-BBI	50	10.000
B-25	74	Str. Ga.	911CC-BBI	51	10.000
B-26	75	Str. Ga.	911C-DC-BBOI	52*	10.000
B-27	76	Str. Ga.	911DJ-IBO	53	10.000
B-28	77	Str. Ga.	911CJ-IBO	54	10.000
B-29	78	Str. Ga.	911DJ-IBI	55	10.000
B-30	79	Str. Ga.	911CJ-IBI	56	10.000
B-31	80	Str. Ga.	911C-DJ-IBOI	57*	10.000
B-32	81	Str. Ga.	911DJ-KBO	58	10.000
B-33	82	Str. Ga.	911CJ-KBO	59	10.000
B-34	83	Str. Ga.	911DJ-KBI	60	10.000
B-35	84	Str. Ga.	911CJ-KBI	61	10.000
B-36	85	Str. Ga.	911C-DJ-KBOI	62*	10.000
B-37	86	Str. Ga.	911DJ-IAO	63	10.000
B-38	87	Str. Ga.	911CJ-IAO	64	10.000
B-39	88	Str. Ga.	911DJ-IAI	65	10.000
B-40	89	Str. Ga.	911CJ-IAI	66	10.000
B-41	90	Str. Ga.	911C-DJ-IAI	67	10.000
B-42	91	Str. Ga.	911DJ-KAO	68	10.000
B-43	92	Str. Ga.	911CJ-KAO	69	10.000
B-44	93	Str. Ga.	911DJ-KAI	70	10.000
B-45	94	Str. Ga.	911CJ-KAI	71	10.000
B-46	95	Str. Ga.	911C-DJ-KAOI	72*	10.000
B-47	96	Str. Ga.	911DC-920FCAOU	73	10.000
B-48	97	Str. Ga.	911DC-920FCAOL	74	10.000
B-49	98	Str. Ga.	911DC-920FCAIU	75	10.000
B-50	99	Str. Ga.	911DC-920FCAIL	76	10.000

*Combined Gages

Channels A-24 through B-13 were used for 40 channel scan of selected information.

TABLE IV B.- INSTRUMENTATION HOOK-UP, "LIFTOFF" TEST

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT @ GAGE
C-1	100	PWR SUPP	C REF Vo		10.004
C-2	101	Str. Ga.	911DC-920FCBOU	77	10.004
C-3	102	Str. Ga.	911DC-920FCBOL	78	10.004
C-4	103	Str. Ga.	911DC-920FCBIU	79	10.004
C-5	104	Str. Ga.	911DC-920FCBIL	80	10.004
C-6	105	Str. Ga.	911DF-920FFAOU	81	10.004
C-7	106	Str. Ga.	911DF-920FFAOL	82	10.004
C-8	107	Str. Ga.	911DF-920FFAIU	83	10.004
C-9	108	Str. Ga.	911DF-920FFAIL	84	10.004
C-10	109	Str. Ga.	911DF-920FFBOU	85	10.004
C-11	110	Str. Ga.	911DF-920FFBOL	86	10.004
C-12	111	Str. Ga.	911DF-920FFBIU	87	10.004
C-13	112	Str. Ga.	911DF-920FFBIL	88	10.004
C-14	113				
C-15	114				
C-16	115				
C-17	116				
C-18	117	Str. Ga.	911DC-920FFUL	93*	10.004
C-19	118	Str. Ga.	911CC-916AFUL	94*	10.004
C-20	119	Str. Ga.	911DC-920FAUL	95*	10.004
C-21	120	Str. Ga.	911CC-916AAUL	96*	10.004
C-22	121				
C-23	122				
C-24	123				
C-25	124				
C-26	125				
C-27	126				
C-28	127				
C-29	128				
C-30	129				
C-31	130	Str. Ga.	TRAY	105	10.004
C-32	131	Str. Ga.	TRAY	106	10.004
C-33	132	Str. Ga.	TRAY	107	10.004
C-34	133	Str. Ga.	TRAY	108	10.004
C-35	134				
C-36	135				
C-37	136				
C-38	137				
C-39	138				
C-40	139				
C-41	140				
C-42	141				
C-43	142				
C-44	143				
C-45	144	DEFL	911C/DE M-Y	D-31	10.558
C-46	145	DEFL	911C/DE M-Z	D-68	9.707
C-47	146	DEFL	936BC-BI CC	D-29	9.706
C-48	147	DEFL	936EC-EI BB	D-30	9.704
C-49	148	DEFL	936EC-920FB D	D-07	9.714
C-50	149	DEFL	936EC-920FD E	D-08	9.705

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT @ GAGE
D-1	150	PWR SUPP	D REF Vo		10.240
D-2	151	DEFL	920FF C-Y	D-06	9.992
D-3	152	DEFL	911C-DF N-X	D-33	10.010
D-4	153	DEFL	911C/DL-A J-X	D-13	9.997
D-5	154	DEFL	911C/DL-A J-Y	D-14	10.018
D-6	155	DEFL	911C/DL-A J-Z	D-15	9.993
D-7	156	DEFL	920FL-A A-X	D-01	9.976
D-8	157	DEFL	920FL-A A-Y	D-02	10.000
D-9	158	DEFL	920FL-A A-Z	D-21	9.995
D-10	159	DEFL	920FC B-X	D-03	9.988
D-11	160	DEFL	920FC B-Y	D-04	9.985
D-12	161	DEFL	920FC B-Z	D-22	9.993
D-13	162	DEFL	916AC V-X	D-53	10.000
D-14	163	DEFL	916AC V-Y	D-54	9.993
D-15	164	DEFL	916AC V-Z	D-55	9.992
D-16	165	DEFL	936BC S-Y	D-46	10.002
D-17	166	DEFL	936BC S-Z	D-47	9.995
D-18	167	DEFL	936CC Q-Y	D-42	9.994
D-19	168	DEFL	936CC Q-Z	D-43	9.996
D-20	169	DEFL	936DC H-Y	D-11	9.999
D-21	170	DEFL	936DC H-Z	D-26	9.995
D-22	171	DEFL	936EC F-Y	D-09	9.990
D-23	172	DEFL	936EC F-Z	D-24	9.990
D-24	173	DEFL	936BF T-Y	D-48	9.991
D-25	174	DEFL	936BF T-Z	D-80	9.999
D-26	175	DEFL	936CF R-Y	D-44	9.996
D-27	176	DEFL	936CF R-Z	D-45	9.994
D-28	177	DEFL	936DF I-Y	D-12	10.000
D-29	178	DEFL	936DF I-Z	D-27	9.995
D-30	179	DEFL	936EF G-Y	D-10	10.000
D-31	180	DEFL	936EF G-Z	D-25	9.993
D-32	181	DEFL	911C/DD L-Y	D-19	9.993
D-33	182	DEFL	911C/DD L-Z	D-20	10.002
D-34	183	DEFL	911C-DF N-Z	D-35	9.989
D-35	184	AOAI	TEST STR PITCH	Q-10	
D-36	185	AOAI	TEST STR ROLL	Q-9	
D-37	186	DEFL	LM TEST STRU X	D-70	9.983
D-38	187	DEFL	LM TEST STRU Y	D-71	9.991
D-39	188	DEFL	LM TEST STRU Z	D-72	9.990
D-40	189	DEFL	RM TEST STRU X	D-73	9.995
D-41	190	DEFL	RM TEST STRU Y	D-74	9.998
D-42	191	DEFL	RM TEST STRU Z	D-75	10.000
D-43	192	DEFL	LE TEST STRU X	D-76	9.996
D-44	193	DEFL	LE TEST STRU Y	D-77	9.997
D-45	194	DEFL	LE TEST STRU Z	D-78	9.995
D-46	195	DEFL	RE TEST STRU X	D-32	10.005
D-47	196	DEFL	RE TEST STRU Y	D-69	10.002
D-48	197	DEFL	RE TEST STRU Z	D-79	10.002
D-49	198	AOAI	RM TRUN PITCH	Q-11	
D-50	199	AOAI	RM TRUN ROLL	Q-12	

*Combined Gages

TABLE IV B. (CONTD.)- INSTRUMENTATION HOOK-UP, "LIFTOFF" TEST

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT. @ GAGE
A-1	0	PWR SUPP	A REF Vo		10.850
A-2	1	DEFL	LM TRUN K-X	D-16	10.561
A-3	2	DEFL	LM TRUN K-Y	D-17	10.523
A-4	3	DEFL	LM TRUN K-Z	D-18	10.642
A-5	4	DEFL	RM TRUN P-X	D-39	10.256
A-6	5	DEFL	RM TRUN P-Y	D-40	10.526
A-7	6	DEFL	RM TRUN P-Z	D-41	10.643
A-8	7	DEFL	LESB TRUN X-X	D-59	10.517
A-9	8	DEFL	LESB TRUN X-Y	D-60	10.582
A-10	9	DEFL	LESB TRUN X-Z	D-61	10.645
A-11	10	DEFL	RESB TRUN Y-X	D-62	10.534
A-12	11	DEFL	RESB TRUN Y-Y	D-63	10.530
A-13	12	DEFL	RESB TRUN Y-Z	D-64	10.644
A-14	13	DEFL	KEEL O-X	D-36	10.641
A-15	14	DEFL	KEEL O-Y	D-37	10.642
A-16	15	DEFL	KEEL O-Z	D-38	10.651
A-17	16	DEFL	916AL-A U-X	D-50	10.651
A-18	17	DEFL	916AL-A U-Y	D-51	10.523
A-19	18	DEFL	916AL-A U-Z	D-52	10.652
A-20	19	DEFL	916AF W-Y	D-57	10.581
A-21	20	DEFL	ESBS Z-X	D-65	10.527
A-22	21	DEFL	ESBS Z-Y	D-66	10.612
A-23	22	DEFL	ESBS Z-Z	D-67	10.645
A-24	23	DEFL	916AF W-X	D-56	10.532
A-25	24	DEFL	916AF W-Z	D-58	10.646
A-26	25	DEFL	920FF C-X	D-05	10.641
A-27	26	DEFL	920FF C-Z	D-23	10.650
A-28	27	DEFL	911C-DF N-Y	D-34	10.581
A-29	28				
A-30	29				
A-31	30				
A-32	31				
A-33	32				
A-34	33				
A-35	34				
A-36	35	LOAD CELL	KEEL Y	50-23	10.518
A-37	36	Str. Ga.	RM TRUN -Z	31	
A-38	37	Str. Ga.	LM TRUN -Z	91	
A-39	38	Str. Ga.	RM TRUN -X	32	
A-40	39	Str. Ga.	LM TRUN -X	90	
A-41	40	LOAD CELL	RESB TRUN Z	L10-5	9.982
A-42	41	LOAD CELL	LESB TRUN Z	L12-10	10.529
A-43	42	LOAD CELL	911CDD Y	L10-8	10.525
A-44	43	LOAD CELL	911CDF Y	L10-6	10.531
A-45	44	LOAD CELL	911D[illegible] Y	L10-7	10.534
A-46	45	LOAD CELL	911CI Y	L10-9	10.530
A-47	46	LOAD CELL	911DG Y	L5-4	9.977
A-48	47	LOAD CELL	911CG Y	L5-2	9.968
A-49	48				
A-50	49				

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT. @ GAGE
B-1	50	PWR SUPP	B REF Vo		10.000
B-2	51	Str. Ga.	LM TRUN +Z	89	9.9655
B-3	52	Str. Ga.	LM TRUN +X	92	9.9657
B-4	53	Str. Ga.	RM TRUN +Z	29	9.9659
B-5	54	Str. Ga.	RM TRUN +X	30	9.9658
B-6	55	Str. Ga.	911DC-DBO	33	10.000
B-7	56	Str. Ga.	911CC-DBO	34	10.000
B-8	57	Str. Ga.	911DC-DBI	35	10.000
B-9	58	Str. Ga.	911CC-DBI	36	10.000
B-10	59	Str. Ga.	911DC-BAO	37	10.000
B-11	60	Str. Ga.	911CC-BAO	38	10.000
B-12	61	Str. Ga.	911DC-BAI	39	10.000
B-13	62	Str. Ga.	911CC-BAI	40	10.000
B-14	63	Str. Ga.	911C-DJ-IAO	0	10.000
B-15	64	Str. Ga.	911C-DC-DBOI	41*	10.000
B-16	65	Str. Ga.	911C-DC-BAOI	42*	10.000
B-17	66	Str. Ga.	911DC-DAO	43	10.000
B-18	67	Str. Ga.	911CC-DAO	44	10.000
B-19	68	Str. Ga.	911DC-DAI	45	10.000
B-20	69	Str. Ga.	911CC-DAI	46	10.000
B-21	70	Str. Ga.	911C-DC-DAOI	47*	10.000
B-22	71	Str. Ga.	911DC-BBO	48	10.000
B-23	72	Str. Ga.	911CC-BBO	49	10.000
B-24	73	Str. Ga.	911DC-BBI	50	10.000
B-25	74	Str. Ga.	911CC-BBI	51	10.000
B-26	75	Str. Ga.	911C-DC-BBOI	52*	10.000
B-27	76	Str. Ga.	911DJ-IBO	53	10.000
B-28	77	Str. Ga.	911CJ-IBO	54	10.000
B-29	78	Str. Ga.	911DJ-IBI	55	10.000
B-30	79	Str. Ga.	911CJ-IBI	56	10.000
B-31	80	Str. Ga.	911C-DJ-IBOI	57*	10.000
B-32	81	Str. Ga.	911DJ-KBO	58	10.000
B-33	82	Str. Ga.	911CJ-KBO	59	10.000
B-34	83	Str. Ga.	911DJ-KBI	60	10.000
B-35	84	Str. Ga.	911CJ-KBI	61	10.000
B-36	85	Str. Ga.	911C-DJ-KBOI	62*	10.000
B-37	86	Str. Ga.	911DJ-IAO	63	10.000
B-38	87	Str. Ga.	911CJ-IAO	64	10.000
B-39	88	Str. Ga.	911DJ-IAI	65	10.000
B-40	89	Str. Ga.	911CJ-IAI	66	10.000
B-41	90	Str. Ga.	911C-DJ-IAI	67	10.000
B-42	91	Str. Ga.	911DJ-KAO	68	10.000
B-43	92	Str. Ga.	911CJ-KAO	69	10.000
B-44	93	Str. Ga.	911DJ-KAI	70	10.000
B-45	94	Str. Ga.	911CJ-KAI	71	10.000
B-46	95	Str. Ga.	911C-DJ-KAOI	72*	10.000
B-47	96	Str. Ga.	911DC-920FCAOU	73	10.000
B-48	97	Str. Ga.	911DC-920FCAOL	74	10.000
B-49	98	Str. Ga.	911DC-920FCAIU	75	10.000
B-50	99	Str. Ga.	911DC-920FCAIL	76	10.000

*Combined Gages

Channels A-24 through B-13 were used for 40 channel scan of selected information.

TABLE IV c.- INSTRUMENTATION HOOK-UP, "KEEL" TEST

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT @ GAGE
C-1	100	PWR SUPP	C REF Vo		10.004
C-2	101	Str. Ga.	911DC-920FCBOU	77	10.004
C-3	102	Str. Ga.	911DC-920FCBOL	78	10.004
C-4	103	Str. Ga.	911DC-920FCBIU	79	10.004
C-5	104	Str. Ga.	911DC-920FCBIL	80	10.004
C-6	105	Str. Ga.	911DF-920FFAOU	81	10.004
C-7	106	Str. Ga.	911DF-920FFAOL	82	10.004
C-8	107	Str. Ga.	911DF-920FFAIU	83	10.004
C-9	108	Str. Ga.	911DF-920FFAIL	84	10.004
C-10	109	Str. Ga.	911DF-920FFBOU	85	10.004
C-11	110	Str. Ga.	911DF-920FFBOL	86	10.004
C-12	111	Str. Ga.	911DF-920FFBIU	87	10.004
C-13	112	Str. Ga.	911DF-920FFBIL	88	10.004
C-14	113				
C-15	114				
C-16	115				
C-17	116				
C-18	117	Str. Ga.	911DC-920FFUL	93*	10.004
C-19	118	Str. Ga.	911CC-916AFUL	94*	10.004
C-20	119	Str. Ga.	911DC-920FAUL	95*	10.004
C-21	120	Str. Ga.	911CC-916AAUL	96*	10.004
C-22	121				
C-23	122				
C-24	123				
C-25	124				
C-26	125				
C-27	126				
C-28	127				
C-29	128				
C-30	129				
C-31	130	Str. Ga.	TRAY	105	10.004
C-32	131	Str. Ga.	TRAY	106	10.004
C-33	132	Str. Ga.	TRAY	107	10.004
C-34	133	Str. Ga.	TRAY	108	10.004
C-35	134				
C-36	135				
C-37	136				
C-38	137				
C-39	138				
C-40	139				
C-41	140				
C-42	141				
C-43	142				
C-44	143				
C-45	144	DEFL	911C/DE M-Y	D-31	10.558
C-46	145	DEFL	911C/DE M-Z	D-68	9.707
C-47	146	DEFL	936BC-BI CC	D-29	9.706
C-48	147	DEFL	936EC-EI BB	D-30	9.704
C-49	148	DEFL	936EC-920FB D	D-07	9.714
C-50	149	DEFL	936EC-920FD E	D-08	9.705

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT @ GAGE
D-1	150	PWR SUPP	D REF Vo		10.240
D-2	151	DEFL	920FF C-Y	D-06	9.992
D-3	152	DEFL	911C-DF N-X	D-33	10.010
D-4	153	DEFL	911C/LL-A J-X	D-13	9.997
D-5	154	DEFL	911C/DL-A J-Y	D-14	10.018
D-6	155	DEFL	911C/DL-A J-Z	D-15	9.993
D-7	156	DEFL	920FL-A A-X	D-01	9.976
D-8	157	DEFL	920FL-A A-Y	D-02	10.000
D-9	158	DEFL	920FL-A A-Z	D-21	9.995
D-10	159	DEFL	920FC B-X	D-03	9.988
D-11	160	DEFL	920FC B-Y	D-04	9.985
D-12	161	DEFL	920FC B-Z	D-22	9.993
D-13	162	DEFL	916AC V-X	D-53	10.000
D-14	163	DEFL	916AC V-Y	D-54	9.993
D-15	164	DEFL	916AC V-Z	D-55	9.992
D-16	165	DEFL	936BC S-Y	D-46	10.002
D-17	166	DEFL	936BC S-Z	D-47	9.995
D-18	167	DEFL	936CC Q-Y	D-42	9.994
D-19	168	DEFL	936CC Q-Z	D-43	9.996
D-20	169	DEFL	936DC H-Y	D-11	9.999
D-21	170	DEFL	936DC H-Z	D-26	9.995
D-22	171	DEFL	936EC F-Y	D-09	9.990
D-23	172	DEFL	936EC F-Z	D-24	9.990
D-24	173	DEFL	936BF T-Y	D-48	9.991
D-25	174	DEFL	936BF T-Z	D-80	9.999
D-26	175	DEFL	936CF R-Y	D-44	9.996
D-27	176	DEFL	936CF R-Z	D-45	9.994
D-28	177	DEFL	936DF I-Y	D-12	10.000
D-29	178	DEFL	936DF I-Z	D-27	9.995
D-30	179	DEFL	936EF G-Y	D-10	10.000
D-31	180	DEFL	936EF G-Z	D-25	9.993
D-32	181	DEFL	911C/DD L-Y	D-19	9.993
D-33	182	DEFL	911C/DD L-Z	D-20	10.002
D-34	183	DEFL	911C-DF N-Z	D-35	9.989
D-35	184	AOAI	TEST STR PITCH	Q-10	
D-36	185	AOAI	TEST STR ROLL	Q-9	
D-37	186	DEFL	LM TEST STRU X	D-70	9.983
D-38	187	DEFL	LM TEST STRU Y	D-71	9.991
D-39	188	DEFL	LM TEST STRU Z	D-72	9.990
D-40	189	DEFL	RM TEST STRU X	D-73	9.995
D-41	190	DEFL	RM TEST STRU Y	D-74	9.998
D-42	191	DEFL	RM TEST STRU Z	D-75	10.000
D-43	192	DEFL	LE TEST STRU X	D-76	9.996
D-44	193	DEFL	LE TEST STRU Y	D-77	9.997
D-45	194	DEFL	LE TEST STRU Z	D-78	9.995
D-46	195	DEFL	RE TEST STRU X	D-32	10.005
D-47	196	DEFL	RE TEST STRU Y	D-69	10.002
D-48	197	DEFL	RE TEST STRU Z	D-79	10.002
D-49	198	AOAI	RM TRUN PITCH	Q-11	
D-50	199	AOAI	RM TRUN ROLL	Q-12	

