Mini Class Blended Wing Body Unmanned Aerial Vehicle Aerostructure Design for Fused Deposition Modelling 3D Printing

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Keynote Speaker

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Short Biography

Dr. Rizal Nasir is an Associate Professor of Mechanical Engineering at the Universiti Teknologi MARA. He holds a Bachelor of Engineering (Mechanicals-Aeronautics) from Universiti Teknologi Malaysia (UTM), Master of Science in Aerospace Engineering from Bath University, U.K., and Ph.D. in Mechanical (Aerospace) Engineering from Universiti Teknologi MARA. His specific research interests are in flight dynamics of blended wing-body (BWB) aircrafts, unmanned aerial systems and 3D-printed aerostructures. He has supervised over 20 graduate students in these fields and his graduate students are currently holding positions in local and international aviation, aerospace manufacturing and unmanned aerial systems companies. He has been funded for several research projects from government, industry and military. He is also a consultant to Centre of Excellence in Aerospace Engineering (PUSPEKA) under the Royal Malaysian Air Force and has involved in various structural studies on combat aircrafts such as Su-30MKM, F/A-18D, MiG-29N, and PC-7 Mk.II. He has more than 50 journal articles, 60 proceedings, and two book chapters.

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Abstract

Mini-class unmanned aerial vehicle (UAV) in this case refers to a Class I (less than 150 kg) fixed wing type automatic or remotely piloted airplane of less than 15 kilograms of MTOW and sits below small class but above micro class UAVs. This type of UAV is normally constructed from high density foam with glass or carbon fibre skin. The strength of this aerostructure lies in its often aluminium or carbon fibre-made rods within its wing in which such structural design is lightweight but not robust. Most of the mini-class UAVs are of straight, rectangular wing with conventional tail setup attached to tubular or squarish fuselage (body). Blended wing-body airplane is normally a tail-less flying-wing type in which its body and wing are 'blended' in gradual transition from its centre to its wing tip. Constructing the BWB airframe and internal aerostructures by using manual construction is labour intensive, requiring highly skilled craftsmen and sometimes, almost impossible. 3D printing has made the job of constructing BWB airframe and aerostructure possible even without highly skilled craftsmen at a faster rate. However, 3D printer, especially of fused deposition modelling (FDM) type, is not a magic tool. In this conference, the experience of researchers and students from the Flight Technology and Test Centre (FTTC) Research Group are discussed, especially in getting aerostructure design and printing strategy to produce the strongest, most robust but lightweight airframe that complies with its velocity-load factor flight envelope.