NASA TECH BRIEF

Lewis Research Center

FORTRAN Program for Computing Coordinates of Circular-Arc, Single and Tandem, Turbine and Compressor, Blade Sections on a Plane

A FORTRAN IV computer program has been developed which computes and plots coordinates for circular arc blade sections on a plane.

Specialized airfoil shapes are needed for today's highly loaded, high-speed compressors and turbines to avoid choking and premature separation of the air from the blade. Shapes under study include single-segment airfoils, airfoils with slots, and multiple segment airfoils in a tandem arrangement.

Many of the single and tandem blade designs being studied have airfoil surfaces consisting of single circular arcs. The computation of geometry for such airfoils, particularly when placed in a tandem arrangement with controlled slot parameters, is complicated by a large number of geometric calculations.

Either single-blade sections or tandem-blade sections with up to 5 segments per blade section can be designed with the program. Surfaces of blade segments consist of single circular arcs. The arrangement of blade segments with respect to each other (for tandem blades) is dependent upon input parameters specifying gap, overlap, and convergence between the segments.

Input is brief and can be altered rapidly. Input parameters describing the overall blade section include chord, camber, solidity, and inlet blade angle. Input to describe individual segments of the blade section include chord, camber, gap between adjacent segment and local segment, overlap of segments, maximum segment thickness, and radii of segment leading and trailing edge circles. The position of the blade segments with respect to each other is also a function of the inputs. Numerical examples are included to illustrate typical input values and the form in which the output is given.

The output consists of three main parts: (1) coordinates of individual segments suitable for making machine drawings, (2) geometrical input for companion blade-to-blade ideal flow programs, and (3) a Calcomp plot of the computed blade section in cascade at the input blade angle.

Notes:

1. One of the principal uses of this program is in conjunction with other computer programs for the analytical study of the performance and flow through turbomachine blading. This program permits the user to quickly generate and visualize circular arc blade shapes.
2. This program is written in FORTRAN IV for use on the IBM 7094.
3. Requests for further information may be directed to:
   COSMIC
   112 Barrow Hall
   University of Georgia
   Athens, Georgia 30601
   Reference: LEW-11237

Patent status:

No patent action is contemplated by NASA.

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