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23rd International Congress of Aeronautical Sciences

Final Programme

TORONTO - CANADA
8 to 13 September, 2002
The first 100 years of powered flight started in Dayton, Ohio...so will the next.

International Air & Space Symposium and Exposition

The Next 100 Years

Premier Global Event for the Centennial of Flight
14–17 July 2003 • Dayton Convention Center • Dayton, Ohio USA

After four years of painstaking research from their Dayton bicycle shop, the Wright brothers sent humanity soaring into the future above the sand dunes of Kill Devil Hills. Now, after a century of stunning achievements in aviation and space, the world once again turns to Dayton. Over four exciting days, the international aerospace community will come together to honor the pioneering spirit of our industry, and lay the groundwork for a new century of discovery that will change our world—and expand our access to the universe.

To learn more about the International Air and Space Symposium and Exposition and all of AIAA’s Evolution of Flight centennial activities, go to: www.aia.org/dayton2003.

To exhibit, contact Howard O’Brien, Jr.
phone: 800/739-4424 (U.S. callers) or 703/264-7535 (international callers)
e-mail: howardo@aiaa.org
Message from the President of the International Council of the Aeronautical Sciences

Canada hosted the 10th ICAS Congress in Ottawa in 1976 and it was with great pleasure that the International Council of the Aeronautical Sciences accepted the invitation of CASI to come again to Canada to hold its 23rd Congress in Toronto in September 2002.

At the inaugural meeting of ICAS in 1957, the vision set out by Theodore von Karman and the Founding Fathers was that the ICAS Congress should provide aeronautical scientists and engineers from all over the world with a forum in which they could meet to learn about new discoveries in aeronautical science, technology and products, exchange ideas and experiences and develop a friendly professional network free from cultural, political and ideological constraints. ICAS has served that vision well and over the years has increasingly established itself as the foremost international forum for aeronautical science and engineering. Today, special attention is being given to students and young engineers and scientists and the opportunity that the ICAS Congress provides for them to meet with colleagues from all over the world. We also must prepare for the increasingly global nature of our industry and the increasingly international nature of all aspects of aeronautical products, from research through development, production, operations, training and maintenance.

The global changes in the structure of the industry along with new priorities in R&T topic areas such as information technology, electronics, microsystems and system of systems solutions are challenges for our established scientific and engineering community. The ICAS Executive Committee and the Programme Committee are seriously watching these changes and are adjusting to today’s and future requirements to support a healthy collaboration between academia, research and industry.

The Call for Papers for the 23rd Congress - for the first time web-based - attracted over 570 submissions from 32 countries. From these, the ICAS Programme Committee, chaired by Billy Fredriksson of Sweden, had the difficult task of selecting about 350 papers for presentation. The calibre of the authors and the quality of their submissions was well up to the high standards set by previous ICAS Congresses and, as is evident from the programme set out in the following pages, ICAS 2002 promises to be a highly stimulating and rewarding event.

The City of Toronto will provide a most attractive venue for the Congress and, on behalf of ICAS, I must thank the Canadian Aeronautics and Space Institute for undertaking the substantial organisational task that is entailed in hosting this event. I am personally delighted that CASI proposed Toronto for 2002. Let me extend my grateful thanks to all authors who are sharing their work and ideas with us as well as to all session chairs who are bringing in their expertise. I have no doubt that, for everyone who participates in the Congress, it will be a meeting to remember.

Wolfgang Schmidt, President of ICAS

Message from the President of CASI

It is my great pleasure to invite you to the 23rd Congress of the International Council of the Aeronautical Sciences in beautiful Toronto, Canada.

The industry worldwide has never faced a more daunting challenge than it does now as we struggle with major challenges on a wide variety of fronts, from trade to terrorism. As much as it has been deeply affected by recent economic and political events, the aerospace sector remains a potent force for growth and advancement. This 23rd Congress affords us all the opportunity to regroup and move forward.

Canada, with its vast open spaces, its deep roots in aviation, and its leading-edge capabilities in aerospace is a country well-sui-
ted to host the 2002 Congress. Toronto is the commercial capital of the country -- a bright, modern, multicultural city renowned for its warm hospitality and its cosmopolitan atmosphere. Delegates will enjoy a wide variety of technical tours and sightseeing opportunities. For accompanying persons, Toronto is a wonderful city to explore with a marvellous mix of museums, art galleries, historical and cultural points of interest, and shopping to rival any major city in the world. Just as important, Toronto has a well-deserved reputation as one of the safest, cleanest cities in North America.

We are looking forward to welcoming you to the 23rd ICAS Congress in Toronto, Canada.

