

The Rare Bear

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History

- Restored and modified Grumman F8F Bearcat
- Wings shortened
- 4,000 Hp engine put in
- P-3 Orion propeller



F8F-2 Modifications

- 2,250 Hp engine
- Variable speed supercharger
- Four 20 mm cannons
- 1 ft added to vert. stabilizer height



Basic Geometry

$S_{\text{ref}}:$ 221.6 ft²

$_:$ 0.45

$b:$ 30.5 ft

$_{1/4}:$ 2°

$AR:$ 4.2

$S_{\text{tail}}:$ 54 ft²

$C_r:$ 10.26 ft

$S_{\text{wet}}:$ 872 ft²

$C_t:$ 4.64 ft

Basic Geometry

Control Effectors:

Ailerons: 17 ft²

Elevator: 19 ft²

Rudder: 10 ft²

Twist:

0°

Root Airfoil:

NACA 23015

Tip Airfoil:

NACA 23009

$t/c)_{\text{root}}$:

15%

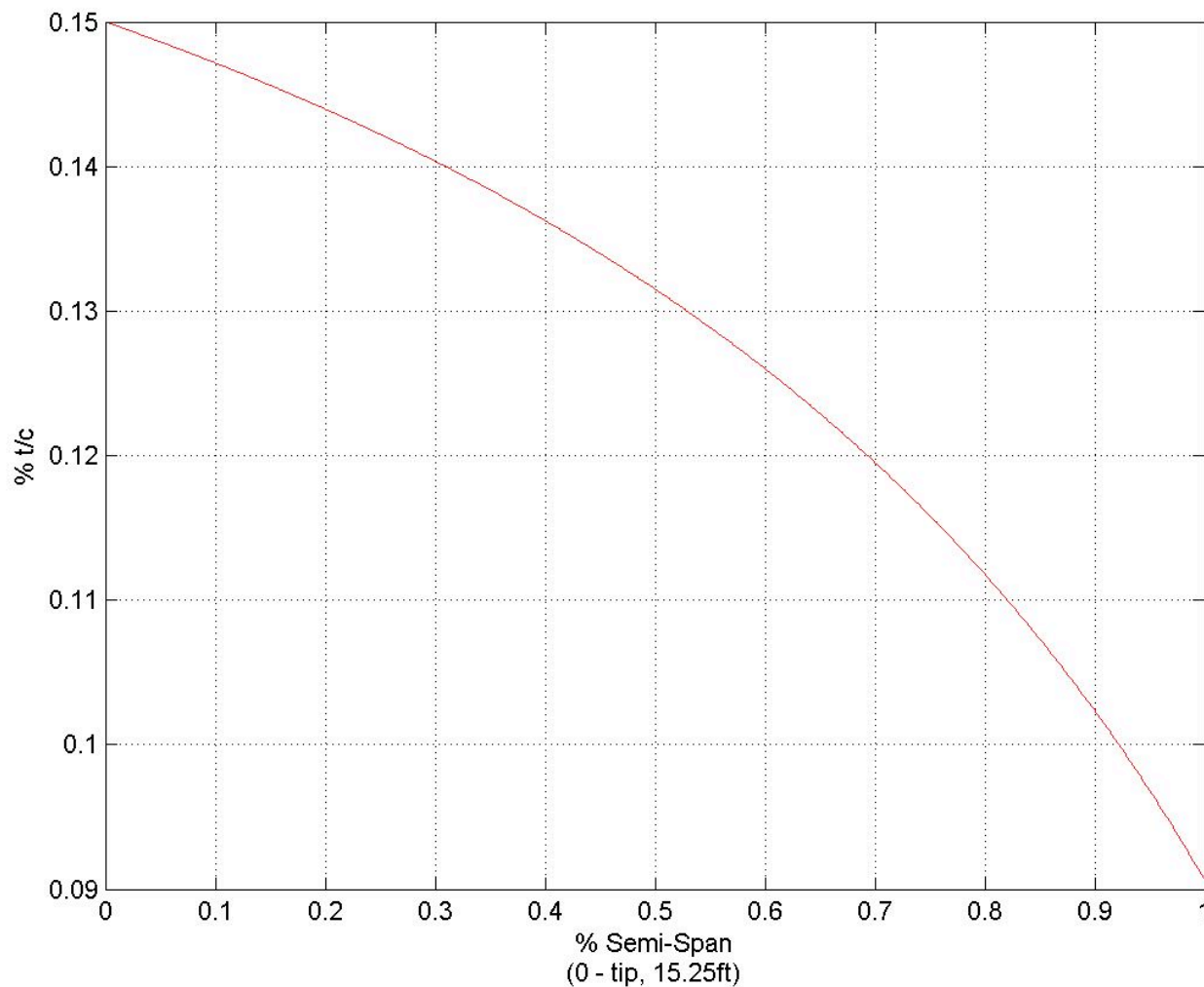
High Lift Devices:

