Professor John Kosmatka, Fulbright Scholar

NASA California Space Grant Director

Department of Structural Engineering
Department of Aerospace and Mechanical Engineering
University of California, San Diego (USA)

Department of Engineering
Università degli Studi Di Napoli Parthenope (Italy)

Seminar

Research Challenges in Unmanned Aerial Platform Development for Environmental Monitoring

June 6th, 2019 at 3:30 PM in aula 3 - Centro Direzionale di Napoli – Univesità degli Studi di Napoli Parthenope

Abstract
Unmanned aerial platforms are being developed and used for a wide variety of applications ranging from environmental surveillance to rapid emergency response. The choice of aerial platform (airships, fixed wing, or rotatory-wing) and sensors depend upon the mission requirements. The use of advanced composite materials has led to innovative aerial platform designs for specialized research missions, but these platforms are not certified for nonstop long duration (multi-days or months) extreme-weather flights. These new platforms will require onboard autonomous inspection methods. In this seminar, three research programs will be presented along with an overview of NASA's aeronautics interests and the aerospace structures program at the University of California, San Diego. The first research program involves a collaboration with the NASA Armstrong Research Center to develop advanced ultra-low-drag fixed-wing unmanned aircraft (UAV's) for long endurance environmental monitoring. The large wing area composed of advanced composite fabrics and molded-in-place solar panels make these aircraft suitable for multi-day flights. The second research program involves the use of embedded fiber-optic strain sensors to detect, locate, monitor, and predict the remaining structural life (prognosis) of internal damage (fiber breakage, delaminations) using ambient in-flight loads. This innovative work, funded by NASA headquarters, involves a network of Bragg-grated sensors and an onboard system to perform the real-time interrogation. In addition, this distributed network of dynamic strain sensor approach has been demonstrated using UAVs to monitor the internal structural flight loads and adjust the control surface setting (wing shape control) to reduce critical loads during flight. The third research program involves the development of an open-centered hydrokinetic turbine system using a double set of blades mounted to an annular rotor. This university research in parallel with industry partners focuses on the development of pico-scale (<1000 Watts) power generation systems having innovative rapid-prototyped blade shapes and configuration. Grid-scale (>8000 Watts) power generation has been demonstrated in Alaska rivers.

Short biography
John Kosmatka is a tenured full Professor at the University of California, San Diego, the inaugural holder of the Callaway Golf Endowed Chair of Structural Mechanics, and the Director of the NASA California Space Grant Consortium which oversees the distribution of NASA educational research funding in California. He has held research fellowship positions at three NASA Centers (Langley, Glenn, and Ames). He has authored over 150 papers in peer-reviewed international journals and conferences, as well as the holder of 36 U.S. Patents. His research publications are in the areas of unmanned aircraft development, nonlinear dynamics and stability, composite structural mrechancis, and structural health monitoring. He teaches undergraduate and graduate courses and supervises MS and PhD students. He received the 2018 UCSD Outstanding Teaching Award and was voted by the students as the UCSD Professor of Year. Dr Kosmatka is an Associate Fellow of the AIAA and concurrently serves as the Chair of the AIAA Structural Dynamics Technical Committee.
As part of his Fulbright U.S. Scholar visit, Dr Kosmatka is hosted in the Dept of Engineering at the Universita degli Studi Di Napoli Parthenope (Italy) in the research group directed by Professor Lega.