

Abstract Submitted
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Princeton High Reynolds Number Supertank facility KONSTANTINOS STEIROS, MARCUS HULTMARK, Princeton University, Mechanical and Aerospace Engineering — Characterizing the aerodynamic behavior of large structures presents a major challenge in many engineering fields, including modern wind engineering, architecture, and urban planning research. The combination of enormous Reynolds numbers, relatively small Mach numbers, and unsteady or periodic events, render such flow measurements practically impossible in a conventional test facility. To address this issue, we present a novel recirculating wind tunnel facility, the Supertank, where the gauge pressure will be varied from 0 to 80 bar, enabling the testing of a large range of Reynolds numbers. The novelty of this facility lies in its large size, allowing a test section of $0.88 \times 0.88 \text{ m}^2$ cross section and 7.5 m length, and in its easily accessible design. In that manner, series of wind turbines and even small wind farms will be able to be characterized at high Reynolds numbers, and it will serve as an ideal facility to evaluate numerical models and simulations. Several technical details of the facility will be discussed, along with the potential that this facility will unlock for applied and fundamental research.

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