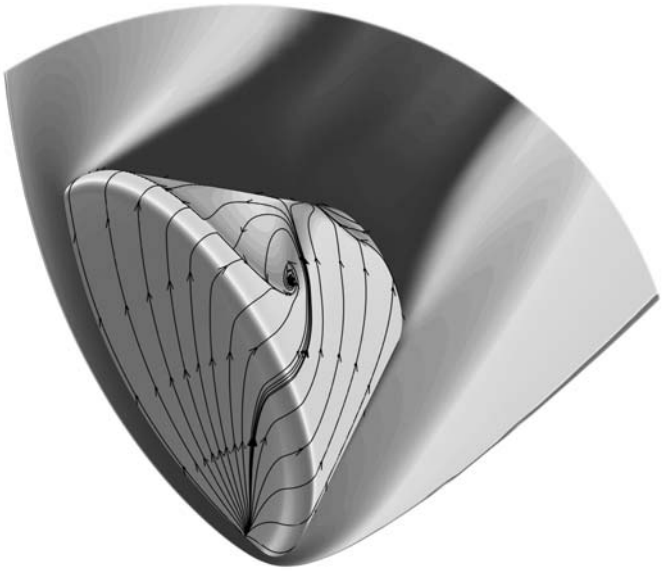
von Karman Institute for Fluid Dynamics
Chaussée de Waterloo 72
B-1640 Rhode-ST-Genèse
Belgium

.

(Please correct your address if necessary)

von KARMAN INSTITUTE
FOR FLUID DYNAMICS

COURSE ON HYPERSONIC ENTRY AND CRUISE VEHICLES



30 June – 3 July 2008

NASA Ames Research Center

Center for Turbulence Research

Stanford University PSAAP Center

Sponsored by NATO-RTO,
U.S. DOE, U.S. AFOSR & NASA

INTRODUCTION

In-depth knowledge of gas dynamics at hypersonic speeds is required to define the environment and requirements for the design and safe operation of space vehicles, planetary probes, and rockets. The constitutive equations that describe conservation of mass, momentum, and energy in the hypersonic regime require the development of physical models for high enthalpy and non-equilibrium effects. In turn, the development of these models requires reliable experimental data to guide and verify the models. The hypersonic regime presents unique challenges for measurement techniques and flight tests.

The objectives of this course are to review the up-to-date physical models describing complex high-enthalpy and turbulence effects, measurement techniques for flight test and ground-based experiments, as well as numerical simulation strategies specific to the hypersonic regime. The course is tailored to provide professionals and students working and/or supporting aerospace industries, space agencies, and defense programs a snap shot of the state-of-the-art in this rapidly progressing technology.

The directors of the course are Prof. P. Moin from Stanford University, Dr. N. N. Mansour from NASA Ames Research Center, and Prof. O. Chazot from the von Karman Institute for Fluid Dynamics.

TIMETABLE

MONDAY JUNE 30, 2008 (Stanford University)

8:45 AM
Introduction to the course
Dr. N.N. Mansour, NASA Ames Research Center, USA

9:00 AM
Irreversible thermo-dynamics and non-equilibrium effects in hypersonic flows
Dr. D. Giordano, European Space Research and Technology Centre, ESA, The Netherlands

10:15 AM
Kinetic and transport theory of plasmas
Dr. T.E. Magin, Stanford University, USA

11:45 AM
Kinetic mechanism for high enthalpy air flows
Dr. A. Bourdon, Ecole Centrale Paris, France

2:30 PM
Optical diagnostics and collisional-radiative models
Prof. C.O. Laux, Ecole Centrale Paris, France

4:00 PM
Experimental and theoretical simulation of heterogeneous catalysis in aerothermochemistry
Prof. V.L. Kovalev, Moscow State University, Russia

TUESDAY JULY 1, 2008 (Stanford University)

9:00 AM
Critical hypersonic aero-thermodynamic phenomena
Mr. R.M. Cummings, U.S. Air Force Academy, USA

