UNIVERSITY OF NOTRE DAME
Department of Aerospace and Mechanical Engineering
AE 440: Flight Mechanics and Introduction to Design
Fall 1998

Project #5
Due: Friday, September 18, 1998

You are in the process of designing a UAV and are interested in its taxi performance. For a variety of reasons you want it to be able to "takeoff" without rotation (e.g. B-52). For the information provided determine the elevator deflection required for this to occur and estimate the ground-roll distance.

* Wing area = 8 ft^2
* Wing reference chord = 1 ft
* Horizontal tail reference area = 2 ft^2
* Weight = 10 lb
* Static Thrust = 2.5 lb
* Wing/Body Clalpha = 0.08 /deg
* Wing/Body Cdo = 0.02
* Wing/Body k= 0.04
* Wing/Body Cmac = - 0.02
* Wing/Body incidence angle* (on gear) = 5 deg
* Horizontal tail incidence angle* = 0 deg
* Horizontal tail Clalpha = 0.07 /deg
* Horizontal tail Cldeltae = 0.04 /deg
* Body Station for cg = 2 ft
* Body Station for nose gear = 0.33 ft
* Body Station for main gear = 2.4 ft
* Body Station for Wing/Body AC = 2.4 ft
* Body Station for Horizontal Tail AC = 4.0 ft
* Nominal landing gear length = 0.5 ft

*(incidence angles for wing/body and horizontal tail are measure from their respective zero lift lines)

Your project memo should include:
a. Aircraft model development with FBD and all appropriate terminology
b. Equations of motion
c. Description of method of solution
d. Benchmark or validation studies
e. Desired “design” results