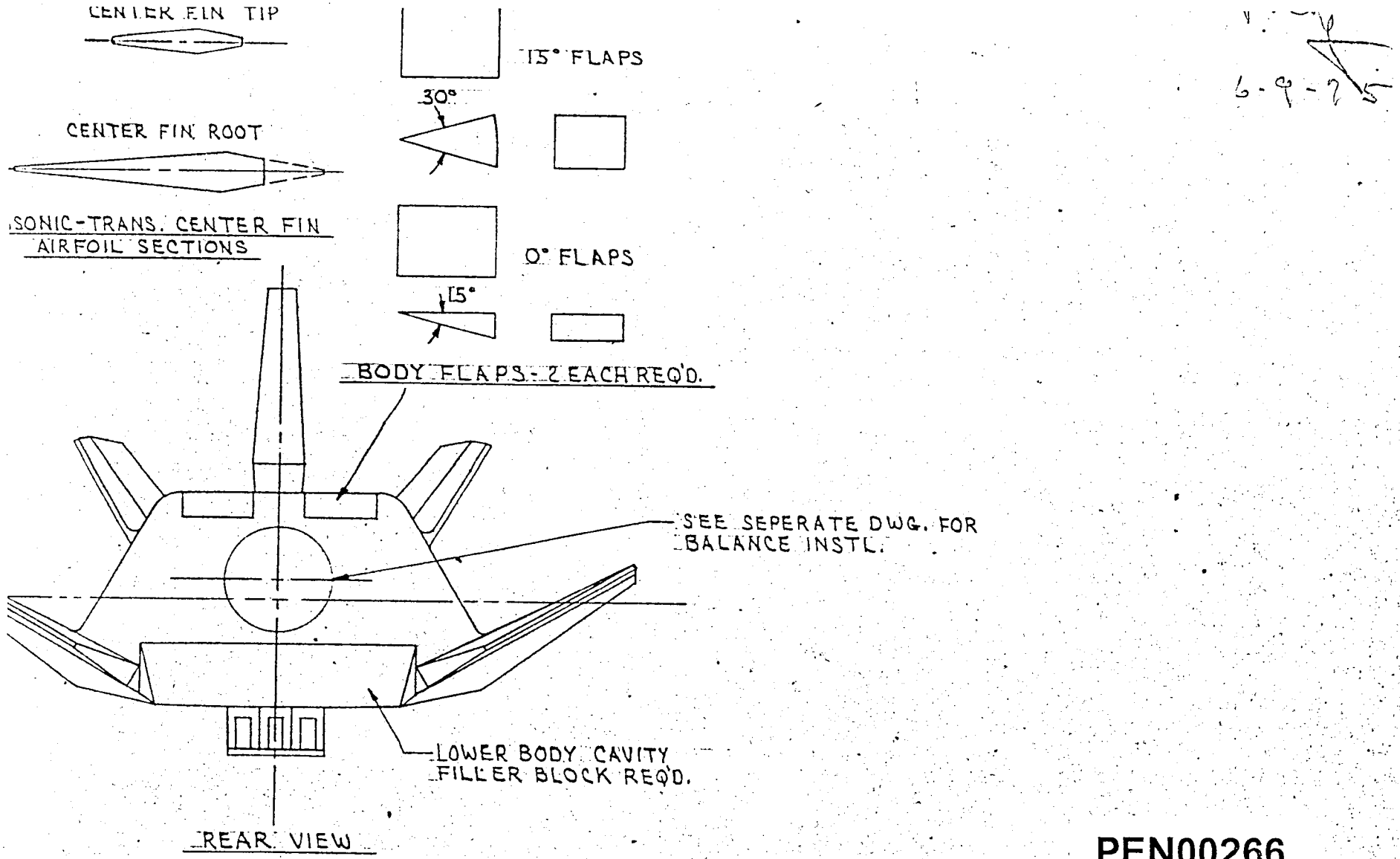


6-9-75

)N - 0°, ±10° - 20°
REW + STAIN.
, SCREWS EACH)

PEN00266

DWN	6-5-75	MCDONNELL AIRCRAFT COMPANY SAINT LOUIS, MISSOURI MCDONNELL DOUGLAS CORPORATION
CHK		
STR		
GP		
PE		X-24C-12I WIND TUNNEL MODEL
		SIZE: — CODE IDENT NO. 76301 — 226-811
		SCALE FULL WT LB SHEET

4

Pentland
6-25-75

X-24-C-12 I Shop Work

Reqd. for Sept. 1 entry in LTPT

m.s • Bore fuselage for Balance Adapters & bore dowel holes

m.s. • ~~✓~~ Machine Balance Adapters, for Bals. 2030 & 834

• Mill fuselage for Side fins & drill & tap holes

• Finish Side Fin Castings, 0° Toe in

• " " " " , 10° Toe in

m.s • ~~✓~~ Mill base of fuselage to final dimensions

m.s • ~~✓~~ Cut elevons from wing along hinge lines

• ~~✓~~ Drill & countersink elevon deflection plates

? • ~~✓~~ Finish "five" center vertical tails & drill & tap.

