5th International Conference on Astrodynamics Tools and Techniques (ICATT)

ESA/ESTEC, The Netherlands
29 May - 1 June 2012

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Introduction

The 5th International Conference on Astrodynamics Tools and Techniques (ICATT) is an event organized by the European Space Agency (ESA) with the collaboration of the National Aeronautics and Space Administration (NASA), the Japan Aerospace Exploration Agency (JAXA), the Deutsches Zentrum für Luft und Raumfahrt (DLR), the Centre National d'Études Spatiales (CNES), the Agenzia Spaziale Italiana(ASI) and the Central Aerohydrodynamics Institute of Russia (TsAGI)

ICATT aims at providing agencies, companies, organizations, universities, and institutes with a forum of excellence in the area of astrodynamics and space flight mechanics. Participants are invited to showcase their latest tools and techniques so as to promote the creation and exchange of ideas and the identification of new trends and required developments.

In addition to the latest theoretical advances in the field of astrodynamics, ICATT is especially devoted to astrodynamics software tools. Demonstrations and short tutorials are welcome.

Organisation

Committees

Organizing Committee

A. Benoit, S. Erb, I. Huertas, A. Martinez, G. Ortega, S. Ueda, C. Yabar.

Technical Committee

D. Barbagallo (ASI), A. Benoit (ESA/TEC-EC), A. Cropp (ESA/TEC-ECN), S. Erb (ESA/TEC-ECN), E. Fletcher (ESA/HSO-L), J. Gavira (ESA/HSO-ID), B. Girouart (ESA/TEC-ECC), J.F. Goester(CNES), I. Huertas (ESA/TEC-ECN), S.P. Hughes (NASA), J.P. Huot (ESA/TEC-EES), R. Jehn (ESA/HSO-GFA), J. Kauffmann, (ESA/LAU-SNS), R. Kiehling (DLR), P. Labourdette (CNES), A. Martinez (ESA/TEC-ECN), O. Montenbruck (DLR), G. Ortega (ESA/TEC-ECN), A. Rinalducci (ESA/TEC-ECN), S. Theil (DLR), E. Tremolizzo (ESA/TECECC), M. Trujillo (ESA/TEC-QI), S. Ueda (JAXA), C. Yabar (ESA/TEC-ECN), O. Yanova (TsAGI).

Tuesday 29 May 2012

08:30 Registration

09:15 Welcome Speech
Guillermo Ortega, ESA

09:30 **Tutorial #1: "Fundamentals of the NASA General Mission Analysis Tool"**
S. Hughes, NASA

12:00 *Lunch Break*

13:00 **Tutorial #2: "Autonomous Navigation of Satellites"**
O. Montenbruck, DLR

15:30 *Coffee Break*

16:00 **Tutorial #3: "Re-Entry Trajectories For Space Vehicles"**
J.F. Goester, CNES

18:30 Welcome Cocktail

Wednesday 30 May 2012

08:30 Registration
09:30 Opening Speech
Alain Benoit, ESA

Track 1: Satellite Constellations, Formation Flying and Rendezvous and Docking
Chairs: P. Labourdette(CNES), S.Theil(DLR)

10:00 OSCAR/DRAGON: Tools for Maneuver Strategy Computation
Labourdette, P. ; Gaudel-Vacaresse, A. ; Carbonne, D.
CNES, (FRANCE)
10:30 New ASTOS Software Capabilities Applied to Rendezvous Scenarios
Weikert, S. ; Schaeff, S. ; Eggert, J. ; Juergens, M. ; Wiegand, A.
Astos Solutions GmbH, (GERMANY)
11:00 Autonomous GNC for Proximity Operations around Asteroids
Gil-Fernandez, J. ; Prieto-Llanos, T. ; Cadenas, R.
GMV, (SPAIN)

11:30 Coffee Break

12:00 Trajectory Operation Tools for the HTV
Kawashima, I [1]; Yamanaka, K [1]; Uematsu, H [1]; Wada, K [1]; Motoyama, N [2]
[1]Japan Aerospace Exploration Agency, (JAPAN); [2]Mitsubishi Space Software CO., LTD., (JAPAN)
12:30 Disturbance by Solar Pressure of Rendezvous Trajectories in GEO
Fehse, Wigbert
ESA/ESTEC (retired), (NETHERLANDS)

Track 2: Earth Orbit Design and Maintenance
Chairs: R.Kiehling(DLR/GSOC), O. Yanova(TsAGI)

