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An airborne jet train that flies on a soft porous track[1] PARISA MIRBOD, YIANNIS ANDREOPOULOS, SHELDON WEINBAUM, The City College of the City University of New York, New York, NY 10031, USA — This paper explores the quantitative feasibility of developing an airborne jet train that flies on a soft porous track within centimeters of the earth's surface at speeds approaching current commercial jet aircraft. The jet train employs a lift mechanism first proposed in Feng & Weinbaum (2000) J. Fluid Mech. 422:282 and a nearly frictionless track suggested in Wu et al. (2004) Phys. Rev. Lett. 93(19):194501. Using an asymptotic analysis for large values of the permeability parameter $H/\sqrt{K_p}$, where H is the porous layer thickness and K_p the Darcy permeability, we first show that it is possible to support a 70 metric ton jet train carrying 200 passengers on a confined porous material if its K_p is approximately 5 x 10^{-9} m^2. For this $K_p$one finds that the tilt of the planform is < 0.1 degrees and the lift-off velocity is < 5 m/s. Compression tests on a fiber-fill material with these properties show that the fibers contribute $<$ 0.2 percent of the total lift and hence the friction force of the fiber phase is negligible. Using jet engines of 10,000 lbf thrust, about 1/5 that of a 200 passenger jet aircraft, one is able to obtain a cruising velocity approaching 700 km/hr. This would allow for huge fuel savings, especially on short flights where much of the energy is used to climb to altitude and overcoming lift induced drag.

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