

von KARMAN INSTITUTE FOR FLUID DYNAMICS

EXPERIMENTAL DETERMINATION OF DYNAMIC STABILITY PARAMETERS



February 18-22, 2008





von Karman Institute for Fluid Dynamics 72, Chaussée de Waterloo 1640 Rhode-Saint-Genèse, Belgium

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Lecture Series Secretary von Karman Institute for Fluid Dynamics 72 Chaussée de Waterloo B-1640 Rhode-St-Genèse Belgium

INTRODUCTION

The stability of aerial vehicles has always been one of the most important topics studied for a safe and smooth flight. An aerial vehicle should have the tendency to return back to a stable position, when it is disturbed from its original path. Dynamic stability is usually thought as the vehicle's response over time when disturbed from a given angle of attack, slip or bank. The advent of flight at high angles of attack has revived our interest in the dynamic stability of aircrafts and missiles. One of the biggest problems in studying dynamic stability is the accurate determination of dynamic stability parameters, in other words, the damping coefficients.

The objective of this lecture series is to provide a review of the experimental dynamic stability tools and to present a state-of-the-art survey of the analytical, wind-tunnel and flight-test techniques used for dynamic stability work. Experts from all around the world will present the fundamentals of dynamic stability testing, the detailed post processing methodologies, advances in experimental tools, etc. Demonstrations on experimental facilities and examples from flight tests are also to be presented. Although the main concern is on experimental activities, there will also be some demonstrations on the usage of numerical CFD tools on the topic.

The Lecture Series is intended not only to provide suitable training and information to engineers and scientists who wish to enter the field, but also to provide a focal point for technical discussions and an opportunity to exchange views and ideas among engineers and scientists who already work in the field.

This Lecture Series is supported by EWA, European Wind-Tunnel Association, a Network of Excellence for aeronautical applications and advanced measuring technologies funded by the European Commission.

The directors of this Lecture Series are S. Paris and C.O. Asma of the von Karman Institute.

TIMETABLE

MONDAY FEBRUARY 18, 2008

08:45	Welcome address
09:15	Flight mechanics F. Quagliotti, Politecnico di Torino, Italy
11:00	Static stability and dynamic stability F. Quagliotti
14:00	Free to tumble technique: introduction (theory) G. Guglieri, Politecnico di Torino, Italy
15:45	Free to tumble technique: application (practical aspects) G. Guglieri
17:00	Reception

TUESDAY FEBRUARY 19, 2008

- **09:00** Forced oscillation technique: introduction (theory) G. Guglieri, Politecnico di Torino, Italy
- 11:00 Forced oscillation technique: application (practical aspects) G. Guglieri
- 14:00 Extended derivative based models F. Quagliotti
- 15:45 The magnetic suspension of wind tunnel models: the principles and application to dynamic testing *M. Goodyer, University of Southampton, UK*

WEDNESDAY FEBRUARY 20, 2008

- 09:00 Computational methods to determine aerodynamic stability derivatives
 - P. Plostins and P. Weinacht, US Army, ARL, USA
- 11:00 Free flight and instrumented flight techniques to extract aerodynamic stability derivatives *P. Plostins and P. Weinacht*
- 14:00 Ballistic range determination of nonlinear dynamic stability parameters G. Chapman and Dr. Yates, AerospaceComputing, Inc., USA
- **15:45** Visit of labs, demonstration of free to tumble mechanism *S. Paris, von Karman Institute, Belgium*

THURSDAY FEBRUARY 21, 2008

- 09:00 Fast response pressure measurements
 - J. F. Brouckaert, von Karman Institute, Belgium
- **11:00** Dynamic stability of space capsules at lower speeds *O. Karatekin, Royal Observatory, Belgium*
- 14:00 Experimental research of dynamic derivatives of unsteady moved aircraft *T. Löser, DNW, Germany*
- 15:45 Numerical research of dynamic derivatives of unsteady moved aircraft A. Huebner, DLR, Germany

FRIDAY FEBRUARY 22, 2008

- 09:00 Dynamic stability analysis using CFD methods S. Murman, NASA Ames, USA
- **11:00 Comparison of aerodynamic dynamic stability data sources** *G. Chapman*
- 14:00 VKI bus departure

PRACTICAL INFORMATION

Lunch will be taken from 12h30 to 14h00. Coffee breaks are scheduled each morning and afternoon.

Please pass this announcement to someone who may be interested if you are unable to attend the Lecture Series yourself