10:15 AM
Flight experiments on air-breathing propulsion – HYSHOT
Prof. R. Morgan, University of Queensland, Australia

11:45 AM
X-43A hypersonic vehicle technology development
Mr. R.T. Voland, ACENT Laboratories LLC, USA

2:30 PM
Experimental roles, capabilities, and contributions to aerothermodynamic problems of hypersonic flights and planetary entry
Dr. B. Hollis, NASA Langley Research Center, USA

4:00 PM
Direct simulation Monte Carlo for atmospheric entry
Prof. I. Boyd, University of Michigan, USA

WEDNESDAY JULY 2, 2008 (NASA Ames Research Center)

8:30 AM
Roughness-induced laminar-turbulent transition
Prof. S.P. Schneider, Purdue University, USA

9:45 AM
Hypersonic boundary-shear layer transition
Dr. S.A. Berry, NASA Langley Research Center, USA

11:15 AM
Turbulence modeling for reentry and shock dominated flows
Prof. P. Moin & Prof. G. Iaccarino, Stanford University, USA

1:30 PM
Tour of the NASA Ames facilities (group I)

2:30 PM
Analysis and model validation of shock layer radiation in air
Dr. D. Bose, NASA Ames Research Center, USA

4:00 PM
System design constraints - trajectory aerothermal environment
Dr. D. Prabhu, NASA Ames Research Center, USA

THURSDAY JULY 3, 2008 (NASA Ames Research Center)

8:30 AM
Computational fluid dynamics simulations for atmospheric entry
Prof. G. Candler, University of Minnesota, USA

9:45 AM
High order numerical schemes for hypersonic flow simulations
Dr. H.C. Yee, NASA Ames Research Center, USA

11:15 AM
A risk-based approach for aerothermal/TPS analysis and testing
Dr. M. Wright, NASA Ames Research Center, USA

1:30 PM
Tour of the NASA Ames facilities (group II)

2:30 PM
Hypersonic stagnation point aerothermodynamics in Plasmatron facilities
Prof. O. Chazot, von Karman Institute for Fluid Dynamics, Belgium

4:00 PM
Numerical approximation of Boltzmann moment systems with Levermore closure
Dr. T. Barth, NASA Ames Research Center, USA

PRACTICAL INFORMATION

Stanford University: breakfast at 8:00 AM, coffee breaks at 11:30 AM and 3:45 PM, lunch at 1:00 PM.

NASA Ames Research Center: breakfast at 8:00 AM, coffee breaks at 11:00 AM and 3:45 PM, lunch at 12:30 PM.

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Phone: 32 2 359 96 04 Fax: 32 2 359 96 00
Email: secretariat@vki.ac.be
Website: http://www.vki.ac.be

Programme

LECTURE SERIES
2007-2008

VKI LS

☐ BASICS OF AERO-ACOUSTICS AND THERMO-ACOUSTICS
(3-7 December 2007)

☐ INTRODUCTION TO CFD
(28 January-1 February 2008)

☐ POST-PROCESSING OF NUMERICAL & EXPERIMENTAL DATA
(11-15 February 2008)

☐ EXPERIMENTAL DETERMINATION OF DYNAMIC STABILITY PARAMETERS
(18-22 February 2008)

☐ AEROENGINE DESIGN: FROM STATE OF THE ART TURBOFANS TOWARDS INNOVATIVE ARCHITECTURES
(3-7 March 2008)

☐ LARGE EDDY SIMULATION AND RELATED TECHNIQUES. THEORY AND APPLICATIONS
(10-14 March 2008)

☐ STRUCTURAL DESIGN OF AIRCRAFT ENGINES - KEY OBJECTIVES AND TECHNIQUES
(13-16 May, 2008)

☐ ATMOSPHERIC BOUNDARY LAYER FLOWS IN AIR POLLUTION MODELLING
(19-23 May 2008)

☐ INTRODUCTION TO OPTIMIZATION METHODS AND TOOLS FOR MULTIDISCIPLINARY DESIGN IN AERONAUTICS AND TURBOMACHINERY
(2-6 June 2008)

