AS 310

Project Requirements

This project is due by the end of class Wednesday August 10, 2016. After that time all papers will receive a grade of 0 (zero).

The project will consist of a group of three students. The students will complete a performance report that will include the following sections following a cover page with the title of the project, semester, section, and the full names of the group members:

1. Executive summary of the performance characteristics of the aircraft. This section will discuss any negative aspects in performance, i.e. takeoff, climb angle, single engine, cruise, etc.
2. Answers to all of the performance problems listed on the project page. To include clean and labeled graphs and charts.
3. Raw data to include drop down tables and their values for each problem.

Group Project Grading will consist of the following:

50% - Section 2 answers must be correct

30% - Section 3 complete

10% - Section 1 Complete and professional

10% - Overall thoroughness, grammar, punctuation, and professional presentation

100% - Overall Group Project Grade

Each group member will rate the other group members for a participation grade. That grade will be average including the self assessment by the group members. This will be assessed at the beginning of class Wednesday August 10, 2016. You must be present to grade yourself, or your self assessment will be a 0 included in the average.

The Individual Project grade to be recorded will consist of the following:

Individual Project Grade = Group Project Grade x Group Participation Grade

AS 310

Project Section 2 Requirements

Note: All airspeeds are true. Assume no wind.

1. Determine the Stall speed for the aircraft in each configuration.
2. Produce the drag vs thrust plot for each configuration.

Glide Configuration

3. Determine the best glide speed.
4. Determine L/Dmax
5. How far can the aircraft be from the landing zone when it is released.

Landing Configuration

6. Determine Vref.
7. Determine the landing distance over a 70' obstacle spoilers and no spoilers.
8. Determine the Landing distance with no obstacle spoilers and no spoilers.
9. Determine the stop distance for spoilers and no spoilers.

Takeoff Configuration

10. Determine Vr in the takeoff configuration.
11. Determine V2.
12. Determine the angle of climb at V2 on 1 and 2 engines.
13. Determine the takeoff distance no obstacle with engines operating at 100% and JATO.
14. Determine the takeoff distance no obstacle with engines operating at 100% and 1 JATO.
15. Determine the takeoff distance no obstacle with engines operating at 100% and no JATO.
16. Determine Vx, Vy, and Vyse at 100% thrust.
17. Determine the angle of climb for Vx, Vy, and Vyse.
18. Determine the ROC for Vx, Vy, and Vyse.

Cruise Configuration

19. Determine the max forward velocity.
20. Determine the velocity for best range.
21. Determine the range for the aircraft at max forward velocity.
22. Determine the range for the aircraft at velocity for best range.

AS 310

Project Brief

Your team is tasked with predicting the performance characteristics for the following flight profiles:

Glide configuration: Pilot. Clean. 800 lbs of fuel. JATO full (2x).

Landing Configuration: Pilot. Full Flaps on final. Gear Extended. Engines Extended.

Takeoff configuration: Pilot. Passenger. Gear extended. Jet engines extended and operating. JATO enabled 6 seconds operation. Drag Chute Jettisoned.

Cruise profile: Pilot. Passenger. Clean. 800 lbs of fuel. (assume 500 lbs of fuel for entire flight), Jato Solid Fuel Burned

