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Numerical Investigation of the C-start in an Elastic Plate DANIEL CANUTO, JEFF ELDREDGE, University of California Los Angeles, ROBERTO ZENIT, Universidad Autonoma de Mexico — The C-start is a swimming mechanism employed by certain fish to achieve rapid acceleration from rest. In addition to its relatively low energy cost, the agility that this mechanism permits makes its understanding important for the design of biomimetic swimmers. To investigate the dynamics of C-starts, we conduct two-dimensional numerical simulations of an elastic plate rotated about its edge through a specified angle. The plate is free to translate in one direction, normal to its rotational axis and parallel to the plate's final orientation. The results obtained are compared with experimental data. Based on the swimming velocity, it is found that the C-start can be divided into three distinct stages: motion begins with a period of nearly constant acceleration, continues with a transient period as the tail's rotation ends, and concludes with a very gradual deceleration, or "coasting". These stages are analyzed, as are the effects of important design parameters (e.g., body density, bending stiffness) on the dynamics observed in each stage.

Daniel Canuto
University of California Los Angeles

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