JANUARY 2013 ISSUE 132

Servo Chatter

Palmerston North Aeroneers

www.aeroneers.com

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Xmas BBQ 2012

PRESIDENTIAL PONDERINGS

PRESIDENT'S REPORT

Happy New Year.

With the Nationals in the South Island this year, I do not think anyone from the Aeroneers went down.

The Christmas BBQ was a great night. The Glider Club made us very welcome, the weather was good, the food was good and many thanks to those who helped out with tables and chairs and food preparation.

The Tomboy competition was won by Bruce Woodfield with a well built unit. Competition for this class should start in February so watch your calendar for Vintage and Tomboy.

We still have not had a "Cub" day mainly because of the weather, but this will happen in February so "Cub men" keep watch on the calendar.

The AGM is coming up in February so if any members want to put their names forward I am sure you will enjoy being involved with the Club. New people have new ideas.

The farmer hopes to have the hay removed before the end of January and then we will be able to have gliding and vintage.

Happy flying.

Peter Vining
President

January 2013

You know that your landing gear is up and locked when it takes FULL power to taxi to the terminal.

CLUB CAPTAIN

Top 15 Reasons To Date A Pilot

We know how to push all the right buttons
Suck, Squeeze, Bang, Blow aren't just the 4 cycles of an engine
A little turbulence makes things interesting
We make smooth precision approaches
We can go upside down, right side up or all around
We spend a lot of time holding it in position
We are federally licensed to go down your landing strip
We have good hand – eye coordination
We can go with or without seeing (VFR vs IFR)
High thrust capabilities
We know a bunch of different maneuvers
High manifold pressure and high RPM make for a good climb
We like to go fast
We get up and stay up for hours
We have extensive training and get proficient by soloing

Charging Lithium-ion Continued

Li-ion cannot absorb overcharge, and when fully charged the charge current must be cut off. A continuous trickle charge would cause plating of metallic lithium, and this could compromise safety. To minimize stress, keep the lithium-ion battery at the 4.20V/cell peak voltage as short a time as possible.

Once the charge is terminated, the battery voltage begins to drop, and this eases the voltage stress. Over time, the open-circuit voltage will settle to between 3.60 and 3.90V/cell. Note that a Li-ion battery that received a fully saturated charge will keep the higher voltage longer than one that was fast-charged and terminated at the voltage threshold without a saturation charge.

If a lithium-ion battery must be left in the charger for operational readiness, some chargers apply a brief topping charge to compensate for the small self-discharge the battery and its protective circuit consume. The charger may kick in when the open-circuit voltage drops to 4.05V/cell and turn off again at a high 4.20V/cell. Chargers made for operational readiness, or standby mode, often let the battery voltage drop to 4.00V/cell and recharge to only 4.05V/cell instead of the full 4.20V/cell. This reduces voltage-related stress and prolongs battery life.

Some portable devices sit in a charge cradle in the on position. The current drawn through the device is called the parasitic load and can distort the charge cycle. Battery manufacturers advise against parasitic load because it induces mini-cycles. The battery is continuously being discharged to 4.20V/cell and then charged by the device. The stress level on the battery is especially high because the cycles occur at the 4.20V/cell threshold.

A portable device must be turned off during charge. This allows the battery to reach the set threshold voltage unhindered, and enables terminating charge on low current. A parasitic load confuses the charger by depressing the battery voltage and preventing the current in the saturation stage to drop low. A battery may be fully charged, but the prevailing conditions prompt a continued charge. This causes undue battery stress and compromises safety.

Battery professionals agree that charging lithium-ion batteries is simpler and more straightforward than nickel-based systems. Besides meeting the voltage tolerances, the charge circuits are relatively simple. Limiting voltage and observing low current in triggering “ready” is easier than analyzing complex signatures that may change with age. Charge currents with Li-ion are less critical and can vary widely. Any charge will do, including energy from a renewable resource such as a solar panel or wind turbine. Charge absorption is very high and with a low and intermittent charge, charging simply takes a little longer without negatively affecting the battery. The absence of trickle charge further helps simplify the charger.

Overcharging Lithium-ion

Lithium-ion operates safely within the designated operating voltages; however, the battery becomes unstable if inadvertently charged to a higher than specified voltage. Prolonged charging above 4.30V forms plating of metallic lithium on the anode, while the cathode material becomes an oxidizing agent, loses stability and produces carbon dioxide (CO2). The cell pressure rises, and if charging is allowed to continue the current interrupt device (CID) responsible for cell safety disconnects the current at 1,380kPa (200psi).