Fassi Kafyeke, President of the Canadian Aeronautics and Space Institute
<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Session/Session Title</th>
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<tr>
<td>Monday 9 Sep</td>
<td>08:30-09:00</td>
<td><strong>REGISTRATION</strong></td>
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<tr>
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<td>09:00-10:00</td>
<td>ICAS DANIEL &amp; FLORENCE GUGGENHEIM MEMORIAL LECTURE : CIVIL AIRCRAFT PROPULSION : THE LAST 50 YEARS</td>
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<td>10:30-12:30</td>
<td>Multidisciplinary Design Optimization I</td>
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<td>Aircraft Design</td>
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<td>Low Speed Applications I</td>
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<td>Unmanned Air Vehicles</td>
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<td>High Speed Applications I</td>
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<tr>
<td>Tuesday 10 Sep</td>
<td>08:30-09:30</td>
<td><strong>GENERAL LECTURE I - AEROSPACE IN 2020 : A EUROPEAN VISION</strong></td>
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<td>10:00-12:30</td>
<td>Multidisciplinary Design Optimization II</td>
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<td>12:30-14:30</td>
<td>Unconventional Aircraft</td>
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<td>High Speed Applications II</td>
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<td>CFD for Complex Flows</td>
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<td>Wednesday 11 Sep</td>
<td>08:30-09:30</td>
<td><strong>GENERAL LECTURE II - DEVELOPMENT AND APPLICATION OF TECHNOLOGY FOR THE SONIC CRUISER</strong></td>
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<td>CFD Algorithms I</td>
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<td>High Speed Aerodynamic Analysis</td>
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<td>CFD Algorithms II</td>
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<td>Thursday 12 Sep</td>
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<td><strong>GENERAL LECTURE III - MARKET DRIVERS AND INNOVATION BEHIND THE AIRBUS PRODUCTS</strong></td>
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<td>CFD for Design</td>
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<td>CFD Validation</td>
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<td>Other Unsteady Aerodynamics</td>
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<td>16:00-16:30</td>
<td>VON KARMAN LECTURE</td>
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<td>Friday 13 Sep</td>
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<td><strong>CLOSING CEREMONY</strong></td>
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<td>17:00-17:30</td>
<td><strong>TECHNICAL VISITS</strong></td>
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Monday, 9 September
8:30 - 9:00
Opening Ceremony and Welcoming Addresses
F. KAFYEKE - President of CASI
W. SCHMIDT - President of ICAS
A. CARYT - President of NRC
T. BRZUSTOWSKI - President of NSEC
9:00 - 10:00
ICAS Daniel and Florence Guggenheim Memorial Lecture
Chairman: W. SCHMIDT - President of ICAS
ICAS 2002-0.1
Civil Aircraft Propulsion: The last 50 years
Pr. H.I.H. SARAVANAMUTTU, Carleton University, CA

Monday 10:30 - 12:30
Session 1.1
Multidisciplinary Design Optimization I
Chairman:
V. BALABANO, V. RD INC., US
C. AUSSARD, ONERA, FR
ICAS 2002-1.1.1
A Probabilistic Methodology for the Treatment of System-of-System Problems and Application to Future Aviation Transportation Architectures
D. DELAIRE, F. HANOVER, R. MAHLEN, D. SCHMIDT, Georgia Institute of Technology US
ICAS 2002-1.1.2
Evaluation and Implementation of Multidisciplinary Design Optimization (MDO) Strategies
G. RENAUD, G. SHI, IAR/NRC, CA
ICAS 2002-1.1.3
Evaluation of Three Decomposition MDO Methods
S. CHEN, F. ZHANG, M. KHALID, IAR/NRC, CA
ICAS 2002-1.1.4
Conceptual Aircraft Design - A Genetic Search and Optimization Approach
N. ALLI, Ryerson University, CA

Session 2.1 - Propellers and Rotors
Chairman:
E. SAMPARDO, BOBING, US
A. NUGROHO, IAS, IN
ICAS 2002-2.1.1
CFD Analysis of Low Speed and Cruise APARAN Configuration powered by High Speed Propellers
M. AMATO, CIRA, IT
M.A. AVERARDO, Alenia, IT
ICAS 2002-2.1.2
Computational Simulations of Propellers in Cruise
E.A. ROMANDER, NASA ARC, US
ICAS 2002-2.1.3
Rotorcraft Aerodynamic and Aeroacoustic Modeling using Vortex Particle Methods
D.S. O'ROURKE, F. NITZSCHE, Carleton University, CA, D.G. TRANTOS, S.G. VATOS, National Technical University of Athens, GE
ICAS 2002-2.1.4
A Numerical Method for 3D Aerodynamics Design of a Compressor Stage
N. CHEN, W. HUANG, Z. ZHANG, CAS, CN

Session 3.1 - Structures Materials I
Chairman:
S.V. HDAS, Concordia Univ., CA
R. BITTEN, EADS, DE
ICAS 2002-3.1.1
Geometrically Linear/Nonlinear Sandwich Structures with Anisotropic Face Sheets: Foundation of the Theory and Behavior
L. URBESCU, Virginia Polytechnic Institute and State University, US
ICAS 2002-3.1.2
Failure Prediction of Stringer Stiffened Composite Panels with Impact Damage under Axial Compression
R. CURTS, DISTL, US
C. SOUS, Y. ZHUK, J. GUZ, Imperial College of Science, UK
ICAS 2002-3.1.3
A Linear 3D Finite Element Unit Cell Model for Fibre Wravines in Composite Materials
A.J. GUNNISON, M.L. SCOTT, RMIT, AU
R.S. THOMSON, Cooperative Research Centre for Advanced Composite Structures Ltd., AU, D. HACHENBERG, Airbus Deutschland GmbH, DE
ICAS 2002-3.1.4
Load Response and Failure of Thick RTM Composite Lugs
W. HALLIW, G. SAKHRA, Hashimi University of Technology, IR
ICAS 2002-3.1.5
Aeroelasticity I
Chairman:
A. JOHNSO, Manager Loads and Dynamics, CA
B. WENZELL, POI, SE
ICAS 2002-4.1.1
Numerical Simulation of Active Control of Transonic Flutter
C.B. ALLEN, University of Bristol, UK
ICAS 2002-4.1.2
Stability Analysis in the Time-Domain Applied to Adaptive Transport Aircraft Wings
W. SEND, DLR, DE
ICAS 2002-4.1.3
Nonlinear Aeroc ballistic Signal Analysis of an Aeroshell-Airplane Combination
H. ALCHEMBAIR, Ryerson University, CA
ICAS 2002-4.1.4
On the Nonlinear Dynamics Approach of Modeling the Bifurcation for Transonic Limit Cycle Flutter
H. MATSUMITA, T. MIYATA, L.E. CHRISTIANSEN, T. LEHN-SCHMIDT, Fukuoka University, JP

