ABSTRACT

Numerical methods have been developed for solving various flow problems about bodies of arbitrary shape. These methods are based on the distribution of singularities interior to the body surface while the boundary condition is satisfied on the surface of the body. In most practical problems these methods appear to be more economical than the commonly used surface distribution technique. The particular problems considered in this thesis are

(i) incompressible potential flow about various two-dimensional bodies of arbitrary shape,

(ii) incompressible potential flow about three-dimensional non-lifting wings having sharp leading edges,

(iii) inviscid compressible flow about two-dimensional aerofoils,

(iv) compressible flow about two-dimensional aerofoils taking boundary layer effects into account,

(v) incompressible potential flow about oscillating aerofoils.

Computer programs have been developed in FORTRAN IV language for the above cases. To check the accuracy of the numerical methods developed in this thesis, computer programs based on the standard Hess and Smith approach have also been

developed for all these cases. The numerical results obtained by the present approach compare well with those of Hess and Smith method. One definite advantage of the present approach is that for same numerical accuracy the methods are considerably faster than the Hess and Smith method. Thus the numerical methods based on internal singularity distribution technique are most suitable for calculating flows about bodies of arbitrary shape.