10:00 SKAT: a versatile station-keeping analysis Tool for LEO and GEO
Parraud, P. [1]; Maisonobe, L. [1]; De Juana, J. M. [2]
[1]CS, (FRANCE); [2]EUMETSAT, (GERMANY)
10:30 SMAT - System and Mission Analysis Tool for Earth Observation Missions
Letterio, F. ; Pirondini, F. ; Cornara, S. ; Alacevich, R. ; Altés Arlandis, B. ; Renard, M. ; Tonetti, S.
DEIMOS Space S.L.U., (SPAIN)
11:00 Recommended Set of Models and Input Parameters for the Simulations of orbital Dynamics of the QB50 CubeSats
Scholz, T. [1]; Asma, C. O. [1]; Aruliah, A. [2]
[1]von Karman Institute for Fluid Dynamics, (BELGIUM); [2]University College London, (UNITED KINGDOM)

11:30 Coffee Break

12:00 Stake:a Tool to optimize full electric Station-Keeping
Le Berre, M ; Gicquel, AH
Astrium Satellites, (FRANCE)

13:00 Lunch Break

Track 3: Satellite Constellations, Formation Flying and Rendezvous and Docking (II)
Chairs: S. Ueda(JAXA), S. Theil(DLR)

14:00 Dynamic Rendezvous and Docking Simulation Facility:use Cases and 2012 Status
Caballero, F. [1]; Martín-Romero, J.R. [1]; Mollinedo, L. [2]; Suatoni, M. [2]; Colmenarejo, P. [2]
[1]INTA, (SPAIN); [2]GMV, (SPAIN)

14:30 PANGU: Planet and Asteroid Natural scene Generation Utility
Rowell, Nick [1]; Parkes, Steve [1]; Dunstan, Martin [1]; Dubois-Matra , Olivier [2]
[1]University of Dundee, (UNITED KINGDOM); [2]European Space Agency, ESTEC, (NETHERLANDS)

15:00 Formation Flying Acquisition based on Propagated Relative GPS in a Highly Elliptic Orbit
Cropp, A
ESA, (NETHERLANDS)

15:30 Coffee Break

16:00 PROBA-3 Formation Flying Demonstration Mission Design
Tarabini Castellani, L. [1]; Llorente, J.S. [1]; Peters, T.V. [2]; Mestreau-Garreau, A. [3]; Cropp, A. [3]
[1]SENER Ingeniería y Sistemas, S.A., (SPAIN); [2]GMV Aerospace and Defence, S.A.U., (SPAIN); [3]ESA/ESTEC, (NETHERLANDS)

16:30 PROBA-3 High Precision Formation Flying Control System
Agenjo, Alfredo [1]; Sánchez, Raúl [1]; Escorial, Diego [2]; Tarabini-Castellani, Lorenzo [1]; Cropp, Alexander [3]
[1]SENER, (SPAIN); [2]GMV, (SPAIN); [3]ESA-ESTEC, (NETHERLANDS)

Track 4: Orbit and Attitude Control Tools
Chairs: O. Montenbruck(DLR), B. Girouart(ESA)

14:00 Passive Magnetic Attitude Stabilization System on Small Satellites
Farrahi, A. ; Cubas, J. ; Franchini, S.
Universidad politécnica de Madrid, (SPAIN)

14:30 A Satellite Library in EcosimPro for the AOCS' effects on the Propulsion Subsystem
Koppel, C [1]; DeRosa, M [2]; Moral, J [3]; STEELANT, J [2]
[1]KopooS Consulting Ind;, (FRANCE); [2]ESTEC, (NETHERLANDS); [3]Iberespacio, (SPAIN)

15:00 Kinematic Attitude Maneuvers With Path Constraints
de Angelis, E.L. [1]; Avanzini, G. [2]; Giulietti, F. [1]
[1]University of Bologna, (ITALY); [2]University of Salento, (ITALY)

15:30 Coffee Break

16:00 Releasing the Cloud: A Deployment System Design for the QB50 CubeSat Mission
Bernal, C.A.
ISIS, (NETHERLANDS)

16:30 Development of Generic AOCS Unit Simulation Models
Pigg, M. [1]; Dungate, D. [1]; Pattenden, T. [1]; Girouart, B. [2]; Perriault, N. [3]; Maingam, F. [3]; Bakouche, C. [3]; Bacchetta, A. [4]; Polle, B. [5]; Theureau, D. [5]
[1]Tessella plc., (UNITED KINGDOM); [2]ESA-ESTEC, (NETHERLANDS); [3]Thales Alenia Space, (FRANCE); [4]Thales Alenia Space, (ITALY); [5]Astrium, (FRANCE)