*Combined Gages

TABLE IV c. (CONTD.)- INSTRUMENTATION HOOK-UP, "KEEL" TEST

CHAN NO.		FUNCT.	LOCATION	IDENT. NO.	VOLT. @ GAGE
SIG. CONDT	SCAN				
A-1	0	PWR SUPP	A REF Vo		10.850
A-2	1	DEFL	LM TRUN K-X	D-16	10.561
A-3	2	DEFL	LM TRUN K-Y	D-17	10.523
A-4	3	DEFL	LM TRUN K-Z	D-18	10.642
A-5	4	DEFL	RM TRUN P-X	D-39	10.256
A-6	5	DEFL	RM TRUN P-Y	D-40	10.526
A-7	6	DEFL	RM TRUN P-Z	D-41	10.643
A-8	7	DEFL	LESB TRUN X-X	D-59	10.517
A-9	8	DEFL	LESB TRUN X-Y	D-60	10.582
A-10	9	DEFL	LESB TRUN X-Z	D-61	10.645
A-11	10	DEFL	RESB TRUN Y-X	D-62	10.534
A-12	11	DEFL	RESB TRUN Y-Y	D-63	10.530
A-13	12	DEFL	RESB TRUN Y-Z	D-64	10.644
A-14	13	DEFL	KEEL O-X	D-36	10.641
A-15	14	DEFL	KEEL O-Y	D-37	10.642
A-16	15	DEFL	KEEL O-Z	D-38	10.651
A-17	16	DEFL	916AL-A U-X	D-50	10.651
A-18	17	DEFL	916AL-A U-Y	D-51	10.523
A-19	18	DEFL	916AL-A U-Z	D-52	10.652
A-20	19	DEFL	916AF W-Y	D-57	10.581
A-21	20	DEFL	ESBS Z-X	D-65	10.527
A-22	21	DEFL	ESBS Z-Y	D-66	10.612
A-23	22	DEFL	ESBS Z-Z	D-67	10.645
A-24	23	DEFL	916AF W-X	D-56	10.532
A-25	24	DEFL	916AF W-Z	D-58	10.646
A-26	25	DEFL	920FF C-X	D-05	10.641
A-27	26	DEFL	920FF C-Z	D-23	10.650
A-28	27	DEFL	911C-DF N-Y	D-34	10.581
A-29	28				
A-30	29				
A-31	30				
A-32	31				
A-33	32				
A-34	33				
A-35	34				
A-36	35	LOAD CELL	FESS Z	50-10	10.533
A-37	36	Str. Ga.	RM TRUN -Z	31	
A-38	37	Str. Ga.	LM TRUN -Z	91	
A-39	38	Str. Ga.	RM TRUN -X	32	
A-40	39	Str. Ga.	LM TRUN -X	90	
A-41	40	LOAD CELL	RESB TRUN Z	50-98	10.543
A-42	41	LOAD CELL	LESB TRUN Z	50-34	9.982
A-43	42	LOAD CELL	916AA-L Z	L12-10	10.538
A-44	43	LOAD CELL	916AF-G Z	L10-7	10.580
A-45	44				
A-46	45				
A-47	46				
A-48	47				
A-49	48				
A-50	49				

CHAN NO.		FUNCT.	LOCATION	IDENT. NO.	VOLT. @ GAGE
SIG. CONDT	SCAN				
B-1	50	PWR SUPP	B REF Vo		10.000
B-2	51	Str. Ga.	LM TRUN +Z	89	9.9655
B-3	52	Str. Ga.	LM TRUN +X	92	9.9657
B-4	53	Str. Ga.	RM TRUN +Z	29	9.9659
B-5	54	Str. Ga.	RM TRUN +X	30	9.9658
B-6	55	Str. Ga.	911DC-DBO	33	10.000
B-7	56	Str. Ga.	911CC-DBO	34	10.000
B-8	57	Str. Ga.	911DC-DBI	35	10.000
B-9	58	Str. Ga.	911CC-DBI	36	10.000
B-10	59	Str. Ga.	911DC-BAO	37	10.000
B-11	60	Str. Ga.	911CC-BAO	38	10.000
B-12	61	Str. Ga.	911DC-BAI	39	10.000
B-13	62	Str. Ga.	911CC-BAI	40	10.000
B-14	63	Str. Ga.	911C-DJ-IAO	0	10.000
B-15	64	Str. Ga.	911C-DC-DBOI	41*	10.000
B-16	65	Str. Ga.	911C-DC-BAOI	42*	10.000
B-17	66	Str. Ga.	911DC-DAO	43	10.000
B-18	67	Str. Ga.	911CC-DAO	44	10.000
B-19	68	Str. Ga.	911DC-DAI	45	10.000
B-20	69	Str. Ga.	911CC-DAI	46	10.000
B-21	70	Str. Ga.	911C-DC-DAOI	47*	10.000
B-22	71	Str. Ga.	911DC-BBO	48	10.000
B-23	72	Str. Ga.	911CC-BBO	49	10.000
B-24	73	Str. Ga.	911DC-BBI	50	10.000
B-25	74	Str. Ga.	911CC-BBI	51	10.000
B-26	75	Str. Ga.	911C-DC-BBOI	52*	10.000
B-27	76	Str. Ga.	911DJ-IBO	53	10.000
B-28	77	Str. Ga.	911CJ-IBO	54	10.000
B-29	78	Str. Ga.	911DJ-IBI	55	10.000
B-30	79	Str. Ga.	911CJ-IBI	56	10.000
B-31	80	Str. Ga.	911C-DJ-IBOI	57*	10.000
B-32	81	Str. Ga.	911DJ-KBO	58	10.000
B-33	82	Str. Ga.	911CJ-KBO	59	10.000
B-34	83	Str. Ga.	911DJ-KBI	60	10.000
B-35	84	Str. Ga.	911CJ-KBI	61	10.000
B-36	85	Str. Ga.	911C-DJ-KBOI	62*	10.000
B-37	86	Str. Ga.	911DJ-IAO	63	10.000
B-38	87	Str. Ga.	911CJ-IAO	64	10.000
B-39	88	Str. Ga.	911DJ-IAI	65	10.000
B-40	89	Str. Ga.	911CJ-IAI	66	10.000
B-41	90	Str. Ga.	911C-DJ-IAI	67	10.000
B-42	91	Str. Ga.	911DJ-KAO	68	10.000
B-43	92	Str. Ga.	911CJ-KAO	69	10.000
B-44	93	Str. Ga.	911DJ-KAI	70	10.000
B-45	94	Str. Ga.	911CJ-KAI	71	10.000
B-46	95	Str. Ga.	911C-DJ-KAOI	72*	10.000
B-47	96	Str. Ga.	911DC-920FCAOU	73	10.000
B-48	97	Str. Ga.	911DC-920FCAOL	74	10.000
B-49	98	Str. Ga.	911DC-920FCAIU	75	10.000
B-50	99	Str. Ga.	911DC-920FCAIL	76	10.000

*Combined Gages

Channels A-24 through B-13 were used for 40 channel scan of selected information.

TABLE IV D.- INSTRUMENTATION HOOK-UP, "END SUPPORT BEAM" TEST

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT @ CAGE
C-1	100	PWR SUPP	C REF Vo		10.004
C-2	101	Str. Ga.	911DC-920FCBOU	77	10.004
C-3	102	Str. Ga.	911DC-920FCBOL	78	10.004
C-4	103	Str. Ga.	911DC-920FCBIU	79	10.004
C-5	104	Str. Ga.	911DC-920FCBIL	80	10.004
C-6	105	Str. Ga.	911DF-920FFAOU	81	10.004
C-7	106	Str. Ga.	911DF-920FFAOL	82	10.004
C-8	107	Str. Ga.	911DF-920FFAIU	83	10.004
C-9	108	Str. Ga.	911DF-920FFAIL	84	10.004
C-10	109	Str. Ga.	911DF-920FFBOU	85	10.004
C-11	110	Str. Ga.	911DF-920FFBOL	86	10.004
C-12	111	Str. Ga.	911DF-920FFBIU	87	10.004
C-13	112	Str. Ga.	911DF-920FFBIL	88	10.004
C-14	113				
C-15	114				
C-16	115				
C-17	116				
C-18	117	Str. Ga.	911DC-920FFUL	93*	10.004
C-19	118	Str. Ga.	911CC-916AFUL	94*	10.004
C-20	119	Str. Ga.	911DC-920FAUL	95*	10.004
C-21	120	Str. Ga.	911CC-916AAUL	96*	10.004
C-22	121	Str. Ga.	ESB	97	10.004
C-23	122	Str. Ga.	ESB	98	10.004
C-24	123	Str. Ga.	ESB	99	10.004
C-25	124	Str. Ga.	ESB	100	10.004
C-26	125	Str. Ga.	ESB	101	10.004
C-27	126	Str. Ga.	ESB	102	10.004
C-28	127	Str. Ga.	ESB	103	10.004
C-29	128	Str. Ga.	ESB	104	10.004
C-30	129	Str. Ga.	ESB	109	10.004
C-31	130	Str. Ga.	ESB	110	10.004
C-32	131	Str. Ga.	ESB	111	10.004
C-33	132	Str. Ga.	ESB	112	10.004
C-34	133	Str. Ga.	ESB	113	10.004
C-35	134	Str. Ga.	ESB	114	10.004
C-36	135	Str. Ga.	ESB	115	10.004
C-37	136	Str. Ga.	ESB	116	10.004
C-38	137	Str. Ga.	TRAY	105	10.004
C-39	138	Str. Ga.	TRAY	106	10.004
C-40	139	Str. Ga.	TRAY	107	10.004
C-41	140	Str. Ga.	TRAY	108	10.004
C-42	141				
C-43	142				
C-44	143				
C-45	144	DEFL	911C/DE M-Y	D-31	10.558
C-46	145	DEFL	911C/DE M-Z	D-68	9.707
C-47	146	DEFL	936BC-BI CC	D-29	9.706
C-48	147	DEFL	936EC-EI BB	D-30	9.704
C-49	148	DEFL	936EC-920FB D	D-07	9.714
C-50	149	DEFL	936EC-920FD E	D-08	9.705

CHAN NO. SIG. CONDT	CHAN NO. SCAN	FUNCT.	LOCATION	IDENT. NO.	VOLT @ CAGE
D-1	150	PWR SUPP	D REF Vo		10.240
D-2	151	DEFL	920FF C-Y	D-06	9.992
D-3	152	DEFL	911C-DF N-X	D-33	10.010
D-4	153	DEFL	911C/DL-A J-X	D-13	9.997
D-5	154	DEFL	911C/DL-A J-Y	D-14	10.018
D-6	155	DEFL	911C/DL-A J-Z	D-15	9.993
D-7	156	DEFL	920FL-A A-X	D-01	9.976
D-8	157	DEFL	920FL-A A-Y	D-02	10.000
D-9	158	DEFL	920FL-A A-Z	D-21	9.995
D-10	159	DEFL	920FC B-X	D-03	9.988
D-11	160	DEFL	920FC B-Y	D-04	9.985
D-12	161	DEFL	920FC B-Z	D-22	9.993
D-13	162	DEFL	916AC V-X	D-53	10.000
D-14	163	DEFL	916AC V-Y	D-54	9.993
D-15	164	DEFL	916AC V-Z	D-55	9.992
D-16	165	DEFL	936BC S-Y	D-46	10.002
D-17	166	DEFL	936BC S-Z	D-47	9.995
D-18	167	DEFL	936CC Q-Y	D-42	9.994
D-19	168	DEFL	936CC Q-Z	D-43	9.996
D-20	169	DEFL	936DC H-Y	D-11	9.999
D-21	170	DEFL	936DC H-Z	D-26	9.995
D-22	171	DEFL	936EC F-Y	D-09	9.990
D-23	172	DEFL	936EC F-Z	D-24	9.990
D-24	173	DEFL	936BF T-Y	D-48	9.991
D-25	174	DEFL	936BF T-Z	D-60	9.999
D-26	175	DEFL	936CF R-Y	D-44	9.996
D-27	176	DEFL	936CF R-Z	D-45	9.994
D-28	177	DEFL	936DF I-Y	D-12	10.000
D-29	178	DEFL	936DF I-Z	D-27	9.995
D-30	179	DEFL	936EF G-Y	D-10	10.000
D-31	180	DEFL	936EF G-Z	D-25	9.993
D-32	181	DEFL	911C/DD L-Y	D-19	9.993
D-33	182	DEFL	911C/DD L-Z	D-20	10.002
D-34	183	DEFL	911C-DF N-Z	D-35	9.989
D-35	184	AOAI	TEST STR PITC	Q-10	
D-36	185	AOAI	TEST STR ROLL	Q-9	
D-37	186	DEFL	LM TEST STRU X	D-70	9.983
D-38	187	DEFL	LM TEST STRU Y	D-71	9.991
D-39	188	DEFL	LM TEST STRU Z	D-72	9.990
D-40	189	DEFL	RM TEST STRU X	D-73	9.995
D-41	190	DEFL	RM TEST STRU Y	D-74	9.998
D-42	191	DEFL	RM TEST STRU Z	D-75	10.000
D-43	192	DEFL	LE TEST STRU X	D-76	9.996
D-44	193	DEFL	LE TEST STRU Y	D-77	9.997
D-45	194	DEFL	LE TEST STRU Z	D-78	9.995
D-46	195	DEFL	RE TEST STRU X	D-32	10.005
D-47	196	DEFL	RE TEST STRU Y	D-69	10.002
D-48	197	DEFL	RE TEST STRU Z	D-79	10.002
D-49	198	AOAI	RM TRUN PITCH	Q-11	
D-50	199	AOAI	RM TRUN ROLL	Q-12	

*Combined Cages

TABLE IV D. (CONTD.)- INSTRUMENTATION HOOK-UP, "END SUPPORT BEAM" TEST

	1.2 x LIMIT LOAD (LBS.)				APPLIED LOAD (LBS.)*				REACTED LOAD (LBS.)*			
	MAIN TRUNNION		ESB	KEEL	MAIN TRUNNION		ESB	KEEL	MAIN TRUNNION		ESB	KEEL
	VERTICAL	LONGITUDINAL	VERTICAL	LATERAL	VERTICAL	LONGITUDINAL	VERTICAL	LATERAL	VERTICAL	LONGITUDINAL	VERTICAL	LATERAL
TEST I (LANDING)	138,650	41,620	—	—	139,600	47,230	—	—	145,810	46,625	—	—
TEST II (LIFT-OFF)	63,855	84,330	—	—	67,840	86,940	—	—	68,675	86,310	—	—
TEST III (MANEUVERING - KEEL)	—	—	—	21,460	—	—	—	25,050	—	—	—	23,045
TEST IV (LANDING-ESB)	—	—	43,350	—	—	—	45,030	—	—	—	43,515	—

* INCLUDES TARE

TABLE V.- LDEF VERIFICATION TEST LOADS

STRUCTURAL ELEMENT	TYPE OF STRESS	STRESS-PSI		
		120% OF LIMIT STRESS	MEASURED STRESS	PREDICTED STRESS FROM TEST LOADS
DIAGONAL (TENSILE)	AXIAL	5,328	5,304	5,310
DIAGONAL (COMPRESSIVE)	AXIAL	-3,372	-4,111	-4,140
END SUPPORT BEAM	COMBINED	12,090	10,697	12,136
CENTER RING (BELOW TRUNNION)	COMBINED	5,292	6,737	5,990
CENTER RING (ABOVE TRUNNION)	COMBINED	-5,412	-5,505	-5,240
LONGERON	AXIAL	-268	-307	-312

