Programme

LECTURE SERIES
2011-2012

VKI-LS

- ☐ INTRODUCTION TO MEASUREMENT TECHNIQUES
  October 10-14, 2011
- ☐ UNCERTAINTY QUANTIFICATION IN COMPUTATIONAL FLUID DYNAMICS (RTO-AVT-VKI)
  October 24-28, 2011
- ☐ ENGINE INTAKE AEROTHERMAL DESIGN : SUBSONIC TO HIGH SPEED APPLICATIONS (RTO-AVT-VKI)
  November 14-16, 2011
- ☐ INTRODUCTION TO CFD
  January 16-20, 2012
- ☐ STRUCTURAL DESIGN OF AIRCRAFT ENGINES (RTO-AVT-VKI)
  January 24-27, 2012
- ☐ LARGE EDDY SIMULATION AND RELATED TECHNIQUES: THEORY AND APPLICATIONS
  February 6-10, 2012
- ☐ AIRCRAFT NOISE
  March 12-16, 2012
- ☐ INTRODUCTION TO OPTIMIZATION AND MULTIDISCIPLINARY DESIGN IN AERONAUTICS AND TURBOMACHINERY
  May 7-11, 2012
- ☐ COMBUSTION IN AERO ENGINES
  June 4-8, 2012
- ☐ PHYSICS-BASED MODELING & SIMULATION FOR AEROSPACE SYSTEMS
  August 21-23, 2012
- ☑ FLUID DYNAMICS ASSOCIATED TO LAUNCHER DEVELOPERS (RTO-AVT-VKI)
  September 17-21, 2012

OTHER EVENTS

- ☐ SHORT COURSE ON RADIAL COMPRESSOR
  February 6-10, 2012
- ☐ SYMPOSIUM OF VKI PHD RESEARCH 2012
  March 5-7, 2012

THE VON KARMAN INSTITUTE

VKI is a non-profit international educational and scientific organisation, hosting three departments (aeronautics and aerospace, environmental and applied fluid dynamics, and turbomachinery & propulsion). It provides post-graduate education in fluid dynamics (research master in fluid dynamics, former "VKI Diploma Course", doctoral program, stagiaire program and lecture series) and encourages "training in research through research". The von Karman Institute undertakes and promotes research in the field of fluid dynamics.

It possesses about fifty different wind tunnels, turbomachinery and other specialized test facilities, some of which are unique or the largest in the world. Extensive research on experimental, computational and theoretical aspects of gas and liquid flows is carried out at the VKI under the direction of the faculty and research engineers, sponsored mainly by governmental and international agencies as well as industries.

The von Karman Institute organizes each year 8 to 12 one-week Lecture Series on specialized topics in the field of aerodynamics, fluid mechanics and heat transfer with application to aeronautics, space, turbomachinery, the environment and industrial fluid dynamics. These courses have gained over the years world wide recognition for their high quality which is the result of a careful choice of subjects of current interest and lecturers known for their excellency in that field and willing to co-operate in building up well-structured courses.

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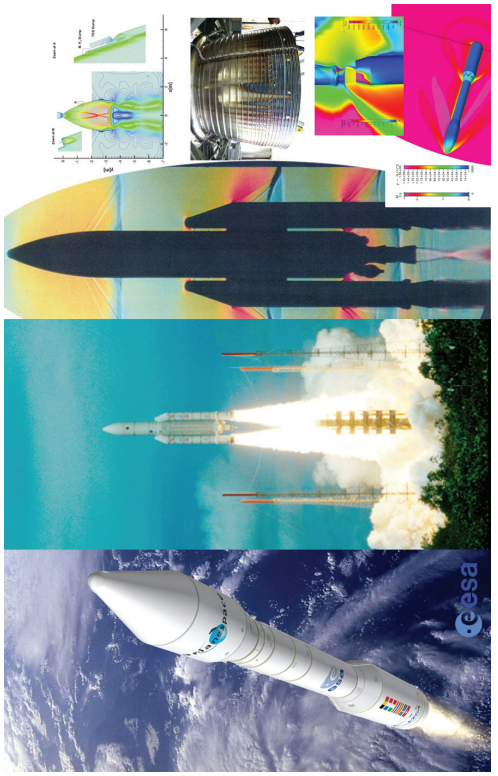
von KARMAN INSTITUTE FOR FLUID DYNAMICS



FLUID DYNAMICS ASSOCIATED TO LAUNCHER DEVELOPERS

VKI RTO-AVT 206

September 17-21, 2012

In collaboration with the RTO
NATO RESEARCH AND TECHNOLOGY ORGANIZATION

INTRODUCTION

Computational Fluid Dynamics play more and more a key role in the design and qualification of future launcher developments. CFD is not only used for improved understanding of fluid physics in ground based facilities but also to establish the required data base for design in flight conditions. Fundamental is the validation of the modeling associated with critical phenomena and their remaining uncertainties driving the margins for design.

The course will be a top down, industrial driven course addressing key elements for future launcher developments and will be given by key experts in the field.

