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Upstream Influence of Axisymmetric Bodies on Trailing Vortices in Formation Flight TANYA JOHNSON, JUSTIN JAWORSKI, Lehigh University — In formation flight, a leader wing generates a trailing vortex that travels downstream and interacts with a secondary, follower wing. The pressure field of the follower wing can affect the trajectory and character of the trailing vortex prior to impingement, and this upstream influence is investigated by analytical and numerical means. The linearized boundary-layer form of the Navier-Stokes equations models the finite-distance evolution of a Batchelor vortex in an imposed pressure gradient that is axisymmetric about the vortex axis. The analysis results in a heat conduction problem that can be solved using Green's functions and the effects of the vortex boundary condition on the finite domain are included. Results are presented for constant and linear pressure gradients, as well as pressure fields representative of canonical axisymmetric follower bodies. This work may be extended and applied to the stability analysis of streamwise finite-core vortices arising in formation flight.

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