☐ ADVANCES IN LAMINAR-TURBULENT TRANSITION MODELLING (RTO-AVT-VKI)
(9-3 June 2008)

☐ NON-EQUILIBRIUM GAS DYNAMICS, FROM PHYSICAL MODELS TO HYPERSONIC FLIGHTS (RTO-AVT-VKI)
(8-12 September 2008)

☐ 35TH CFD / ADIGMA COURSE ON VERY HIGH ORDER DISCRETIZATION METHODS
(Postponed, Date will be announced on the website http://www.vki.ac.be)

OTHER CONFERENCES:

☐ XIX BIANNUAL SYMPOSIUM ON MEASURING TECHNIQUES IN TURBOMACHINERY
(7-8 April 2008)

COURSE FEE

The course fee of €325 or $500 includes printed notes and administrative costs.The price includes VAT (21%).

FELLOWSHIPS

To encourage greater participation in the course by university members, the course fee will be waived for students (including postdoctoral fellows). A limited number of participants will be accommodated.

The request to be considered as a student must accompany the application to attend the course.

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 Fortis Bank, avenue de la Forêt de Soignes 322, 1640 Rhode-Saint-Genèse, Belgium, IBAN BE57 2100 3153 3035 (strongly recommended). SWIFT BIC GEBA BE BB.

PROCEEDINGS

Lectures will be given in English and printed notes will be distributed during registration. Proceedings of other 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.

HOW TO REGISTER

Only participants who have pre-registered will be able to attend. It is highly recommended that the registration form be sent 15 days before the beginning of the course. Online registration is also possible at the following URL: htpp://www.vki.ac.be. A letter of acceptance will be sent on receipt of the application form. Non-US citizens who are not greencard holders require an authorization and are encouraged to register as soon as possible.

LOCATION

Days 1 and 2 of the course will be held at Stanford University in classroom 127 of building 530. Days 3 and 4 will be held at the NASA Ames Conference Center, Building 3, NASA Research Park, just outside the NASA Ames Research Center in Moffett Field. Directions can be found at the following URLs: http://campus-map.stanford.edu and http://naccenter.arc.nasa.gov.

ACCOMMODATION & TRANSPORT

A list of hotels can be found at the following URL: www.stanford.edu/dept/rde/chs/general/hotel.html.

We recommend the following hotels located near Stanford:

Westin Palo Alto	
www.starwoodhotels.com	$$$$
Stanford Terrace Inn	
www.stanfordterraceinn.com	$$$
Cardinal Hotel	
www.cardinalhotel.com	$$-$
Stanford Guest House	
www.stanford.edu/dept/rde/guesthouse	$

The following hotel is located on the campus of the NASA Research Park:

NASA Lodge	
http://naccenter.arc.nasa.gov	$

Stanford offers a free shuttle, called Marguerite, which provides transportation around campus from 6 AM to 8:30 PM. No identification is needed; simply wait at a marked bus stop and board the "Marguerite" bus when it arrives.

The local commute train, called Caltrain, links the Palo Alto station with the Mountain View station (10 minute journey). Information is available at the following URL: www.caltrain.com. A NASA shuttle bus, available during commute hours, runs between the Mountain View station and the NASA Ames Research Center.

APPLICATION FOR ADMISSION TO VKI LECTURE SERIES

Lecture Series Title: . . . . . .

☐ Mr ☐ Mrs

Family name: . . . . . Firstname: . . . . . Nationality: . . . . .

Name & full address of organisation, institution or university: . . . . . .

Phone nr: . . . . . Fax nr: . . . . . .

Position or title: . . . . . E-mail: . . . . . .

☐ Asking for student registration: ☐ undergraduate student ☐ Ph.D. candidate or University assistant ☐ Postdoctoral fellow

Company / University VAT number:
VAT of the von Karman Institute: BE 0407 185 709

☐ Interested in the tour of the NASA Ames facilities
US citizen or green card holder: ☐ yes ☐ no

Date: . . . . . Signature: . . . . . .