Session 5.1
Flight Dynamics of Spacecraft and Missiles
Chairman:
E. BLATT, MTRA BAe, US
F. SACHER, ASTRID, DE
ICAS 2002-5.1.1 (Ll)
The Effect of Aircraft Biases on the Delivery of an Enhanced Laser Guided Weapon
J. RAFLY, University of Liverpool, UK
K.L. EDWARDS, QinetiQ Ltd, UK
ICAS 2002-5.1.2
Numerical Prediction of the Airframe Ice Acquisition Growth
T. WANG, Tianqiang Institute, TV
ICAS 2002-5.1.3 (SL)
Aircraft Design Flight Dynamics and Airframe Analysis
N. YOKÖHAMA, University of Tokyo, JP
ICAS 2002-5.1.4
A Systematic Approach to Mission Capability Analysis of Air Ambulance Helicopters
M. KUSUMO, A.K. SINHA, RMIT AU
ICAS 2002-5.1.5
Aeroelasticity and Aircraft Design
M. ZHANG, Beijing University of Aeron & Astro, CN
M. LIU, Shenyang Aircraft Research Inst., CN

Session 6.1
Integrated Product Development I
Chairman:
G. HULMEN, SAAB, SE
ICAS 2002-6.1.1 (LL)
Joint Strike Fighter (JSF) Development Focusing on Reduced Lifecycle Costs
M.L. FORSÖN, Lockheed Martin Aeronautics Company, US
ICAS 2002-6.1.2
A Framework for Achieving Lifecycle Value in Aerospace Product Development
A. TANKE, M. MUHAMMAD, MIT, US

Session 1.2
Aircraft Design
Chairman:
R.E. MOON, NASA UC, US
L. EDLUND, SAAB, SE
ICAS 2002-6.2.1
Preliminary Design Phase 928JET - Keeping the 728JET Family Commonality
H. ALIGHANBARI, Ryerson University, CA
ICAS 2002-6.2.2
Nonlinear Predictions of Wing-Tip Effects on Lift-Induced Drag
P. BOUDIN, ONERA, FR

Session 2.2
Low Speed Applications I
Chairman:
R. KIND
ICAS 2002-6.2.3
Numerical Study of Reynolds number Effects on the Aerodynamics of the Deltawing with Rounded Leading Edge
J. HENKINER, Fairchild Dornier GmbH, DE
ICAS 2002-6.2.4
Wind Shape Optimization using a Constraint NURBS Surface Geometrical Representation
J.Y. TREPANIER, CERCA, CA

Session 3.2
Structural Analysis Numerical Simulation
Chairman:
S. PAPETOS, Univ. of Patras, GE
Y. XIONG, GE GRID, US
ICAS 2002-6.2.1
Structural Reliability Analysis of Composite Panels With Impact Damage
M. KUSUMO, A.K. SINHA, RMIT AU
ICAS 2002-6.2.2
Aeroelasticity and Aircraft Design
M. ZHANG, Beijing University of Aeron & Astro, CN
M. LIU, Shenyang Aircraft Research Inst., CN

Session 5.2
Flight Dynamics of Light Aircraft
Chairman:
F. THOMAS, DLR, DE
F. WADDICK, Cirrus Design Corp., US
ICAS 2002-5.2.1
Three Surfaces Aircraft Model Flying Qualities Comparison: Flight Tests and Numerical Results
D.P. COOKE, A. DE MARCO, N. GENITO, Universita Federico II, IT

Monday 14:00 - 15:30
Session 8.1
Student Session I
Chairman:
S. LAINE, IST, FI
ICAS 2002-8.1.1
The Investigation of Multi-disciplinary and Multi-objective Optimization Method for the Aircraft Configuration Design
X. LIU, CN, G. ZHENGHONG, Northwae Polytechnic University, CN
ICAS 2002-8.1.2
Hybrid Two-level Genetic Optimization Algorithm with different Fitness Models for Aerodynamic Design Problems
V. CHERNYKH, RU
ICAS 2002-8.1.3
Optimization of Flapping Wing Motion
K. ITÔ, University of Tokyo, JP
ICAS 2002-5.2.2
A Low Cost Flight test Instrumentation Package for Light Aircrafts
B. EGGLETON, W. D. MUNNEN, N.C.
CHOI, Found Aircraft Canada, CA

ICAS 2002-5.2.3
Theoretical Experimental and In-flight Spin Investigations for an Executive Light Airplane
G. GOD, A. BARO N, Institute of Aviation, PL

Session 6.2 - Manufacturing I
Chairman : K. FOWLER, BAE Dynamics, UK

ICAS 2002-6.2.1 (I.L)
Some Manufacturing Activities in Japanese Aeronautical Industries
Y. Y. SUKUMURA, Japan Aircraft Development Corporation, JP

ICAS 2002-6.2.2 (SL)
Design of Assembly Operations for the Defense Aerospace Industry
A. VAUGHN, J. T. SHIELDS, MIT, US

ICAS 2002-6.2.3
Cost and Cycles Reduction Based on Material Process Simulation
D. DELIGIO, N. GUERDA-DEGEORGES, A. ABDI, G. MAUN, EADS CH, FR

Session 7.2
Aerospace Education Systems and International Cooperation
Chairman : M. ONODAIRI, Politecnico di Torino, IT
N. BALKHADIR, Univ. of Portsmouth Business School, UK

ICAS 2002-7.2.1 (I.L)
The Way of Harmonization and Cooperation in Aerospace Education
B. ISHCHIKA, T.U. MUNICH, DE

ICAS 2002-7.2.2 (I.L)
The Contribution of University to the Aerospace Research and Technologies
E. VELLEMIJN, P. SANTRI, Univ. La Sapienza, IT

