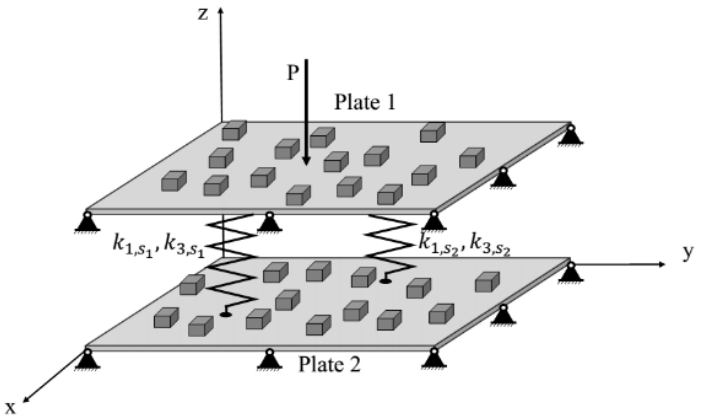
Aerospace Engineering Research Programme

Wednesday 1st July 2020, 15:00

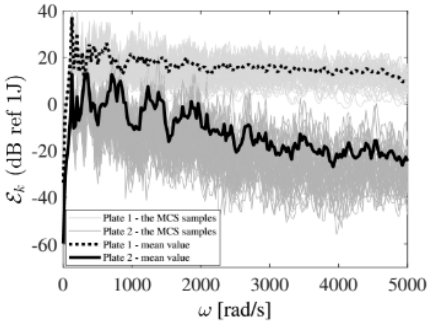
Virtual Seminar Speaker

Tan PUXUE, University of Liverpool, UK

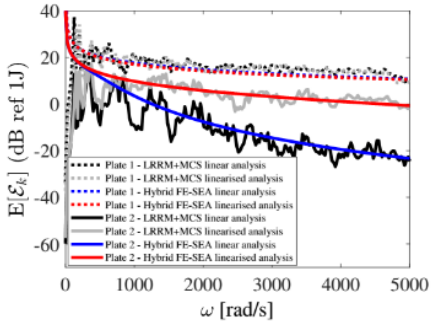
"A Hybrid Finite Element-Statistical Energy Analysis Formulation for Built-up Systems with Nonlinear Joints"



(a) Built-up plate system with nonlinear translational springs



(b) The MCS samples and the mean value



(c) Linear and linearised analysis

Abstract:
The present investigation deals with the development and validation of a hybrid finite element-statistical energy analysis (FE-SEA) formulation employed to obtain the ensemble-average of the time-averaged vibrational energy response of dynamic systems with nonlinear joints. The proposed FE-SEA formulation is validated via a nonlinear stochastic benchmark model. The theoretical formulation related to the latter, is entirely derived by employing a variational approach. The weak-form of the governing equations, for each of the sample in the ensemble, are based on Kirchhoff's thin-plate assumptions and are restricted to out-of-plane motion only. The classical Lagrange-Rayleigh-Ritz Method (LRRM), combined with the Monte Carlo Simulation (MCS), is used as solution technique. An appropriate degree of uncertainty is introduced into the model in order to break the system symmetries ensuring transition from an exponential to a Rayleigh distribution of the modal spacing. Both in the hybrid FE-SEA and in the LRRM+MCS the localised nonlinearities are linearised by means of the Method of Harmonic Balance (MHB). Various built-up plate systems, consisting of rectangular isotropic, homogeneous and linear elastic plates, elastically coupled by virtue of nonlinear translational and/or torsional springs and subjected to harmonic point loads are investigated

Next Seminar ↓

PAST SEMINARS

June 2020

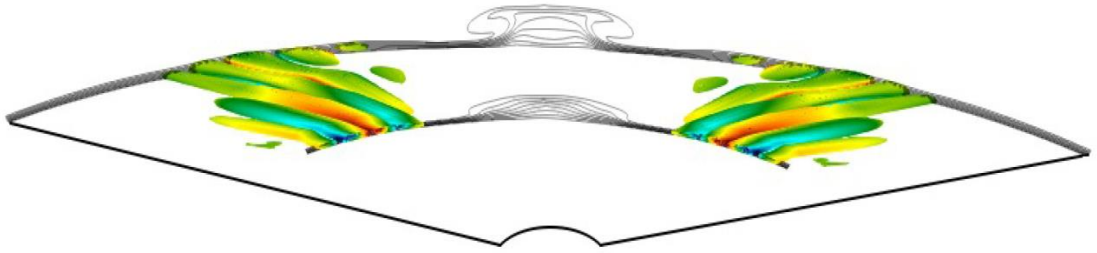
Wednesday 17th June 2020, 15:00

Virtual Seminar Speaker

Helio Ricardo de A. Quintanilha Jr., University of Liverpool, UK

"Laminar-turbulent transition in hypersonic boundary layer flow on an Elliptic Cone"

Abstract



Optimal condition peaking in the crossflow region of the elliptic cone at 33km altitude.

