CCTAE

Centro de Ciências e Tecnologias Aeronáuticas e Espaciais

(Center for Aerospace Science and Technology)

Summary of Activities 2011

Version of: March 28, 2012

Members

Researchers

- Luís Manuel Braga da Costa Campos (coordinator)
- Agostinho Rui Alves da Fonseca
- André Calado Marta
- Fernando José Parracho Lau
- Filipe Szolnoky Ramos Pinto Cunha
- João Manuel Gonçalves de Sousa Oliveira
- Joaquim Manuel Guerreiro Marques
- Pedro da Graça Tavares Álvares Serrão

I. Publications

Books

- L. M. B. C. Campos, "Complex Analysis with Applications to Flows and Fields", CRC Press, 2010, 1029 pages. ISBN: 978-1-4200711-8-4.
- L. M. B. C. Campos, "Transcendental Representations with applications to Solids and Fluids", CRC Press, *in press*, 845 pages. (second volume of series "Mathematics and Physics in Science and Engineering").

Chapters of Books

1. L.M.B.C. CAMPOS & J.M.G.MARQUES "Collision probabilities, aircraft separation and airways safety". In *Aeronautics and Astronautics*, editor M. Mulder, pages 571-588, Intech. ISBN 978-953-307-473-3.

Papers in Journals

1. L.M.B.C. CAMPOS & J.M.G.S OLIVEIRA "On the acoustic modes in a duct containing a parabolic shear flow", Journal of Sound and Vibration, Volume 330, pages 1166-1195, 2011. [Impact Factor: 1.334; 5-year Impact Factor: 1.572]

2. L.M.B.C. CAMPOS “On a wave-particle in closed and open isotropic universes”, Journal of Mathematical Physics, volume 52, pages 013508-1 to 013508-26, 2011. [Impact Factor: 1.291; 5-year Impact Factor: 1.210]

3. L.M.B.C. CAMPOS “On magneto-acoustic-gravity-inertial waves Part I: Generation, propagation, dissipation and radiation”. Monthly Notices of the Royal Astronomical Society, Volume 410, pages 717-734, 2011. [Impact Factor: 4.888; 5-year Impact Factor: 4.747]

4. L.M.B.C. CAMPOS “On magneto-acoustic-gravity-inertial waves Part II: Application to magnetic and rotating stars”. Monthly Notices of the Royal Astronomical Society, Volume 410, pages 735-761, 2011. [Impact Factor: 4.888; 5-year Impact Factor: 4.747]

5. L.M.B.C. CAMPOS “On several generalizations of Fibonacci numbers with applications to population problems”. Non-linear Studies, volume 18, number 2, pages 235-254, 2011.

6. L.M.B.C. CAMPOS & J.M.G.MARQUES “On the probability of collision for crossing aircraft”. Aircraft Engineering and Aerospace Technology volume 83, number 5, pages 306-314, 2011. [Impact Factor: 0.372; 5-year Impact Factor: 0.352]

7. Joana da Rocha, A. Suleman and F. J. P. Lau 2011, “Flow-Induced Noise and Vibration in Aircraft Cylindrical Cabins”. Journal of Vibration and Acoustics, Vol. 133, No. 5. [Impact Factor: 0.390; 5-year Impact Factor: 0.701]

8. J. Vale, A. Leite, F. Lau, & A. Suleman 2011, “Aero-Structural Optimization and Performance Evaluation of a Morphing Wing with Variable Span and Camber”, JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES, Vol 22 (10), 1057-1073. [Impact Factor: 1.604; 5-year Impact Factor: 1.811]

Communications to International Symposia

1. F. CUNHA, “Helicopter Operations in Portugal”, American Helicopter Society 67th Annual Forum, Virginia Beach, VA, May 3-5, 2011.

2. L.M.B.C. CAMPOS & J.M.G. OLIVEIRA, “On the acoustic modes in a duct containing a parabolic shear flow”, 18th International Congress of Sound and Vibration, Rio de Janeiro, July 2011.

3. L.M.B.C. CAMPOS & F.J.P. LAU, “On sound generation by moving surfaces”, 18th International Congress of Sound and Vibration, Rio de Janeiro, July 2011.

4. L.M.B.C. CAMPOS & F.S.R.P. CUNHA, “On the power spectra of sound transmitted through turbulence”, 18th International Congress of Sound and Vibration, Rio de Janeiro, July 2011.

5. L.M.B.C. CAMPOS & F.J.P. LAU, “On propeller acoustic design synthesis with application to angular inflow”, 18th International Congress of Sound and Vibration, Rio de Janeiro, July 2011.

Reports

In the context of the project "EGNOS Operational Test and Validation", 330 reports of the operational evaluation of the EGNOS system in Lisbon were produced. These reports are available at IST and were delivered to EUROCONTROL to contribute to the global analysis of the EGNOS system.

II. Research and Technology Projects

Projects as leader or partner

EU funded projects

2009-2011

- COSMA (Community Oriented Solutions to Minimize aircraft noise annoyance), funded by European Union, 7th Framework Programme, 2nd Call, Aeronautics; leader: EADS-Innovation Works; role of IST: models of: (i) propagation in atmospheric turbulence and wind; (ii) effects of ground and obstacles on sound (iii); jet and turbine noise source components for engines.

2011-1014

- X-NOISE EV (Aircraft Noise Network) – Phase IV, funded by the European Union, 7th Framework Programme, 3rd Call. Leader-SNECMA, France.

