APPENDIX D

CONICAL ISOGRID ADAPTER TEST PLAN

The following test plan is based on survey tests imposing 116 pounds per inch load at the 120-inch diameter flange and 284 pounds per inch at the 60-inch diameter flange. The failure loads are expected to be about twice these values.

D.1 TEST SETUP

The test setup will be located in Building 52, which is the main test building of the Convair Structures Test Facility, Harbor Drive Facility, San Diego.

D.1.1 LOAD APPLICATION FIXTURES. Two steel load application fixtures (Figure D-1) will be fabricated to apply test loads to the conical isogrid adapter. Since the adapter will be tested in an inverted position, the lower loading fixture, which consists of a 60-inch diameter by 1-inch thick by 11-inch high steel cylinder, is bolted to the 60-inch diameter adapter interface. A ring frame is provided at the adapter-to-test-fixture interface to react the radial kick loads from the 45 degree conical adapter to cylindrical fixture transition. The lower fixture is bolted to the floor of the test facility.

The upper loading fixture consists of a 120-inch diameter by 1-inch thick by 20-inch high steel cylinder welded to a 124-inch square loading frame made of 8-inch by 3/8-inch-wall square tubing. Loading cylinder clevis attachments are provided at the four corners of the loading frame. A ring frame is provided at the adapter interface to react the radial kick loads from the conical adapter to cylindrical fixture transition. The 20-inch high cylindrical section of the test fixture is used between the loading frame and the test specimen to ensure uniform load redistribution from the four loading cylinders.

D.2 LOADING SUBSYSTEM

D.2.1 HYDRAULIC CYLINDERS. Load will be applied to the adapter test specimen by four 6-inch bore hydraulic cylinders (on hand) plumbed to permit loading in any combination of tension and compression. This will allow the application of any desired combination of axial load and bending moment. The cylinders will be equally spaced around the periphery.

D.2.2 LOAD CONTROL. The loading cylinders will be controlled by an Edison Load Maintainer which will provide for manual application of load to all cylinders simultaneously. The pressure channels will be calibrated prior to each loading condition to

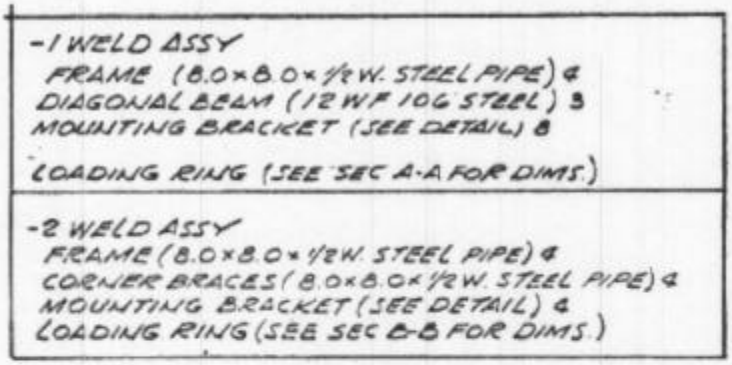


Figure D-1. Load application fixtures.

apply the correct pressure to each channel at any desired percent of maximum test load. Hydraulic power will be supplied by a 10-gallon-per-minute, 3000-psi hydraulic pump unit.

D.3 INSTRUMENTATION

D.3.1 STRAIN GAGES. Forty axial strain gages will be installed on the test specimen as shown in Figure D-2.

D.3.2 DEFLECTION TRANSDUCERS. Ten deflection transducers with a range of 1/2 inch will be installed for measuring radial deflections, and four with a range of 1/4 inch will be installed for measuring axial deflections.

D.3.3 LOAD CELLS. Four strain gage type tension/compression load cells with a range of 80,000 pounds each will be installed, one in series with each hydraulic cylinder. This arrangement will provide an accurate measurement of applied loads at every load increment.

