

Contents

Session I

Fundamental Numerical Techniques

A.J. CHORIN, Chairman

1. N.N. YANENKO and Y.I. SHOKIN: On the Group Classification of Difference Schemes for Systems of Equations in Gas Dynamics.....3
2. K. ROESNER: Numerical Integration of the Euler-Equations for Three-Dimensional Unsteady Flows.....18
3. P. KUTLER and H. LOMAX: The Computation of Supersonic Flow Fields about Wing-Body Combinations by "Shock-Capturing" Finite Difference Techniques.....24
4. M.L. WILKINS, S.J. FRENCH and M. SOREM: Finite Difference Schemes for Calculating Problems in Three Space Dimensions and Time.....30
5. A. SAKURAI: Foundation of Approximate Solutions.....34
6. W.P. CROWLEY: FLAG: A Free-Lagrange Method for Numerically Simulating Hydrodynamic Flows in Two Dimensions.....37
7. S.Z. BURSTEIN and A.A. MIRIN: Difference Methods for Hyperbolic Equations Using Space and Time Split Difference Operators of Third Order Accuracy.....44
8. P.J. ROACHE: A New Direct Method for the Discretized Poisson Equation.....48
9. G. MORETTI: Initial Conditions and Imbedded Shocks in the Numerical Analysis of Transonic Flows.....54

Session II

Numerical Techniques and Applications

V.V. RUSANOV, Chairman

1. J. BOUJOT, J.L. SOULÉ and R. TEMAM: Traitement Numérique d'un Problème de Magnétohydrodynamique.....61
2. A.D. GOSMAN and D.B. SPALDING: Computation of Laminar Recirculating Flow Between Shrouded Rotating Discs.....67
3. B.W. THOMPSON: Some Semi-Analytical Methods in Numerical Fluid Dynamics.....73
4. H.J. LUGT and H.J. HAUSSLING: Laminar Flows Past a Flat Plate at Various Angles of Attack.....78
5. B.J. DALY and F.H. HARLOW: Inclusion of Turbulence Effects in Numerical Fluid Dynamics.....84

VI

6. H.B. KELLER and T. CEBECI: Accurate Numerical Methods for Boundary Layer Flows. I. Two Dimensional Laminar Flows.....92
7. R. DE VOGELAERE: The Reduction of the Stefan Problem to the Solution of an Ordinary Differential Equation.....101
8. C.P. KENTZER: Discretization of Boundary Conditions on Moving Discontinuities.....108
9. P.J. ZANDBERGEN: The Viscous Flow Around a Circular Cylinder.....114
10. J.E. FROMM: A Numerical Study of Buoyancy Driven Flows in Room Enclosures.....120

Session III

Boundary Layers

R. TIMMAN, Chairman

1. O.R. BURGGRAF and K. STEWARTSON: The Structure of the Laminar Boundary Layer Under a Potential Vortex.....129
2. E. KRAUSE and E.H. HIRSCHEL: Exact Numerical Solutions for Three-Dimensional Boundary Layers.....132
3. R.A. WAGSTAFF and S.S. LEE: Higher Order Effects in Laminar Boundary Layer Theory for Curved Surfaces138
4. F.G. BLOTTNER: Finite-Difference Methods for Solving the Boundary Layer Equations with Second-Order Accuracy.....144
5. R.W. MACCORMACK: Numerical Solution of the Interaction of a Shock Wave with a Laminar Boundary Layer.....151
6. B.B. ROSS and S.I. CHENG: A Numerical Solution of the Planar Supersonic Near-Wake with its Error Analysis.....164
7. R.C. ACKERBERG: Boundary-Layer Separation at a Free Streamline-Finite Difference Calculations.....170
8. G.O. ROBERTS: Computational Meshes for Boundary Layer Problems.....171
9. K.L.E. NICKEL: Error Bounds in Boundary Layer Theory.....178

Session IV

Flow Field Calculations

O.M. BELOTSERKOVSKII, Chairman

1. P. LAVAL: Time-Dependent Calculation Method for Transonic Nozzle Flows.....187
2. J.L. STEGER and H. LOMAX: Generalized Relaxation Methods Applied to Problems in Transonic Flow.....193

