

RTO Technical Publications: a quarterly listing

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This is a listing of unclassified RTO technical publications NASA received and announced in the NASA STI Database during the quarter cited above. Requests for reports on the list may be made by document identification number (19990052868) from the NASA Center for Aerospace Information, 7121 Standard Drive, Hanover, MD 21076-1320. Requests may also be made by e-mail help@sti.nasa.gov, fax (301) 621-0134, or telephone (301) 621-0390. Where stock permits, requests will be filled with printed copies; if printed copies are not available, microfiche copies will be supplied. This listing can also be viewed and downloaded via the NASA STI Program home page at <http://www.sti.nasa.gov>.

19990052868 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France

High Order Approximations for Compressible Fluid Dynamics on Unstructured and Cartesian Meshes

Barth, Timothy, Editor, NASA Ames Research Center, USA; Deconinck, Herman, Editor, Von Karman Inst. for Fluid Dynamics, Belgium; March 1999; 582p; In English; Higher Order Discretization Methods in Computational Fluid Dynamics, 14-15 Sep. 1998, Rhode-Saint-Genese, Moffett Field, CA, Belgium, USA; Sponsored by Research and Technology Organization, France Report No.(s): RTO-EN-5; ISBN 3-540-65893-9; Copyright Waived; Avail: CASI; A25, Hardcopy; A06, Microfiche

The development of high-order accurate numerical discretization techniques for irregular domains and meshes is often cited as one of the remaining challenges facing the field of computational fluid dynamics. In structural mechanics, the advantages of high-order finite element approximation are widely recognized. This is especially true when high-order element approximation is combined with element refinement (h-p refinement). In computational fluid dynamics, high-order discretization methods are infrequently used in the computation of compressible fluid flow. The hyperbolic nature of the governing equations and the presence of solution discontinuities makes high-order accuracy difficult to achieve. Consequently, second-order accurate methods are still predominately used in industrial applications even though evidence suggests that high-order methods may offer a way to significantly improve the resolution and accuracy for these calculations. To address this important topic, a special course was jointly organized by the Applied Vehicle Technology Panel of NATO's Research and Technology Organization (RTO), the von Karman Institute for Fluid Dynamics, and the Numerical Aerospace Simulation Division at the NASA Ames Research Center. The NATO RTO sponsored course entitled "Higher Order Discretization Methods in Computational Fluid Dynamics" was held September 14-18, 1998 at the von Karman Institute for Fluid Dynamics in Belgium and September 21-25, 1998 at the NASA Ames Research Center in the United States. During this special course, lecturers from Europe and the USA gave a series of comprehensive lectures on advanced topics related to the high-order numerical discretization of partial differential equations with primary emphasis given to computational fluid dynamics (CFD). Additional consideration was given to topics in computational physics such as the high-order discretization of the Hamilton-Jacobi, Helmholtz, and elasticity equations. This volume consists of five articles prepared by the special course lecturers. These articles should be of particular relevance to those readers with an interest in numerical discretization techniques which generalize to very high-order accuracy. The articles of Professors Abgrall and Shu consider the mathematical formulation of high-order accurate finite volume schemes utilizing essentially non-oscillatory (ENO) and weighted essentially non-oscillatory (WENO) reconstruction together with upwind flux evaluation. These formulations are particularly effective in computing numerical solutions of conservation laws containing solution discontinuities. Careful attention is given by the authors to implementational issues and techniques for improving the overall efficiency of these methods. The article of Professor Cockburn discusses the discontinuous Galerkin finite element method. This method naturally extends to high-order accuracy and has an interpretation as a finite volume method. Cockburn addresses two important issues associated with the discontinuous Galerkin method: controlling spurious extrema near solution discontinuities via "limiting" and the extension to second order advective-diffusive equations (joint work with Shu). The articles of Dr. Henderson and Professor Schwab consider the mathematical formulation and implementation of the h-p finite element methods using hierarchical basis functions and adaptive mesh

refinement. These methods are particularly useful in computing high-order accurate solutions containing perturbative layers and corner singularities. Additional flexibility is obtained using a mortar FEM technique whereby nonconforming elements are interfaced together. Numerous examples are given by Henderson applying the h-p FEM method to the simulation of turbulence and turbulence transition.

