

Abstract Submitted
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A PIV study of the flow field around a rigid rotating helix SHAN ZHONG, Manchester University, VICTOR PINEDO, ALEXANDER SMITS, Princeton University — Micro-organisms such as bacteria and spermatozoa propel themselves through viscous fluid using flagella which exhibit helical waves. Their typical swimming Reynolds number is 10^{-3} or less. This study presents an attempt of examining the flow field around a rotating flagellum using a scaled-up model. The helical models are made of 2mm diameter metal wires. They have a helical diameter of 17mm and an axial length of 220mm. Three helices with a different pitch angle of 30° , 45° and 60° were tested. The experiment was performed in a rectangular silicone oil bath with a dynamic viscosity of 4.875 Pa.s. The helix was rotated at a frequency of 0.25, 0.5 and 1Hz respectively. The Reynolds number based on the tangential velocity of the rotating helix ranged from 0.02 to 0.09. PIV measurements were undertaken on the central plane parallel to the helical axis. The thrust produced by the rotating helices were also measured using a force sensor.

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