ICAS 2002-7.2.3 (I.L)
The Global Role of the US-Top Universities for the Provision of the Human Resources in Engineering Science to the Aerospace Community
B. LISGLIAN, Center for International Cooperation in Space, US

Session 8.2
Student Session II
Chairman : I. POLL, Cranfield Univ. UK

ICAS 2002-8.2.1 (S)
A Semi-Analytical Numerical Method of Determining Stress Intensity Factors for Multiple Sites Damage Structure
L. WU, China Aviation Society, CN

ICAS 2002-8.2.2 (S)
Hypothesis on the Enhancing of the Probability of Survival of Space and Transporathmic Aircraft in Space
Lightweight and Microorganisms Contaminated Environment
G. SHENBENG, Tianjin Polytechnic University, IT

Session 9.3
Aircraft Control and Handling
Chairman : B. NEDERHUIS, ENAV, IT

ICAS 2002-9.3.1
A Unique Spray Forming Process for Lightweight Materials for Aeronautical Applications
ADOLPH, Z. G. HARNET, S. M. YAM, Beijing Institute of Aeronautical Materials, CN

ICAS 2002-9.3.2
Aerodynamic and Flight Dynamic Real-Time Analysis during Spin and Carefree Maneuvering Tests of the Saab JAS39 Gripen
M. J. STAAL, SAAB Aerospace, SE

ICAS 2002-9.3.3
Development of a Handling Qualities Evaluation Toolbox on The Basis of Gustion's Criteria
H. HENDAIKO, Institute of Technology of Bandung, ID

Session 10.3
Spacecraft and Natural Hazards
Chairman : P. LANDCHE, O. NIEPER, FR

ICAS 2002-10.3.1
High AOAP Approach and Landing Control Low Design for the X-31 A-Vector Project
A. KNOBL, EADS, MIL, DE

Session 11.3
Manufacturing II
Chairman : J. CARLIDAN, BO, ENG, US
O. MASEFIELD, ECLIPSE, AVIATION, US

ICAS 2002-11.3.1
Efficient Wing Design for Complex Aircraft Configuration Utilizing CAX Unstructured CFD and Inverse Problems
T. FUJITA, Tohoku University, JP

ICAS 2002-11.3.2
Numerical Optimization of the Wing of a Supersonic Aircraft
S. TAKUYO, TAI, JAP

ICAS 2002-11.3.3
Computerization in Reusable Space Transport Systems at Supersonic Speed
A. HENZE, RWTH-AACHEN, DE

Session 13.3
Structural Integrity Damage Tolerance
Chairman : G. ZAMULA, TAI, JAP
F. HENET, TU Braunschweig, DE

ICAS 2002-13.3.1
Service Life of Airplane Structures
G. NESTERENKO, TAI, JAP

ICAS 2002-13.3.2
Modeling of Full-scale Aircraft Structural Tests
R. HEMIT, NCA, CA

Session 14.3
Multi-disciplinary Design Optimization II
Chairman : J. GIERSB, BOEING, US
G. DIRKX, AIRBUS, DE

ICAS 2002-14.3.1
"Smart Spring" Concept for Helicopter Vibration and Noise Control
D. ZIMCH, C. YONG, V. VICKMANASGBARISH, NCA, CA

ICAS 2002-14.3.2
Development and Testing of Friction Stir Welding (FSW) as a Joining Method for Primary Aircraft Structure
B. CHRISTNER, ECLIPSE, AVIATION, US

ICAS 2002-14.3.3
Creed Forming of AlMg alloys for Aeronautic and Space Applications
J. UHL, Airbus Germany GmbH, DE

ICAS 2002-14.3.4
Wind Tunnel Simulation of Air Clump on Tail Unit
Z. RITZE, Aeronautical and Research Institute, CZ - M. HOLL, VIZL, CZ

Session 8.3
Student Session III
Chairman : LMBC CAMPOS, SP

ICAS 2002-8.3.1 (ST)
Captive Carrying Testing as a Means for Rapid Evaluation of UAV Handling Qualities
C. MUNOZ, R. KRULS, Linkoping University, SE
L. E. LEEWYN, Linkoping University, US

ICAS 2002-8.3.2 (ST)
Small Leading Edge Flap for Post Stall Flow Control on a 45 deg Delta Wing
T. MATSUMOTO, S. YOKOUCHI, Y. NAKAMURA, Nagoya University, JP

ICAS 2002-8.3.3 (ST)
The Global Model of the US-Top Universities for the Provision of the Human Resources in Engineering Science to the Aerospace Community
B. LISGLIAN, Center for International Cooperation in Space, US

ICAS 2002-8.3.4 (ST)
Recent Development in Scaling Methods for Icing Wind Tunnel Testing at Reduced Scale
R. J. KIND, Carleton University, CAM
M. OLESKIW, NRC, CA

Monday 16:00 - 18:00

Session 1.3
Unmanned Air Vehicles
Chairman : Mac SINCLAIR, MS AERO, CA
P. HOFST, TU Braunschweig, DE

ICAS 2002-1.3.1
Advanced Technologies for Next Generation UAVs
S. TIAH, IAI, IL

ICAS 2002-1.3.2
A System Approach to the Design of Multi-Mission Airframe for Unmanned Air Vehicle Systems
A.K. SINHA, R. KUSUMO, RMIT, AU

ICAS 2002-1.3.3
HELPLANT Structural Analysis of High Altitude Very-Long Endurance Solar Powered Platform for Telecommunication and Earth Observation Applications
G. ROMEO, G. FRULLA, Turin Polytechnic University, IT

ICAS 2002-1.3.4
Designing and Development of Unmanned Aerial Vehicle
M. ASIM, ABD, Pakistan Air Force, PK

Session 2.3
High Speed Applications I
Chairman : O. BALL, BO, ENG, US
C. WIELAND, ASTRUM, DE

