JCRC Flight Line

2019 Volume IV April 2019

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Board Members

	Term
TIM EDWARDS –	2019 – 2019
CRAIG QUILLEN –	2019 – 2020
TERRY BAILEY –	2019 – 2021
ANTHONY HALL–(CHAIRMAN)	2017 – 2022
ED MCENTIRE –	2019 – 2019
SKIP WELLER –	2019 – 2024

President's Message

As you know, our Vice President has resigned. There will be a special election at the April meeting to fill the position for the remainder of the year. Until then, Anthony Hall is the acting VP. Please send any nominations for Vice President to me, by e-mail, no later than 21 April, and, of course, nominations can be made at the April meeting. Congratulations and welcome to Ed McEntire who was elected to fill the remainder of the vacated board seat until the November regular elections. Thanks Ed.

Dan Jackson

Quotable Quotes

He who would learn to fly one day must first learn to stand and walk and run and climb and dance; one cannot fly into flying.

Friedrich Nietzsche

If God had really intended men to fly, he'd make it easier to get to the airport.

— George Winters

Editor

Please send your input either by e-mail (rossgtenn@gmail.com) or post - Glenn Ross, 134 Chock Creek Road, Johnson City, TN 37601-3639 - by the 19th of the month you would like it included. Electronic input should be .jpegs and word documents (.doc or .docx).

THANKS!

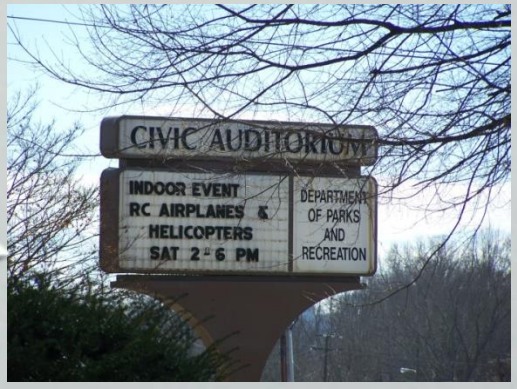
Glenn Ross

Next Meeting

Tuesday, 30 April, 2019, 6:45 PM at Odom – Fennell Field, Tri Cities Model Airport

FYI -

Saturday the sixteenth of March was our second Indoor Fun Fly for 2019. Held again at the Kingsport Auditorium, it was disappointing as only two club Officers and four flyers showed up. A couple of visitors did drop by…….



Everyone knows we're here, but that doesn't help if no one shows up.

Wonder if anyone's coming?

Those who came had plenty of room.

One is the loneliest number that you'll ever do…

Upcoming Activities

Spring Work Day

9 AM till 3 PM, 13 April 2019
at Odom-Fennell Field

Spring Fun Fly In

10 AM till 3 PM, 27 April 2019
at Odom-Fennell Field

Joe Nall

10 – 18 May at the
Triple Tree Aerodrome,
Woodruff, South Carolina

Chill and Grill

6 PM till Dusk, every Tuesday evening, Rain or Shine starting 7 May and running through 27 August at Odom-Fennell Field.

Join us for Burgers or Hot Dogs with flying and fellowship – unless there's

lightening !!

Giving credit where credit is due, the following is Part two of an article published in the March 1, 2002 edition of Sailplane & Electric Modeler Magazine. I would credit the author by name but I still can't find it.:

Power Requirements

Both pitch and diameter affect how much output power the motor must produce to turn the propeller at a given rpm. The following equation shows the relationship between motor output power (also called shaft power, or propeller input power), rpm, pitch, and diameter:

$$power = k\ rpm^3\ diameter^4\ pitch$$

The factor ***k*** depends on the units used to express power, pitch, and diameter, and also on characteristics of the propeller such as the airfoil it uses, its overall shape, thickness, and so on. For power in Watts, and diameter and pitch in inches, ***k*** is about 5.3×10-15 for an average model airplane propeller.

This formula tells us a number of things. First, it tells us that rpm is not directly proportional to power. Doubling the shaft power and keeping pitch and diameter the same will only increase rpm by a factor of 1.26 (the cube root of 2).

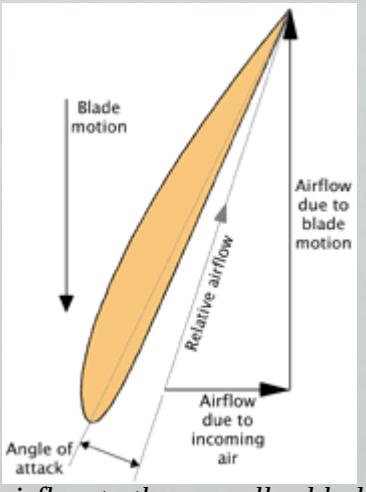
It also tells us that increasing the pitch slightly will increase the power requirements slightly, whereas a slight increase in diameter will result in a dramatic increase in power needed to maintain the same rpm. For example, going from a 10 inch propeller to an 11 inch propeller of the same diameter would require 1.46 times the power to maintain the same rpm (11/10 to the fourth power). Or, if the shaft power were kept the same, the rpm would drop to 88% of what it was (the reciprocal of the cube root of 1.46 from the previous result).

