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## Better Bicycle Helmets for Commuters – Evaluation of Ventilation

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### ABSTRACT

As a continuation of the work on the development of setting the requirements for ventilation of a bicycle helmet for commuters [1], 15 full scale helmet mock-ups were created by the students of the Estonian Academy of Arts. In order to encourage creativity for ventilation solutions the students were not restricted to consider the other properties except it was pointed out that the meaning of helmets use is protection.

These 1:1 scaled mock-ups were tested at Thermal Environment Laboratory, Lund University for their heat transfer characteristics (insulation) in a wind tunnel on a thermal head manikin [2]. The helmets were tested at the room temperature with the air velocities of 0.2, 1.6 and 6.0 m/s. air velocities of 0.2 and 1.6 were tested without a wig and 1.6 and 6.0 were tested with wig to simulate the effect of hair. In addition, 4 reference helmets were tested in some conditions. Three (3) of them were one of the best, one average and one of the less well performing helmets of the study by Brühwiler et al. [3], and one was a helmet commonly bought and used by an ordinary bicyclist.

The new design helmets were affected by ventilation and covered a wide range of insulation. The reference helmets from the earlier study [3] stayed quite in the middle of the tested range. Thus, the new solutions could work much better or worse than available helmets. However, practically any new helmet was better than the common helmet from the shop. It was also very clear that various air velocities affected heat loss from the helmets. This means that a best solution for a commuter has to be defined by the user's bicycling velocity.

The best ventilation solutions will be chosen and the design work with considering of impact testing will be continued.

**Keywords:** bicycle helmets, heat loss, ventilation, design.

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