Enhancing Bobsleigh Performance Through Biomimetic Design Inspired by the Peregrine Falcon (Falco peregrinus) and Kingfisher (Alcedo atthis)

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The project explored biomimicry to optimize bobsleigh design. This was motivated by the sustainable development culture under SDG 13 for taking urgent action to combat climate change and its impacts through decarbonization. The bobsleigh as a sport qualifies as a clean sport and passes leisure requirements. The designs were inspired by two birds, the Peregrine Falcon, and the Common Kingfisher. Hand sketching was initially used to conceptualize the design of the bobsleighs. This was followed by Computer-Aided Design (CAD) modelling, which was guided by allometrics. The CAD models were then used to conduct Computational Fluid Dynamic simulations to test for the aerodynamic behaviour and compute the aerodynamic drag coefficients of the bobsleighs. The visual and computed data generated from the desktop simulations were analyzed, and existing literature was referred in order to interpret and validate the consistency of the results. Finally, to further validate the findings of the desktop simulations, Wind Tunnel testing was conducted. The results of the CFD analysis provided the drag coefficients for three different types of bobsleighs: the standard, falcon-inspired and kingfisher-inspired bobsleighs. The drag coefficients for each were found to be 0.35, 0.260, and 0.263, respectively. The visual and calculated outputs were consistent, and the drag coefficients fell within the range of those found in existing literature and proven wind tunnel testing. The study demonstrated an improved performance of the two new designs, compared to the standard bobsleigh.

Awards Won:
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: Full Scholarship from King Fahd University of Petroleum and Minerals(KFUPM) (and a $400 cash prize)
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: NOT TO BE READ -- $400 cash prize for each Full Scholarship from King Fahd University award recipient