TABLE VI.- LDEF STRUCTURAL ELEMENT STRESSES

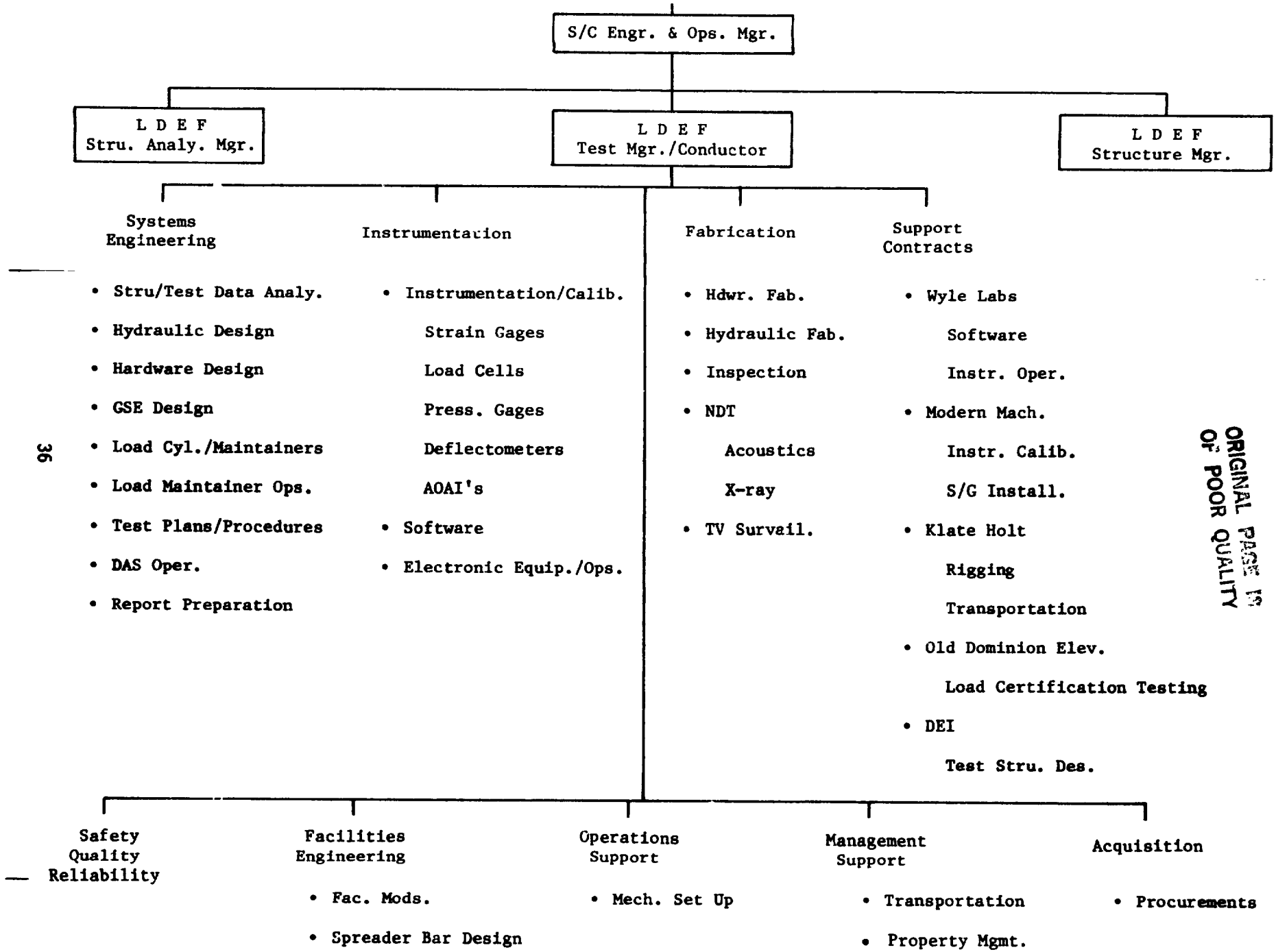


FIGURE 1.- TEST ORGANIZATIONAL STRUCTURE

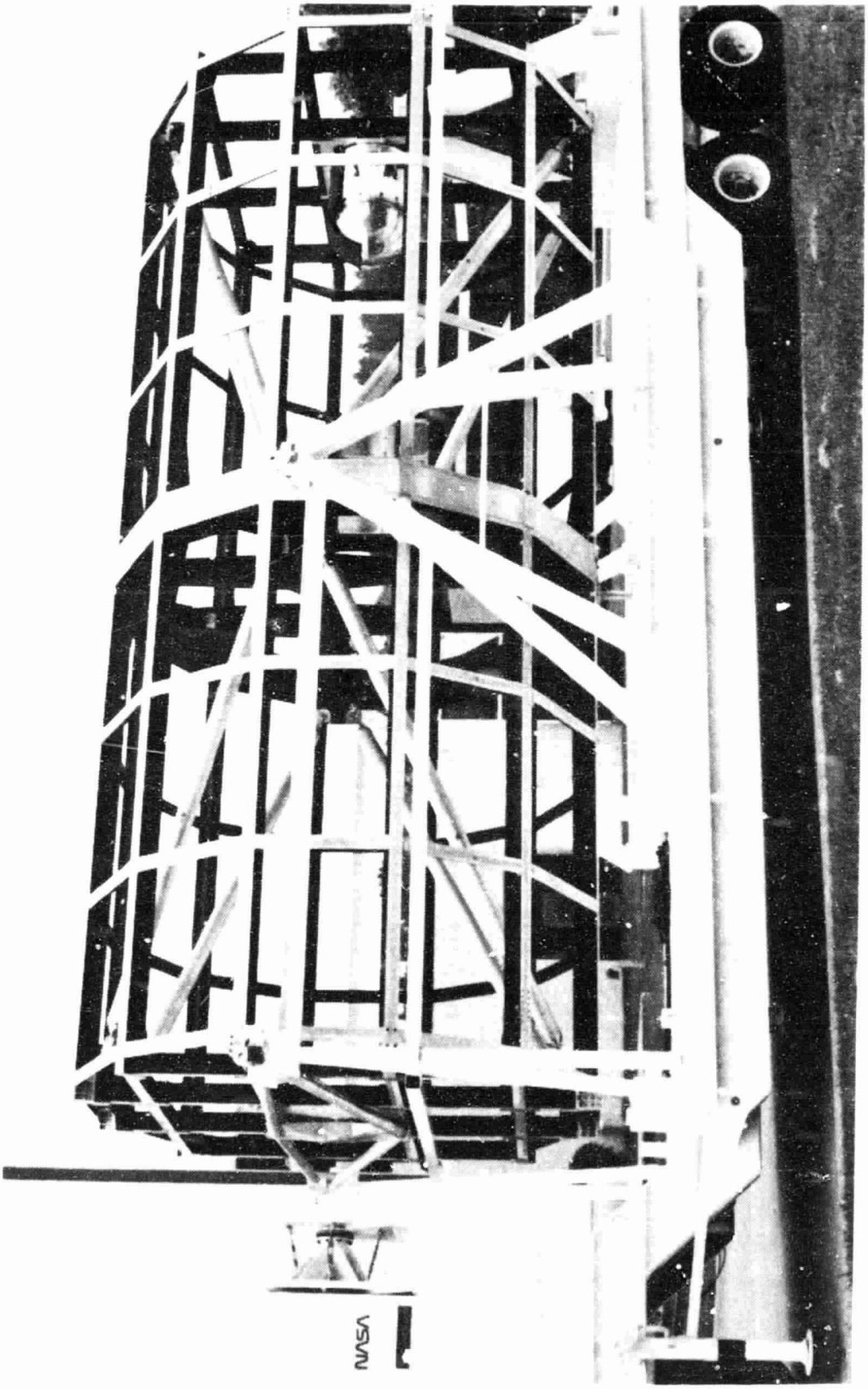


FIGURE 2.- LDEF STRUCTURAL FRAMEWORK

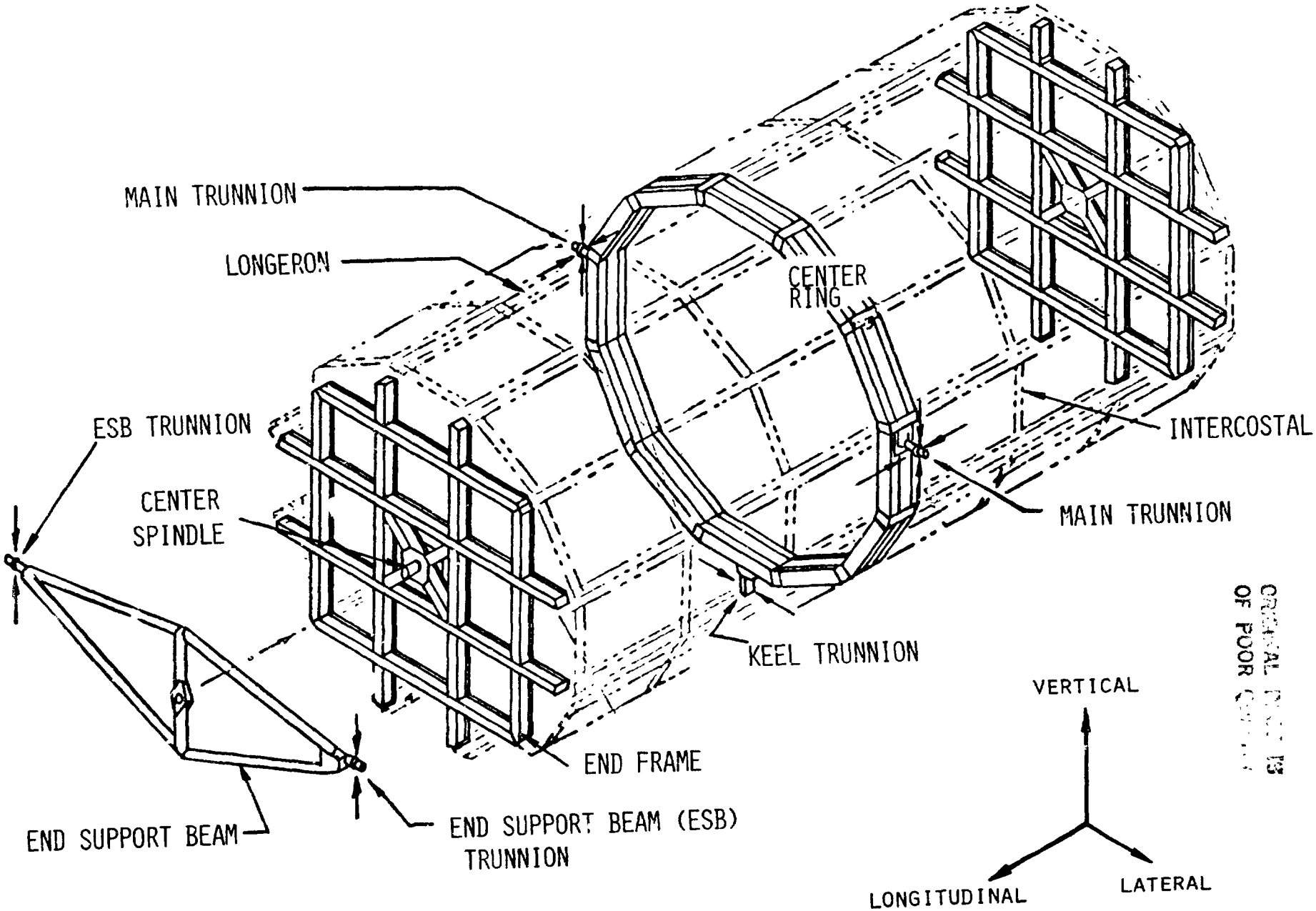


FIGURE 3.- LDEF STRUCTURE EXPLODED VIEW

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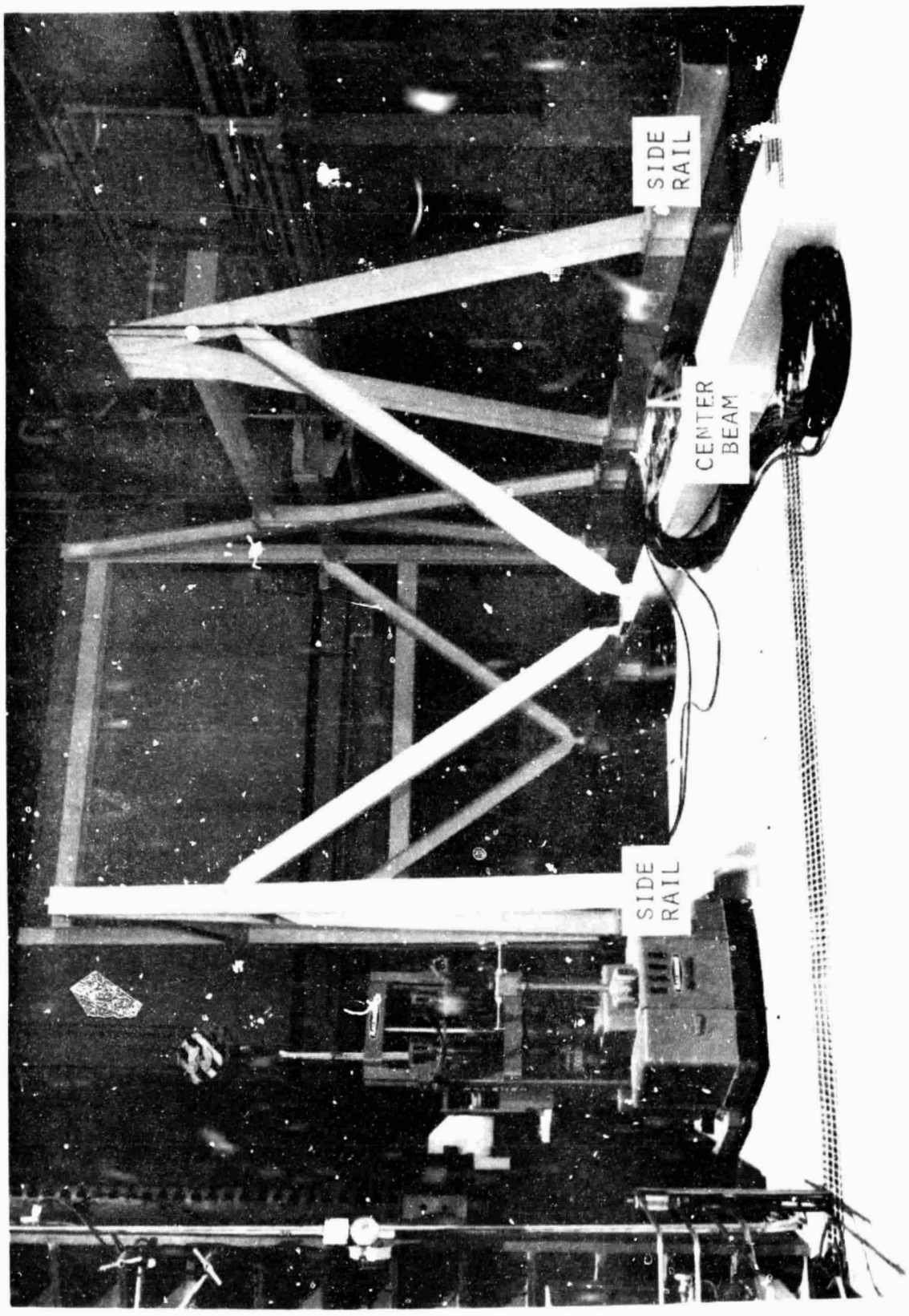

FIGURE 4.- TEST SUPPORT FRAME

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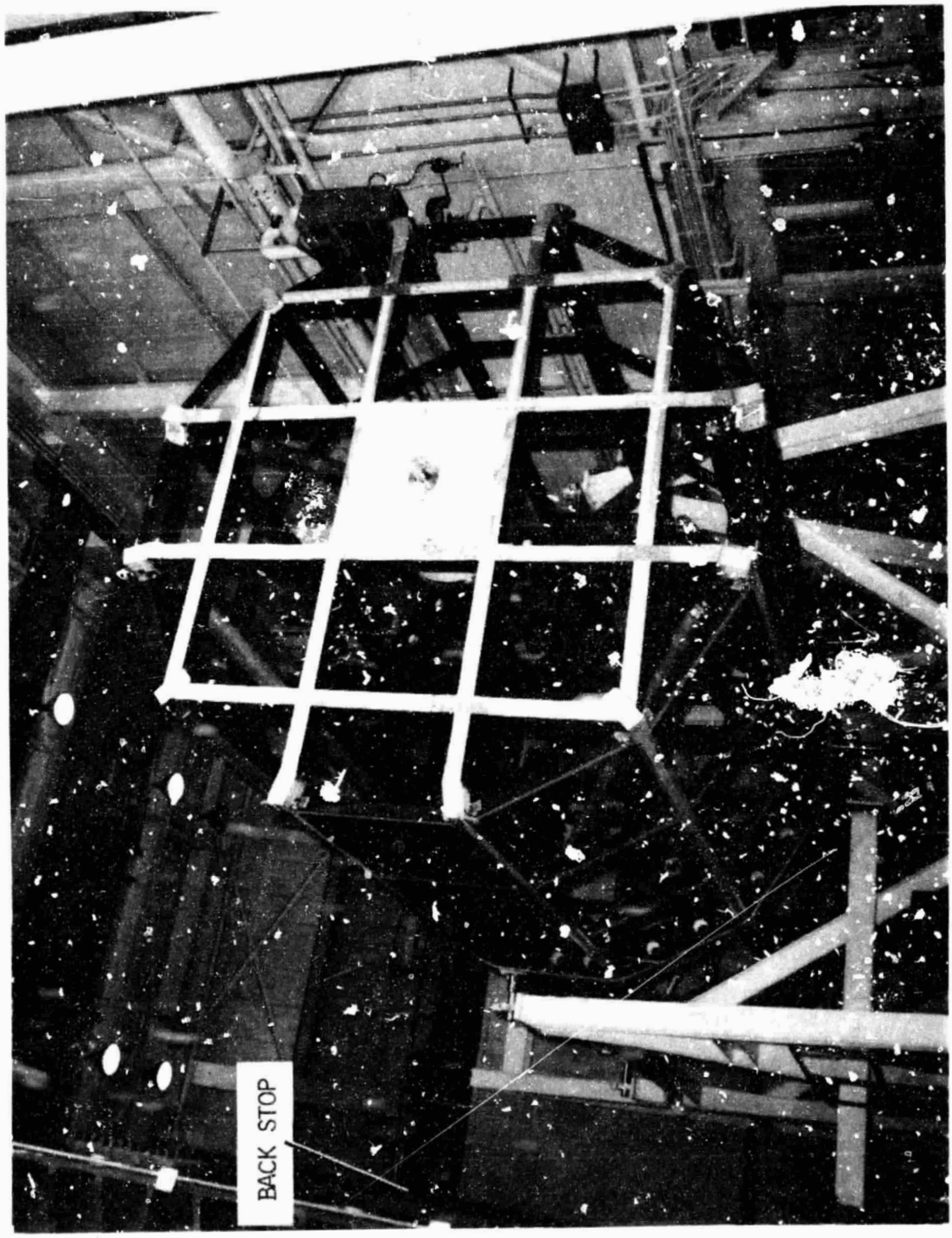

FIGURE 5.- LDEF IN TEST SUPPORT FRAME

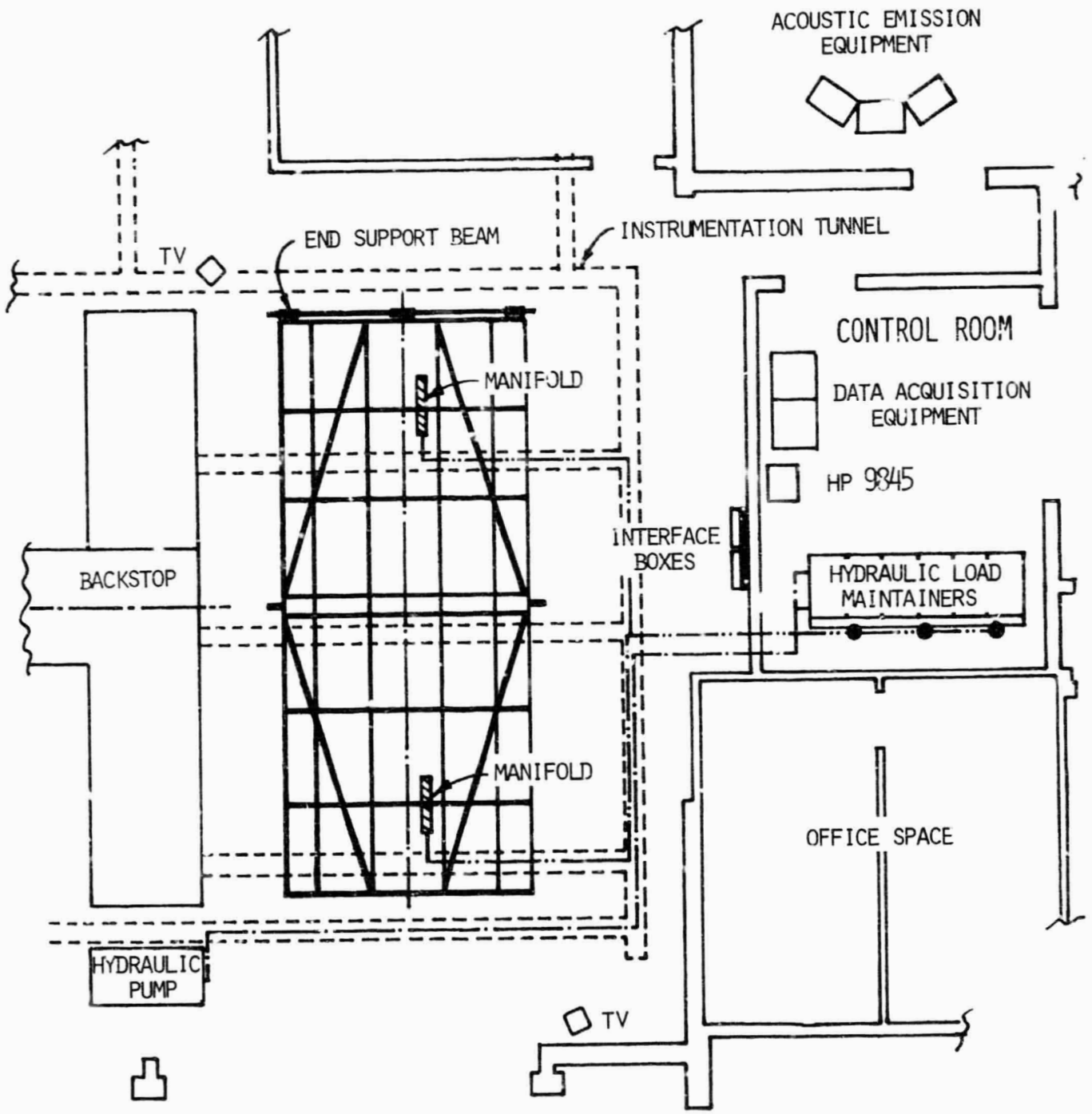

FIGURE 6.- LDEF TEST FACILITY TOP VIEW

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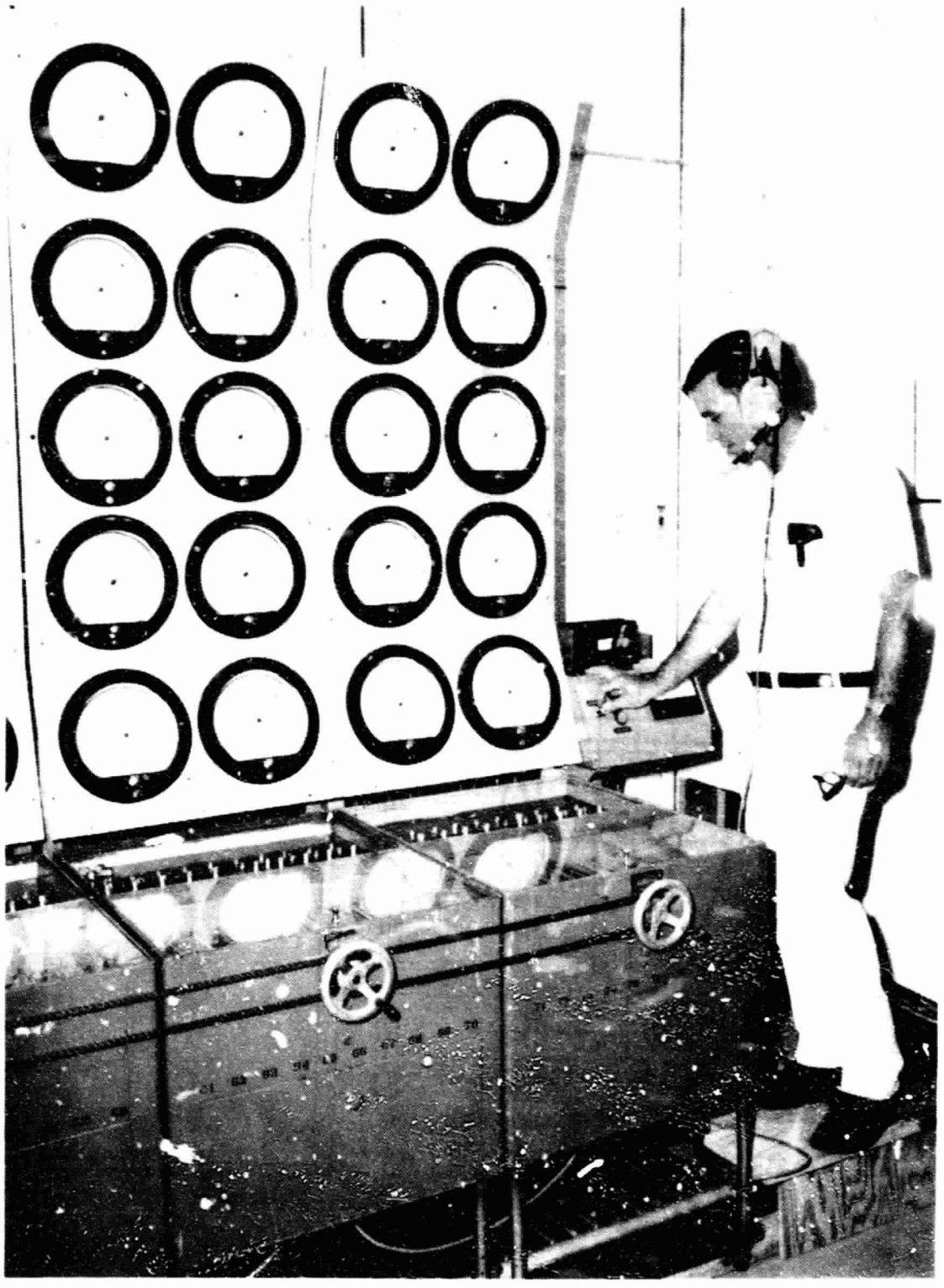

