An Owl cannot fly without ...

Volume 14, Issue 11
November 2023

Flight Feathers

The official publication of OneWingLowSquadron.org

MEETINGS

FIRST SATURDAY OF THE MONTH AT 11AM

NO MEETINGS JULY/AUGUST

NEXT MEETING:

DECEMBER 2nd

EMERGENCY CALLS FROM OUR FIELD

352-485-5111

2023

WISE OWLS

RON SANDERS
PRESIDENT & TREASURER
~
RICHARD GIBSON
VICE PRESIDENT
~
GILBERT PRIEUS
SECRETARY
~
ART SCHEURER
SAFETY COORDINATOR & FIELD MARSHALL
~
BRET MARTIN
FERNANDO MESA
AMA INTRO PILOT INSTRUCTORS

A Message from the President of Orlando Buzzards per Tangerine Soaring

"Finally, thanks to the OWLS club for giving up their weekend of flying for us, Fernando and Ron took care of all the coordinating and getting the permission from the Marshall family to use the barn, field and camping, a few club members stopped by to watch and conversate.

Thanks everyone, see you at Hodges field in March.
Raed"

A Message From Bert:

"I updated the photo gallery menu on our website and provide some very realistic looking photos. I also made a small upgrade to the gallery and now folks can click on most photos for a larger view. Individual member photos are exempt, but all others can be expanded."

Link provided:
OWLS 2023 – One Wing Low Squadron
http://onewinglowsquadron.org/owls-2023/

A Very Interesting Video

Although our club is not focused on model rocketry, this branch of hobby flying has made some amazing progress, inspired by the progress of full-sized rockets. The following is a link to a YouTube video of a model rocket that demonstrates just such impressive flying.

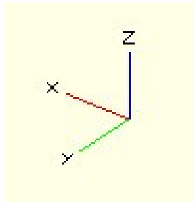
https://www.facebook.com/reel/1266436394750048

From the "Scientist's Corner"

And finally, to compensate for a lack of photos this month, I am presenting an article on airfoils.

The Scientist Corner

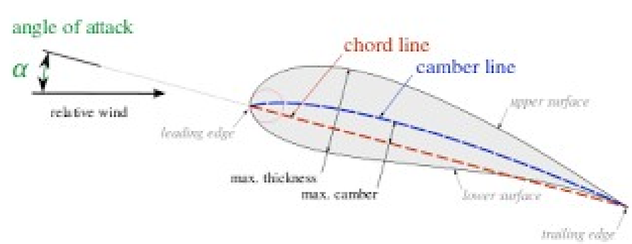
Ed Centanni



Basic Airfoils

In this article I will be talking about airfoils, particularly as they relate to RC aircraft. _Definition:_ an airfoil is any surface, such as a wing, stabilizer, propeller, or rotor, designed to aid in lifting or controlling an aircraft by interacting with the air currents through which it moves. Even though I will be primarily focused on wings, the same principles apply to the other above aircraft components. Airfoils produce lift when there is a difference in the speed of the air flowing over the top and bottom surfaces of the wing. The surface with the faster airspeed has less pressure and essentially sucks the wing in that direction.

First let's define some terms. A picture is worth a thousands words but I'll provide some words too.



Angle of Attack: The angle

Leading Edge: The front most edge of a wing immediately facing the airflow

Trailing Edge: The rear most edge of a wing.

Chord: The chord is the length, in a straight line, from the leading edge to the trailing edge

Wing Span: The maximum extent across the wings of an aircraft measured from wingtip to wingtip.

Camber: The convex or arched shape of a surface. A wing may have none, 1, or two cambered surfaces

Camber line: A line that runs from the leading edge to the trailing edge at an equal distance between the upper and lower surfaces of a wing

Laminar flow: This is when a fluid (air) flows over a surface with little or no disruption between the layers of the fluid – air flows without turbulence.

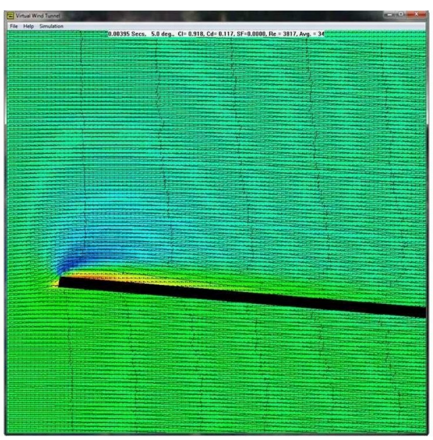
Boundary Layer: As air flows over a surface some of the air particles stick to the surface and effectively become part of the surface and modify its shape by extending its height. This is called the boundary layer.

