Problem 290B

Suppose that the lift force experienced by a spinning baseball is to be estimated by $\rho U \Gamma a$ where ρ is the air density ($1\ kg/m^3$), U is its forward velocity (say $40\ m/s$), a is its radius ($0.03\ m$) and Γ is a circulation which is estimated as $2\pi a^2 \omega$ where ω is the velocity of spin (take $\omega = 200\ rad/s$). If the path of the baseball between the pitcher's mound and home plate (distance $\approx\ 20m$) is modelled as part of a circle, estimate the distance (in m) between the home plate arrival locations with and without the spin, in other words estimate the distance, H:
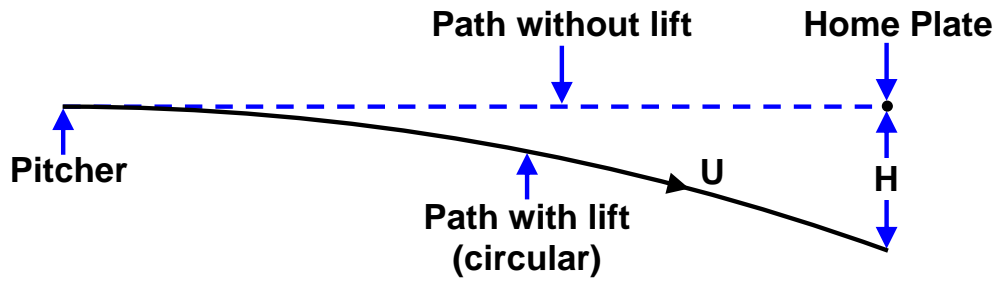
Neglect gravity. My estimate(?) of the mass of the baseball is $0.2\ kg$.