FIGURE 7.- HYDRAULIC LOAD MAINTAINERS

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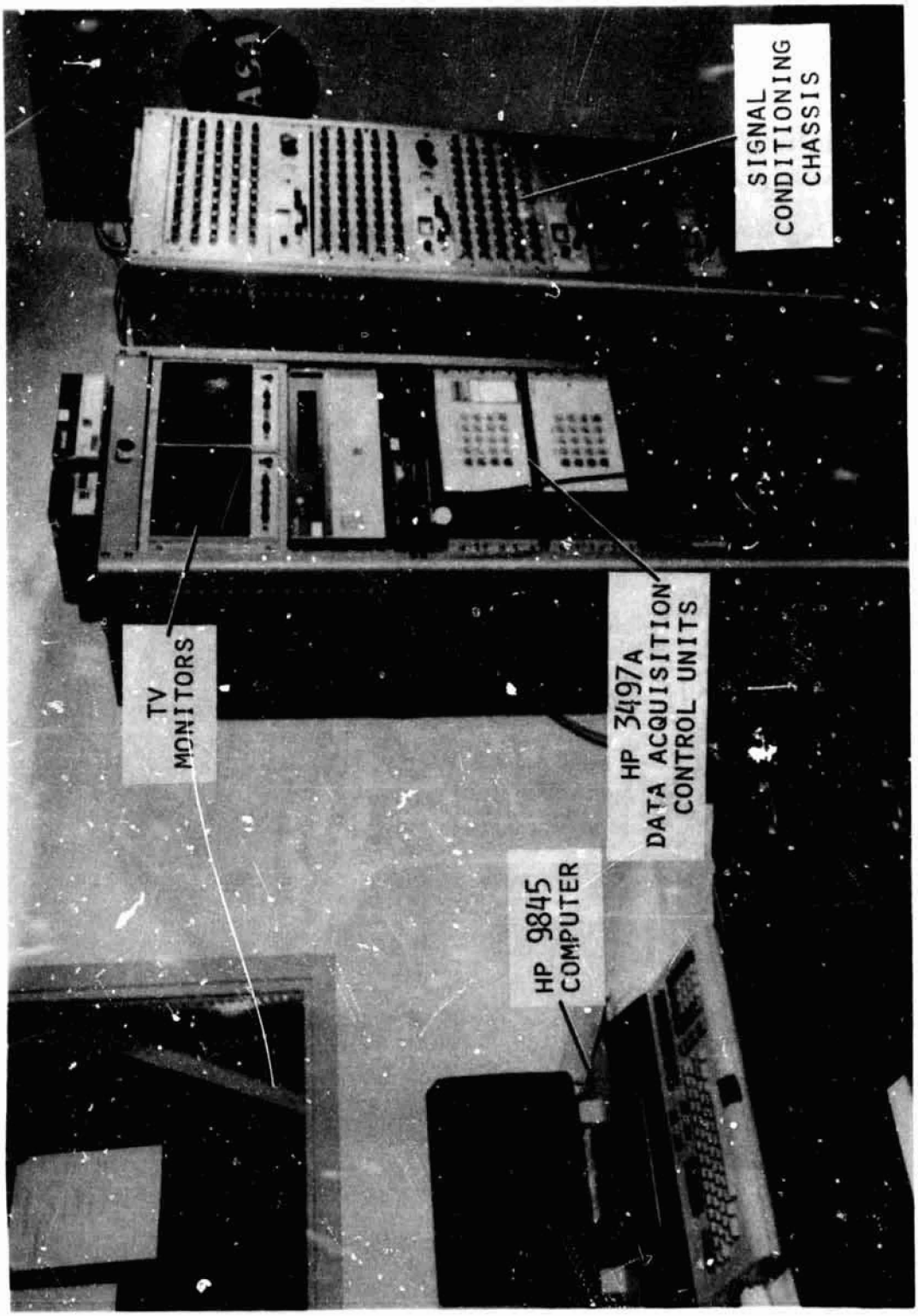

FIGURE 8.- DATA ACQUISITION SYSTEM

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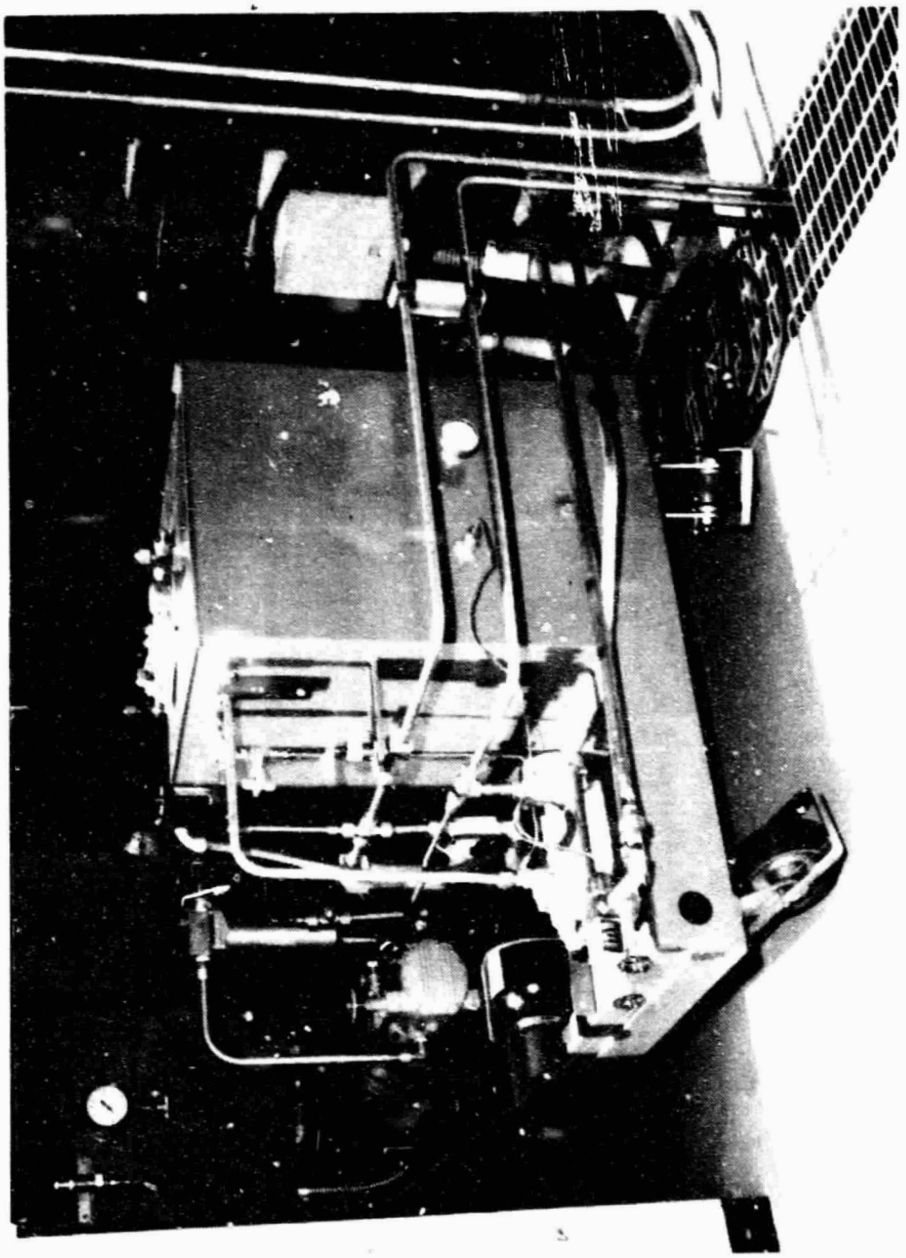

FIGURE 9.- HYDRAULIC PUMP

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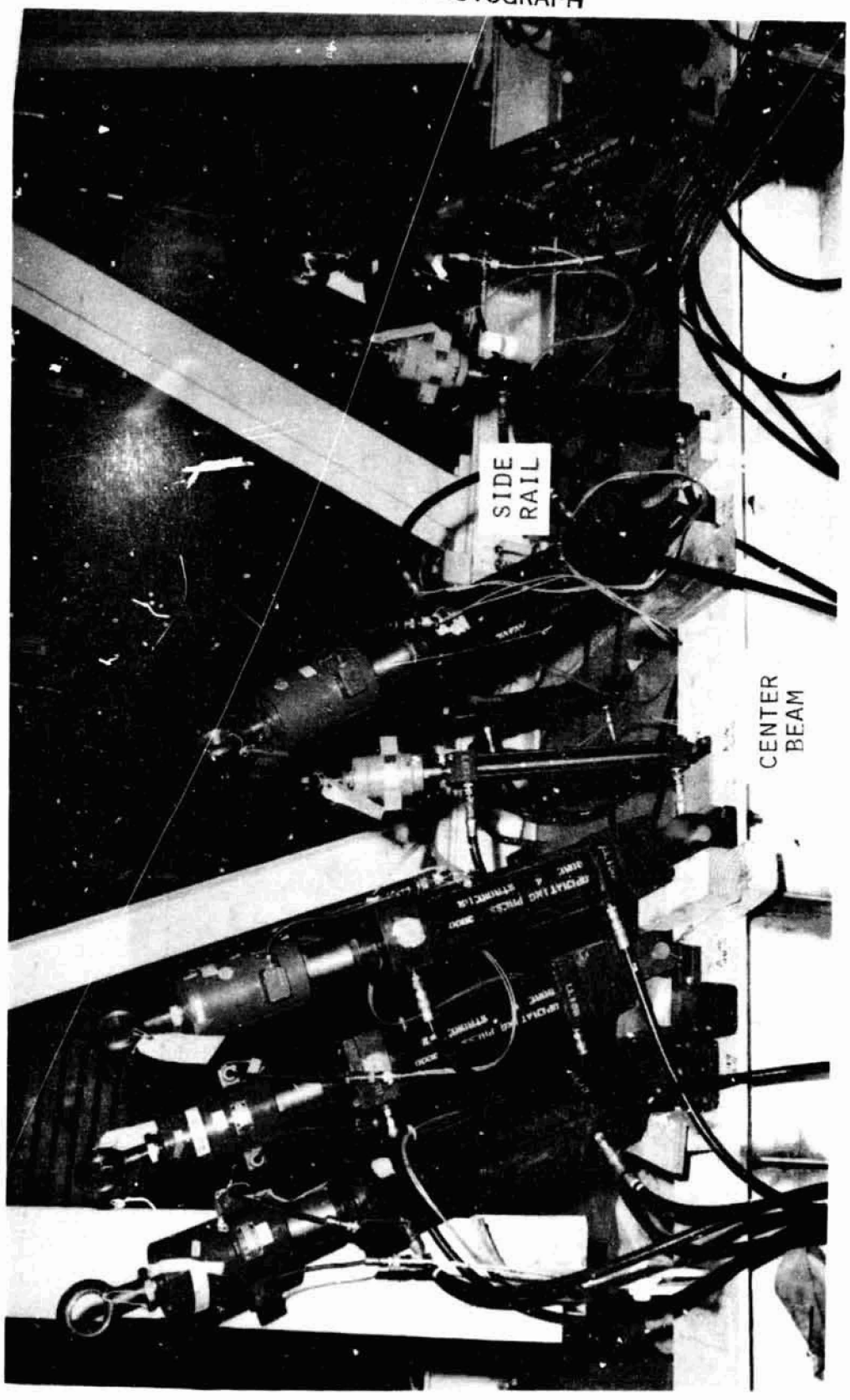


FIGURE 10.- TYPICAL INSTALLATION OF HYDRAULIC CYLINDERS AND LOAD CELLS

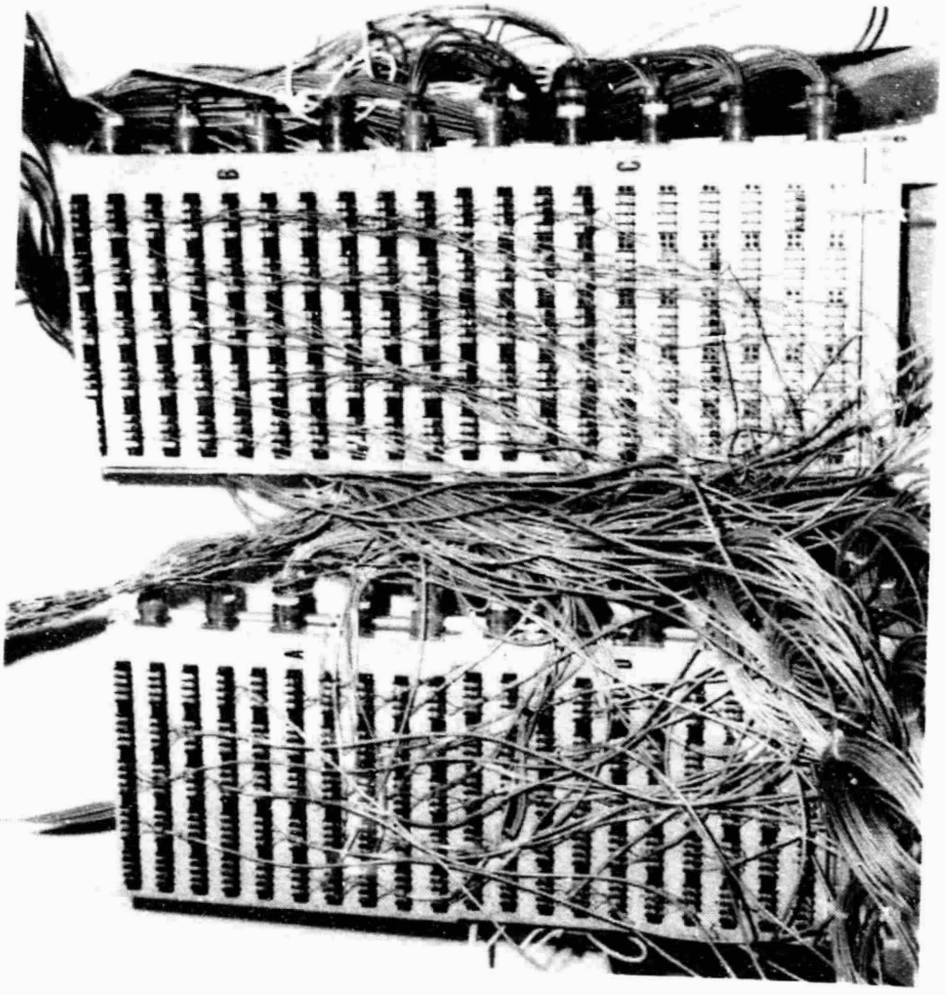


FIGURE 11.- DAS INTERFACE BOXES

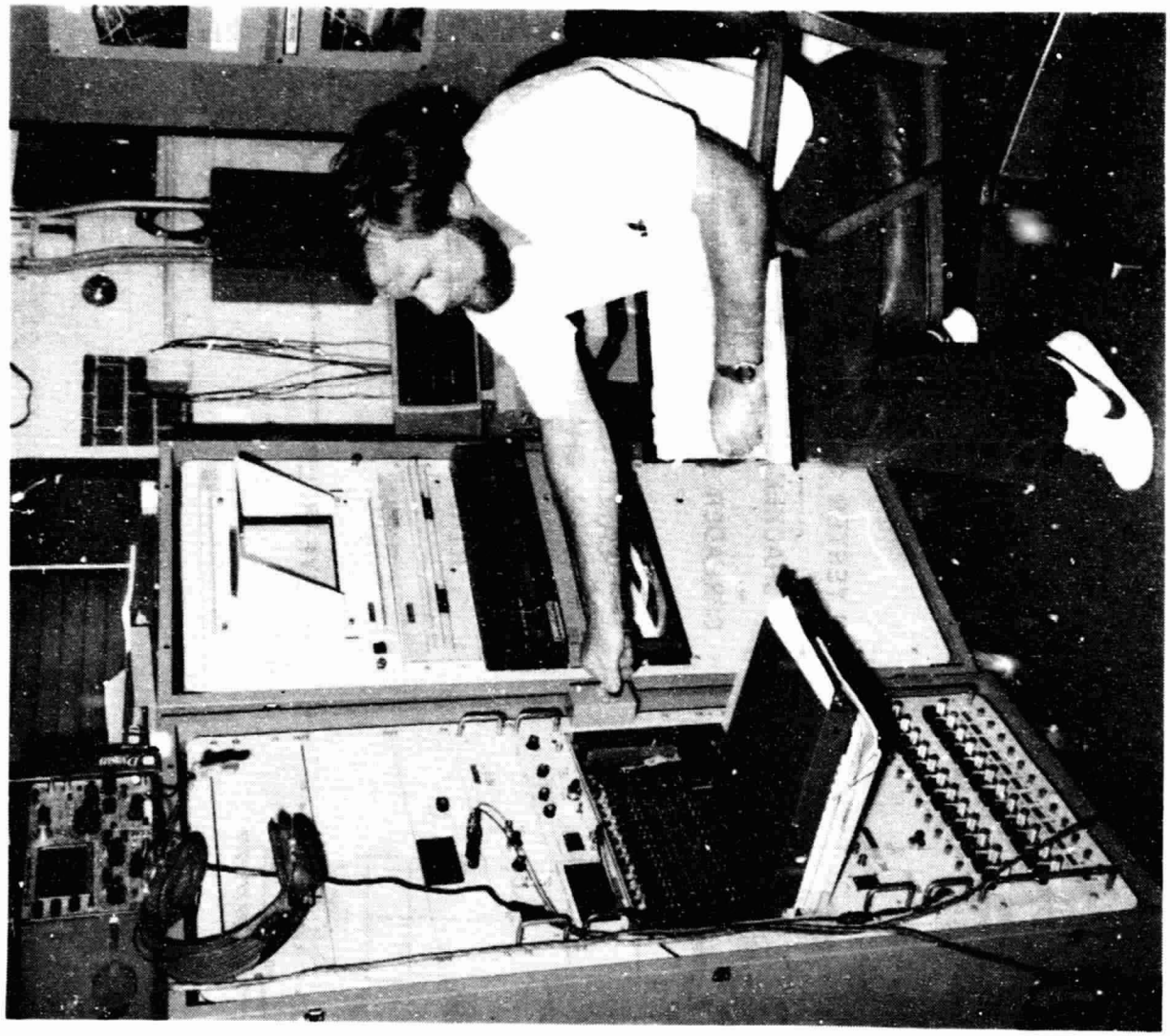
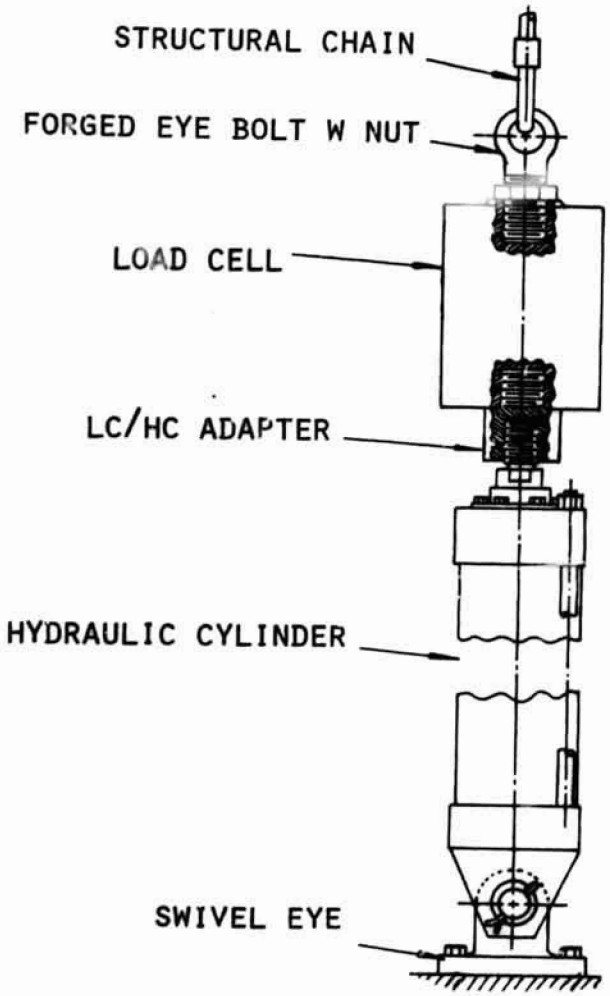