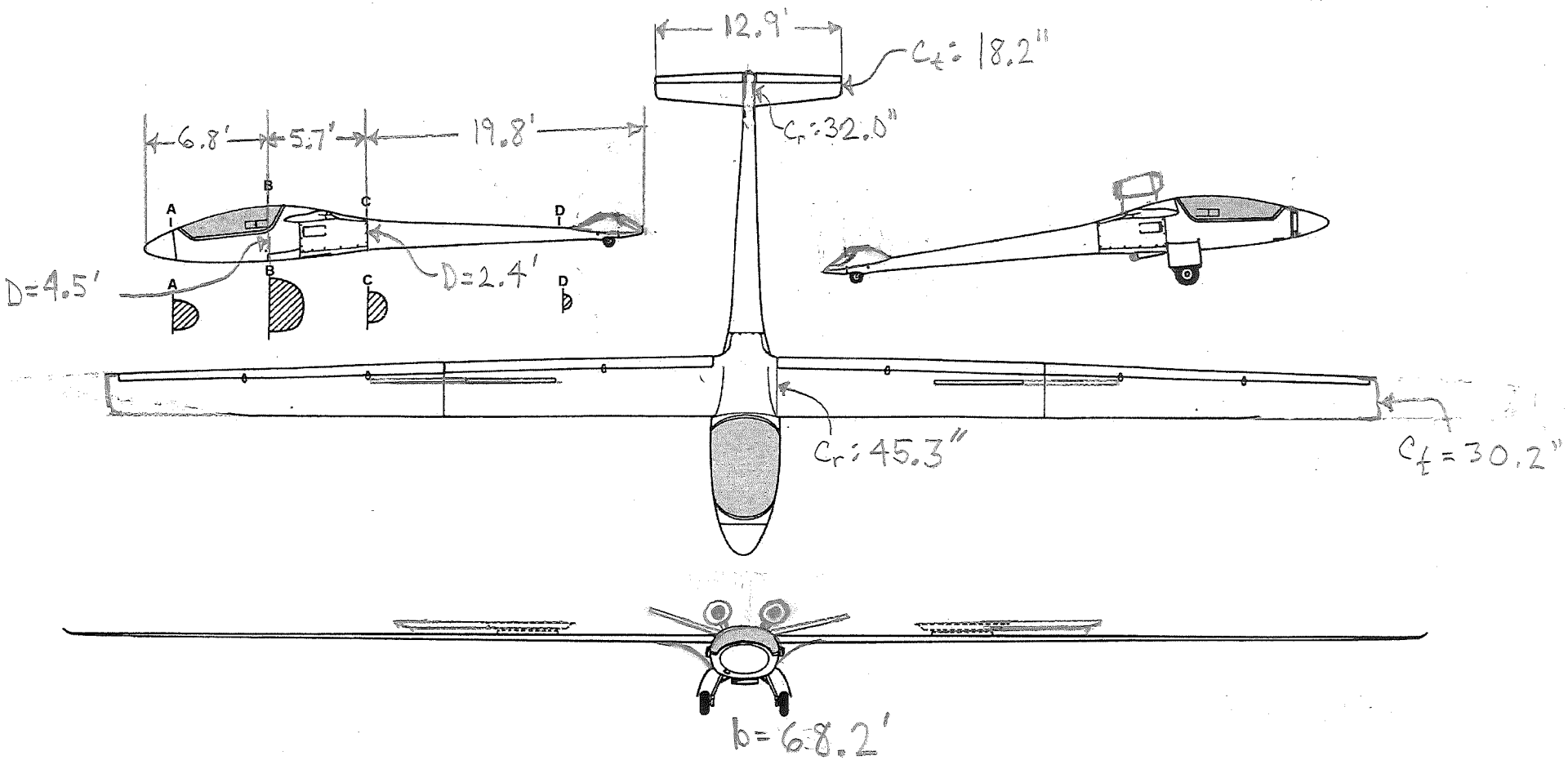
Glide Profile: The aircraft will be towed and released at 30,000' MSL on a clear night.

Landing Profile: The aircraft will approach and land at a dirt strip at 10,000' MSL.

Takeoff Profile: The aircraft will take off from a dirt strip at 10,000' MSL.

Cruise Profile: The aircraft will descend to and cruise at an average altitude of 200' MSL.

P	T °F	P psf
SL: 0.002377	59	2116.2
10K: 0.001756	23.30	1455.6
30K: 0.0008907	-47.98	629.7



Note: Assume Constant taper on all wings and stabs. Assume rounded fuselage.