Reynolds Number (RN): This is a number that corresponds to the amount of laminar flow or turbulent flow of air over a square foot surface. High RN means a relatively turbulent flow, low RN means a more smooth (Laminar) flow. This number is acquired using a complex formula that takes into account the speed, mass, compressibility, and viscosity of the air. R/C aircraft typically operate with Reynolds Numbers less than 500,000 (Laminar flow) as opposed to a full scale aircraft which operates with a turbulent boundary layer.

NACA: National Advisory Committee for Aeronautics. In the late 1920s and into the 1930s, NACA developed a series of thoroughly tested airfoils. The shape of the airfoils is described using the word NACA followed by a series of 4 digits that can be entered into calculations to generate the cross section of the airfoil and and calculate it's properties. Here's a link to an online NACA calculator: http://airfoiltools.com/airfoil/naca4digit

Types of airfoils:

Flat: A wing can be simply a flat rectangular surface. When the flat wing to rotated to provide a positive angle of attack, some of the air layers flowing over the top separates from the surface and form a separation bubble just behind the leading edge effectively creating a short cambered surface that produces lift. If the angle of attack is negative then negative lift is produced. These types of RC aircraft tend to have pitch instability at higher speeds when the angle of attack becomes small or zero.



Conventional: A conventional wing has one (asymmetric) or two (symmetric) curved surfaces. A single curved surface is usually the upper. The camber of these surfaces can be positive or negative. This shape is considered the most efficient for lift and drag and is the most common used in both full size and RC aircraft. Here are some examples of conventional wing shapes. Red indicates a turbulent flow, black a laminar flow and blue is supersonic. From to top bottom:

--RC Park flyer

--RC Pylon Racer

--Full size Laminar Flow wing

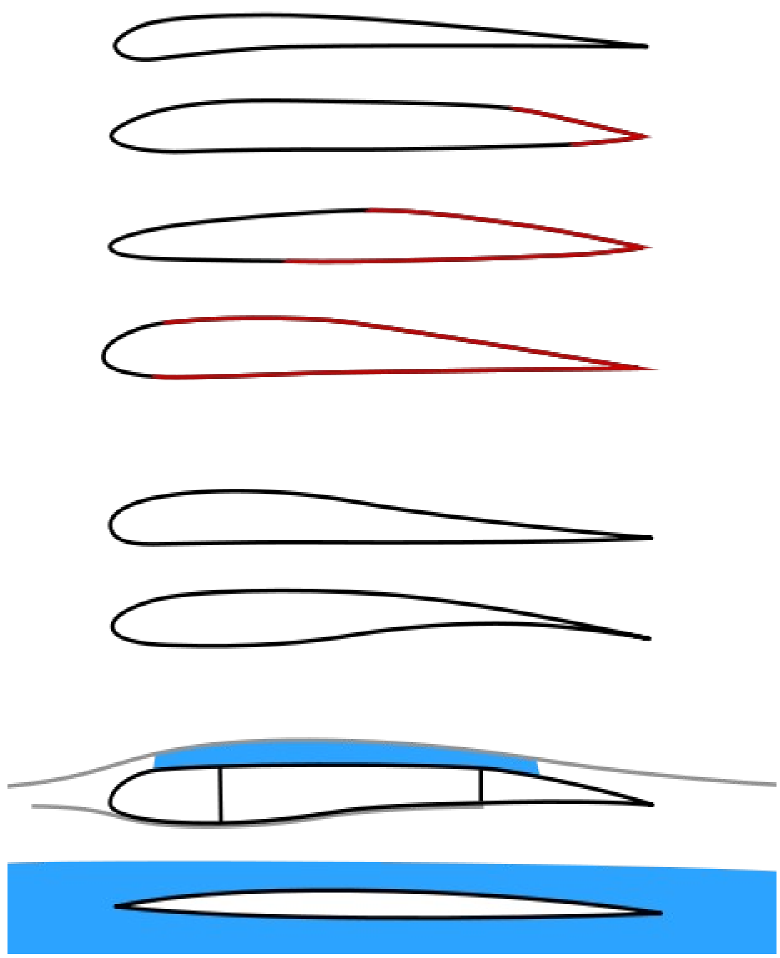
--Jet Airliner

--Flying Wing

--Aft loaded wing with room for large spar (glider?)