? • ~~✓~~ Drill & countersink fuselage to mount center Vertical tails

m.s • ~~✓~~ Mill bottom of fuselage for engine base block

m.s • ~~✓~~ Mill aft bottom of fuselage 6½° & 24° for lower body cavity

m.s • ~~✓~~ Mill three engine base blocks for 3, & 6 module engines & blank

m.s • ~~✓~~ Machine 3 & 6 module engine cowls

m.s • ~~✓~~ Machine 4 engine sidewalls

m.s • ~~✓~~ Machine 7 engine partitions

m.s • ~~✓~~ Machine 9 engine fuel struts

Boattail 12I

Penland
9-16-76

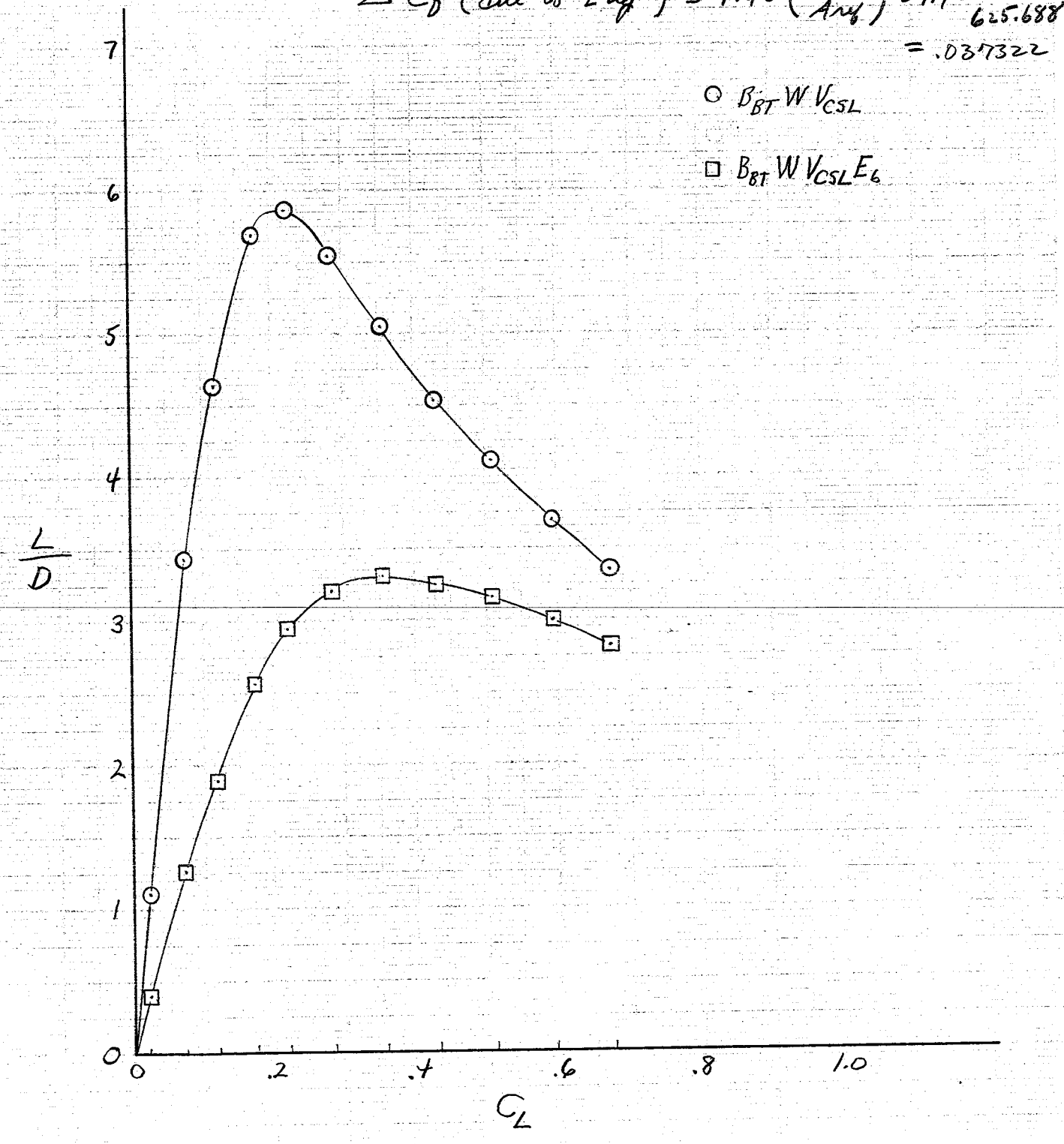
$M = 0.33$, $R_\ell = 100 \times 10^6$

Converted to Flight Re. No.

ΔC_F (Tunnel to Flight) $= -0.0051$

ΔC_D (due to Eng) $= 1.40 \left(\frac{A_{eng}}{A_{ref}}\right) = 1.4 \frac{16.68}{625.688}$