FIGURE 12.- DUNEGAN/ENDEVCO MDL. 1032-DART ACOUSTIC EMISSION MONITORING SYSTEM



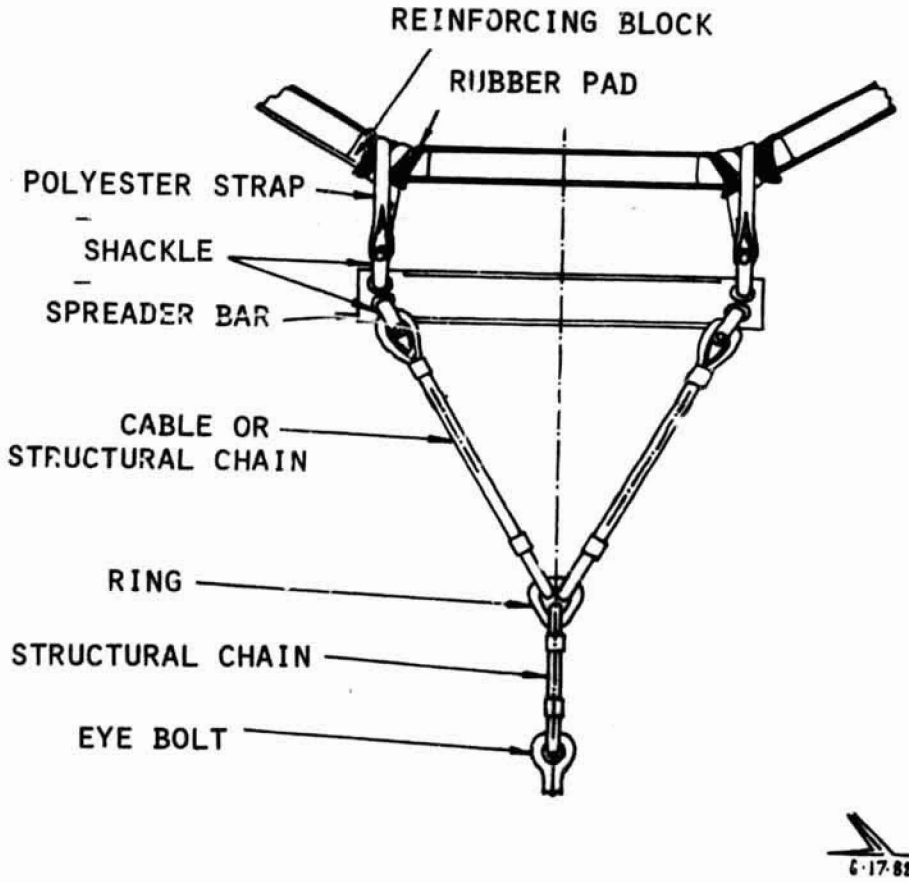


FIGURE 13.- TYPICAL LOAD APPLICATION TRAIN

FIGURE 14 A.- DEFLECTOMETER MOUNTING

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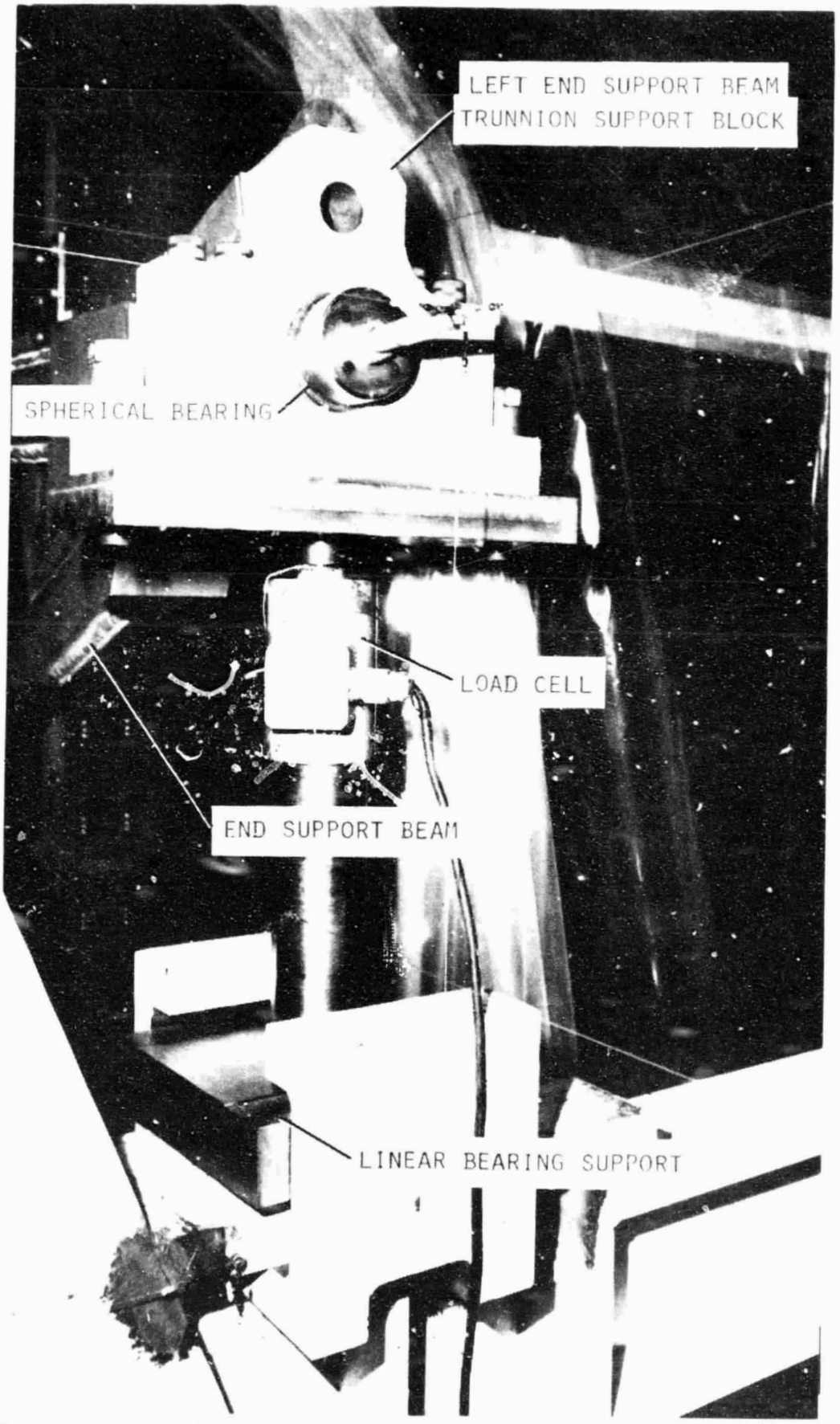

FIGURE 14 B.- DEFLECTOMETER MOUNTING

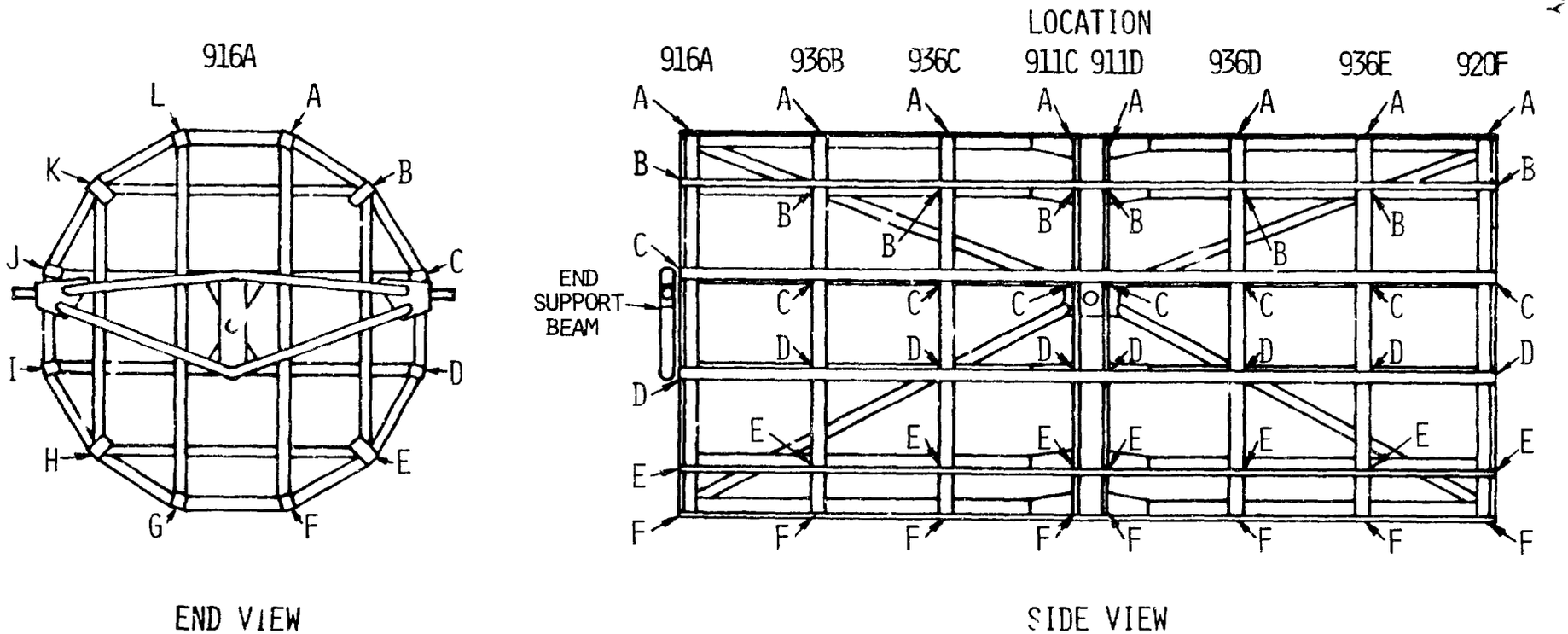

FIGURE 15.- LDEF STANDARD LOCATION DESIGNATION (JOINT NUMBERING SYSTEM)