ICAS 2002-2.3.1
Wind Tunnel Simulation of Ice Accretion on Tail Unit
J. MEIER, NLA, NL

Session 5.3
Aircraft Control and Handling
Chairman : B. FELDING, BAE Systems, UK
Z. CHEN, Beijing Univ., CN

ICAS 2002-5.3.1
Feedback Stabilized Bifurcation Tailoring Applied to Aircraft Models
G. CHARLES, M.M. LOVENBERG, X.F. WANG, D.P. STODEN, Univ. of Bristol, UK

ICAS 2002-5.3.2
Aerodynamic and Flight Dynamic Real-Time Analysis during Spin and Carefree Maneuvering Tests of the Saab JAS39 Gripen
H. STAAL, SAAB Aerospace, SE

ICAS 2002-5.3.3
New Approaches in Textile and Impregnation Technologies for the Cost Effective Manufacturing CFRP Aerospace Components
A. GIESLER, J. FILSINGER, EADS, DE

Session 7.3
Weather and Natural Hazards
Chairman : P. LANDCHE, O. NIEPER, FR
G. RENT, QINQUO, UK

ICAS 2002-7.3.1
Recent Development in Scaling Methods for Icing Wind Tunnel Testing at Reduced Scale
R. J. KIND, Carleton University, CAM
M. OLESKIW, NRC, CA

ICAS 2002-7.3.2
Coping with Wake Vortex
K.U. HANN, DJF, DE

Session 8.3
Student Session III
Chairman : LMBC CAMPOS, SP

ICAS 2002-8.3.1 (ST)
Captive Carrying Testing as a Means for Rapid Evaluation of UAV Handling Qualities
C. MUNOZ, R. KRULS, Linkoping University, SE
L. E. LEEWYN, Linkoping University, US

ICAS 2002-8.3.2 (ST)
Small Leading Edge Flap for Post Stall Flow Control on a 45 deg Delta Wing
T. MATSUMOTO, S. YOKOUCHI, Y. NAKAMURA, Nagoya University, JP

ICAS 2002-8.3.3 (ST)
Thermodynamic Design of an Alternative Propulsion System for Emergency Power Units
S. TAKUYO, TAI, JAP

ICAS 2002-8.3.4 (ST)
Experimental Study of the Structure and Development of a Wingtip Vortex in the Near-Field
C. WRIGHT, Utah State University, USA

ICAS 2002-8.3.5
Recent Development in Scaling Methods for Icing Wind Tunnel Testing at Reduced Scale
R. J. KIND, Carleton University, CAM
M. OLESKIW, NRC, CA

Tuesday, 10 September
8:30 - 9:30
General Lecture I
Chairman : J. HEFNER - NASA, US
ICAS 2002-1.4.1
Aerospace in 2020 : European Vision
H. VON BOSE, European Commission, BE

Tuesday 10:00 - 12:30
Wednesday 16:00 - 18:00

Session 1.9 CFD Algorithms II
Chairmen: A. RGZ, KTH, SE
R. IWAI, ABA, USA

ICAS 2002-1.9.2 Simulations of Standardized Mean Behaviors and Coherent Structures of Incompressible Turbulent Flows Using Unstructured, Average-Based Governing Equations G. GAO, Florida Atlantic University, US

ICAS 2002-1.9.3 A Fully Coupled Newton-Krylov Solver for Turbulent Aerodynamic Flows T. CHISHOLM, D.W. ZINGG, University of Toronto, CA

ICAS 2002-1.9.4 Sensitivity and Uncertainty Analysis of Aerodynamic Flows D. PELLETIER, E. TURGEON, J. BOHGDAND, Ecole Polytechnique de Montréal, CA

Session 2.8 Flow Instabilities
Chairmen: R. HENKE, AIRBUS, DE

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ICAS 2002-7.8.2 (I.L.) Diagnostics of Leakages in Gas Turbines H. ASGHAR, Advance Engineering Research Organization, Wah Cantt Pakistan, PK

ICAS 2002-7.8.3 A Cost/Benefit Analysis on Airbus functionalities for a Future ATM System A. MAUMUS, AIRBUS, FR

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Session 1.8 High Speed Aerodynamic Analysis
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Session 2.7 - Development in ATM
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ICAS 2002-7.7.2 A Orientation Directed Methodology for Managing the Complexity of ATM Systems B. LASKACARRE, ONERA, FR

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<td>S. TOHTAIN</td>
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### GENERAL INFORMATION

#### LOCATION AND DATES

The 23rd Congress of the International Council of the Aeronautical Sciences will be held at the Royal York Hotel in Toronto, Canada from Sunday 8th to Friday 13th September.

#### REGISTRATION FEES (CANADIAN DOLLARS)

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<th>Category</th>
<th>Member (Early-before June 15)*</th>
<th>Member*</th>
<th>On-site Member*</th>
<th>Non-Member (Early-before June 15)</th>
<th>Non-Member</th>
<th>On-site Non-Member</th>
<th>Student**</th>
<th>Day Delegate</th>
<th>Accompanying Person***</th>
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<td>$ 850</td>
<td>$1050</td>
<td>$1150</td>
<td>$1050</td>
<td>$1250</td>
<td>$1350</td>
<td>$ 250</td>
<td>$ 400</td>
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* Members of any ICAS Member Associations. Membership number must be supplied. Early means before June 15.

** The Student verification section of the registration form must be completed and signed. Student registrations without this section completed will be rejected.