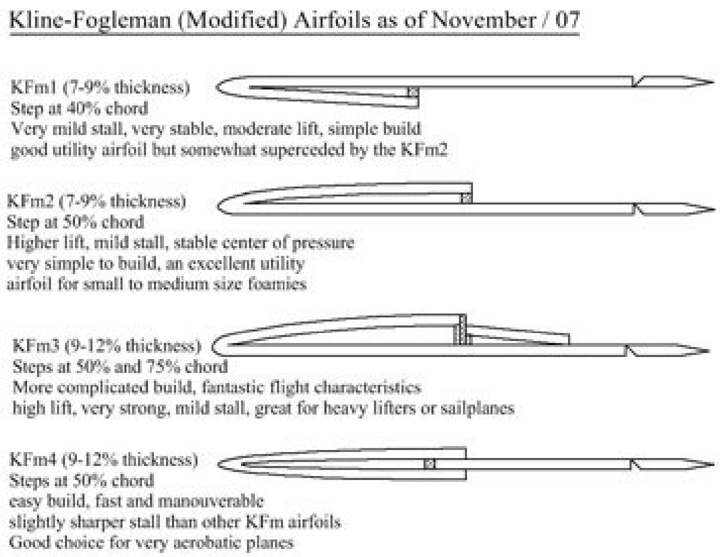
--Transonic supercritical

--Supersonic.



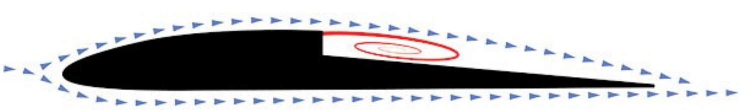
Kline-Fogleman: The Kline-Fogleman airfoil is a relatively recent invention that came from a desire to build a superior paper airplane glider.

Although not as efficient as conventional airfoils in terms of lift it has found popularity in the RC aircraft world due to ease of construction, excellent stall characteristics, low drag, and suitability to non-traditional materials and smaller forms.

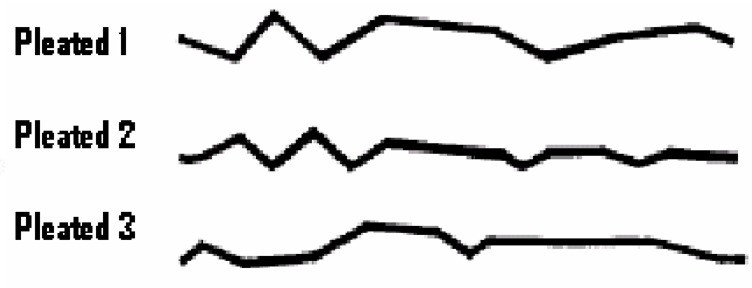


The airfoil forms a vortex bubble behind the step that extends to the trailing edge effectively halving the surface of the wing that presents resistance to the air flow. Additionally the center of lift is spread over a wider area making the Center of Gravity less critical to stable flight.

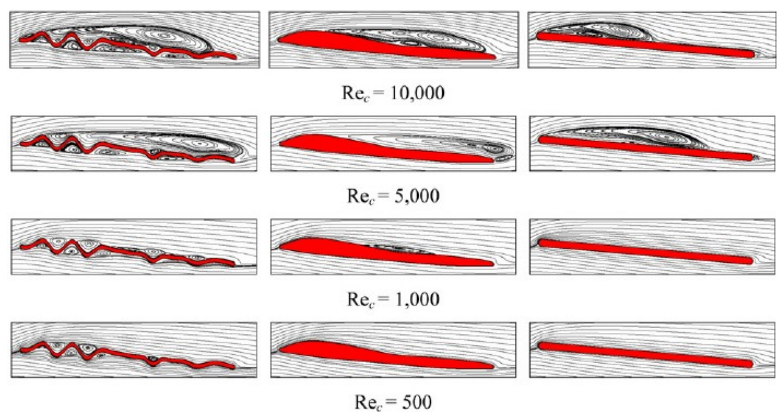
Link to a KF airfoil dimension calculator is here: http://kf.ideabadger.com/



Dragonfly: The dramatic decrease in honey bee populations and a desire to have replacement mechanical pollinators (and ultra small surveillance aircraft) have spurred research into the airfoils of small insects. It was found that the fast and maneuverable dragonfly has a pleated shape airfoil. The following is the airfoil shapes of a dragonfly wing at three different areas from the wing root (pleated 1) to the wing tip (pleated 3).



Research comparing the characteristics of the dragonfly wing, a comparable conventional airfoil, and a flat wing was performed and a chart appears below. It shows the flow characteristics and Reynolds numbers of the three wing types at different air speeds. It was found that lift of the pleated wing was superior to the comparable conventional wing suggesting that the multiple vortexes generated in the pleat valleys contributed to lift.



The wings used in the research were small sized but much larger than an actual dragonfly wing. The chord was roughly 80mm, the span was 280mm and the thickness was 6mm. A link to the research paper is here: http://jeb.biologists.org/content/jexbio/203/20/3125.full.pdf