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Development of a Simulator to Mimic a Dolphin Blowhole Jet Flow Field[1] CHRIS BARTON, RICHARD GAETA, ALVIN NGO, MITCHELL FORD, ARVIND SANTHANAKRISHNAN, AARON ALEXANDER, JAMEY JACOB, Oklahoma State University — The health of bottlenose dolphins can be monitored by marine biologists through an analysis of their mucus contained in their breath. To capture a dolphin's breath in the wild, an Unmanned Aerial Systems (UAS) can fly "through" the breath when expelled thus the extent of the exhaled breath is required to properly design the UAS platform. This jet is impulsive, unsteady, two-phase, and in cross flow. A mechanical device has been designed and fabricated to simulate this type of jet for use in wind tunnels and ultimately for UAS aircraft trials. Requirements for this simulator were obtained using three separate dolphins under human care of varying age, weight, and gender by taking high-speed videos of the dolphin's breath in two planes. PIV measurements were calculated from the videos and used to guide the development of the specialized jet simulator. In addition, existing mass flow data from measurements of dolphins show that these breaths vary from 20-140 liters per second in a time duration of 0.26-0.31 seconds. These requirements were used to design the biologically inspired two-phase jet. Flow measurements of the blow-hole jet dynamics are compared with in-situ field data of actual dolphins.

[1]Dolphin Quest

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