FCT Funded Projects

- Projecto PTDC/FIS/103306/2008 “Análise dinâmica das cordas da guitarra portuguesa e sua interacção com o corpo do instrumento (Dynamical analysis and improvements on the Portuguese guitar strings and string-body interaction)”. Projecto leader: CCTAE (PI: Pedro Serrão). Budget: 8019,00 Euro.

- "Multidisciplinary Optimization in Aeronautical and Astronautical Design." (Principal investigator in fluid-structure interaction: André Marta) Scientific and technological cooperation between IST (Portugal) and ITA (Brazil) under the FCT/CAPES initiative - 2011/2012. Budget: 10000 Euros.

Industry Contract Research

- "Turbomachinery Aerodynamic Design Tools", General Electric - Global Research, USA. From 15-1-2011 to 31-12-2011. Budget: 19219 Euros.

- "EGNOS Operational Test and Validation". Project financed by EUROCONTROL, NAV Portugal, and additionally having as partners Força Aérea Portuguesa, VINAIR, IDMEC. The EGNOS system was certified for aeronautical applications in 2011. Agostinho Fonseca participated in the IDMEC contribution.

- "Implementation and operational evaluation of a GBAS system". Project co-financed by NAV Portugal. This is a national collaboration project, having as partners NAV Portugal, Força Aérea Portuguesa, VINAIR and IDMEC. Agostinho Fonseca participated in the IDMEC contribution.

Other projects

Members of CCTAE were involved in the following projects:

- “Teste e verificação de um atenuadores acústicos”. Partners: Pronorma and IST.
- "Electric Long Endurance UAV". (Project coordinator: André Marta). Budget: 26724 Euros. LAETA collaborative project including the groups CCTAE, IDMEC, AEROG and INEGI, in the research line of Aeronautics and Space. Portugal, 2011–2014.

New experimental installations

- Further development and application of a Research Flight Simulator.

Experimental prototypes

- Construction of a Mini-UAV, a quad-rotor with multiple degrees of freedom obtained from the rotation of two rotors in two different axis.

III. Scientific Orientation

PhD Thesis

On-going PhD Thesis

- José Lobo do Vale. PhD in Aerospace Engineering, co-supervised by Fernando Lau.
- Aníbal da Luz Santos Mota. PhD in Aerospace Engineering, co-supervised by Fernando Lau.
- Daniel Neto Cabrita e Gil Saraiva. PhD in Aerospace Engineering, started in 2011, co-supervised by Agostinho Rui Alves da Fonseca and José Raúl Carreira Azinheira (IDMEC).

Master Thesis

Completed Master Thesis

1. “Desenvolvimento de uma Turbina Eólica de Eixo Vertical”, Guilherme Botelho de Oliveira e Silva. MSc thesis, Aerospace Engineering, IST. (Advisors: Fernando Lau & João Oliveira).
2. “Previsão de níveis de ruído aeronáutico na vizinhança do Aeroporto de Lisboa”, Gonçalo Simas Delfino Correia. MSc thesis, Aerospace Engineering, IST. (Advisor: João Oliveira).
3. “Structural Loads Handbook”, Pedro Filipe Fernandes de Albuquerque. Mestrado em Engenharia Aeroespacial. (Advisor: Filipe Cunha).
4. “Design and construction of a multi-rotor with various degrees of freedom”, Nelson dos Santos Fernandes. MSc thesis, Aerospace Engineering, IST. (Advisor: Filipe Cunha).
5. “Aero-structural optimization of sailplane wings”, Bruno Cadete, MSc thesis, Aeronautical Engineering, AFA, Portugal, December 2011. (Advisor: André Marta).
6. “Closed loop development tests of an evaporating experiment for the International Space Station Fluid Science Laboratory”. Stefano Carli, MSc thesis, Aerospace Engineering, IST, Portugal, September 2011. (Advisor: André Marta).
7. “A TIME-domain methodology for rotor dynamics: analysis and force identification”, Pedro Vaz Dias Lopes Paulo. MSc thesis, Aerospace Engineering, IST. (Advisors: Nuno Manuel Mendes Maia & Fernando Jose Parracho Lau)
8. “Development of Control Strategies for the Joined-Wing Aircraft”, Bernardo Medina dos Santos Cunha. MSc thesis, Aerospace Engineering, IST (Advisors: Afzal Suleman & Fernando Jose Parracho Lau)
9. "Sensores embebidos em materiais compósitios", Carlos Diogo Coimbra Henriques. MSc thesis, Aerospace Engineering, IST. Advisors: José Raúl Carreira Azinheira (IDMEC) & Agostinho Rui Alves da Fonseca (CCTAE).

IV. Other Activities

- L. M. B. C. Campos was Member of the Juri for the Student Contest of the Aerospace Department of Delft University, 29 June 2011.
- L. M. B. C. Campos was Member Scientific Advisory Committee (SAC) of Aerodays 2011, Madrid, Sponsored by the European Union.
- André Marta participated in: "Uncertainty Management and Quantification in Industrial Analysis and Design State-of-the-art on uncertainty quantification and its incorporation on numerical aerodynamic and structural models". Workshop organized by the European Research Community on Flow, Turbulence and Combustion (ERCOFTAC), Munich, Germany, 3-4 March 2011.

V. Funding

Funding received in 2011:

FCT (base e programático)	52 257 Euro
FCT (project PTDC/FIS/103306/2008)	8 019 Euro
FCT/CAPES initiative	10 000 Euro
General Electric - Global Research	19 219 Euro
EU funded projects	57 000 Euro
Total funding	141 495 Euro