Propeller Characterization for QPROP
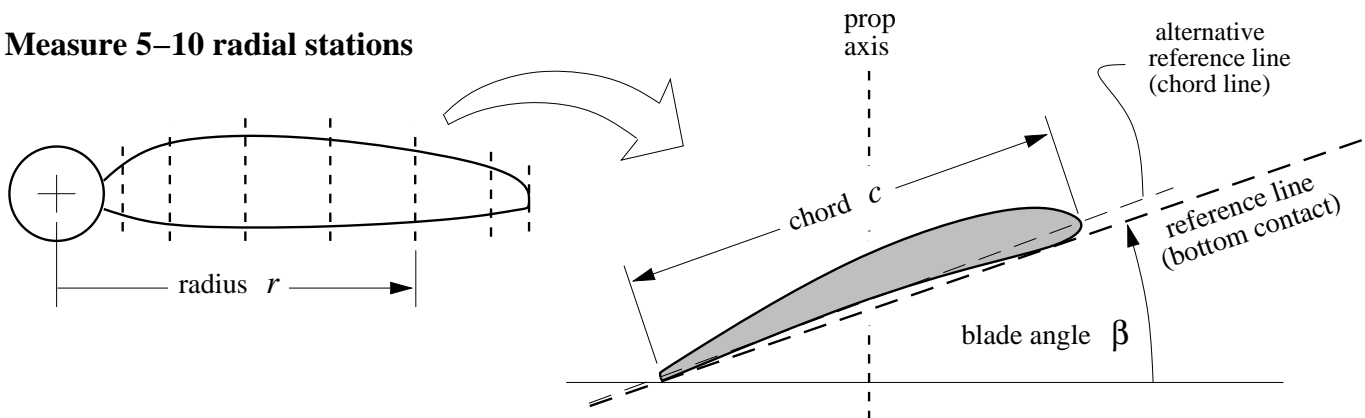
Measure 5–10 radial stations

prop axis

alternative reference line (chord line)

chord c

reference line (bottom contact)

radius r

blade angle β

Measure airfoil at representative ~80% radius station

1) Wrap fine solder around blade airfoil. Carefully slide off blade without bending.

2) Xerox solder with 500%–800% enlargement onto graph paper. Read off about 25–30 x,y coordinates, bunched at LE as shown. Or, scan and digitize using pixelmap edge–finding software.
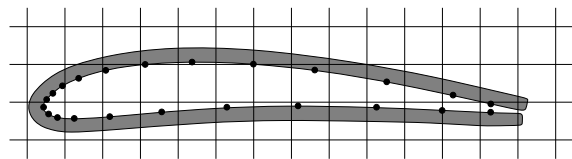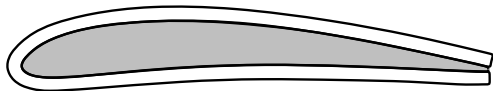
4) Scale coordinates to unit chord, rotate to put your chosen reference line horizontal.

y

x

0.0   1.0
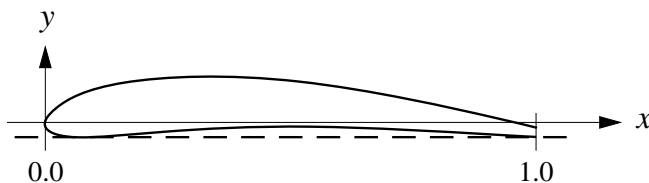
3) Smooth coordinates in XFOIL. Re–panel with 140–180 panels. Alternative: Use closest–fit NACA airfoil, match TE thickness.
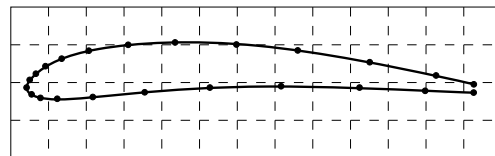
Determine airfoil aero–model parameters

1) Compute XFOIL fixed–Re (Type 1) polars at one or more typical Reynolds numbers.
2) Fit parabola to drag polar. Read off CLCD0, CD0, CD2, CLmax, CLmin.
3) Fit straight line to lift curve. Read off CL0, CL_a.
4) REref is the Reynolds number of polar used for curve fits.
5) Assume REexp = –0.5 , or estimate using additional polars at other Reynolds numbers.

C_L

ΔC_D

CLmax

ΔC_L

$CD2 = \Delta C_D / \Delta C_L^2$

CLCD0

CD0   CLmin

C_D

C_L

fit

computed

ΔC_L

$CL\_a = \Delta C_L / \Delta \alpha$

CL0

$\Delta \alpha$
(radians)

α

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