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NASA TECH BRIEF

Langley Research Center

Mislift and Miss-Drag Programs

The problem:

In the early design phase of aircraft or missile development it is necessary to have estimates of the aerodynamic loading for the entire supersonic flight regime. Several theoretical methods are currently available for the low supersonic speed range, based on supersonic linearized theory for determining the aerodynamic loading of aircraft configurations. These methods have been shown to be valid for speeds up to about MACH-3, which includes vehicles designed with emphasis on supersonic cruise efficiency. However, in a number of instances, especially in missile configurations, the speed and volumetric limitations of the linearized theory are exceeded to such a degree that these methods are of questionable value.

The solution:

A method has been developed and coded for digital computation that predicts the aerodynamic loading on configurations for which the linear theory assumptions are violated.

How it's done:

The method is formulated especially for pointed bodies of revolution with low-fineness ratio noses and relatively thin wings. The configurations are also assumed to be vertically symmetric about the body center line in the XY-and XZ-planes. The angle of attack is assumed to be small so that the lifting and non-lifting solutions can be considered separately. A theory appropriate to bodies of revolution with low-fineness ratios is applied to the body to obtain the surface pressures at zero-lift conditions and the variation of body surface pressure with angle of attack at near zero-lift conditions. A thin-wing theory is applied to obtain the wing-induced and body-induced flow fields. For lifting conditions, the wing is considered to be basically a flat plate. The influence of the body upwash field on wing loadings and the carry-over of wing lift on the body are also taken into account.

Notes:

1. This program was written in FORTRAN IV for use on the CDC-6000 series computers.
2. Inquiries concerning this program should be directed to:

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