

# **CCTAE**

**Centro de Ciências e Tecnologias  
Aeronáuticas e Espaciais**

**(Center for Aerospace Science and Technology)**

**Summary of Activities  
2010**

Version of: March 31, 2011

# 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 pp. . ISBN: 978-1-4200711-8-4.

### Chapters of Books

1. L.M.B.C. CAMPOS & P.J.S. Gil “On the trajectory of rockets in the atmosphere”, in *Progress in Industrial Mathematics at ECMI 2008*, ed. Fitt, A.D.; Norbury, J.; Ockendon, H.; Wilson, E., Volume 13, Springer-Verlag, Series Mathematics in Industry, pp. 739-746 (ISBN 978-3-642-12109-8; DOI 10.1007/978-3-642-12110-4).
2. L.M.B.C. CAMPOS & J.M.G. MARQUES “On aircraft response and control during a wake encounter”, in *Progress in Industrial Mathematics at ECMI 2008*, ed. Fitt, A.D.; Norbury, J.; Ockendon, H.; Wilson, E., Volume 13, Springer-Verlag, Series Mathematics in Industry, pp. 747-752 (ISBN 978-3-642-12109-8; DOI 10.1007/978-3-642-12110-4).
3. L.M.B.C. CAMPOS & J.M.G. MARQUES “On alternative safety metrics for the probability of collision between aircraft”, in *Progress in Industrial Mathematics at ECMI 2008*, ed. Fitt, A.D.; Norbury, J.; Ockendon, H.; Wilson, E., Volume 13, Springer-Verlag, Series Mathematics in Industry, pp. 753-758 (ISBN 978-3-642-12109-8; DOI 10.1007/978-3-642-12110-4).

## Papers in Journals

1. L.M.B.C. CAMPOS & M.H. KOBAYASHI "Sound Transmission from a Source Outside a Non-isothermal Boundary Layer", AIAA Journal, volume 48, n° 5, pages 878-892.
2. L.M.B.C. CAMPOS & F.S.R.P. CUNHA "On the torsion of a prism with a non-equilateral triangular cross-section", International Journal of Engineering Science, Volume 48, pages 718-725.
3. A. C. Marta & J. J. Alonso, "Toward optimally seeded airflow on hypersonic vehicles using control theory", Computers & Fluids, Volume 39, Issue 9, pages 1562-1574 (Oct 2010).
4. J. Rocha, A. Suleman & F. Lau, "Flow-Induced Noise and Vibration in Aircraft Cylindrical Cabins". Journal of Vibration and Acoustics, 2010 (Accepted). [IF: 0.708; 5-year IF: 0.921]
5. J. Rocha, A. Suleman & F. Lau, "Turbulent Boundary Layer Induced Noise and Vibration of a Multi-Panel Walled Acoustic Enclosure". Canadian Acoustics, Vol. 38, No. 4, December 2010.

## Communications to International Symposia

1. L.M.B.C. CAMPOS & M.H.KOBAYASHI "On the propagation of sound in a sheared and swirling flow". 16 th AIAA/CEAS Aeroacustics conference, 7-9 June Strockhlom.
2. L.M.B.C. Campos & P.G.T.A. Serrão, "On the continuors spectrum of sound in sheared and swirlingflows", 16 th AIAA/CEAS Aeroacustics conference, 7-9 June, Strockhlom.
3. L.M.B.C. CAMPOS & F.S.R.P. CUNHA "Acoustic signal distorsion by atmospheric turbulence", Internoise 2010, Lisbon 13-16 June 2010.
4. L.M.B.C. Campos & P.G.T.A. Serrão, "Effect of wind on noise propagation", Internoise 2010, 13-16 June, Lisbon.
5. L.M.B.C. Campos & P.G.T.A. Serrão, "Outdoor to indoor transmission of aircraft noise", Internoise 2010, 10-13 June, Lisbon.
6. L.M.B.C. CAMPOS & F.J.P. LAU. "Shielding of engine noise by aircraft structure", Internoise 2010, 13-16 Jun. 2010.
7. L.M.B.C. CAMPOS & A.R.A FONSECA. "Building effects on airport noise", Internoise 2010 Lisboa, 13-16 June 2010.
8. João Manuel Gonçalves de Sousa Oliveira, Paulo Jorge Soares Gil, "Propagation of sound in ducts with elliptical cross-section and lined walls", 39th International Congress and Exposition on Noise Control Engineering: Inter-Noise 2010, 10-13 June 2010, Lisbon.
9. Luis Manuel Braga da Costa Campos, João Manuel Gonçalves de Sousa Oliveira, "Ground Effects on Helicopter Noise", 39th International Congress and Exposition on Noise Control Engineering: Inter-Noise 2010, 10-13 June 2010, Lisbon.
10. L.M.B.C. Campos & P.G.T.A. Serrão, "On the discrete and continuous spectrum of waves in a sheared and swirling flows". 16th European Conference on Mathematics for Industry, July 26-30, Wuppertal.