$= .037322$



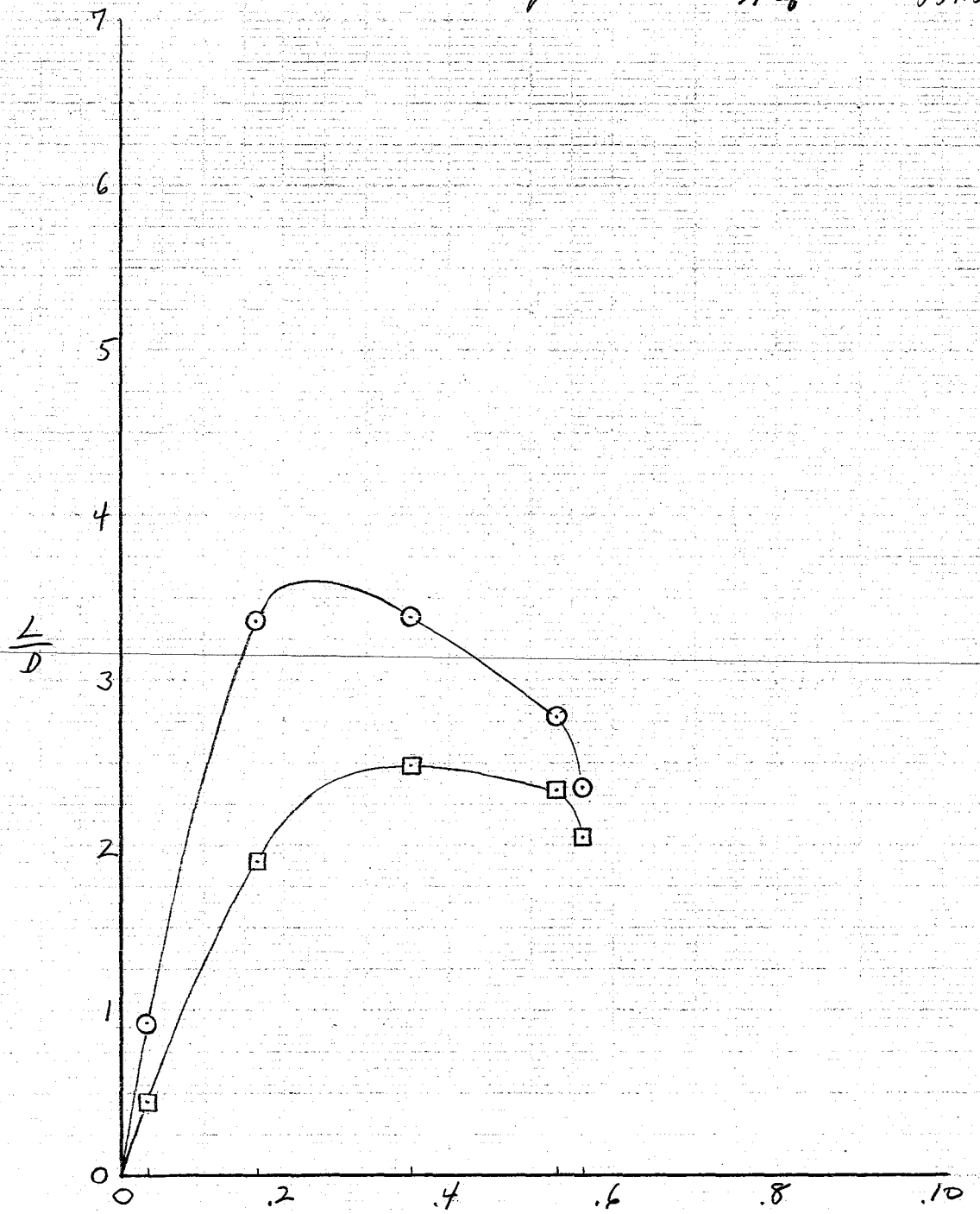
XI Increased Fineness Ratio

$M = 0.2$, $R_L = 100 \times 10^6$

Extrapolated to Flight Re. No.

$\Delta C_F = (\text{Tu. to Flt}) = -.0051$

$\Delta C_{D\,engine} = 1.4 \frac{A_{eng}}{A_{ref}} = 1.4 \frac{1490}{551.55} = +.03782$



Baseline 12I

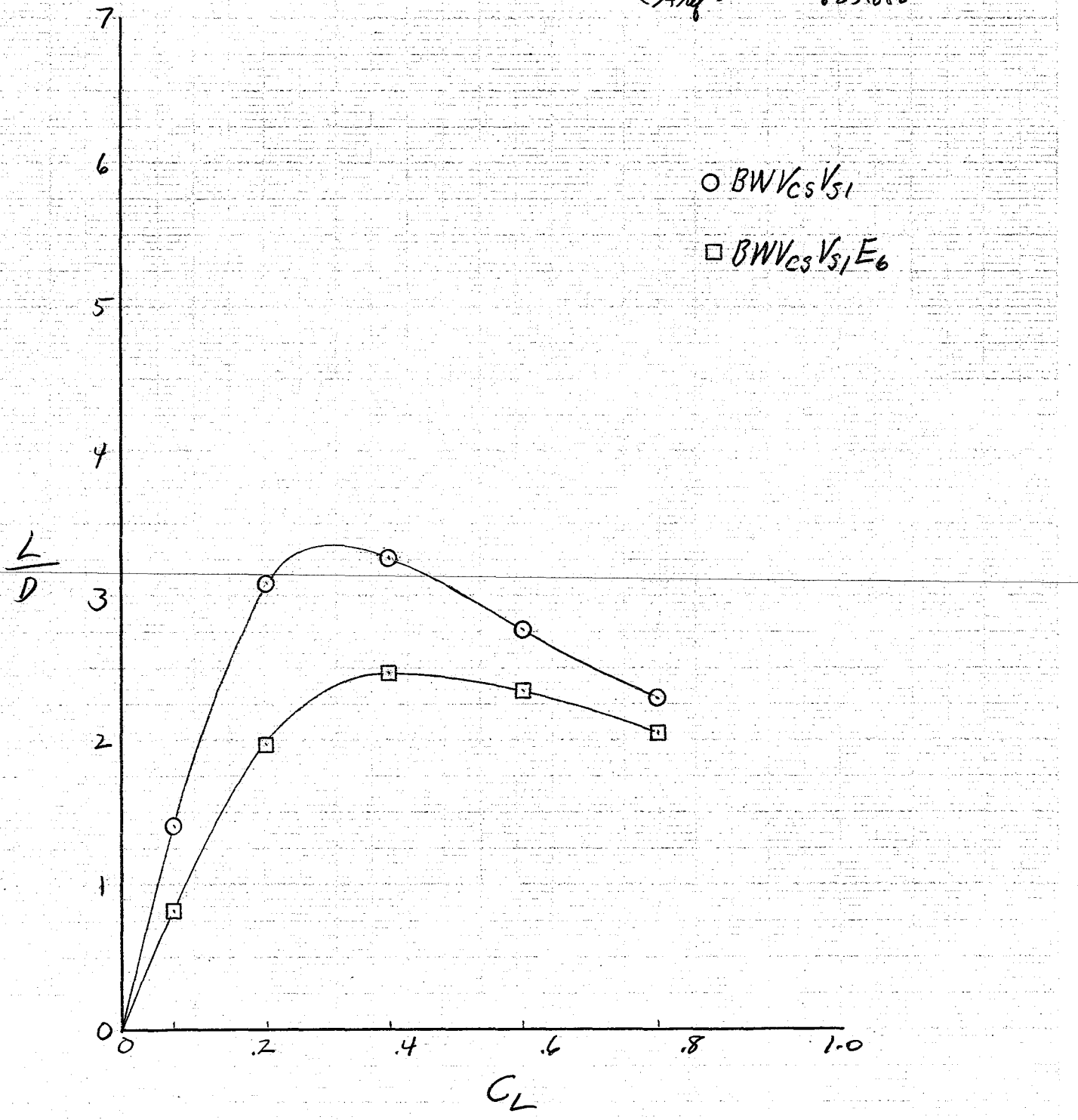
Penland
9-16-76

$M = 0.2, \quad R_l = 100 \times 10^6$

Extrapolated to Flight Re. No.

