BRISTOL AIRCRAFT (WESTERN) LIMITED

ENGINEERING REPORT 4042

ANALYSIS OF BEECH TRUSS ASSEMBLY PART NUMBER 404-184200, TUBE NO. 35 SERIAL NO. AJ86 (FOR AIRCRAFT 1416) (EXPEDITOR 3T)

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This truss has tube number 35 with a bow of 0.068"/' at the lower end.

The maximum allowable by Beech is .065.

The critical condition is in compression.

The following data is from Beech Structural Analysis 37 Report 700 page 2.

Max. Comp. Load 2407#

Tube Size 1" x .065"

Area .1909"^{2}

L'/ρ 60.22

From ANC-5 of March, 1955 Table 2.21 the column is short and the expression for allowable load in 4130 steel is:

$$F_c = 79500 - 51.9 \left(L'/\rho\right)^{1.5}$$

To allow for eccentricity this expression is modified to:

$$F_c = 79500 - 51.9 \left(\frac{L'}{\rho}\right)^{1.5} - \frac{Pec}{I}$$

where P = load

e = eccentricity

c = distance from the neutral axis to the most compressed fibre.

I = second moment of area of the section

L' = effective length

ρ = radius of gyration of the section

$\therefore$ For the case under consideration:

$$F_c = 79500 - 51.9 (60.22)^{1.5} - \frac{2407 \times .068 \times .5}{.021}$$

$$= 51360 \text{ psi}$$

For a short column, to determine the actual stress we use the expression:

$$\sigma = \frac{P}{A} + \frac{Pec}{I}$$

where σ = compressive stress

Cont'd.....

A = sectional area

and the other symbols are as before.

∴ For the case under consideration,

$$\sigma = \frac{2407}{.1909} + \frac{2407 \times .068 \times .5}{.021}$$

$$\sigma = 16500 \text{ psi}$$

$$\therefore \quad MS = \frac{51360}{16500} - 1$$

$$= 2.11$$

$$= 211\%$$

Hence the tube is satisfactory.

Reference: Extract from Beech Telegram of 9 Nov. 1956 5:08 p.m.
"Truss assembly considered satisfactory for use".