11. L.M.B.C. CAMPOS & F.S.R.P. CUNHA "On the distortion of acoustic spectra due to propagation through turbulence". 16th European Conference on Mathematics for Industry, July 26-30, Wuppertal.
12. L.M.B.C. CAMPOS & J.M.G. MARQUES "On aircraft separation, navigation accuracy and airways". 16th European Conference on Mathematics for Industry, July 26-30, Wuppertal.
13. L.M.B.C. CAMPOS "On the torsion of a prism with non-equilateral cross-section". 16th European Conference on Mathematics for Industry, July 26-30, Wuppertal.
14. L.M.B.C. CAMPOS & J.M.G. MARQUES "On safe separation distances between aircraft due to turbulent wakes", 16th European Conference on Mathematics for Industry, July 26-30, Wuppertal.
15. L.M.B.C. CAMPOS & J.M.G. MARQUES "On the minimization of trim drag for aircraft with multiple control surfaces", 16th European Conference on Mathematics for Industry, July 26-30, Wuppertal.
16. L.M.B.C. CAMPOS "On generation of magneto-acoustic-gravity-inertial waves in stars". Joint European and National Meeting in Astronomy, September 6-10, Lisbon.
17. L.M.B.C. CAMPOS "Relations between properties of magnetic and rotating stars". Joint European and National Meeting in Astronomy, September 6-10, Lisbon.
18. L.M.B.C. CAMPOS "On Alfvén waves in the solar wind". Joint European and National Meeting in Astronomy, September 6-10, Lisbon.
19. A. C. Marta, S. Shankaran and A. Stein, "Blade Shape Optimization using a RANS Discrete Adjoint Solver". ID 1410, 2nd International Conference on Engineering Optimization, IST, Lisbon, Portugal. September 2010.
20. J. VALE, A. SULEMAN & F.J.P. LAU "Development of Camber Morphing Capability in a Telescopic Morphing Wing", EngOpt2010 2nd International Conference On Engineering Optimization, 6 - 9 September 2010, Lisbon.
21. L.M.B.C. CAMPOS & J.M.G. MARQUES. "On three-dimensional collision probabilities relevant to air traffic management", 27th International Congress of Aeronautical Sciences, 19-24 September, Nice.
22. L.M.B.C. CAMPOS & M.H. KOBAYASHI "On the propagation of sound in high-speed non-isothermal shear flows", 27th International Congress of Aeronautical Sciences, 19-24 September, Nice
23. L.M.B.C. CAMPOS & J.M.G. MARQUES. "On maximization of control power in low-speed flight for a flying wing configuration", 27th International Congress of Aeronautical Sciences 19-24 September, Nice.
24. L.M.B.C. CAMPOS & F.J.P. LAU "On the generation of sound by moving surfaces in a potential flow", 14th Confederation of European Aeronautics Society - Aeroacoustics Subcommittee (CEAS-ASC) Workshop, October 7-8, Warsaw.
25. Rocha, J., A. Suleman, and F. Lau, "Prediction of Turbulent Flow-Induced Noise in Aircraft Cabins," Proceedings of the ASME 2010 International Mechanical Engineering Congress and Exposition (IMECE 2010), Vancouver, BC, Canada, November 12-19, 2010.

26. Rocha, J., A. Suleman, and F. Lau, "Flow-induced Noise in Aircraft Cylindrical Cabins: Analytical Model Validation," Proceedings of the 39th International Congress and Exposition on Noise Control Engineering (INTER-NOISE 2010), Lisbon, Portugal, June 13-16, 2010; also presented at the Canadian Acoustical Association Symposium 2010 Proceedings - Acoustic Week in Canada, Victoria, B.C., Canada, October 13-15, 2010.
27. Rocha, J., A. Suleman, and F. Lau, "An Accurate Coupled Structural -Acoustic Analytical Framework for the Prediction of Random and Flow-Induced Noise in Transport Vehicles: Its Validation," Canadian Acoustical Association Symposium 2010 Proceedings - Acoustic Week in Canada, Niagara-on-the-Lake, ON, Canada, October 14-16, 2010.
28. Rocha, J., A. Suleman, and F. Lau, "Turbulent Flow-Induced Noise in the Cabin of a BWB Aircraft," Proceedings of the Canadian Society for Mechanical Engineering Forum 2010 (CSME 2010), Victoria, BC, Canada, June 7-9, 2010.