ΔC_F (Tu. to F(t.)) $= -.0051$

ΔC_D (E_6 eng.) $= 1.40\left(\frac{A_{eng}}{A_{ref}}\right) = 1.4\,\frac{16.68}{625.688} = \pm 0.037322$



L-16 Wing-Body

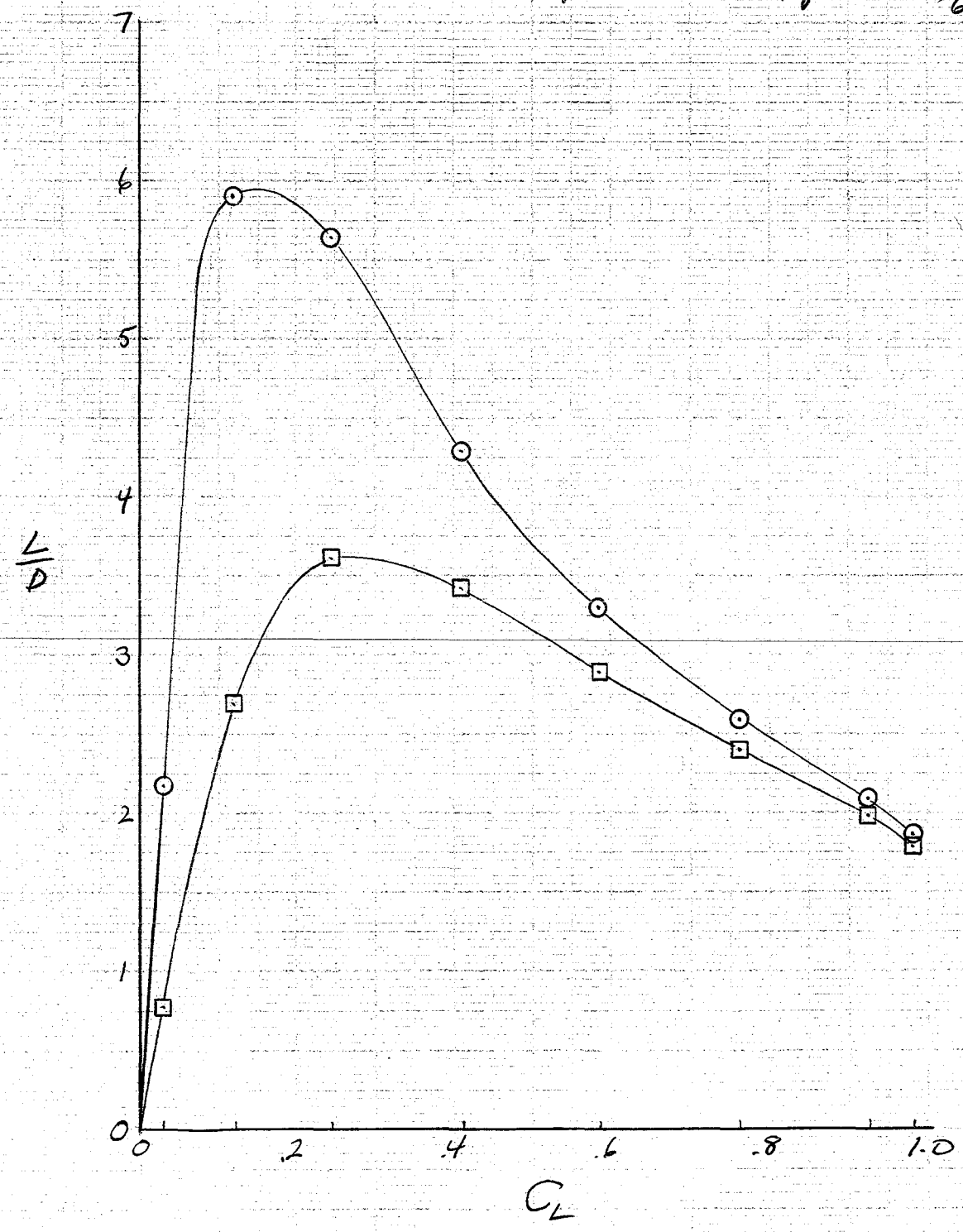
Penland
9-16-76

$M = 0.2, R_\ell = 100 \times 10^6$

Extrapolated to Flight Re. No.

ΔC_F (Tu. to Flt.) $= -0.0051$

ΔC_D (Eb eng) $= 1.40 \frac{A_{eng}}{A_{ref}} = 1.40 \frac{12.45}{605.98} = +0.0236$