The course will provide an overview of the key fluid dynamic issues driving the design of launchers and will elaborate in detail on topics such as: propulsion systems with emphasis on start up and shut down, propellant behavior, combustion instability, sloshing phenomenon, phase change events, cavitation, cryogenic and two-phase flows, pressure oscillations and slag accumulation in solid rocket boosters, nozzle optimization and flow detachment, side loads as well as address overall propulsion system simulation tools such as the ESPSS (European Space Propulsion System Simulation)

VON KARMAN INSTITUTE FOR FLUID DYNAMICS

In addition special sessions will be devoted to external aerodynamics and aerothermodynamic elaborating on aeroacoustics at take off and unsteady aerodynamics in flight such as buffeting, nozzle coupling, thruster jet interaction and staging. The course will provide a forum for discussion on real applied design issues describing the underlying physics thereby improving the general knowledge base for future launcher developments.

The Lecture Series directors are Jean Muylaert, Director of the von Karman Institute and Serge Radulovic from Astrium EADS.

TIMETABLE

Monday 17 September 2012

08:45 Registration
09:15 Welcome address
09:30 Introduction and overview of critical fluid dynamics issues associated with launcher developments
J. Muylaert, von Karman Institute & S. Radulovic, Astrium EADS, France
11:15 Thrust chamber & nozzle design
G. Hageman, Astrium EADS, The Netherlands
14:00 Thrust chamber & nozzle design (cont'd)
G. Hageman
15:45 Shocks structures in nozzles
G. Hageman
17:00 Reception

Tuesday 18 September 2012

09:00 Launcher aerodynamics
J.-F. Pallegoix, Astrium EADS, France
10:45 Plume interaction and stage separation
J.-F. Pallegoix
14:00 Acoustics at lift-off
H. Lambare, CNES, France
15:45 Unsteady aerodynamics and buffeting
H. Lambare

Wednesday 19 September 2012

09:00 Solid propellant pressure oscillations
J. Anthoine, ONERA, France
10:45 Hybrid propulsion
J. Anthoine
14:00 Design of propulsion systems
J. Breteau, ESA HQ, France
15:45 Design of propulsion systems (cont'd)
J. Breteau

Thursday 20 September 2012

09:00 Pre-flow phenomena in upper stage engines
J. Steelant, ESTEC, The Netherlands
10:45 Multi-disciplinary propulsion simulations at engineering level by means of ESPSS
F. di Matteo & J. Steelant
14:00 Sloshing and ergol management
P. Behruzi, EADS Astrium, Germany
15:45 Sloching and ergol management (cont'd)
P. Behruzi

Friday 21 September 2012

09:00 Turbomachinery developments and cavitation
L. d'Agostino, Alta, Italy
10:45 Turbomachinery developments and cavitation (cont'd)
L. d'Agostino, Alta, Italy
14:00 End of Lecture Series

It is highly recommended that the registration/hotel reservation form is sent at the latest 15 days before the beginning of the course. A letter of acceptance and additional information will be sent on receipt of the application form.

COURSE FEE

The course fee of 890 € includes printed notes, lunches, beverages, and administrative costs. The prices include VAT (21%). For non-Nato citizens, a request should be sent directly to RTO (RTO Paris, attention : Mrs. S. Cheyne – OCD Division, rue Ancelle 7, 92200 Neuilly-sur-Seine, France, or by e-mail to CheyneS@rta.nato.int) at least 6 weeks prior to this course. The acceptance should then be joined to your inscription and sent to VKI.

FELLOWSHIPS

To encourage greater participation in our Lecture Series programme by university members, the Institute has established a limited number of VKI Lecture Series fellowships for citizens of NATO countries contributing to the financing of the VKI, as well as for citizens of other NATO countries coming from a university in a VKI financing country. The recipient of a fellowship is entitled to attend the VKI Lecture Series at a reduced fee, which will be 595 € (VAT included) for assistants not having a Ph.D. degree and for Ph.D. candidates, or 295 € (VAT included) for undergraduate students. The request to be considered for an award must accompany the application to attend the Lecture Series, and the applicant must provide a recommendation letter from his or her professor; if not done so, the request will not be taken into consideration. All possible alternative sources of funding should be investigated before aid is requested under this scheme, so that those most in need will benefit.

METHODS OF PAYMENT

Payment 2 weeks prior to the beginning of the course (name and course title clearly indicated) by bank transfer to our account Nr 210-0315330-35 at BNP Paribas Fortis Bank, avenue de la Forêt de Soignes 322, 1640 Rhode-Saint-Genèse, Belgium, IBAN BE57 2100 3153 3035 (strongly recommended). SWIFT BIC GEBABEBB. *Late registration can be paid in cash (euro), or by VISA or Eurocard at the beginning of the course.*

Lectures will be given in English and printed notes will be distributed during registration. Proceedings of non-RTO lecture series may be purchased at VKI (by e-mail vanhaelen@vki.ac.be or by fax: 32 2 359 96 00).
Information can be found on http://www.vki.ac.be.

ONLINE REGISTRATION AVAILABLE
https://www.vki.ac.be/registration