

# *Geometrical Methods for Determining the Accuracy of Approximate Solutions of the Boltzmann Equation*

## *Part I*

### *One-Group Scattering and Absorbing Media*

R. T. ACKROYD

*Communicated by I. N. SNEDDON*

#### SUMMARY

A geometrical method of solving the Boltzmann equation for a one-group scattering and absorbing medium is given. The method, which can be used to obtain either analytical or numerical solutions, provides in the first place a bound, in the least squares sense, for the error of an approximate solution for the neutron density. In principle, the error of this approximate solution can be made arbitrarily small. An upper bound to the error of any approximate solution can then be obtained. Furthermore, upper and lower bounds can be given at any point of the medium for the average value of the true neutron density taken over an arbitrarily small region about the point. Upper and lower bounds can also be given for any direction at any point for the true angular neutron density averaged over any small plate for a cone of arbitrarily small solid angle and axis normal to the plate. A brief note is then given of a method for solving the multigroup Boltzmann equation.

#### CONTENTS

1. Introduction . . . . .	812
2. Theory . . . . .	814
2.1. The Boltzmann Equation . . . . .	814
2.2. Definition of an Approximate Solution . . . . .	816
2.3. Relaxed Boltzmann Equations . . . . .	818
2.4. A Function Space . . . . .	821