The fact that pitch affects power requirements only slightly is very important, because it means that we can make small changes in pitch to improve model performance without having to worry too much about increasing current. For example, if we have a model with a 10×7 prop that has good take-off and climb performance, but poor high-speed performance, we can switch to a 10×8 prop and only increase power required by about 14%. Assuming the motor is near its maximum efficiency point, current will also increase by about 14%, say from 25A to 29A. Larger changes in pitch should be accompanied by a slight reduction in diameter to keep the current levels reasonable.

In practice, changing from one propeller to another will change both the rpm and the power. This is because changing the load on a motor shaft will change the rpm, which will change the power required, which will change the rpm, and so on. The motor and propeller combination will find a new operating point at which the shaft power produced equals the propeller input power required. Next month, I'll talk about how motor output power is related to input voltage, current, and rpm, and how this can be mathematically connected to the propeller formula above to predict what will actually happen.

Airflow

As was mentioned earlier, a propeller is really a rotating wing, and as such, is subject to the same aerodynamic effects as a wing. As a propeller rotates, the blades meet the oncoming air. The angle at which this happens is a function of how fast the air is moving towards the propeller and how fast the propeller is turning. If the air were stationary, the angle of attack of a given section of the blade would be exactly equal to the blade angle at that point.



The relative angle of attack of the airflow to the propeller blade depends on the rotational speed of the blade, and the speed of the incoming air flow.

In reality, the air is not stationary, even if the plane is not moving, because the air accelerates before it reaches the propeller. As a result, from the blade's point of view, the air is meeting it at some relatively low angle, which is the blade's angle of attack.

Like any wing, a propeller blade can stall if the angle of attack is too high. This can happen with a very highly pitched blade when moving at too low an airspeed. It is for this reason that high pitch propellers, like a 10×9 or 12×12 often exhibit poor performance at low airspeeds. A plane equipped with such a propeller will often exhibit poor launch or take-off performance, and then come alive once the model is up to speed.

Also like a wing, if the angle is too low, no lift will be produced. A low pitched propeller on a fast plane (for example, 8×3, 12×5, etc.) can get to the point where it produces no thrust (in a dive, when gravity is providing the force to keep the plane moving). In high speed level flight, thrust from such a propeller can drop too low to overcome drag long before the plane has reached its designed flying speed. According to Astroflight's Bob Boucher, such propellers should be relegated to stirring paint. Of course, this statement was made in the days before slow-flyer models, which often sport very large low pitch props.

For many aircraft, a good compromise is a propeller with a diameter to pitch ratio of about 3:2 or 4:3 (for example, 8×6, 9×6, 10×7, 11×8, 12×8, 12×9, and so on). Such a propeller will become unstalled at relatively low airspeeds (usually below the model's stall speed), and will remain efficient at relatively high flying speeds.

In many full scale aircraft, the propeller has in-flight adjustable pitch, so that it can have a low pitch for maximum take-off thrust, and a higher pitch for optimal cruising efficiency. Some small full-scale aircraft can be fitted with one of three different propellers depending on the need at the time: low pitch for getting heavy loads off the ground but slow cruising, standard for general use, or high pitch for light loads but fast cruising.

Three or More Blades

Most model propellers have only two blades because a two bladed propeller is generally more efficient than a larger propeller that produces the same thrust and air speed. A common misconception is that this is due to the blades operating in each other's' wakes, but this is only a small factor. Remember that the air in which the propeller is turning is moving away from the back of the propeller, so the wake from each blade will move backwards too, leaving clean air for the next blade to bite into. A reasonably pitched propeller would have to have a large number of blades before they start interfering with each other's' air.

That being said however, a multi-bladed prop does have more induced drag caused by tip vortices (air spilling over the blade tips, just like wingtip vortices on a wing), because there are more tips. So,

overall efficiency is lower, in much the same way that a biplane (even one without struts and bracing wires) is less efficient than a monoplane with the same wing area. A multi-bladed prop often has a larger total blade surface area than the equivalent larger two-bladed prop, further reducing efficiency (due to parasite drag).