17:00 GNCDE: An Integrated GNC Development Environment for Attitude and Orbit Control systems
Gandía., F. ; Barrena, V. ; Colmenarejo, P.
GMV, (SPAIN)

18:00 Conference Dinner at ESTEC

Thursday 31 May 2012

Track 5: Open Source Tools
Chairs: S. Hughes(NASA), R. Jehn(ESA)

09:30 PyGMO/PaGMO: a Tool for Massively Parallel Engineering Optimization and its Application to global low-thrust trajectory Optimiz.
Izzo, Dario
ESA, (NETHERLANDS)

10:00 Astrodynamics Web Tools: A collaborative Web computing infrastructure Project
San-Juan, J. F. ; Lopez, R. ; Lopez-Ochoa, L. M. ; Lara, M.
University of La Rioja, (SPAIN)

10:30 Open Governance of the Orekit space flight dynamics Library
Maisonobe, L. [1]; Cefola, P. J. [2]; Frouvelle, N. [1]; Herbiniere, S. [3]; Lizy-Destrez, S. [4]; Neidhart, T. [5]
[1]CS Communication & Systemes, (FRANCE); [2]Buffalo university and consultant, (UNITED STATES); [3]Thales Alenia Space, (FRANCE); [4]ISAE, (FRANCE); [5]independent expert, (BELGIUM)

11:00 Coffee Break

11:30 Tudat: a modular and robust astrodynamics Toolbox
Kumar, K [1]; Abdulkadir, Y. [1]; van Barneveld, P.W.L. [1]; Belien, F. [1]; Billemont, S. [1]; Brandon, E. [1]; Dijkstra, M. [1]; Dirkx, D. [1]; Engelen, F. [1]; Gondelach, D. [1]; van der Ham, L. [1]; Heeren, E. [1]; Iorfida, E. [2]; Leloux, J. [1]; Melman, J. [1]; Mooij, E. [1]; Musegaas, P. [1]; Noomen, R. [1]; B., Römgens [1]; A., Ronse [1]; Leite Pinto Secretin, T.A. [1]; Tong Minh, B. [1]; J., Vandamme [1]; Persson, S.M. [3]
[1]Delft University of Technology, (NETHERLANDS); [2]Università di Pisa, (ITALY); [3]McGill University, (CANADA)

12:00 The SIRIUS Flight Dynamics Library for the next 25 Years
Claude, Denis [1]; Tanguy, Yannick [2]
[1]Thales, Defence & Security C4I Systems Division, (FRANCE); [2]CNES, (FRANCE)

12:30 Semi-analytical Satellite Theory for the OREKIT Open-source Space Flight Dynamics Library
Cefola, P. [1]; San-Juan, Juan F. [2]; Maisonobe, Luc [3]; Parraud, Pascal [3]; Di Costanzo, Romain [3]
[1]University at Buffalo, (UNITED STATES); [2]Universidad de La Rioja, (SPAIN); [3]CS Communications & Systems, (FRANCE)

Track 6: Safety and Awareness Tools and Techniques
Chairs: E. Fletcher (ESA), M.Trujillo (ESA)

09:30 STELA a Tool for long term orbit Propagation
Fraysse, H [1]; Le Fevre, C [1]; Morand, V [1]; Deleflie, F [2]; Mercier, P [3]; Dental, C [3]
[1]CNES, (FRANCE); [2]IMCCE, (FRANCE); [3]THALES C4I, (FRANCE)

10:00 Optimal Design of a net-shaped space debris removal System
Bombelli, A.; Benvenuto, R.; Carta, R.; Lavagna, M.; Armellin, R.
Politecnico di Milano, (ITALY)

10:30 ELECTRA : Launch and Re-entry Risk Analysis Tool
Hourtolle, C. ; Gaudel-Vacaresse, A. ; Blazquez , A.
CNES, (FRANCE)

11:00 Coffee Break

11:30 Real-time footprint Control of spacecraft Debris using a deorbitation System based on solid Propulsion and autonomous Guidance
Hervouet, S ; Perrot, L
SCILOC INGENIERIE, (FRANCE)

12:00 Orbital debris conjunction Analysis
Noomen, R ; Leloux, J
Delft University of Technology, (NETHERLANDS)

12:30 Experimental set-up of a net-shaped space debris removal System
Benvenuto, R.; Carta, R.; Bombelli, A. ; Lavagna, M. ; Armellin, R.
Politecnico di Milano, (ITALY)

13:00 Lunch Break

Track 7: Interplanetary Flight and Non-Earth Orbits Tools and Techniques
Chairs: S. Hughes(NASA), R. Jehn(ESA)

