

## TABLE OF CONTENTS

### VOLUME 1

|  |                                 |     |
|--|---------------------------------|-----|
| PREFACE  | J.J. Green .....                | IX  |
| INTRODUCTION   | R.R. Dexter and J. Singer ..... | XII |
| THE DANIEL AND FLORENCE GUGGENHEIM<br>MEMORIAL LECTURE   |                                 |     |
| High Power Lasers in Space and Aeronautics .....   | 1                               | 1   |
| A. KANTROWITZ  |                                 |     |
| SUBSONIC AND TRANSONIC FLOWS   |                                 |     |
| Review of NASA Supercritical Airfoils .....  | 8                               | 8   |
| R.T. WHITCOMB  |                                 |     |
| Transonic Lift Augmentation of Two-Dimensional<br>Supercritical Aerofoils by Means of Aft Camber,<br>Slot Blowing and Jet Flaps, in High Reynolds<br>Number Flow ..... | 19                              | 19  |
| D.J. PEAKE, A.J. BOWKER, M. MOKRY,<br>H. YOSHIHARA and R. MAGNUS   |                                 |     |
| Effects of Reynolds Number on Swept-Wing-Body<br>Configurations with High Lift Devices at<br>Transonic Speeds .....  | 94                              | 94  |
| E. ATRAGHJI and H. SORENSEN  |                                 |     |
| Research on the Transonic Aerofoil Sections<br>at the National Aerospace Laboratory, Japan .....   | 121                             | 121 |
| T. SHIGEMI   |                                 |     |
| Recent Developments in Methods for Calculating<br>Transonic Flows over Wings .....   | 134                             | 134 |
| M.G. HALL and M.C.P. FIRMIN  |                                 |     |
| Viscous Effects in Transonic Flow past Airfoils .....  | 152                             | 152 |
| J.J. KACPRZYNSKI   |                                 |     |
| BOUNDARY LAYERS  |                                 |     |
| Recent Developments in Boundary Layer<br>Transition Research .....   | 173                             | 173 |
| E. RESHOTKO  |                                 |     |

|   |     |
|---|-----|
| Analysis of Viscous Flow over Swept Wings ..... | 186 |
| E. KRAUSE                                       |     |

|   |     |
|---|-----|
| Numerical Solution of Navier-Stokes Equations<br>for Interaction of Shock Wave with Laminar<br>Boundary Layer ..... | 195 |
| M. HANIN, M. WOLFSHTEIN and U.E. LANDAU   |     |

|  |     |
|--|-----|
| Extension of the "Reynolds Analogy" through<br>an Integral Method Approach ..... | 200 |
| E. VALLERANI   |     |

#### VORTICES AND WAKES

|  |     |
|--|-----|
| On the Calculation of Non-Linear Aerodynamic<br>Characteristics and the Near Vortex Wake ..... | 214 |
| J. ROM, C. ZOREA and R. GORDON   |     |

|  |     |
|--|-----|
| Recent Contributions to the Solution of<br>Nonlinear Aerodynamic Interference Problems ..... | 229 |
| D. HUMMEL  |     |

|  |     |
|--|-----|
| Numerical Computations of Wake Vortices<br>behind Lifting Surfaces ..... | 244 |
| A. MATTEI and E. SANTORO   |     |

|   |     |
|---|-----|
| The Deformation of a Vortex Sheet behind a Swept<br>Back Wing; Comparison of Measurements and<br>Calculations ..... | 267 |
| TH.E. LABRUJERE and O. DE VRIES   |     |

|   |     |
|---|-----|
| Turbulent Trailing Vortex with Central<br>Jet or Wake ..... | 278 |
| J.A.H. GRAHAM, B.G. NEWMAN and W.R. PHILLIPS                |     |

|  |     |
|--|-----|
| Aircraft Trailing Vortex Instabilities ..... | 293 |
| W.P. JONES and H.L. CHEVALIER                |     |

|  |     |
|--|-----|
| Experimental Investigation of Wing-Tip<br>Vortex Abatement ..... | 303 |
| S.W. YUAN and A.M. BLOOM   |     |

#### UNSTEADY FLOWS

|  |     |
|--|-----|
| Application to the Viggen Aircraft Configuration<br>of the Polar Coordinate Method for Unsteady<br>Subsonic Flow ..... | 312 |
| V.J.E. STARK   |     |

|   |     |
|---|-----|
| Computation of Aerodynamic Loads on Helicopter Rotorblades in Forward Flight, Using the Method of the Acceleration Potential .....  | 323 |
| TH. VAN HOLLEN  |     |
| EXPERIMENTAL AERODYNAMICS IN WIND TUNNELS AND IN FLIGHT   |     |
| Two-Dimensional Wind Tunnel Tests on a Conventional Wing Section over a Wide Range of Reynolds Numbers and up to High Subsonic Free-Stream Speeds .....   | 335 |
| D. BROWN  |     |
| Simulation of High Altitude Flight in Wind-Tunnels and Correlation of Free-Flight and Wind Tunnel Data .....  | 357 |
| W. WUEST  |     |
| Experimental Study of Viscous Flow on Multiple Element Airfoils .....   | 369 |
| B.L.G. LJUNGSTRÖM   |     |
| Experimental Studies of the Leading Edge Suction Force, Including the Maximum Attainable Suction Force versus Reynolds Number and the Induced Distributions on Various Wing Planforms and Air Intakes ..... | 382 |
| S.O. RIDDER   |     |
| The Determination of Ice Deposition on Slender Wings: an Experimental Technique and Simplified Theory .....   | 397 |
| J.W. FLOWER   |     |
| Determination of Ice Shapes and Their Effect on the Aerodynamic Characteristics for the Unprotected Tail of the A 300 .....   | 409 |
| B. LASCHKA and R.E. JESSE   |     |
| Status and Future of Determination of Aerodynamic Derivatives from Flight Data .....  | 419 |
| V. KLEIN  |     |
| Estimates of the Stability Derivatives of a Helicopter from Flight Measurements .....   | 431 |
| D.G. GOULD and W.S. HINDSON   |     |
| Static Aeroelastic Effects on the Aerodynamics of the SAAB 37 Viggen Aircraft, a Comparison between Calculations, Windtunnel Tests and Flight Tests .....   | 438 |
| J. KLOOS and L. ELMELAND  |     |