None

$t/c)_{\text{tip}}$:

9%

Basic Geometry (Cont'd)



Analysis

TOGW: 8500 lbs

Payload/TOGW: 2.35% (200 lb pilot as payload)

Fuel/TOGW: 13.76% (180gal @ 6.5 lb/gal)

Wing Loading: 38.35 lb/ft²

Propulsion System: Wright R3350 Radial Engine

Power: 4000+ hp (2983kW)

Power/Weight: 0.47 hp/lb (0.77kW/kg)

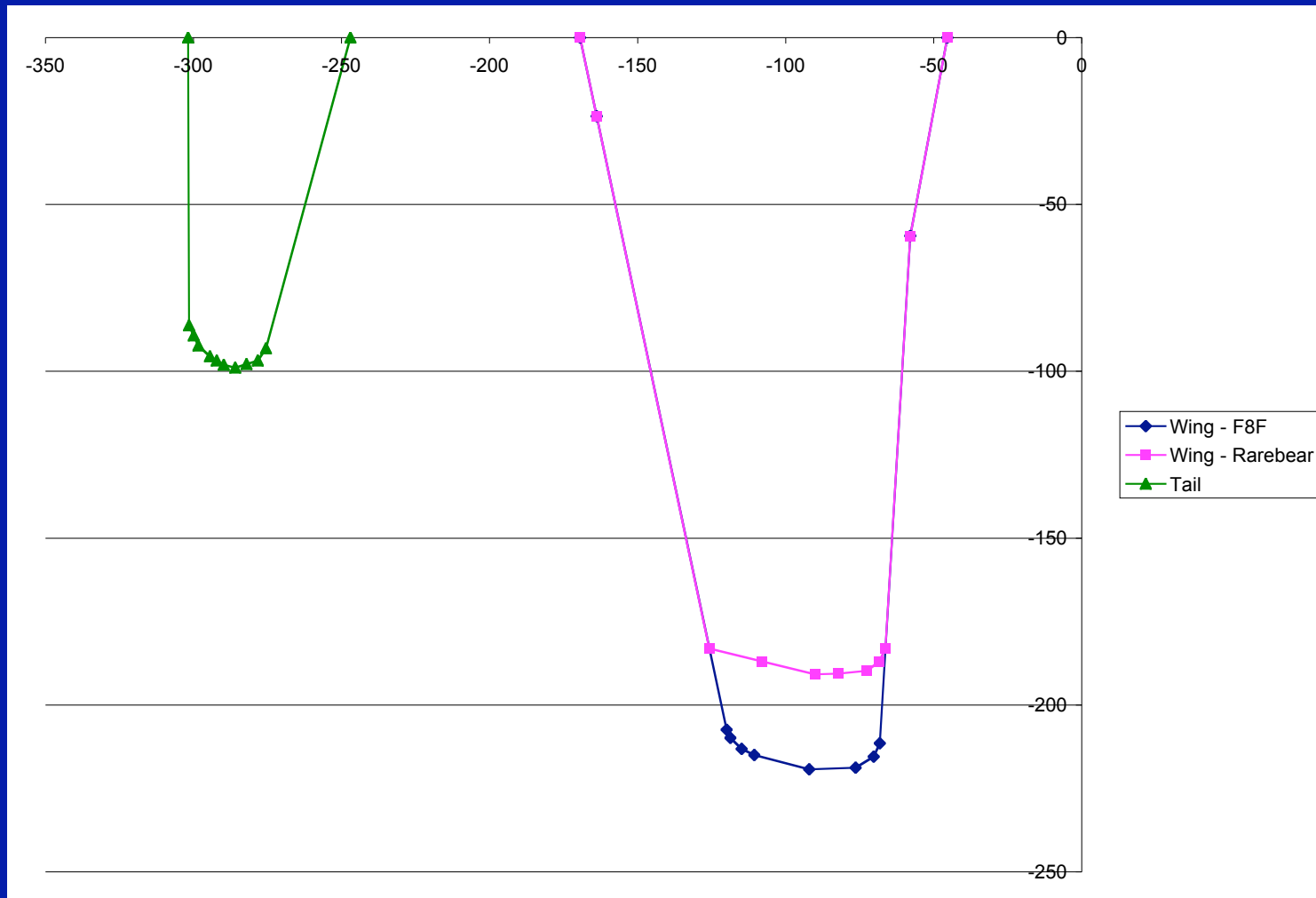
Analysis (Cont'd)

