

Technical Comments

Comment on "The Neutral Point in Stability and Control Analysis"

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THE excellent article by Rodgers¹ contains one minor error. The author says that when a vehicle that is dynamically stable in pitch in the water passes into air, "the density, and therefore the relative mass parameter, decreases by a factor of about 1000. This could result in the moment unbalance changing signs and the vehicle therefore becoming unstable."

Actually, the relative mass parameter μ is inversely proportional to the density, so that the nondimensional centrifugal force term $2\mu\dot{q}$, where \dot{q} is the nondimensional pitch rate, must increase. If the vehicle is stable in the water, the neutral point must be a distance ξ_n behind the center of gravity. The nose-down pitching moment about the neutral point due to centrifugal force $2\mu\dot{q}\xi_n$ must therefore increase. By the criterion of Ref. 1, this must further stabilize the vehicle, not destabilize it.

If it is true that vehicles can become dynamically unstable

in pitch on passing from water to air, this must be attributed to changes in the aerodynamic coefficient derivatives, not directly to the change in density.

Reference

¹ Rodgers, E. J., "The neutral point in stability and control analysis," *J. Aircraft* 2, 33-38 (1965).

Reply by Author to P. J. Roache

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THE error, pointed out by Roache in the preceding, in application of the method of the cited paper does exist. I would like to thank him for his comments. I am encouraged that he did find the error, using the method presented in the paper.

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