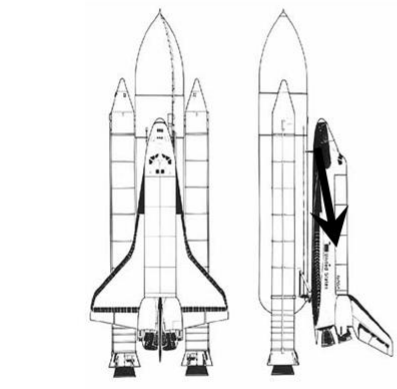
Problem 1 (20 points)

Foam can't hurt the Shuttle?



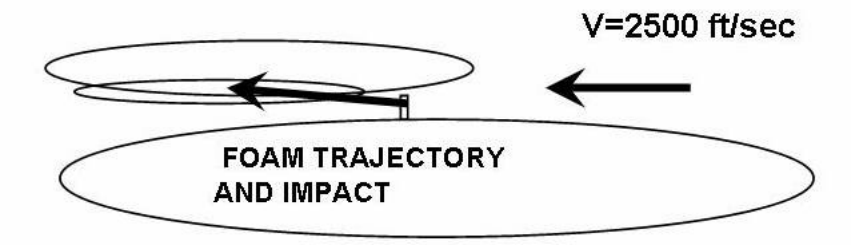
WING SPAN 78ft FT

FOAM PATH 56 ft FT

TIME 16.15.40.21.708

TIME 16.15.40.21.858

The space shuttle Columbia was damaged on liftoff when a piece of insulating foam from the bipod ramp that holds the shuttle to the external tank came loose, accelerated in the air flow and hit the leading edge of the wing. The wing span of the shuttle is 78 ft. Use 56 ft. as your estimate of the flight path length of the foam in the air stream (see figure).



The incident occurred at an altitude of 65600 ft where the atmospheric density is .000171 slugs/cu ft. The velocity of the shuttle was 2500 fps. The foam block had a cross sectional area of 1 sq ft and a weight of 2 lbs. Assume a drag coefficient CD=1.25.