| | | |
|-----------------------------|-------|---|
| $C_{L540kts}$ | 0.045 | |
| $C_{L490kts}$ | 0.055 | ($\alpha = 0.46^\circ$) |
| $C_{L\text{Landing}}$ | 0.807 | ($\alpha = 12.7^\circ$) |
| $C_{L\text{max}}$ | 1.36 | ($V_{TD} = 1.3 * V_{\text{stall}}$, α_{SL} , 7330 lbs) |
| $C_{L\text{ground effect}}$ | 0.25 | (calculated) |
| Tail Scrape: | 12° | (sitting on main gear and tail wheel) |
| dC_m/dC_L | -0.99 | |
| $(L/D)_{\text{max}}$ | 12 | (from FRICTION.exe) |

Analysis (Cont'd)

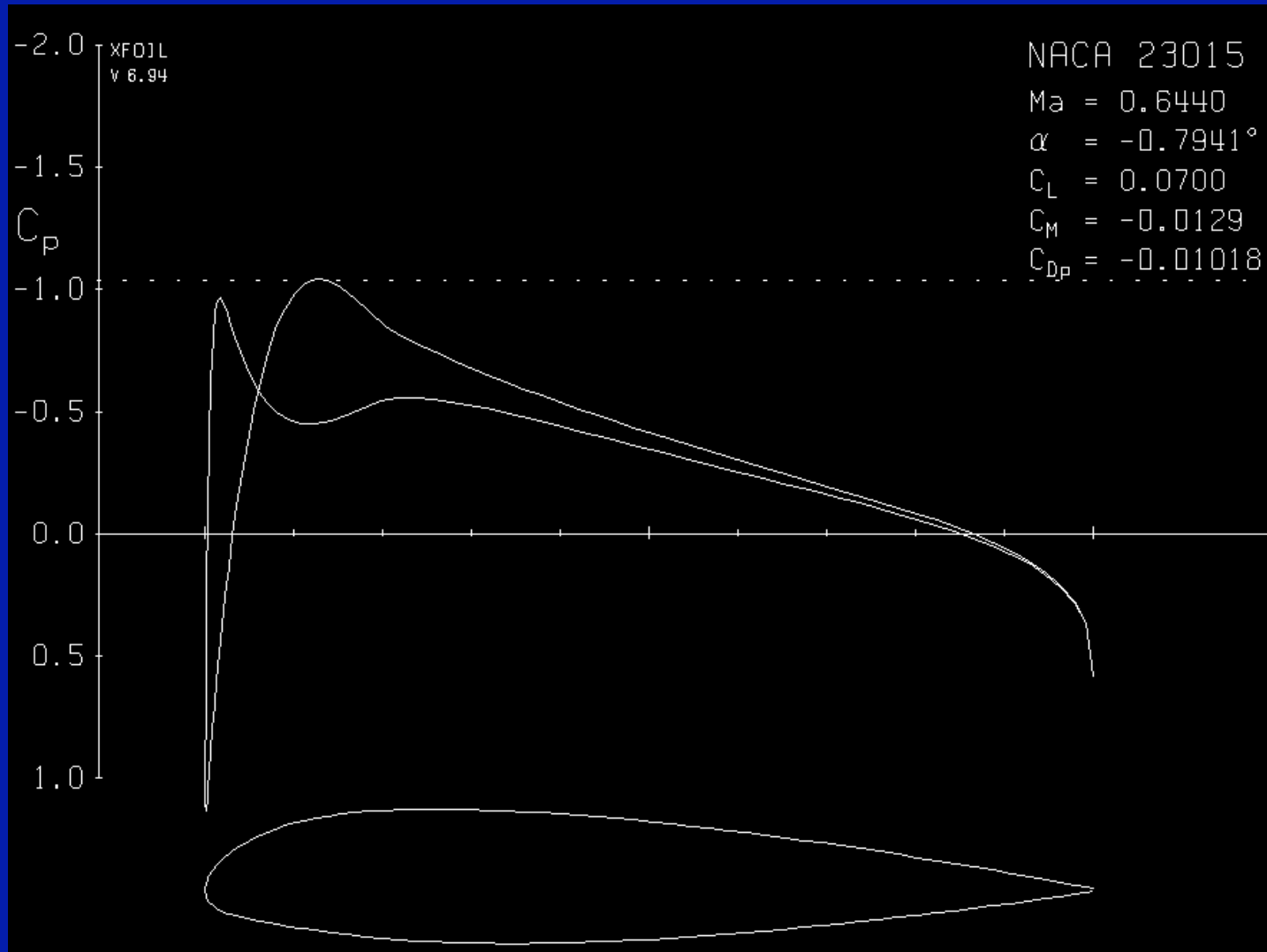
| | | |
|----------------------------------|----------|------------------------------|
| Neutral Point _{Plane} : | 25.37 % | (% chord of wing, VLMpc) |
| Neutral Point _{Wing} : | 30.5 % | (% chord of wing, VLMpc) |
| Wing moment arm: | 2.02 ft | (wing np to plane np, VLMpc) |
| Tail moment arm: | 16.35 ft | |
| Load Split (540 mph): | | |
| | Wing: | 0.94 |
| | Tail: | 0.06 |
| CG Location: | 20.37% | (% chord of wing) |
| Static Margin: | 5% | |

Analysis (Cont'd)