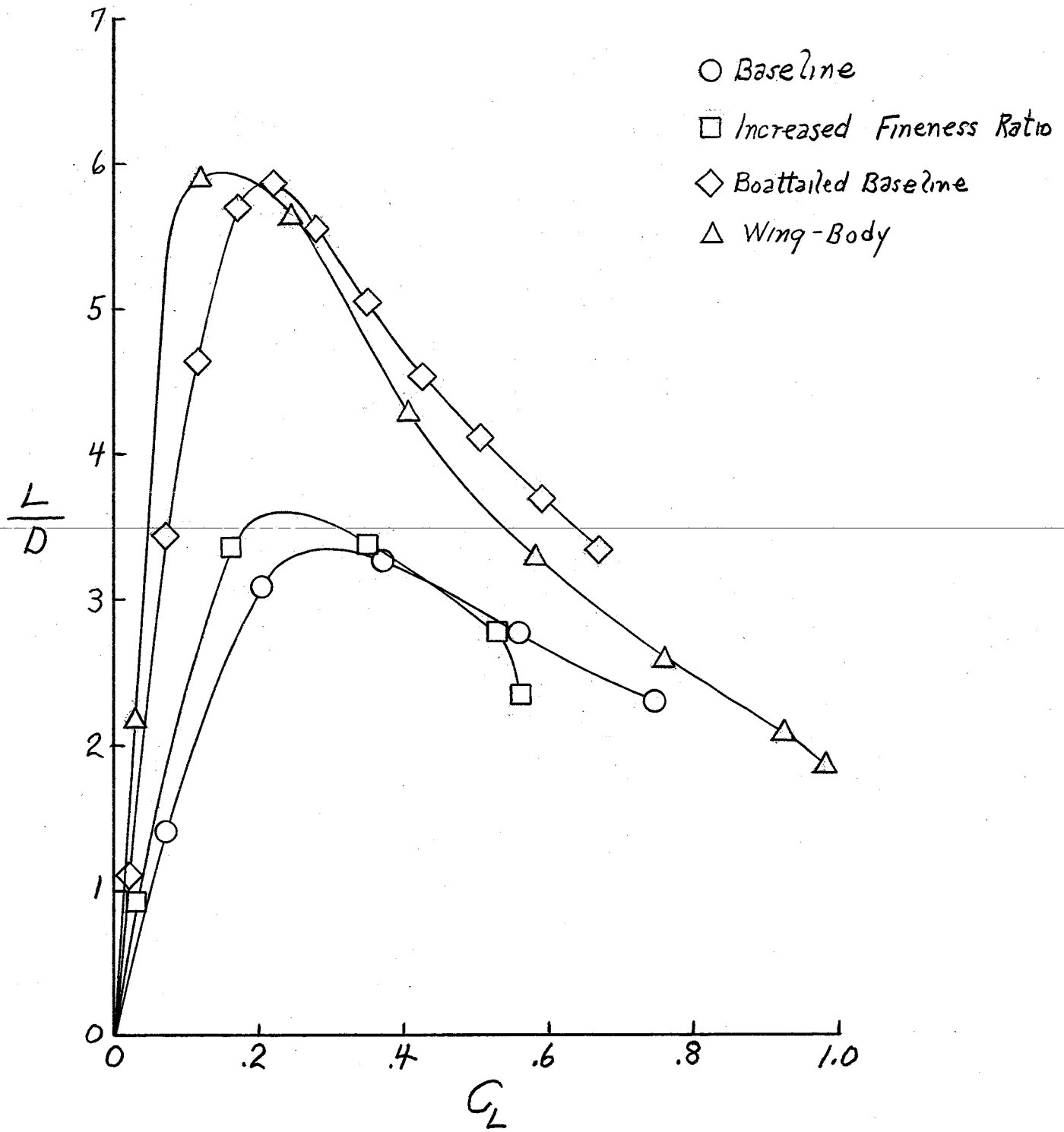


Penland
9-16-76

X-24C

$M \sim .2$, $R_\ell = 10^8$

Without Engine

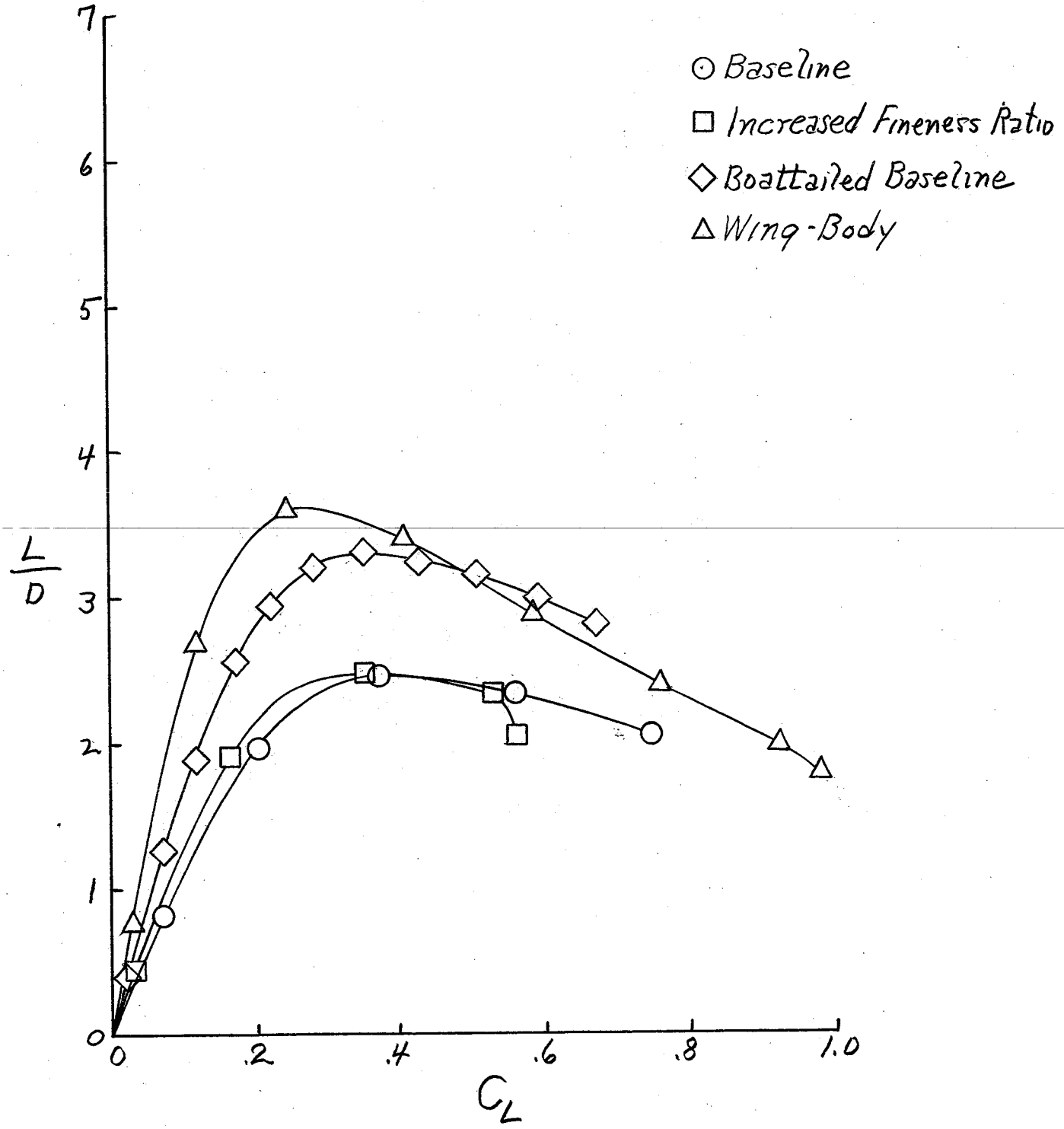


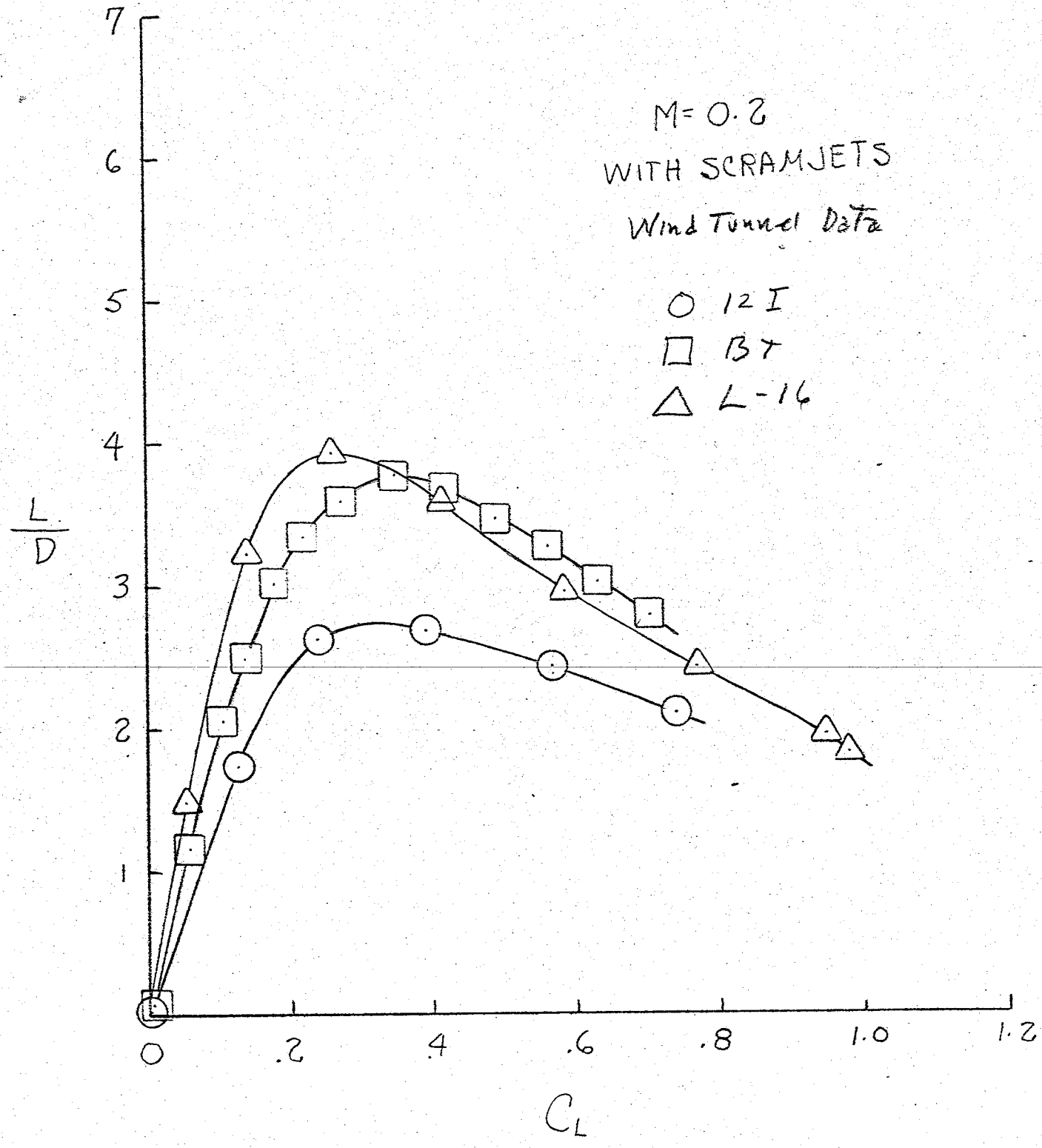
Penland