Derived from text

Computational Fluid Dynamics; Partial Differential Equations; Discretization (Mathematics); Approximation; Unstructured Grids (Mathematics); Galerkin Method; Essentially Non-Oscillatory Schemes; Weighting Functions

19990053143 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France

Fluid Dynamics Problems of Vehicles Operating Near or in the Air-Sea Interface *Problemes de Dynamique des Fluides des Vehicules Evoluant dans ou Pres de l'Interface Air-Mer*

Fluid Dynamics Problems of Vehicles Operating Near or in the Air-Sea Interface; February 1999; 380p; In English, 5-8 Oct. 1998, Amsterdam, Netherlands; Sponsored by Research and Technology Organization, France; See also 19990053144 through 19990053173; Original contains color illustrations

Report No.(s): RTO-MP-15; AC/323(AVT)TP/9; ISBN 92-837-0004-X; Copyright Waived; Avail: CASI; A17, Hardcopy; A03, Microfiche

The papers prepared for the RTO Applied Vehicle Technology (AVT) Symposium on "Fluid Dynamics Problems of Vehicles Operating Near or in the Air-Sea Interface" which was held 5-8 October 1998 in Amsterdam, The Netherlands, are contained in this report. In addition, a Technical Evaluator's Report aimed at assessing the success of the Symposium in meeting its objectives, and an edited transcript of the General Discussion held at the end of the Symposium are also included. In addition to presentations from the NATO Countries, this Symposium included several presentations by Russian and Ukrainian authors. In total, 30 papers were presented during sessions on the following subjects: (1) Aerodynamics and Flight Dynamics around Ships; (2) Stabilization and Control Techniques for Ships; and (3) Non-Classical Aircraft Flying Near the Air-Sea Interface.

Author

Fluid Dynamics; Aerodynamics; Ships; Air Water Interactions; Conferences

19990054217 Research and Technology Organization, Information Systems Technology Panel, Neuilly-sur-Seine, France

Frequency Assignment, Sharing and Conservation in Systems (Aerospace) *L'Attribution, le Partage et la Conservation des Frequences pour les Systemes Aeronautiques et Spatiales*

Frequency Assignment, Sharing and Conservation in Systems (Aerospace); January 1999; 224p; In English; Information Systems Technology, 5-7 Oct. 1998, Aalborg, Denmark; See also 19990054218 through 19990054236; Original contains color illustrations
Report No.(s): RTO-MP-13; AC/323(IST)TP/1; ISBN 92-837-0003-1; Copyright Waived; Avail: CASI; A10, Hardcopy; A03, Microfiche

This volume contains the Technical Evaluation Report, the Keynote Address and the 18 unclassified papers, presented at the Information Systems Technology (IST) Panel Symposium held in Aalborg, Denmark from 5th to 7th October 1998, The papers presented covered the following headings: Spectrum Management and Use; and Emerging Technology and Criteria.

Author

Conferences; Information Systems; Frequency Assignment; Systems Management

19990056413 Research and Technology Organization, Systems Concepts and Integration Panel, Neuilly-sur-Seine, France

Optical Gyros and Their Application *Gyroscopes Optiques et Leurs Applications*

May 1999; 314p; In English; See also 19990056414 through 19990056427; Original contains color illustrations

Report No.(s): RTO-AG-339; AC/323(SCI)TP/9; ISBN 92-837-1014-2; Copyright Waived; Avail: CASI; A14, Hardcopy; A03, Microfiche

This AGARDograph is written by leading experts from France, Germany, Russia and the USA. It consists of 15 chapters that can be divided into four main parts. The first one gives a detailed description of the laser and fiber optical gyro theory, the main sources of errors and the methods used to reduce their influence. The analysis of many types of modern laser gyros allowing various requirements to accuracy, dimension, weight and cost is presented in the second part. The reader can also find here some areas of practical applications of laser gyros. The third part is devoted to fiber optical gyros that have been developed recently and which are very successful technologically and commercially. The last part of the book considers special applications of optical gyros for laser dynamic goniometry and metrology, fundamental and applied research (such as nuclear physics, aerodynamics, etc.), railway track surveying and estimation of deformation of objects.

