

AEM 338 Project #1

Due: 7th April 2017 by 5:00pm

Groups of 3 or 4.

Prepare a short memo describing the flight performance of a Cessna 172 ($C_{D0} = 0.034$) at a gross weight of 2500 lbs with the following powerplants:

- Continental O-300: 145 hp at 2700 rpm with a fixed pitch 76 inch cruise prop (standard early 172)
- Continental IO-360: 210 hp at 2700 rpm with a fixed pitch 78 inch climb prop (USAF T-41C @ USAFA)
- Continental IO-360: 210 hp at 2700 rpm with a fixed pitch 78 inch cruise prop (USAF T-41C non-standard)
- Continental IO-360: 210 hp at 2700 rpm with a variable pitch 78 inch prop (USAF T-41D @ USAFA)

Evaluate and compare the following performance metrics:

- 50 foot obstacle takeoff distance at SSL and 10000 feet (standard day) on concrete.
- Rate of climb versus altitude
- Max cruise speed at SSL

Notes:

- A climb prop is a propeller with the pitch necessary to maximize the rate of climb performance
- A cruise prop is a propeller that maximizes the cruise velocity.
- Use the propeller curves attached below. Blade angles are between 15 and 45 degrees.
- Include the trim drag resulting from operating at a particular CL. (e.g. takeoff rotation)
- Do not exceed 2700 rpm or 210 hp at any point in the flight
- You may wish to add 10° flaps during the takeoff roll to reduce the ground roll.
- The memo should contain two sections: 1) a one-page summary and 2) a detailed explanation and discussion of your analysis including an appendix of computer codes.