Empty Weight: 1,300 lbs Pilot Weight: 180 lbs Passenger Weight: 210 lbs Max Jet Fuel: 800 lbs (53.36 gal) Solid Rocket Fuel: 200 lbs ea (weight)

Wing Airfoil: NACA 63_2-215 (assume laminar flow) Stab Airfoil: NACA 0009 (assume laminar flow; the aircraft uses water ballast to trim so no Di)

Gear Area Equiv: 432 in^2 ea Spoiler Flat Plate Equivalent: 576 in^2 ea Flat Plate Cd: 1.28 Drag Chute: 6' Diam

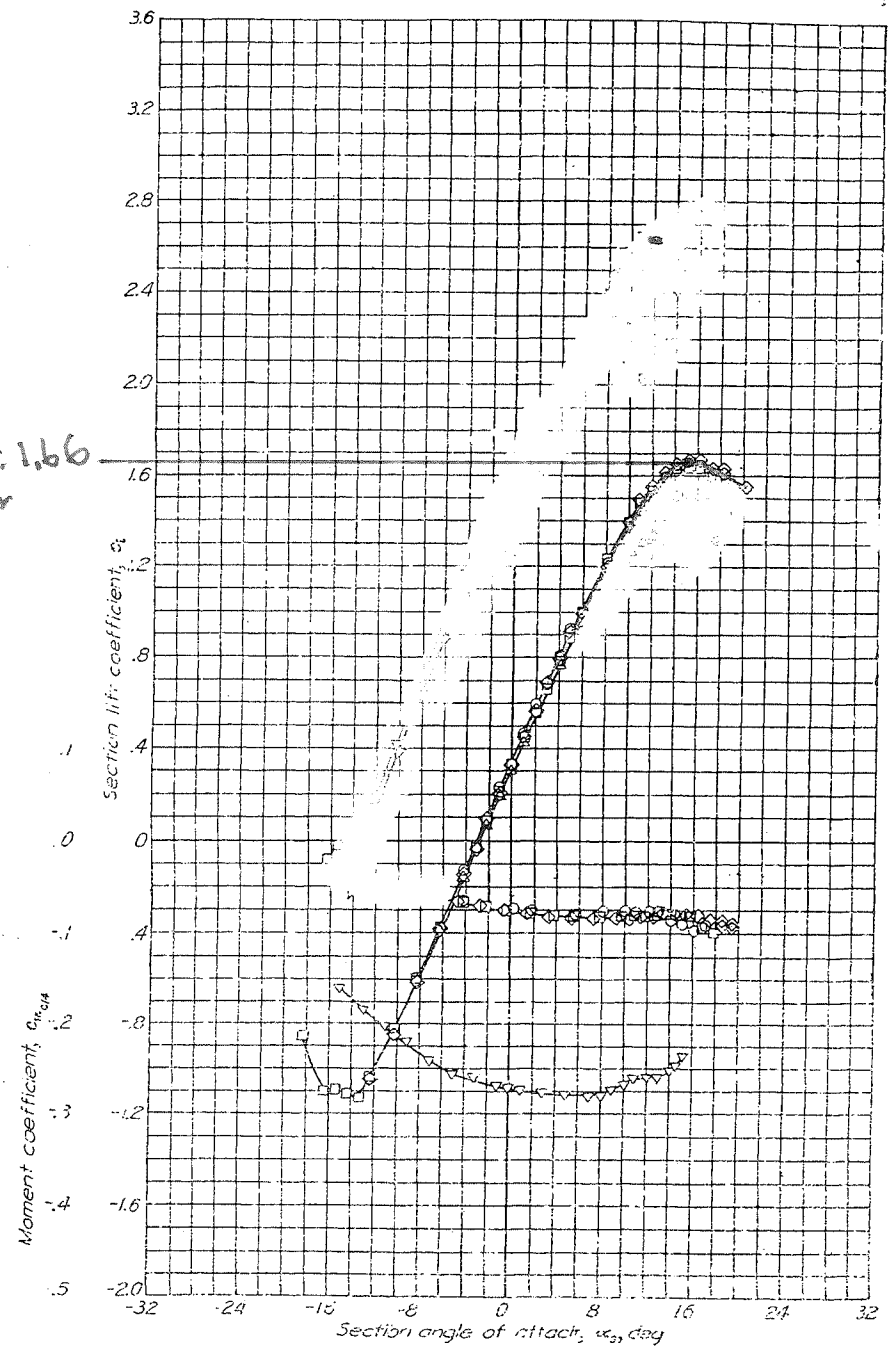
Engine Area Eq.: 44 in^2 & Cd: 0.0209 Aircraft Fuse C_{fe}: 0.0166 Thrust SSL: 3200 lbs each SFC: 0.48