Author

Laser Gyroscopes; Optical Gyroscopes; Fiber Optics; Sagnac Effect; Integrated Optics

19990068480 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France
Aeromedical Aspects of Aircrew Training *Les Aspects Aeromedicaux de la Formation des Equipages*
June 1999; 96p; In English, 14-18 Oct. 1998, San Diego, CA, USA; See also 19990068481 through 19990068496
Report No.(s): RTO-MP-21; AC/323(HFM)TP/8; ISBN 92-837-1016-9; Copyright Waived; Avail: CASI; A05, Hardcopy; A01, Microfiche

A RTO Human Factors and Medicine Panel Workshop held in San Diego, California, in October 1998 brought together Aero-medical Trainers to discuss current Aeromedical Training Programs and to present new approaches to this training. Various approaches to Aeromedical Training were also discussed and STANAG 3114 "Aeromedical Training of Flight Personnel" was reviewed. Presentations included: categories of training, subjects taught, frequency of training, duration of courses, period of validity and altitude chamber profiles utilized. Most NATO countries were present and provided overviews of their programs, as did representatives from Poland and the Czech Republic. Presentations also included new approaches to Aeromedical Training including: Simulator Based Physiology Training (SYMPHYS), Simulator Based Disorientation Training and In-Flight Disorientation Training. The Workshop recommended changes to STANAG 3114 including, but not limited to: removal of the split between Rotary and Fixed-wing aircraft training requirements, addition of the requirement for instruction on aeromedical aspects of new Life Support Equipment and addition of the requirement for a practical Spatial Disorientation experience during refresher training. Also recommended was the establishment of a Working Group to study the variation between countries in rates of Decompression Illness from altitude chamber exposure. It was also recommended that NATO validate the need for a new STANAG on Night Vision Training.

Author

Aerospace Medicine; Human Factors Engineering; Training Devices; Training Simulators; Flight Training; Flight Simulation; Altitude Simulation; Flight Crews

19990070390 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France
Qualification of Life Extension Schemes for Engine Components *Homologation des Programmes de Prolongation du Cycle de vie des Organes Moteur*

March 1999; 172p; In English, 5-6 Oct. 1998, Corfu, Greece; See also 19990070391 through 19990070408
Report No.(s): RTO-MP-17; AC/323(AVT)TP/7; ISBN 92-837-1012-6; Copyright Waived; Avail: CASI; A08, Hardcopy; A02, Microfiche

Contains the papers presented at the Workshop on Qualification of Life Extension Schemes for Engine Components. The replacement cost of service-damaged components contributes significantly to the life cycle costs of an aero-engine. Damaged engine components also impact on the reliability and safety of aircraft. The papers discuss component damage management in turbines, including life management aspects of high cycle fatigue, and techniques for extending lives of service-damaged parts to achieve engine life cycle cost reductions, without compromising safety. Operators' needs and benefits accruing from component life extension are discussed. Various technologies available to life cycle managers for component life extension are described. The technologies include surface modification treatments and coatings, repair and refurbishment procedures, as well as improved component life cycle management practices based on damage tolerance and inspection. Emphasis is placed on the qualification testing requirements that must be satisfied to ensure that repaired or modified parts, or parts for which new life cycle management practices are applied, remain safe and reliable when returned to service.

Author

Aircraft Engines; Cost Reduction; Engine Parts; Gas Turbine Engines; Aircraft Maintenance; Operating Costs; Service Life; Life Cycle Costs; Damage Assessment; Aircraft Safety; Conferences