*** Each accompanying person must be registered.

Registration fee includes

- Full Delegates – Attendance at the Congress sessions and Technical Tours (subject to availability), refreshments and light lunch each day, Reception on Sunday, Buffet Supper on Monday, Green Lecture lunch on Tuesday, book of abstracts, proceedings on CD-ROM and registration kit.
- Students – Attendance at the Congress sessions and Technical Tours (subject to availability), refreshments and light lunch each day. Reception on Sunday, Buffet Supper on Monday, Green Lecture lunch on Tuesday, book of abstracts and registration kit.
- Day Delegates – Attendance at the Congress sessions, refreshments and light lunch on day of attendance, book of abstracts and registration kit.

Paper Hard Copies – Hard Copies are not included in the registration fees. Nevertheless they will be available on site at the cost of CAN $ 4/ per paper.

Accompanying Persons – Attendance at Reception on Sunday, City Bus Tour of Toronto and Buffet Supper on Monday, and registration kit.

Volatility in the aeronautics and travel industries may necessitate changes to the events and amenities included in the registration fees.

#### REGISTRATION AND PAYMENT

All participants are required to complete the registration form found in this Program. Payment of the full registration fee must be included with your registration form. Registrations are transferable.

For further information, please contact:

23rd ICAS Congress
Canadian Aeronautics and Space Institute
1685 Russell Road, Unit 1-R, Ottawa, ON  K1G 0N1 Canada
Telephone: (613) 234-0191  Fax: (613) 234-9039
E-mail: casi@casi.ca  Web: www.casi.ca

#### METHODS OF PAYMENT

All payments should be made in Canadian Dollars.

Cheque:

Cheques should be made payable to CASI and enclosed with this registration form. Please add $10 if your cheque is not drawn on a Canadian bank.

**The Student verification section of the registration form must be completed and signed. Student registrations without this section completed will be returned.

CANCELLATION OF REGISTRATION

Written notification of cancellation must be received by 15th August 2002 in which case registration fees will be refunded less a cancellation fee of $50.

Cancellations received after 15th August 2002 are non-refundable.

#### REGISTRATION DEKKS

PREPUD Registrations: Mezzanine Level, Canadian Foyer ON-SITE Registrations: Convention Level, Toronto Room

Business hours

Sunday 14:00 – 19:00 hours
Monday 07:00 – 17:00 hours
Tuesday – Thursday 07:30 – 17:00 hours
TECHNICAL TOURS

Technical Tours 1, 2 and 3 are included in the registration fee for Full Delegates and Students. Lunch is included in each Tour, and will be served at one of the facilities visited. Technical Tours are offered subject to availability and minimum numbers of participants - please check with the Registration Desk on Thursday September 12.

Friday 13 September 08:30 to 15:00 hrs
The following Tours have been arranged with the kind cooperation of Bombardier Aerospace, Defence Research and Development Canada, Flight Safety Canada Inc., MacDonald Dettwiler, Pratt & Whitney Canada Inc., and University of Toronto Institute for Aerospace Studies.

TECHNICAL TOURS I
Bombardier Aerospace and University of Toronto Institute for Aerospace Studies
Participants will have the opportunity to see the final development engineering and assembly lines for the Bombardier Dash-8 turbo-prop family and the Global Express business jet. This is followed by a visit to the UTIAS laboratories to see the research flight simulator facility, aerospace materials test lab, CFD lab and ornithopter work.

TECHNICAL TOURS II
Flight Safety Canada, Defence Research and Development Canada, and University of Toronto Institute for Aerospace Studies
Participants will have the opportunity to see Flight Safety training simulators for all Bombardier (deHavilland) aircraft; DRDC facilities including the human centrifuge, high altitude simulator, diving research facility and virtual reality lab; and at the UTIAS laboratories, the research flight simulator facility, aerospace materials test lab, CFD lab and ornithopter work.

TECHNICAL TOURS III
Pratt & Whitney Canada and MD Robotics
At PWAC participants will see assembly and test areas for civilian turbofan engines, and receive a briefing on the use of CFD applications. The visit to MD Robotics will include the International Space Station Remote Manipulator System manufacturing area.

Monday 16 September (post-Congress tour) 08:30 to 16:00 hrs
The Institute for Aerospace Research of the National Research Council Canada invites delegates to visit their laboratories in Ottawa. Persons may register at the NRC booth in the Canadian Room of the Royal York Hotel during the conference. Visitors will be responsible for their own travel to Ottawa and their hotel accommodation in Ottawa.

The visit will cover the major facilities of the three IAR laboratories: the Aerodynamics Laboratory, the Flight Research Laboratory, and the Structures, Materials and Propulsion Laboratory located at the Uplands Airport Campus and the Montreal Road Campus. Transportation from one Laboratory to the other will be provided, along with a light lunch. There will be a limit of 25 participants for this visit.

SOCIAL PROGRAM

Sunday 8th September Reception 19:00 - 21:00 hrs
Delegates and Accompanying Persons are invited to attend a Reception

Monday 9th September Buffet Supper 19:00 - 22:00 hrs
Delegates and Accompanying Persons are invited to attend a buffet supper

Tuesday 10th September Lunch & John Green Memorial Lecture 12:30 - 14:30 hrs
Delegates are invited to attend a lunch followed by the Memorial Lecture

Thursday 12th September ICAS 2002 Dinner 19:30 hrs
The Awards dinner will be held in the Royal York Hotel, preceded by a cash bar, and will include a three-course dinner with wine

ACCOMPANYING PERSONS PROGRAM

Monday 9th September Morning Tour Sights of Toronto Bus Tour (included in fee)
The morning tour will pass by the Roy Thompson Concert Hall, Casa Loma, City Hall, Yorkville district, Eaton Centre, Royal Ontario Museum, Ontario Art Gallery, Chinatown, Skydome and CN Tower, etc.
Lunch 12:00 - 14:00 hrs
Lunch on Boat Tour of Toronto Harbour and Islands or at CN Tower
$35 per person
The afternoon is available for local shopping or sightseeing

Tuesday 10th September All-day Tour Niagara Region
Includes stops at Town of Niagara-on-the-Lake, Butterfly Conservatory, Niagara Gorge, Whirlpool and Horseshoe (Canadian) Falls, historic sites, Shaw Theatre, Botanical Gardens and Niagara Parks. Time is available for a ride on the Maid of the Mist boat, or tunnels behind the Falls. Lunch is included.
Morning - Black Creek Pioneer Village $65 per person
Lunch - at the Village
$65 per person
Afternoon - McMichael Gallery
$65 per person
Kleinburg is a picturesque small town on the outskirts of Toronto. It is famous as the site of the McMichael Collection including paintings by the Canadian Group of Seven artists and also native works of art.
The Gallery is housed in an imposing log timbered structure set in a forested ravine area surrounded by trails.