μr: 0.031 μb: 0.49 Engine Params: $X = 4.7$ $M = 0.84$

Jato Thrust: 700 lbs ea

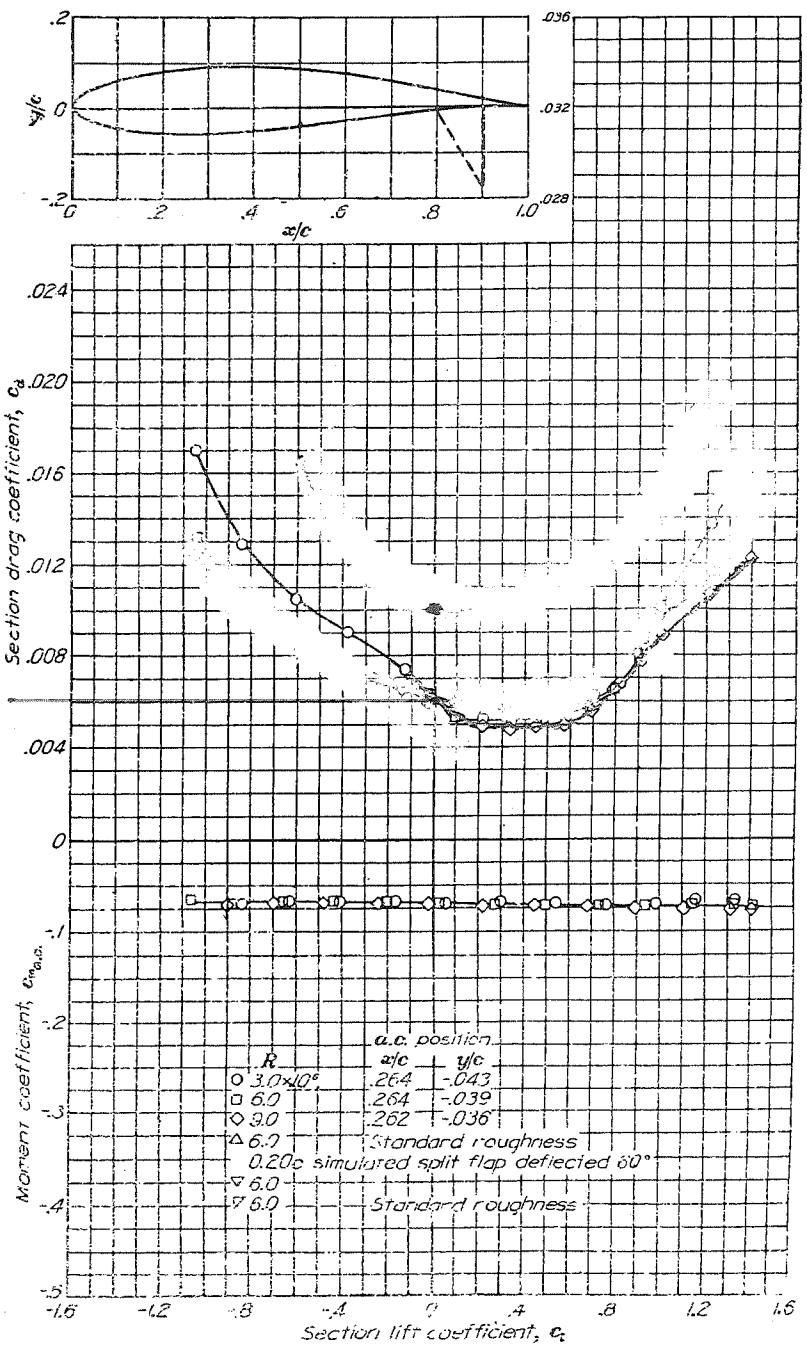