For best performance, reduced noise, and increased motor life, all propellers should be balanced before use. I use a Top Flite magnetic balancer, which due to its nearly frictionless bearings, will show even the slightest imbalance.

Multi-bladed propellers do have the ability to turn power into thrust and airspeed in less space than a larger two-bladed prop though, which makes them advantageous when ground clearance is an issue (or fuselage clearance for wing or pylon mounted propellers).

Practical Considerations – Balancing

As electric flyers, balancing a propeller is very important. It's important on glow powered models too, but the result of an unbalanced propeller is a lot less apparent, due to the noise and vibration of the engine. On an electric model, an unbalanced propeller is far noisier than a balanced one. Furthermore, an unbalanced propeller wastes power, because it is putting a sideways force on the motor shaft, pushing it against one side of the bearing. It also can also cause the shaft to bend somewhat, which means the motor armature (in a direct drive application) runs off-center, further reducing efficiency.

I use a Top Flite magnetic balancer, and sand material off the back side of the heavy blade as close to the tip as possible (the further from the center you remove material, the less you will have to remove). One of my direct drive models which sounds like a glow model when flown with an unbalanced prop, becomes inaudible at 200 feet when flown with a well-balanced prop of the same brand.

AMA Updates-

Last month, we printed information about The FAA requirement for external markings and AMA's guidance and stance on the new interim rule. The bulk of the article explained who has to register with the FAA, how to register and get your FAA number and how to verify if your registration number is still valid, for those who registered in the past.

During the March Monthly meeting there was a lively discussion with questions like "***why?, what good does it do?, Do we really have to do this?, Is FAA really going to enforce, and what's the penalty?***". So, for clarity, it has not been the club's policy in the past to be an enforcement arm for the Federal Government, but we do instruct our members to follow the guidance and requirements of the AMA as we are an AMA chartered club and enjoy the benefits of flying under their insurance protection. It is our policy to follow AMA's guidance.

Effective **25 February, ALL** Unmanned Aircraft flown outdoors must display their assigned FAA Registration number visibly on the **EXTERIOR** of the aircraft. This is in accordance with the FAA Interim Final Rule issued 13 Feb, 2019. According to AMA, you need to list both your FAA Registration number and your AMA number:

Q: Do I need to list both my AMA number and my federal registration number on my aircraft?
A: Yes, you need to list both your AMA number and Federal registration number on your aircraft**

*****Source: AMA Government Relations Blog -***
https://amablog.modelaircraft.org/amagov/2019/02/13/faa-issues-interim-final-rule-for-external-marking-requirement/

So far, there has been no guidance from either AMA or the FAA on how you go about putting your FAA number on the exterior of your Unmanned Aerial System (UAS) –better known as Plane, Copter, Quad copter, Dirigible, model Blimp, drone or whatever else you fly in the great OUTDOORS. AMA has a short video about the subject showing the number nicely printed and placed on the underside of the landing gear and shows it being written on with a sharpie marker. There is no guidance, as yet on colour, font size, typeface, materials or mounting methods. In that vein, we are lucky, because in Europe, their requirements are the number must be on a plate and affixed with screws or rivets.

There are many options that are readily available. Walmart and Office Depot both sell label makers that use a variety of font sizes and typefaces which print on adhesive backed label strips; some label strips are even clear. One can also get clear sheets for ink jet printers and make a sheet of numbers to be cut out and applied as needed. **Right now it's up to you how, and where you mark your aircraft.**

Remember, if you are uncertain whether or not you have a valid FAA registration, you can access your FAA account at https://faadronezone.faa.gov/#/. This site will allow you to view your personal FAA registration number and expiration date. Also, AMA strongly advises to avoid registering your model aircraft anywhere but at the official FAA website. Please be aware of unofficial registration websites that charge exorbitant fees or require separate registration fees for each recreational aircraft. For any other questions or concerns, contact the AMA government affairs team at 765-287-1256 ext 236 or amagov@modelaircraft.org. The latest information can be found at www.modelaircraft.org/gov, *Model Aviation*, and on social media.

JCRC Sponsors

Hobby Town USA

Located at 3515 Bristol Highway in Johnson City, Hobby Town offers a full range of hobby needs, from model rail roading, to automotive modeling and aviation modeling. A strong sponsor of JCRC, they offer JCRC club members a 10% discount. Phone: (423) 610-1010.

Benedict's Ace Hardware Store

Due to the sale of *Great Planes model parts and accessories*, Benedicts Ace Hardware is discontinuing their aircraft parts sales. Once the current inventory, shown in the picture below, is gone, they will be out of this product line with no plans to restock. Get stuff while you can. They are at 3607 North Roan Street in Johnson City; (423) 282-1950.