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von Karman Institute for Fluid Dynamics

## SHORT TRAINING PROGRAM

**Active Research Topics** 

2013-2014

ACTIVE RESEARCH TOPICS AT VKI Indicate the department in which you wish to work and then indicate your interests placing numbers from 1 to 5 next to the project titles listed below (1 being your main interest); in case you are interested in more than one department, please indicate the order of preference between departments.

## **AERONAUTICS/AEROSPACE**

Nature\*

<ul> <li>ATMOSPHERIC RE-ENTRY FLOWS</li> <li>O Re-entry capsule aerothermodynamics and stability.</li> <li>O Shock wave/boundary layer interactions in supersonic or hypersonic flows; fins, ramps and corner flows</li> <li>O Simulation of re-entry capsule aerothermodynamics and computation of viscous non equilibrium hypersonic flows using upwind FV or RDS methods</li> <li>O Rarified flow gas dynamics and particle flow (DSMC)</li> </ul>	E E,N N N
<ul> <li>PLASMA WIND TUNNEL and THERMAL PROTECTION SYSTEMS</li> <li>O Intrusive/non-intrusive measurements in (ICP) plasma facilities and validation by numerical simulation</li> <li>O Spectroscopic diagnostics for plasma flows</li> <li>O Modeling and simulation methods for plasma flows</li> </ul>	E,N E N
<ul> <li>NON-INTRUSIVE MEASUREMENT TECHNIQUES FOR HIGH SPEED FLOW</li> <li>laser Doppler velocymetry in high speed (subsonic/supersonic) flow</li> <li>laser Particle Image Velocimetry in high speed (subsonic/supersonic) flow</li> <li>Infrared thermography for heat transfer in hypersonic flows</li> </ul>	E E E
<ul> <li>AEROACOUSTICS</li> <li>O Acoustic beamforming applied to wind tunnel testing of airframe configurations.</li> <li>O Development and validation of prediction methods for airframe noise.</li> </ul>	N,E N,E
SMALL SATELLITES O Developments of reentry cube sat	N,E
<ul> <li>TURBULENCE</li> <li>O Stability and transition to turbulence for a laminar hypersonic boundary layer; Natural and roughness induced mechanisms</li> <li>O Compressible Direct Numerical Simulation and Large Eddy Simulation on unstructured grids with Residual distribution.</li> </ul>	N,E N
UNCERTAINTY QUANTIFICATION IN CFD O application to space reentry aerodynamics and plasma flows	E, N
<ul> <li>SPACE WEATHER PREDICTION</li> <li>O Simulation and modelling of plasma flows related to interaction of the solar wind with the earth magnetic field, coronal mass ejections</li> </ul>	N

## COMPUTATIONAL FLUID DYNAMICS ALGORITHMIC DEVELOPMENTS

COMI O IMITORALI LOID D'IRAMICO MEGORITIMIC DE VELOI MENTO	
O Acceleration of flow solvers by advanced parallel computing platforms (GPGP	U) N
O High order discretization methods for compressible flow simulation: Residual	
Distribution and discontinuous Galerkin Finite Element Methods	Ν
O Acceleration of flow solvers by advanced CFD algorithms	
(multigrid, implicit methods)	Ν
O Adjoint methods for error estimation and adaptive grid simulation	Ν

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