Int. J. Heat Mass Transfer. Vol. 6, pp. 251–252. Pergamon Press 1963. Printed in Great Britain.

DISCUSSION

ON A METHOD FOR THE DETERMINATION OF LOCAL CONVECTIVE HEAT TRANSFER FROM A CYLINDER PLACED NORMAL TO AN AIR STREAM, by D. A. VAN MEEL

THE main purpose of the above mentioned paper [1] was explicitly stated to be the description of an accurate method of obtaining by measurement the local heat transfer at the outside surface of a cylinder in cross flow. It is based upon using a thin platinum film, suitably painted and fired on a Pyrex cylinder, as a resistance thermometer to measure the outside surface temperature. One purpose of this discussion is to draw attention to the fact that such a method was successfully tried before in a similar situation, and the results published about two years ago [2].

In this earlier work [2], one platinum film measured the outside surface temperature distribution, and another the inside surface temperature distribution. With these temperature distributions as boundary conditions, the steady state heat conduction equation was solved. The coefficients in the solution were determined from a forty point Fourier analysis of the measured surface temperatures, and finally the local heat flux obtained. In particular, the heat transfer at the forward stagnation point was determined directly from the results of measurements. In [1] however, this quantity was computed from a well established correlation, and its value used to determine the constant γ [1]. Since this constant γ appears in the expression for the heat transfer at the other locations around the cylinder, such procedure to determine the local heat transfer really involves an adjustment of the measurements, so that the stagnation point heat transfer agrees with the well known correlation. Such adjustment was rendered necessary because of insufficient data when only one platinum film was used on the outside cylinder surface.

In conclusion, the method of [1] was reported about two years earlier in [2]. Moreover, it yielded insufficient data, and hence had to be supplemented with a well known correlation equation for the stagnation point heat transfer.

Corning Glass Works,
Engineering Division,
Corning, New York

O. E. TEWFIK

REFERENCES

1. D. A. VAN MEEL, A method for the determination of local convective heat transfer from a cylinder placed normal to an air stream, *Int. J. Heat Mass Transfer*, **5**, 715–722 (1962).
2. O. E. TEWFIK and W. H. GIEDT, Heat transfer, recovery factor, and pressure distributions around a circular cylinder normal to a supersonic rarefied air stream, *J. Aerospace Sci.* **27**, 721–729 (1960).

BOOK REVIEW

The Laminar Boundary Layer Equations. N. CURLE, Clarendon Press, Oxford, 1962, 162 pp. 30*s*.

THIS new book, one of the series of Oxford Mathematical Monographs, is intended either for readers who are not yet familiar with boundary-layer theory and need an introductory text on the subject, or for those who are already experienced in the field but who require in one volume an outline of the more important methods of boundary-layer analysis which are currently available. The book should be of special interest to practising engineers because it emphasizes the more rapid, and from the engineer's point of view more useful, approximate methods of calculating boundary-layer characteristics.

In order to keep the book down to a reasonable size however, the author was compelled not only to omit discussion of many topics, such as three-dimensional boundary layers and mass transfer through boundary layers, but also to give only brief, sometimes inadequate, descriptions of some methods and to refer the reader to the original papers for further details. It is a pity, however, that a few pages were not devoted to showing how the solutions in two dimensions, which are discussed at length, may also be applied to problems in three dimensions when there is axial symmetry; this would have been more useful than the all-too-brief introduction to natural convection given in Section 6.12.

The first half of the book is concerned with incompressible flow. The differential equations which govern fluid flow in a laminar boundary layer are first introduced, followed by a discussion of the integral equations for momentum, kinetic energy and thermal energy, after which are given the transformations due to Crocco and von Mises. A feature of the introduction which should benefit engineers, among others, is an extensive, often enlightening, use of physical arguments to interpret the mathematics.

Analytical, numerical and approximate methods of solving the velocity equation for incompressible flow are then discussed in turn. A particularly useful chapter, which could well have been longer, is that which compares the relative merits of the approximate methods.

In the discussion of solutions to the temperature equation for incompressible flow, approximate methods are again given prominence. One way of gauging the accuracy of the approximate methods, used here as well as elsewhere in the book, is to compare with exact similar solutions. There are, however, several approximate methods which, because they are based directly on the similar solutions, can give good accuracy for wide ranges in the relevant parameters. While these are included in the book, they are perhaps not emphasized sufficiently.

The second half of the book deals with the compressible boundary layer, first with zero pressure gradient, then with zero heat transfer and finally when neither pressure gradient nor heat transfer is zero. Several methods for solving the equations are given for each of these conditions, but at the present time no single method possesses overwhelming advantages over others however the book, goes a long way in helping the reader to decide which method best suits his particular needs.

The final chapter discusses briefly the interactions between shock waves and boundary layers.

The book is well produced and keeps up the high standards set by these publishers in the past, although the soft covers will not long withstand the amount of use a book of this nature is likely to receive, particularly those copies which are placed in libraries.

As with any book which deals with a rapidly developing field, specialists may find that their own particular branch is not covered in sufficient detail and that some of the more recent work is not mentioned. The author is to be congratulated, however, for including so much that is both relevant and useful in this fairly slim volume.

H. L. Evans

ANNOUNCEMENT

The Eighth Midwestern Mechanics Conference will be held on the Campus of Case Institute of Technology, University Circle, Cleveland 6, Ohio, 1–5 April, 1963.

This Conference is held every two years, the last having taken place at Michigan State University in September, 1961. The present Board of Directors consists of Professors Simon Ostrach, Chairman, and R. H. Scanlon, Secretary, both of Case; Peter Chiarulli, Illinois Institute of Technology; A. M. Kuethe, University of Michigan; and L. E. Malvern, Michigan State University.

The program will be broad in scope and will consist of technical sessions in the general areas of Applied Mechanics and Heat Transfer. A number of prominent speakers will present general lectures.

The submittal of papers in the areas of fluid and solid mechanics, heat transfer and related subjects is invited. Abstracts should be sent as soon as possible, to the Chairman, Professor Simon Ostrach, Engineering Division, Case Institute of Technology, University Circle, Cleveland 6, Ohio. Three copies of the paper are due by 1 November, 1962.