14:00 GRAVMOD2: a new Tool for precise gravitational Modelling of planetary Moons and small Bodies
Zuccarelli, V. [1]; Cadenas, R. [2]; Huertas, I. [3]; Weikert, S. [4]
[1]Astos Solutions, (ITALY); [2]GMV, (SPAIN); [3]ESA, (SPAIN); [4]Astos Solutions, (GERMANY)

14:30 Development of a Tool for science Operations and Opportunities at ESAC - The Solar System Science Operations Laboratory
Costa, M. [1]; Altobelli, N. [2]; Cardesín, A. [3]; Almeida, M. [4]
[1]Ingeniería y Servicios Aeroespaciales S. A. (INSA)/TU Madrid, (SPAIN); [2]ESA, (SPAIN); [3]INSA/ESA, (SPAIN); [4]VEGA/ESA, (SPAIN)

15:00 Autonomous Navigation around Asteroids
Noomen, R ; Melman, J ; Mooij, E
Delft University of Technology, (NETHERLANDS)

15:30 Coffee Break

16:00 EUCLID Sky Scanning Tool
Cacciatore, F [1]; Sánchez, M [1]; Anselmi, A [2]
[1]Deimos-Space, (SPAIN); [2]Thales Alenia Space - Italy, (ITALY)

16:30 A Tutorial for DITAN to Design Low-Thrust Trajectories
Schorr, M [1]; Jehn, R [2]
[1]Technische Universität Darmstadt, (GERMANY); [2]ESA/ESOC, (GERMANY)

17:00 Multi-view 3D Reconstruction of Asteroids
Delaunoy, Amaël [1];Kanani,Keyvan [2]; Sturm, Peter [1];Dubois-Matra, Olivier [3]
[1]INRIA Grenoble, (FRANCE); [2]Astrium SAS, (FRANCE); [3]ESA-ESTEC, (NETHERLANDS)

Track 8: Re-Entry and Aero-Assisted Maneuvers
Chairs: J.F. Goester(CNES), J. Gavira(ESA)

14:00 Mars PLAY and EDL Activities at Thales Alenia Space Italy
Buonocore, M. [1]; Mura, F. [1]; Calantropio, F. [1]; Geelen, K. [2]
[1]Thales Alenia Space, (ITALY); [2]European Space Agency, (NETHERLANDS)

14:30 End-to-End Simulation Environment for Exomars 2016 Entry Descent and Landing Phase
De Sanctis, S. [1]; Calantropio, F. [1]; Buonocore, M. [1]; Lorenzoni, L. [2]
[1]Thales Alenia Space, (ITALY); [2]European Space Agency, (NETHERLANDS)

15:00 Propulsive Guidance and Control for planetery Landing
Canuto, E. ; Molano -Jimenez, A. ; Acuna-Bravo, W.
Politecnico di Torino, (ITALY)

15:30 Coffee Break

16:00 Model-based Guidance and Control for atmospheric planetery Entry
Canuto, E. [1]; Ospina, J. [1]; Molano Jimenez, A. [1]; Buonocore, M. [2]
[1]Politecnico di Torino, (ITALY); [2]Thales Alenia Space Italia, (ITALY)

16:30 Aerodynamic-Angle attitude Control for atmospheric planetery Entry
Canuto, E. [1]; Ospina , J. [1]; Molano -Jimenez, A. [1]; Buonocore, M. [2]
[1]Politecnico di Torino, (ITALY); [2]Thales Alenia Space Italia, (ITALY)

17:00 ABMAT: Mission Design and Analysis Tool for Aerobraking Scenarios and Operations Strategies
Cichocki, F. ; Sanchez, M.
Deimos-Space S.L.U., (SPAIN)

Friday 1 June 2012

Track 9: Orbit and Attitude Determination, Estimation and Prediction
Chairs: O. Montenbruck(DLR) , S. Ueda(JAXA)

09:30 Hybrid perturbation Theories based on Computational Intelligence
San-Juan, J. F. ; P\'erez, I. ; San-Mart\' in, M.
Universidad de La Rioja, (SPAIN)

10:00 High Fidelity Propagation of Asteroids using DROMO-based Techniques
Urrutxua, H. ; Pelaez, J.
Technical University of Madrid, (SPAIN)

10:30 High Order Algorithms for the Management of Uncertainties with Applications in Space Situational Awareness
Armellin, R. [1]; Di Lizia, P. [1]; Valli, M. [1]; Morselli, A. [1]; Lavagna, M. [1]; Bernelli-Zazzera, F. [1]; Berz, M. [2]
[1]Politecnico di Milano, (ITALY); [2]Michigan State University, (UNITED STATES)