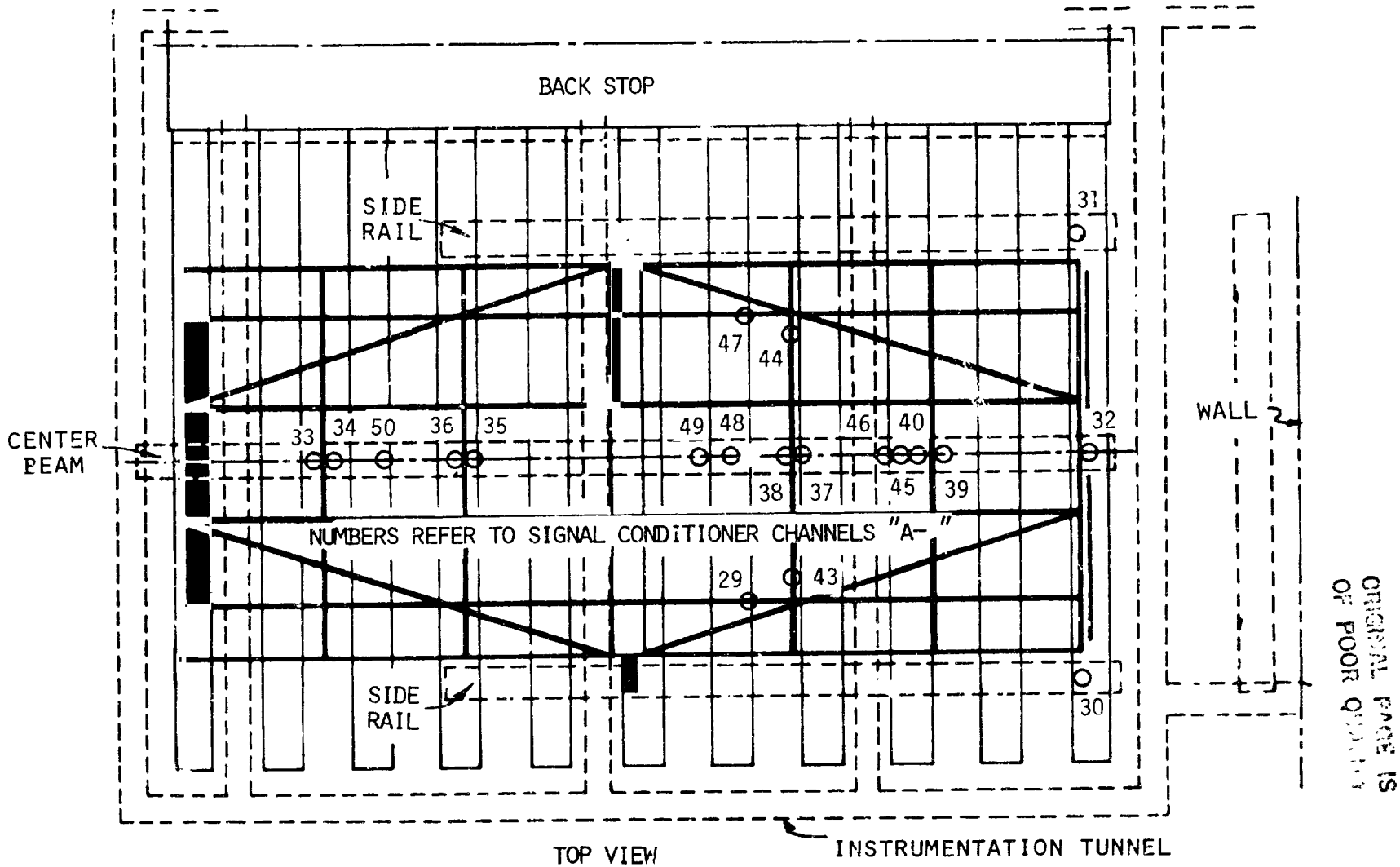

FIGURE 16 A.- FACILITY LOAD INPUT ATTACH POINTS, "LANDING" TEST

SWIVEL EYE MOUNT LOCATIONS FOR LOAD APPLICATION TRAINS

8-11-92

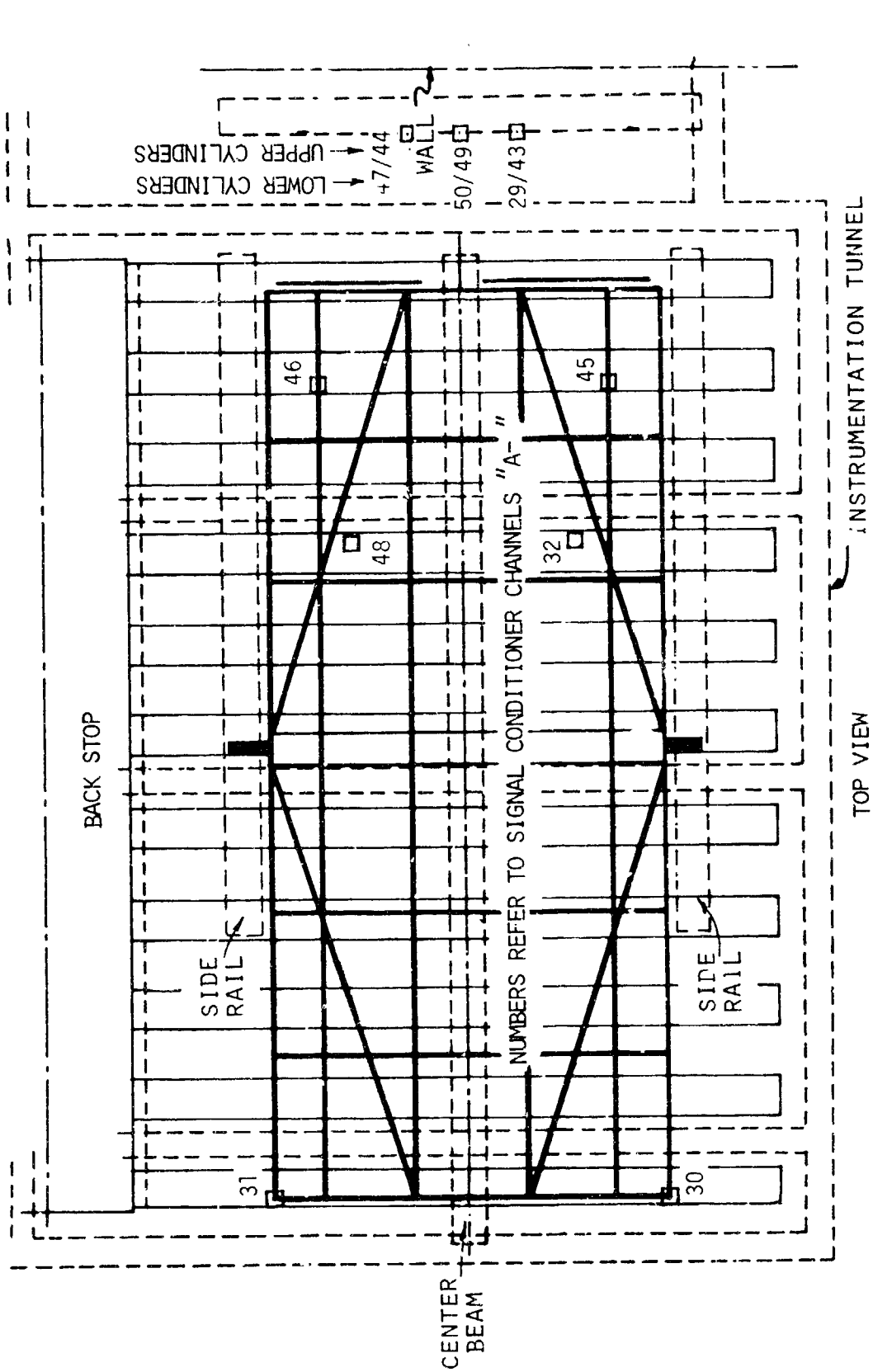

FIGURE 16 B.- FACILITY LOAD INPUT ATTACH POINTS, "LIFTOFF" TEST
SWIVEL EYE MOUNT LOCATIONS FOR LOAD APPLICATION TRAINS

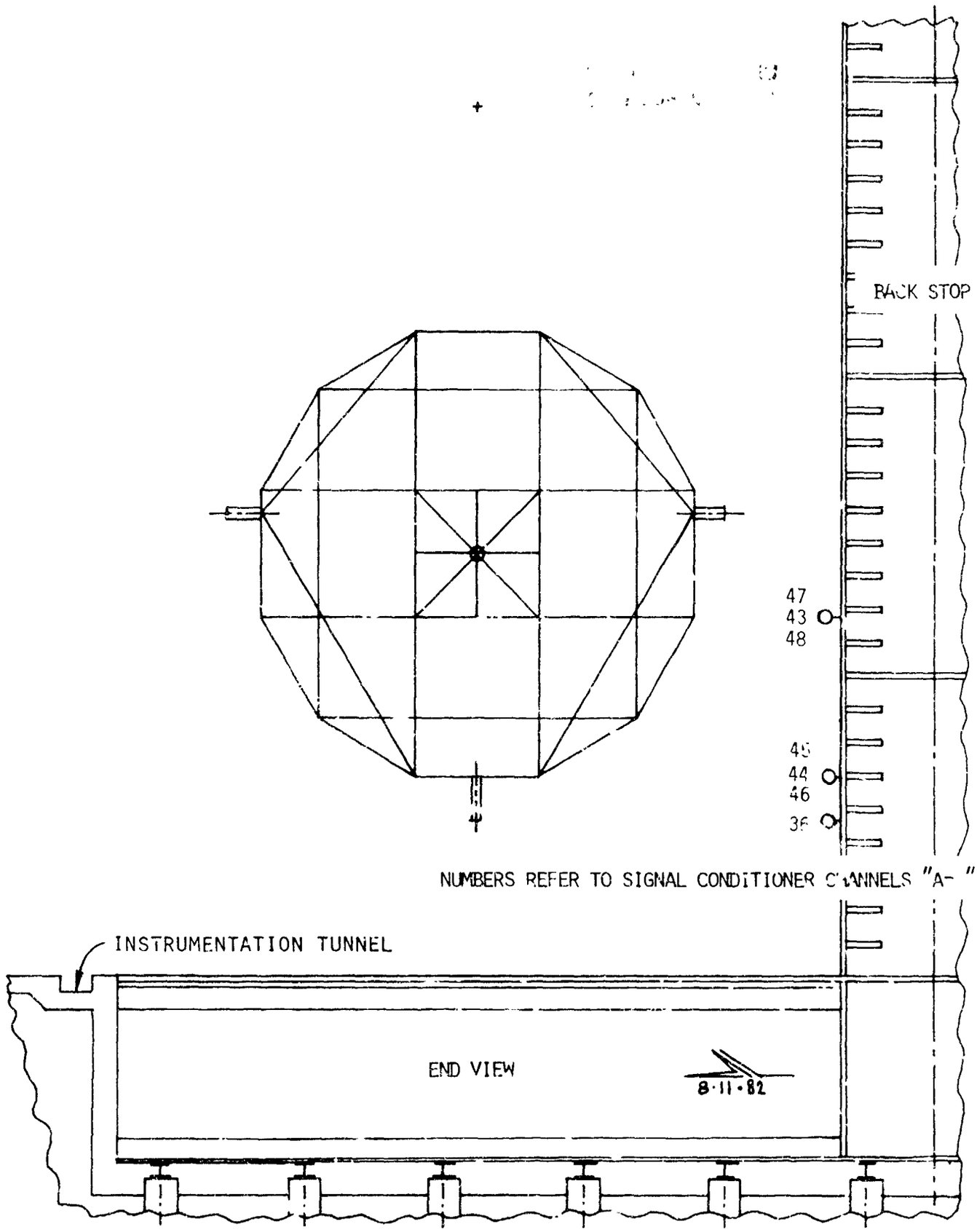

FIGURE 16 c.- FACILITY LOAD INPUT ATTACH POINTS, "KEEL" TEST

SWIVEL EYE MOUNT LOCATIONS FOR LOAD APPLICATION TRAINS

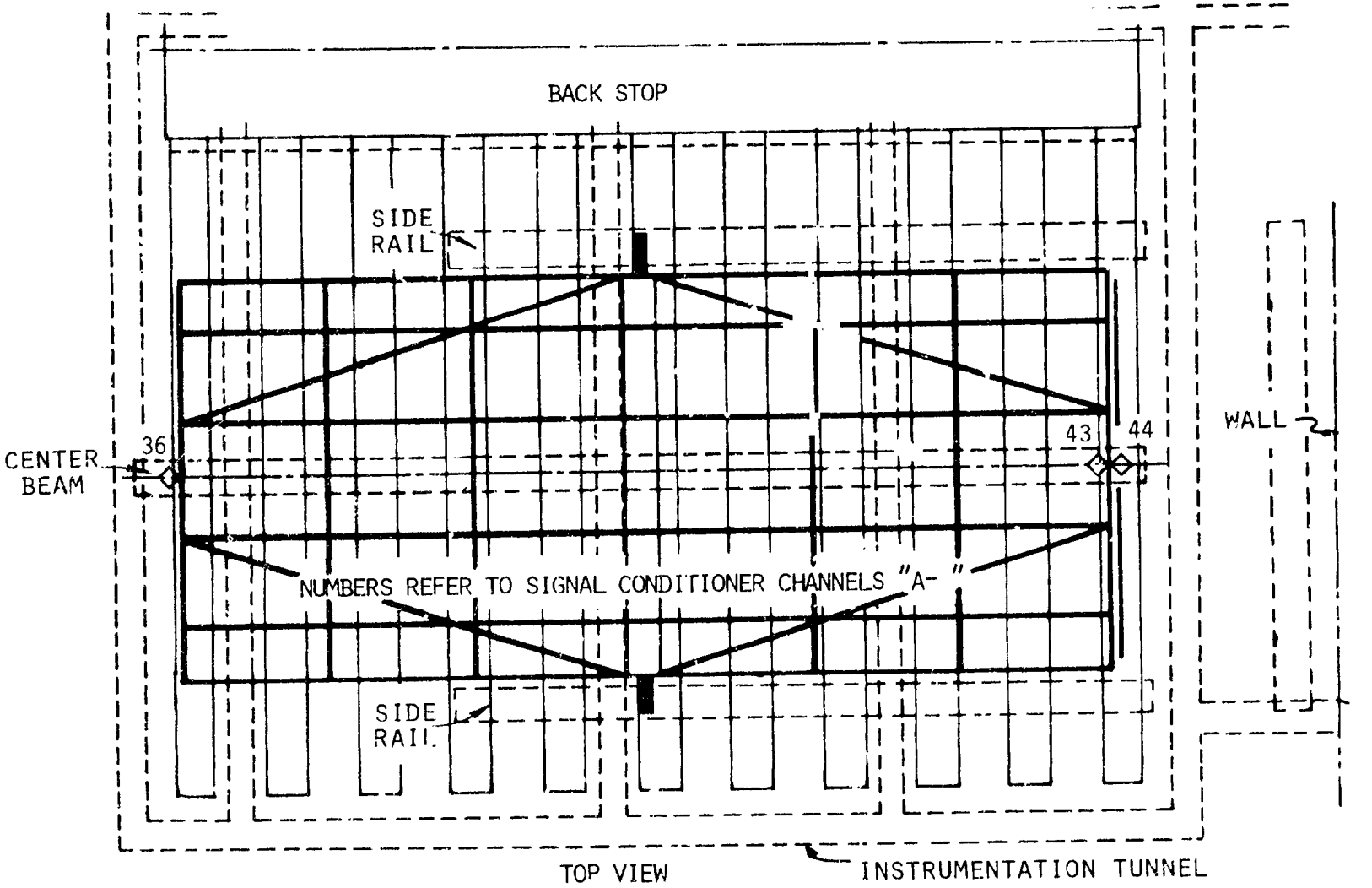

FIGURE 16 D.- FACILITY LOAD INPUT ATTACH POINTS, "END SUPPORT BEAM" TEST

SWIVEL EYE MOUNT LOCATIONS FOR LOAD APPLICATION TRAINS

8-17-82

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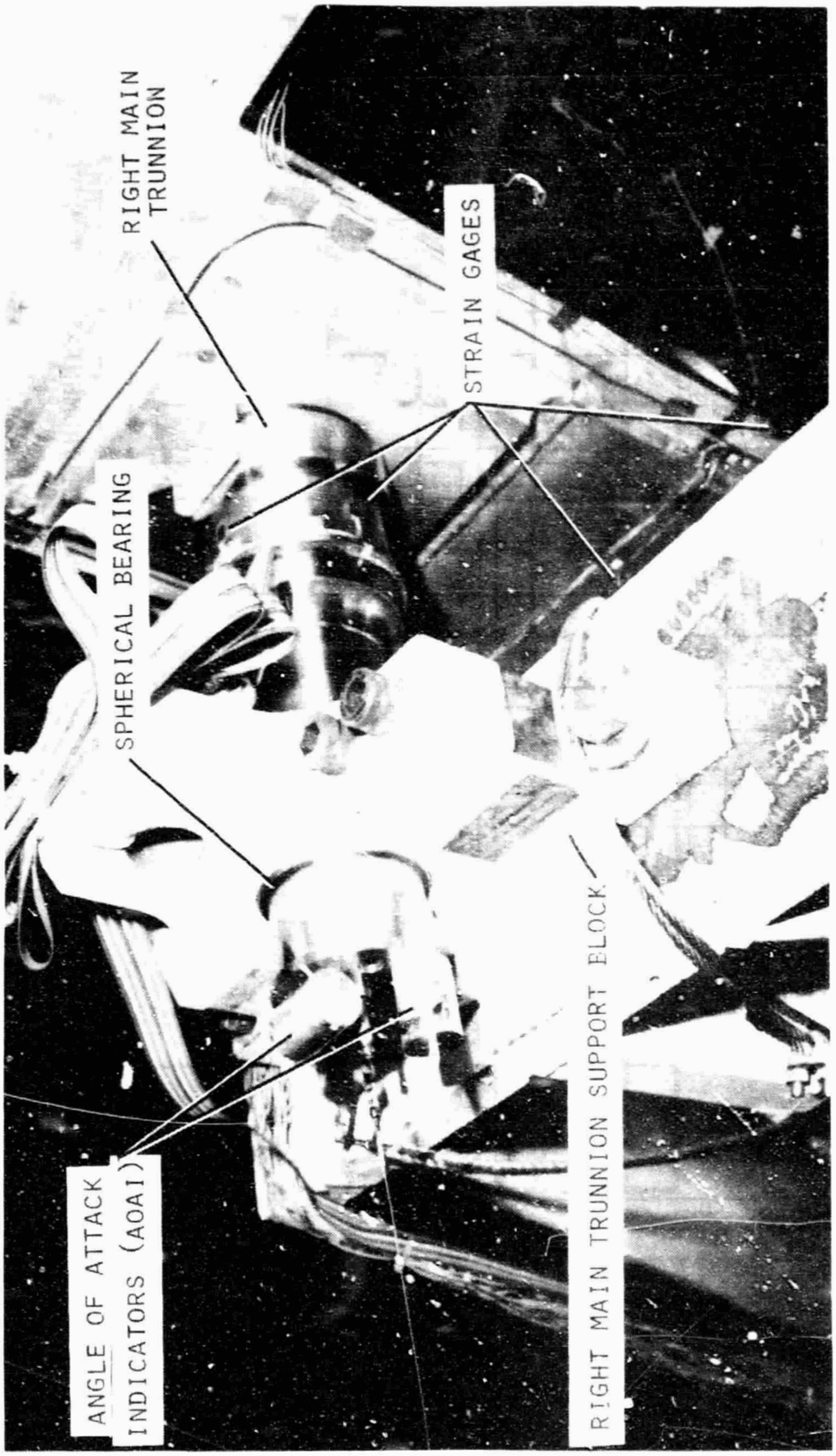

FIGURE 17.- MAIN TRUNNION INSTRUMENTATION

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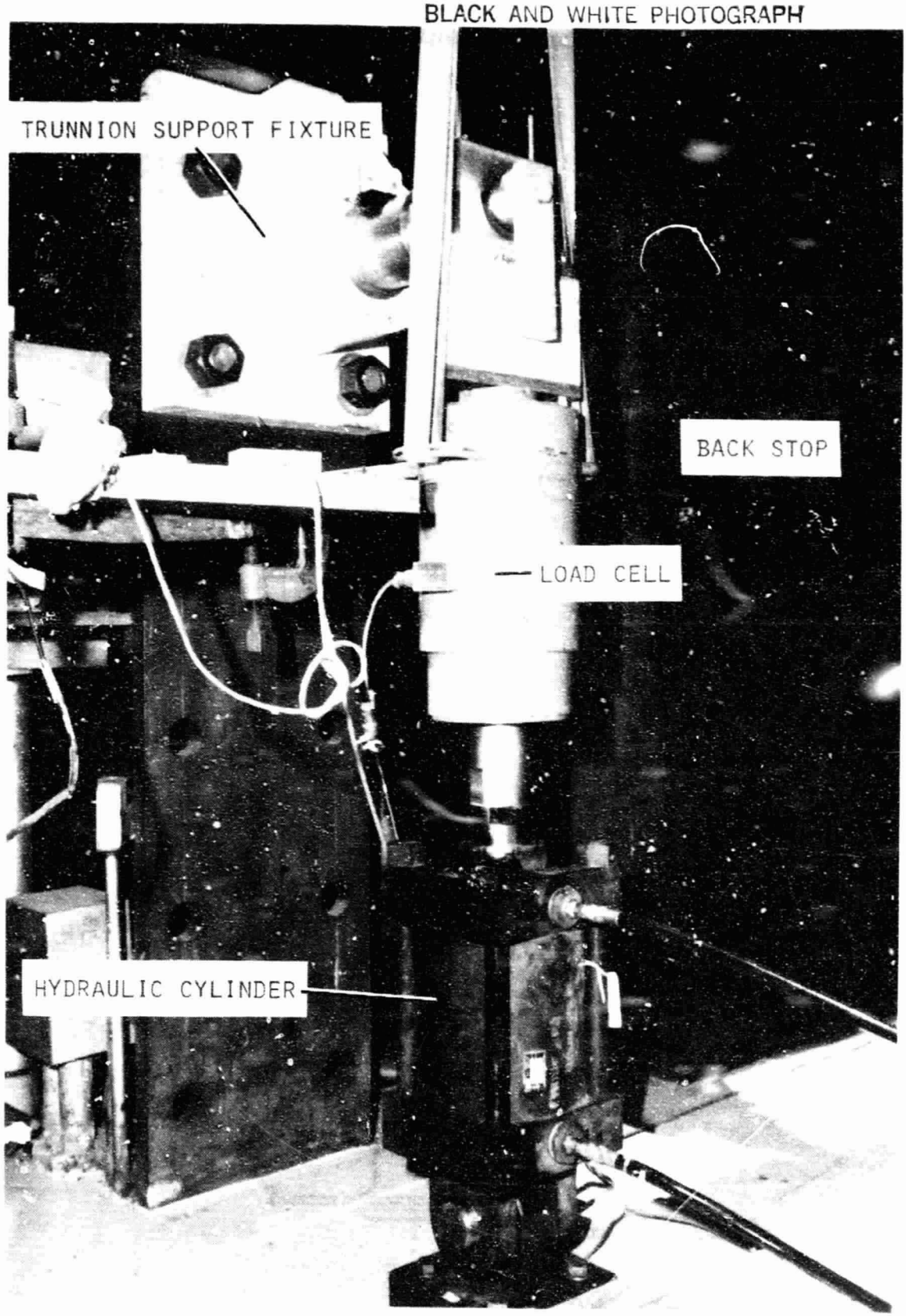
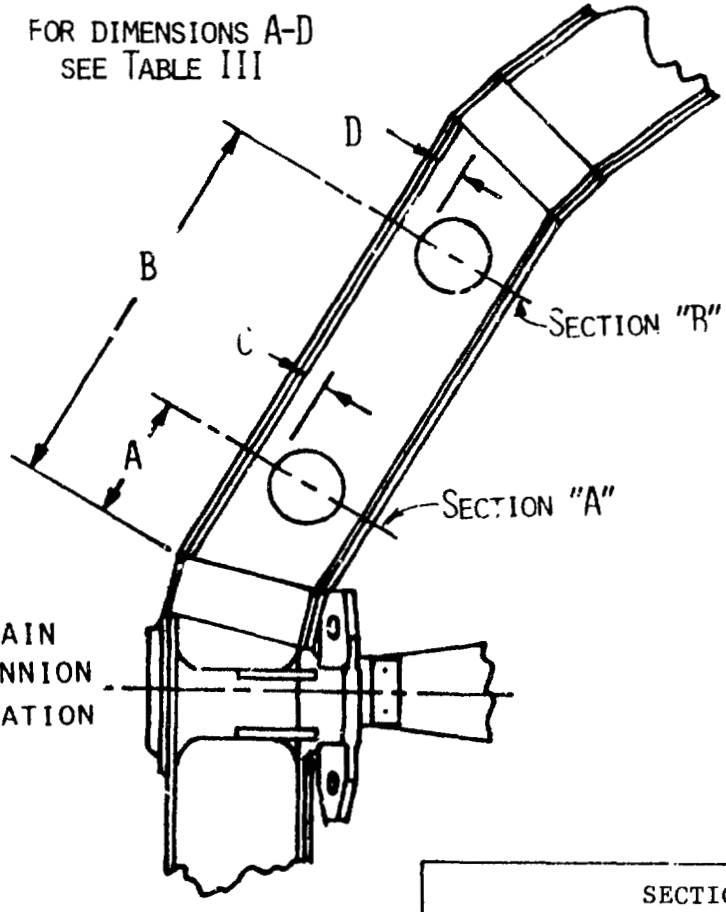
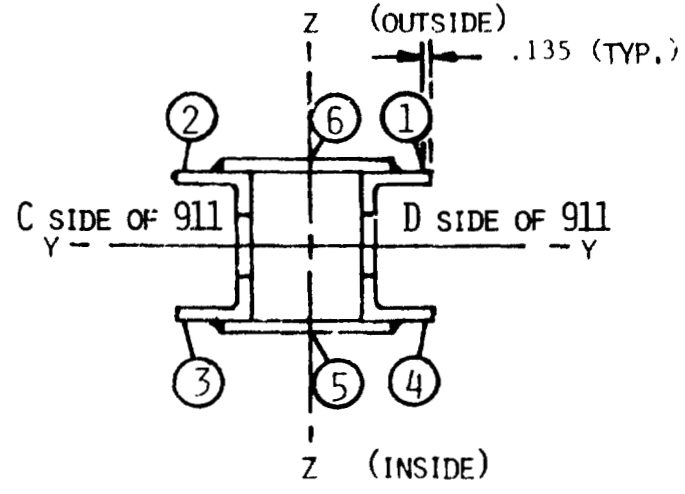


FIGURE 18.- MAIN TRUNNION CALIBRATION TEST

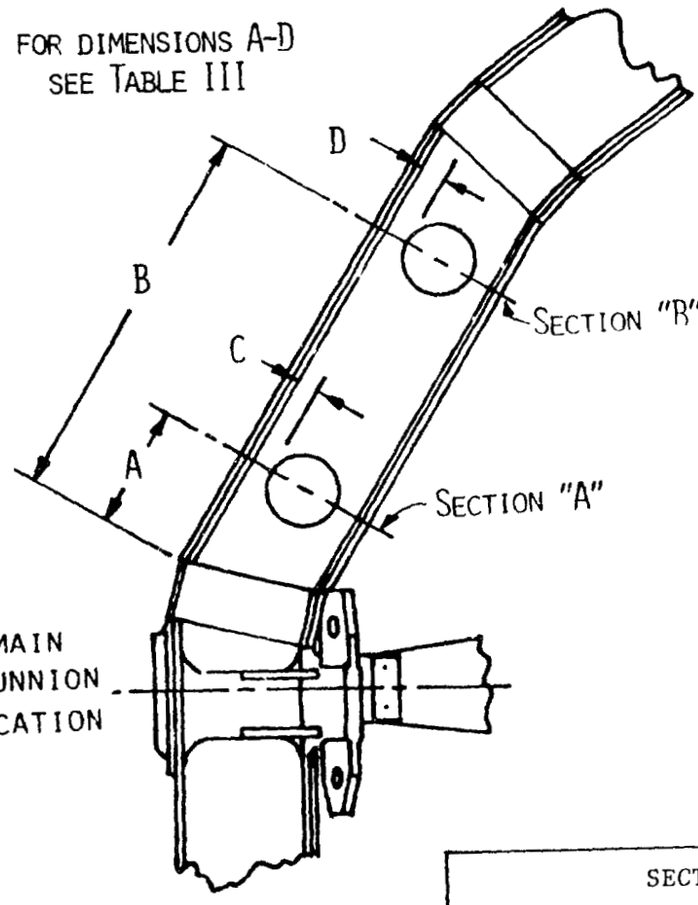


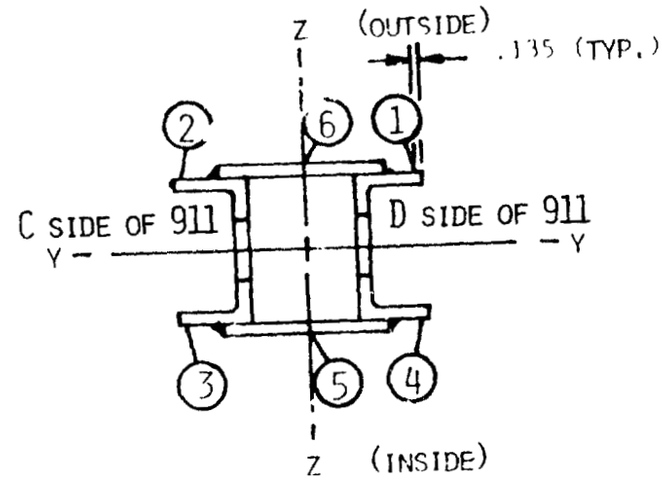


TYP. SECT.

