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Finite Wing Hydrodynamic Forces during Water-to-Air Interface Transition WARREN WEISLER, RAJMOHAN WAGHELA, DR. KENNETH GRANLUND, DR. MATTHEW BRYANT, North Carolina State University — Wings are used for numerous applications in both air and water and their lift generation in either domain is well understood. However, the lift generated by a wing when it is transitioning out of water and into air has not been quantified to date. This experimental study aims to examine the lift generated by a wing as it is translated through the water-to-air interface. Studies on egress velocities of 0.2 - 0.75 m/s were conducted to examine the effect of velocity on lift generation over a range of angles of attack from 0- 10 degrees. To examine the effects of starting depth, the translation of the wing was started at depths from 9.5c, 7c, 5c, and 3c. The experimental campaign utilized a rectangular NACA 0015 wing with a chord of 10 cm and an aspect ratio of 4. It was observed that the profile of lift generation during transition was dependent on velocity. At the "slower" velocities there is a spike in lift when the wing leading edge nears the water surface, sometimes more than double the steady values. As the speed increases, the spike in lift disappears and lift decreases before the leading edge even reaches the surface. The results from the angle of attack testing show that the transition profile appears to scale with angle of attack.

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