9-17-76

X-24C

$M \sim .2$, $R_l = 10^8$

With Engine



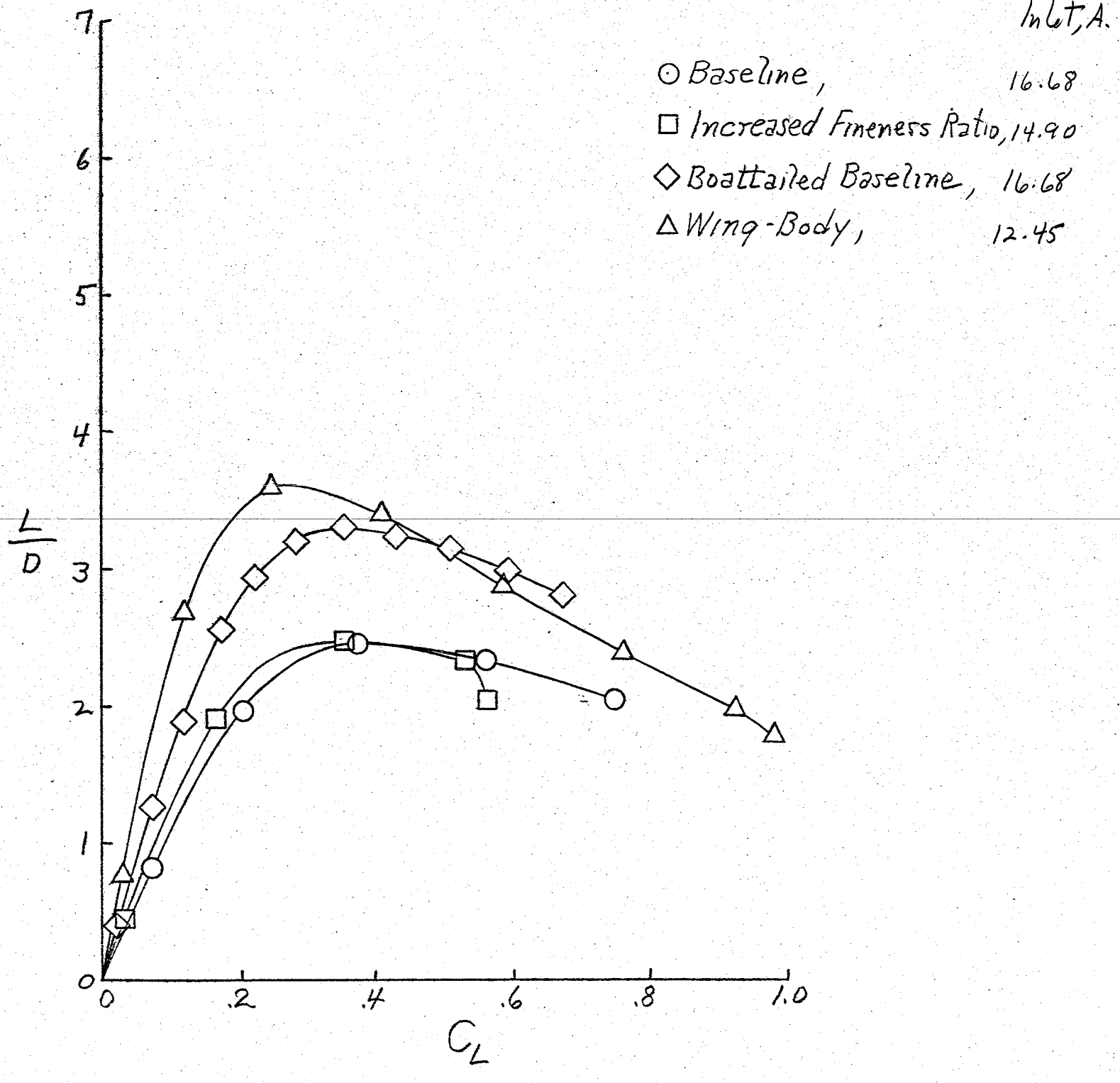

M = 0.8
WITH SCRAMJETS
Wind Tunnel Data
○ 12 I
□ 13 T
△ L-16
L/D
7
6
5
4
3
2
1
0
.2
.4
.6
.8
1.0
1.2
C_L

