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Brief 71-10508

NASA TECH BRIEF

Lewis Research Center

Design and Evaluation of Convectively Cooled Nozzles

The problem:

To devise a method of designing the coolant passages of a convectively cooled nozzle such that the design would be compatible with the overall structure and the nozzle operation would remain within acceptable stress limits.

The solution:

Two digital computer programs for the design and evaluation of the nozzle coolant passages. The programs perform the necessary calculations for the final design of a convectively cooled nozzle operating at steady-state conditions.

How it's done:

The first program utilizes a desired gas sidewall temperature profile as an input and calculates the coolant passage dimensions required to achieve it. The second program utilizes fixed coolant passage dimensions as an input and calculates the resulting temperature profile. Both programs are usually used to arrive at a design; the first program to obtain approximate coolant passage dimensions, and the second to check the resulting wall temperatures for a practical set of coolant passage dimensions. The resulting wall temperatures and pressures are used to determine the magnitude of the tangential and longitudinal stresses in the coolant passage walls. The second program may also be used for evaluating existing designs; that is, for calculating wall temperatures of a given coolant passage design for any set of coolant flow conditions.

The programs are set up to utilize a library subroutine of hydrogen properties, a range of heat transfer correlations, and different tube surface roughness conditions.

Notes:

1. This program is written in FORTRAN IV for use on the IBM-7094 computer.
2. Requests for further information may be directed to:

   COSMIC
   112 Barrow Hall
   University of Georgia
   Athens, Georgia 30601
   Reference: B71-10508

Patent status:

No patent action is contemplated by NASA.

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