VII

3. E.M. MURMAN and J.A. KRUPP: Solution of the Transonic Potential Equation Using a Mixed Finite Difference Scheme....199
4. M. HOLT and B.S. MASSON: The Calculation of High Subsonic Flow Past Bodies by the Method of Integral Relations.....207
5. B.D. MOISEENKO and B.L. ROZHDESTVENSII: The Calculation of Hydrodynamic Forces with Tangential Discontinuities.....215
6. A.P. BAZZHIN: Some Results of Calculations of Flows Around Conical Bodies at Large Incidence Angles.....223
7. N.E. HOSKIN and B.D. LAMBOURN: The Computation of General Problems in One Dimensional Unsteady Flow by the Method of Characteristics.....230
8. V.H. RANSOM, H.D. THOMPSON and J.D. HOFFMAN: Stability and Accuracy Studies on a Second-Order Method of Characteristics Scheme for Three-Dimensional, Steady, Supersonic Flow.....236
9. R.E. MELNIK and D.C. IVES: Subcritical Flows Over Two Dimensional Airfoils by a Multistrip Method of Integral Relations.....243

Session V

1. Shock Waves, 2. Turbulence

H. CABANNES, Chairman

1. O.M. BELOTSEKOVSKII: On the Calculation of Gas Flows with Secondary Floating Shocks.....255
2. R. COLLINS and HSIANG-TEH CHEN: Motion of a Shock Wave Through a Nonuniform Fluid.....264
3. V.V. RUSANOV: Non-linear Analysis of the Shock Profile in Difference Schemes.....270
4. B.M. SEGAL and J.H. FERZIGER: Shock Wave Structure by Several New Modeled Boltzmann Equations.....279
5. A.J. CHORIN: Computational Aspects of the Turbulence Problem.....285
6. C.E. LEITH: Two-Dimensional Turbulence and Atmospheric Predictability.....290
7. R. VAGLIO-LAURIN and G. MILLER: A Heuristic Approach to Three-Dimensional Boundary Layers.....296
8. T.H. GAWAIN and G.D. O'BRIEN, JR.: Numerical Simulation of Transition and Turbulence in Plane Poiseuille Flow.....308
9. L.D. TYLER: Heuristic Analysis of Convective Finite Difference Techniques.....314
10. A.L. GONOR, V.I. LAFYGIN and N.A. OSTAPENKO: The Conical Wing in Hypersonic Flow.....320

VIII

Session VI

Navier-Stokes Equations.

Fully Viscous Flows

K. STEWARTSON, Chairman

1. M. FORTIN, R. PEYRET and R. TEMAM: Calcul des Ecoulements d'un Fluide Visqueux Incompressible.....337
2. S.C.R. DENNIS and A.N. STANFORTH: A Numerical Method for Calculating the Initial Flow Past a Cylinder in a Viscous Fluid.....343
3. C.W. HIRT: An Arbitrary Lagrangian-Eulerian Computing Technique.....350
4. T.D. TAYLOR and E. NDEFO: Computation of Viscous Flow in a Channel by the Method of Splitting.....356
5. H.H. BOSSEL: Study of Vortex Flows at High Swirl by an Integral Method Using Exponentials.....365
6. B.D. NICHOLS: Recent Extensions to the Marker-and-Cell Method for Incompressible Fluid Flows.....371
7. W.R. BRILEY and H.A. WALLS: A Numerical Study of Time-Dependent Rotating Flow in a Cylindrical Container at Low and Moderate Reynolds Numbers.....377
8. R. GLOWINSKI: Méthodes Numériques pour l'Ecoulement Stationnaire d'un Fluide Rigide Visco-Plastique Incompressible.....385
9. B.B. NOVACK and HSIEN KEI CHENG: Numerical Analysis and Modeling of Slip Flows at Very High Mach Numbers.....395

Session VII

Incompressible Flow Problems

K. ROESNER, Chairman

1. C. BRENNEN: Some Numerical Solutions of Unsteady Free Surface Wave Problems Using the Lagrangian Description of the Flow.....403
2. O.F. VASILIEV: Numerical Solution of the Non-Linear Problems of Unsteady Flows in Open Channels.....410
3. J.W. PRITCHETT: Incompressible Calculations of Underwater Explosion Phenomena.....422
4. R.K.-C. CHAN, R.L. STREET and J.E. FROMM: The Digital Simulation of Water Waves - An Evaluation of SUMMAC.....429
5. T.D. BUTLER: Linc Method Extensions.....435
6. T. STRELKOFF: An Exact Numerical Solution of the Solitary Wave.....441

IX

7. F.H. HARLOW, A.A. AMSDEN and C.W. HIRT: Numerical
Calculation of Fluid Flows at Arbitrary Mach Number.....447
8. W.E. PRACHT: Implicit Solution of Creeping Flows, with
Application to Continental Drift.....452
9. A.K. WHITNEY: The Numerical Solution of Unsteady Free
Surface Flows by Conformal Mapping.....458