Wednesday 11th September Half-day Tour
Includes stops at Town of Niagara-on-the-Lake, Niagara Gorge, Whirlpool and Horseshoe (Canadian) Falls, winery visit, historic sites, Shaw Theatre, Botanical Gardens and Niagara Parks. Time is available for a ride on the Maid of the Mist boat, or a visit to the tunnels behind the Falls. Lunch is included.
Morning - Black Creek Pioneer Village $100 per person
Lunch - at the Village
$100 per person
Afternoon - McMichael Gallery
$100 per person
See descriptions above. Transportation between attractions will be provided.

Friday 13th September All Day Tour Niagara Region $95 per person
Includes stops at Town of Niagara-on-the-Lake, Niagara Gorge, Whirlpool and Horseshoe (Canadian) Falls, visit historic sites, Shaw Theatre, Botanical Gardens and Niagara Parks. Time is available for a ride on the Maid of the Mist boat, or a visit to the tunnels behind the Falls. Lunch is included.

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PATRONS

Bombardier Aerospace
NRC Institute for Aerospace Research
Bell Helicopter
Natural Sciences and Engineering Research Council
Pratt & Whitney Canada

SPONSORS

Aerovations
Boeing Canada
Carleton University
MS Aero
Magellan Aerospace Corporation
Messier-Dowty Inc.
Rolls-Royce Canada
TDM Technical Services
**HOTEL INFORMATION FORM**

23rd Congress of the International Council of the Aeronautical Sciences  
8th September - 13th September 2002, Toronto, Canada

Please complete the form in BLOCK CAPITALS  
Mail/fax the form to the hotel of your choice, Reference ICAS

On receipt of this application, a provisional booking will be sent to you BY THE HOTEL  
with details of payment and cancellation charges  
Telephone: (613) 234-0191 Fax: charges.

**Guest:** 
Surname:  
First Name:  
Organisation:  
Address:  
City:  
Postal Code:  
Country:  
Telephone (work):  
Telephone (home):  
Fax:  
E-mail:  
Arrival Date:  
Departure Date:  
Number of Nights:  
Number of Rooms:  
Single:  
Double:  
Twin:  
Total Number to be Accommodated:  
Credit Card:  
Expiry date:  
Cardholder name:  

The Fairmont Royal York Hotel has set aside a quantity of rooms for ICAS delegates and accompanying persons.  
Mention code ICAS when you register. This will entitle you to the special Conference rates below (CAN. $).  

<table>
<thead>
<tr>
<th>Conference hotel</th>
<th>Description</th>
<th>Rating</th>
<th>Single</th>
<th>Double/Twin</th>
<th>Deluxe</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAIRMONT ROYAL YORK</td>
<td>A grand hotel in the heart of the city. Airport connections, on subway, close to main railway station and bus station, convenient to all main shops, entertainment, restaurants.</td>
<td>****</td>
<td>CAN. $208</td>
<td>CAN. $208</td>
<td>CAN. $228</td>
</tr>
</tbody>
</table>

Reception on Sunday, Buffet Supper on Monday, Green Lecture lunch on Tuesday, book of abstracts, proceedings on CD-ROM  

**Delegates may wish to contact other hotels - a wide variety of style and rates is available. Two are shown below.**

<table>
<thead>
<tr>
<th>Hotel</th>
<th>Description</th>
<th>Rating</th>
<th>Availability and prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal Meridien</td>
<td>One of Toronto's most elegant hotels in style, service, ambiance and décor. Located downtown, 7-10 minute walk from Conference Hotel.</td>
<td>****</td>
<td>Contact hotel for rates and availability Approximate rate CAN. $285 and up</td>
</tr>
<tr>
<td>King Edward Hotel</td>
<td>Toronto ON M5J 1E3 Tel: 416-861-3633 Fax: 416-366-4414</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality Inn Downtown</td>
<td>Downtown near Eaton's Centre, City Hall 12-15 minute walk from Conference Hotel, 10 minutes by subway</td>
<td>**</td>
<td>Contact hotel for rates and availability Approximate rate CAN. $139 and up</td>
</tr>
</tbody>
</table>

For more information, please contact the hotel directly.

