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Synthetic C-start maneuver in fish-like swimming[1] R. ZENIT, Universidad Nacional Autonoma de Mexico, R. GODOY-DIANA, PMMH UMR7636 CNRS, ESPCI ParisTech, UPMC (Paris 6), U. Paris Diderot (Paris 7) — We investigate the mechanics of the unsteady fish-like swimming maneuver using a simplified experimental model in a water tank. A flexible foil (which emulates the fish body) is impulsively actuated by rotating a cylindrical rod that holds the foil. This rod constitutes the head of the swimmer and is mounted through the shaft of the driving motor on an rail with an air bearing. The foil is initially positioned at a start angle and then rapidly rotated to a final angle, which coincides with the free-moving direction of the rail. As the foil rotates, it pushes the surrounding fluid, it deforms and stores elastic energy which drive the recovery of the straight body shape after the motor actuation has stopped; during the rotation, a trust force is induced which accelerates the array. We measure the resulting escape velocity and acceleration as a function of the beam stiffness, size, initial angle, etc. Some measurements of the velocity field during the escape were obtained using a PIV technique. The measurements agree well with a simple mechanical model that quantifies the impulse of the maneuver. The objective of this work is to understand the fundamental mechanisms of thrust generation in unsteady fast-start swimming.

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Roberto Zenit
Universidad Nacional Autonoma de Mexico

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