Should the pressure rise further, a safety membrane bursts open at 3,450kPa (500psi) and the cell might eventually vent with flame. The thermal runaway moves lower when the battery is fully charged; for Li-cobalt this threshold is between 130–150C°C (266–302°F), nickel-manganese-cobalt (NMC) is 170–180°C (338–356°F), and manganese is 250°C (482°F). Li-phosphate enjoys similar and better temperature stabilities than manganese.

BATTERY UNIVERSITY

Lithium-ion is not the only battery that is a safety hazard if overcharged. Lead- and nickel-based batteries are also known to melt down and cause fire if improperly handled. Nickel-based batteries have also been recalled for safety concerns. Properly designed charging equipment is paramount for all battery systems.

Over-discharging Lithium-ion Li-ion should never be discharged too low, and there are several safeguards to prevent this from happening. The equipment cuts off when the battery discharges to about 3.0V/cell, stopping the current flow. If the discharge continues to about 2.70V/cell or lower, the battery's protection circuit puts the battery into a sleep mode. This renders the pack unserviceable and a recharge with most chargers is not possible. To prevent a battery from falling asleep, apply a partial charge before a long storage period.

Battery manufacturers ship batteries with a 40 percent charge. The low charge state reduces aging-related stress while allowing some self-discharge during storage. To minimize the current flow for the protection circuit before the battery is sold, advanced Li-ion packs feature a sleep mode that disables the protection circuit until activated by a brief charge or discharge. Once engaged, the battery remains operational and the on state can no longer be switched back to the standby mode.

Do not recharge lithium-ion if a cell has stayed at or below 1.5V for more than a week. Copper shunts may have formed inside the cells that can lead to a partial or total electrical short. If recharged, the cells might become unstable, causing excessive heat or showing other anomalies. Li-ion packs that have been under stress are more sensitive to mechanical abuse, such as vibration, dropping and exposure to heat.

Charging Lithium-ion Polymer

Charging Li−ion polymer, also referred as Li-polymer, is very similar to a regular lithium-ion battery and no changes in algorithm are necessary. Most users won't even know if their battery is Li−ion or Li−polymer. The word "polymer" has been used as promotional hype and does not reflect special attributes other than to know that the battery is built in a different way to a standard Li-ion. Most polymer batteries are based on a hybrid architecture that is a cross between Li-ion and Li-polymer. There are many variations within the polymer family, and the true dry polymer battery for the consumer market is still years away. Also know as the "plastic battery," this system was first announced in early 2000 but was never able to attain the conductivity needed for most applications at ambient temperatures. Read more about the Lithium-polymer battery and the Pouch Cell. Simple Guidelines for Charging Lithium-based Batteries • A portable device should be turned off while charging. This allows the battery to reach the threshold voltage unhindered and reflects the correct saturation current responsible to terminate the charge. A parasitic load confuses the charger.

- Charge at a moderate temperature. Do not charge below freezing.
- Lithium-ion does not need to be fully charged; a partial charge is better.
- Chargers use different methods for "ready" indication. The light signal may not always indicate a full charge.
- Discontinue using charger and/or battery if the battery gets excessively warm.
- Before prolonged storage, apply some charge to bring the pack to about half charge.
- Over-discharged batteries can be "boosted" to life again. Discard pack if the voltage does not rise to a normal level within a minute while on boost.

To be continued…

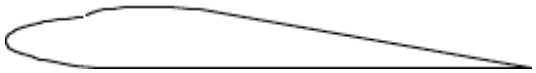
HOW DO WINGS WORK? CONTINUED

MODEL AIRPLANES, THE BERNOULLI EQUATION, AND THE COANDA EFFECT © 1994 by Jef Raskin (who played major role in development of first Apple Mac)

Continued from last month:

ALBERT EINSTEIN'S WING

My friend Yesso, who works for the aircraft industry (though not as a designer), came up with a proposed improved airfoil. Reasoning along the lines of the common explanation he suggested that you should get more lift from an airfoil if you restarted the top's curve part of the way along:



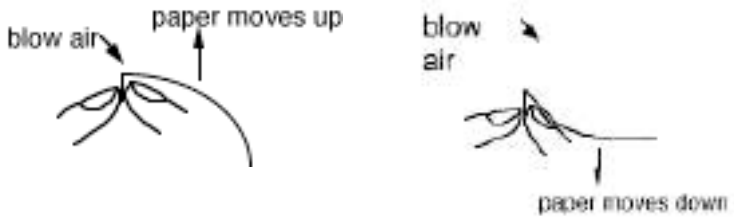
An extra lump for extra lift? This is just a "reasonable" version of the lumpy airfoil that I presented above. Yesso's idea was, of course, based on the concept that a longer upper surface should give more lift. I was about to tell Yesso why his foil idea wouldn't work when I happened to talk to Jörgen Skögh. He told me of a humped airfoil Albert Einstein4 designed during WWI that was based on much the same reasoning Yesso had used [Grosz 1988].