Penland
9-17-76

X-24C

$M \sim .2$, $R_l = 10^8$

With Engine

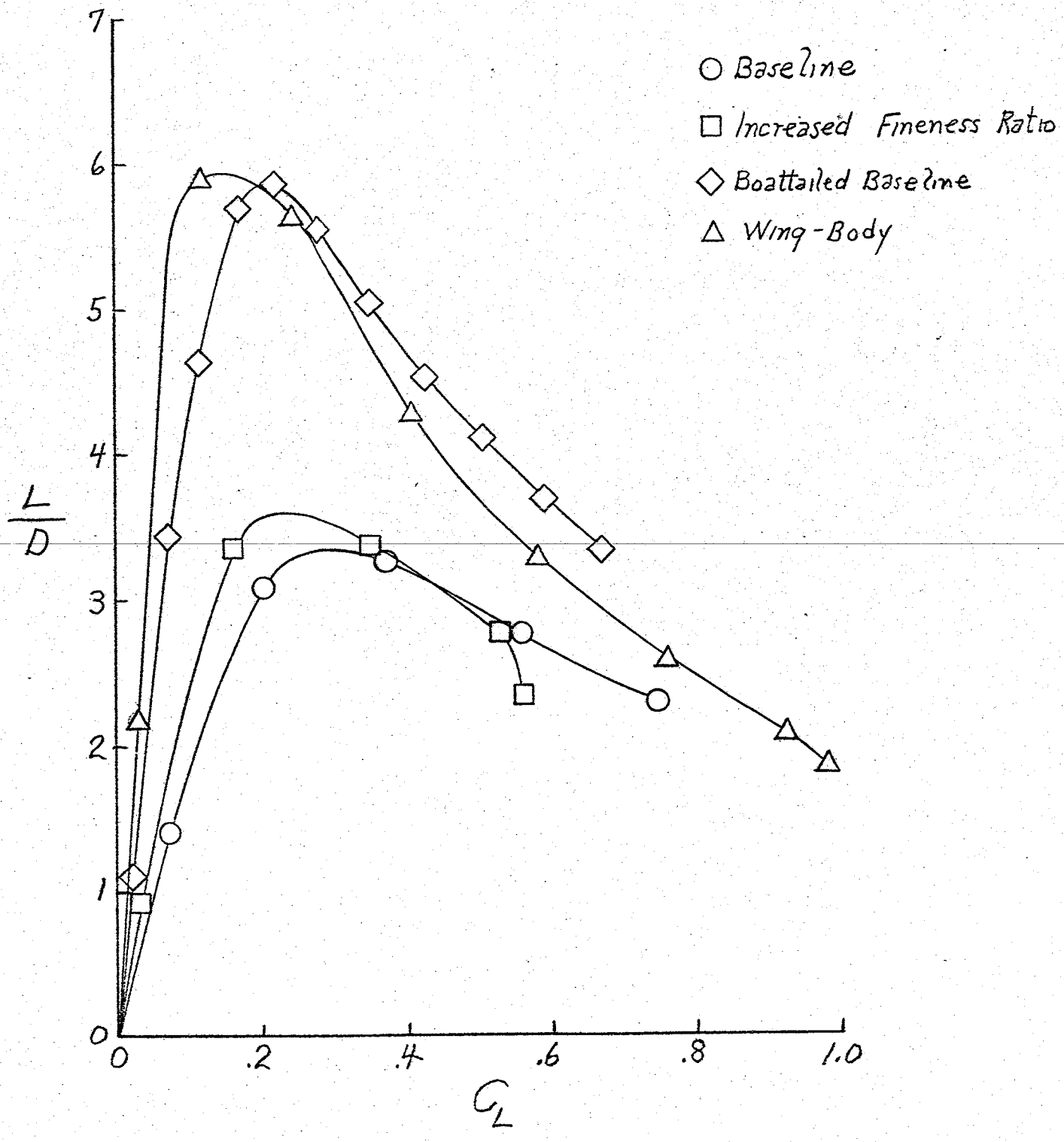


Penland
9-16-76

X-24C

$M \sim .2$, $R_\ell = 10^8$

Without Engine



Extrap. to Flight. $R_L = 100 \times 10^6$

Penland
9-16-76

Run 126 12 I Boattail
17 12 I Baseline

Run No	α		(1) $(C_D - .0051)$	(2) $(C_D + .03222)$		Without E_f (1) C_L/C_D	With E_f (2) C_L/C_D	C_L	
126	-2.90		.02905	.06637		-2.1170	-.9266	-.0615	
$B_{BT}WV_{CSL}$	-.93		.02213	.05945		-1.4099	-.5248	-.0312	
& E_6	1.13		.02018	.05750		1.11497	.3913	.0225	
	3.15		.02136	.05868		3.4363	1.2508	.0734	
	5.20		.02584	.06316		4.6401	1.8984	.1199	
	7.25		.03061	.06793		5.6779	2.5585	.1738	
	9.29		.03768	.07500		5.8599	2.9440	.2208	
	11.35		.05138	.08870		5.53328	3.2052	.2843	
	13.41		.07067	.10799		5.046	3.3022	.3564	
	15.48		.09513	.13245		4.5212	3.2473	.4301	
	17.55		.12417	.16149		4.1097	3.16	.5103	
	19.62		.16097	.19829		3.6827	2.9896	.5928	
	21.70		.20207	.23939		3.334	2.8142	.6737	
	1.11		.02031	.05763		1.1078	.3904	.0225	
17	-4.80		.07936	.11668		-2.9549	-2.0098	-.2345	
$BWV_{CS}V_{S1}$	.65		.05290	.09022		-1.2458	-.73044	.0659	
& E_6	6.11		.05053	.08785		1.3992	.80478	.0707	
	11.49		.06548	.10280		3.0834	1.96401	.2019	
	16.92		.11495	.15227		3.26403	2.46404	.3752	
	22.47		.20239	.23971		2.7650	2.3345	.5596	
	28.19		.32757	.36489		2.2832	2.050	.7479	
	.73		.05279	.09011					

Extrap. to Flight $R_2 = 100 \times 10^6$

Rutland 9-16-76

Run 2 X-1

Run 18 L-16

Run No.	α		$(C_D - .0051)$	$(C_D + .03272)$		C_L/C_D without Eq. (1)	C_L/C_D with Eq. (2)	Planform ref. C_L	
2	-4.04		.06424	.10206		-3.9461	-2.4838	-.2535	
BW/s2Vcs	1.33		.03979	.07761		-2.4504	-1.2563	-.0975	
X1	6.66		.03565	.07347		.91725	.44508	.0327	
	11.89		.04954	.08736		3.3609	1.9059	.1665	
	17.31		.10514	.14296		3.3793	2.4853	.3563	
	22.85		.19088	.22870		2.7829	2.3227	.5312	
	27.18		.24048	.27830		2.3499	2.0305	.5651	
	1.31		.03949	.07731		-2.4462	-1.2495	-.0966	
			$(C_D - .0051$	$C_D + .02366)$					
18	-4.96		.03803	.06679		-5.5746	-3.1741	-.1799	
BW/cs	-.59		.01781	.04657		-3.8405	-1.4688	-.0581	
L-16	3.57		.01590	.04466		2.1761	.7747	.0294	
