



Mechanical and Aerospace Engineering Department  
University of California Davis  
Davis, California 95616-5294  
<http://mae.ucdavis.edu/research/spaceEd/>

## 2009-2010 Monthly Seminar Series on Space Research

15 October, 19 November, 21 January, 18 February, 15 April, 20 May  
3<sup>rd</sup> Thursday 4:00-5:00 pm

# Non-dimensional Flight Dynamics of Trans-atmospheric Vehicles

Eugene A. Ustinov, Ph.D.

Caltech/Jet Propulsion Laboratory, Pasadena, CA

Date: 15 October 2009 Thursday Time: 4:10-5:00 pm (Refreshments will be provided at 4:00 pm) Location: 1062 Bainer

### ABSTRACT

Hosted by: Professor Nesrin Sarigul-Klijn

Total column mass of the atmosphere described by atmospheric (static) pressure, and its vertical extent described by atmospheric scale height, are two integral atmospheric parameters driving the impact of the atmosphere on the flight of a trans-atmospheric vehicle. The idea is to include these parameters into equations of flight dynamics. This leads to formulation of two composite non-dimensional parameters combining the above integral parameters of the atmosphere and relevant parameters of the vehicle: non-dimensional airspeed and non-dimensional mass ratio. These parameters, together with a few other auxiliary non-dimensional quantities make it possible to formulate non-dimensional equations of flight dynamics. Since the resulting equations involve integral parameters of the atmosphere, they can be analytically integrated in a wide class of situations, providing analytic relations that are easier to visualize and analyze than numerical solutions, and which also can be useful, e.g., for scalability studies.

### ABOUT THE SPEAKER

**Dr. Eugene Ustinov** is an investigation scientist at Jet Propulsion Laboratory, Pasadena, CA. His research interests are in remote sensing of Earth and planetary atmospheres and sensitivity analysis of geophysical models. He is currently participating in Chandrayaan-1 project. Prior to his move to JPL in 1998 he worked as a research associate at Cornell University; as a NRC Senior Research Associate at NASA GSFC; and as a researcher at the Institute for Atmospheric Physics, Moscow, USSR/Russia. He has flight experience in Yak-18, MiG-15 and MiG-17 planes and Mi-1 helicopter. He holds PhD degrees from the Institute for Space Research (IKI)(1978) in Astrophysics and from the Tartu University, Tartu, Estonia (1992) in Astronomy.

### *For more information about*

***SpaceED (Space Engineering Research and Graduate Program) or the seminars please contact Professor Nesrin Sarigul-Klijn at (530)-752-0682 or [nsarigulklijn@ucdavis.edu](mailto:nsarigulklijn@ucdavis.edu)***

Members of the campus community and visitors from the region are welcome to attend the seminar series.

Sign-in is required at the event. SpaceED seminar will replace MAE297 seminar on 3<sup>rd</sup> Thursdays.

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