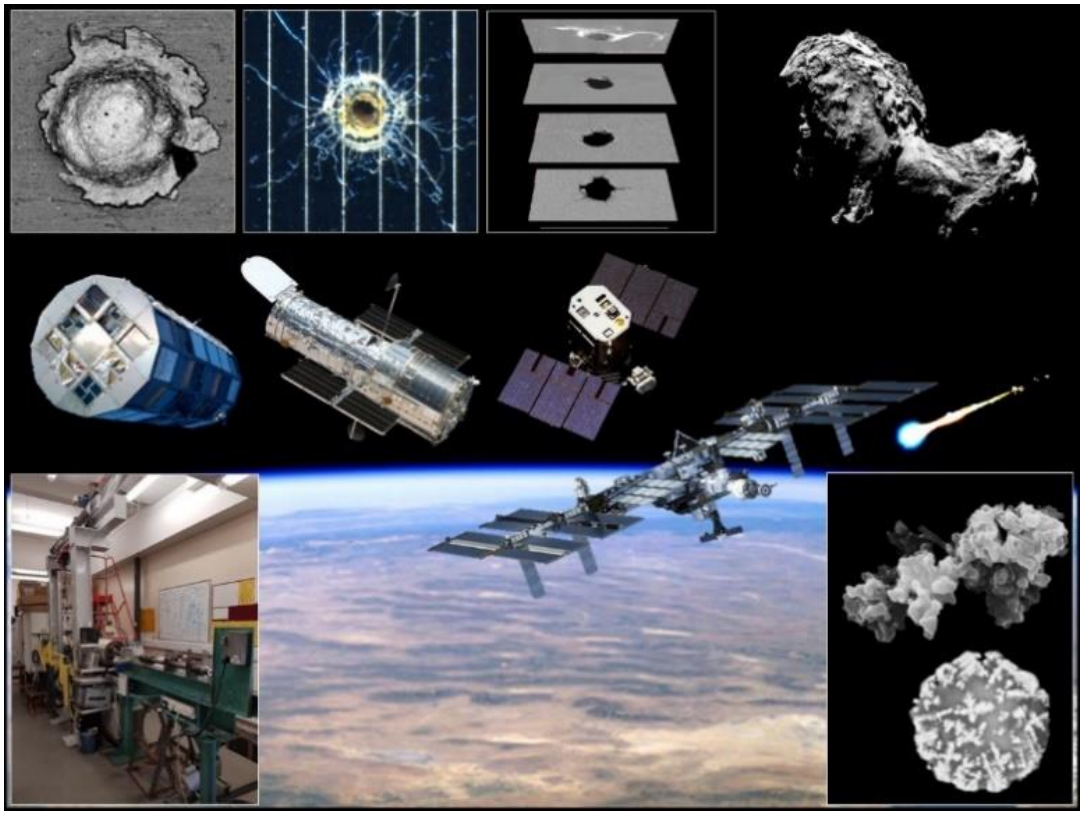
Next Seminar ↓

Wednesday 3rd June 2020, 15:00

Virtual Seminar Speaker

Prof Mark Burchell, **University of Kent, UK**

"Cosmic Dust, Hypervelocity Impacts and the Deep Space Gateway"



Abstract:
Small dust particles (10s of nm to mm scale) are common in space, and travel at speeds of many km s^{-1}. As such they present an impact hazard to space vehicles, so knowing their flux is important for space travel. It also provides a means to probe the composition of the comets, asteroids and other bodies which are the sources of the dust. How this dust is observed and measured to date, and how it might be done in the future at a new space station near the Moon (the Deep Space Gateway) will be discussed.

Next Seminar ↓

May 2020

Wednesday 20th May 2020, 15:00

Virtual Seminar Speaker

Dr Davide Proment, **University of East Anglia, UK**

"Flying in a superfluid: Starting flow past an airfoil and its acquired lift"

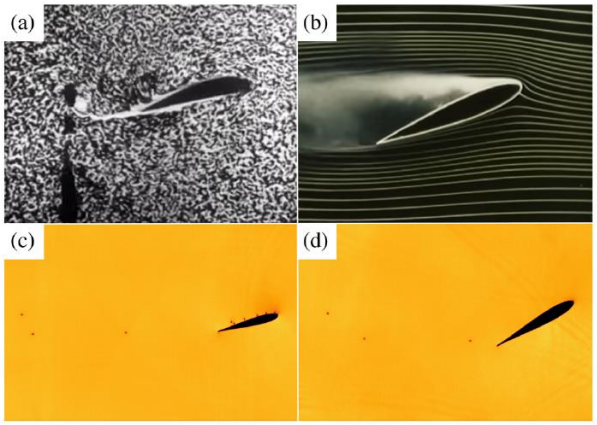


FIG. 4. Viscous vs superfluid flight/stall: (a) flight of foil in a viscous fluid at a low angle of attack. (b) Stall at high angle of attack. (c) Stall in a superfluid at low angle of attack. (d) Flight at high angle of attack.

Abstract:
The lift in subsonic flight is related to the presence of a velocity boundary layer which allows for the roll up of the starting vortex at the trailing edge of the airfoil, as it is accelerated from rest in a fluid. The vortex induces a net circulation on the airfoil and a consequent lift.

A superfluid is a fluid with zero viscosity and no velocity boundary layer can be developed. Here we investigate the possibility of generating a lift in a superfluid described by the Gross–Pitaevskii equation. Using numerical simulations and phenomenological arguments, we are able to establish that a lift is possible and it has the feature of being quantised. Our results shed new light on vortex generation and manipulation mechanisms in superfluids

Next Seminar ↓