Drag Chute Weight: 70 lbs

NO FLAPS
Project



NACA 63$_2$-415 Wing Section

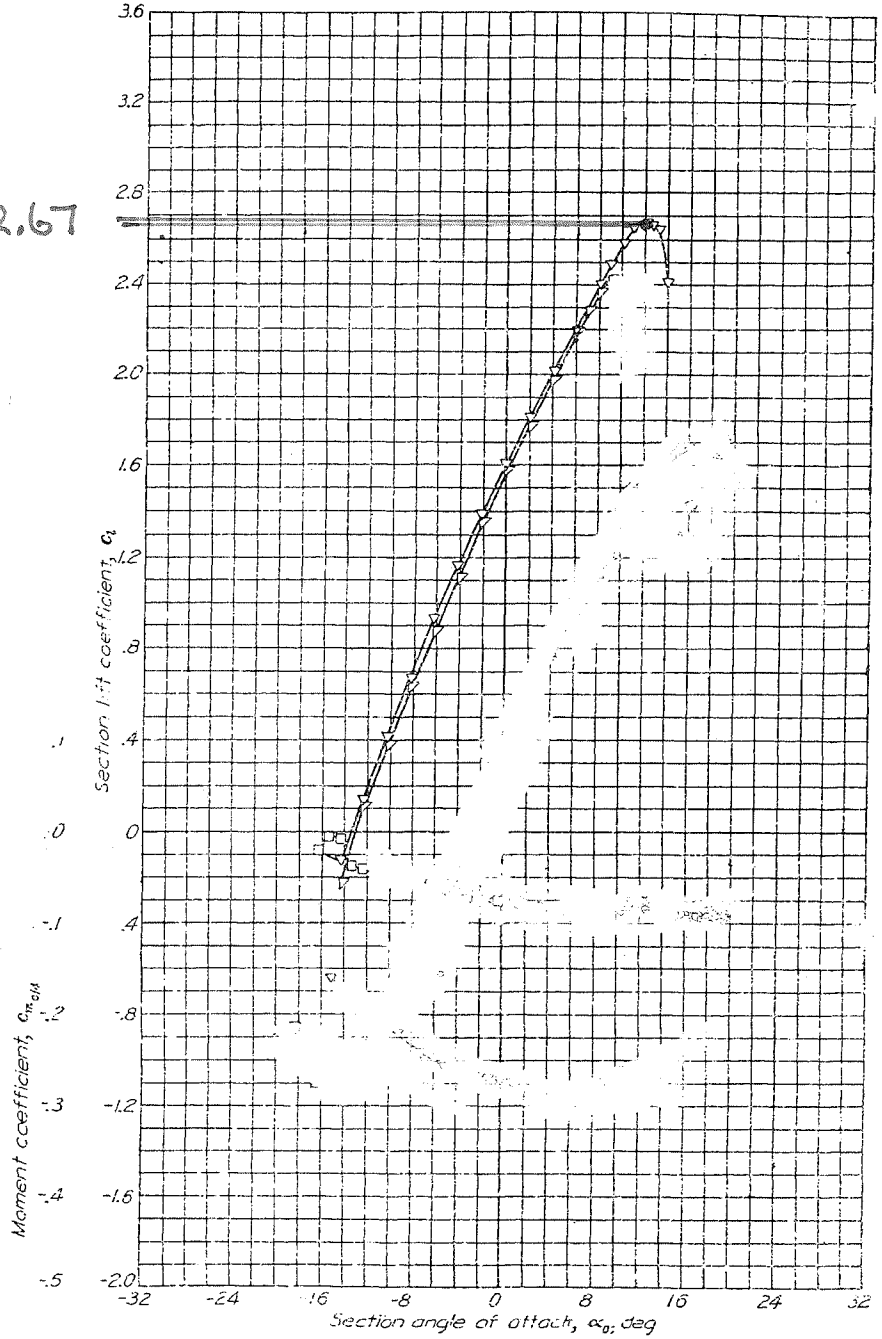
