

TECHNICAL NOTES

A13005.84

FOREST PRODUCTS LABORATORY

U. S. FOREST SERVICE

MADISON, WISCONSIN

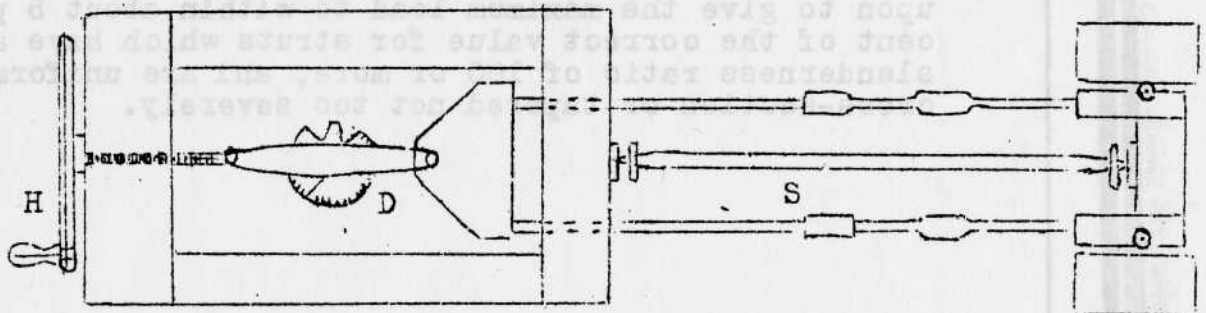
No. B-4

TWO SIMPLE TESTS FOR INSPECTION OF AIRPLANE STRUTS

In the field of testing, slender struts are unique. No other structural members can be tested to maximum load without injury, nor will they permit of the securing of data for an accurate computation of the maximum load, but with slender struts either of these things can be done very simply. The following two methods have been developed and verified by the Forest Products Laboratory as of practical application in strut inspection.

First Method of Test

The strut may be loaded as such, increasing the load gradually till the maximum is reached - that is, until the load ceases to increase with increasing deflection. Repeated experiments on Sitka spruce and Douglas fir airplane struts of various patterns have shown that, if stopped at this point, the test does not injure the strut, provided the slenderness ratio (L/r) is 100 or more. The sketch below illustrates a simple machine by which struts may be tested in this way at the rate of 100 or more an hour.



Simple Strut Testing Machine

The strut S is supported on knife edges. The load is applied by a handscrew H and is measured by a dynamometer D. The screw is turned until the pointer of the dynamometer ceases to move; the load then recorded is the maximum load of the strut.

Second Method of Test

The strut is tested as a beam. It is supported by a knife-edge at either end and loaded in the middle, one knife-edge being placed on a platform scale to measure the reaction. The reaction R and corresponding deflection d are carefully measured for one or more loads (safely within the elastic limit). The ratio

$$\frac{2R}{d} = p,$$

which is constant up to the elastic limit, may now be substituted in the formula,

$$Q = 0.206 \frac{l^3}{L^2} p$$

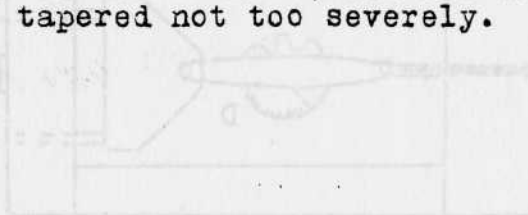
where

l = span used in beam test

L = effective length of strut

Q = Euler or maximum load of the strut as such (pin-end conditions)

Numerous tests on Sitka spruce and Douglas fir struts have proved that this method can be relied upon to give the maximum load to within about 5 per cent of the correct value for struts which have a slenderness ratio of 100 or more, and are uniform in cross-section or tapered not too severely.



Simple Strut Testing Machine