	SECTION "A"			SECTION "B"		
POSITION NUMBER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER
1	37	B-10	911DC-BAO	48	B-22	911DC-BBO
2	38	B-11	911CC-BAO	49	B-23	911CC-BBO
3	40	B-13	911CC-BAI	51	B-25	911CC-BBI
4	39	B-12	911DC-BAI	50	B-	911DC-BBI
5	42-I	B-16	911C-DC-BAOI	52-I	B-26	911C-DC-BBOI
6	42-O			52-O		

FIGURE 19 A.- STRAIN GAGE LOCATION, CENTER RING, BAY 2

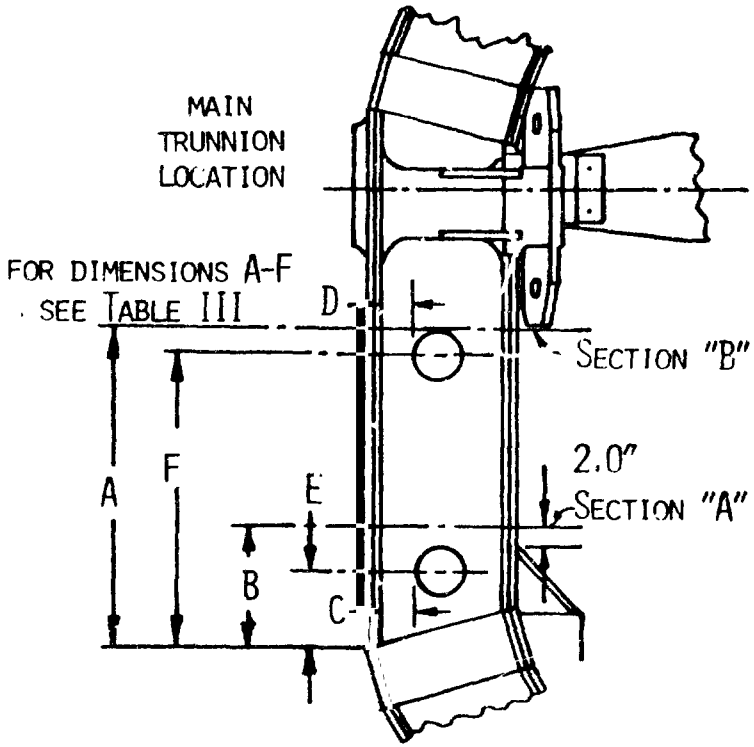


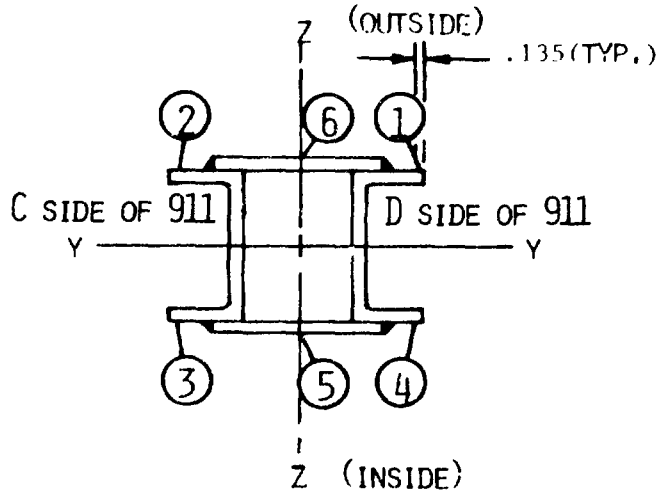


TYP. SECT.

	SECTION "A"			SECTION "B"		
POSITION NUMBER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER
1	68	B-42	911DJ-KAO	58	B-32	911DJ-KBO
2	69	B-43	911CJ-KAO	59	B-33	911CJ-KBO
3	71	B-45	911CJ-KAI	61	B-35	911CJ-KBI
4	70	B-44	911DJ-KAI	60	B-34	911DJ-KBI
5	72-I	B-46	911C-DJ-KAOI	62-I	B-36	911C-DJ-KBOI
6	72-O			62-O		

FIGURE 19 B.- STRAIN GAGE LOCATION, CENTER RING, BAY 10

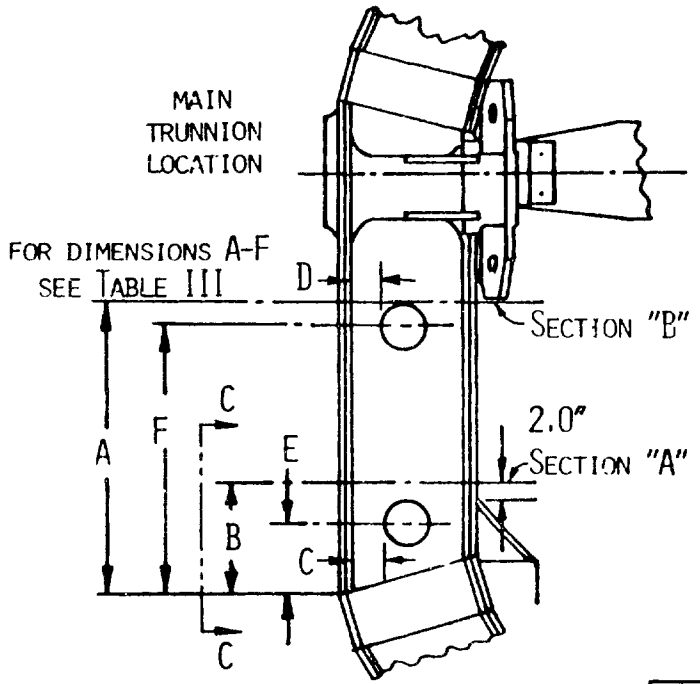


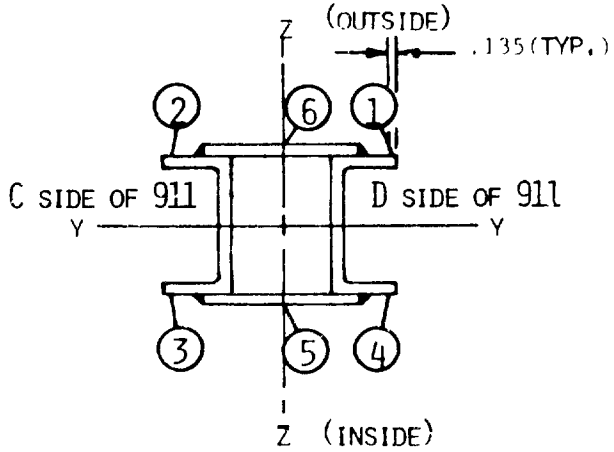


TYP. SECT.

	SECTION "A"			SECTION "B"		
POSITION NUMBER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER
1	43	B-17	911DC-DAO	33	B-6	911DC-DBO
2	44	B-18	911CC-DAO	34	B-7	911CC-DBO
3	46	B-20	911CC-DAI	36	B-9	911CC-DBI
4	5	B-19	911DC-DAI	35	B-8	911DC-DBI
5 6	47-I 47-O	B-21	911C-DC-DAOI	41-I 41-O	B-15	911C-DC-DBOI

FIGURE 19 c.- STRAIN GAGE LOCATION, CENTER RING, BAY 3

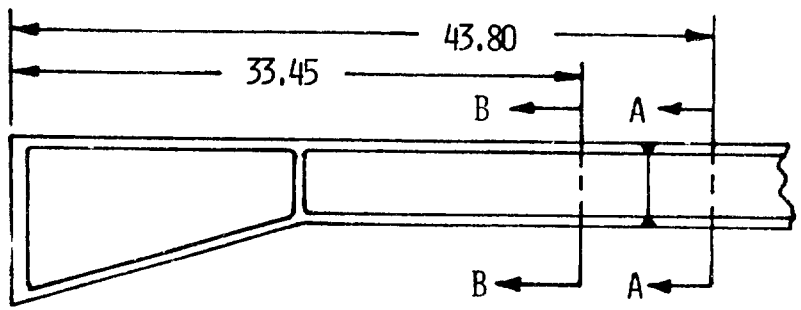




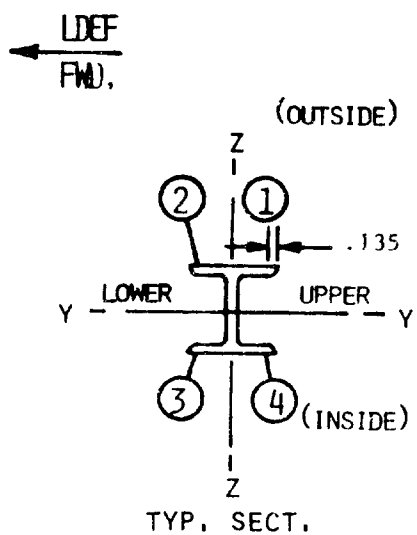
TYP. SECT.

	SECTION "A"			SECTION 'B"		
POSITION NUMBER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER
1	63	B-37	911DJ-IAO	53	B-27	911DJ-IBO
2	64	B-38	911CJ-IAO	54	B-28	911CJ-IBO
3	66	B-40	911CJ-IAI	56	B-30	911CJ-IBI
4	65	B-39	911DJ-IAI	55	B-29	911DJ-IBI
5	67-I	B-41	911C-DJ-1AI	57-I	B-31	911C-DJ-IBOI
6	0	B-14	911C-DJ-IAO	57-O		

FIGURE 19 D.- STRAIN GAGE LOCATION, CENTER RING, BAY 9

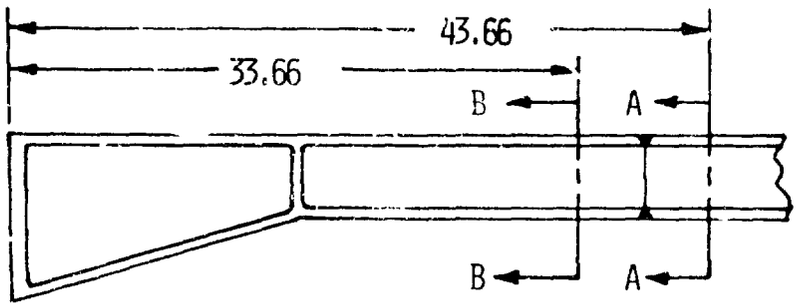


MEMBER 911DC TO 920FC



	SECTION "A"			SECTION "B"		
POSITION NUMBER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER
1	73	B-47	911DC-920FCAOU	77	C-2	911DC-920FCBOU
2	74	B-48	911DC-920FCAOL	78	C-3	911DC-920FCBOL
3	76	B-50	911DC-920FCAIL	80	C-5	911DC-920FCBIL
4	75	B-49	911DC-920FCAIU	79	C-4	911DC-920FCBIU

FIGURE 19 E.- STRAIN GAGE LOCATION, LONGERON



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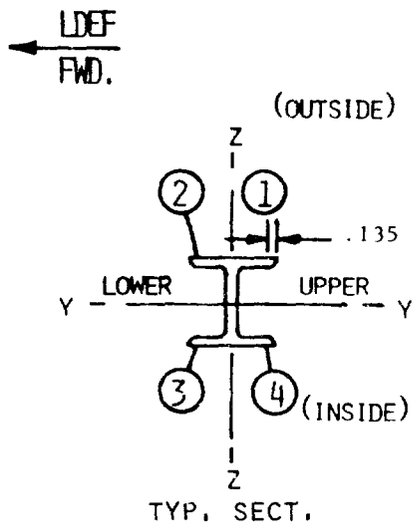
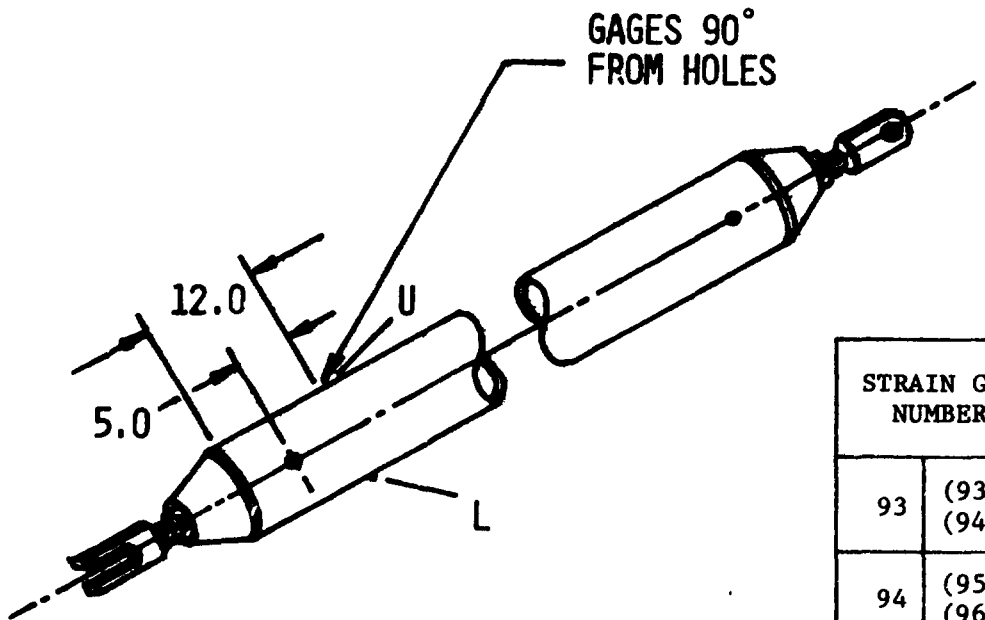


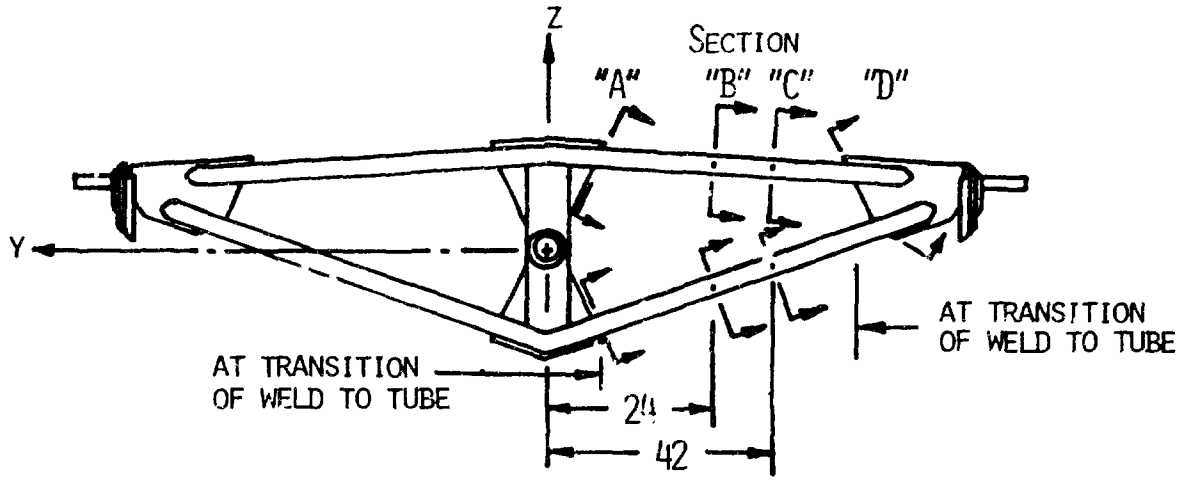
	SECTION "A"			SECTION "B"		
POSITION NUMBER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER	STRAIN GAGE NUMBER	SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER
1	81	C-6	911DF-920FFAOU	85	C-10	911DF-920FFBOU
2	82	C-7	911DF-920FFAOL	86	C-11	911DF-920FFBOL
3	84	C-9	911DF-920FFAIL	88	C-13	911DF-920FFBIL
4	83	C-8	911DF-920FFAIU	87	C-12	911DF-920FFBIU

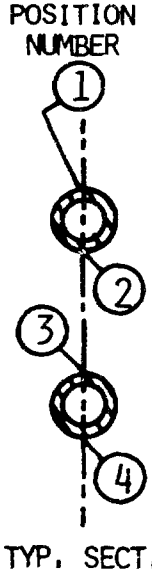
FIGURE 19 F.- STRAIN GAGE LOCATION, LONGERON



STRAIN GAGE NUMBER		SIG. CONDT. CHAN. NO.	LDEF LOCATION IDENTIFIER
93	(93U) (94L)	C-18	11DC-920FF (AFT)
94	(95U) (96L)	C-19	11CC-916AF (FWD)
95	(97U) (98L)	C-20	11DC-920FA (AFT)
96	(99U) (100L)	C-21	11CC-916AA (FWD)

FIGURE 19 G. - STRAIN GAGE LOCATION, DIAGONAL





	SECTION "A"		SECTION "B"		SECTION "C"		SECTION "D"	
POSITION NUMBER	STRAIN GAGE NO.	SIG. CONDT. CHAN. NO. TEST 4	STRAIN GAGE NO.	SIG. CONDT. CHAN. NO. TEST 4	STRAIN GAGE NO.	SIG. CONDT. CHAN. NO. TEST 4	STRAIN GAGE NO.	SIG. CONDT. CHAN. NO. TEST 4
1	103	C-28	101	C-26	99	C-24	97	C-22
2	104	C-29	102	C-27	100	C-25	98	C-23
3	115	C-36	113	C-34	111	C-32	109	C-30
4	116	C-37	114	C-35	112	C-33	110	C-31