$C_L = 1.66$



0.0060

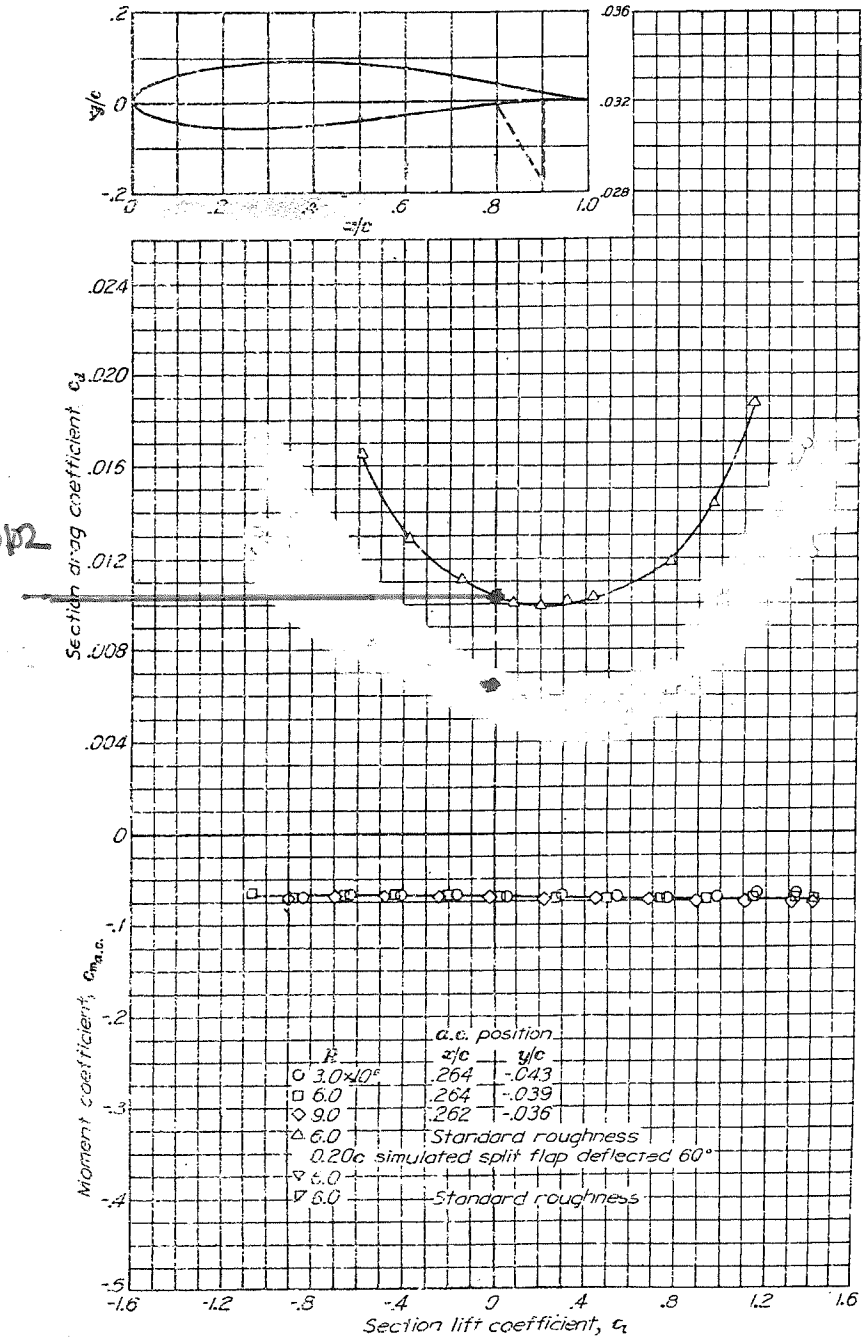
NACA 63$_2$-415 Wing Section (*Continued*)

