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Flow Separation Control with Rotating Cylinders JAMES SCHULMEISTER, MIT, JASON DAHL, University of Rhode Island, GABRIEL WEYMOUTH, Singapore-MIT Alliance for Research and Technology, MICHAEL TRIANTAFYLLOU, MIT — The use of small counter-rotating rotating cylinders to control flow separation and reduce the drag of a fixed circular cylinder in cross-flow is investigated experimentally at Reynolds number (Re) 52,000 and computationally at Re 100 and 10,000. The moving surface of the control cylinders imparts momentum to the flow near the location of flow separation. The transfer of momentum delays separation further downstream and thereby reduces drag. The relationship between drag and rotation rate is found to be Reynolds number regime dependent; at Re = 100 the drag decreases linearly with rotation rate and at Re = 10,000, the relationship is non-linear. This non-linearity appears to be due to the interaction between vortex shedding from the small control cylinders (which does not occur at Re 100) and the main cylinder wake. Finally, the power consumed by the active control mechanism is considered and estimated to be significantly smaller than the power savings in reduced drag.

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