	7.93		.02416	.05292		5.9023	2.6946	.1210	
	12.44		.05152	.08028		5.6347	3.6161	.2464	
	16.85		.11272	.14148		4.2876	3.4160	.4102	
	21.24		.21033	.23909		3.2796	2.8851	.5854	
	25.76		.34515	.37391		2.5971	2.3974	.7608	
	30.31		.52252	.55128		2.0918	1.9827	.9274	
	32.94		.62051	.64927		1.8648	1.7822	.9820	
			Wing area ref. L-16 only.			C_L wing ref. used. L-16 only.		C_L planform for plotting vs ℓ.	

NASA-Langley Form 10 (AUG 1969)

Inlet Area: 12I & L16 & 52

$(.60)^2 .8(6) = 1.728$ in.

12 I — $\frac{\text{Area Inlet}}{\text{Area (plan)}} = \frac{1.728}{100.11} = 0.017261$ (plan ref.)

L16 — $\frac{1.728}{114.242 \text{ (platform)}} = 0.015126$ (plan ref)

-52 — $\frac{(.5)^2 .8(6)}{67.2 \text{ (wing)}} = \frac{1.2}{} = 0.017857$ (wing ref.)

--52 — $\frac{1.20}{79.96} = 0.01501$ (plan ref)

L16 — $\frac{1.728}{96.957} = 0.017822$ (wing ref)

Flight C_D Cal. For: 12I, BT, X1, & L-16

Baseline: X-24C-12I (Both Original Base & Boattail Versions)

Engine Size: $\frac{\text{Area Rqd.}}{\text{Area Test.}} = \frac{16.68\ ft^2}{10.8} = 1.544$ scale fact. = 1/30

ΔC_{D_0} (engine) = .01 (Test) $\times 1.544 = 0.$ $\times \frac{\text{Aplan}}{\text{Awlf}} \left(\frac{1}{.017241}\right) = 1.773$

- Case w.o. eng. – subtract .0051 to C_D & cal. C_D
- Case with eng. – " " " " & add $1.40 \frac{16.68}{625.6875} = 1.40(.026659) = 0.037322$

ie $-.0051 + .037322 = \boxed{0.03222}$ to C_D & cal C_D

Increased Fineness Ratio: X-24C-X1 1/32.85 = scale fact.

Engine Size: 14.90 $A_{ref} = 73.6\ in^2$, $l = 19.98$

$A_{base} = 6.774$

C_{D_0} (No eng) = .040

- w.o. eng .0051
- with eng $-.0051$ & add $1.40 \frac{14.90}{551.5515} = .03782$

ie $-.0051 + .03782 = \boxed{.03272}$

Wing-Body: X-24C-L16

Engine Size: $\frac{12.45\ ft^2}{10.8} = 1.153$ Scale fact. 1/30

$A_{ref\ wing} = 96.957$

ΔC_{D_0} (engine) = 0.0198 (Test) $\times 1.153 = 0.01$ (Flight)

- Correct C_{D_0} to Planform Ref = .8487(0) = 0.01 (Flight)

- Case w.o. eng. Correct C_{D_0} for C_F = $\boxed{-0.0051}$ =

- Case with eng $-.0051 + \frac{12.45}{105.98} 1.4 = -.0051 + .02876 = \boxed{0.02366}$