FLAPS
Project



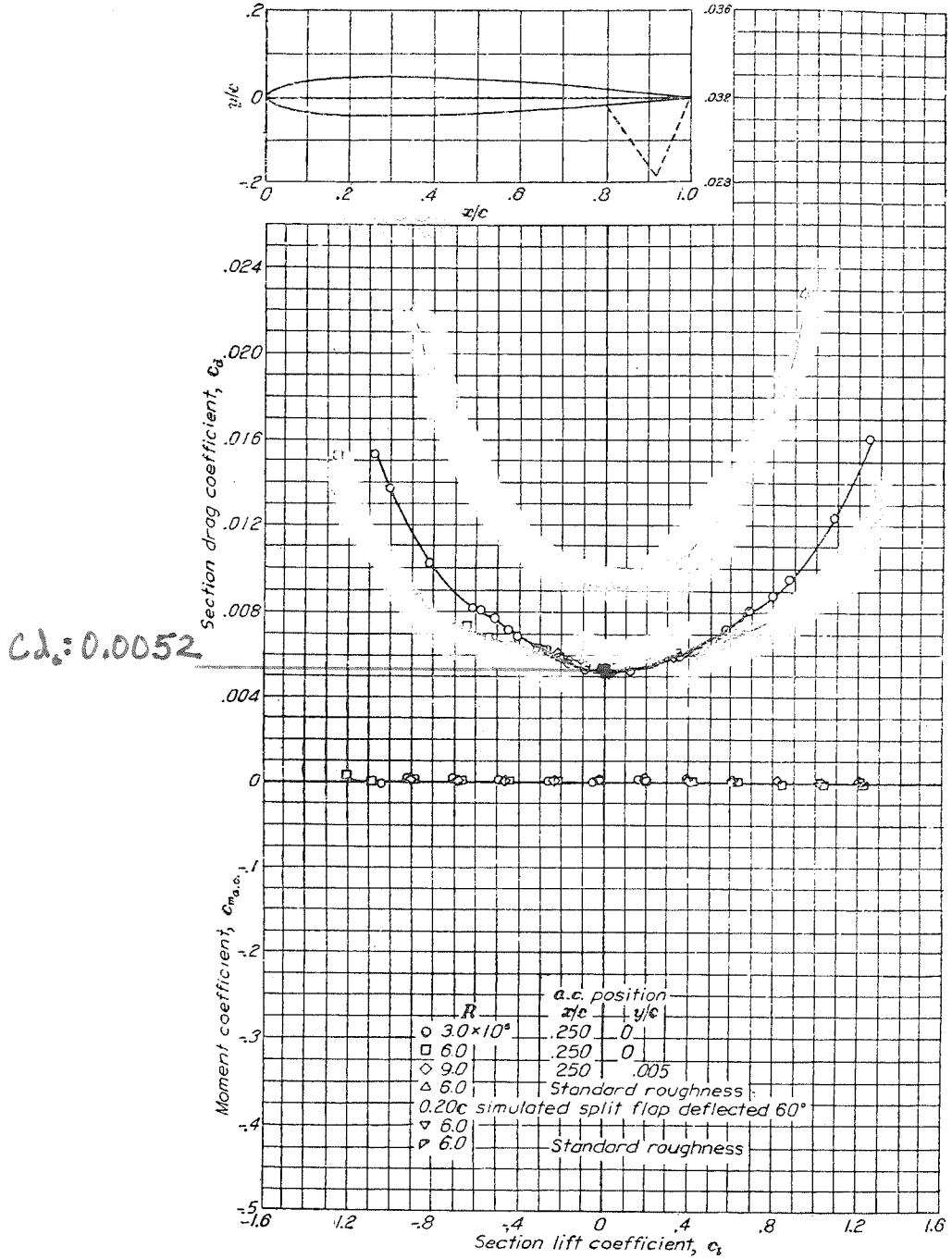
$C_{L_{max}} : 2.67$

NACA 63$_2$-415 Wing Section



$C_{d_0} : 0.012$

NACA 63$_2$-415 Wing Section (*Continued*)



$C_{l_0} = 0.0052$

NACA 0009 Wing Section (*Continued*)