## II. Research and Technology Projects

### Projects as leader or partner

#### EU funded projects

##### 2007-2010

- X3-NOISE (Aircraft Noise Network) - Phase III, funded by the European Union, under the 6th Framework programme, 1st call, European Research Area/Aeronautics; leader-SNECMA-France; role of IST: Support task 5: Scientific exchanges.

##### 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.

#### FCT Funded Projects

- Projecto PTDC/FIS/103306/2008 “Análise dinâmica das cordas da guitarra portuguesa e sua interacção com o corpo do instrumento”. Projecto leader: CCTAE (PI: Pedro Serrão).

#### Industry Contract Research

- Developing New Design Optimization tools for GE Aviation Turbine and Compressor Aero Needs General Electric - Global Research, USA from 15-2-2010 to 31-12-2010 (PI: André Marta)

#### Other projects

Members of CCTAE were involved in the following projects:

1. Programa MITPortugal  
Project: Development of Integrated Systems for Smart Interiors  
Task: Interfaces Between Humans and Electronic and Mechanical Devices  
IST partner: IDMEC
2. Projecto: Excelência na Engenharia de Manutenção  
IST partner: IDMEC

## III. Scientific Orientation

### PhD Thesis

#### Completed PhD Thesis

1. “Coupled Structural-Acoustic Analytical Models for the Prediction of Turbulent Boundary-Layer-Induced Noise in Aircraft Cabins”, Joana da Rocha, 2010, University of Victoria, Mechanical Engineering. (Supervisors: Afzal Suleman and Fernando Lau).

### Master Thesis

#### Completed Master Thesis

1. “Engine Condition Monitoring as a Route to Savings: Portugália Airlines as a Case-study”, Gonçalo Matos dos Santos Marques. (Advisor: Pedro Serrão).
2. “Modelização do esforço de carga sobre o trem de aterragem de um avião”, Luís Félix Fernandes Falcão Araújo. (Advisor: João Oliveira).
3. “Automatic Recouping Method - Development of an algorithm for optimizing simulations responses”, André Carlos Meira Pires. (Advisor: João Oliveira).
4. “Modelling of Aerodynamic Interactions in Compound Helicopters”, Carlos Santos Sousa. (Advisor: Filipe Cunha).
5. “Damage Tolerance Design”, Bernardo Vilhena Gavinho Lourenço. (Advisor: Filipe Cunha).
6. “An Experimental Study on the Design of Ornithopter and Tiltrotor Configurations”, Horácio José Gomes Moreira (Avisors: Afzal Suleman e Agostinho Rui Alves da Fonseca)
7. “Análise de Ciclo de Vida de um Airbus A330-200”, João Vasco de Oliveira Fernandes Lopes (Advisor: Agostinho Rui Alves da Fonseca)

## IV. Other Activities

- L. M. B. C. Campos is the portuguese representative at the ESA (European Space Agency) Future Launcher Preparatory Program (FLPP).
- L. M. B. C. Campos was Chairman of session: “General acoustics”, 10th AIAA/CEAS Aeroacoustics Conference, 7-9 June, Stockholm.
- L. M. B. C. Campos was Chairman of session: “Airport Noise”, Internoise 2010, 13-16 June, Lisbon.

- André Marta participated in: “The Future of Multidisciplinary Design Optimization: Advancing the Design of complex Systems”, Workshop sponsored by the National Science Foundation (NSF) Workshop, Fort Worth, Texas, USA, 16 September 2010.

## V. Funding

Funding received in 2011:

|                                    |             |
|------------------------------------|-------------|
| FCT (base e programático)          | 45.3 kEuro  |
| FCT (project PTDC/FIS/103306/2008) | 4.6 kEuro   |
| General Electric project           | 14.3 kEuro  |
| EU funded projects                 | 70 kEuro    |
| Total funding                      | 134.2 kEuro |