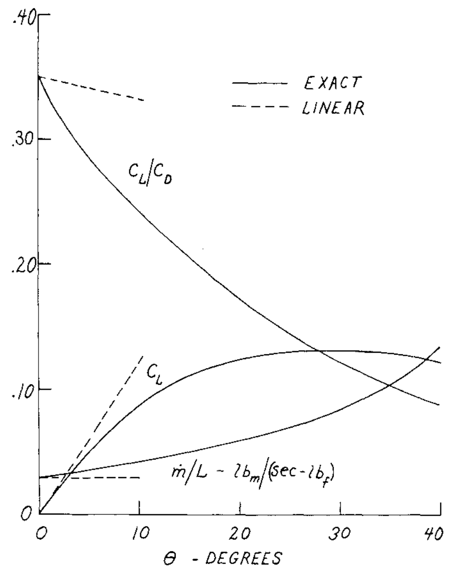

Fig. 3 Performance of lifting device with internal flow sink, $M_\infty = 3$.

cate optimal performance at small θ. This suggests the usefulness of linear theory, also illustrated, where

$$\frac{p - p_\infty}{\rho_\infty V_\infty{}^2/2} = \frac{2\theta}{(M_\infty{}^2 - 1)^{1/2}} \tag{5}$$

θ is in radians. The resulting performance parameters are

$$C_L = 2\theta/(M_\infty{}^2 - 1)^{1/2} \tag{6}$$

$$C_L/C_D = 1/[\theta + (M_\infty{}^2 - 1)^{1/2}] \tag{7}$$

$$\dot{m}L = (1 - 1/M_\infty{}^2)^{1/2}/a_\infty \tag{8}$$

The lift coefficients are lower than those of conventional airfoils, because of the reliance on suction alone. At a small angle of attack, a flat plate would generate twice the lift. The lift-drag ratio is about one order of magnitude smaller, at angle θ of optimal lift of the present device, than for the flat plate at the same angle of attack. This is due to the absorption of mass and the reaction to its momentum. Further, the absorption of such large flow rates obviously makes the configuration impractical with known technology.

In the case of the more general device of Fig. 1, alteration of energy could be substituted for the mass sink of the present example. It is noted that the lift coefficient is unchanged. The amount of drag would depend on the internal process. One possibility appears to be a compression process.

Although it does not seem possible to eliminate the sonic boom entirely because of the wake and end effects, a contribution due to lift is nonessential. Perhaps the integration of wings and engines, which normally contribute adversely themselves, can reduce the boom.

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The Spadoryc—A Method of Determining Damping

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Introduction

Because existing methods of obtaining the value of damping from experimentally acquired decay traces are cumbersome, a slide rule has been devised which will enable the engineer to accomplish this with a high degree of speed and with acceptable accuracy.

Background

If A_0 and A_n represent the amplitudes of a freely oscillating decaying vibration at times n cycles apart, the damping of

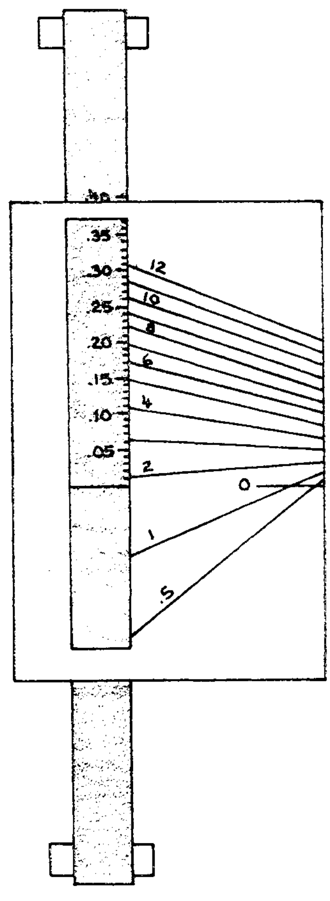

Fig. 1 The spadoryc.

Received July 10, 1968.