Albert Einstein's airfoil. It had no aerodynamic virtues. This meant that instead of telling Yesso merely that his idea wouldn't work, I could tell him that he had created a modernized version of Einstein's error! Einstein later noted, with chagrin, that he had goofed.

EVIDENCE FROM EXPERIMENTS

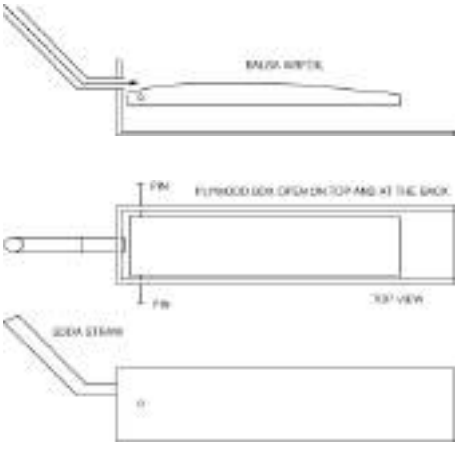
If it were the case that airfoils generate lift solely because the airflow across a surface lowers the pressure on that surface then, if the surface is curved, it does not matter whether it is straight,concave, or convex; the common explanation depends only on flow parallel to the surface. Here are some experiments that you can easily reproduce to test this idea.

1. Make a strip of writing paper about 5 cm X 25 cm. Hold it in front of your lips so that it hangs out and down making a convex upward surface. When you blow across the top of the paper, it rises. Many books attribute this to the lowering of the air pressure on top solely to the Bernoulli effect.



Now use your fingers to form the paper into a curve that it is slightly concave upward along its whole length and again blow along the top of this strip. The paper now bends downward.

2. As per the diagrams, build a box of thin plywood or cardboard with a balsa airfoil held in place with pins that allow it to flap freely up and down. Air is introduced with a soda straw. That's one of the nice things about science. You don't have to take anybody's word for a claim, you can try it yourself!6In this wind tunnel the air flows only across the top of the shape. A student friend of mine made another where a leaf blower blew on both top and bottom and he got the same results, but that design takes more effort to build and the airfoil models require leading and trailing edge refinement. Incidentally, I tried to convince a company that makes science



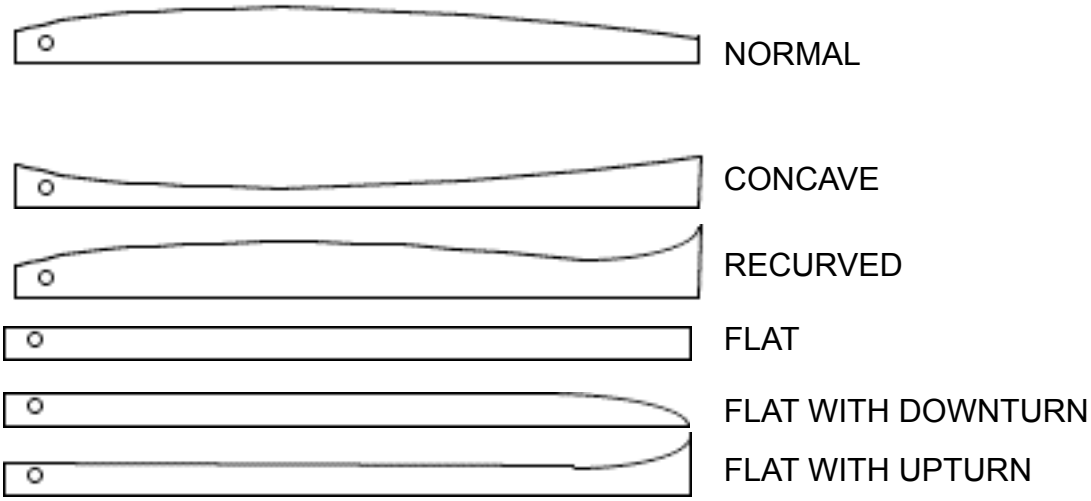
HOW DO WINGS WORK?

demonstrators to include this in their offerings. They weren't interested in it because "it didn't give the right results.""Then how does it work?" I asked. "I don't know," said the head designer.