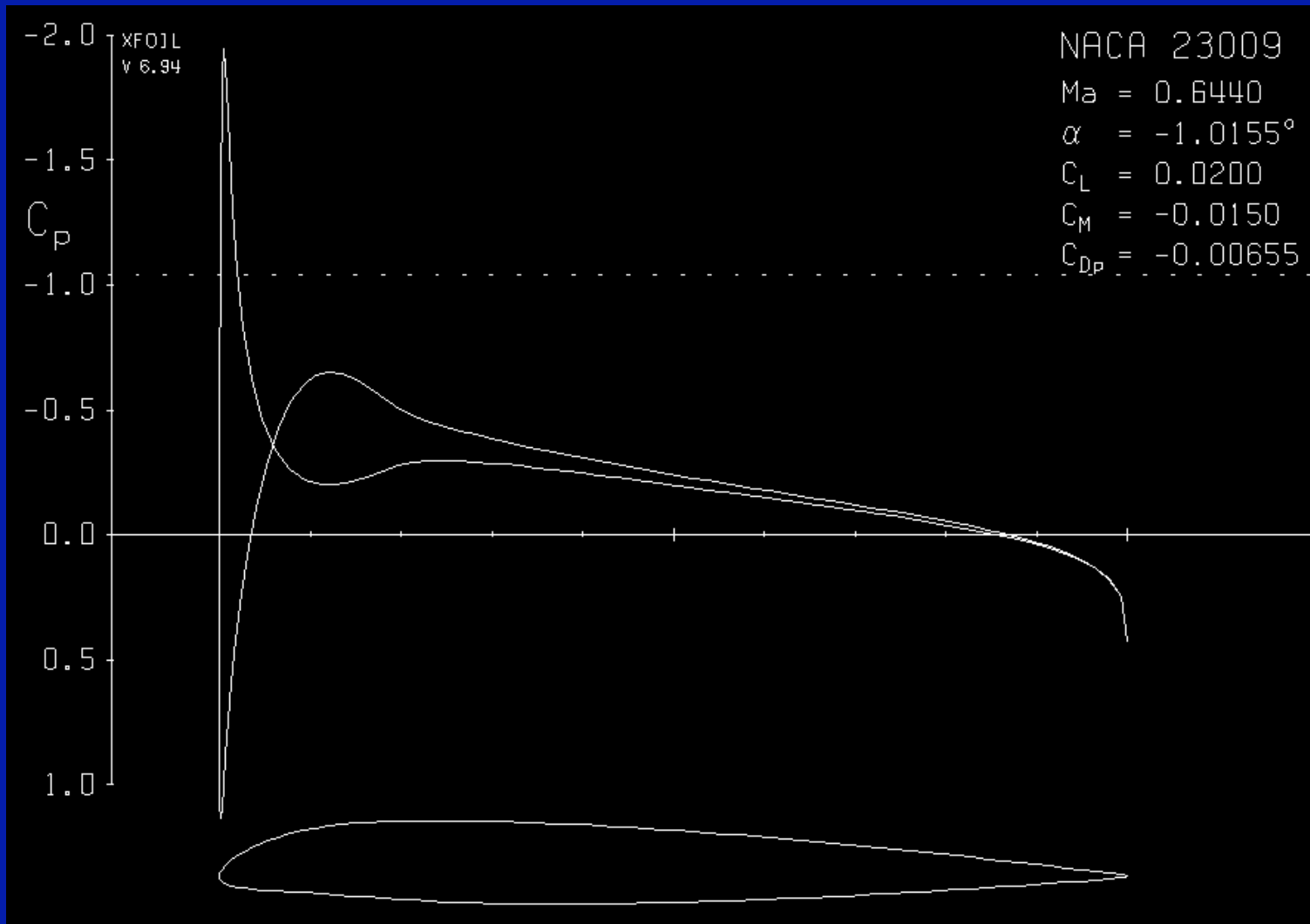
Outline Used for VLMpc Inputs

Analysis (Cont'd)