VOLUME 2

COMPOSITE MATERIALS

|  |     |
|--|-----|
| New Materials and Structures .....   | 447 |
| W.R. JOHNSTON  |     |
| Artificial and Natural High-Temperature<br>Composites .....                          | 457 |
| W. BUNK  |     |
| Advanced Material Applications to Subsonic<br>Transport Aviation .....               | 472 |
| D.G. SMILLIE and D.M. PURDY  |     |
| Theoretical and Experimental Stress Analysis<br>of a Composite Pressure Vessel ..... | 490 |
| A. SEGAL, A. DOTHAN, M. NEWMAN and J.M. LIFSHITZ                                     |     |

AIRCRAFT STRUCTURES

|   |     |
|---|-----|
| Design Criteria for Buckling and Vibration of<br>Imperfect Stiffened Shells ..... | 495 |
| J. SINGER and A. ROSEN  |     |
| The Interaction of Local and Overall Buckling<br>of Thin-Walled Structures .....  | 518 |
| A. VAN DER NEUT   |     |
| Fail-Safe Characteristics of Built-Up<br>Sheet Structures .....                   | 530 |
| H. VLIEGER  |     |
| Thermal Re-entry Problems of<br>Anisotropic Structures .....                      | 543 |
| L. BROGLIO  |     |
| Structural Optimization under Constraints<br>of Whatever Kind .....               | 550 |
| P. SANTINI and R. BARBONI   |     |

STRUCTURAL DYNAMICS

|  |     |
|--|-----|
| Problems of Flight in Turbulence ..... | 561 |
| G. COUPRY                              |     |

|  |     |
|--|-----|
| Linear and Non-linear Oscillations<br>in Mechanics .....   | 575 |
| J.H. ARGYRIS, P.C. DUNNE, T. ANGELOPOULOS and B. BICHAT  |     |
| Influence of Sloshing in Wing Tip Tanks on the Vibration<br>Natural Modes of an Aircraft .....                               | 585 |
| R. VALID and R. OHAYON   |     |
| Theoretical and Experimental Research on Vibrations<br>of Thin Walled Stiffened Structures .....                             | 595 |
| G. CAVALLINI and A. SALVETTI   |     |
| On the Kinematic Theory of Rolling Tires .....   | 609 |
| I. KLOC  |     |
| <br><b>AIRCRAFT DESIGN</b>   |     |
| Automation of the Aircraft Design Process .....  | 617 |
| R.R. HELDENFELS  |     |
| Modern Applications of Electronics Technology<br>in Civil Aviation - Present Status and Future<br>Trends .....               | 629 |
| E. EULA  |     |
| <br><b>PROPELLION</b>  |     |
| Overview of NASA Aeronautical Propulsion Research<br>and Technology Program .....  | 639 |
| H.W. JOHNSON   |     |
| Matched Propulsion for Advanced Vehicles .....   | 648 |
| G. ROSEN   |     |
| Theoretical and Experimental Studies of a High<br>Pressure Ratio Centrifugal Compressor at Red-<br>uced Rotating Speed ..... | 655 |
| Y. RIBAUD and P. AVRAM   |     |
| A Study of the Concorde Air Intake in Yaw .....  | 665 |
| J. LEYNAERT, T.W. BROWN and D. COLLARD   |     |
| Air Intake Wind Tunnel Tests .....   | 677 |
| J. LAVERRE, M. BAZIN and J.P. LEDY   |     |
| Flow Calculation of Convergent Propulsive Nozzles<br>Comparison with Experiment .....  | 691 |
| M. FENAIN, L. DUTOUQUET and J.L. SOLIGNAC  |     |

|  |     |
|--|-----|
| Generalization of the Equations for Intersecting<br>Turbulent Jets ..... | 706 |
| V. PIMSNER and S. VINTILA  |     |

#### NOISE AND POLLUTION PROBLEMS

|   |      |
|---|------|
| Recent Developments in Noise Research at NGTE .....   | 714  |
| F.W. ARMSTRONG  |      |
| Noise Shielding Aircraft Configurations, a Comparison<br>between Predicted and Experimental Results ..... | 730  |
| G. HELLSTRÖM  |      |
| Recent Developments at the Ultimate Noise<br>Barrier .....  | 741  |
| J.S. GIBSON   |      |
| The Problem of Pollution for the SST .....  | 752  |
| A. FERRI  |      |
| New Results Concerning the Emission of Pollutants<br>from Combustion Processes in Gas Turbines .....      | 761  |
| G. KAPPLER, TH. JUST and G. WINTERFELD  |      |
| Technology for the Reduction of Aircraft Turbine<br>Engine Pollutant Emissions .....                      | 773  |
| D.W. BAHR and C.C. GLEASON  |      |
| <br>THE INTERNATIONAL COUNCIL OF THE<br>AERONAUTICAL SCIENCES .....                                       | XIII |
| <br>PARTICIPATING SOCIETIES OF ICAS .....   | XIV  |
| <br>AUTHOR INDEX .....  | XVII |
| <br>DISCUSSOR INDEX .....   | XIX  |