An experiment may be difficult to interpret but, unless it is fraudulent, it cannot give the wrong results.

AIRFOIL DEMONSTRATOR.

These drawings are full size, but the exact size and shape aren't important. I made a number of airfoils to test. Here are drawings of the ones I made:



EXPERIMENTAL RESULTS

When the straw is blown into, the normal airfoil promptly lifts off the bottom and floats up. When the blowing stops, it goes back down. This is exactly what everybody expects. Now consider the concave shape; the curve is exactly the same as the first airfoil , though turned upside down. If the common explanation were true, then, since the length along the curve is the same as with the "normal" example, you'd expect this one to rise, too. After all, the airflow along the surface must be lowering the pressure, allowing the normal ambient air pressure below to push it up. Nonetheless, the concave airfoil stays firmly down; if you hold the apparatus vertically, it will be seen to move away from the airflow.

In other words, an often-cited experiment which is usually taken as demonstrating the common explanation of lift does not do so; another effect is far stronger. The rest of the airfoils are for fun--try to anticipate the direction each will move before you put them in the apparatus. It has been noted that "progress in science comes when experiments contradict theory" [Gleick 1992] although in this case the science has been long known, and the experiment contradicts not aerodynamic theory, but the often-taught common interpretation. Nonetheless, even if science does not progress in this case, an individual's understanding of it may. Another simple experiment will lead us toward an explanation that may help to give a better feel for these aerodynamic effects.

To be continued...

THE WIRE POST.....

THIS JUST IN FROM THE WIRE POST:- SOME WEBSITES TO PERUSE WHILE THE GLUE IS SETTING DURING THOSE LONG COLD WINTER EVENINGS....

Companies that did not spend quite any time considering how their online name might appear!

1. 'Who Represents' is where you can find the name of the agent who represents any celebrity. Their website is:
www.whorepresents.com

2. 'Experts Exchange' is a knowledge base where programmers can exchange advice and views at:
www.expertsexchange.com

3. Looking for a great pen? Look no further than 'Pen Island ....' It can be found at:
www.penisland.net

4. Need a therapist? Try 'Therapist Finder' at:
www.therapistfinder.com

5. Then there's the 'Italian Power Generator' Company. Check it out at:
www.powergenitalia.com

6.'IP computer' software, there's always:
www.ipanywhere.com

7. And the designers at 'Speed of Art' await you at their wacky Web site:
www.speedofart.com

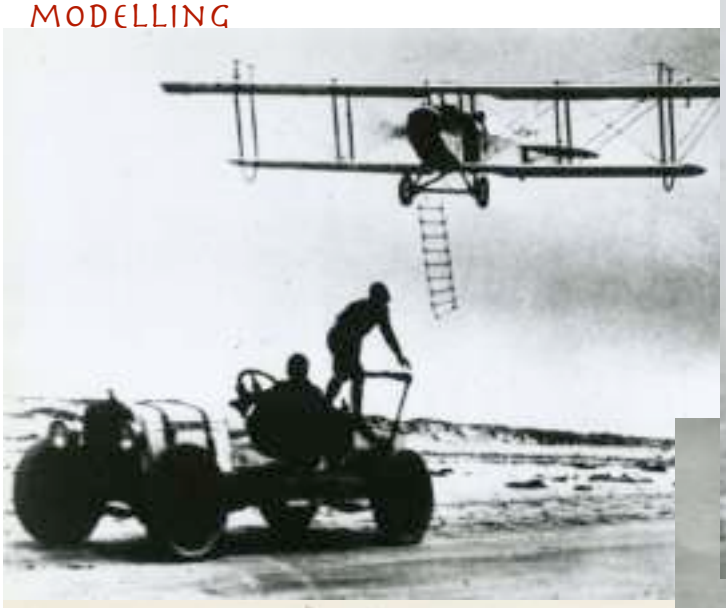
These are not made up. Check them out yourself!

Seen by the Wire Post himself on the side of a building in Castle Hill, NSW. The company, apparently, analysed gasses for a living and called their company 'Analgas Pty Ltd'

It's only 11 months until Christmas so its time to start getting into the mood. . ..

THE WIRE POST.....

THIS JUST IN FROM THE WIRE POST:- WAYS TO AMUSE YOUR SELF WHEN NOT MODELLING



CLUB DETAILS

Opinions expressed in this publications are those of each contributor only. The Editor and Committee reserve all right in respect of submitted material.

Contributors are reminded that the deadline for publication is the 20th of each month.

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