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**Friction drag reduction by air cavities** OLEKSANDR ZVERKHOVSKYI, RENÉ DELFOS, TU Delft, TOM VAN TERWISGA, TU Delft/MARIN, JERRY WESTERWEEL, TU Delft — Air lubrication is investigated, as it is potentially one of the most efficient frictional drag reduction technologies for ships. Unlike bubbles in the boundary layer, which are explained to be effective while reducing the density of the liquid, artificial air cavities underneath a ship may reduce the amount of wetted surface, which presumably reduces more drag than the extra drag created by the devices required to create the cavities. The efficiency of such cavities has been studied experimentally on laboratory scale in a medium-speed water tunnel containing an optically accessible test section, equipped with a PIV system and cameras to obtain boundary layer- and cavity characteristics, and a force balance to measure the drag. The results of this study confirm that the drag reduction is proportional to the amount of non-wetted area. Based on experimental observations, a design criterion is presented for obtaining stable cavities with a low rate of air consumption. Furthermore, the experiments give insight into the formation and stability of air cavities, including the interaction between a series of cavities along the streamwise direction.

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