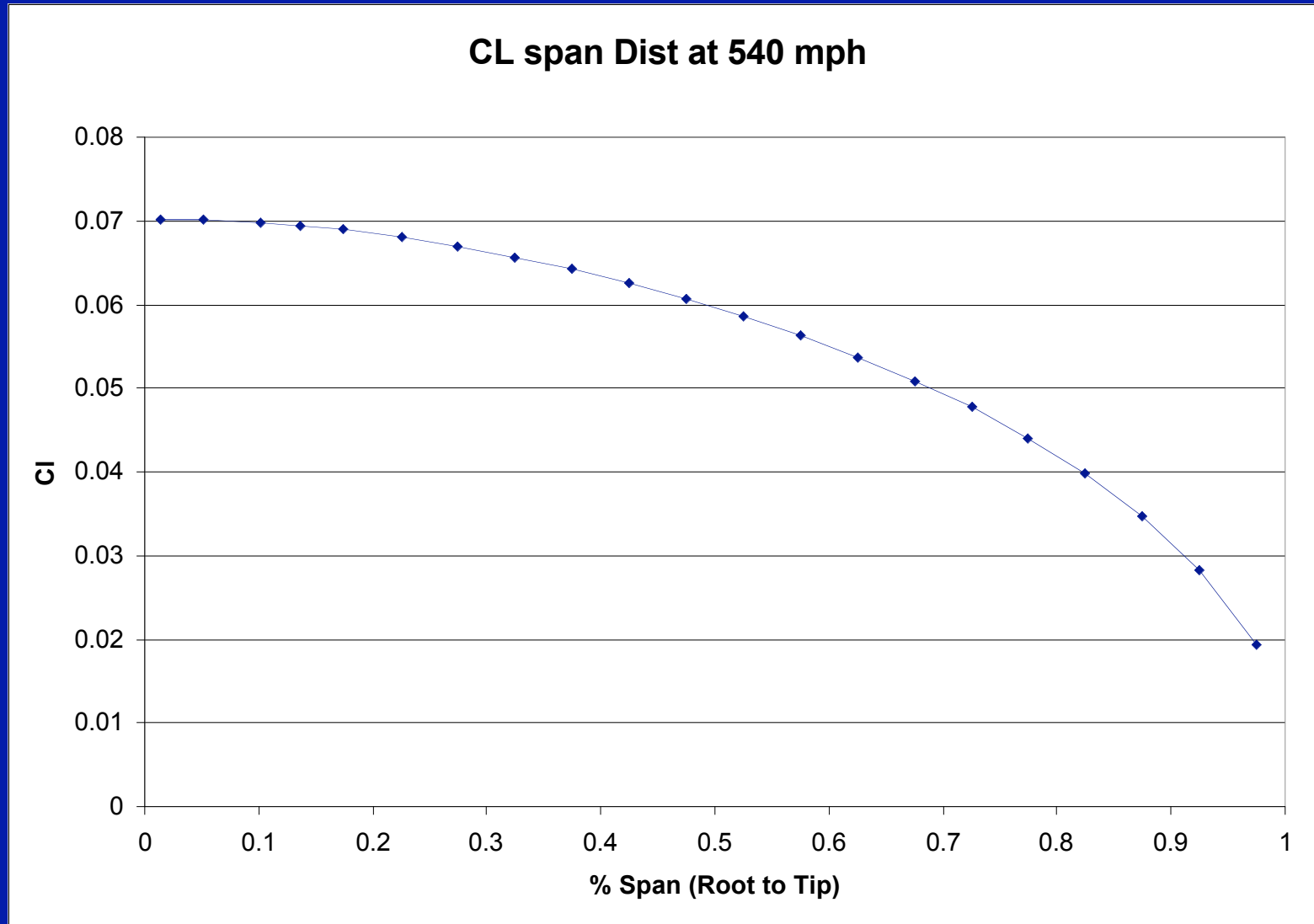
NACA 23015 (Wing Root) X-Foil Figure

Analysis (Cont'd)



NACA 23009 (Wing Tip) X-Foil Figure

Analysis (Cont'd)



Span-wise Lift Distribution:

Basic Performance

| | | |
|----------------------|-----------|----------------------|
| Max Speed: | 540 mph | (@ 5000ft, 792 ft/s) |
| Closed Course Speed: | 490 mph | (719 ft/s) |
| Approach Speed: | 120 kts | (202.5 ft/s) |
| Landing Speed: | 110 kts | (185.7 ft/s) |
| Stall Speed: | 84.62 kts | (142.8 ft/s) |

Basic Performance (Cont'd)

| | | |
|-----------------|------------|---------------------|
| Climb Rate: | 107.1 ft/s | (73 mph) |
| Endurance: | 0.3 hrs | (@540mph, 600 gph) |
| Range: | 162 mi | (@540 mph, 600 gph) |
| $C_{Dcruise}$: | 0.0107 | (@540 mph) |