11:00 Coffee Break

11:30 Re-examination of Pioneer 10 and 11 Tracking Data Including Spacecraft Thermal Modeling.
Modenini, D. ; Tortora, P.
University of Bologna, (ITALY)

12:00 Enhancement of Trajectory Determination of Orbiter Spacecraft by using Planetary Optical Images
Silvestri, D. ; Tortora, P.
University of Bologna, (ITALY)

Track 10: Ascent Tools And Techniques
Chairs: D. Barbagallo (ASI), J.Kauffmany(ESA)

09:30 An innovative semi-analytic Method for fast Launcher Trajectory Optimization
Dodelin, G. ; Cerf, M. ; Reynaud, S.
ASTRIUM SPACE TRANSPORTATION, (FRANCE)

10:00 Capabilities of ASTER Program Package for the Through Trajectory Optimization
Yanova, O. ; Filatyev, A. ; Golikov, A.
Central Aerohydrodynamic Institute (TsAGI), (RUSSIAN FEDERATION)

10:30 Turbo-boost For Launchability Analysis Tool (LAT)
Cremaschi, F. ; Volks, S. ; Jürgens, M.
Astos Solutions GmbH, (GERMANY)

11:00 Coffee Break

11:30 Extensive Suite for efficient and accurate generic Mission Analyses
Dodelin, G. ; Correia Da Costa, B. ; Cerf, M. ; Fessard, M. ; Reynaud, S.
ASTRIUM SPACE TRANSPORTATION, (FRANCE)

12:00S VAGO MDO Environment for the Design of Expendable Launch Vehicles
Castellini, F. [1]; Riccardi, A. [2]; Lavagna, M. [1]; Büskens, C. [2]
[1]Politecnico of Milano, (ITALY); [2]University of Bremen, (GERMANY)

12:30 Automatic Launch Window Analysis (ALWA), stand-alone Tool or ASTOS Feature
Hornig, A. ; Cremaschi, F.
Astos Solutions GmbH, (GERMANY)

13:00 Lunch Break

Track 11: Student Session
Chairs: G. Ortega(ESA), A. Martinez (ESA)

13:30 Design of a Combinatorial Tool for Preliminary Space Mission Analysis
Leite Pinto Secretin, T.A. ; Noomen, R.
Delft University of Technology, (NETHERLANDS)

14:00 SVAGO MDO Environment's Potential for Educational Activities
Riccardi, A. [1]; Castellini, F. [2]; Büskens, C. [1]; Lavagna, M. [2]
[1]University of Bremen, (GERMANY); [2]Politecnico of Milano, (ITALY)

14:30 Modelling and Simulations of Atmospheric Space Debris Trajectories
Mooij, E. ; Ronse, A.L.A.B.
Delft University of Technology, (NETHERLANDS)

Track 12: Optimization and Dynamics, Multidisciplinary Design Optimization
Chairs: O. Yanova(TsAGI), S. Erb(ESA)

14:00 WORHP — The ESA NLP Solver
Büskens, C. ; Wassel, D.
Universität Bremen, (GERMANY)

14:30 From WORHP to TransWORHP
Knauer, M. [1]; Büskens, C. [2]
[1]Universität Bremen, (GERMANY); [2]Universität Bremen, Zentrum für Technomathematik, (GERMANY)

15:00 Optimization of the Image Acquisition Planning for the BepiColombo Rotation Experiment
Palli, A. ; Tortora, P.
University of Bologna, (ITALY)

15:30 Closing Speech
R. Jehn, ESA

Posters

Design and Analysis of Libration Point Trajectories with the use of NASA GMAT
Cappaert, J. [1]; Detsis, E. [2]; Welch, C. [3]
[1]International Space University, (BELGIUM); [2]International Space University, (GREECE); [3]International Space University, (UNITED KINGDOM)

Managing the spin Condition by Means of magnetic Actuators: a Review
de Angelis, E.L. [1]; Avanzini, G. [2]; Giulietti, F. [1]
[1]University of Bologna, (ITALY); [2]University of Salento, (ITALY)

iStarmad: the App revolutioning the Way of performing space mission Analysis and Design
Starnone, D.
Star-n1 engineering, (ITALY)

T-SMAD (Tools for Space Mission Analysis and Design): a Collection of Tools to support the concurrent engineering design Process
Wuilbercq, R ; Cafiero, G ; Radice, G
University of Glasgow, (UNITED KINGDOM)