Professor Mark Lowenberg
M.Sc.(Eng.)(Witw.), PhD (Bristol)

Professor of Flight Dynamics

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Summary

Prof. Lowenberg is a member of the Dept. of Aerospace Engineering and Head of the Dynamics and Control Research Group. His principal research interest is nonlinear flight dynamics in general, including related wind tunnel experimentation, and in the use of bifurcation analysis to study nonlinear systems in particular. This work was instrumental in initiating bifurcation-based flight dynamics studies in the UK, following a number of research contracts with the then Defence Evaluation and Research Agency (DERA). These led DERA to invest in both in-house bifurcation analysis capability and other external contracts aimed at refining the techniques and software for flight dynamics applications. More recently, Lowenberg and his research collaborators have focused not only flight dynamics applications (with Airbus and NASA Langley Research Center) but also aircraft ground manoeuvres and landing gear shimmy analysis (with Airbus) and on periodically forced systems, namely rotor stability (with AgustaWestland Helicopters) and flapping-wing vehicle flight.

The experimental work is presently aimed at the development of a novel wind tunnel multi-degree-of-freedom dynamic test rig for improving the understanding of aircraft behaviour during manoeuvres involving nonlinear/unsteady aerodynamics. The 'manoeuvre rig' allows motions in up to 5DOF under conditions that replicate the onset of departure/upset behaviour, and is designed to be used both to help develop mathematical modelling techniques for such conditions, and to 'physically simulate' responses in a manner as close as possible to free flight. This is a collaborative effort involving Prof M. Goman at De Montfort University and the IIT Kanpur.

Lowenberg has been a member of the AIAA Atmospheric Flight Mechanics Technical Committee (and Technical Co-Chair of the 2012 AIAA Atmospheric Flight Dynamics conference) and previously the AIAA Guidance, Navigation & Control Technical Committee and the Royal Aeronautical Society Aerodynamics Committee. He has served on the EPSRC Peer Review College since 2002. He has co-created (with Prof. Mikhail Goman of De Montfort University/TsAGI) an MSc module/short course on Nonlinear Flight Mechanics.

In addition to research and postgraduate supervision (has or is supervisor/co-supervisor to more than 20 PhD's), Prof. Lowenberg teaches subjects in the 2nd year Flight Mechanics unit, 3rd year Experimental Aerodynamics and the final year Aircraft Dynamics & Control unit in the Masters in Aeronautical Engineering degree programme; and supervises 3rd and 4th year projects, including the final-year Design Project.

Prof. Lowenberg was Senior Tutor and 3rd Year Tutor in the Department during academic year 2012-13, and Head of Department from 2007 to 2011.

Biography

Dr Lowenberg obtained his BSc (Eng) and MSc in Aeronautical Engineering from the University of the Witwatersrand in Johannesburg, South Africa, and later a PhD from the University of Bristol. His early career included four years in the Flight Mechanics Division of the Council for Scientific and Industrial Research (CSIR) in South Africa and six years as a lecturer at the University of the Witwatersrand. He joined the Department of Aerospace Engineering at Bristol in December 1992.

Keywords

- Aircraft dynamics
- aircraft control
- wind tunnel testing
- aircraft design

Memberships

Organisations

Department of Aerospace Engineering

Other sites

- Aerospace

Research Groups

- Fluid and Aerodynamics
- Dynamics and Control - Core

Recent publications

- Howcroft, C, Neild, S, Lowenberg, M & Cooper, JE, 2019, 'Efficient aeroelastic beam modelling and the selection of a structural shape basis'. *International Journal of Non-Linear Mechanics*, vol 112., pp. 73-84
- Cook, RG, Calderon, DE, Cooper, JE, Lowenberg, MH & Neild, SA, 2019, 'Industrially-inspired Gust Loads Analysis of Various Aspect Ratio Wings Featuring Geometric Nonlinearity'. *Journal of Aircraft*.
- Tartaruga, I, Cooper, J, Lowenberg, M & Lemmens, Y, 2019, 'Enhanced evolutionary-based optimization techniques applied to a nonlinear landing gear design problem'. *Journal of Aircraft*.
- Yap, EJH, Rezgui, D, Lowenberg, MH, Neild, SA & Rahman, K, 2019, 'RESONANT FREQUENCY TUNING OF A NONLINEAR HELICOPTER INCEPTOR MODEL: A SENSITIVITY ANALYSIS'. in: *Proceedings of the 45th European Rotorcraft Forum*., Warsaw, Poland, pp. 1-14
- Rezgui, D & Lowenberg, MH, 2019, 'Nonlinear Blade Stability for a Scaled Autogyro Rotor at High Advance Ratios'. American Helicopter Society
- Calderon, D, Cooper, J, Lowenberg, M, Neild, S & Coetzee, E, 2019, 'Sizing High-Aspect-Ratio Wings with a Geometrically Nonlinear Beam Model'. *Journal of Aircraft*, vol 56., pp. 1455-1470
- Iannelli, A, Marcos, A & Lowenberg, M, 2019, 'Robust estimations of the Region of Attraction using invariant sets'. *Journal of the Franklin Institute*, vol 356., pp. 4622-4647
- Gong, Z, Araujo-Estrada, S, Lowenberg, M, Neild, S & Goman, M, 2019, 'Experimental Investigation of Aerodynamic Hysteresis Using a Five-Degree-of-Freedom Wind-Tunnel Maneuver Rig'. *Journal of Aircraft*, vol 56., pp. 1029-1040
- Iannelli, A, Lowenberg, M & Marcos, A, 2019, 'An extension of the structured singular value to nonlinear systems with application to robust flutter analysis'.
- Marr, I, McMahon, C, Lowenberg, M & Sharma, S, 2019, 'Identifying the mode and impact of technological substitutions'. *IEEE Access*.

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