D.3.4 TEST DATA RECORDING AND PRINTOUT. All data will be recorded on magnetic tape, using a high-speed recording system which can record all 48 data channels in 0.5 second. The data will then be processed on site using the NOVA 1200 digital computer in the recording system. Data will be printed out in digital form and corrected to engineering units on a high-speed printer. This printer can display at 100 alpha-numeric characters per second, and will print out each 48 channel scan in about 15 seconds.

D.4 TEST PROCEDURE

The proposed initial survey testing will be nondestructive with maximum line loading limited to 116 lb/inch at the 120-inch diameter base of the conical isogrid adapter and 284 lb/inch at the 60-inch diameter interface.

A total of five loading conditions consisting of different combinations of axial and body bending loads will be applied. For each condition, load will be varied from zero to maximum in ten increments. All instrumentation output will be recorded at each loading increment. The five proposed loading conditions and the maximum loading for each are summarized in Table D-1. For all loading conditions the maximum compressive loading will be applied along the zero degree axis as denoted in Figure D-2.

After completion of the five survey tests the adapter will be loaded to failure. The estimated failure loads are listed in Table D-1.

Table D-1. Test loads.

Condition	Description	Axial Load (lb)	Bending Moment (in.-lb)
1	Max Bending	0	0.68×10^6
2	75% Bending	15,500	0.51×10^6
3	50% Bending	31,000	0.34×10^6
4	25% Bending	38,000	0.17×10^6
5	Max Axial	44,000	0
6	Ultimate	73,000	1.64×10^6

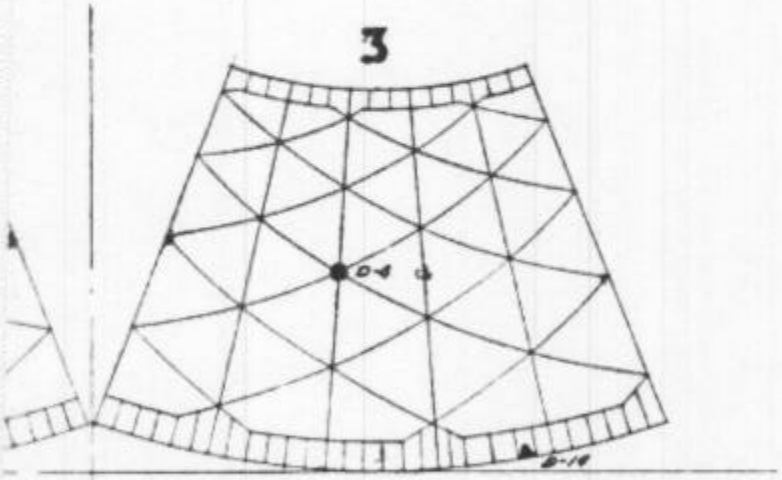
SYMBOLS

■ AXIAL STRAIN GAGES (30)

● RADIAL LINEAR TRANSDUCERS (10) NORMAL TO SURFACE

▲ AXIAL DEFL. TRANSDUCERS (4)

● AXIAL STRAIN GAGES (2) IN REPAIR AREAS. (ORIENTED IN DIRECTION OF LOADING AT CENTER OF REPAIR) GAGES TO BE MOUNTED ON INNER REPAIR PATCH.



NOTE:

1. S-1 – S-38. ODD NUMBERED GAGES ARE LOCATED INSIDE ON THE FORE & AFT STRINGER MEMBERS AS SHOWN IN SECTIONS A-A & B-B IN LINE WITH THE LOAD DIRECTION, OR ON DIAGONALS IN LINE WITH THE STRINGER MEMBER. EVEN NUMBERED GAGES ARE LOCATED ON THE OUTSIDE SKIN OR SPLICES & ALWAYS ORIENTED IN THE SAME DIRECTION AS THE ODD NUMBERED GAGES.
2. FAE-12-12S13, FAE-25-12S13, M-200/E910 INSTALLATIONS & GAGE NOTE.

Figure D-2. Isogrid conical adapter