Mail/fax the form to the hotel of your choice, Reference ICAS

Please complete the form in BLOCK CAPITALS

Signed:  
Date:  
Name:  
Position:  

**Institution:**  
**Country:**  
**City:**  
**Postal/Zip Code:**  
**Telephone (work):**  
**Telephone (home):**  
**Fax:**  
**E-mail:**  
**Organization:**  
**Department:**  
**Address:**  
**City:**  
**Postal/Zip Code:**  
**Country:**  
**Telephone:**  
**Fax:**  
**E-mail:**  
**Member Association (if applicable):**  
**Membership No:**  

**Special Dietary or Other Requirements:**

**Students**

I certify that this delegate is a full-time student studying at:  
**Institution:**  
**City:**  
**Province/State:**  
**Postal/Zip Code:**  
**Telephone:**  
**Fax:**  
**E-mail:**  
**Country:**  
**Position:**

The following hotels may be of interest to ICAS delegates:

- **Fairmont Royal York Hotel**
  - **Address:** 100 Front Street West, Toronto, ON M5J 1E3  
  - **Tel:** 416-861-3633  
  - **Fax:** 416-366-4414  
  - **Credit Card:** American Express, Visa, MasterCard, Discover  
  - **Description:** A grand hotel in the heart of the city. Airport connections, on subway, close to main railway station and bus station, convenient to all main shops, entertainment, restaurants.  
  - **Availability and prices:** CAN. $285 and up

- **Royal Meridien King Edward Hotel**
  - **Address:** 100 Front Street West, Toronto, ON M5J 1E3  
  - **Tel:** 416-863-6333  
  - **Fax:** 416-368-9040  
  - **Credit Card:** American Express, Visa, MasterCard, Discover  
  - **Description:** One of Toronto’s most elegant hotels in style, service, ambiance and décor. Located downtown, 7-10 minute walk from Conference Hotel.  
  - **Availability and prices:** CAN. $228

On receipt of this application, a provisional booking will be sent to you BY THE HOTEL with details of payment and cancellation charges. Telephone: (613) 234-0191 Fax: charges.

---

**REGISTRATION FORM**

23rd Congress of the International Council of the Aeronautical Sciences  
8th September - 13th September 2002, Toronto, Canada

PLEASE RETURN TO: Canadian Aeronautics and Space Institute  
1685 Russell Road, Unit 1R, Ottawa, ON, Canada, K1G ON1  
Telephone: (613) 234-0191 Fax: (613) 234-9039  
E-mail: casi@cas.ca  
Website: www.casi.ca

**Personal Details**

Please type or print clearly

Surname:  
First Name:  
Title:  
Prof.  Dr.  Ms.  Mr.  Other:  
Other Name:  
Organization:  
Department:  
Address:  
City:  
Postal Code:  
Country:  
Telephone:  
Fax:  
E-mail:  
Member Association (if applicable):  
Membership Number:  
Special Dietary or Other Requirements:

**Students**

I certify that this delegate is a full-time student studying at:  
Institution:  
City:  
Province/State:  
Postal Code:  
Telephone:  
Fax:  
E-mail:  
Country:  
Position:

**Accompanying persons**

1.  
2.  
3.

**REGISTRATION FEES INCLUDE**

**FULL DELEGATES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
<th>Before June 15</th>
<th>After June 15</th>
<th>On site</th>
<th>Total ($) CDN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member*</td>
<td>$850</td>
<td>$1,050</td>
<td>$1,150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Member*</td>
<td>$1,050</td>
<td>$1,250</td>
<td>$1,350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student*</td>
<td>$250</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day Attendance</td>
<td>$400</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accompanying Person</td>
<td>$160</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD-ROM</td>
<td>---</td>
<td>$100</td>
<td>---</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(*) Please refer to General Information for Conditions
### (2) CONGRESS FUNCTIONS

<table>
<thead>
<tr>
<th>Date</th>
<th>Function Description</th>
<th>Included for</th>
<th>Extra Tickets</th>
<th>No. of Tickets x</th>
<th>Total $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun 8 Sept</td>
<td>Reception</td>
<td>delegates &amp;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Extra Tickets</td>
<td>accompanying</td>
<td>$25.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mon 9 Sept</td>
<td>Buffet Supper</td>
<td>delegates &amp;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Extra Tickets</td>
<td>accompanying</td>
<td>$70.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thur 12 Sept</td>
<td>ICAS 2002 Dinner</td>
<td></td>
<td>$95.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sub-total: $______

### (3) ACCOMPANYING PERSONS

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity Description</th>
<th>Fee</th>
<th>No. of Tickets x</th>
<th>Total $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon 9 Sept</td>
<td>AM - Toronto Sights Bus Tour</td>
<td>$35.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Noon - Boat Cruise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CN - Tower &amp; lunch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tue 10 Sept</td>
<td>All-day tour Niagara Falls</td>
<td>$95.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B) Afternoon tour-Lunch, McMichael Collection</td>
<td>$65.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C) All-day tour-Pioneer Village, Lunch, McMichael Collection</td>
<td>$100.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fri 13 Sept</td>
<td>All-day tour-Niagara Falls</td>
<td>$95.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sub-total: $______

### (4) TECHNICAL TOURS

<table>
<thead>
<tr>
<th>Subject to availability</th>
<th>1st Choice</th>
<th>2nd Choice</th>
<th>3rd Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday 13 Sept</td>
<td>Bombardier, University of Toronto Institute for Aerospace Studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flight Safety, Defence and Civil Institute for Environment Medicine, University of Toronto</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pratt &amp; Whitney Canada</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SUMMARY OF PAYMENT

**Total Payment Enclosed**: (1) + (2) + (3) + (4) = $______

**Methods of Payment**: All payments should be made in Canadian dollars.

- **Cheque**: Cheques should be made payable to CASI and enclosed with the registration form. Please add $10.00 if your cheque is not drawn on a Canadian bank.
- **Bank Transfer**: Payment can be made by bank transfer into account 00006003-act.1102631, Royal Bank, 90 Sparks Street, Ottawa, ON K1P 5T6.
- **Credit Cards**: Visa, MasterCard and American Express only.
  - **Visa**
  - **Mastercard**
  - **American Express**

Card No: ___________________________ Expiry Date: _____ / ____

Signature: _______________________

Written notification of cancellation must be received by 15 August 2002. Fees will be refunded less $50.00. After 15 August, registration fees will be non-refundable.

Note: All prices include Canadian federal tax (GST) of 7%. GST #R106842149