FIGURE 19 H.- STRAIN GAGE LOCATION, END SUPPORT BEAM

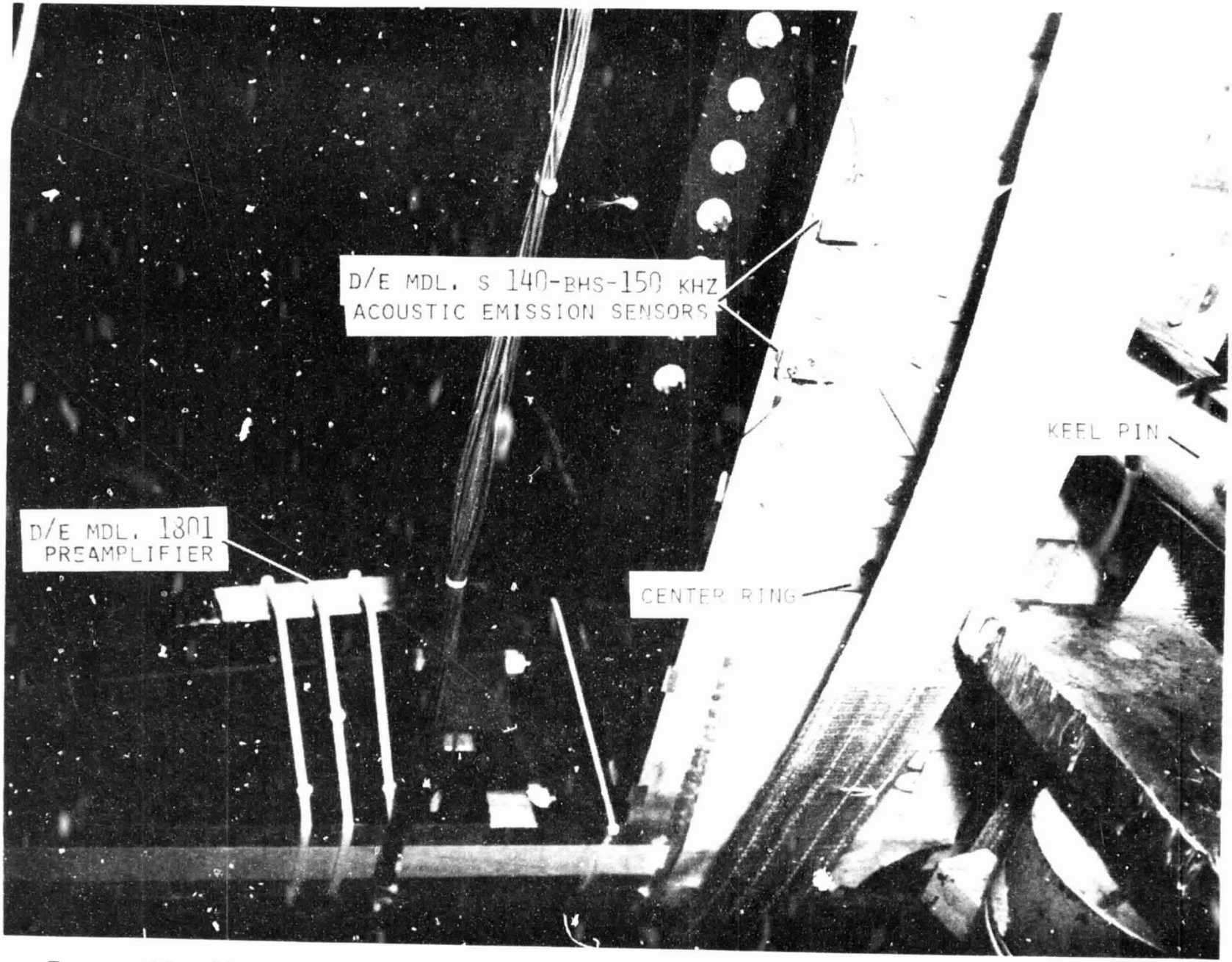


FIGURE 20.- TYPICAL ACOUSTIC EMISSION TRANSDUCER INSTALLATION

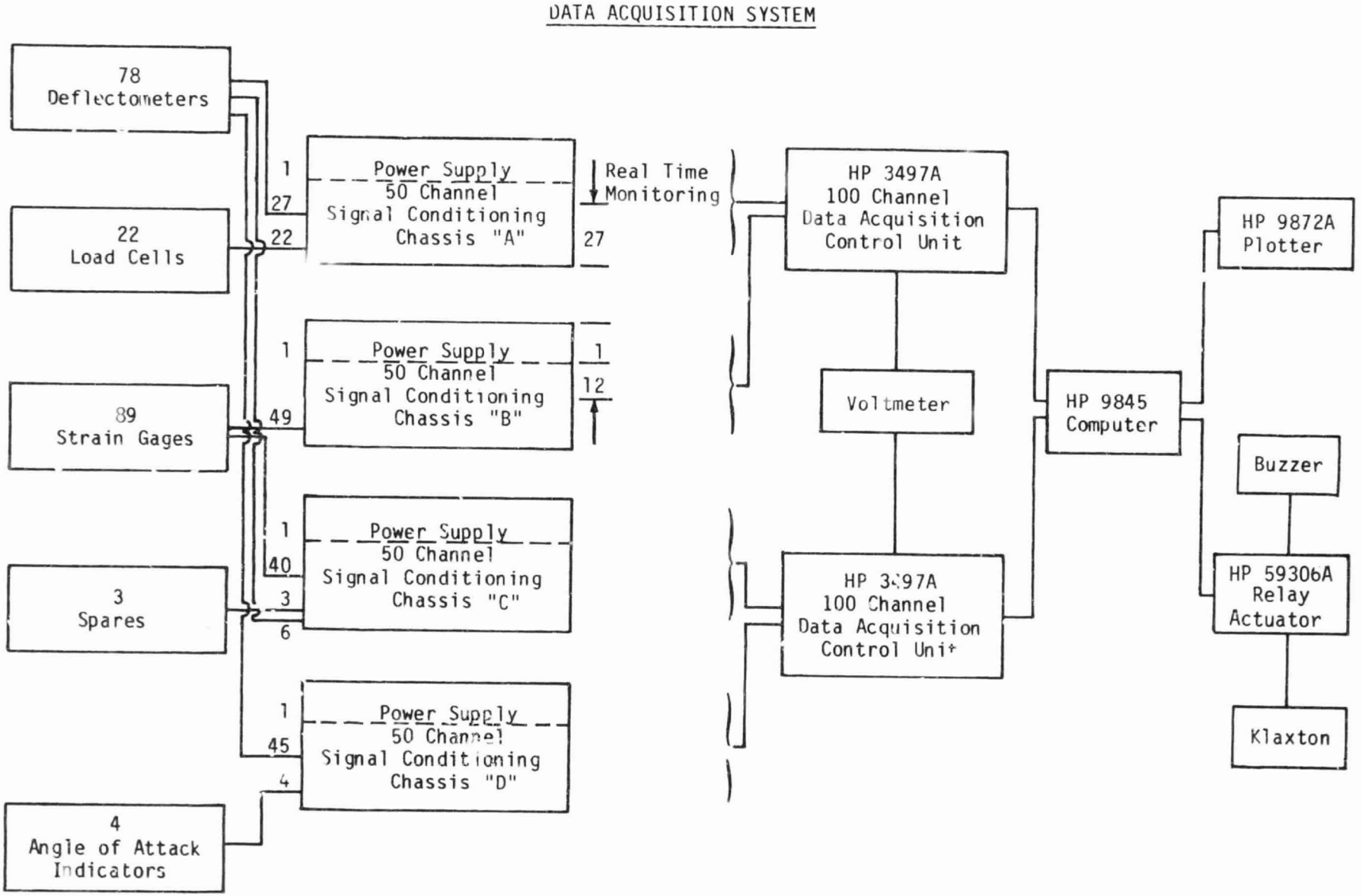


FIGURE 21.- DATA ACQUISITION SYSTEM SCHEMATIC

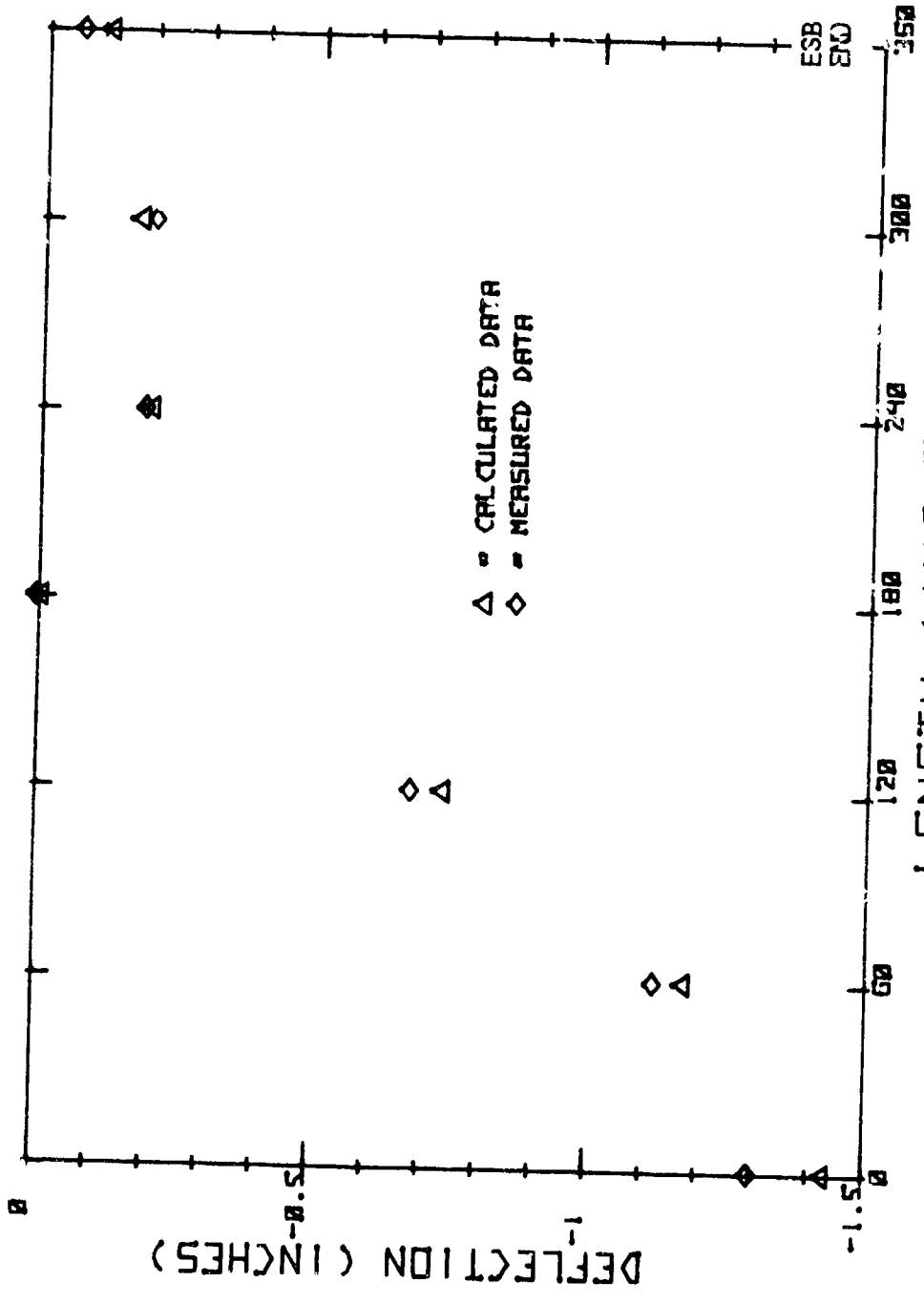


FIGURE 22 A.- DEFLECTIONS OF LDEF VS LENGTH OF LONGERON ABOVE TRUNNION FOR "LANDING" TEST

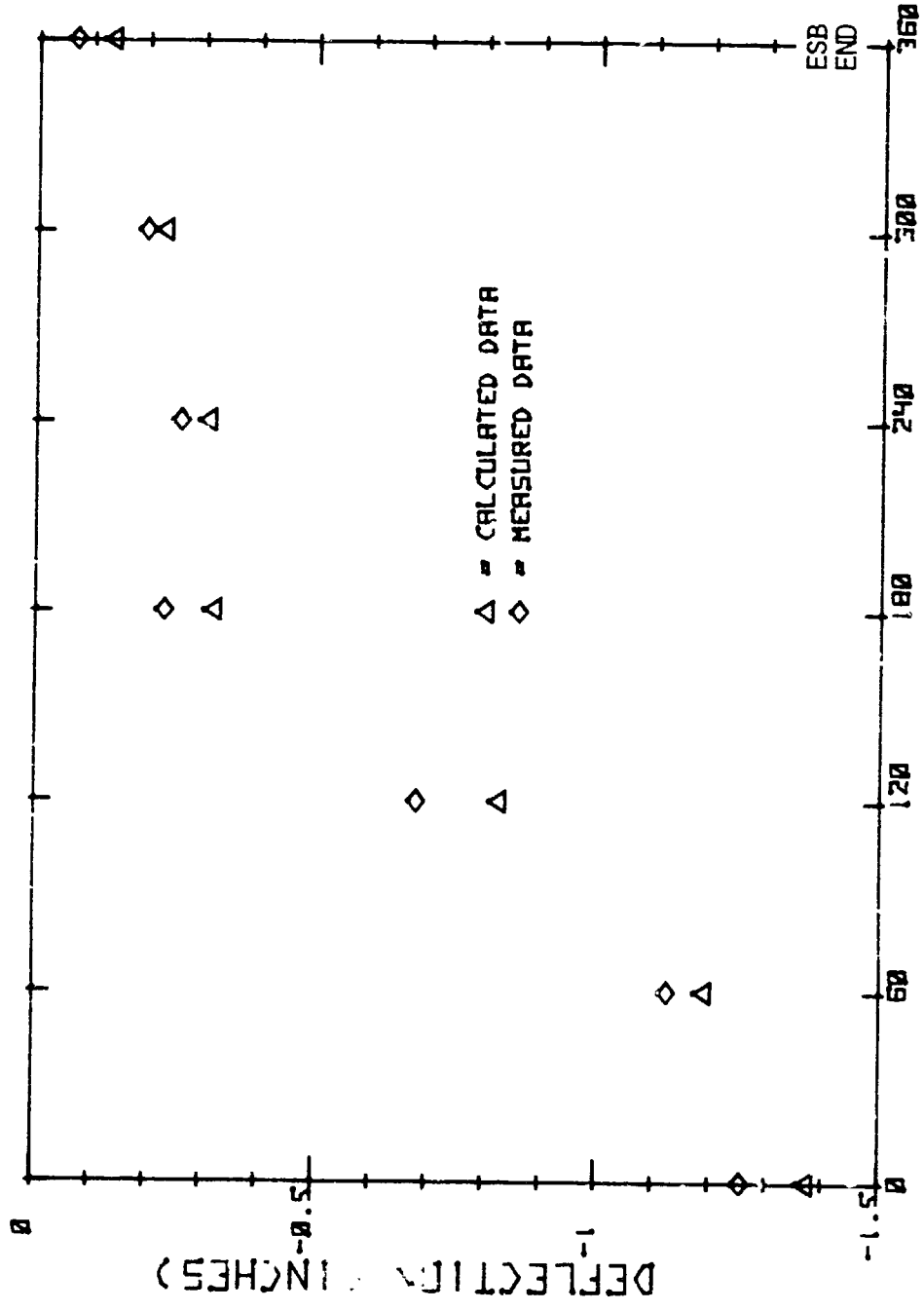


FIGURE 22 B.- DEFLECTIONS OF IDEF VS LENGTH OF BOTTOM LONGERON FOR "LANDING" TEST

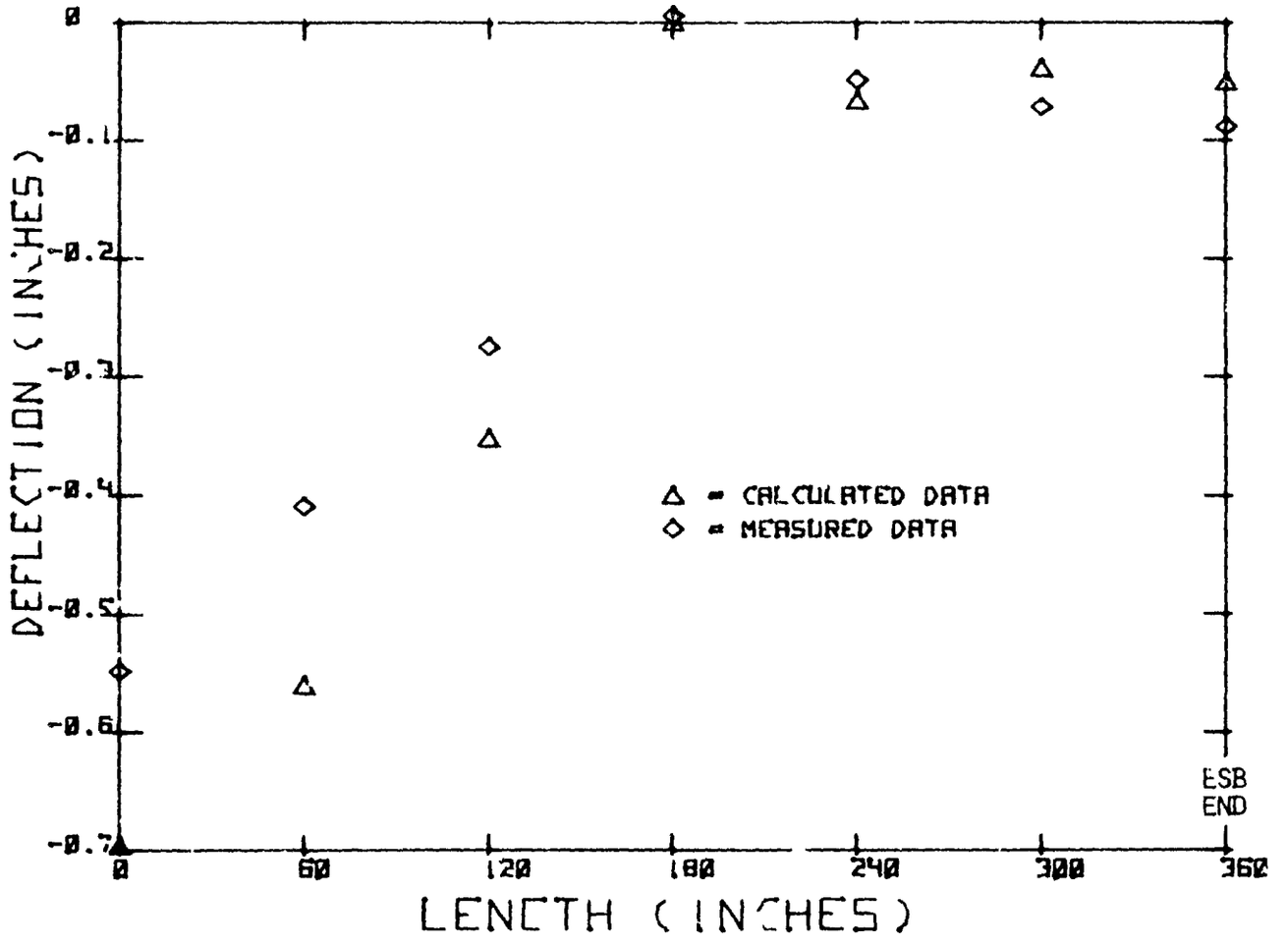


FIGURE 22 c.- DEFLECTIONS OF LDEF VS LENGTH OF LONGERON ABOVE TRUNNION FOR "LIFTOFF" TEST

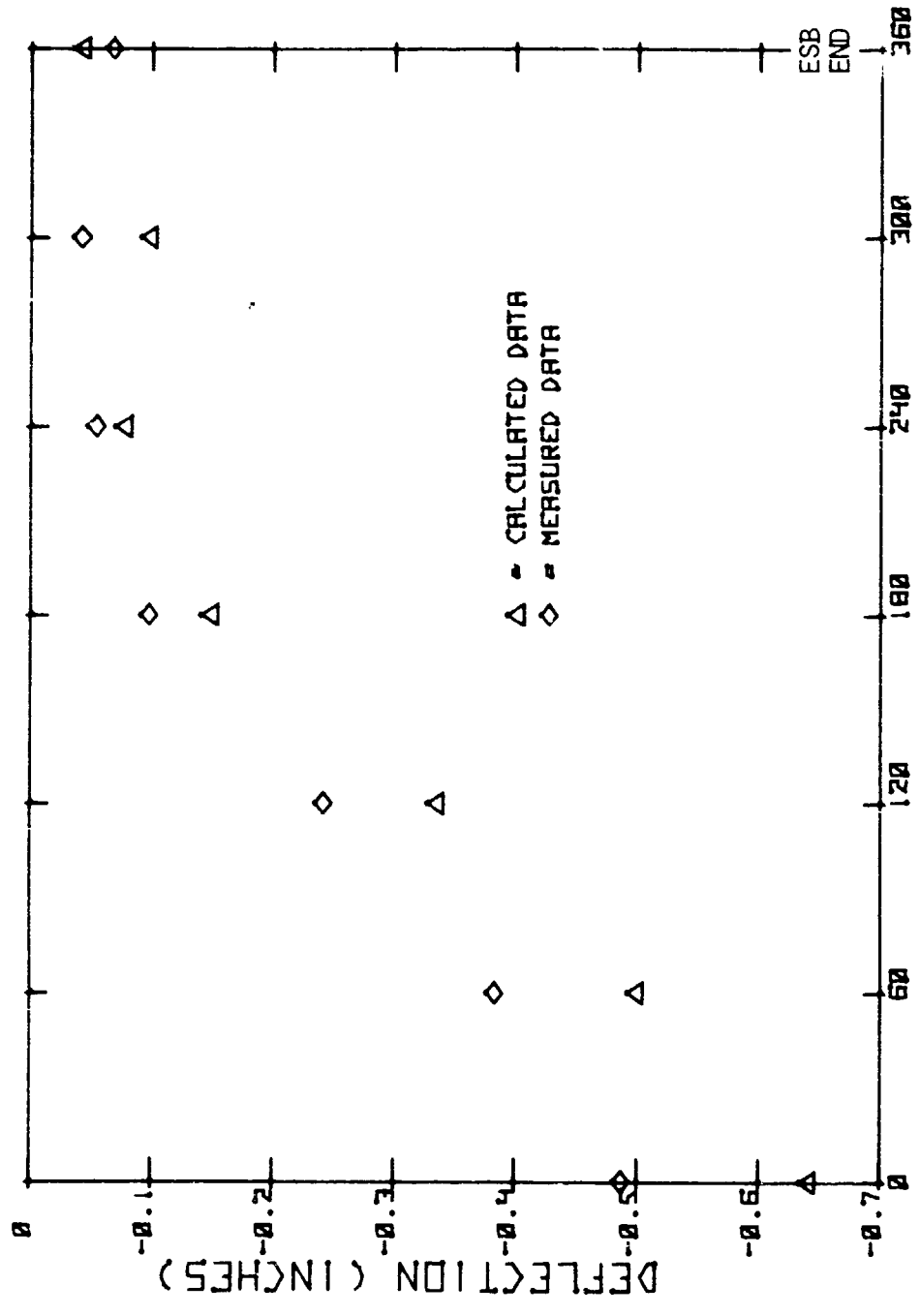


FIGURE 22 D.- DEFLECTIONS OF IDEF VS LENGTH OF BOTTOM LONGERON FOR "LIFTOFF" TEST