The Joukowski airfoil is obtained by applying the transformation $z + \frac{1}{2}u$ to a circle. It is a quartic curve. Here we describe another airfoil; it also is a quartic curve given by the equation $AF$:

$$m^2(x^2 + y^2)^2 - 2(x^2 + y^2)(Ax + By) + (Cx + Dy)^2 = 0$$

$A = m(mu - v)$, $B = (2 + m^2)v - mu$, $C = mu - v$, $D = -(u + mv)$. Here is how our curve is obtained. Given two lines $L, M$ meeting at $O$ and a point $P$. For every line $N$ through $P$ make the circle through the three points $O, Q, R$ of $N$ with $L, M$. Our airfoil is the envelope of this family of circles.

Let us choose coordinates so that $O$ is at the origin; $P = (u, v)$, $L$ is the $x$-axis and $M$ has equation $y = mx$. Suppose that the line $N$ meets the $x$-axis at $(t, 0)$ then the equation for $N$ is $y = \frac{v}{u-t}(x - t)$ and it meets $M$ when $mx = \frac{v}{u-t}(x - t)$. Thus the equation of the circle in the family for this line is $x^2 + y^2 - tx - sy$, where $s = \frac{t(mv + u - t)}{m(t-u) + v}$.

The envelope of a family of curves $f(x, y, t)$ depending on a parameter $t$ has an equation obtained by elimination of $t$ from the system $F = f(x, y, t) = 0, G = \frac{\partial f}{\partial t}$, $f(x, y, t) = 0$. We can easily eliminate $t$ from these by computing the discriminant of $F$ with respect to $t$ giving the equation $AF$ above.

This curve has a singularity at the origin and the singular tangents are the factors of the quadratic terms. Since the quadratic term is squared it is a cusp. The line $y = mx$ is also tangent and the curve is tangent to the $x$-axis.

We can rewrite this equation in terms of complex coordinates $z = x + iy$ in order to obtain

$$m^2(z\bar{z})^2 + z\bar{z}(bz + \bar{b}) + 2(f\bar{z}^2 + ez\bar{z} + f\bar{z}^2) = 0.$$ 

Solving we obtain $b = mv - m^2u + I(2v + m^2v - mu)$, $2e = (1 + m^2)(u^2 + v^2)$, $2f = \frac{1}{2}(u^2 - v^2)(m^2 - 1) - 2muv + I(m(v^2 - u^2) + (1 - m^2)vu)$. 


Figure 1. $m = 1.1, u = 1, v = .1$

Using the Maple plot package we obtain the two Figures. 

\begin{verbatim}
implicitplot(subs(m=1.1,u=1,v=.1,AF),x=0..3/2,y=0..1,numpoints=20000)
implicitplot(subs(m=1.1,u=2,v=.3,AF),x=0..3,y=0..1,numpoints=20000)
\end{verbatim}

Figure 2. $m = 1.1, u = 2, v = .3$
Let
\[
x = \frac{vt^2(mt^2 - 2(mu - v)t + (mu - v)(u + mv))}{m^2t^4 - 4m(mu - v)t^3 + 2(3(mu - 2v)(mu - v)t^2 - 4u(mu - v)^2t + (u^2 + v^2)(mu - v))}
\]
\[
y = \frac{vt^2(mt - mu + v)^2}{m^2t^4 - 4m(mu - v)t^3 + 2(3(mu - 2v)(mu - v)t^2 - 4u(mu - v)^2t + (u^2 + v^2)(mu - v))}
\]
then these satisfy the equation \(AF = 0\).

With Maple
\[
p := \text{subs}(m=1.05, u=6, v=.3, x);\]
\[
q := \text{subs}(m=1.05, u=6, v=.3, y);\]
\[
\text{plot([ p, q, t=-300..300], numpoints=3000)}\]
we obtain Figure 3.