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A STUDY OF SPECIAL AND UNUSUAL CONDITIONS
AFFECTING HIGH-SPEED AIRCRAFT AND MISSILES

H. F. ALLEN

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PURPOSE

The project covers theoretical analyses and laboratory tests to determine the type of tests necessary to substantiate the structural integrity of aircraft operating under elevated temperature conditions and to investigate methods of heating and load application.

STATUS

The jig for loading the AT-6 fin and measuring deflections at elevated temperature is practically complete. The room-temperature-influence coefficients have been measured, and the section properties at the root of the fin are being calculated. The first load test at elevated temperature will be carried out in the near future.

THEORETICAL PHASE

As soon as the section properties at the root of the fin have been calculated, the time variation of the deflections at various points on the fin will be calculated on the basis of the cantilever-beam tests at 600°F. The fin will be loaded so that the maximum stresses are approximately the same as in the cantilever beams, so that the memory function as determined for the material at 600°F will be applicable.
The results of the memory-function studies and the cantilever-beam tests are being written up in rough draft for the final project report.

**EXPERIMENTAL PHASE**

The room-temperature-influence coefficients for the AT-6 fin have been determined, using the test setup shown in the photograph, Plate I. Deflections at eight points on the fin and at four points on the jig were measured by means of dial gages while loads were applied at each point in turn. The fin deflections were corrected for jig deflections and rotation, and the matrix of average deflections per unit load was prepared. From this matrix, the deflections at each point have been calculated for a unit load on the load linkage.

The apparatus for measuring deflections of the fin during the elevated-temperature tests is practically complete. Deflections will be measured by steel wires running over ball-bearing pulleys to dial gages in the case of the jig points, and to pointers in the case of the fin points, which will have longer deflections. The dial gages and pointers are grouped on a panel, together with a stop watch and hydraulic pressure gage, and the panel will be photographed by a motion picture camera during the test.

It is planned to carry out the first test at 600°F. The initial applied load will correspond to a maximum stress in the fin of 15,000 psi, and the load will be applied for five minutes and then removed. This essentially duplicates the test carried out on the cantilever beam for the determinations of the memory-function. The fin will then be loaded to failure at 600°F.
Plate I

Test Setup for Measuring Influence Coefficients