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An investigation of boat-tail helmet to reduce drag

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Abstract. A helmet is a kind of shielding equipment used to shield the head from fatal injuries. The helmet experiences drag while moving at a certain velocity. The total drag on the helmet increases with an increase in velocity. The drag force at high velocity has a significant effect on the rider's neck and may result in cervical spondylosis. Now a day's neck pain, neck sprain, spondylosis have become significant issues related to the human body. The reduction of drag on the helmet will be a boon for society, which will reduce the force on the neck. The decrease in drag is an essential field of study. The drag force can be reduced by various methods like coating on the surface, modifying the helmet's shape, etc. The study's purpose is to decrease drag on the helmet by improving the helmet's shape. The CFD analysis is carried out to find the best profile of the helmet and fineness ratio of the boat-tailed helmet to minimize drag. The CFD results are validated with the wind tunnel laboratory outcomes. Based on the findings, a considerable reduction in the drag is accomplished at the velocity of 32.5 m/s.

Keywords: boat-tail; CFD; drag; helmet

1. Introduction

The helmet covered the head protected it from injury in case of accidents. The helmet helps the head in shielding the human head. In civilian development, helmets are utilized for recreational pursuits and plays, critical activities, and transportation. Since the 1990s, most helmets are created of resin or plastic materials. The vital aspect is the much feasible head security in a collision. The helmet should guard not just against free injuries but also notable acceleration-deceleration. Helmet durability even a helmet strength to fast absorb energy should be guided by effective helmet aerodynamics. The resulting drag should be as tiny as possible to produce a decreased influence on the human body, particularly the neck. The different forces acting on a helmet are skin friction drag, base drag, and wave drag. The drag can be reduced by giving streamline shape to the moving body. The coefficient of drag for various shapes is given in Table 1 V. C. Sathish Gandhi *et al.* (2014). The drag coefficient is generally depending on shape of the object and the

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