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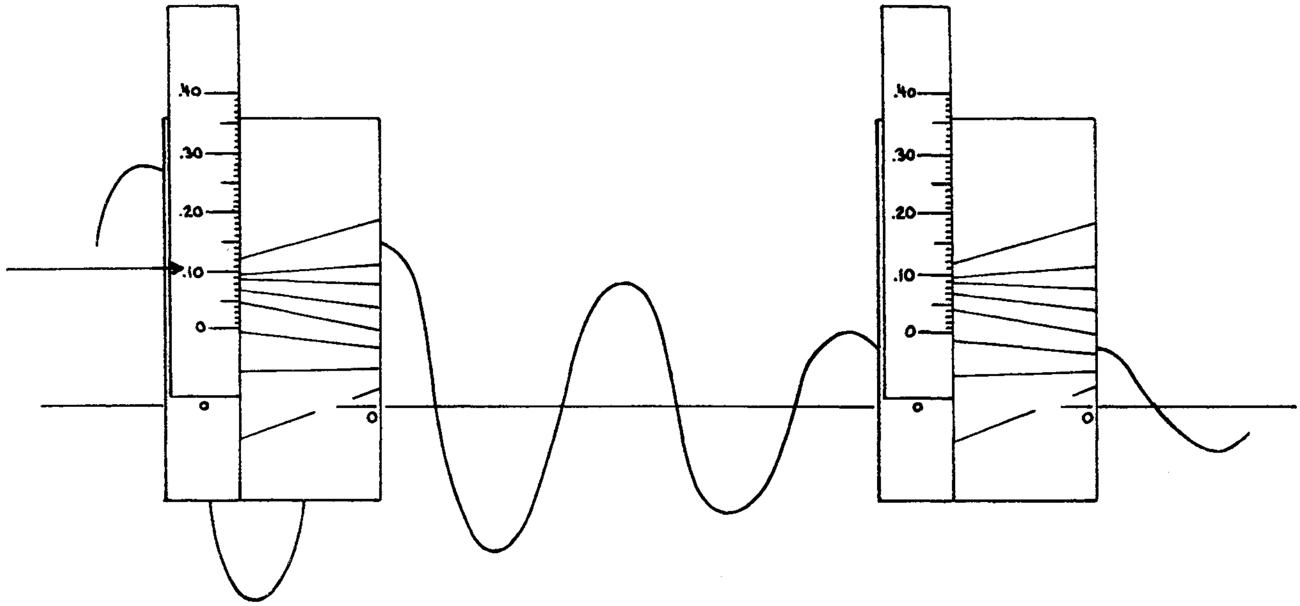

Fig. 2 Obtaining damping.

the system is

$$2\frac{C}{C_c} = g = \frac{1}{n\pi}\log\frac{A_0}{A_n} = \frac{1}{n\pi}\log A_0 - \frac{1}{n\pi}\log A_n$$

This is the formula on which the spadoryc is based.

Description

The components of the slide rule (Fig. 1) are a fixed grid that converts a linear scale to a logarithmetic scale, and a sliding section graduated in damping, g.

Operation

This is essentially a two-stage procedure, but each stage may be broken down in detail as follows:

1a) The double amplitude of the decay trace oscillation A_n is "measured" on the right-hand linear scale (Fig. 2). 1b) The corresponding point B_n on the log scale is established (visually). 1c) The zero of the sliding scale is set to coincide with B_n.

2a) The double amplitude A_0 at a point n cycles earlier on the decay trace is "measured" as in 1a. 2b) B_0 is established as in 1b. 2c) The damping is read from the n cycle on the sliding portion of the spadoryc, being the point thereon which coincides with B_0.

Accuracy

Though the spadoryc does trade accuracy for speed, it is no less accurate than the experimental data in most instances. For low-damped oscillations, more cycles may be used, and so a constant percentage accuracy is maintained. The use of the spadoryc in flight flutter test situations has been perfectly satisfactory.

Announcement: 1968 Author and Subject Indexes

It has been the custom to publish the annual author and subject indexes of the AIAA journals in the last issue of the year. This year, however, with the approval of the Publications Committee, we will publish a combined index of the four journals (*AIAA Journal, Journal of Spacecraft and Rockets, Journal of Aircraft,* and *Journal of Hydronautics*). All topic headings will be included, whether or not anything on that subject was published. The index will be mailed to all subscribers to the journals in January 1969. We hope that readers will find the combined index more convenient to use than four separate ones.

Ruth F. Bryans
Director, Scientific Publications